



# Regulatory Study and Facilities Implementation Plan for Lone Star Groundwater Conservation District and San Jacinto River Authority

June 2006



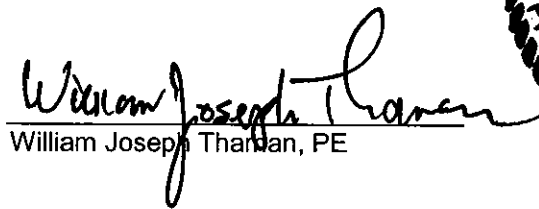
# Regulatory Study and Facilities Implementation Plan

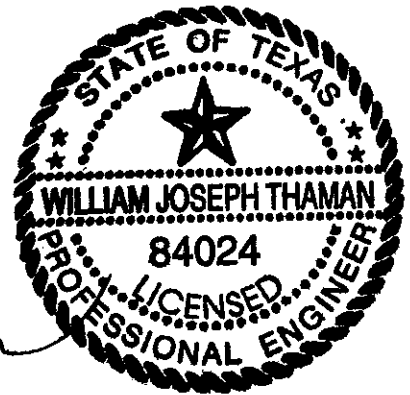
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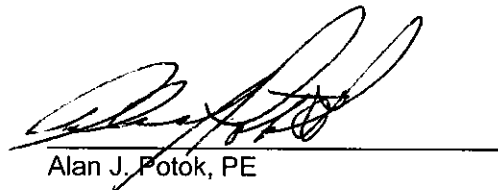
## Lone Star Groundwater Conservation District

and

## San Jacinto River Authority

  
William Joseph Thaman, PE



  
Alan J. Potok, PE

June 2006



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# Introduction

Montgomery County is the 26th fastest growing county in the U.S. and the 5th fastest growing county in Texas. Compared to the 2000 census, population in Montgomery County is projected to increase by 42 percent in the year 2010 and by 192 percent in the year 2040. Montgomery County has been and is currently almost exclusively supplied by groundwater from the Gulf Coast aquifer system.

In 2001, HB 2362 was passed by the 77th Legislature establishing the Lone Star Groundwater Conservation District (LSGCD). Subsequently confirmed by popular vote in Montgomery County later that year, the purpose of the LSGCD is to ensure the protection and beneficial use of the groundwater resources in Montgomery County. In executing its responsibilities the LSGCD established a groundwater permitting and registration system designed to identify all groundwater users in the county. The permitting system has successfully identified more than 500 permittees with requested pumpages totaling more than 68,000 acre-feet per year.

The San Jacinto River Authority (SJRA) manages the surface water resources of the San Jacinto River, including Lake Conroe located immediately outside of Conroe, Texas, in Montgomery County. The current use of surface water from the San Jacinto River is predominantly downstream in Harris County and is used for municipal and industrial purposes. The sustainable yield of Lake Conroe is approximately 100,000 acre-feet annually and is jointly controlled by the SJRA and the City of Houston.

The Texas Water Development Board (TWDB) is the lead water resources planning agency in the state of Texas and the financial resources arm of the state in water supply planning. Since 1997, the TWDB has been engaged in the state water planning process using Senate Bill 1 (SB 1) as a vehicle for collecting localized input from stakeholder groups in planning for the long-term water supply needs of the state. Montgomery County is included in this planning as part of Region H, one of 16 regions defined in the SB 1 process. A product of the SB 1 process is the 2007 State Water Plan. As part of that plan, the annual sustainable recharge rate of the Gulf Coast aquifer in Montgomery County was defined as 64,000 acre-feet. Moreover, the 2007 State Water Plan identified that Montgomery County will require surface water as an alternative to groundwater as a water supply source by 2010 and that the SJRA is the most probable supplier of surface water to that county.

In June 2004, the TWDB in association with the SJRA and the LSGCD entered into a joint planning activity under the State Regional Facility Planning Grant Program to develop a Conjunctive Use of Groundwater and Surface Water Study and Facilities Implementation Plan for meeting the long-term water supply needs of Montgomery County. The investigation includes a study of options for groundwater regulation (GR study) and a Conceptual Facilities Plan. The GR study provides the science and engineering underpinnings for the establishment of groundwater management zones by the LSGCD. It also analyzes the need for reduction in groundwater usage to meet the goals in each zone option identified. The Facilities Implementation Plan is the technical mechanism for implementing the GR study. It sets the timetable for implementation of surface water (or other alternatives) based on goals established in the GR study.

The major tasks to be accomplished in this planning effort were to include:

- Data collection and analysis
- Development of regulatory options and evaluation of management zones for regulation
- Conceptual planning of a wholesale surface water supply system to facilitate the reduction in dependency on groundwater
- Considerations of financial and management options for implementing a wholesale surface water supply system

- Communication with the stakeholder interests in the planning activity and in soliciting support for its implementation

In essence, the planning effort evaluates the projections for water demand in the county and assesses the likely impact of these projections on the piezometric levels of the aquifer using the Northern Gulf Coast Groundwater Availability Model (GAM). The success of varied forms of regulation are then evaluated by imposing different scenarios of groundwater management and reductions and executing these scenarios using the GAM to simulate what future conditions of piezometric levels in the aquifer will be. Once the preferred regulatory option is identified, a surface water system is modeled to determine where and when surface water supplies can be logically implemented.

A detailed synopsis of the Scope of Services under this contract is contained in *Appendix A*. This report is intended to summarize the findings and recommendations of this planning activity.

Public meetings have been conducted throughout the duration of this study, including a final meeting on June 14, 2006, to present the draft report. The comments received during the study and in the final presentation, and any responses to those comments, are contained in *Appendix B*.

# Montgomery County Water Demand

The planning horizon for this study effort is 2040. Population and water demand forecasts were developed by decade starting from 2000 and are consistent with the projections provided by Region H (under SB 1 and the 2007 State Water Plan). However, the objective of this study is to evaluate management zones for regulating the withdrawal of groundwater and therefore requires a more discrete delineation of where within the county these forecasts will occur. Moreover, the disaggregation of water demand must be input into the GAM model in order to simulate the impact that the distribution of water demand will have on the aquifer systems. Therefore, one task in this study was to take the macro level of water demand information provided by the Region H planning and distribute that information to 1-square-mile grid cells within the county to match the GAM model data input format. The following paragraphs describe the process that was used to perform that analysis.

## Region H Water Plan

The Region H Water Plan developed population and water demand projections by use type through the year 2060. Each county in the 13-county region, including Montgomery County, is subdivided into Water User Groups (WUGs) per regional planning criteria that consider population and year 2000 municipal water use. Generally speaking, WUGs represent cities with year 2000 populations greater than 500, water utilities or groups of utilities with year 2000 water usage of more than 280 acre-feet per year or which were designated a WUG by the TWDB Planning Group, and a special WUG called "County-Other" that represents the area of the county left over after individual WUGs have been designated.

The Region H Water Plan subdivides Montgomery County into 35 WUGs. The WUGs are listed in *Table 1* along with 2000-2040 municipal water demands.

**Table 1. Montgomery County Municipal Water Demand by WUG**  
(acre-feet/year)

<b>WUG Name</b>	<b>2000</b>	<b>2010</b>	<b>2020</b>	<b>2030</b>	<b>2040</b>
Conroe	7,175	9,334	10,611	13,190	16,310
Consumers Water Inc.	164	210	237	299	366
County-Other	14,307	21,619	26,954	38,344	51,726
Crystal Springs Water Company	368	564	681	914	1,189
Cut and Shoot	169	210	235	285	348
East Plantation UD	284	439	533	719	937
HMW SUD	1,268	1,625	1,825	2,249	2,737
Houston	82	190	253	375	516
Magnolia	233	275	300	351	412
Montgomery County MUD #18	720	1,685	2,276	3,431	4,784
Montgomery County MUD #19	477	459	452	448	444
Montgomery County MUD #8	651	920	1,085	1,411	1,785
Montgomery County MUD #9	522	856	1,058	1,455	1,917
Montgomery County UD #2	369	526	520	513	507
Montgomery County UD #3	425	472	497	554	624
Montgomery County UD #4	645	924	913	903	892
Montgomery County WCID #1	435	486	512	571	645
New Caney MUD	965	1,371	1,600	2,116	2,670
Oak Ridge North	563	683	748	897	1,067
Panorama Village	605	768	864	1,056	1,153
Patton Village	76	87	88	101	115
Point Aquarius MUD	334	669	873	1,272	1,732
Porter WSC (currently Porter SUD)	1,391	1,847	2,104	2,653	3,305
Rayford Road MUD	999	2,096	2,077	2,059	2,059
River Plantation MUD	811	828	817	806	795
Roman Forest	168	202	222	266	317
Shenandoah	517	512	507	502	497
Southern Montgomery MUD	1,163	1,776	2,149	2,121	2,107
Southwest Utilities	181	241	274	345	426
Splendora	126	188	224	297	383
Spring Creek UD	339	503	593	784	1,010
Stanley Lake MUD	367	682	871	865	859
The Woodlands (CRU/CDP)	13,714	14,671	26,596	28,330	28,197
Willis	424	568	649	816	1,024
Woodbranch	156	152	148	143	139
<b>Total</b>	<b>51,193</b>	<b>68,638</b>	<b>90,346</b>	<b>111,441</b>	<b>133,994</b>

As shown in *Table 2*, most of the total water demand in Montgomery County is from municipal use. On average, municipal use accounts for 89 percent of all water use in the county. Nearly all of the current total water use is supplied by groundwater withdrawn from the Gulf Coast aquifer. All municipal, manufacturing, mining, and steam electric demand was met by groundwater in the year 2000. Irrigation and livestock demands were met by surface water. In the year 2000, 99 percent of all demand was met by groundwater.

**Table 2. Montgomery County Water Demand by Use Type**  
(acre-feet/year)

Use Type	Year 2000 Source	2000	2010	2020	2030	2040
Municipal	Groundwater	51,193	68,638	90,346	111,441	133,994
Manufacturing	Groundwater	1,587	2,045	2,332	2,608	2,883
Mining	Groundwater	414	480	509	526	543
Steam Electric	Groundwater	2,507	5,046	8,537	9,981	11,741
Livestock	Surface water	510	510	510	510	510
Irrigation	Surface water	66	66	66	66	66
<b>Total Water Demand</b>		<b>56,277</b>	<b>76,785</b>	<b>102,300</b>	<b>125,132</b>	<b>149,737</b>

Table 2 shows that in the year 2000, total groundwater demand was estimated at 55,701 acre-feet. Comparatively, the LSGCD permit applications for groundwater in 2005 exceed 68,000 acre-feet. Figure 1 shows the top five groundwater users in Montgomery County based on historic and projected use. This data excludes the WUG's County-Other and HMW SUD – these user groups do not serve a distinct area, but rather multiple areas throughout the county. Historic data through 2004 is from the TWDB Water Use Survey, and the projected data to 2040 is from the Region H plan. The majority of the projected growth by distinct users occurs in The Woodlands and the City of Conroe. The Woodlands in southern Montgomery County is the largest user of groundwater, with a projected use of 28,197 acre-feet per year in 2040. The City of Houston historically has been the third largest producer of groundwater, primarily due to the exportation of roughly 2,500 acre-feet per year from Montgomery County to Harris County to supply Kingwood in northeast Harris County. Since the demand for the exported water is not in Montgomery County, the Region H plan does not reflect the exported groundwater withdrawal.

Figure 1. Historic and Projected Use for the Top Groundwater Users in Montgomery County

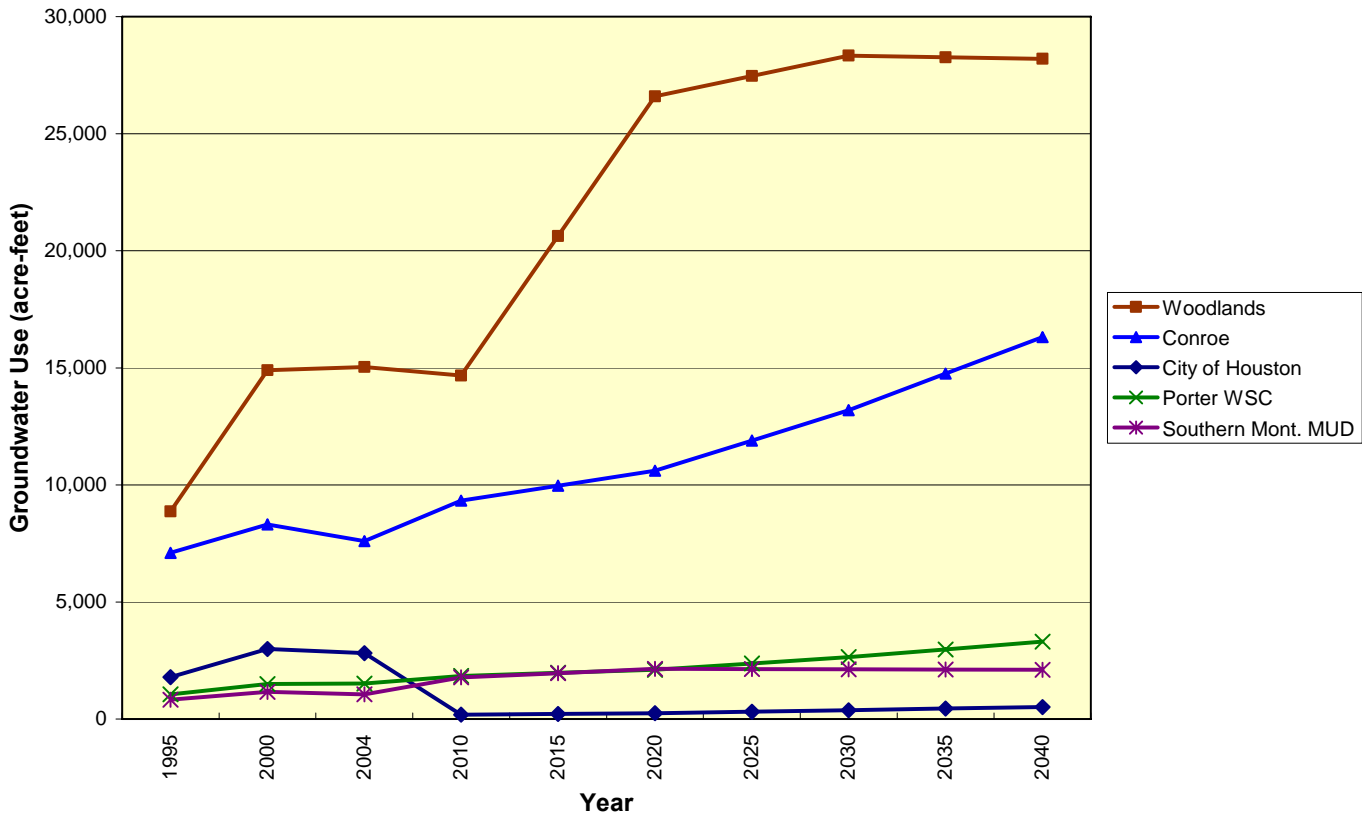




Table 1 lists 35 WUGs in Montgomery County. Figure 2 shows, for the year 2000: the percentage municipal groundwater use for the top four highest demand WUGs, the City of Houston export volume (which is greater than the Houston WUG demand), the County-Other WUG, and the sum of the remaining 29 WUGs. The pumpage from the top five users constitute 49 percent of all municipal use in the county.

**Figure 2. Year 2000 Municipal Use in Montgomery County**

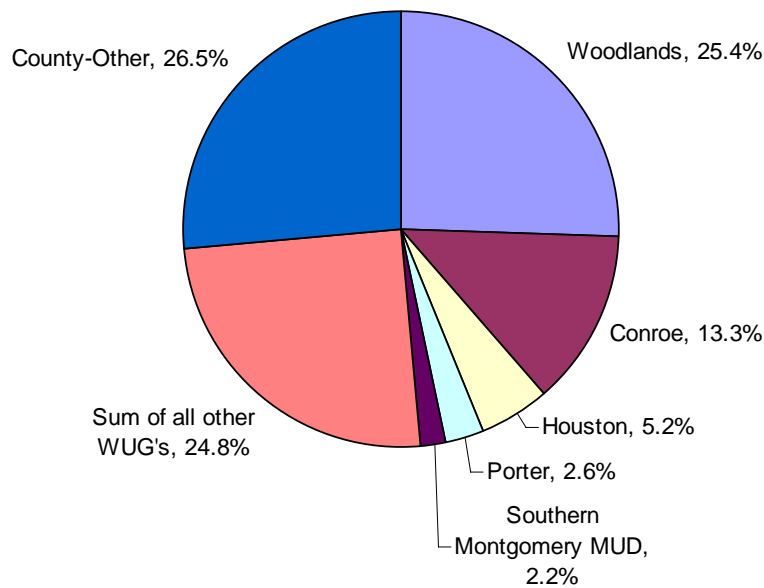
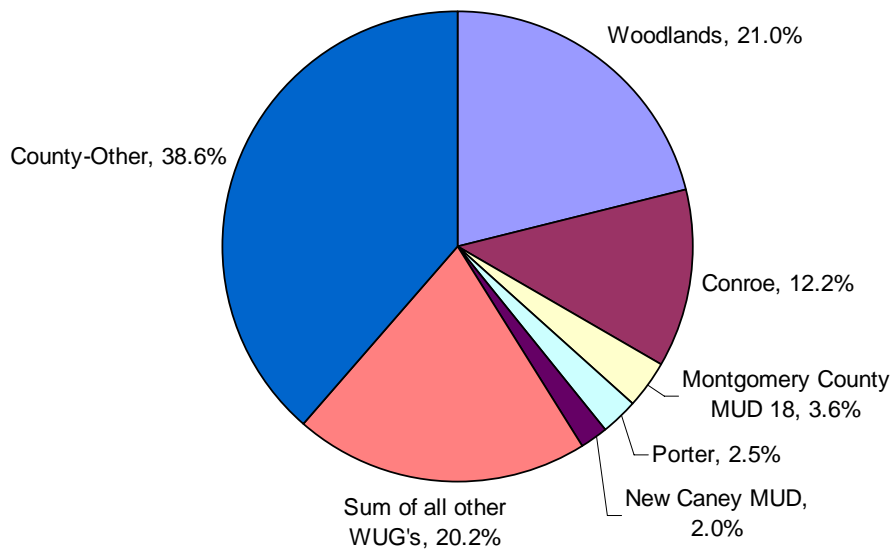


Figure 3 shows, for the year 2040: the percentage municipal groundwater use for the top five highest demand WUGs, the County-Other WUG, and the sum of the remaining 29 WUGs. In this case, pumpage from the top five users amounts to 41 percent of the total municipal use. Pumpage in County-Other represents 38.6 percent in 2040, up from 26.5 percent in 2000. Pumpage in The Woodlands and Conroe still represent a large portion of municipal use in the future, but most of the growth in water demand is occurring relative to the smaller users.

**Figure 3. Year 2040 Projected Municipal Use in Montgomery County**



## Year 2000 Spatial Distribution Methodology

As indicated, it is necessary to disaggregate the historic and projected water demands for the WUG boundaries to distinct 1-square-mile grid cells coincident with the model input format for the computer GAM model. The approach for distributing year 2000 population and total water demand is as follows:

1. For each WUG other than County-Other, obtain the boundaries and the associated public water system wells in Geographic Information System (GIS) format. The public water system well locations were obtained from the Texas Commission on Environmental Quality (TCEQ.)
2. Using the year 2000 U.S. Census blocks, check to see that the population within each WUG boundary is reasonably close to the Region H Water Plan population for the base year (2000). If it is not, use street patterns to make an assumptive adjustment to the WUG boundary that captures the approximate Region H population. In each case where an adjustment was necessary, the initial WUG boundary captured less population than the Region H population and had to be expanded to bring in more population.
3. For each WUG other than County-Other, evenly distribute the year 2000 total demand to the public water system wells.
4. For the County-Other WUG, divide the region according to year 2000 U.S. Census blocks. Sum up the census block populations to verify that the County-Other population is reasonably close to the Region H 2000 population. It is not critical that these population numbers match exactly because the WUG demand will be matched by using ratios (see step 6).
5. Create a GIS point shapefile that represents “demand locations,” either WUG public water system wells if the WUG is municipal and not County-Other, locations of manufacturers that responded to the TWDB water use survey for the Manufacturing WUG, wells at the power plant east of Lake Conroe for the Steam Electric Power WUG, a single estimated location for the Mining WUG, or census block centroids for County-Other.
6. For each WUG, including County-Other, distribute the year 2000 total demand to each demand location according to its population. Since populations within each WUG may not sum to be exactly the population in the Region H plan, it was decided not to use the per capita use factors to calculate total demand. To calculate the demand at each demand location, the total demand for the WUG is multiplied by the ratio of the demand location population to the total WUG population. In this way, the spatially distributed WUG demand equals the Region H total demand for that WUG.

## Population and Demand Projection Methodology

Similarly, the approach for projecting population and total demand through year 2040 is as follows:

1. Obtain population trend analysis from the University of Houston Center for Public Policy for the years 1990-2050 (Small Area Model – Houston). This analysis predicts population growth by U.S. Census tract for Montgomery County and is explained below.
2. Using the trend analysis obtained in step 1, and limiting WUG populations and total demands to Region H projections, project the population and total demand at each demand location for each decade from 2010 through 2040. The effect of the trend analysis is most notable for the WUG County-Other: the sums of population and demand equal the Region H projections; however, the projections are weighted according to the predicted growth for the census tract in which they fall.

## Small Area Model – Houston

The Small Area Model – Houston (SAM-Houston) was developed by Dr. Steven Craig, Professor of Economics at the University of Houston. The goal of SAM-Houston is to provide population and employment forecasts by census tract for the Houston metropolitan area. This is an ambitious goal, as there has not been an available statistical methodology for projecting future population and employment at the micro-geographic level. SAM-Houston population and employment forecasts are available for the five-county metropolitan region, encompassing Harris, Montgomery, Fort Bend, Liberty, and Waller Counties.

The SAM-Houston model contains two modules. The first, the statistical module, captures urban development theory in a statistically appropriate fashion. The second module, land use, describes how the statistical results are modulated by current land use data. The statistical module is the core, as it translates established urban development theory into a statistical model for the Houston metropolitan area. The second module compares the statistical forecasts to the available developable land, and adjusts the forecasts to reflect current land use patterns. The goal of this modeling strategy is to develop a flexible planning tool, appropriate for widely disparate applications.

## LSGCD Permitting System

The LSGCD (also “district”) maintains a database of permitted water use in Montgomery County. This database has been reviewed to determine the volume and location of permitted groundwater withdrawal. Before a discussion of this review it is necessary to define the types of wells and what information the district maintains for each type. Any references to LSGCD rules are from the districts’ amended rules dated February 8, 2005, (see district rules at <http://www.lonestargcd.org> for more information).

LSGCD Rule 3.1(a) states that “an Operating Permit, a Historic Use Permit, or an amendment thereto is required to produce water from a non-exempt well, to substantially alter the size or capacity of a non-exempt well, or to alter an exempt well if the alteration would render the well non-exempt.” Wells that are exempt from this requirement are defined by Rule 3.9(b) as follows:

1. a new or existing well that is drilled, completed, or equipped so that it is incapable of producing more than 25,000 gallons of groundwater a day and that is used solely for domestic use or for providing water for livestock or poultry;
2. the drilling or operation of a water well used solely to supply water for a rig that is actively engaged in drilling or exploration operations for an oil or gas well permitted by the Railroad Commission of Texas provided that the person holding the permit is responsible for drilling and operating the water well and the well is located on the same lease or field associated with the drilling rig;
3. the drilling of a water well authorized under a permit issued by the Railroad Commission of Texas under Chapter 134, Texas Natural Resources Code, or to production from such a well to the extent the withdrawals are required for mining activities regardless of any subsequent use of the water;
4. a new or existing well to be used solely for domestic or livestock use with the capacity to produce more than 25,000 gallons of water per day that will produce a total of less than 9,125,000 gallons of water per year; or
5. leachate wells, monitoring wells, and dewatering wells.

While certain wells are exempt for permitting, a well owner is required to register all new wells and existing wells larger than 4 inches in column pipe diameter for which they have not obtained a permit, except those exempted

under subsections (a)(3) or (5) of Rule 3.9, namely Railroad Commission wells, leachate wells, monitoring wells, and dewatering wells. A well is registered by submitting an application for well registration to the district.

In terms of the current study, the most important types of wells are those that are associated with an Operating Permit, or Historic Use Permit. The primary reason for this is that under the current LSGCD rules, exempt wells will not be affected by the district's groundwater regulatory study; e.g., if you own a well that serves a single-family house, you are not subject to the LSGCD permitting regulations and you will therefore not be required to convert to surface water. Secondly, exempt use currently accounts for a small percentage of the overall groundwater use in the county and is not a major contributor to problems such as significant aquifer water level declines. Conversely, Operating Permits and Historic Use Permits account for the majority of the water use, and in many cases are associated with high-capacity wells that serve high-density residential or commercial development through a distribution system. It is the areas of high-density development that are most prone to problems of significant aquifer water level decline.

Under current LSGCD rules, there is an important distinction between Operating Permits and Historic Use Permits. Under LSGCD District Rule 4.4 dealing with management zone proportional adjustment, exempt use is satisfied first followed by Historic Use Permits then Operating Permits. What this means is that, if there is insufficient water available in a management zone to satisfy everyone, owners of Operating Permits will be the first ones required to make reductions in groundwater withdrawals. If water availability is still deficient, even Historic Use Permit authorized amounts may be reduced. See District rules at <http://www.lonestargcd.org> for more information on Operating Permits and Historic Use Permits.

The LSGCD permitting database stores the data for exempt wells, Operating Permits for non-exempt wells, and Historic Use Permits for non-exempt wells. *Table 3* shows a summary of permitted and pending applications for groundwater compiled from the permitting database in June 2005.

**Table 3. Total Permitted Groundwater in Montgomery County in 2005**

	<b>Count</b>	<b>Gallons</b>	<b>Acre-Feet</b>
HUP	253	18,651,165,375	57,238
HUP AG	27	565,530,559	1,736
HUP TRANSPORTATION	1	63,897,000	196
Total HUPs	281	19,280,592,934	59,170
OP	215	3,046,802,362	9,350
AG OP	5	29,181,702	90
OP TRANSPORTATION	3	206,103,000	633
Operating Permits Pending Approval	16	111,184,325	341
Total OP	239	3,393,271,389	10,414
<b>Total Permitted Groundwater</b>	<b>520</b>	<b>22,673,864,323</b>	<b>69,584</b>

The total Historic Use Permit volume of 59,170 acre-feet per year represents the sum of the maximum year of historic use claimed during the Historic Use Permit application period. The application period ended in 2003 so the total requested volume of all Historic Use Permits will not go above this number. The district has not yet performed technical reviews on the Historic Use Permit applications at the time this report was written. Only when the LSGCD general manager issues permit recommendations and the Historic Use Permits go through application hearings before the LSGCD Board will the final Historic Use Permit volume be known. The total Operating Permit volume of 10,414 acre-feet per year represents the total volume of all Operating Permits as of September 2005. The total Operating Permit volume will continue to increase as new permits are approved each month.

The total volume of permitted groundwater in Montgomery County was 69,243 acre-feet per year in September 2005. This number does not take into account the volume of water used by exempt domestic wells. The permitting database currently has information on 1,420 exempt wells. Most of these registered wells do not have usage information since most house wells are not metered. There is no way to know what percentage of domestic wells are registered, but a rough estimate of exempt use can be obtained by looking at how much municipal use is permitted, estimating the number of people served by those permits, and comparing this to the county population. Going through this exercise, it is estimated that domestic use is roughly 3,000 acre-feet per year or approximately 4 percent of the total municipal use in the county.

The combination of permitted non-exempt use and estimated exempt use in Montgomery County is roughly 72,000 acre-feet per year, which is 7.5 percent higher than the prorated Region H plan groundwater demand of 67,000 acre-feet per year for the same point in time. It is not surprising to see the permitted volume be slightly higher than the volume reported in the regional planning. The volume of water from operating permits and historic use permits does not typically reflect how much water is actually being withdrawn in any given year. The volume of water actually withdrawn from the aquifer in any given year depends to some extent on climate and variations in usage patterns. The actual usage can be higher or lower than usage indicated in the regional planning due to climate alone. Additionally, roughly 85 percent of the permitted withdrawals are associated with Historic Use Permits. The Historic Use Permit volume typically reflects the peak year in the historical usage for each user. Most years will see usage lower than what is claimed in the Historic Use Permits. It is also possible that the Historic Use Permit volume will go down once the LSGCD finishes technical review and permit consideration of all Historic Use Permits.

In its 2004 Groundwater Management Plan, the LSGCD estimates the amount of usable groundwater available from the Gulf Coast aquifer system to be 64,000 acre-feet per year, based on the preliminary rate of annual recharge to the aquifer defined by the TWDB. The total volume of permitted and pending applications for groundwater alone is 69,584 acre-feet per year, which exceeds available supply by 5,584 acre-feet per year. As the difference between demand and supply increases with increasing population, aquifer water levels will generally continue to decline if the total demand is met by groundwater alone. The LSGCD established a planning objective of conserving the long-term reliability of the aquifer in Montgomery County as a precursor to defining any form of regulatory study. In doing so, the LSGCD established planning criteria that would match the regulated groundwater withdrawal to the sustainable recharge rate of 64,000 acre-feet annually.

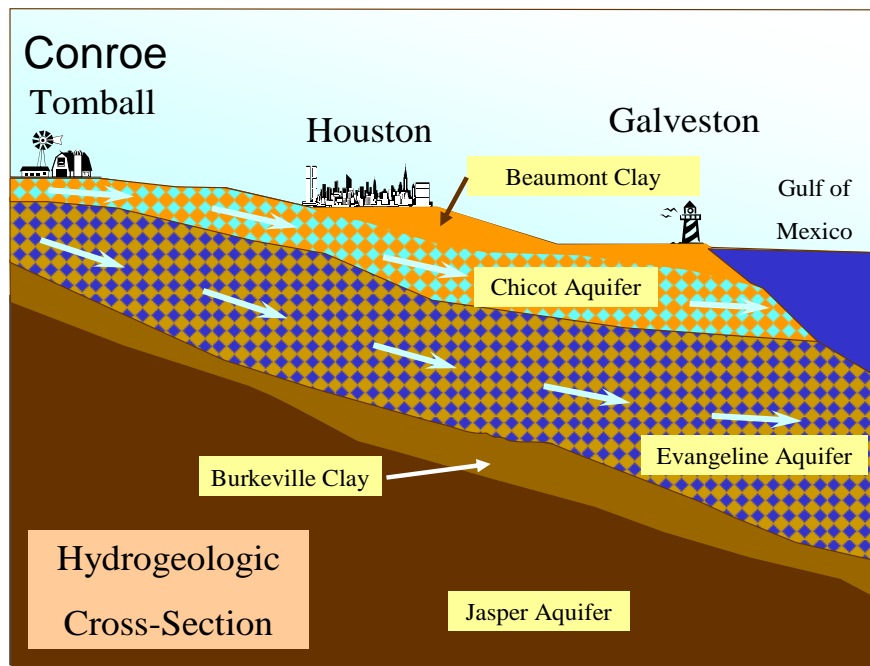
# Groundwater Management Zone Options

The purpose of the evaluating management zone options is to establish a set of planning criteria consistent with the LSGCD rules that encourages the conservation of groundwater resources through a series of timed reductions in permitted allotments. Based on the data collected from the LSGCD permitting system, the total current requests for annual permits of 69,584 acre-feet exceed the defined sustainable recharge rate to the aquifer of 64,000 acre-feet. In its rules, the LSGCD provides for establishing one or more Management Zones for purposes of determining how much water can reliably be permitted and still meet the planning criteria of matching groundwater withdrawal to sustainable recharge. This groundwater regulatory (GR) study provides the science and engineering underpinnings for the establishment of management zones and goals for each zone by the LSGCD, as well as the establishment of a Groundwater Reduction Plan (GRP) or similar regulations for each zone. It also establishes a need for reduction in groundwater usage to meet these goals. This chapter discusses the Gulf Coast aquifer system, the possible impacts of not developing a GRP, the goals of a GRP, and the definition of management zones under a GRP.

## Gulf Coast Aquifer System

The groundwater resource in Montgomery County is the Gulf Coast aquifer system, which comprises the Chicot, Evangeline, and Jasper sands. The Jasper aquifer is separated from the Evangeline aquifer by the Burkeville confining zone, a layer of clay and sandstone that is relatively impermeable except in limited areas. A down-dip cross-section of the Gulf Coast aquifer system is shown in *Figure 4*. The three water-bearing units of the Gulf Coast aquifer system are the Chicot, Evangeline, and Jasper aquifers, each of which outcrop to some extent in Montgomery County. The thickness of each of these water-bearing aquifer subdivisions increases toward the coast. The total thickness of both the Evangeline and Jasper aquifers reaches more than 1,000 feet into southeastern Montgomery County.

**Figure 4. Gulf Coast Aquifer System Cross-Section**

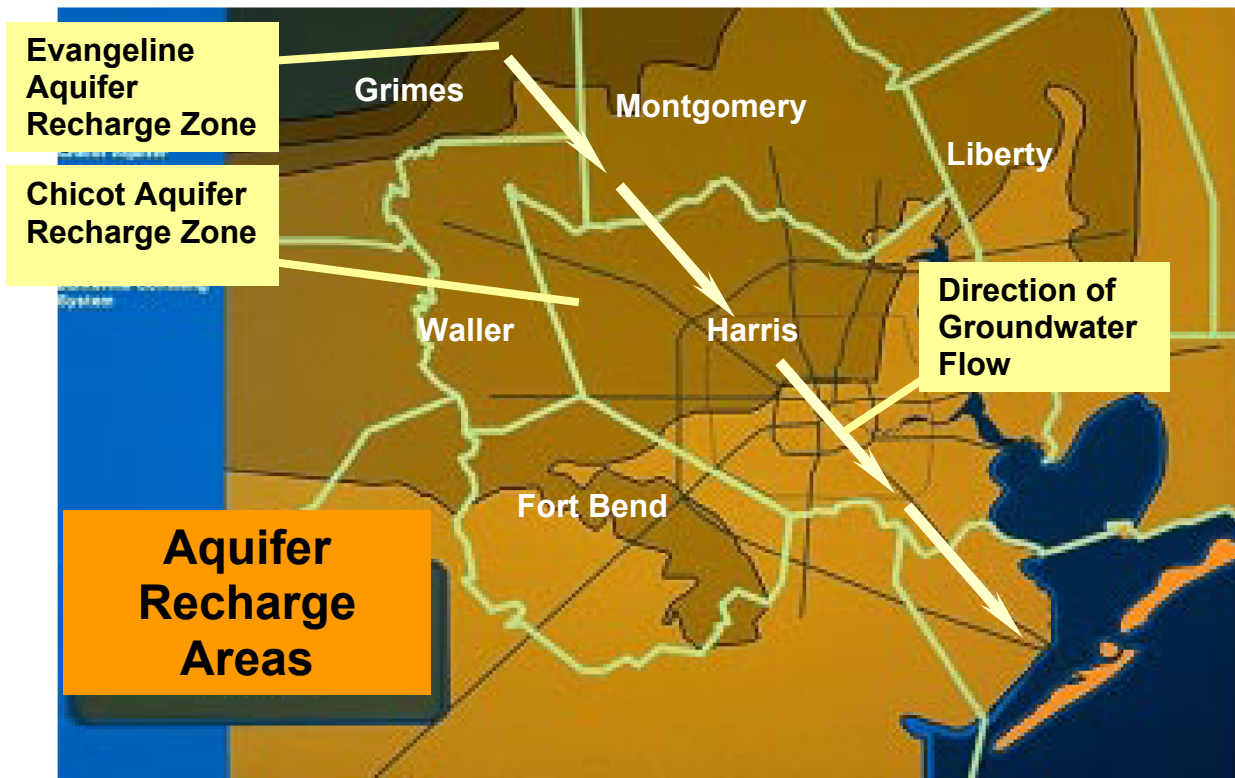


Source of graphic: Harris-Galveston Coastal Subsidence District



The three aquifers of the Gulf Coast aquifer system are recharged from precipitation percolating into the aquifer. As indicated in *Figure 5*, a major portion of Montgomery County is in the recharge area for the Chicot sands. A portion of northwest Montgomery County is in the recharge area of the Evangeline sands. The recharge area for the Jasper sand is located north and west of the county. Water generally flows through the Gulf Coast aquifer system in the direction from northwest to southeast.

**Figure 5. Gulf Coast Aquifer System Recharge Areas**



Source of graphic: Harris-Galveston Coastal Subsidence District

In its 2004 Groundwater Management Plan, the District estimates the amount of usable groundwater available from the Gulf Coast aquifer system to be 64,000 acre-feet per year, based on preliminary data from the North Gulf Coast GAM by the U.S. Geological Survey. This estimate assumes 1.1 inches of the annual rainfall is recharged over the outcrop areas of the aquifers in the county.

The *LSGCD Groundwater Resources Management Information Report* estimates the amount of water in storage in each aquifer subdivision. The storage estimates, derived from geophysical well logs and an assumed porosity of 30 percent, are 14 million acre-feet in the Chicot aquifer, 33 million acre-feet in the Evangeline aquifer, and 34 million acre-feet in the Jasper aquifer.

## Potential Impacts of Unconstrained Pumping in Montgomery County

While there is a considerable volume of water in storage in the Gulf Coast aquifer, withdrawing water at a rate higher than the annual recharge rate of 64,000 acre-feet will result in depleting the aquifer over time. Water levels in monitor wells already show declining water levels over most of the county. The Region H Water Plan indicates that water demand is expected to increase from 54,737 acre-feet in the year 2000 to over 150,000 acre-feet by the year 2040. If groundwater withdrawals are allowed to increase at that rate of demand, water levels will continue to decline accordingly.



The U.S. Geological Survey (USGS), in cooperation with LSGCD, HGCD, City of Houston, and Fort Bend Subsidence District, monitors water levels over time in Harris and surrounding counties. *Figures 6 and 7* show water level change contours for the period 1990 - 2004 in the Chicot and Evangeline aquifers, respectively. The majority of water level observations in the Chicot aquifer from 1990 through 2004 are in Harris County, with little data available for Montgomery County. The small portion of Montgomery County that is contoured in *Figure 6* shows water level decline of approximately 100 feet in southern Montgomery County just west of IH 45. *Figure 7* shows water level changes in the Evangeline aquifer, with the area around The Woodlands exhibiting approximately 120 feet of decline from 1990 to 2004.

**Figure 6. 1990-2004 Chicot Aquifer Water-Level Change**

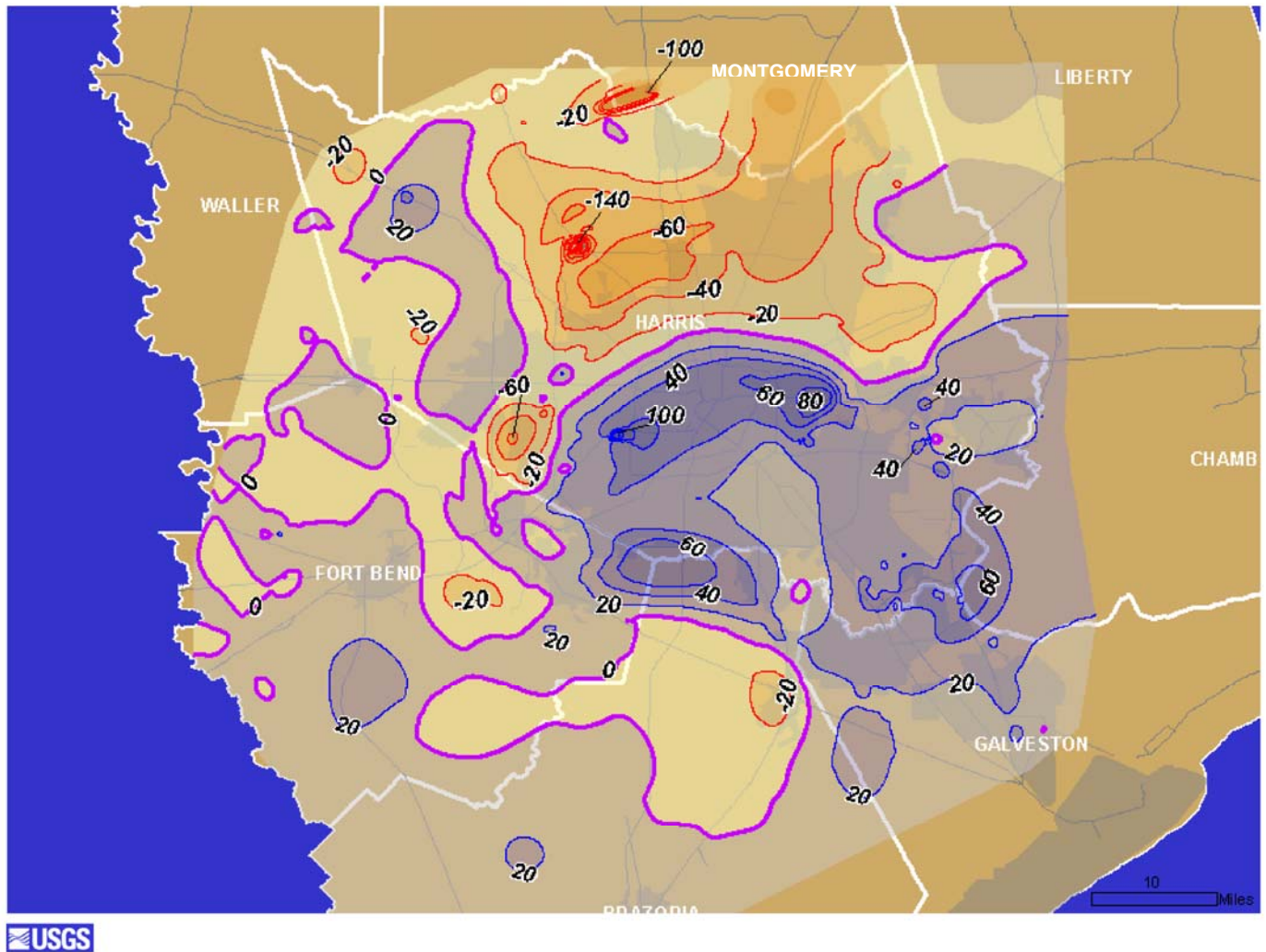


Figure 7. 1990-2004 Evangeline Aquifer Water-Level Change

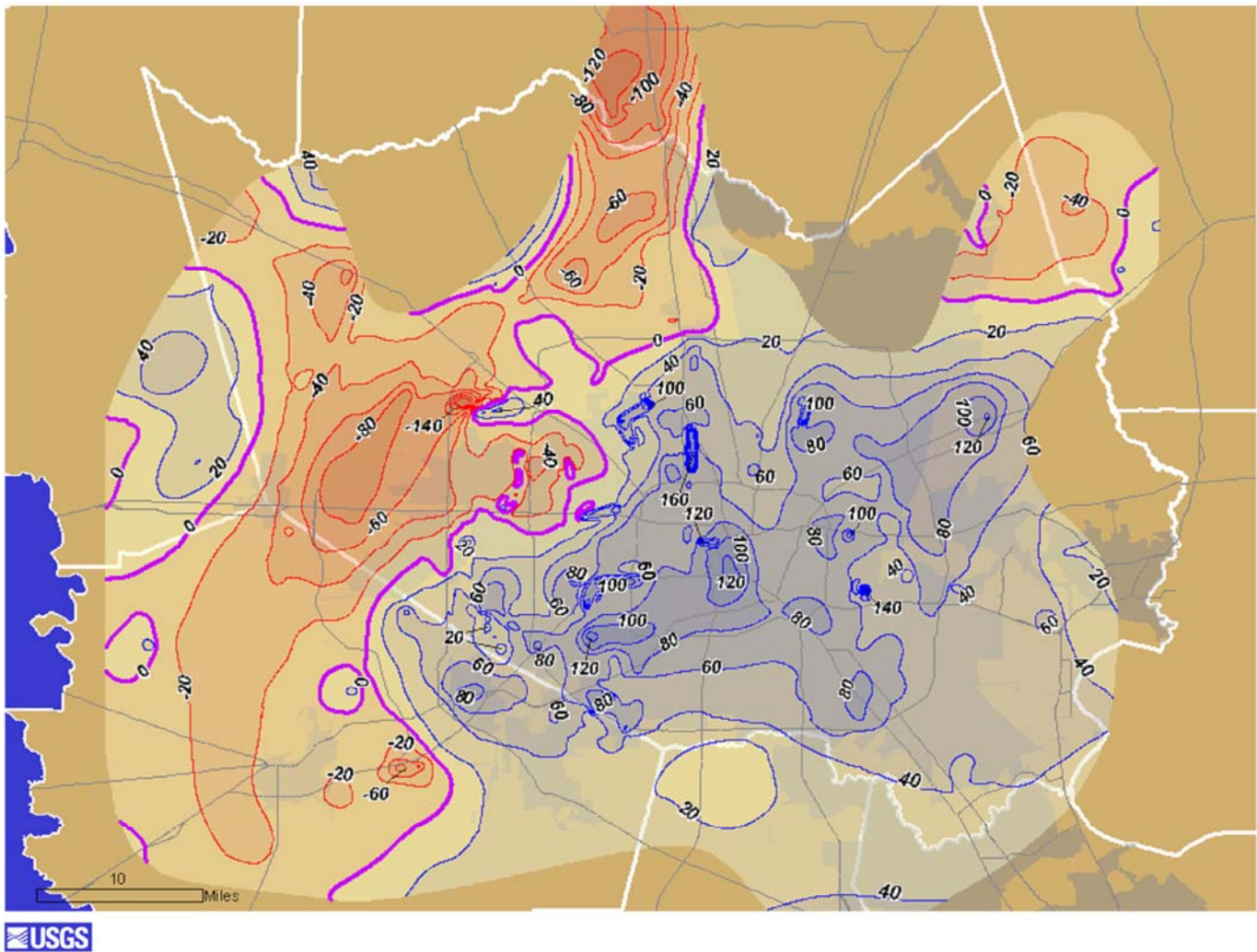
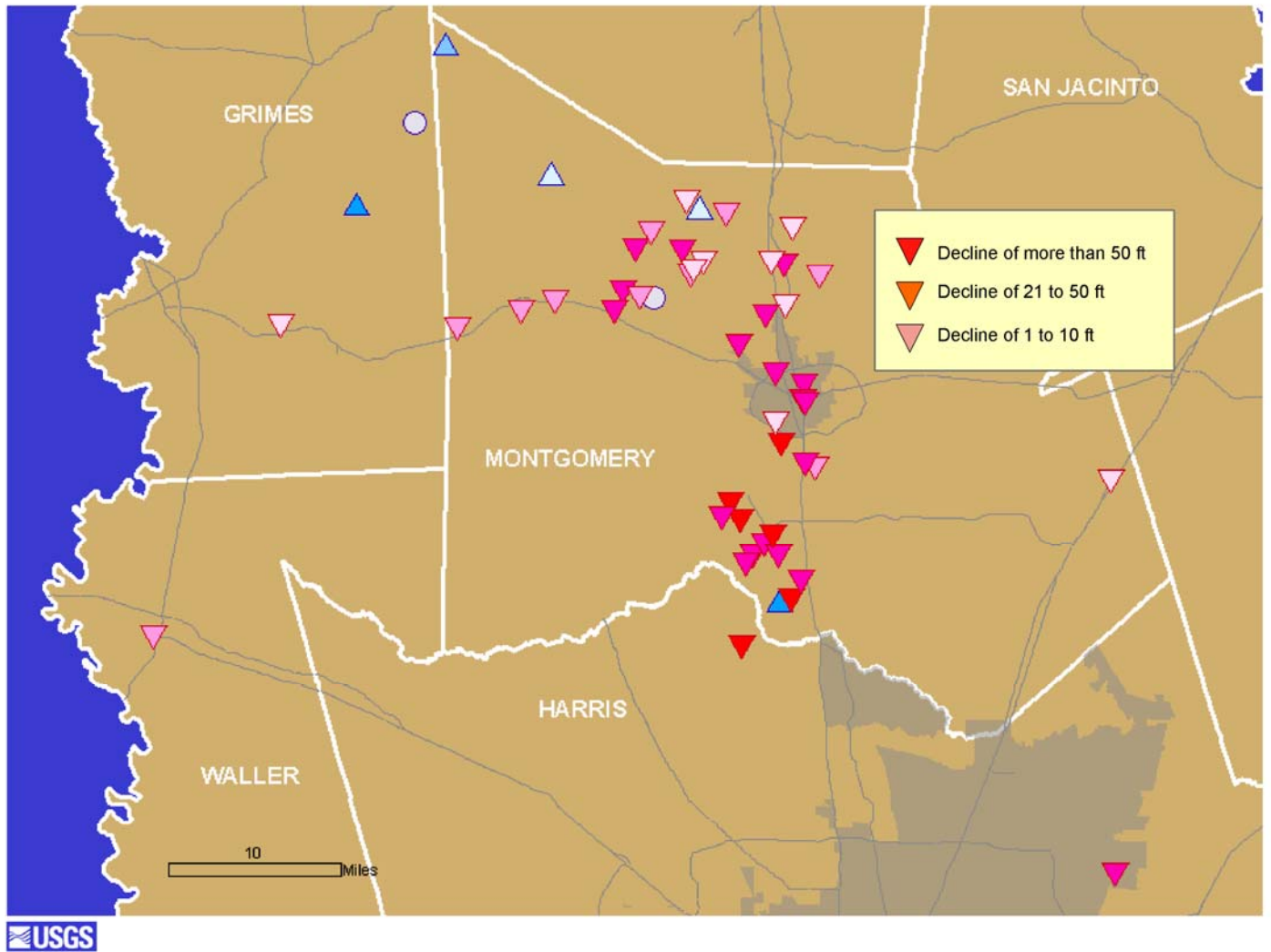


Figure 8 shows water level changes measured by USGS in the Jasper aquifer for the period 2000 – 2004. Most of the water level changes are declines (denoted by downward pointing triangles) in the range of 11-20 feet, primarily along the IH 45 corridor and near Lake Conroe, with some declines of more than 50 feet in the vicinity of The Woodlands.

**Figure 8. 2000-2004 Jasper Aquifer Water-Level Change**

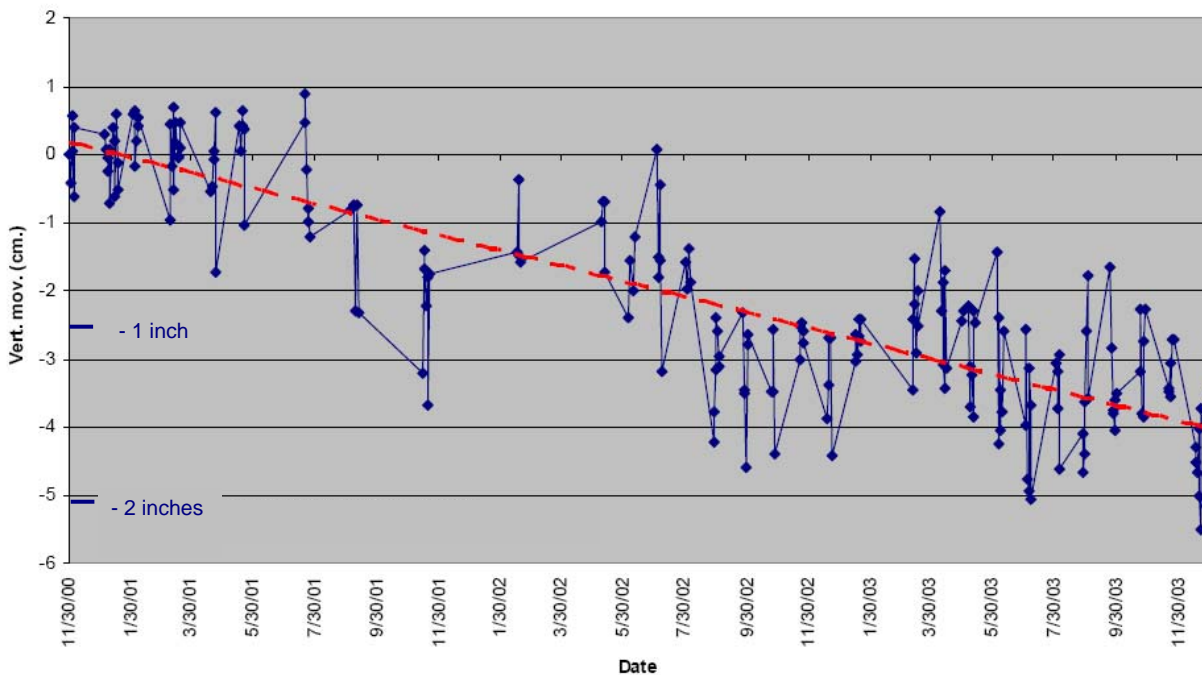




Long-term water level declines have been associated with land subsidence in the Gulf Coast aquifer, particularly in Harris and Galveston Counties. Subsidence in the Gulf Coast aquifer region is a significant enough issue to warrant a subsidence monitoring program in Harris, Galveston, Fort Bend, Brazoria, Montgomery, and Chambers Counties by the HGCD. The HGCD utilizes a combination of extensometers and Geographic Positioning System (GPS) Port-A-Measure (PAM) trailers to record land surface elevation changes continuously. The 14 extensometers are located in Harris and Galveston Counties, and the 8 PAM trailers are moved between 29 permanent sites in several counties including Montgomery County. One PAM site is located in The Woodlands in southern Montgomery County. Figure 9 shows vertical movement recorded at this site from November 2000 to November 2003. The general trend of this data shows a downward movement of the land surface of approximately 0.54 inches per year.

**Figure 9. Vertical Movement in Woodlands GPS-PAM 13 Monitor Site From 2000 to 2003**

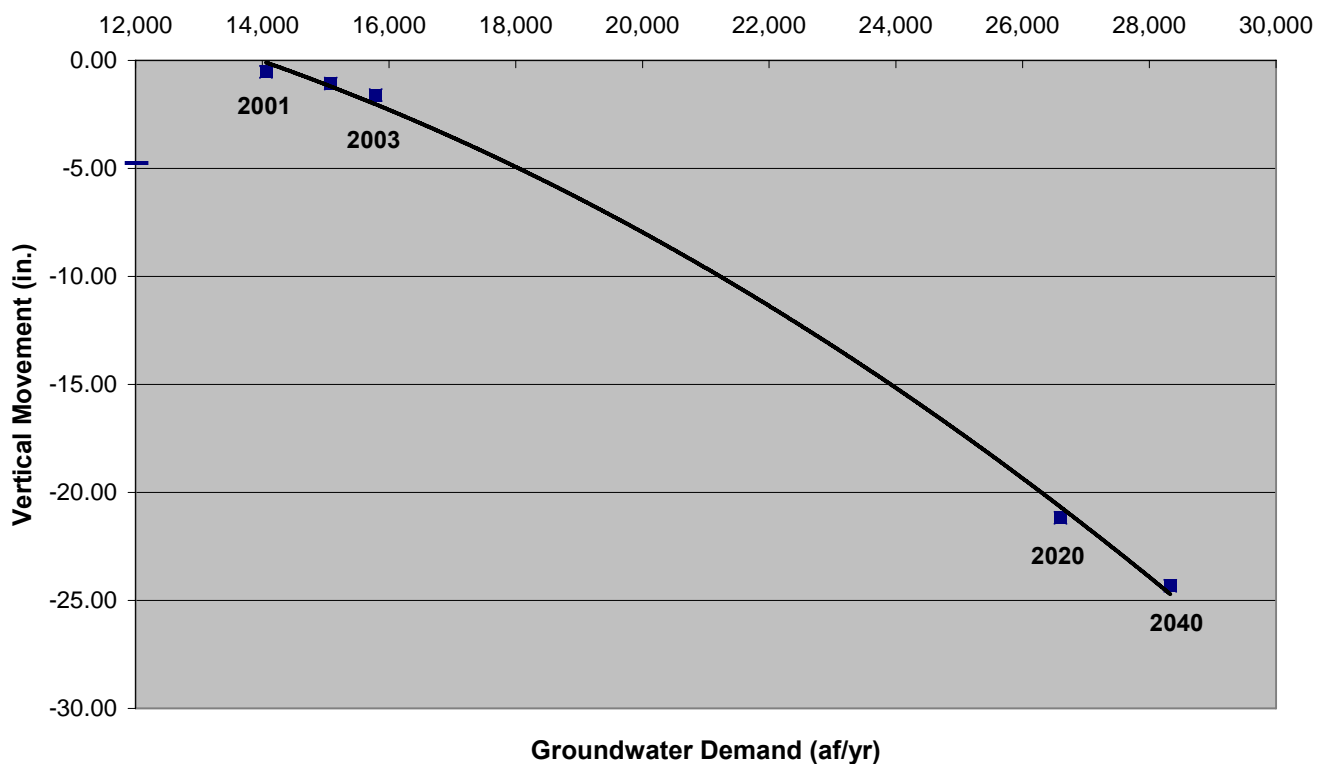
Vert. mov. of PAM 13 w.r.t. ADKS up to 12/31/03 = -0.54 inches/year



Reference: Harris-Galveston Coastal Subsidence District

It is difficult to predict, based on limited information, the magnitude of land surface movement in the future due to increased groundwater withdrawals. Correlating pumpage in The Woodlands to measured land surface movement and projecting to year 2040, *Figure 10* shows that there may be reason to expect as much as two feet of subsidence in The Woodlands if groundwater withdrawals are not curtailed. The most significant potential problem associated with land subsidence is altered drainage patterns, resulting in increased flooding. Subsidence may be an issue facing Montgomery County if groundwater withdrawal is not curtailed, but without more information and detailed compaction modeling, it is uncertain as to how widespread and severe the impacts may be. The effects of subsidence are definitely noticeable in some areas on the Gulf Coast, where subsidence can be severe and the land is sinking into the sea, but generally speaking, the effects of small-scale subsidence are not readily noticeable.

**Figure 10. Projected Vertical Movement of Woodlands GPS-PAM 13 Subsidence Monitor Site Projected to Year 2040**



Subsidence is not the only adverse effect caused by declining water levels. Other problems include increased infrastructure costs and potential water quality degradation. Increased infrastructure costs are associated with having to drop the pump levels or having to replace a well when the pump levels are at a minimum or the well is too inefficient. One-time costs are incurred each time the well equipment is modified or the well is replaced, and operational costs are incurred due to decreased well efficiency from lowered screen length or air entrainment.

Water quality degradation of the water supply increases costs when wells are taken out of service or a portion of well screen is blocked off and, if severe enough, can limit the supply of usable water. Water quality degradation is associated with water level declines in North Harris County in the form of unacceptable arsenic and radioactive constituent concentrations. Concentration of these constituents can increase as water levels decline and the saturated thickness of the water-bearing formations decrease; there is not as much water available to dilute contaminants contained in the soil. That is not to say that the concentration of harmful constituents will always

increase with increasing water level decline. It is also possible that in certain cases the water level could drop below a radionuclide band for instance, resulting in a *decrease* in radionuclide concentration.

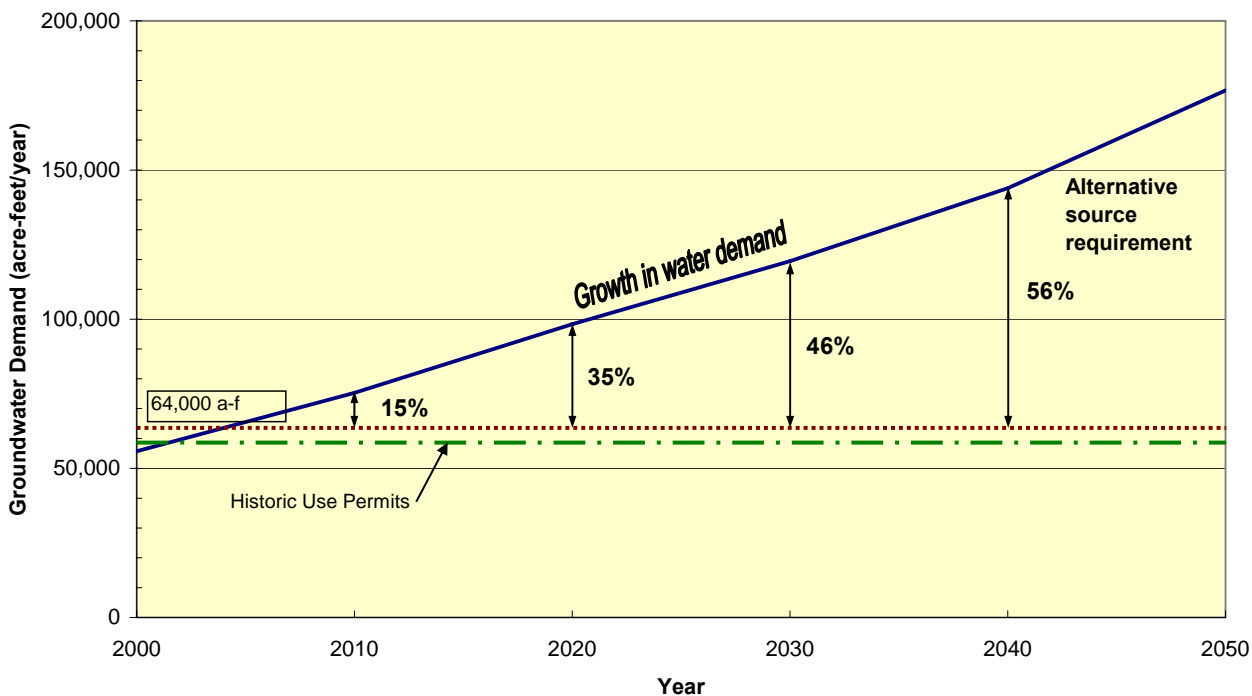
Water quality issues are severe enough in some North Harris County districts as to significantly reduce the amount of usable water that can be delivered to their customers. Montgomery County, on the other hand, has not experienced significant water quality issues to date, but there are signs of potential problems. Porter SUD in southeast Montgomery County shut down a well due to Gross Alpha Activity above the Maximum Contaminant Level (MCL). It is also reported that Crystal Springs Water Company, a water service adjacent to Porter SUD, has also had to shut down one of their wells. There is nothing to indicate at this point that Montgomery County will be plagued by water quality issues due to increased groundwater withdrawal, but the potential exists.

## Groundwater Reductions

The volume of groundwater available for withdrawal in Montgomery County, as reported in the District's 2004 Groundwater Management Plan, is 64,000 acre-feet per year. In order to maintain withdrawals at this level, groundwater demand that exceeds 64,000 acre-feet per year will need to come from one or more alternative sources. The alternative source for large demands is surface water, but lower demand volumes can be met by conservation and/or wastewater re-use. Conservation is something that the District has promoted in the past and will even more strongly promote in the future.

As shown in *Figure 11*, the groundwater demand has presently exceeded the available supply in Montgomery County. By 2010, 15 percent of the demand must come from an alternative source, and by 2040, 56 percent, in order to meet management goals. The volume of water required from an alternative source through 2040 ranges from 11,311 acre-feet per year in 2010 to 79,851 acre-feet per year in 2040.

**Figure 11. Projected Required Reduction in Groundwater Usage**



The above graphic is intended to define the timelines appropriate for groundwater reduction, ignoring any other practical constraints, the most fundamental being the availability of an alternative supply of water to meet the growing demand. Nevertheless, the timetable provides a guideline for when reductions in groundwater are appropriate to meet the project objectives and planning criteria. The mechanism to implement these reductions is through the concept of Management Zones.

## Management Zone Options

A management zone establishes the geographic boundary and allowable groundwater withdrawal within that boundary at a certain point in time. It has the potential to set periodic “milestone” dates for groundwater reduction and to allow for continued growth of groundwater between the milestone dates within the management zone. This study evaluated several alternative scenarios of management zones ranging from one to five within the county. Each zone concept was evaluated against the GAM model to determine its effectiveness in managing the aquifer resource.

## Creation Authorization

*Section 4* of the LSGCD district rules adopted February 8, 2005, is entitled “Management Zones.” Rule 4.1 states:

Using the best available hydrogeologic and geographic data, the Board shall by resolution no later than January 1, 2007, divide the District into zones for the administration of groundwater management and regulation in the District. These management zones shall serve as areas for which the District shall determine water availability, authorize total production, implement proportional reduction of production amongst classes of users, and within which the District shall allow the transfer of the right to produce water as set forth in these Rules. The District shall attempt to delineate management zones along boundaries that, to the extent practicable, will promote fairness and efficiency by the District in its management of groundwater, while considering hydrogeologic conditions and the ability of the public to identify the boundaries based upon land surface features.

Rule 4.2 discusses the potential increase or decrease in the allowable groundwater withdrawal amount within each management zone based upon the total amount of production and groundwater available from recharge in each zone. It indicates that the District, every five years, will use the best scientific information available to determine the amount of recharge available for withdrawal in each management zone, based upon the District Management Plan, and the amount of actual annual production from permittees, registrants, and exempt users in each management zone.

Rule 4.3 specifies that new operating permits may be issued in a management zone where proportional adjustment regulations have been established under Rule 4.4 only if water is available after all proportional adjustments to existing permits have been made. Rule 4.4, dealing with proportional adjustment, allows the District to regulate management zones such that, where permitted withdrawals exceed the availability within a zone, the District can proportionally allocate the available water by reducing the authorized production amounts in Historic Use Permits and Operating Permits until authorized production equals water availability in that zone. Water is allocated first to exempt use, then to Historic Use Permits, and finally to Operating Permits. It is safe to assume during the planning horizon that there will always be enough water to satisfy exempt use since the volume of exempt use is roughly 3,000 acre-feet per year; therefore, the focus is on satisfying Historic Use Permits and Operating Permits, in that order.

Under proportional adjustment, if Historic Use Permits cannot be satisfied, their authorized amounts are reduced on an equal percentage basis until total authorized production equals water availability within that management zone. No water will be authorized for Operating Permits where the full Historic Use Permit amounts cannot be satisfied. If all Historic Use Permits can be satisfied, water is allocated to Operating Permits. If not all Operating

Permits can be satisfied, their authorized amounts are reduced on an equal percentage basis until authorized production equals water availability within that management zone. No new Operating Permits will be approved unless the full authorized production amounts of existing Operating Permits can be satisfied. Only in the case where all Historic Use Permits and Operating Permits can be satisfied and additional water is available within a management zone, can new Operating Permits or amendments to Operating Permits or Historic Use Permits requesting additional water be granted.

Rule 4.4 subsection (f) deals with developing the proportional adjustment regulations such that, where reduction of authorized production or a prohibition on authorization for new or increased production is considered, reasonable time is allowed for water users to secure alternate sources of water. It also allows for situations where an alternate source of water is not readily available or is not competitively priced, or where compliance with the rules constitutes an arbitrary taking of property or the closing and elimination of any lawful business, occupation, or activity.

## Management Zone Alternatives

From review of the LSGCD permitting system, approximately 80 percent of the groundwater demand can be identified in five geographic areas (*Figure 12*):

- The south central area including The Woodlands and water districts along IH 45 south of Conroe
- The central area including Conroe and its extraterritorial jurisdiction
- The areas around Lake Conroe and the SH 105 corridor
- Southeast Montgomery County including the City of Porter
- The southwest area of the county

Lacking better information on the variation of groundwater recharge within the county, it was determined that the appropriate method for allocating allowable groundwater withdrawal within a management zone was to pro-rate the total recharge capacity of 64,000 acre-feet among the area of the management zone to the area of the overall county. Management zone boundary options were established by using major geographic or hydrologic features and considering the integrity of existing corporate limits and ETJ or water district boundaries. In each alternative there will be opportunities to adjust the boundaries of the zones based on political boundaries and the needs of individual water districts. In each alternative there will be opportunities to adjust the boundaries of the zones based on political boundaries and the needs of individual water districts.

The timetable for implementing surface water facilities including the necessary planning, permitting, right-of-way acquisition, engineering and construction is at least 5-6 years. If a project is started in the next couple of years, the earliest feasible conversion to surface water is considered to be in the year 2013. *Figure 13* shows one possible groundwater reduction strategy based on surface water becoming available in 2013 and further reduction points occurring in 2020, 2030, and 2040. The growth in water demand shown is from the 2006 Regional Water Plan. The strategy demonstrates a concept where each reduction step reduces groundwater withdrawals to some level below 64,000 acre-feet per year. Under this strategy then, increasing water demands due to population growth between reduction steps can be met by groundwater, and the groundwater withdrawals never exceed 64,000 acre-feet per year. The vertical black lines indicate groundwater withdrawal reductions and the upward sloping black lines indicate increasing withdrawals that are parallel to the water demand growth curve. This type of strategy would have the least amount of impact on aquifer water levels, but may not be feasible due to required reductions that are below the countywide water availability.



Figure 12. Geographic Areas Comprising 80 Percent of Total Water Demand

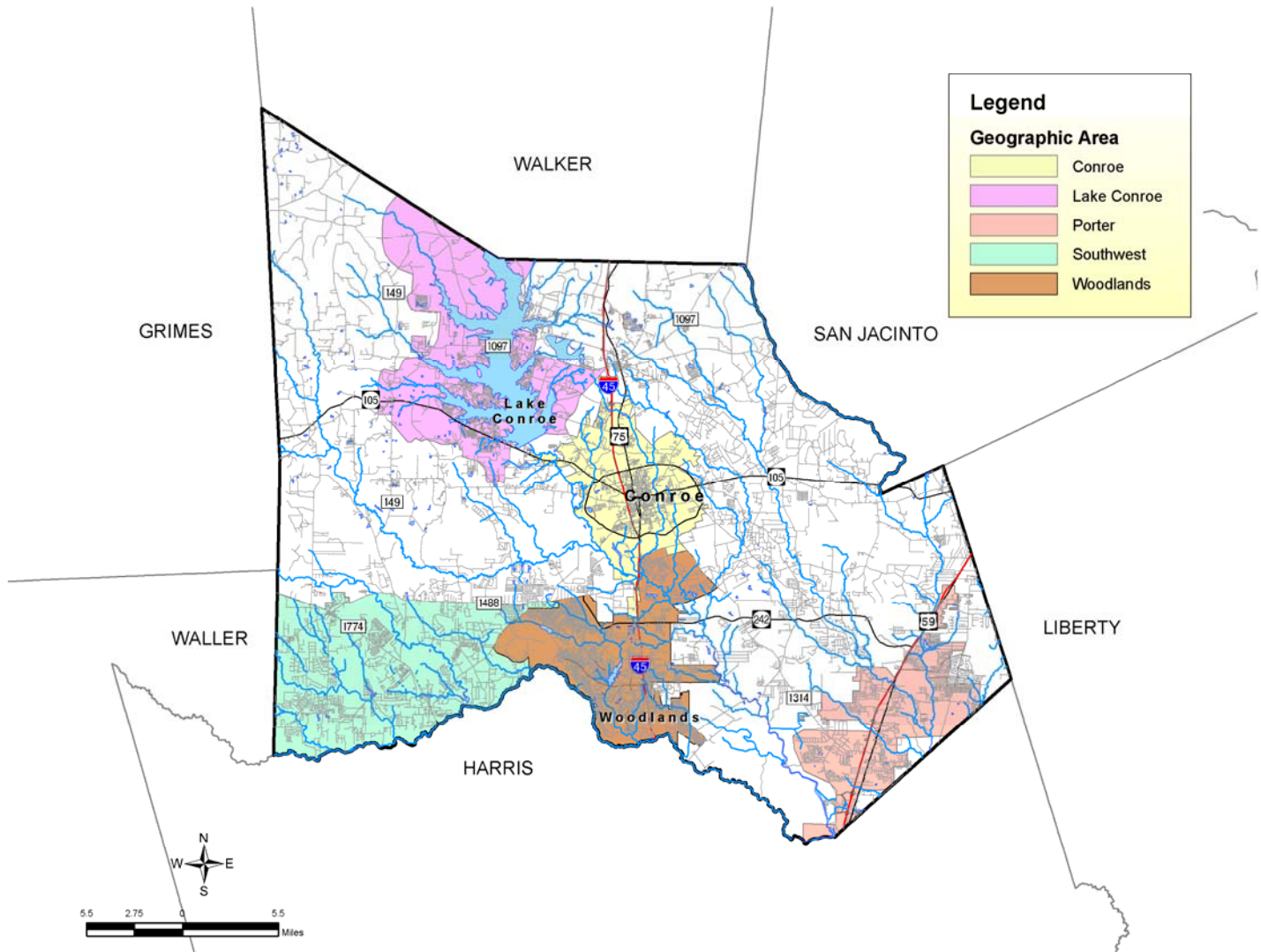


Figure 13. Projected Groundwater Reduction Strategy: Over-Reduction

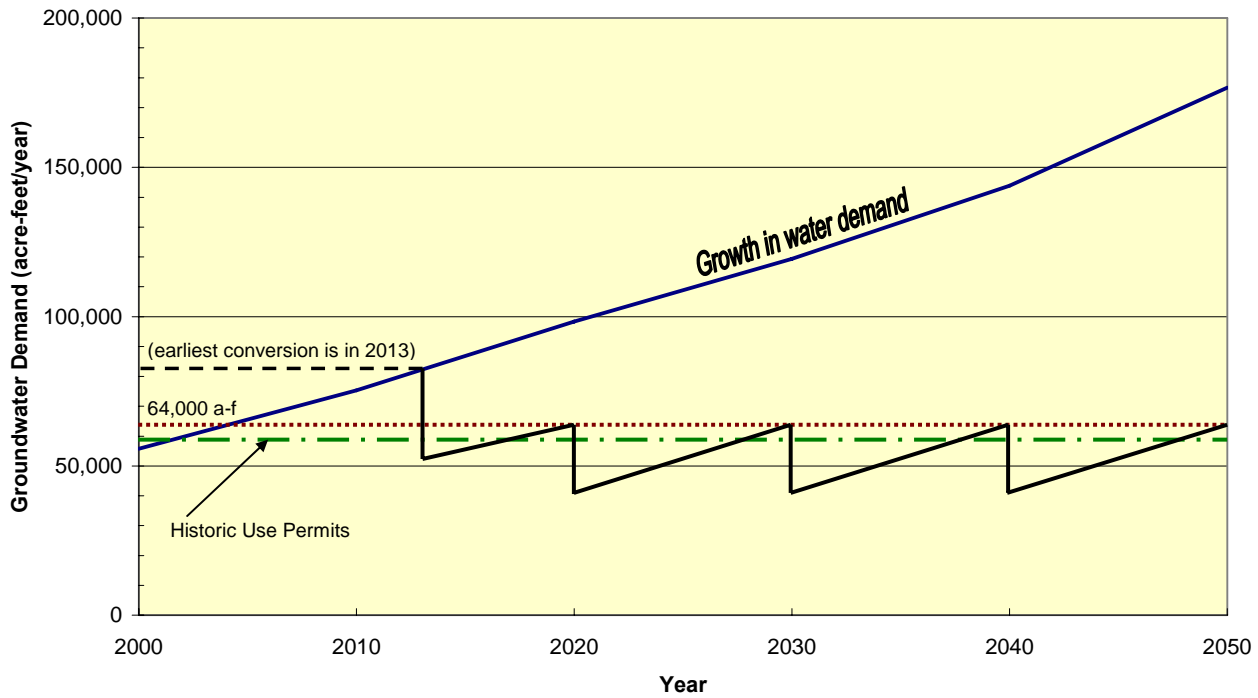
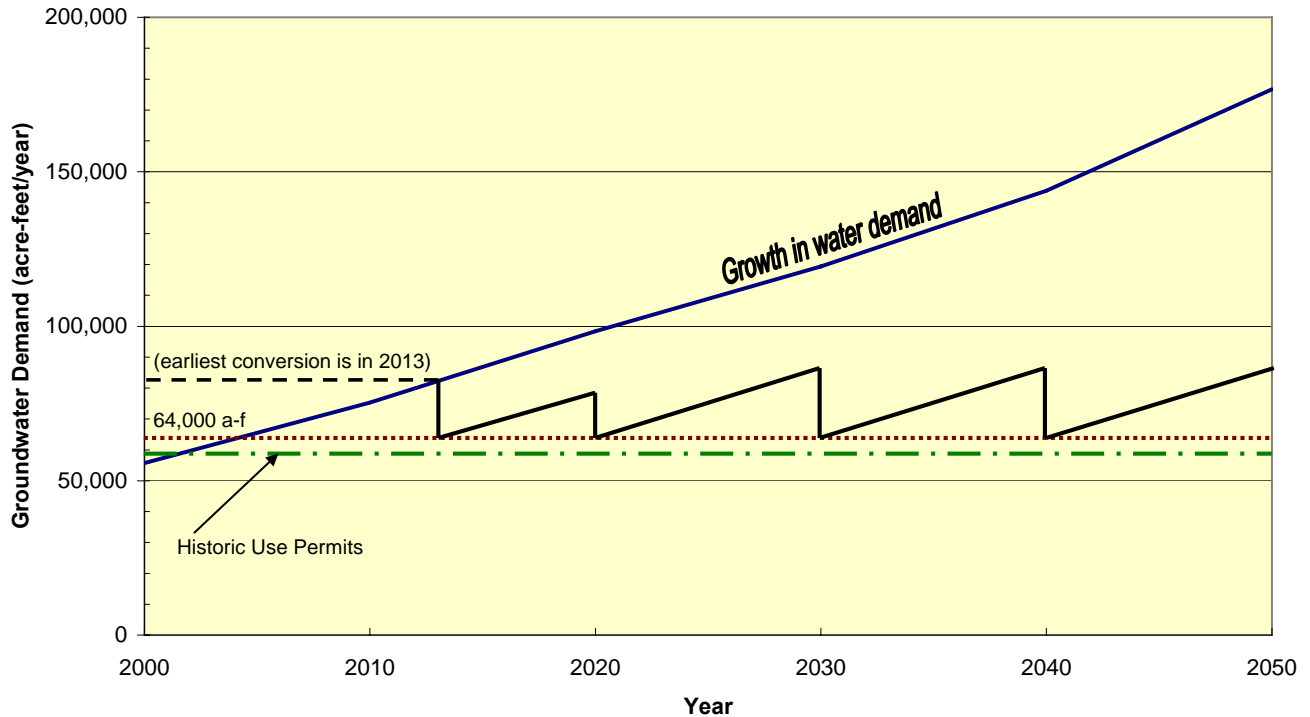


Figure 14 shows another strategy that requires reductions to 64,000 acre-feet per year at each step, then allows groundwater withdrawals to exceed 64,000 acre-feet per year until the next reduction step. This strategy has a greater impact on the aquifer but is easier to achieve in practice. The potential impact to the aquifer in terms of land subsidence cannot be determined without a detailed compaction model. The discussion on management zone alternatives in the following section will address what type of reduction strategy is most feasible for each zone configuration.

**Figure 14. Projected Groundwater Reduction Strategy: Minimum Reduction**



As part of this study, five management zone alternatives were investigated: one with a single zone covering the entire county, two with two zones, one with three zones, and one with four zones. In each scenario, the countywide availability is held to 64,000 acre-feet per year, and the availability within each zone is equal to the countywide availability prorated by each zone’s land surface area.

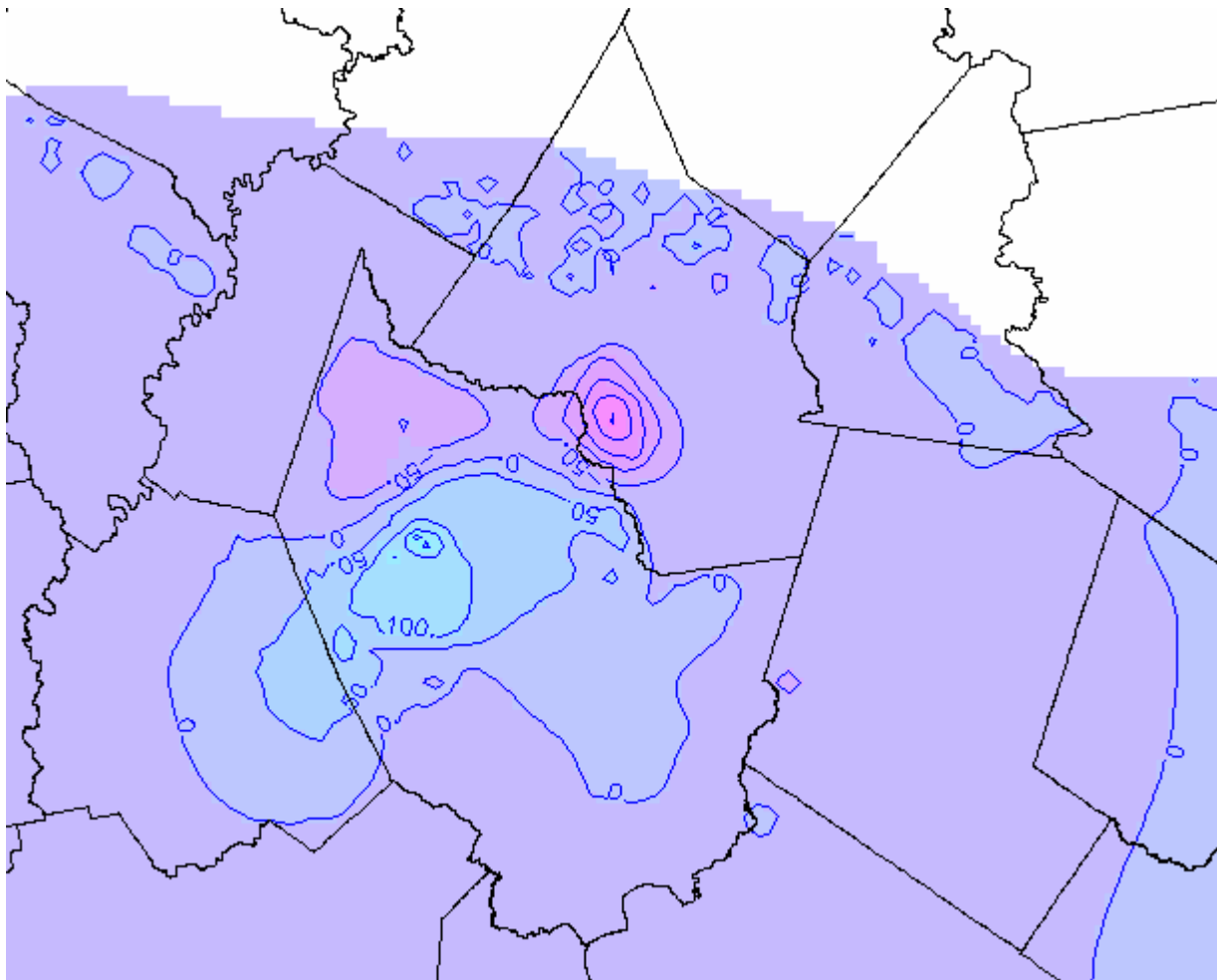
**Predicted Water Level Declines With No Management Zones Implemented**

In order to evaluate the success of various management zone configurations, the Northern Gulf Coast GAM was executed with the spatially distributed groundwater withdrawals mentioned previously. The model was executed for the years 2000 to 2040 to simulate the piezometric levels in the aquifer that would occur if reductions in groundwater withdrawals were not implemented. Results from this “baseline” run will be used to compare against model runs incorporating the management zone alternatives discussed below. The version of the Northern Gulf Coast GAM used overpredicts water level changes and, at the writing of this report, is in the process of being refined by the USGS. This limitation notwithstanding, the model results should accurately represent the relative trends in water level change. The actual magnitudes of change are used solely for comparison purposes.

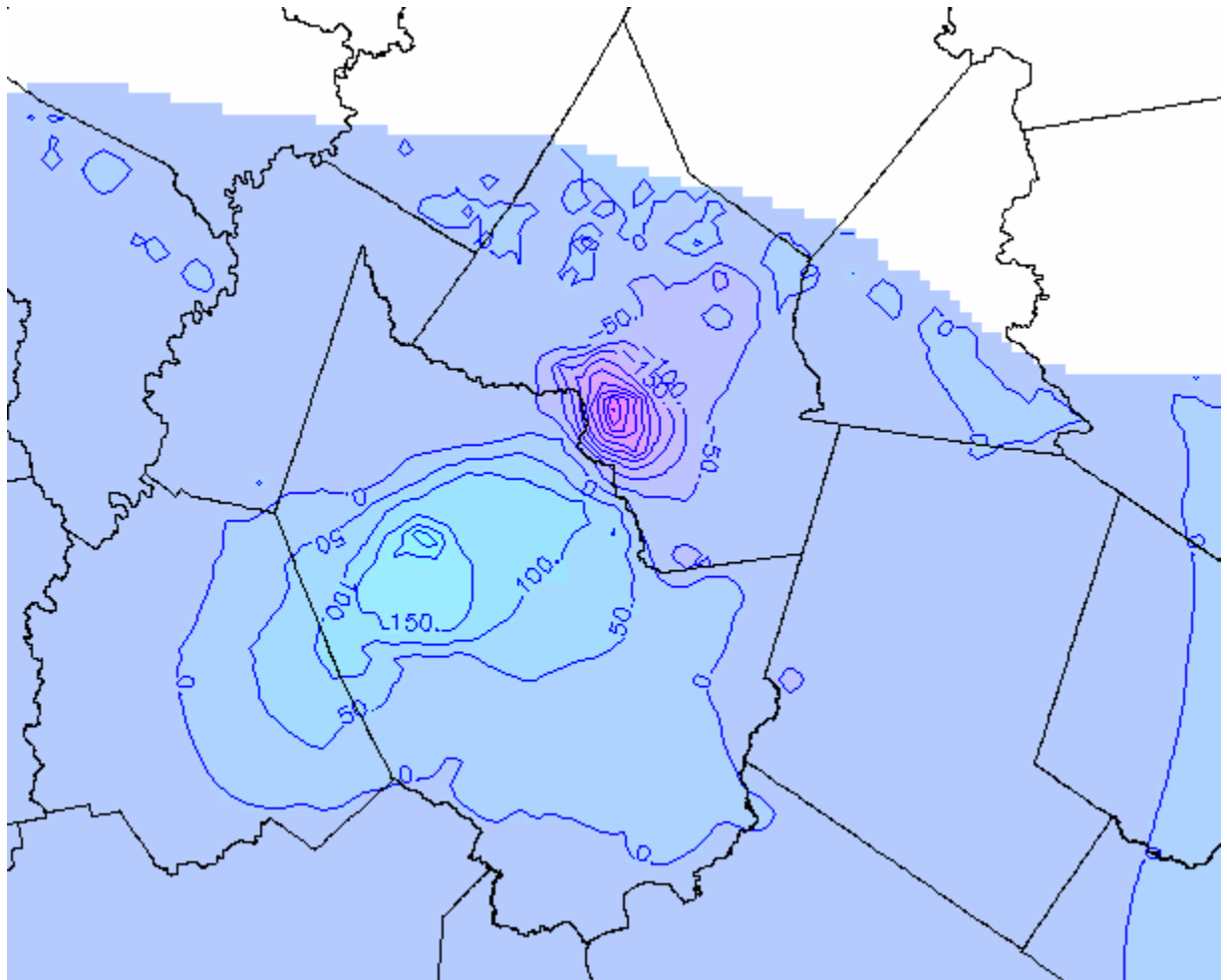
Figures 15-17 illustrate the projected water level declines in the Evangeline aquifer from 2000 to 2010, 2000 to 2020, and 2000 to 2040, respectively. Figure 15 (2000-2010) shows a local cone of depression in The Woodlands area, with a maximum water level decline of approximately 90 feet. Figure 16 (2000-2020) shows a

much more severe cone of depression in The Woodlands, with a shallower cone of depression extending into the City of Conroe. *Figure 17* (2000-2040) shows the cone of depression centered on The Woodlands growing larger, and a significant local cone of depression developing in the City of Conroe area. *Figure 17* also shows a region within The Woodlands where the model grid cells are white, indicating that these cells have no valid data to display. This is a modeling anomaly that is being addressed by the USGS.

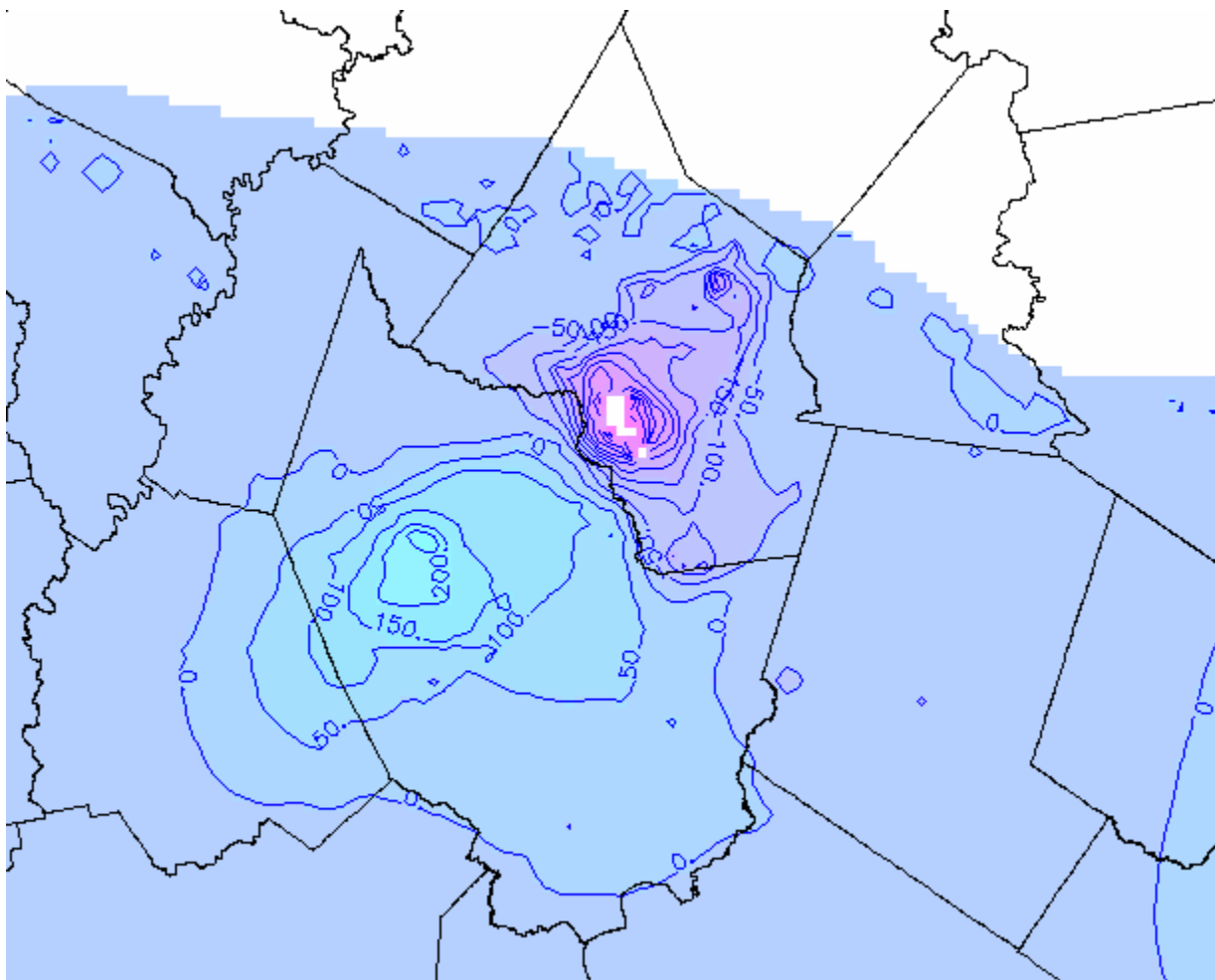
**Figure 15. Predicted Baseline Water Level Declines:  
Evangeline 2000 – 2010**



**Figure 16. Predicted Baseline Water Level Declines:  
Evangeline 2000 – 2020**

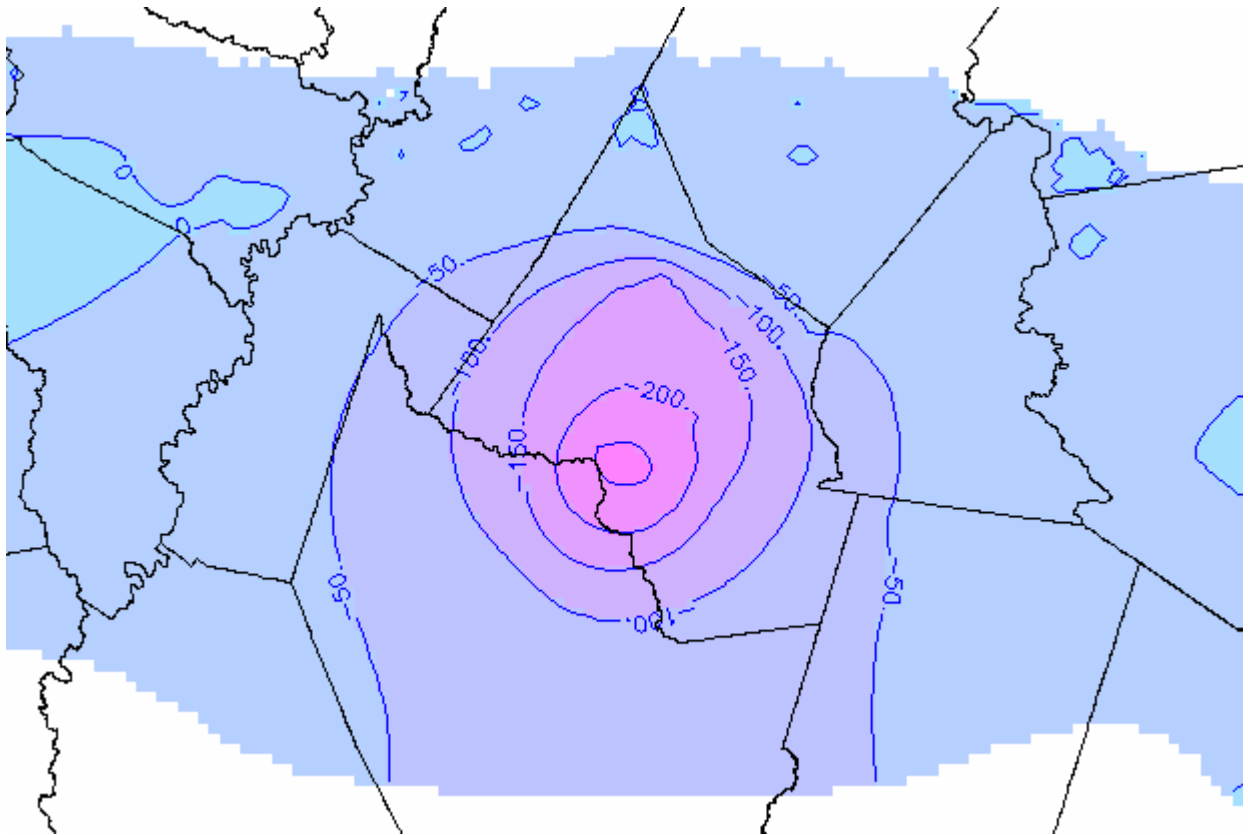


**Figure 17. Predicted Baseline Water Level Declines:  
Evangeline 2000 – 2040**

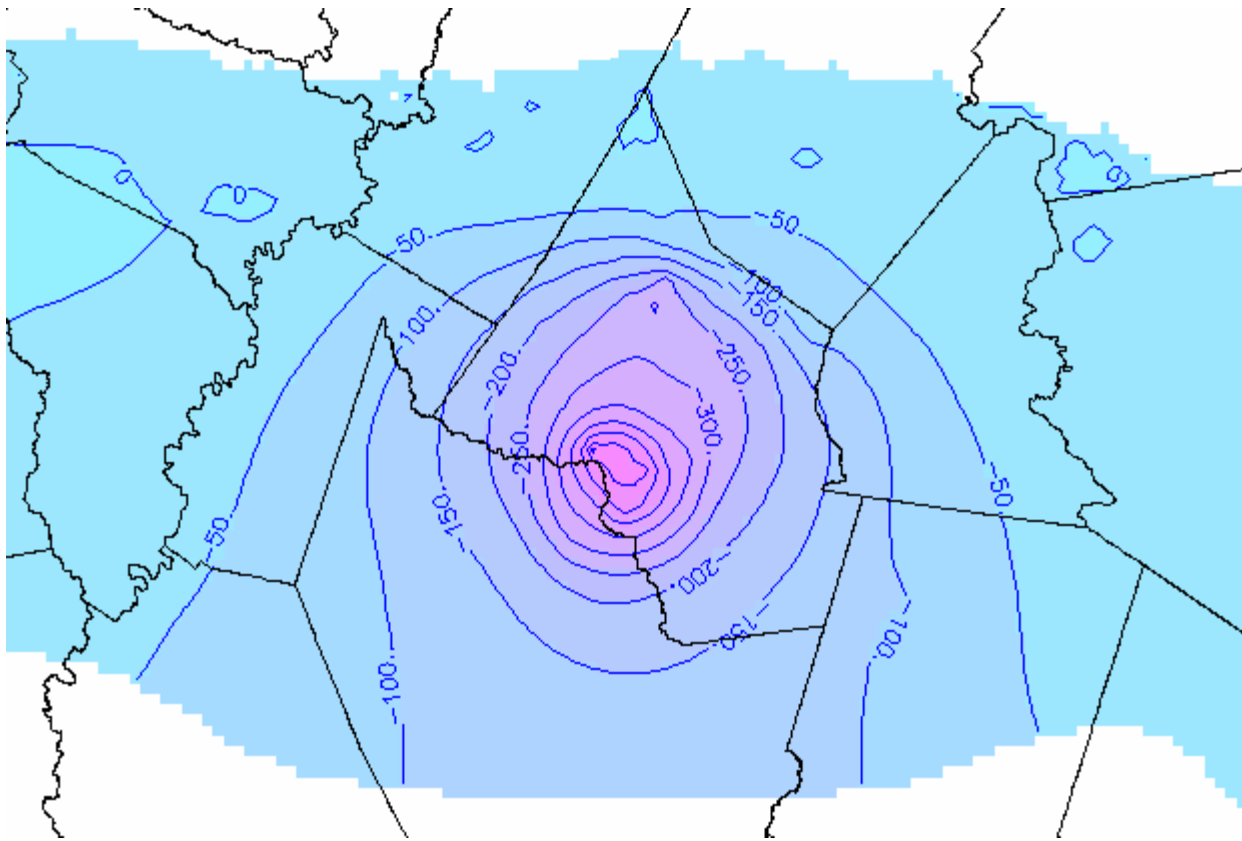


Figures 18-20 illustrate the projected water level declines in the Jasper aquifer from 2000 to 2010, 2000 to 2020, and 2000 to 2040, respectively. Figure 18 (2000-2010) shows a large cone of depression centered on The Woodlands area, with a maximum water level decline of over 250 feet. Water level declines of at least 100 feet are occurring throughout the majority of the county. Figure 19 (2000-2020) shows a much deeper cone of depression in The Woodlands, with a peak decline of more than 500 feet. Water level declines of at least 150 feet are occurring throughout most of the county. Figure 20 (2000-2040) shows a peak decline of more than 700 feet, and declines of at least 200 feet occurring throughout most of the county.

**Figure 18. Predicted Baseline Water Level Declines:  
Jasper 2000 – 2010**

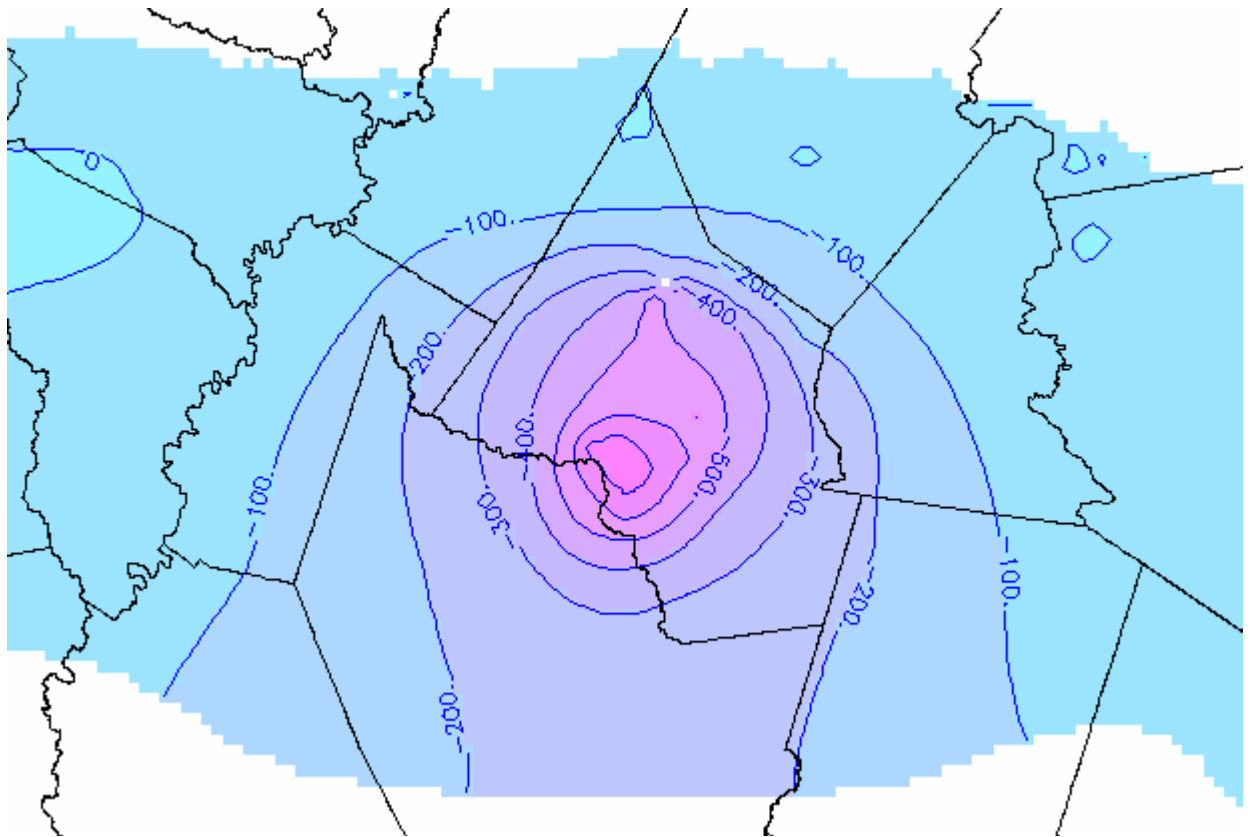


**Figure 19. Predicted Baseline Water Level Declines:  
Jasper 2000 – 2020**





**Figure 20. Predicted Baseline Water Level Declines:  
Jasper 2000 – 2040**

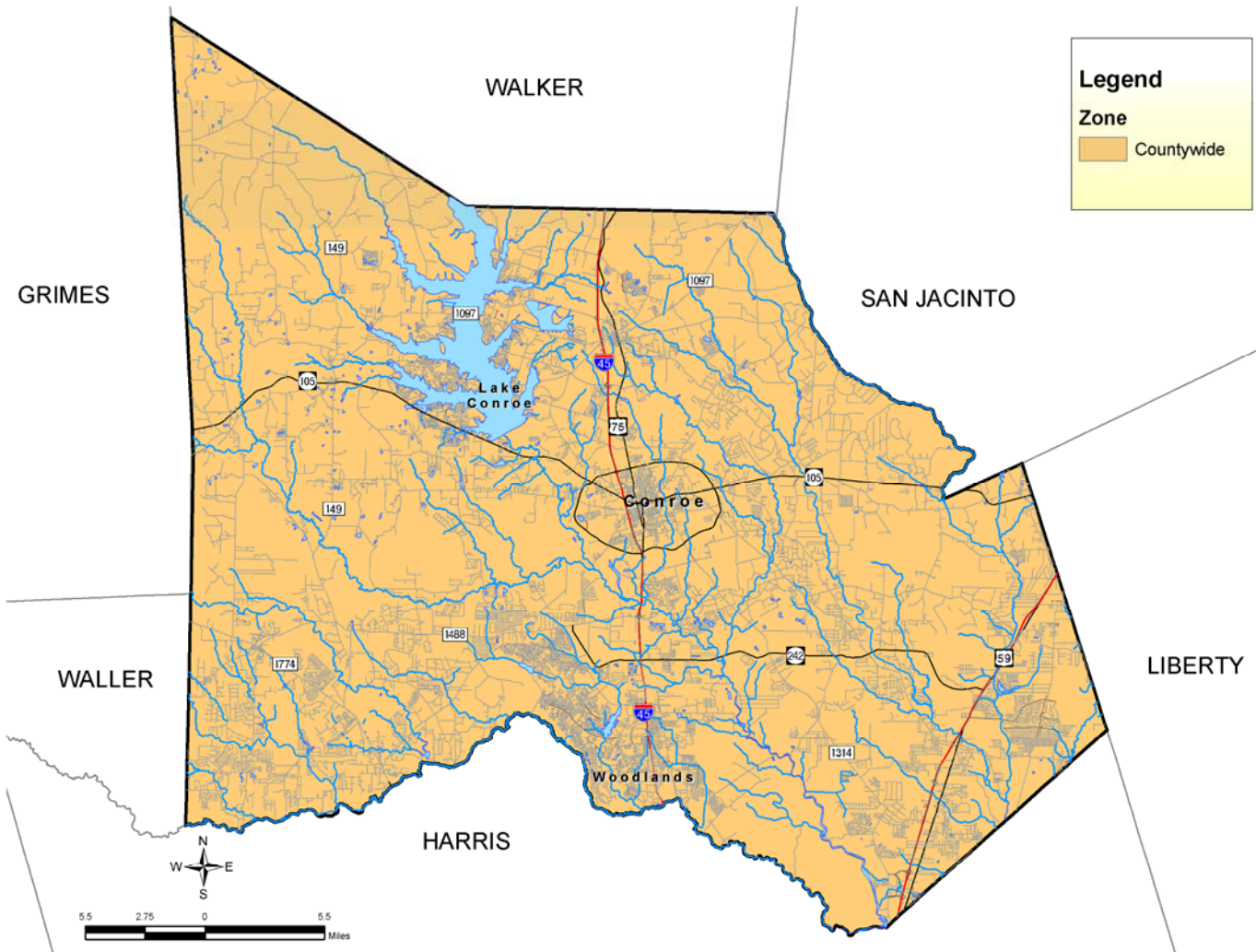


### **Alternative 1:**

#### **Single Management Zone**

The single management zone (*Figure 21. Single Management Zone Alternative 1*) would encompass the entire county and require all public supply and industrial well owners within each permit class to reduce groundwater dependence by an equal amount. As shown in *Table 4*, on the assumption that 2013 would be the earliest possible date for implementing a wholesale surface water supply system, an initial reduction of 22 percent in groundwater will be necessary across the county. *Figure 14* identifies the subsequent reductions required for the remaining decades in the planning period. The single management zone would require all regulated parties to comply with the same reduction criteria. Using the single zone, the Historic Use Permits could be considered equally and could, under current rules, be 100 percent honored. Likewise, the Historic Use Permits could be traded throughout the county.

Figure 21. Single Management Zone Alternative 1



On the other hand, virtually all new operating permits would have to be issued with the understanding that the permits are exceeding the reliable recharge rate and some consideration as to the reliability of the permit itself could be questioned. In other words, a new permittee could suddenly find himself investing in groundwater facilities only to find out in a short period of time he would be required to acquire surface water also.

This problem is solved if the regulatory study allows for two or more regulated parties to jointly agree to participate in a groundwater reduction strategy whereby one of the parties chooses to reduce its groundwater by more than is required in order for the other parties to not reduce theirs as much. The problem exists for all of the management zone alternatives, with the same opportunity for solution. However, the single management zone concept relies most heavily on the willingness of the parties to participate together in order to construct a cost-effective and efficient surface water supply system.

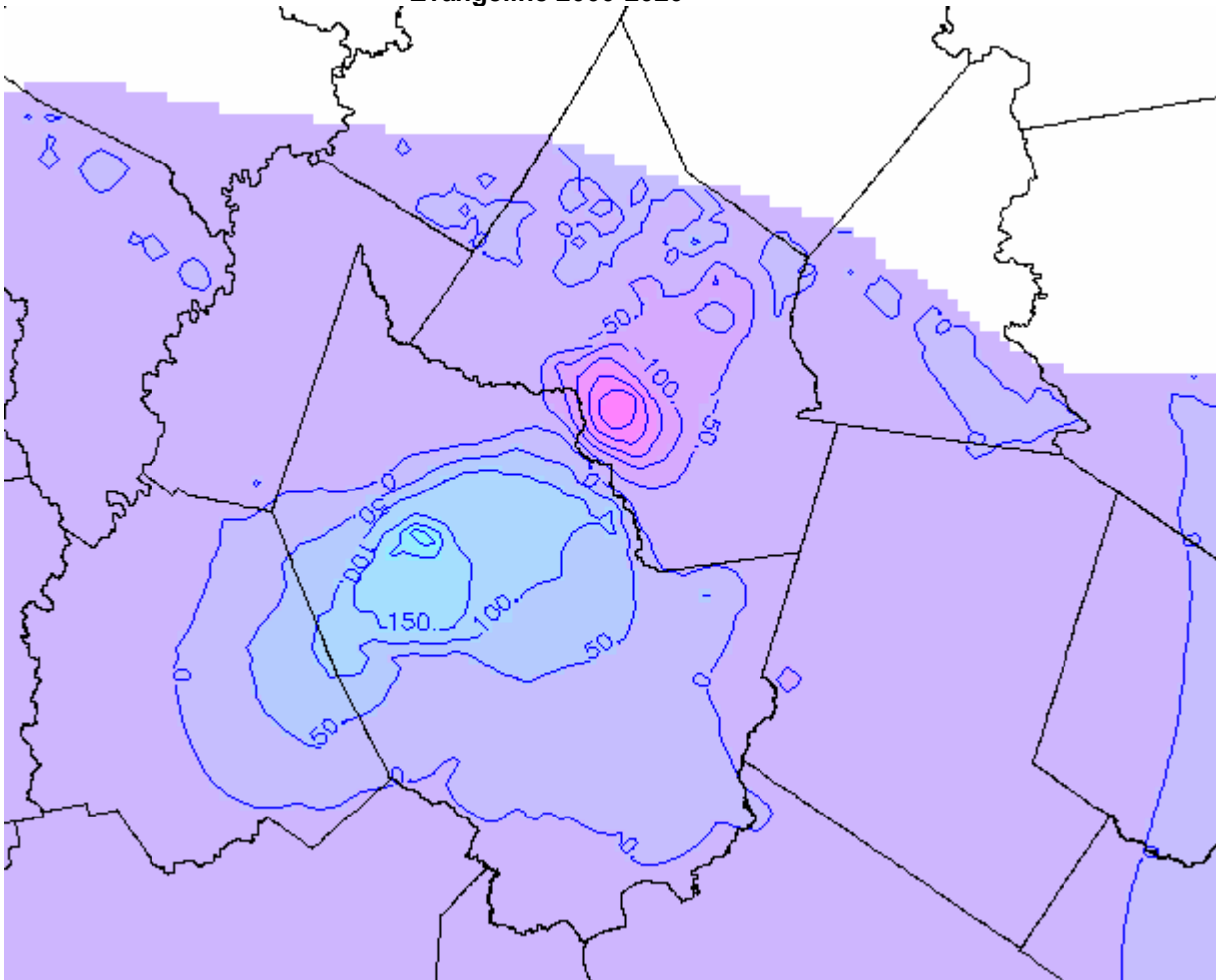
**Table 4. Management Zone Alternative 1: Single Countywide Zone**

Zone	Area (sq miles)	Pro-Rata Share of Available GW (ac-ft/yr)	Historic Use Permit Volume (ac-ft/yr)	Reduction Phase	Total Demand (ac-ft/yr)	Conversion (percent)
Countywide	1,077	64,000	59,170	2013	82,215	22%
				2020	98,330	35%
				2030	119,389	46%
				2040	143,851	56%

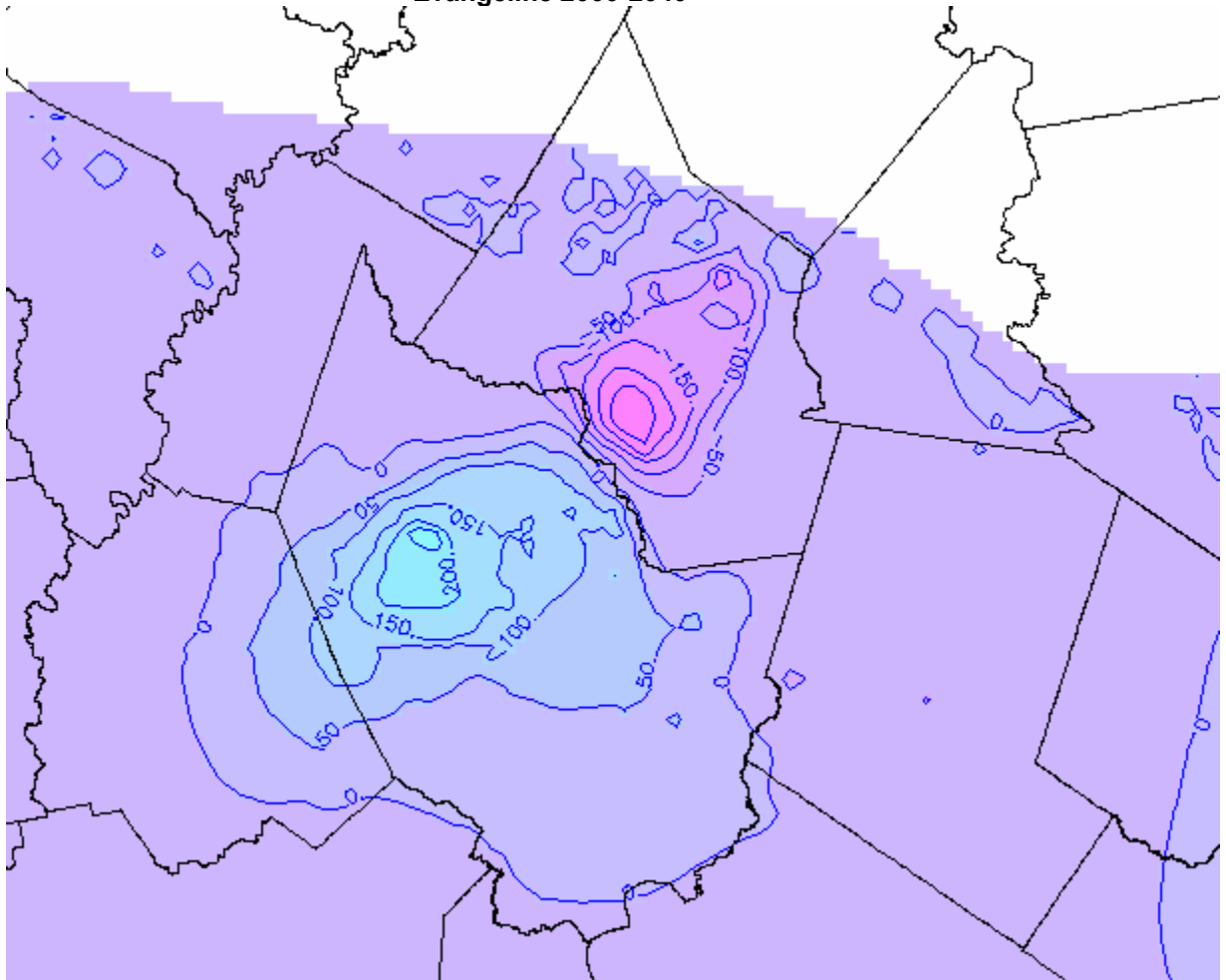
The effectiveness of the single management zone concept was simulated by comparing the relative reduction in piezometric levels with and without a form of regulatory study in place. It was assumed that uniform reduction of groundwater withdrawal occurred throughout the county in accordance with the criteria defined by *Figure 11*.

*Figures 22 and 23* show the predicted water level declines in the Evangeline aquifer for the periods 2000-2020 and 2000-2040, respectively. *Figure 22* (2000-2020) shows the same trend as the baseline run (see *Figure 16*), but with a peak decline ~200 feet less than the baseline condition. *Figure 23* (2000-2040) shows roughly the same water level declines throughout the county compared to the 2000-2020 contours. Compared to the baseline contours for 2000-2040, the single countywide management zone alternative reduces the peak decline by at least 300 feet.

**Figure 22. Single Management Countywide Zone Predicted Water Level Declines:  
Evangeline 2000-2020**

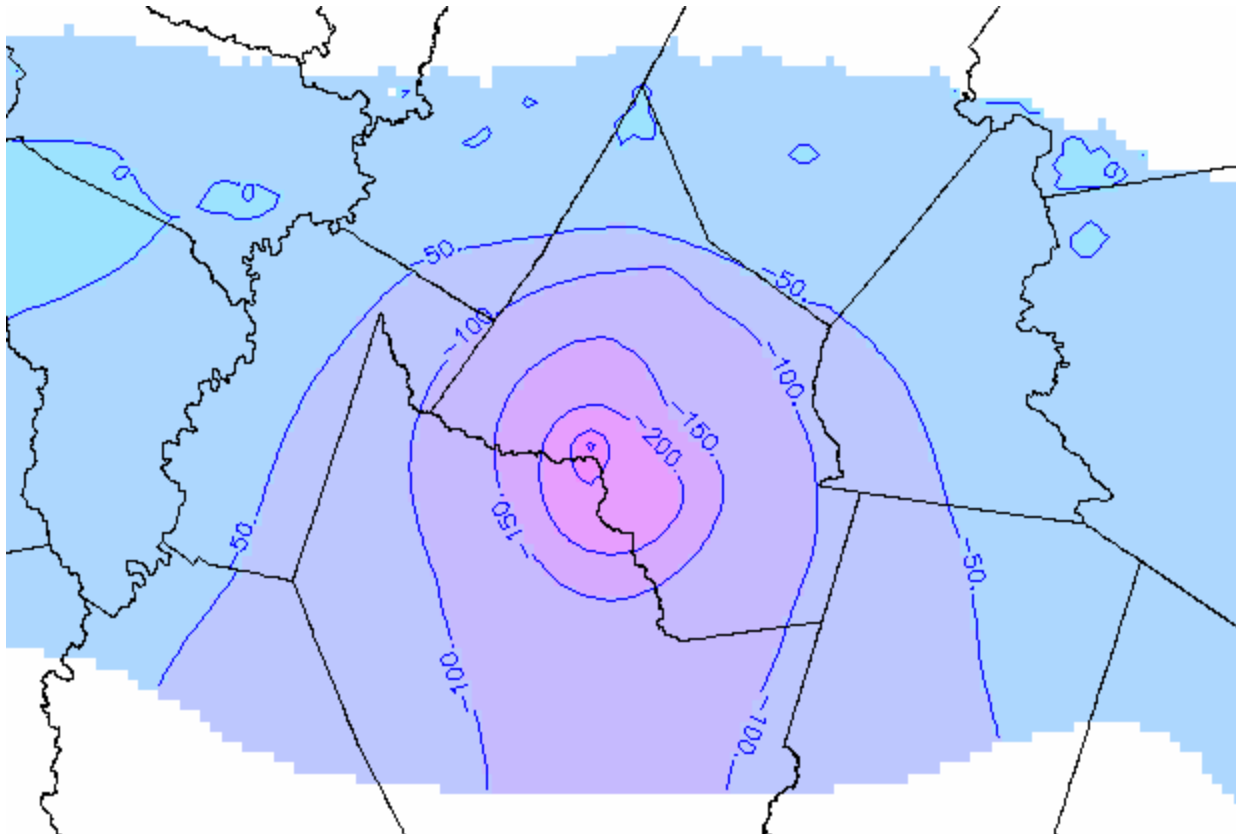


**Figure 23. Single Management Countywide Zone Predicted Water Level Declines:  
Evangeline 2000-2040**

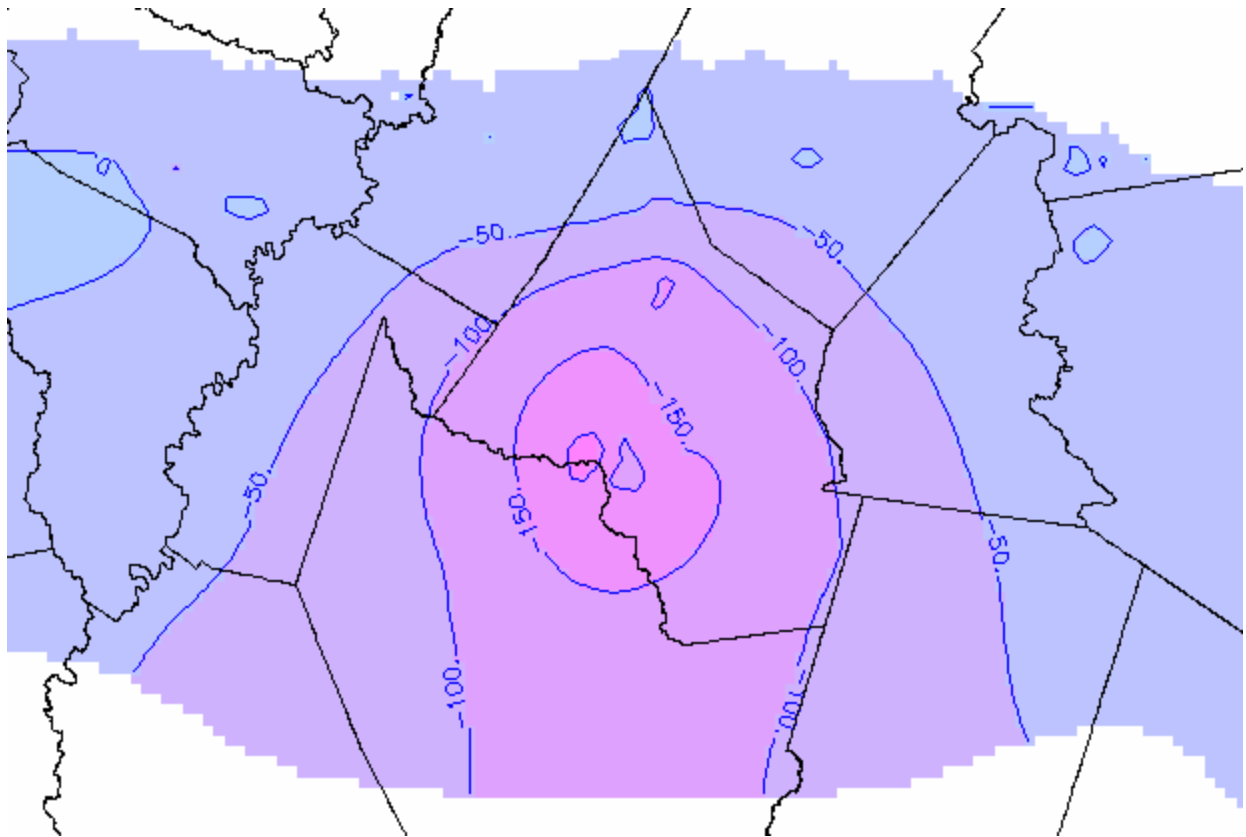


Figures 24 and 25 show the predicted water level declines in the Jasper aquifer for the periods 2000-2020 and 2000-2040, respectively. Figure 24 (2000-2020) shows the same trend as the baseline run (see Figure 19), but with a peak decline ~250 feet less than the baseline condition. Figure 25 (2000-2040) shows roughly the same water level declines throughout the county compared to the 2000-2020 contour, and the peak decline is actually slightly less. Compared to the baseline contour for 2000-2040, the single countywide management zone alternative reduces the peak decline by approximately 500 feet.

**Figure 24. Single Management Zone Predicted Water Level Declines:  
Jasper 2000-2020**



**Figure 25. Single Management Zone Predicted Water Level Declines:  
Jasper 2000-2040**

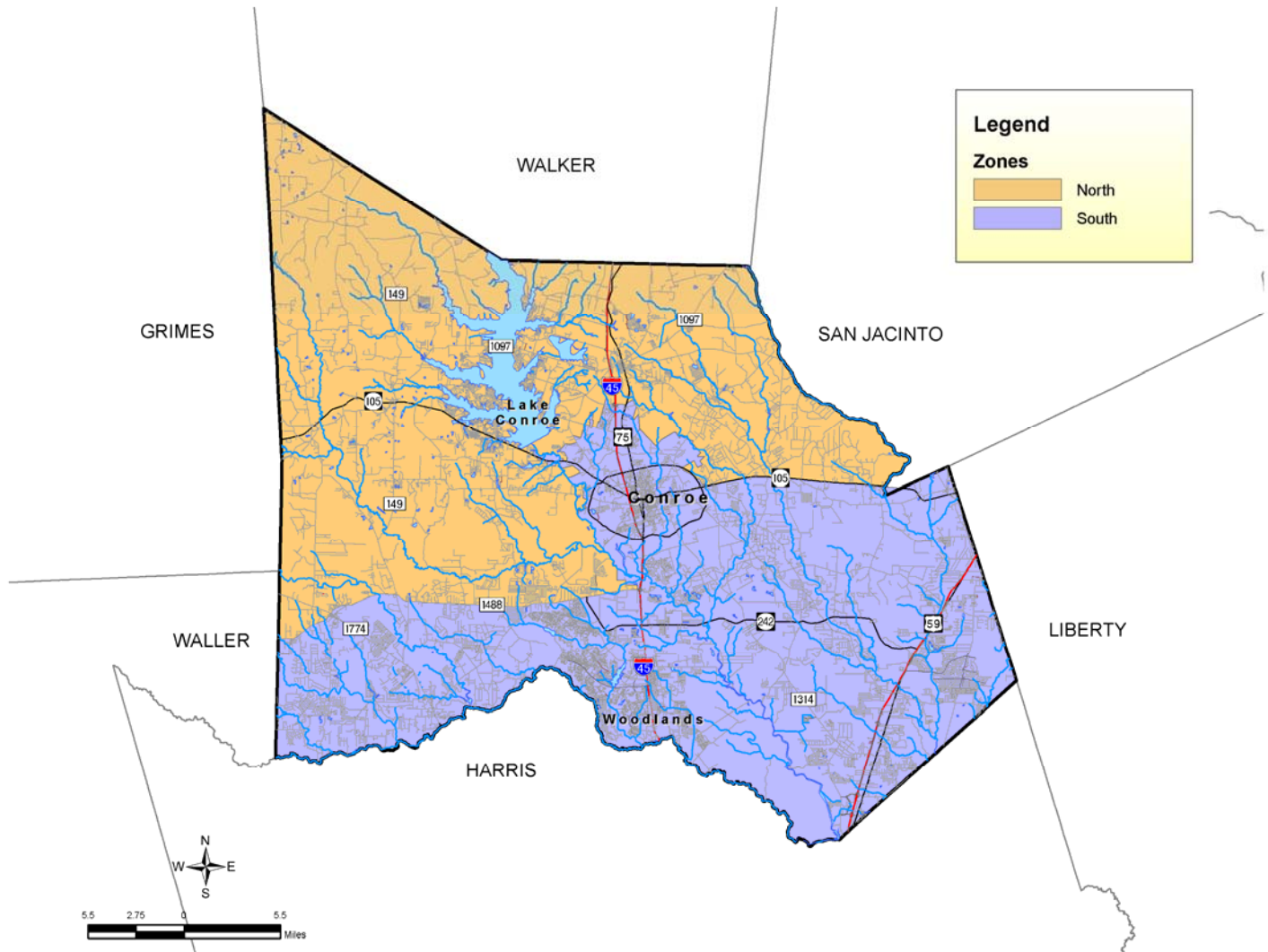


### **Alternative 2:**

#### **Two Management Zones: Focus on Current and Future Growth**

The two management zone concept (*Figure 26*) assumes a dividing line roughly along FM 1488 on the western side of the county, around the City of Conroe and along SH 105 on the east side of the county. Some modifications to this boundary would be necessary to accommodate existing political boundaries as well as the needs of individual water districts. This alternative has somewhat more focus on the growing population areas of southern Montgomery County. The southern zone captures 80 percent of the total existing and projected future water demand in the county. As can be seen, this alternative requires a larger groundwater reduction strategy in the southern portion of the county. An initial reduction of 48 percent would be required in 2013 to meet the sustainable recharge of the aquifer.

Figure 26. Alternative 2: Two Management Zones (North and South)



Under the two management zone concept (see *Table 5*), Historic Use Permit applications in the southern zone exceed the pro-rata share of 64,000 acre-feet (46,333 acre-feet versus 31,288 acre-feet). Some decision of prorating the Historic Use Permits would be necessary. On the other hand, the number of Historic Use Permit applications in the northern zone is less than the allowable amount and could be 100 percent honored.

Alternative sources of water supply have been discussed by public water supply owners in both the southeastern and the southwestern portions of the county. However, the amount of additional supply needs vary considerably, with the southeastern portion of the county requiring less of a groundwater reduction than the south central. It is not effective to assume the same source of surface water supply to the southeast portion of the county as to the south central, indicating that unless the regulated communities all worked together to implement a single system, more than one source of supply would be necessary. The source of supply to the southeast portion of the county



could be the City of Houston. However, at that point the success of the regulatory study would become dependent on an authority outside of the county.

One of the advantages of alternative 2 is that the zone boundaries are drawn such that the majority of future growth in the county is addressed. This allows the Northern zone to grow on groundwater to at least 2030 without any special requirements. The conversion requirement of 12 percent in 2040 can likely be met by water conservation measures. Since the Southern zone comprises almost 50 percent of the county’s land area, the responsibility for conversion is distributed over a much larger area than in alternative 2. The volume of Historic Use Permits will be reduced by 32 percent in the Southern zone and fully honored in the Northern zone.

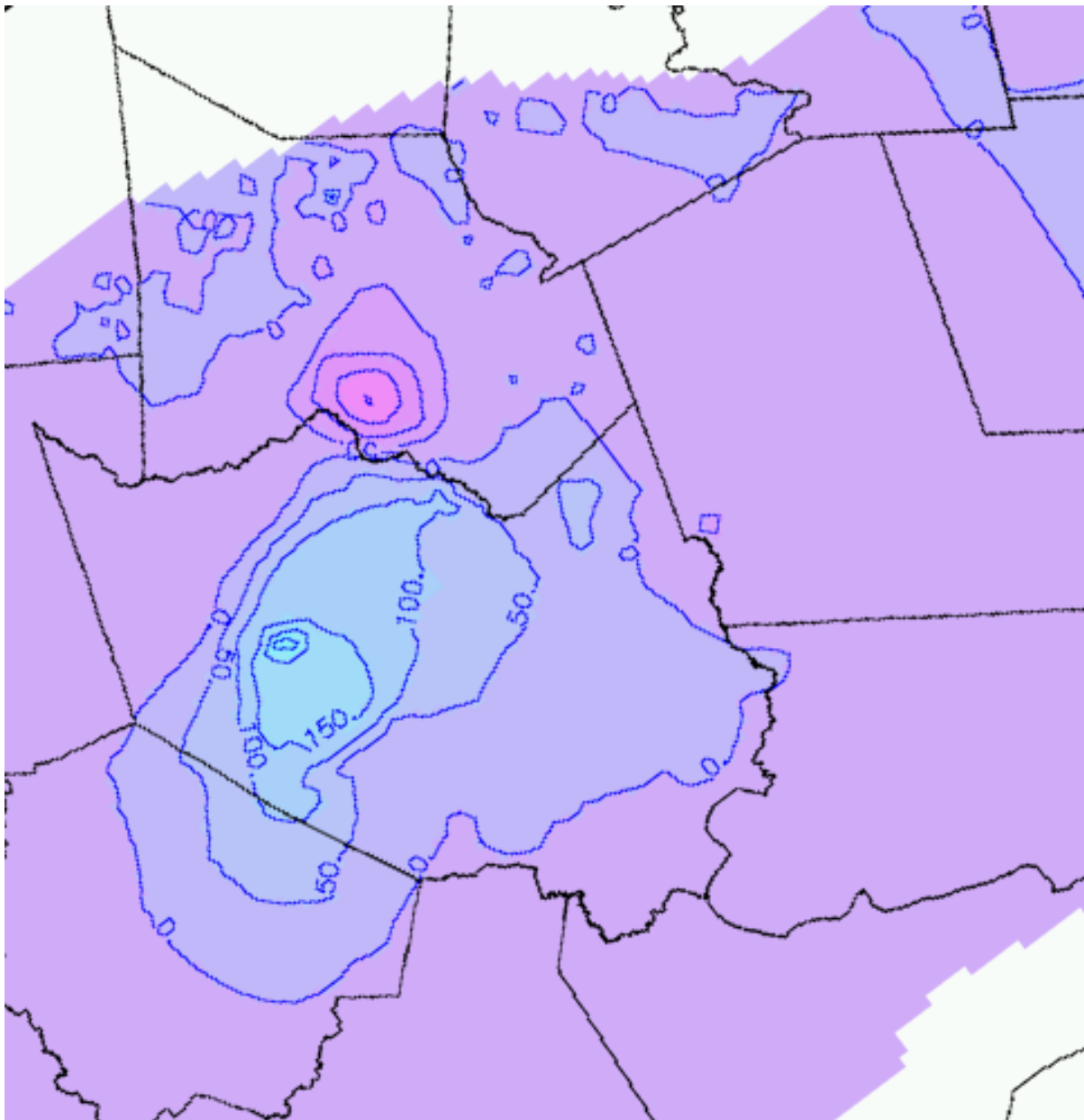
A disadvantage to this alternative is that the potential exists for the requirement of two sources of surface water: one to supply Conroe, The Woodlands, the IH 45 corridor, and the southwest portion of the county; and one to supply the southeast portion of the county, namely the concentrated demand along the US 59 corridor. The only potential downside of this solution is that, if future development around Lake Conroe is intense, it would not address potentially significant water level declines in the Northern zone.

**Table 5. Alternative 2: Two Management Zones (North and South)**

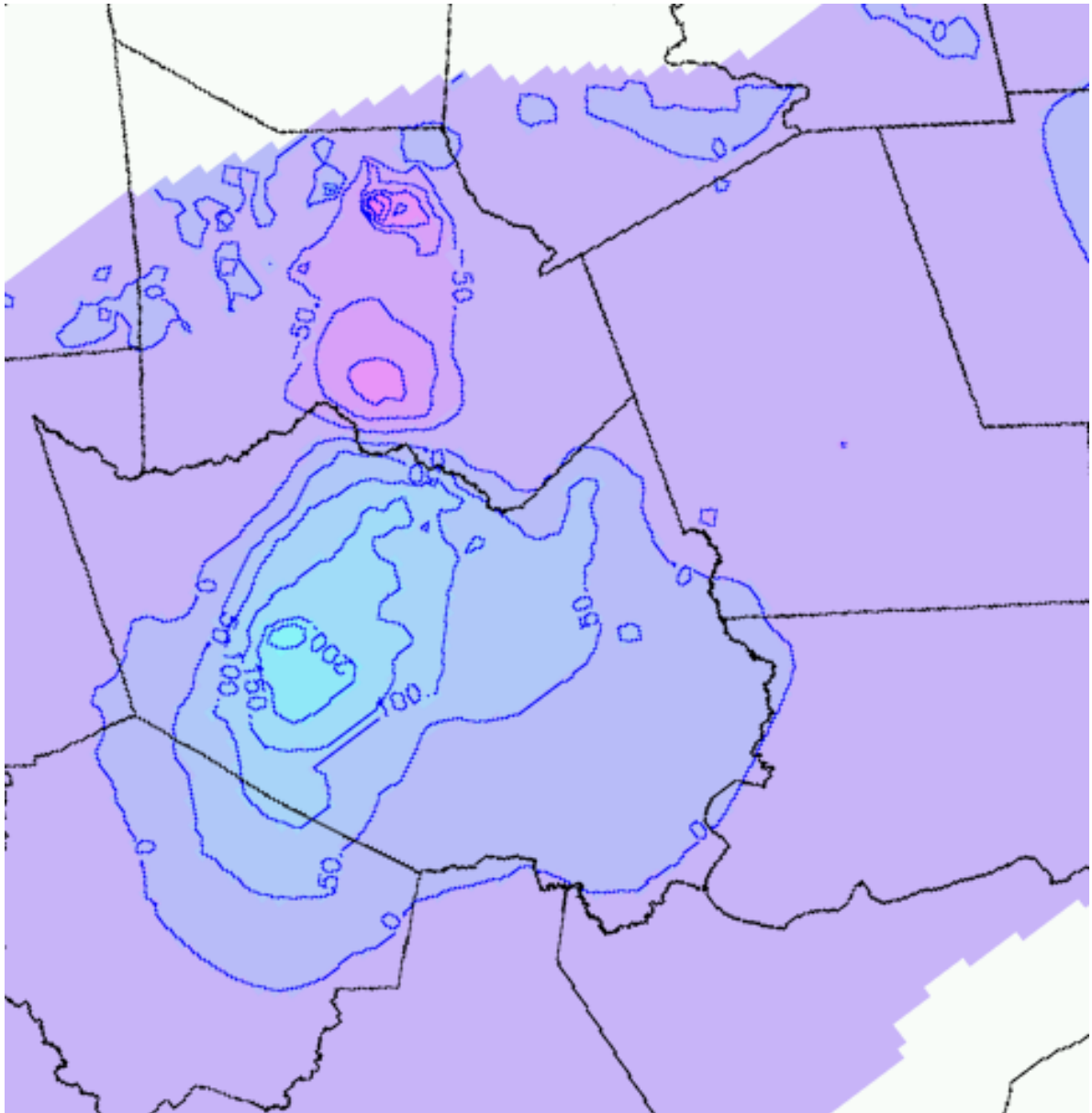
<b>Zone</b>	<b>Area (sq miles)</b>	<b>Pro-rata Share of Available GW (ac-ft/yr)</b>	<b>Historic Use Permit Volume (ac-ft/yr)</b>	<b>Reduction Phase</b>	<b>Total Demand (ac-ft/yr)</b>	<b>Conversion (percent)</b>
<b>Zone of 80% Increased Demand</b>	527	31,288	46,333	2013	60,316	48%
				2020	73,707	58%
				2030	89,660	65%
				2040	106,548	71%
<b>Balance of County</b>	551	32,712	12,837	2013	21,901	0%
				2020	24,623	0%
				2030	29,729	0%
				2040	37,302	12%
<b>Countywide Totals</b>	1,078	64,000	59,170	<b>2013</b>	<b>82,217</b>	<b>22%</b>
				<b>2020</b>	<b>98,330</b>	<b>35%</b>
				<b>2030</b>	<b>119,388</b>	<b>46%</b>
				<b>2040</b>	<b>143,851</b>	<b>56%</b>

This alternative was modeled using the Northern Gulf Coast GAM, following the conversion schedule in *Table 5*. *Figures 27* and *28* show the predicted water level declines in the Evangeline aquifer for the periods 2000-2020 and 2000-2040, respectively. *Figure 27* (2000-2020) shows a much smaller cone of depression compared to the baseline results (see *Figure 16*), with a peak water level decline in The Woodlands area of approximately 250 feet. *Figure 28* (2000-2040) shows that water level declines in The Woodlands area improve to approximately 150 feet, while the localized cone of depression north of the City of Conroe is roughly the same size as in the baseline run. This stands to reason as all of the groundwater reduction in this alternative takes place predominantly in the southern portion of the county.

**Figure 27. Alternative 2: Two Management Zones (North and South)  
Predicted Water Level Declines: Evangeline 2000-2020**

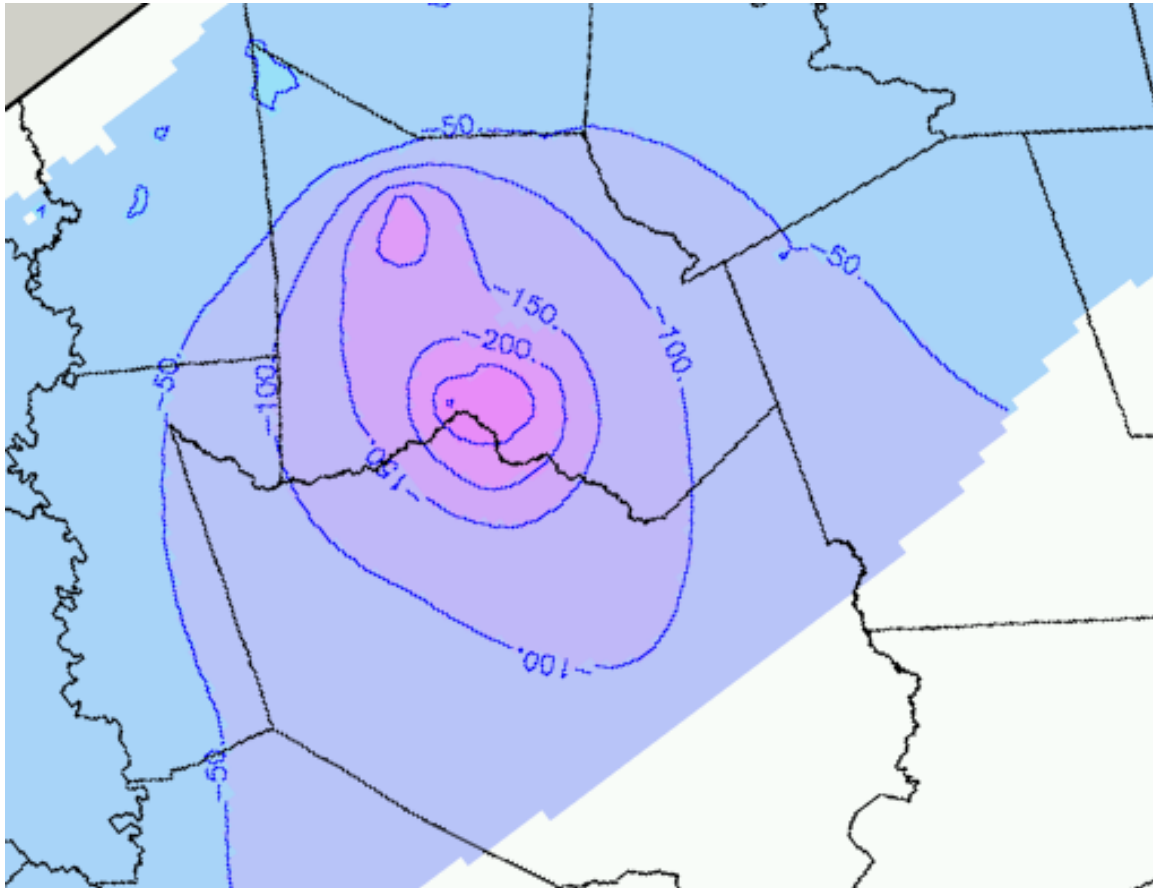


**Figure 28. Alternative 2: Two Management Zones (North and South)  
Predicted Water Level Declines: Evangeline 2000-2040**

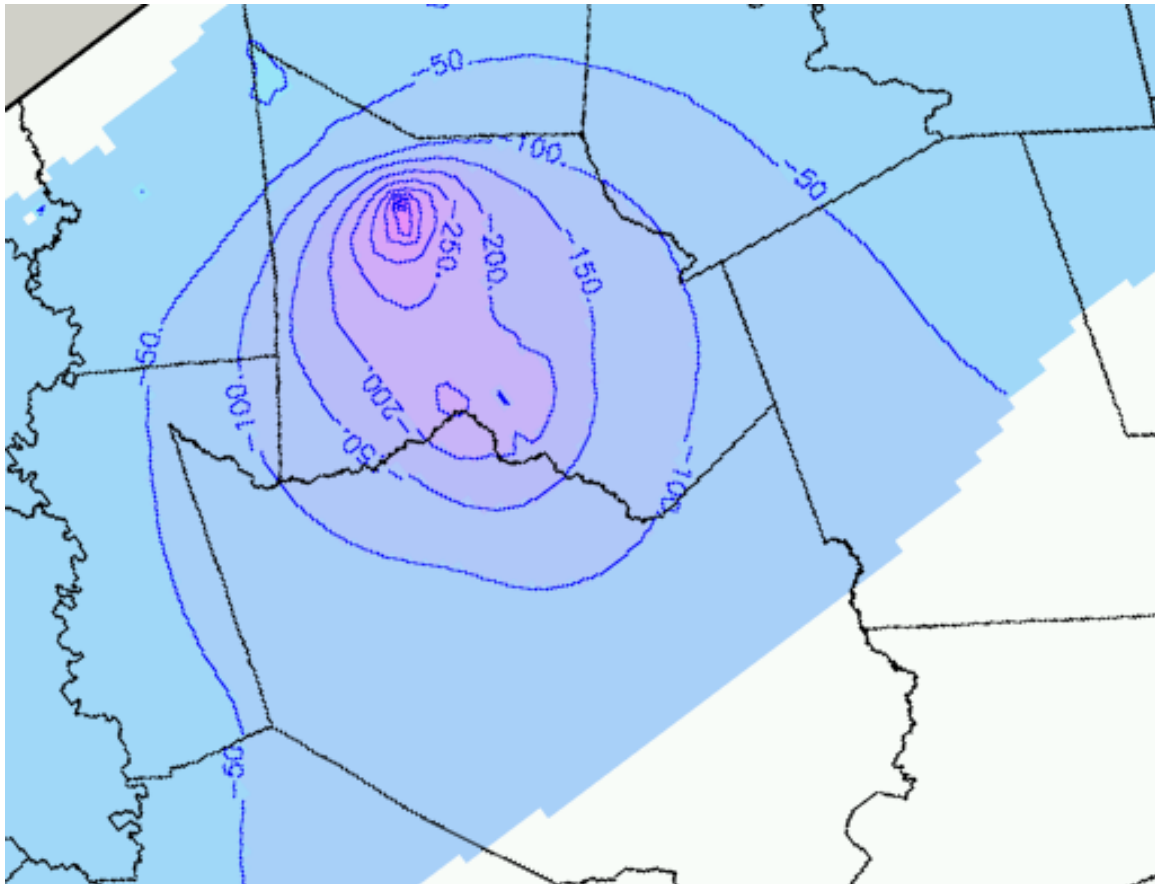


Figures 29 and 30 show the predicted water level declines in the Jasper aquifer for the periods 2000-2020 and 2000-2040, respectively. Figure 29 (2000-2020) shows a much shallower cone of depression compared to the baseline results (see Figure 19), with a peak water level decline in The Woodlands area of approximately 250 feet. There is also a cone of depression near Lake Conroe that did not occur in the baseline run. Figure 30 (2000-2040) shows that water level declines in The Woodlands area improve substantially, but it seems that the problem in the Jasper aquifer has shifted to the Lake Conroe area, with a predicted water level decline of more than 400 feet.

**Figure 29. Alternative 2: Two Management Zones (North and South)  
Predicted Water Level Declines: Jasper 2000-2020**



**Figure 30. Alternative 2: Two Management Zones (North and South)  
Predicted Water Level Declines: Jasper 2000-2040**



### Alternative 3:

#### Two Management Zones: Focus on High Demand Areas

Two management zones alternative 3 would create two zones: one that covers Conroe, The Woodlands, and water districts along the IH 45 corridor; and one that covers the rest of the county. Some modifications to this boundary would be necessary to accommodate existing political boundaries as well as the needs of individual water districts. *Table 6* shows the minimum conversion requirements. For the first reduction phase in 2013, the Conroe/Woodlands zone requires that 83 percent of the water demand be converted to an alternative source. The conversion requirements for 2020, 2030, and 2040 are 85 percent, 89 percent, and 91 percent, respectively. The zone representing the balance of the county does not have any significant conversion requirements, with only a 6 percent conversion required in 2040.

The primary advantage to this alternative is that it focuses directly on the areas with deep localized cones of water level declines. There is enough demand in the Conroe/Woodlands zone to essentially absorb the county's entire conversion requirements, leaving the balance of the county with enough available groundwater to grow on through at least 2030. The 6 percent conversion requirement in 2040 for the balance of the county could easily be handled through conservation, but it is also possible that the projected growth is never realized, in which case there would be no conversion necessary.

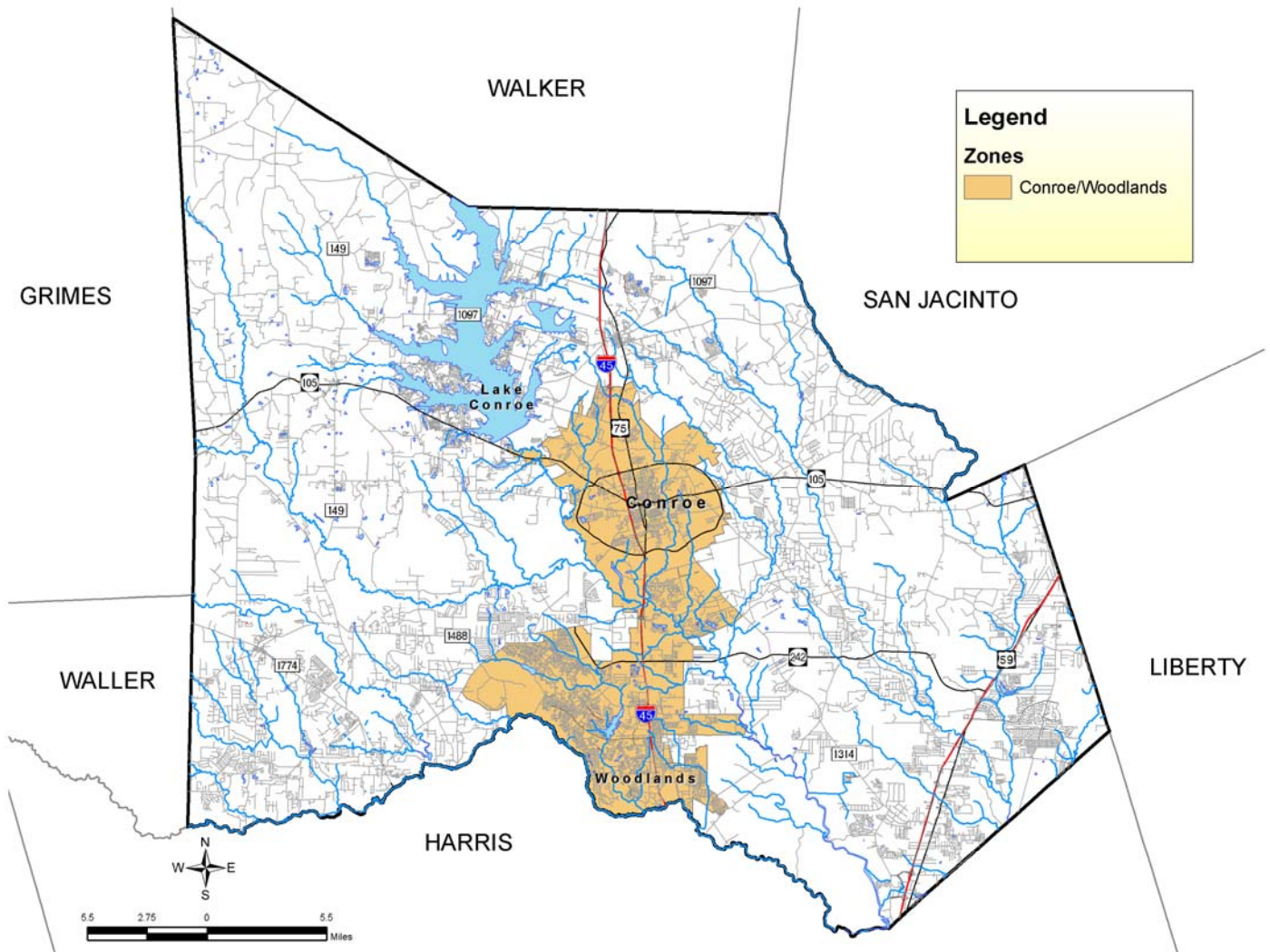
A disadvantage with focusing on the problem areas is that the initial conversion in those areas is very high at 83 percent. Also, the pro-rata share of available groundwater in the Conroe/Woodlands zone is 7,369 acre-feet per year while the Historic Use Permit volume is 32,832 acre-feet per year, meaning that proportional adjustment will reduce the volume of Historic Use Permits by 78 percent by the year 2013. Since LSGCD rules do not permit the transfer of Historic Use Permits across zones, this option would likely be too constrictive to have any chance of success.

**Table 6. Management Zone Alternative 3: Two Zones (Focus on Highest Demand Areas)**

<b>Zone</b>	<b>Area (sq miles)</b>	<b>Pro-rata Share of Available GW (ac-ft/yr)</b>	<b>Historic Use Permit Volume (ac-ft/yr)</b>	<b>Reduction Phase</b>	<b>Total Demand (ac-ft/yr)</b>	<b>Conversion (percent)</b>
<b>Conroe/ Woodlands</b>	124	7,369	32,832	2013	43,557	83%
				2020	49,542	85%
				2030	64,440	89%
				2040	83,540	91%
<b>Balance of County</b>	953	56,631	26,338	2013	38,659	0%
				2020	48,788	0%
				2030	54,949	0%
				2040	60,311	6%
<b>Countywide Totals</b>	1,077	64,000	59,170	<b>2013</b>	<b>82,217</b>	<b>22%</b>
				<b>2020</b>	<b>98,330</b>	<b>35%</b>
				<b>2030</b>	<b>119,388</b>	<b>46%</b>
				<b>2040</b>	<b>143,851</b>	<b>56%</b>



Figure 31. Alternative 3: Two Management Zones (Focus on High Demand Areas)



This alternative was modeled using the Northern Gulf Coast GAM, following the conversion schedule in *Table 6*. Groundwater reductions are only occurring in the Conroe/Woodlands zone shown in *Figure 31*; the remainder of the county is allowed to grow on groundwater.

Figure 32 shows the predicted water level declines in the Evangeline aquifer for the period 2000-2040. Rather than the prominent local cone of depression shown in the baseline results (see Figure 17), this alternative shows a relatively shallow area of depression. There is a local cone of depression just north of the City of Conroe that is not seen in the baseline run.

**Figure 32. Alternative 3: Two Management Zones (Focus on High Demand Areas)  
Predicted Water Level Decline: Evangeline 2000-2040**

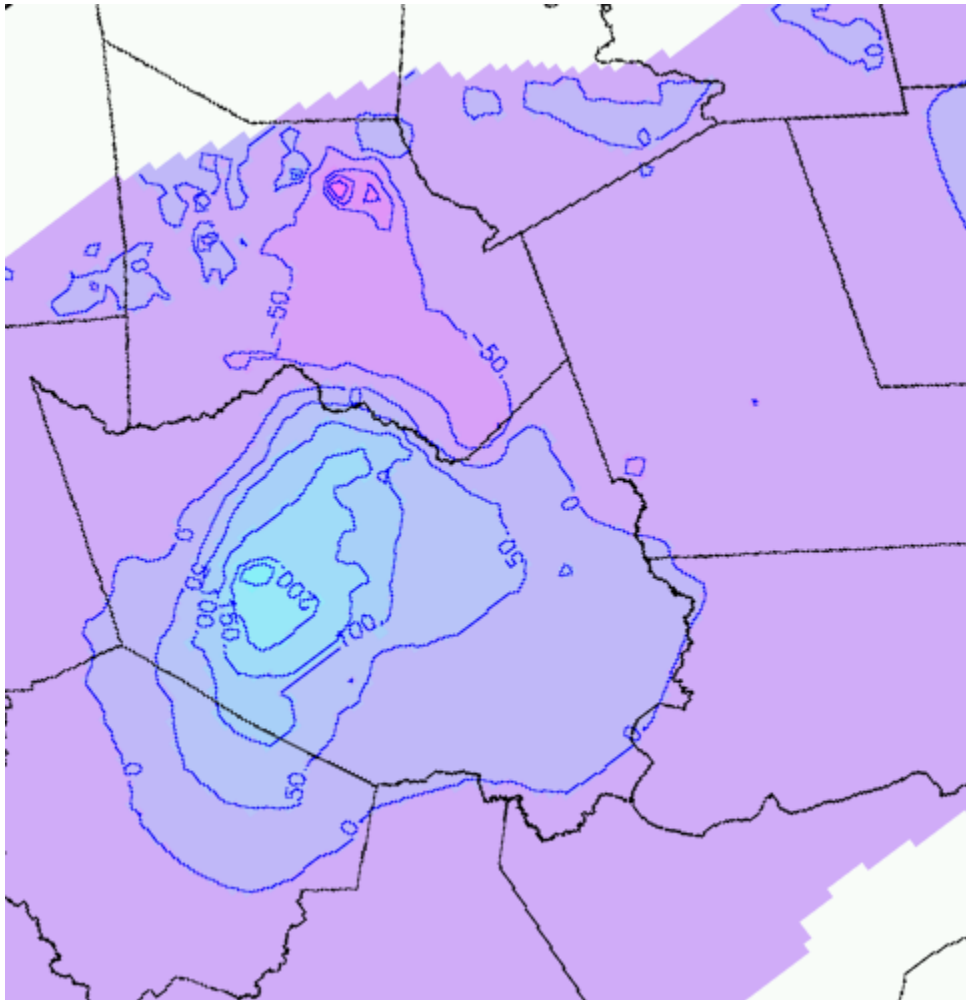
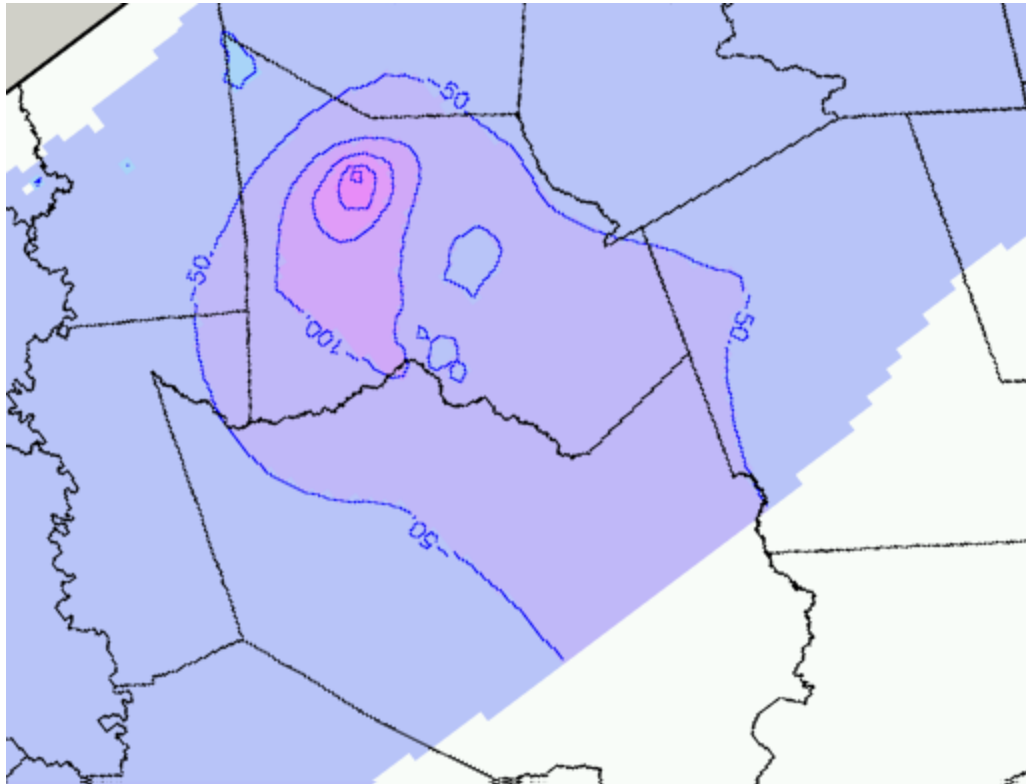




Figure 33 shows the predicted water level declines in the Evangeline aquifer for the period 2000-2040. Rather than the prominent local cone of depression shown in the baseline results (see Figure 20), this alternative shows that the problem has shifted to the Lake Conroe area, although the water level declines are not severe.

**Figure 33. Alternative 3: Two Management Zones (Focus on High Demand Areas)  
Predicted Water Level Decline: Jasper 2000-2040**



#### **Alternative 4:**

##### **Three Management Zones**

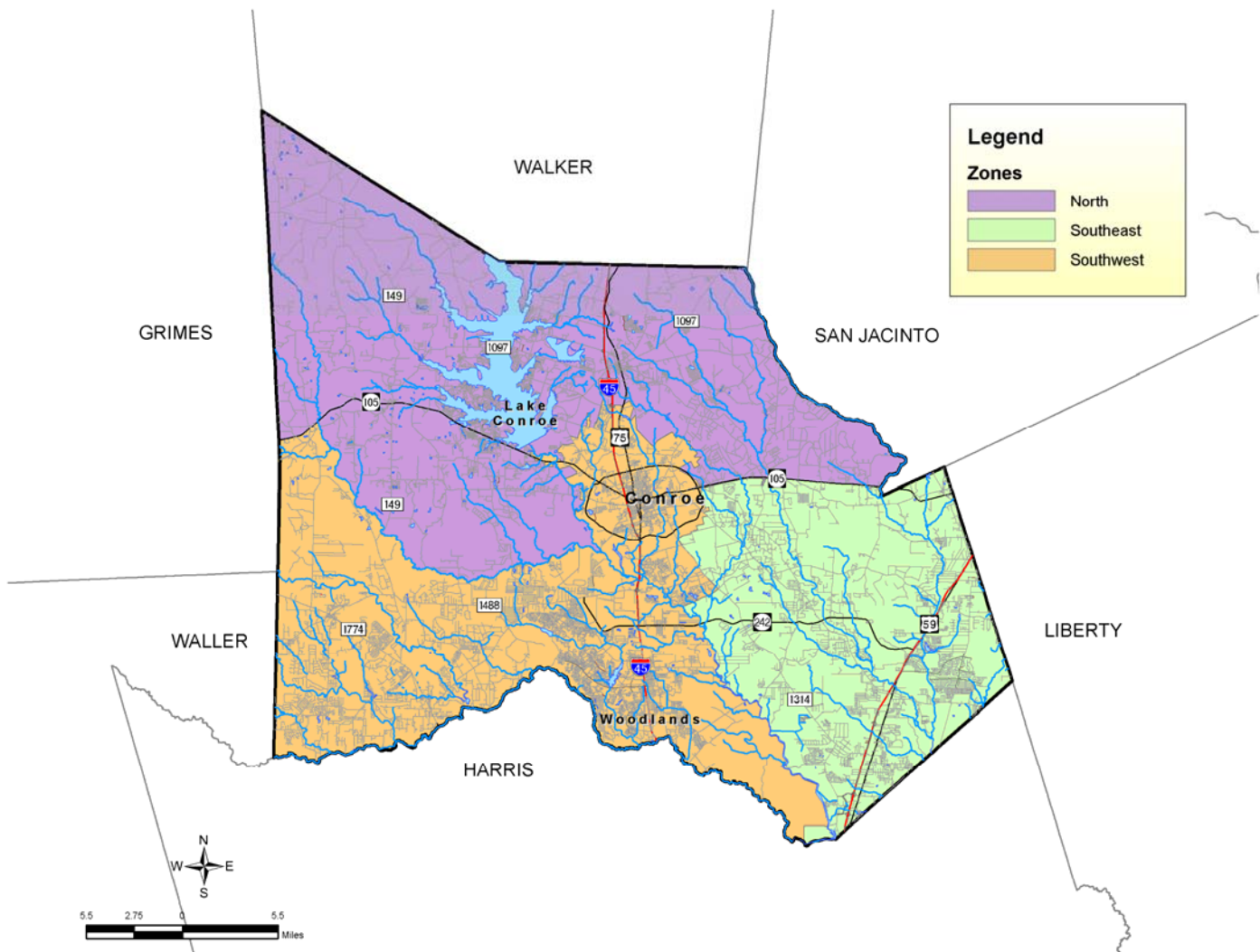
To resolve the differences in the southeastern and the south central portions of the county, a three zone approach was considered that divided the southern zone of the two zone concept at the San Jacinto River and extended the western portion of the zone up to Lake Creek as shown in Figure 34. This is a practical geographic boundary since it is likely no water districts would cross the river, and it addresses practical problems of implementing a surface water supply system since the cost of a major river crossing would add to the cost. Some modifications to the boundary east of Conroe would be necessary to accommodate existing political boundaries as well as the needs of individual water districts.

This alternative maximizes the focus on the highly developed IH 45 corridor, The Woodlands, and the City of Conroe. Based on Historic Use Permit applications (see Table 7), current usage for groundwater in this area exceeds the pro-rata allowable amount of withdrawal by almost 57 percent. By 2030, a reduction in groundwater of almost 71 percent would be required, and 75 percent by 2040.

The northern zone does not require any reduction in groundwater use under this concept. However, this conclusion is dependent on the projections of population growth and water demand, which could well change in the future. As more zones are defined, the need for updating the projections become more critical and could alter the initial findings on groundwater reduction requirements and require further reductions in the northern zone.

This alternative places a high focus on the problems currently experiencing the most dramatic declines in piezometric levels. It would require the highest reduction in groundwater usage at current pumping plants, which could create some difficulties for existing public supply systems that have invested significant monies in their infrastructure, most of which may still have considerable useful life left. As can be seen from *Figures 35 and 36*, this plan is effective in reducing the continued decline of piezometric levels in southern Montgomery County. However, it does indicate that without some additional regulation, increasing declines will be experienced in the areas around Lake Conroe.

**Figure 34. Alternative 4: Three Management Zones**



This alternative focuses on the problem area, distributes the responsibility for conversion to a broader area in the Southwest zone, and keeps the Southeast portion of the county in a separate zone. With this scenario, it is likely that a second source of surface water will be required to supply the Southeast zone, but surface water will not

need to be delivered until 2030, and even then the conversion is only 30 percent or roughly 6,400 acre-feet per year. Additionally, the Southeast zone will not require any reduction in its Historic Use Permit volume.

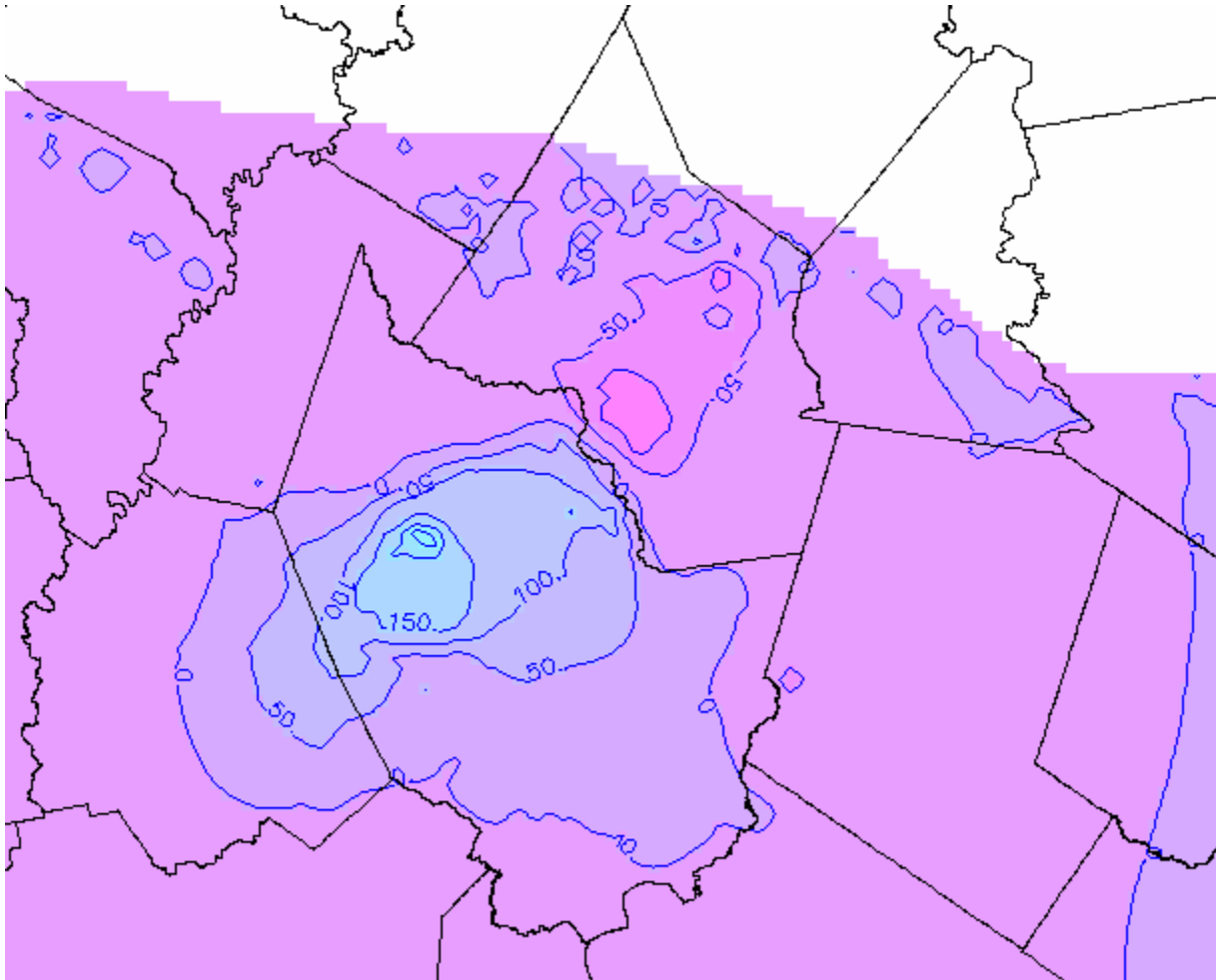
A disadvantage of this approach is that, in the initial conversion phase, only the Southwest zone is required to convert, and at a significant rate of 57 percent. Additionally, only the Southwest zone will have its volume of Historic Use Permits proportionally reduced. The Historic Use Permit volume of 37,861 acre-feet per year will need to be reduced by 44 percent, with no opportunity for transferring Historic Use Permits out of the zone. These two facts will likely cause a public acceptance problem regarding this alternative.

**Table 7. Management Zone Alternative 4: Three Zones**

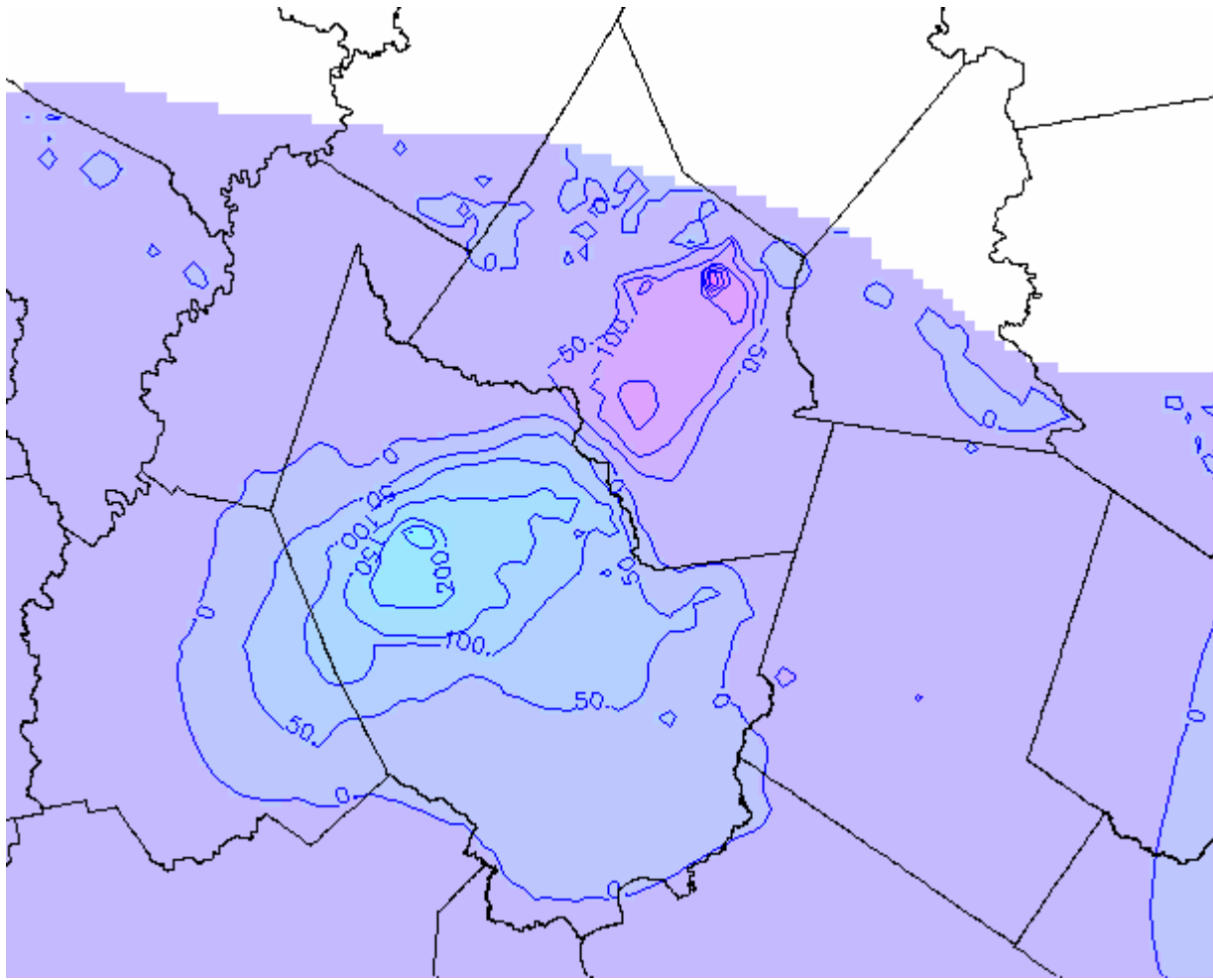
Zone	Area (sq miles)	Pro-rata Share of Available GW (ac-ft/yr)	Historic Use Permit Volume (ac-ft/yr)	Reduction Phase	Total Demand (ac-ft/yr)	Conversion
North	468	27,811	11,567	2013	19,657	0%
				2020	22,100	0%
				2030	26,317	0%
				2040	32,931	16%
Southeast	255	15,153	9,701	2013	13,827	0%
				2020	15,802	4%
				2030	21,592	30%
				2040	28,264	46%
Southwest	354	21,036	37,901	2013	48,731	57%
				2020	60,428	65%
				2030	71,480	71%
				2040	82,656	75%
Countywide Totals	1,077	64,000	59,170	<b>2013</b>	<b>82,215</b>	<b>22%</b>
				<b>2020</b>	<b>98,330</b>	<b>35%</b>
				<b>2030</b>	<b>119,389</b>	<b>46%</b>
				<b>2040</b>	<b>143,851</b>	<b>56%</b>

The three-zone alternative was modeled using the Northern Gulf Coast GAM and following the conversion schedule in *Table 7*. This alternative focuses on the problem areas since there are no groundwater reductions in the North zone and the Southeast zone does not experience significant reductions until 2030. *Figures 35 and 36* show the predicted water level declines in the Evangeline aquifer for the periods 2000-2020 and 2000-2040, respectively. These show that the declines in The Woodlands are greatly decreased compared to the baseline, with peak declines of approximately 100 feet in 2020 and 150 feet in 2040. Similar to other alternatives, there is a local cone of depression just north of the City of Conroe in 2040.

**Figure 35. Alternative 4: Three Management Zones  
Predicted Water Level Decline: Evangeline 2000-2020**

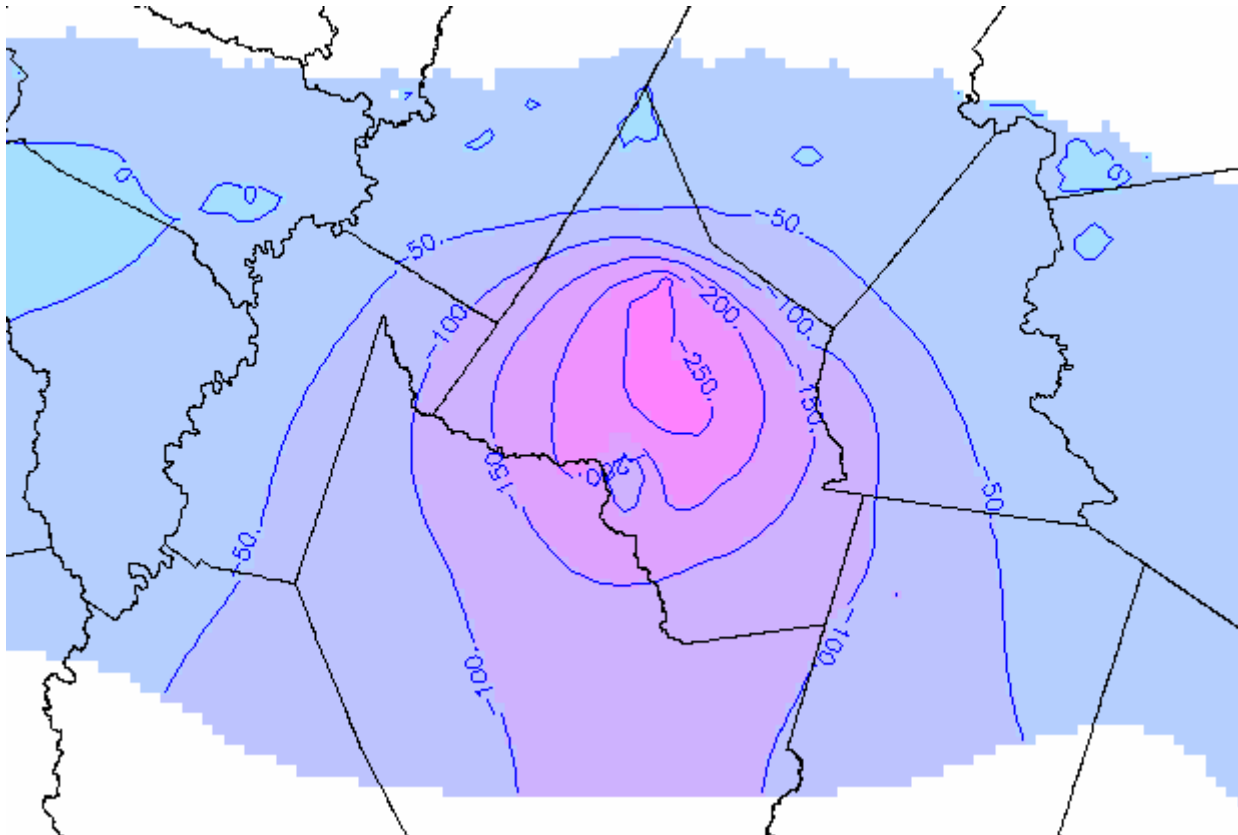


**Figure 36. Alternative 4: Three Management Zones  
Predicted Water Level Decline: Evangeline 2000-2040**

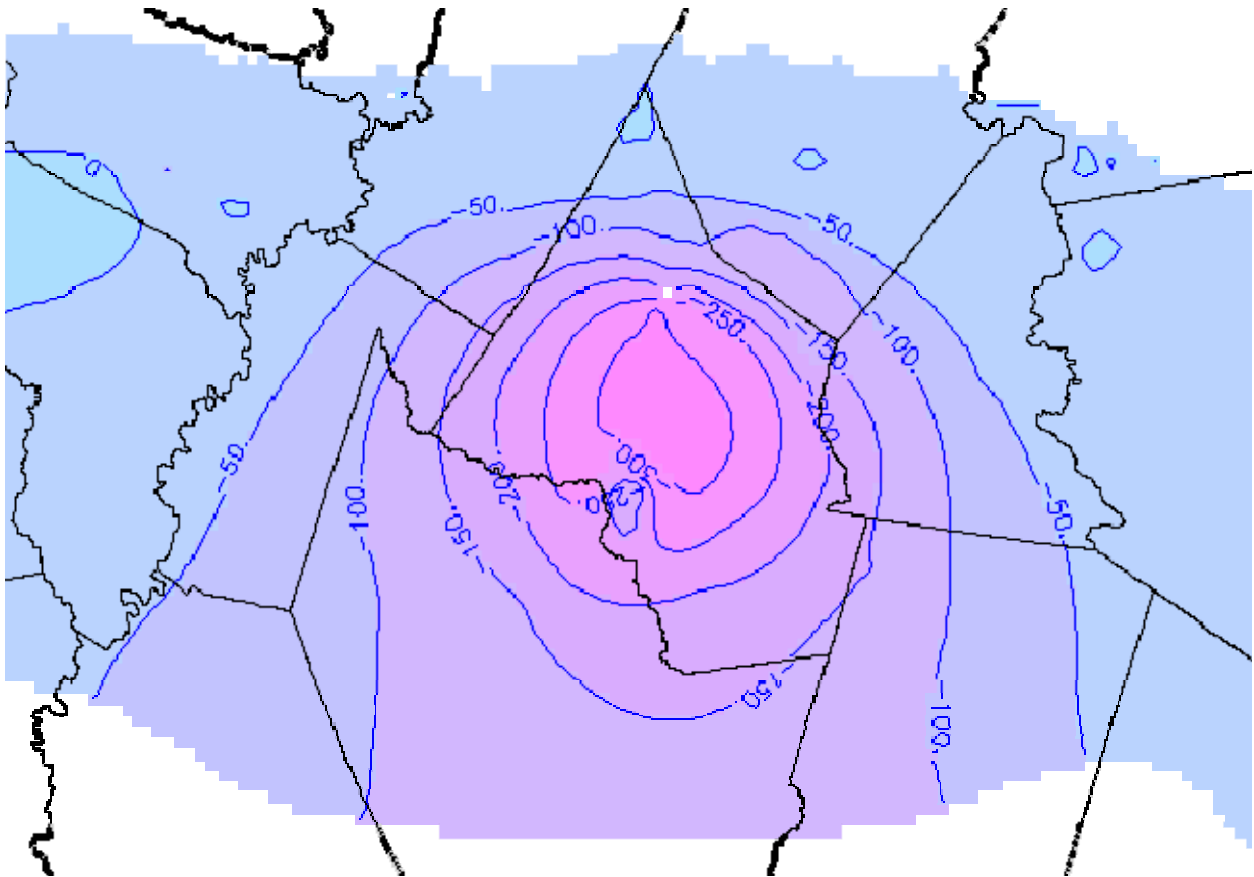


Figures 37 and 38 show the predicted water level declines in the Jasper aquifer for the periods 2000-2020 and 2000-2040, respectively. These show the center of the cone of depression shifting northward, but with much lower maximum declines compared to the baseline: 250 feet versus 700 feet for 2020, and 300 feet versus 700 feet in 2040.

**Figure 37. Alternative 4: Three Management Zones  
Predicted Water Level Decline: Jasper 2000-2020**



**Figure 38. Alternative 4: Three Management Zones  
Predicted Water Level Decline: Jasper 2000-2040**



### Alternative 5:

#### Four Management Zones

A further subdivision of the three management zone concept was considered in order to place some focus on the growing populations surrounding Lake Conroe and development along SH 105 west (see *Figure 39*). The Northern zone was, therefore, subdivided along the IH 45 corridor. As in alternatives 2 and 4, some modifications to the boundary east of Conroe would be necessary to accommodate existing political boundaries as well as the needs of individual water districts.

This alternative continues to focus on the southwestern portion of Montgomery County area for the highest degree of groundwater reduction. However, by separating out the northwestern portion of the county, some additional emphasis is placed on regulation of groundwater in the later years. Applications for Historic Use Permits are still below the pro-rata allotment which would allow them to be 100 percent honored. However, it can be seen from *Table 8* that the projections for water demand in the quadrant will near the total allocation. As population and water demand forecasts are updated, it is probable this area will begin to require some reduction in groundwater use.

The Northeast and Northwest zones are both sparsely populated as compared to the two zones to the south, and both are expected to generally grow at about the same rate overall, but the area around Lake Conroe in the Northwest zone will likely experience the most rapid localized growth. If the Lake Conroe area grows faster than expected and monitored water levels near Lake Conroe drop or are predicted to drop significantly in the future,

splitting the northern portion of the county into two zones makes it easier to address the problem. As compared to alternative 4, it reduces the potential for Historic Use Permit transfer between the northeast and northwest portion of the county.

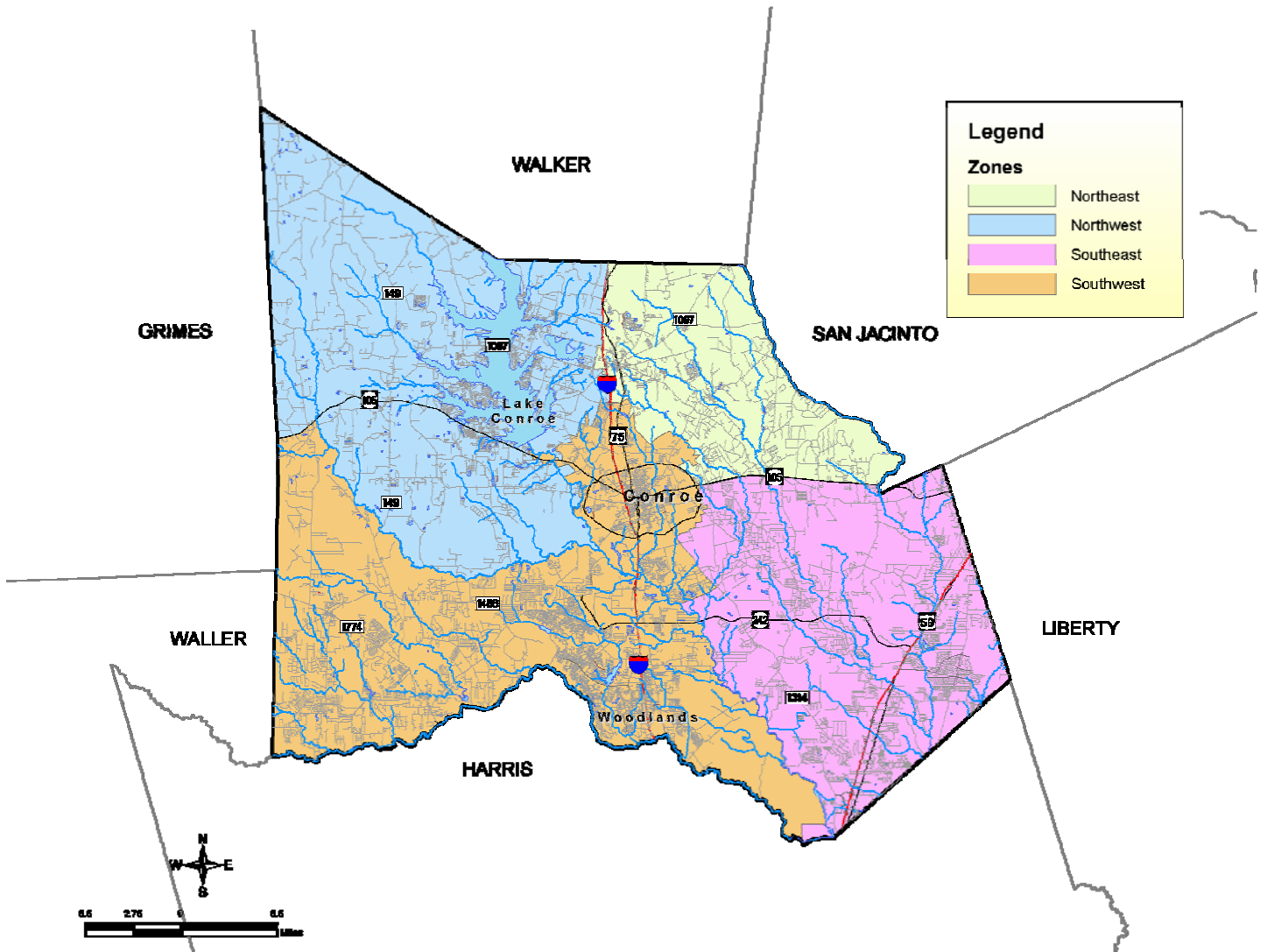
The disadvantages are the same as in alternative 4 above, namely that the Southwest zone bears by far the largest responsibility for conversion, the Southwest zone will have its Historic Use Permit volume reduced by 44 percent, and major public acceptance issues will likely arise.

**Table 8. Management Zone Alternative 5: Four Management Zones**

<b>Zone</b>	<b>Area (sq miles)</b>	<b>Pro-rata Share of Available GW (ac-ft/yr)</b>	<b>Historic Use Permit Volume (ac-ft/yr)</b>	<b>Reduction Phase</b>	<b>Total Demand (ac-ft/yr)</b>	<b>Conversion (percent)</b>
<b>Northeast</b>	130	7,725	2,378	2013	4,155	0%
				2020	4,553	0%
				2030	5,774	0%
				2040	7,074	0%
<b>Northwest</b>	338	20,085	9,190	2013	15,502	0%
				2020	17,547	0%
				2030	20,543	2%
				2040	25,857	22%
<b>Southeast</b>	255	15,153	9,701	2013	13,827	0%
				2020	15,802	4%
				2030	21,592	30%
				2040	28,264	46%
<b>Southwest</b>	354	21,036	37,901	2013	48,731	57%
				2020	60,428	65%
				2030	71,480	71%
				2040	82,656	75%
<b>Countywide Totals</b>	<b>1,077</b>	<b>64,000</b>	<b>59,170</b>	<b>2013</b>	<b>82,215</b>	<b>22%</b>
				<b>2020</b>	<b>98,330</b>	<b>35%</b>
				<b>2030</b>	<b>119,389</b>	<b>46%</b>
				<b>2040</b>	<b>143,851</b>	<b>56%</b>

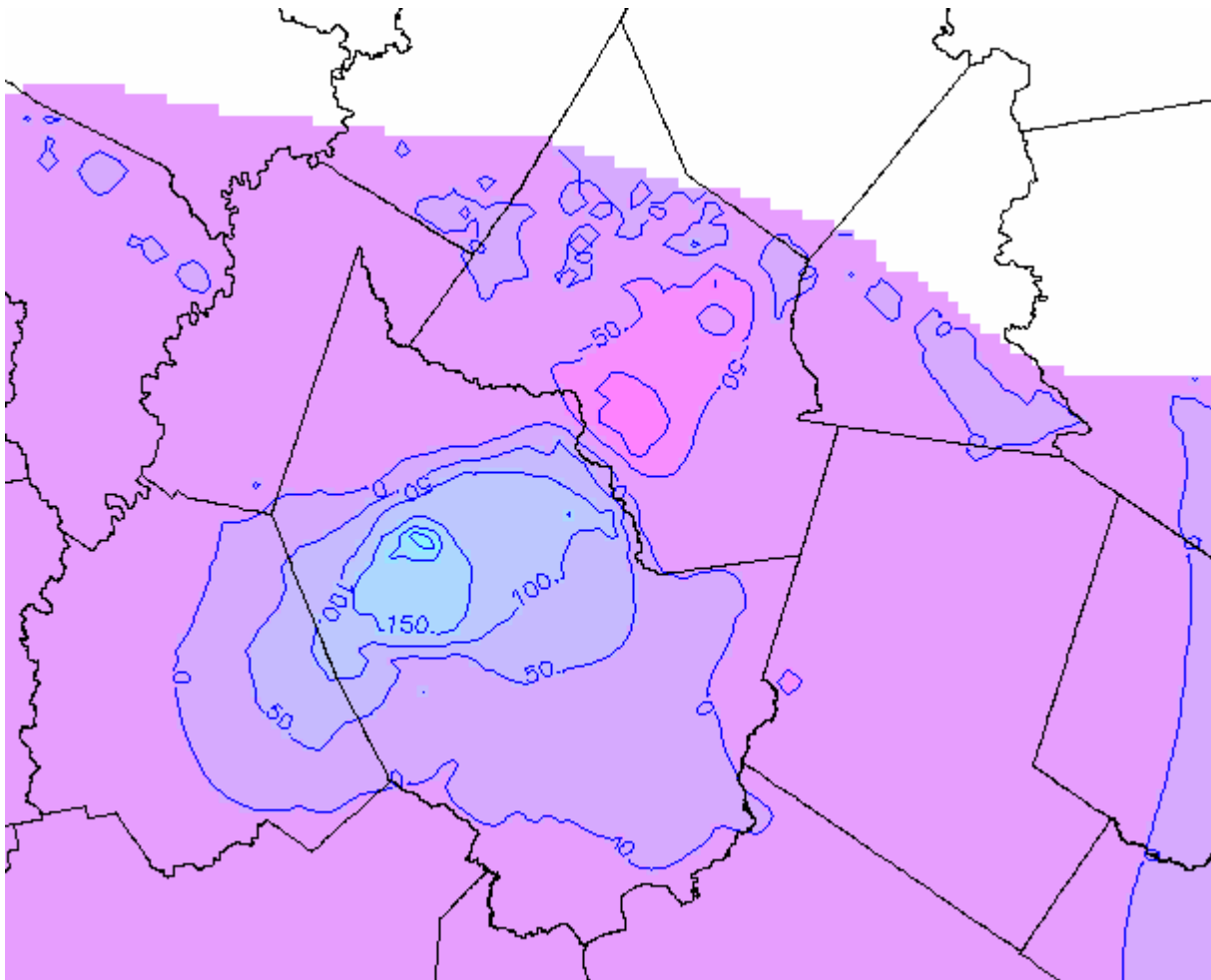


Figure 39. Alternative 5: Four Management Zones

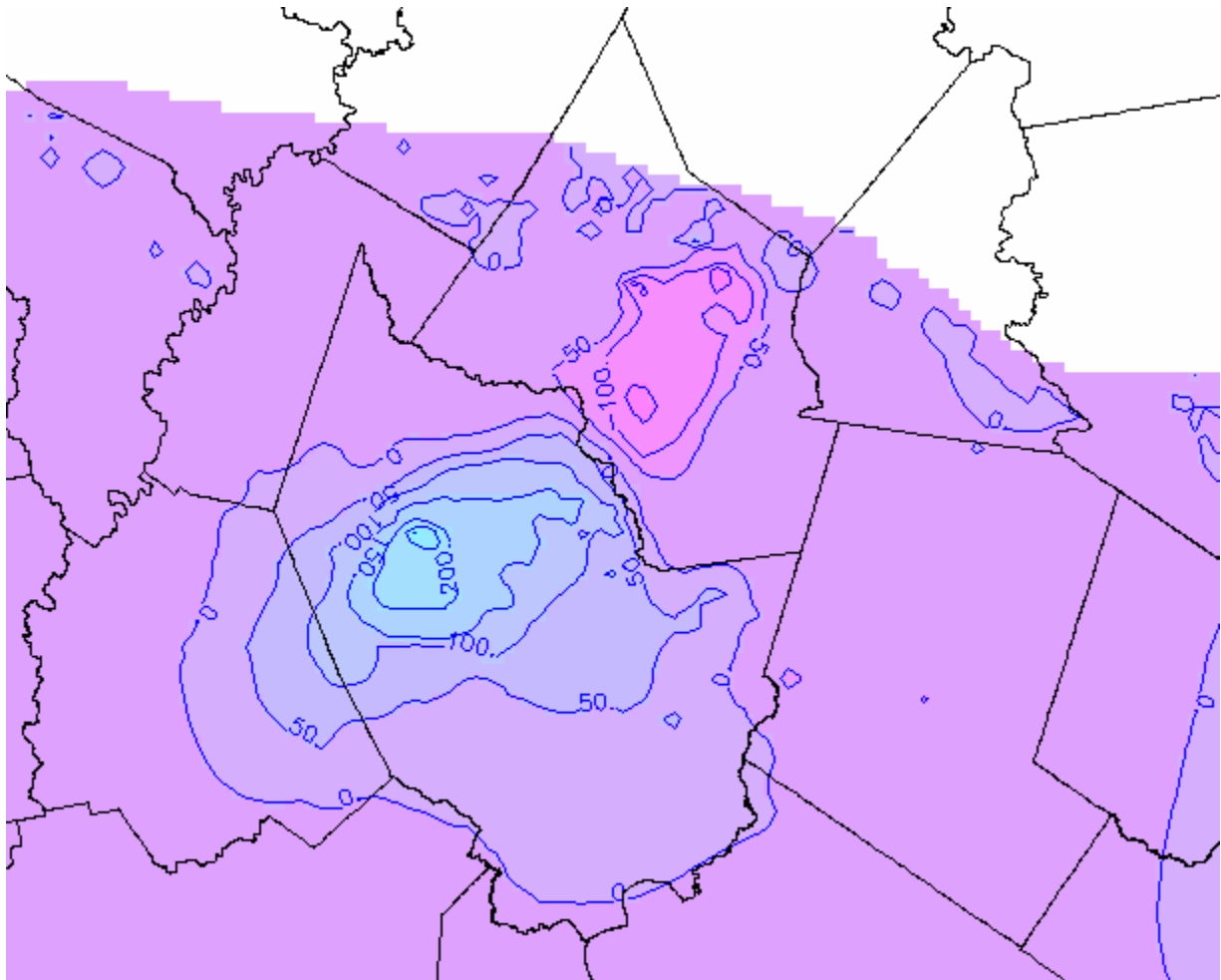


The Four Zone alternative was modeled using the Northern Gulf Coast GAM and following the conversion schedule in *Table 8*. From a modeling standpoint, this alternative is similar to the Three Zone alternative. This alternative also focuses on the problem areas since there are no groundwater reductions in the Northeast zone and the Southeast zone does not experience significant reductions until 2030. There are reductions called for in the Northwest zone, but nothing significant before 2040. *Figures 40* and *41* show the predicted water level declines in the Evangeline aquifer for the periods 2000-2020 and 2000-2040, respectively. These show that the declines in The Woodlands are greatly decreased compared to the baseline, with peak declines of approximately 100 feet in 2020 and 150 feet in 2040.

**Figure 40. Alternative 5: Four Management Zones  
Predicted Water Level Decline: Evangeline 2000-2020**

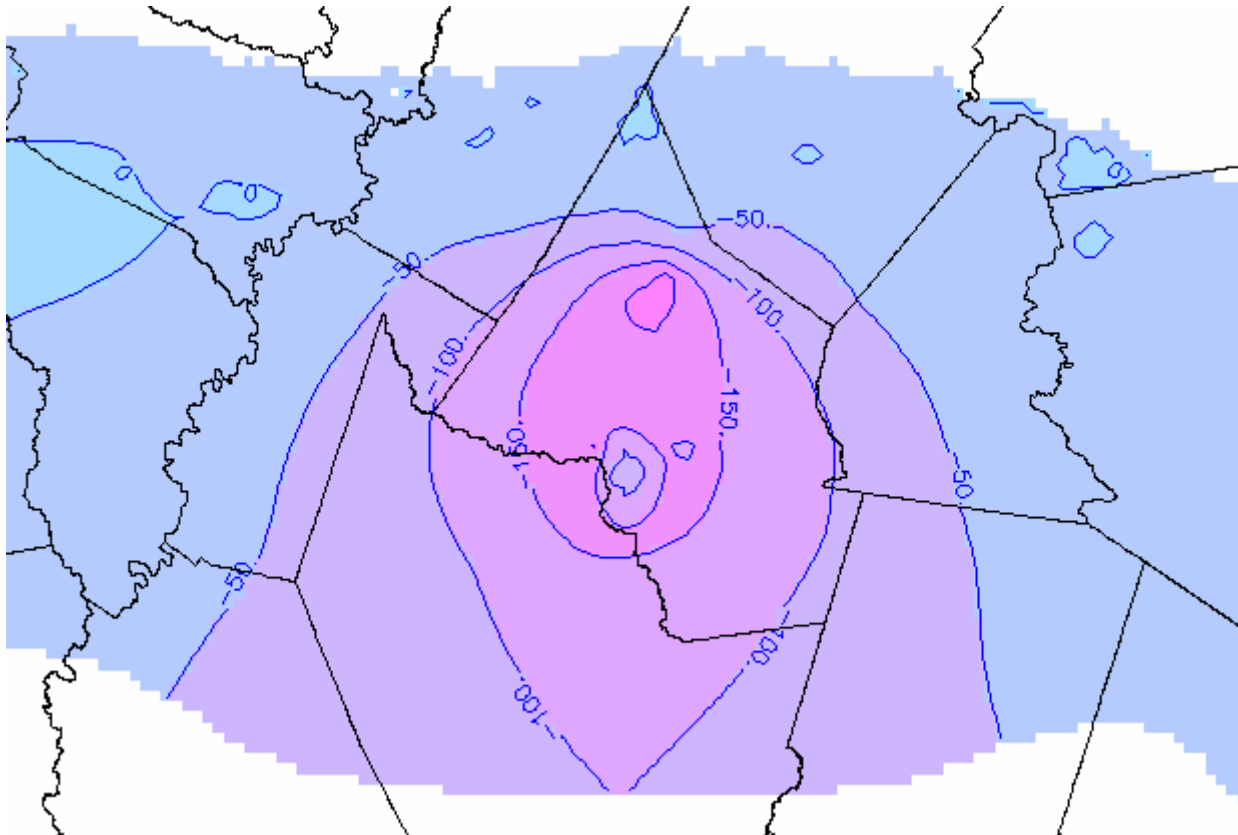


**Figure 41. Alternative 5: Four Management Zones  
Predicted Water Level Decline: Evangeline 2000-2040**



Figures 42 and 43 show the predicted water level declines in the Jasper aquifer for the periods 2000-2020 and 2000-2040, respectively. These show the center of the cone of depression shifting northward, but with much lower maximum declines compared to the baseline: 250 feet versus 700 feet for 2020, and 300 feet versus 700 feet in 2040.

**Figure 42. Alternative 5: Four Management Zones  
Predicted Water Level Decline: Jasper 2000-2020**



**Figure 43. Alternative 5: Four Management Zones  
Predicted Water Level Decline: Jasper 2000-2040**

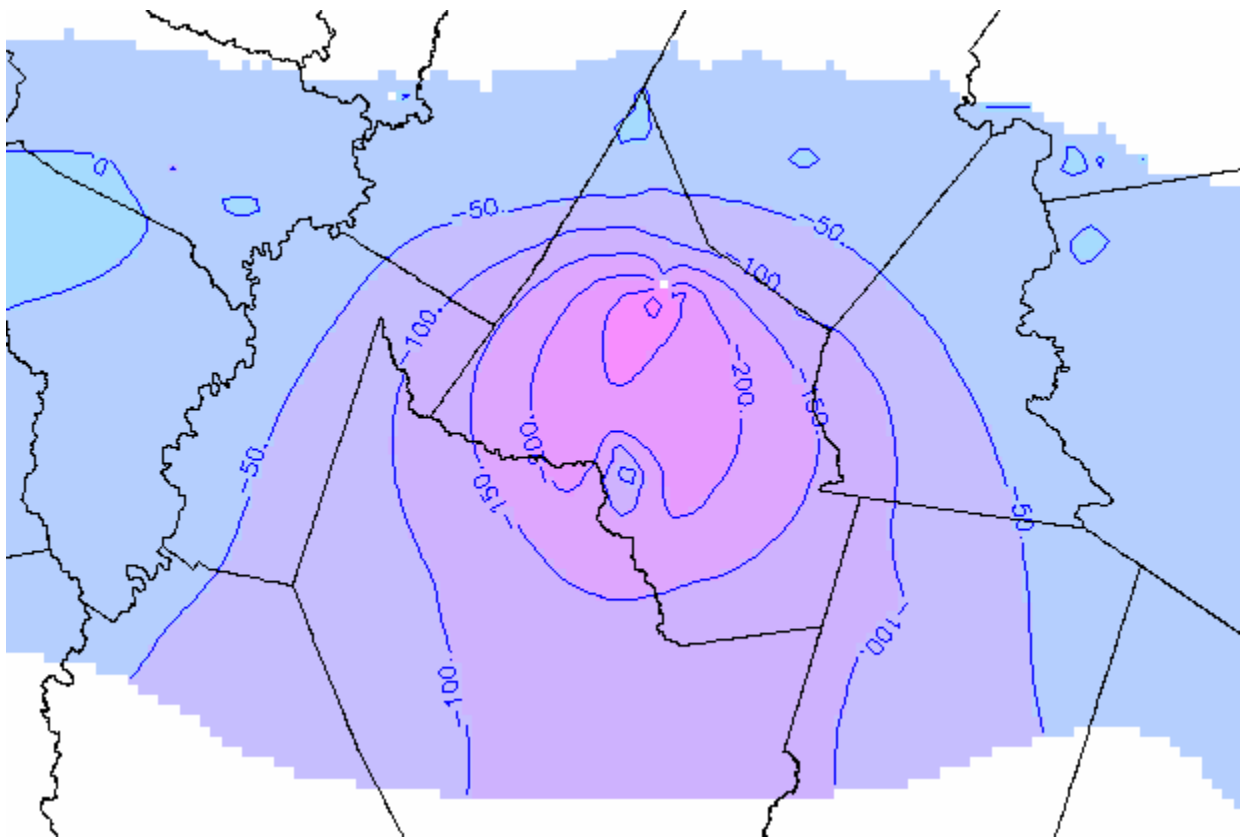


Table 9 provides an overview of the Management Zone alternatives including some of the perceived advantages of each alternative. One of the inherent disadvantages of increasing the number of management zones is that it increases the percentage of groundwater reduction within a zone more than would be required under a single zone, countywide concept. This disadvantage is offset by the advantage of focusing groundwater reduction in the areas currently experiencing water level declines and forcing a solution to the problem. Over-conversion is viable inasmuch as high-demand stakeholders are willing to convert their supply to allow for future growth on groundwater elsewhere. An across-the-board requirement to over-convert supplies can be problematic in that it will require broader conversion across the county and possibly require more extensive surface water system networks.

**Table 9. Management Zone Alternatives – Advantages/Disadvantages**

Number	# Zones	Description	Advantages/Disadvantages
1	1	Single zone countywide	<p>Advantages:</p> <ul style="list-style-type: none"> <li>• All HUPs honored at 100%</li> <li>• Short-term public acceptance</li> <li>• Moderate initial conversion</li> <li>• Maximum HUP transfer</li> </ul> <p>Disadvantages:</p> <ul style="list-style-type: none"> <li>• Dilutes focus on problem area</li> <li>• Potentially increases implementation costs</li> <li>• Requires most stakeholder cooperation</li> </ul>
2	2	One zone consisting of Conroe, The Woodlands, and districts along the IH 45 corridor. The other zone is the balance of the county.	<p>Advantages:</p> <ul style="list-style-type: none"> <li>• Highly focused on problem area</li> <li>• Conversion is delayed outside of the problem area</li> <li>• Flexibility in meeting conversion goals for areas outside of Conroe and The Woodlands</li> </ul> <p>Disadvantages:</p> <ul style="list-style-type: none"> <li>• Very high degree of conversion early in the Conroe/Woodlands zone</li> <li>• Historic Use Permit volume reduced 78 percent by 2013</li> </ul>
3	2	County divided into Northern and Southern zones – boundary is FM 1488 west of IH 45 and SH 105 east of IH 45. City of Conroe is included in Southern zone.	<p>Advantages:</p> <ul style="list-style-type: none"> <li>• Focuses on current and future growth</li> <li>• Distributes responsibility for conversion over broad area</li> </ul> <p>Disadvantages:</p> <ul style="list-style-type: none"> <li>• The potential requirement of two sources of surface water requires high degree of cooperation</li> <li>• Does not address future impacts around Lake Conroe</li> </ul>
4	3	Northern portion of county in one zone, southern portion divided east/west by San Jacinto River	<p>Advantages:</p> <ul style="list-style-type: none"> <li>• Focuses on problem area</li> <li>• Moderate degree of HUP trading possible</li> </ul> <p>Disadvantages:</p> <ul style="list-style-type: none"> <li>• High degree of conversion in southwest portion of county</li> <li>• Public acceptance issues</li> </ul>
5	4	County divided into quadrants – north/south boundary is Lake Creek and SH 105, east/west boundary is IH 45 and San Jacinto River	<p>Advantages:</p> <ul style="list-style-type: none"> <li>• High focus on problem area</li> <li>• Minimizes HUP trading</li> </ul> <p>Disadvantages:</p> <ul style="list-style-type: none"> <li>• High degree of conversion in southwest portion of county</li> <li>• Public acceptance issues</li> </ul>

# Facilities Implementation Plan

## Introduction

As is indicated by *Figure 10*, the magnitude of alternative sources of water suggests that a surface water supply system will be necessary to meet the projected water needs in the future. The current groundwater water supply infrastructure is established such that the source of water is comparatively close to the point of distribution. Individual communities need only to drill one or more wells within or near their service area and install groundwater treatment facilities and storage tanks near the well(s) to be able to deliver water. Larger communities, such as the City of Conroe and The Woodlands, have multiple such plants to deliver water to various parts of the city. Consequently, the groundwater production plants are typically part of the retail system of supply.

However, the economics of surface water supply normally dictate that it is cost effective to build a single larger water treatment system and transmit the water through larger pipelines as a wholesale supply system to multiple end users or retail providers. This is a fundamental change in how water is currently supplied and introduces the concept of conjunctive use of groundwater and surface water supply. Many public water supply systems will remain totally on groundwater. Others may convert totally to surface water. Still many others will receive a combination of both surface and groundwater.

The purpose of this Facilities Implementation Plan is to identify a conceptual plan for how a wholesale surface water supply system could be introduced, what the cost of such a facility might be, and what the potential water rate might be. Also discussed are some alternative management structures that have been put in place in other areas of the region and state to implement a wholesale surface water system.

The facilities proposed in this report are conceptual only and represent one of many possible configurations that could eventually be constructed. The LSGCD does not have express statutory authority to design and implement facilities—the purpose of this plan is to provide a conceptual understanding of what facilities may be required to solve the problem of future water shortages.

## Water Supply Strategies

According to the 2006 Region H Water Plan, Montgomery County will face water shortages beginning in 2010. Current groundwater permits and pending permit applications suggest that the demand is exceeding supply today. *Table 10* shows the countywide projected shortages by planning decade through 2040.

**Table 10. Projected Shortages Through 2040**  
(acre-feet/year)

Use Category	Year			
	2010	2020	2030	2040
Municipal	-10,909	-33,316	-53,880	-76,064
Manufacturing	-343	-884	-1,291	-1,672
Mining	-80	-193	-261	-315
Steam Electric Power	0	0	0	-1,815
Irrigation	0	0	0	0
Livestock	0	0	0	0
<b>TOTAL</b>	<b>-11,332</b>	<b>-34,393</b>	<b>-55,432</b>	<b>-79,866</b>

The shortages increase from 11,332 acre-feet per year in 2010 to 79,866 acre-feet per year in 2040. The shortages can be met by reducing the demand and/or developing new and existing sources of surface water. The 2006 Region H Water Plan has identified and evaluated a number of water management strategies to potentially meet these shortages. *Table 11* shows the recommended strategies from the 2006 Region H Water Plan. The water plan shows that by a combination of conservation, allocation of existing supplies, and the acquisition of new supplies by SJRA, all the shortages can be met.

**Table 11. Recommended Water Management Strategies for Montgomery County**

	2010	2020	2030	2040
Initial Shortage	-11,332	-34,393	-55,432	-79,866
Municipal Conservation	4,285	5,695	6,971	8,312
<b>Net Shortage</b>	<b>-7,047</b>	<b>-28,698</b>	<b>-48,461</b>	<b>-71,554</b>
New Contracts (SJRA)***	96,000	96,000	96,000	96,000
Lake Houston Additional Yield	13,500	11,000	8,500	6,000
TRA - Houston Contract	0	50,000	50,000	50,000
Luce Bayou Transfer	0	Earliest	Moderate	Latest
<b>Total as Recommended</b>	<b>102,453</b>	<b>128,302</b>	<b>106,039</b>	<b>80,446</b>

\*\*\* Values after contract expansions

A detailed discussion of each strategy can be found in the 2006 Region H Water Plan. The recommended strategies address the future supply shortage in Montgomery County, but they do not address delivering water to areas requiring conversion from groundwater to surface water.

The focus of this Facilities Implementation Plan is the development of a wholesale surface water supply system that can be used by the numerous retail, municipal, and industrial water users in Montgomery County as a means



of reducing groundwater use. In order to successfully implement such a program, the following aspects for the program need to be discussed:

- There must be an adequate amount of surface water available from a surface water supplier.
- Someone must be responsible for the planning, design, and construction of the facilities.
- Someone must be able to operate and maintain the system.
- Someone must address the administrative aspects of the system including contracts with water users, billings, etc.

## Proposed Surface Water Facilities

### Implementation Schedule

The 2006 Region H Water Plan demonstrates that there are water shortages in Montgomery County by 2010. It is not feasible to have surface water facilities in place by 2010 because of the time it takes to get facilities built. *Table 12* shows the timetable for implementing surface water. If a project is started in the next couple of years, the earliest surface water facilities could be implemented is the year 2013.

**Table 12. Timetable for Implementing Surface Water**

Step	Months
Preliminary engineering and site selection	8
Treatability studies	3
Permitting	5
Land acquisition: easements and rights-of-way	6-12
Final design	12
Plan review	3
Bid procurement	3
Construction	18-24
Start-up and acceptance	3
<b>Total Time Estimate</b>	<b>61-73</b>

This is not to say that facilities will be constructed by then, but that the earliest feasible timeframe to have surface water facilities operational is 2013. The determining factors as to when facilities will ultimately be implemented include the LSGCD regulatory study requirements, the level of shareholder participation and coordination, and the availability of funding.

Regardless of the number of management zones established, the opportunity exists for the regulated community to work together to implement a cost effective surface water system. The combination of Historic Use Permits, the GR Study, and the comparative cost of surface water to groundwater can provide incentives for communities to work together to implement the most cost-effective system either within a zone or across multiple zones. For

example, if alternative 5 is considered (Four Management Zones), and surface water is planned for the communities in the Southwest zone by 2013, two alternatives can be considered. On one hand, according to the GR study proposed by alternative 5, all existing and future public water supply systems in that zone would require a 22 percent reduction in groundwater demand by 2013. In fact, all new communities would receive operating permits without certainty that those permits would be renewed in the future. Each community could, theoretically, be required to receive some surface water to meet their total demand needs. This would result in a very extensive network of pipelines to each water district. Conversely, agreements could be reached among the regulated community such that only certain communities would receive surface water, and would reduce their groundwater more than required, so that the other communities would remain totally on groundwater.

This same concept can exist across management zones and should at least have some consideration. As future updates to planning and projections for population and water demand are conducted, the conclusions on where groundwater reductions must be considered could change. The idea that the regulated communities could work together to facilitate construction of the most cost-effective surface water system would benefit all of the parties.

As an example, assume alternative 5 (Four Management Zones) is implemented as a regulatory study. Summarizing the data for alternative 5, *Table 13* shows a reduction in groundwater use starting in 2013. Based on these numbers, surface water systems are proposed for the Southwest and Southeast zones. The Southwest would require a reduction in groundwater by 2013, and the Southeast zone by 2020. It should be noted that this schedule is predicated on an assumed growth rate and spatial distribution within each zone. The timetable for conversion may shift or, in the case of the Southeast zone, the need for a surface water system in 2030 may not materialize at all.

**Table 13. Alternative Source Requirements by Phase and Zone**

Zone	Phase I - 2013		Phase II - 2020		Phase III - 2030		Phase IV - 2040	
	Conversion Target	SW Req'd	Conversion Target	SW Req'd	Conversion Target	SW Req'd	Conversion Target	SW Req'd
Southwest	57%	25 mgd	65%	35 mgd	71%	46 mgd	75%	55 mgd
Southeast	-	-	4%	0.6mgd	30%	6 mgd	46%	12 mgd
Northwest	-	-	-	-	2%	0.4mgd	22%	5 mgd
Northeast	-	-	-	-	-	-	-	-

Note: mgd = million gallons per day. 1 mgd = 1,120 acre-feet per year.

## Existing Groundwater Facilities

Water districts in areas of Montgomery County requiring conversion will not, in many cases, switch over to surface water completely, at least initially. Most will phase out a portion of their wells, bring in surface water to existing treatment and storage facilities, and keep some wells operable for average daily demand and daily peaking or for daily peaking only.

Before determining where surface water pipelines can be constructed, the location of existing facilities must be determined for systems defined as "public." For the purposes of this study, an attempt was made to locate the facilities (wells, tanks, treatment plants) for the Public Water Systems (PWSs) in the high growth areas of the county. As defined by the TCEQ, a PWS provides potable water for the public's use. It is considered public if it is of a certain size: it must have at least 15 service connections and must serve at least 25 individuals for at least 60 days out of the year. No attempt was made to locate facilities that are not part of a "public" system, i.e. private house wells and very small systems that do not meet the TCEQ definition of a PWS.

The TCEQ maintains the data for all PWSs in the state of Texas. Information on the PWS wells, entry points, storage facilities and more can be accessed through their online Water Utility Database (WUD). Since the WUD does not give the precise location (i.e. latitude/longitude) for wells and other facilities, TCEQ supplied LSGCD with a geographic database file for all PWS wells in Montgomery County. The TCEQ does not currently maintain geographic coordinates for groundwater treatment and storage facilities, but they do have addresses in some cases. The process for precisely locating treatment facilities involved visually identifying storage tanks on digital aerial photography by using the well locations and/or treatment plant addresses as a starting point. Where storage facilities could not be visually verified for a PWS, it was assumed that they are located in close proximity to their water supply wells.

## Proposed Surface Water Facilities Location

While it is not possible within the scope of this study to determine precisely where facilities will be constructed, it is likely that they will be constructed to reasonably minimize cost and hence the price of water. For instance, to minimize pipeline cost, it is likely that areas of high population density and growth will be preferred over far-flung and sparsely populated low-growth areas. To minimize treatment costs, it is likely that, for the Southwest zone, one large treatment plant at Lake Conroe will be constructed as opposed to multiple smaller plants.

Table 14 shows a summary of the proposed surface water systems by conversion phase and zone. The number of public water systems served and the required conversion rate for those systems is shown. Only the Southwest and Southeast zones will require systems during the planning horizon, and only the Southwest zone will require a system before 2030. Not all public water systems in the Southwest and Southeast zones will be served by a surface water system. For this reason the public water systems that are served must convert at a higher rate than the zone target in order to meet the overall conversion requirement.

**Table 14. Summary of Proposed Surface Water Systems by Phase and Zone**

Zone	Phase I - 2013		Phase II - 2020		Phase III - 2030		Phase IV - 2040	
	Number of Systems Served	Convsn Rate	Number of Systems Served	Convsn Rate	Number of Systems Served	Convsn Rate	Number of Systems Served	Convsn Rate
Southwest	19	75%	23	80%	60	77%	60	84%
Southeast	-	-	-	-	32	56%	32	88%
Northwest	-	-	-	-	-	-	-	-
Northeast	-	-	-	-	-	-	-	-

In order to serve the high population growth areas along the IH 45 corridor in the Southwest zone, one treatment plant is proposed to be located near the dam at Lake Conroe. From there, pipelines are aligned along highways and major thoroughfares. The southeast portion of the county would not likely be served by the same system as the central and southwest portion of the county. Instead, it is envisioned that the southeast part of the county near US 59 will be served by a treatment plant operated at Lake Houston in northern Harris County.

Alignments that are prohibitively expensive are avoided, e.g. along IH 45. The number of special crossings is minimized, such as crossings at freeways or major streams. One goal with respect to pipeline location is to find a feasible alignment that will serve the target areas at a reasonable cost. It is beyond the scope of this study to find alignments that will minimize or eliminate all potential conflicts and issues. Any alignment proposed herein is but one of many potential solutions. Final facility locations can only be determined after evaluating all constraints and performing cost optimization to minimize construction and energy costs.

The Lake Conroe system serving the City of Conroe, The Woodlands, and neighboring water districts would likely be built in phases: an initial system in 2013 followed by treatment plant expansions and additional pipeline construction. It is assumed that the initial phase in 2013 and subsequent pipeline expansions in 2020 and 2030 would have enough capacity for the 2040 projected average daily flow. This would allow growth to occur without having to remove and replace existing pipelines. The system supplying the southeast portion of the county from Lake Houston is not required until the year 2030, at which point the ultimate system would be constructed, followed by a treatment plant expansion in the year 2040.

Tables 15 and 16 show all 60 districts/PWSs served by the Lake Conroe surface water system. Table 15 shows the Conroe/Woodlands/IH 45 corridor water districts/PWSs, along with the amount of water that could be supplied to each district/PWS by conversion step. Table 16 shows the districts/PWSs in southwestern Montgomery County that could be served starting in 2030, as well as the total amount of water supplied for all districts/PWSs and the overall conversion rate for the affected districts/PWSs. These are conceptual lists at this point: the inclusion or exclusion of a particular district will depend on discussions with districts regarding the state of their current water supply inventory and their specific needs.

**Table 15. Conroe/Woodlands/IH 45 Corridor Water Districts/Systems Served by the Lake Conroe Treatment Plant**

Water District/PWS	Surface Water Delivered (acre-feet/year)			
	2013	2020	2030	2040
Chateau Woods MUD	360	475	538	681
City of Conroe	7,288	8,489	10,156	13,679
City of Oak Ridge North	527	598	691	895
City of Panorama Village	0	691	813	966
City of Shenandoah	383	406	387	416
Crighton Ridge Subdivision	73	96	109	138
East Plantation UD	350	426	554	785
Lakeland Water System	87	115	130	165
Lazy River Improvement District	196	258	293	370
Magnolia ISD - Bear Branch	0	57	64	81
Montgomery County MUD 15	398	526	596	754
Montgomery County MUD 19	0	362	345	373
Montgomery County WCID 1	0	410	440	541
Mustang Athletic Club	14	19	21	27
Rayford Road MUD	1,568	1,662	1,585	1,727
River Plantation MUD	619	654	621	668
SJRA (The Woodlands)	13,687	21,277	21,814	23,655
Southern Montgomery County MUD	1,416	1,719	1,633	1,765
Southwind Ridge	17	23	26	32
Spring Creek UD	398	474	604	846
Spring Forest Subdivision	208	275	312	395
Town of Woodloch	208	274	311	393
White Oak Estates WSC	88	116	131	166
<b>Total (acre-feet/year)</b>	<b>27,884</b>	<b>39,400</b>	<b>42,173</b>	<b>49,521</b>
<b>Total (mgd)</b>	<b>25</b>	<b>35</b>	<b>38</b>	<b>44</b>

**Table 16. Southwest Montgomery County Water Districts/Systems  
Served by the Lake Conroe Treatment Plant**

Water District/PWS	Surface Water Delivered (acre-feet/year)			
	2013	2020	2030	2040
Allenwood Subdivision	0	0	74	94
Armadillo Woods	0	0	112	141
Bear Branch Estates	0	0	35	44
Brushy Creek Utility Inc	0	0	151	191
City Of Magnolia	0	0	270	345
Clear Creek Forest Section 12	0	0	362	458
Clover Creek Mud	0	0	231	292
Coe Country	0	0	395	500
Cypresswood Estates	0	0	108	136
Decker Hills	0	0	571	722
Decker Oaks Estates	0	0	72	92
Decker Woods Subdivision	0	0	369	468
Dogwood Hills	0	0	464	587
Hazy Hollow East Estates	0	0	1,050	1,329
High Meadows Ranch Water Supply	0	0	236	298
Hunters Retreat	0	0	233	295
Indigo Lakes Water System	0	0	750	949
Indigo Ranch	0	0	314	398
Kipling Oaks 1	0	0	260	329
Kipling Oaks 2, 3, and 4	0	0	232	294
Lake Windcrest Water System	0	0	629	796
Millers Crossing	0	0	27	34
Mink Branch Valley	0	0	24	30
Old Egypt Subdivision	0	0	13	17
Old Mill Lake	0	0	93	117
Pinedale Mobile Home Community	0	0	204	259
Pinehurst Decker Prairie WSC	0	0	480	607
Rimwick Forest	0	0	36	45
Rustic Oaks Subdivision	0	0	11	14
Shady Brook Acres	0	0	77	97
Sweetgum Forest	0	0	35	44
Thousand Oaks	0	0	90	113
Timberloch Estates	0	0	329	416
Towering Oaks Subdivision	0	0	329	417
Walnut Springs	0	0	339	428
Westwood I and II	0	0	384	485
Woodland Lake Estates	0	0	206	261
<b>SW Montgomery County Total (acre-feet/year)</b>	<b>0</b>	<b>0</b>	<b>9,591</b>	<b>12,141</b>
<b>Grand Total (acre-feet/year)</b>	<b>27,884</b>	<b>39,400</b>	<b>51,765</b>	<b>61,661</b>
<b>Grand Total (mgd)</b>	<b>25</b>	<b>35</b>	<b>46</b>	<b>55</b>
<b>Conversion Rate (%)</b>	<b>75%</b>	<b>80%</b>	<b>77%</b>	<b>84%</b>

Table 17 shows the 33 districts/PWSs in southeastern Montgomery County that could be served by surface water from Lake Houston and the yearly volume of water supplied to each by conversion step.

**Table 17. Southeastern Montgomery County Water Districts/PWSs Served by Surface Water System**

Water District/PWS	Surface Water Delivered (acre-feet/year)			
	2013	2020	2030	2040
Allendale Water System	0	0	142	294
Bennett Woods	0	0	219	453
Chaparral Place	0	0	19	38
City of Houston - UD 5 - Kingwood	0	0	210	454
City of Splendora	0	0	166	338
City of Woodbranch Village	0	0	59	122
Countrywide RV Park	0	0	4	8
Deer Glenn Water System	0	0	281	581
East Montgomery County MUD 3	0	0	208	430
Heritage Oaks	0	0	54	111
Joy Village	0	0	23	47
Live Oak Estates	0	0	796	1,647
Magnolia Mobile Home Park	0	0	21	44
Montgomery County MUD 24	0	0	169	349
Montgomery County MUD 56	0	0	326	674
Montgomery County MUD 83	0	0	38	79
New Caney MUD	0	0	1,185	2,351
Patton Village East	0	0	57	101
Patton Village West	0	0	77	159
Peach Creek Colony	0	0	16	34
Peach Creek Oaks	0	0	28	58
Porter Terrace	0	0	91	187
Porter SUD	0	0	1,486	2,908
River Club River Ridge Water Utility	0	0	66	136
River Club Water Company	0	0	66	136
Riverwalk Subdivision	0	0	93	192
Rolling Hill Oaks	0	0	51	105
Roman Forest Consolidated MUD	0	0	149	280
Timberland Estates	0	0	131	271
Washington County Railroad	0	0	166	344
White Oak Valley Estates	0	0	112	231
Woodridge Estates	0	0	27	56
<b>Total (acre-feet/year)</b>	<b>0</b>	<b>0</b>	<b>6,536</b>	<b>13,220</b>
<b>Total (mgd)</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>12</b>
<b>Conversion rate (%)</b>	<b>0%</b>	<b>0%</b>	<b>56%</b>	<b>88%</b>

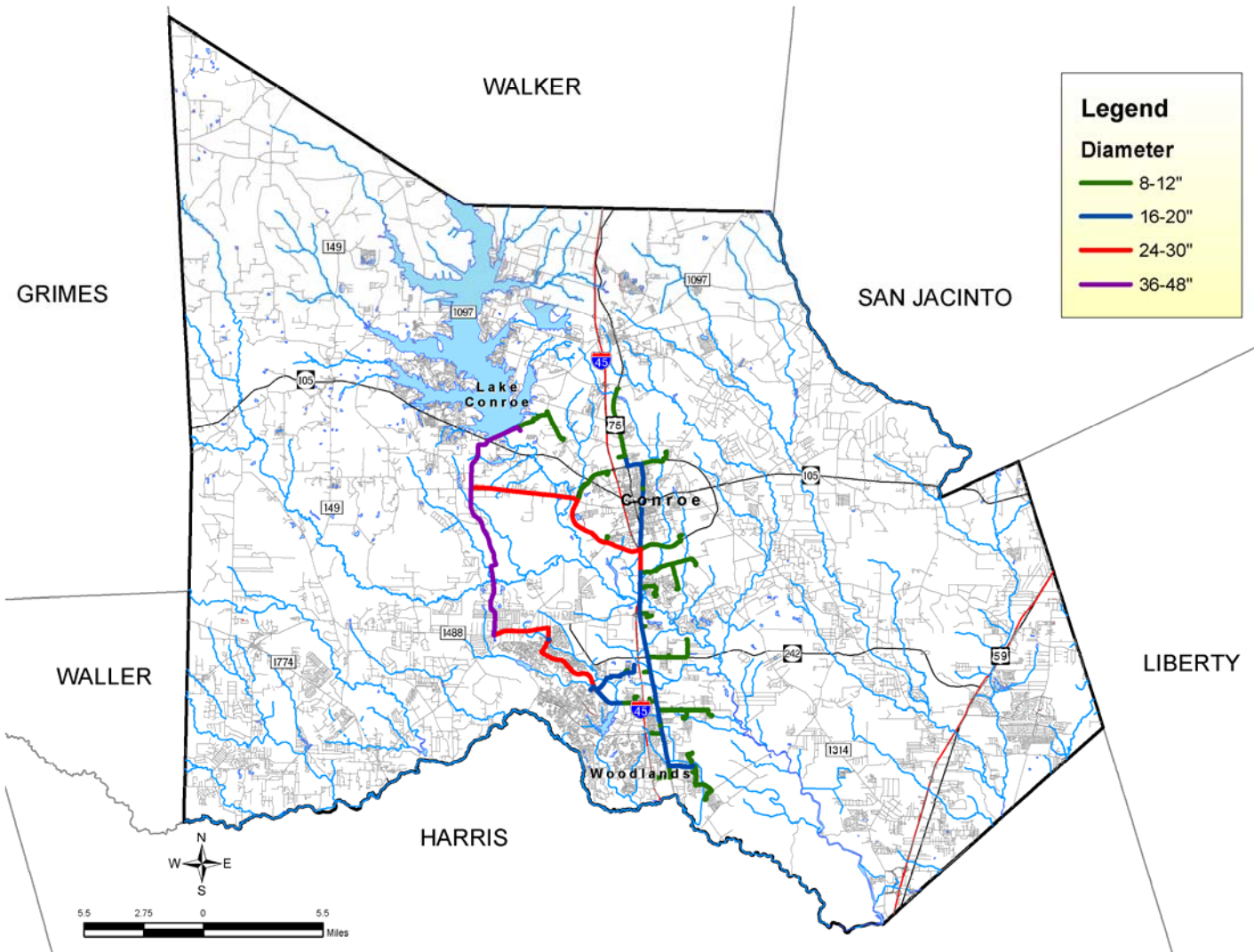
The initial system south of Lake Conroe would supply 20 million gallons per day (mgd) of treated water to the Southwest zone by the year 2013. The other three management zones do not require conversion in 2013. The system brings water to the City of Conroe by following McCaleb Road south to FM 2854, then FM 2854 east into Conroe. The system follows Loop 336 east across IH 45, where it branches the north and south. The north-south railroad alignment is used in both cases. Continuing south of Conroe, the system serves communities along the eastern side of the IH 45 corridor to near the Harris County line. The system serves The Woodlands by following Fish Creek Thoroughfare to FM 1488, and turning east. A map of the 2013 system is shown in *Figure 44*.

A pipeline alignment that serves the rapidly developing IH 45 alignment focuses on the biggest problem area in the county and results in a system that is relatively compact. The downside is that the initial conversion in the affected districts is fairly steep at 75 percent. The initial conversion for affected districts can be lessened by building a larger system serving more districts, but the additional construction and operations/maintenance cost will be passed on to the retail customers.

The next conversion phase occurs in 2020, where surface water is required in the Southwest zone at the rate of 35 mgd. The Southeast zone requires a minor conversion of 4 percent, but that is too small to warrant a surface water system. The other two zones do not require conversion. The 2020 system in the Southwest zone extends the 2013 system in three areas: south down Grogans Mill Road, southwest down FM 2978, and north up to Panorama Village. A map of the 2020 system is shown in *Figure 45*.

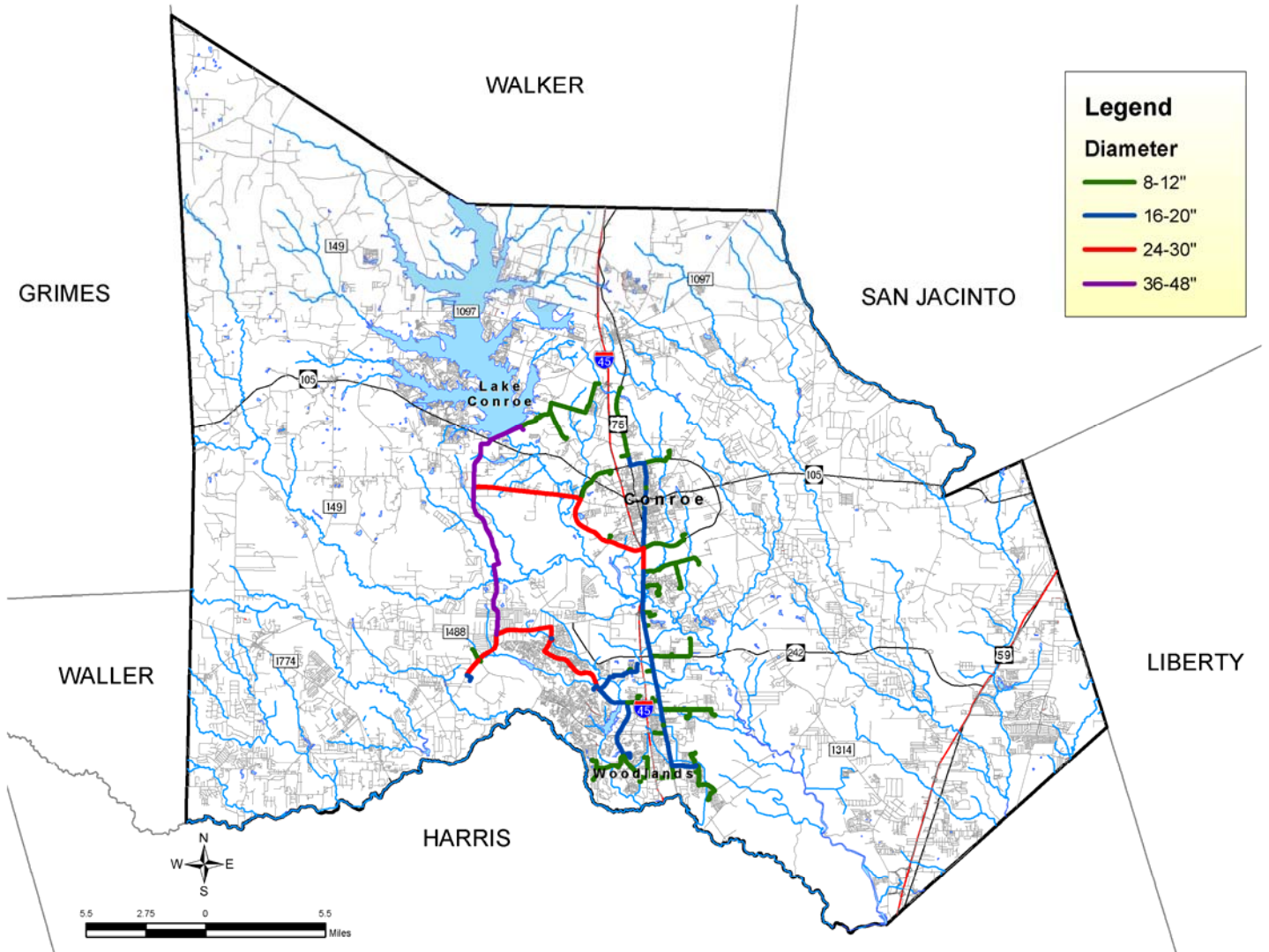


Figure 44. 2013 Lake Conroe Surface Water System





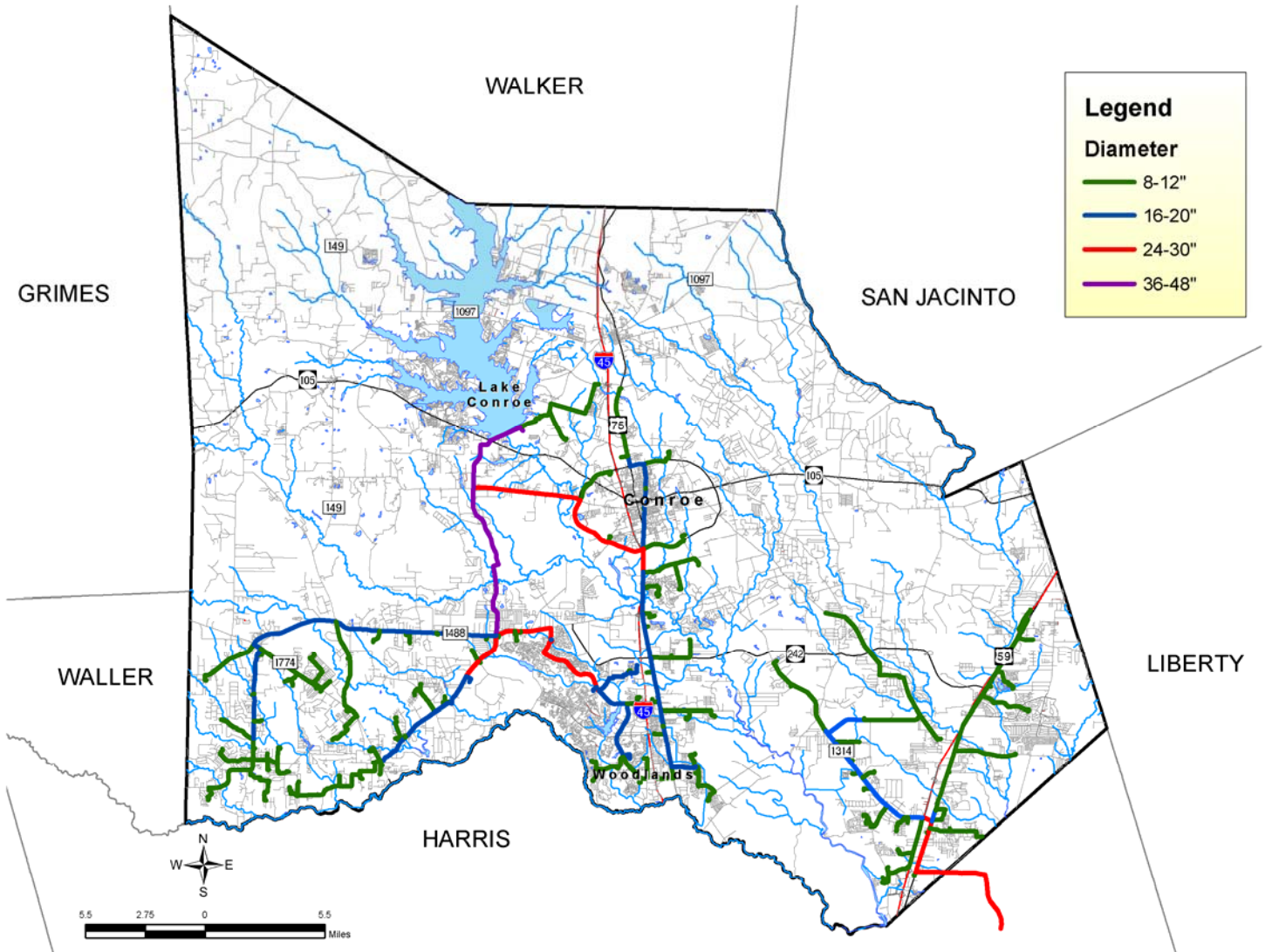
**Figure 45. 2020 Lake Conroe Surface Water System**



The 2030 conversion step requires that 46 mgd be delivered to the Southwest zone, and 6 mgd to the Southeast zone. The Southwest zone system extends the pipeline network into southwestern Montgomery County, delivering water to 37 water districts not served by surface water in 2020. The 2030 system alignment is shown in Figure 46.

The Southeast zone requires that 6 mgd be converted to an alternative source by 2030. The proposed system is served by Lake Houston in north Harris County. This system serves districts along US 59, from Kingwood north to Splendora, northwest along FM 1314 to Allendale Water System, and northwest along FM 1485 to White Oak Valley Estates.

Figure 46. 2030 and 2040 Lake Conroe Surface Water System



The final conversion step in 2040 calls for 55 mgd in the Southwest zone and 12 mgd in the Southeast zone. In both cases the ultimate systems are in place before 2040 (see *Figure 46*), and new construction would consist of treatment plant expansions.

## Facilities Sizing

In this study, facilities are sized to handle average daily flow, with the assumption that peaking will be handled by groundwater. This allows water districts to keep more of their groundwater wells in service than they could otherwise and results in a lower overall surface water system cost. *Table 18* provides a list of criteria used to size treatment, pipeline, pump station, and storage facilities.

**Table 18. Criteria Used to Size Surface Water Facilities**

<b>Treatment</b>
Treatment plants sized for average day flow. Seasonal and daily peaking will be accomplished by groundwater wells and existing storage facilities.
Conventional filtration is assumed.
<b>Pipeline</b>
Pipelines sized for average day flow. Peaking will be done by existing groundwater facilities.
Hazen-Williams formula used to calculate head loss. C value = 120. Pipelines sized assuming a maximum head loss of 5 feet per 1,000 feet of pipe.
Maximum working pressure of pipe material is 150 psi. Used for locating booster pump stations.
Maintain 20 psi at the ground at the end of the alignment to enable filling of storage tanks.
<b>Pump Stations</b>
Pumps are assumed to be 70 percent efficient.
Pump stations are required when pressure rating of pipe is met or exceeded (150 psi).
<b>Storage</b>
Existing groundwater storage facilities are used in areas of conversion.
Ground storage at pump stations are sized to hold 50 percent of average day volume.

Pipe sizes are shown color-coded on the facility location maps. A summary of required facilities and sizes are provided in *Tables 19* through *23*.

**Table 19. Treatment Plant Sizes**

<b>Description</b>	<b>2013</b>	<b>2020</b>	<b>2030</b>	<b>2040</b>
Conventional filtration treatment plant at Lake Conroe	25-mgd plant	10-mgd plant expansion	10-mgd plant expansion	10-mgd plant expansion
Conventional filtration treatment plant at Lake Houston	--	--	6 mgd	6-mgd plant expansion

**Table 20. Pipeline Sizes – Lake Conroe System**

<b>Diameter (inches)</b>	<b>Length (feet)</b>			
	<b>2013</b>	<b>2020</b>	<b>2030</b>	<b>2040</b>
8	71,006	98,335	300,397	300,397
10	96,510	124,452	163,136	163,136
12	11,439	11,439	32,954	32,954
16	34,130	39,282	92,581	92,581
20	70,692	84,788	147,667	147,667
24	6,787	19,749	19,884	19,884
30	87,536	87,536	87,536	87,536
36	39,291	39,291	39,291	39,291
42	21,690	21,690	21,690	21,690
48	1,169	1,169	1,169	1,169
<b>Total</b>	<b>440,250</b>	<b>527,731</b>	<b>906,305</b>	<b>906,305</b>

**Table 21. Pipeline Sizes – Southeast System**

Diameter (inches)	Length (feet)			
	2013	2020	2030	2040
8	--	--	211,653	211,653
10	--	--	34,534	34,534
12	--	--	24,098	24,098
16	--	--	16,638	16,638
20	--	--	29,294	29,294
24	--	--	46,095	46,095
<b>Total</b>	--	--	<b>362,312</b>	<b>362,312</b>

**Table 22. Pump Stations – Lake Conroe System**

Description	2013	2020	2030	2040
Pump station and ground storage: Loop 336 and Cartwright	150 HP + 1 MG storage	150 HP + 1 MG storage	200 HP + 1.6 MG storage	200 HP + 1.6 MG storage
Pump station and ground storage: Main Street and Sleep Hollow	100 HP + 1.4 MG storage	100 HP + 1.4 MG storage	200 HP + 2.4 MG storage	200 HP + 2.4 MG storage
Pump station and ground storage: FM 1488 and FM 2978	--	--	2,850 HP + 16 MG storage	2,850 HP + 16 MG storage

Note. HP = horsepower  
MG = million gallons

**Table 23. Pump Stations – Southeast System**

Description	2013	2020	2030	2040
Pump station and ground storage: FM 1314 and Loop 494	--	--	--	1,080 HP + 5.1 MG storage

Note. HP = horsepower  
MG = million gallons



# Financial Analysis

The financial analysis associated with the LSGCD management plan and the subsequent implementation of surface water facilities has the following components:

- Estimates of total cost for proposed regional surface water facilities
- Estimates of debt service schedules associated with proposed regional surface water facilities based on alternative funding mechanisms
- Evaluation of the impact of regional facilities to local water utilities and ratepayers in terms of increased water service rates
- Development of information relative to a takings impact assessment

An estimate of facility costs is necessary to ultimately determine the cost impact to local water utilities and retail ratepayers. The total cost of a surface water system is the sum of the following: capital costs, other project costs, and annual project costs. For this project, capital costs include water treatment plants, pipelines, pump stations, and water storage tanks. Other project costs include expenses not directly associated with construction, such as engineering, land acquisition for easements, financial and legal services, environmental studies, and mitigation. Annual project costs include repayment of borrowed funds, operation and maintenance expenses, and energy costs.

## Facility Project Costs

The surface water system is envisioned to be owned and/or operated by a wholesale supplier of treated surface water who will sell water to retail suppliers of water who in turn supply water to individual users. The costs to integrate a regional surface water system are divided into two categories: direct costs and secondary costs. The direct costs, which comprise the majority of the costs, include the planning, design, construction operation, and maintenance of the facilities. It does not include the costs of system administration, which will be driven by the ultimate management authority identified to implement the program. Secondary costs are those costs that current retail water suppliers will bear as a result of not having the opportunity to continue to use the current water development infrastructure (wells, plants, etc.) they have in place which still has a useful life associated with it and likely some remaining debt retirement. These secondary costs should be recognized in order to not penalize the takers of surface water, and in fact move toward a "price neutral" cost of water. A "price neutral" concept would allow the retail suppliers to use water, either groundwater or surface water, for the same cost and in doing so, create an incentive to build a cost effective surface water system.

The Direct Costs associated with the surface water system include:

- Capital cost of raw water storage and conveyance. The two potential suppliers of surface water are the SJRA and the City of Houston. The City of Houston ordinance rate for surface water is \$0.37 per 1,000 gallons. The rate for the SJRA is \$0.23 per 1,000 gallons
- Capital cost for construction of pipelines, pumps, storage, and treatment facilities. Unit costs for infrastructure facilities were taken from *Appendix 4C (Cost Estimating Procedure) of the TWDB Region H 2006 Regional Water Plan*.
- Operating and maintenance (O&M) costs for the treatment plant. Prior experience indicates these costs to be in the vicinity of \$0.26 per 1,000 gallons of water treated.



- O&M costs for the pumps and pipelines, etc. Prior experience indicates these costs to approximate 1 percent of the capital costs for pipelines and static facilities and 3 percent for the mechanical equipment. This is consistent with the cost estimating procedures of the TWDB Region H 2006 Regional Water Plan.

The secondary costs associated with groundwater systems include:

- Capital costs for construction of wells. Prior experience indicates this cost is approximately \$0.40 per 1,000 gallons of water produced.
- Operating costs associated with the operation of the wells. Prior experience indicates this cost is approximately \$0.40 per 1,000 gallons

The costs associated with storage, pumping and distribution of the water to customers is not included in this cost evaluation since these are activities associated with the retail supplier and are not part of the regional system.

The following costs tables are based on the conceptual facility layouts depicted in *Figures 44* thru *46*. The treatment plant capacities are predicated on the required amount of groundwater reduction on a countywide basis as opposed to multiple management zones. This allows for a 20-mgd facility initially which is the required reduction amount on a countywide basis in 2013 as opposed to a 25-mgd facility which would be required to satisfy the requirements of the southwest zone alone. Total project cost and construction cost summaries for both the Lake Conroe and Southeast systems are shown in *Tables 24* through *27*. Per TWDB guidelines, engineering, financial and legal services, and contingencies are estimated as a lump sum of 30 percent of the total construction cost for pipelines and 35 percent for all other types of projects. Engineering is typically 10-12 percent, contingency 10-15 percent, and financial/legal approximately 8-10 percent. Land and easement costs were estimated assuming a 20-foot easement width for pipelines and \$50,000 per acre land-related cost. Environmental studies and mitigation was estimated as 3 percent of total construction. Undepreciated groundwater assets assumes the average cost to construct a new water supply well is \$1.2 million.

**Table 24. Project Cost Summary – Lake Conroe System**

Description	Cost (millions)			
	2013	2020	2030	2040
Construction (Capital) cost	\$121.7	\$31.6	\$66.4	\$14.9
Engineering, financial and legal services, and contingencies	\$38.4	\$10.5	\$20.6	\$5.2
Land and easement	\$10.1	\$2.0	\$8.7	\$0.0
Environmental - studies and mitigation	\$3.6	\$0.9	\$2.0	\$0.4
Undepreciated groundwater assets	\$21.6	\$7.4	\$13.0	\$0.0
<b>Total Project Cost</b>	<b>\$195.4</b>	<b>\$52.4</b>	<b>\$110.7</b>	<b>\$20.6</b>



**Table 25. Construction Cost Summary – Lake Conroe System**

Description	Cost (millions)			
	2013	2020	2030	2040
Treatment	\$38.6	\$20.7	\$13.8	\$14.9
Pipelines	\$76.9	\$10.6	\$30.3	\$0.0
Pipeline crossings	\$1.7	\$0.0	\$0.0	\$0.0
Pump stations	\$2.7	\$0.0	\$16.0	\$0.0
Pump station storage	\$1.7	\$0.3	\$6.3	\$0.0
<b>Total Construction Cost</b>	<b>\$121.7</b>	<b>\$31.6</b>	<b>\$66.4</b>	<b>\$14.9</b>

**Table 26. Project Cost Summary – Southeast System**

Description	Cost (millions)			
	2013	2020	2030	2040
Construction (Capital) cost	--	--	\$71.9	\$23.9
Engineering, financial and legal services, and contingencies	--	--	\$22.4	\$7.8
Land and easement	--	--	\$8.3	\$0.0
Environmental - studies and mitigation	--	--	\$2.2	\$0.7
Undepreciated groundwater assets	--	--	\$15.0	\$10.0
<b>Total Project Cost</b>	<b>\$0.0</b>	<b>\$0.0</b>	<b>\$119.8</b>	<b>\$42.4</b>

**Table 27. Construction Cost Summary – Southeast System**

Description	Cost (millions)			
	2013	2020	2030	2040
Treatment	--	--	\$15.7	\$11.8
Pipelines	--	--	\$42.3	\$0.0
Pipeline crossings	--	--	\$13.9	\$0.0
Pump stations	--	--	\$0.0	\$9.7
Pump station storage	--	--	\$0.0	\$2.4
<b>Total Construction Cost</b>	<b>\$0.0</b>	<b>\$0.0</b>	<b>\$71.9</b>	<b>\$23.9</b>

## Secondary Costs

The conceptual plan identified in *Figure 44* provides conjunctive use of groundwater and surface water to 87 different water plants. The databases obtained from TCEQ were used to estimate the remaining practical life of the groundwater wells that will be affected by implementing such a system. The affected wells are summarized by age as follows:

Age of Well	Number of Wells Affected
0 – 5 years	9
6 – 10 years	24
10 – 15 years	6
16 – 20 years	5
20 – 25 years	11
26 – 30 years	30

On the assumption the useful life of a groundwater well would be 20 years, one aspect of the project implementation is to replace as many older wells as possible by the retail supplier that may need major repairs anyway. Doing so benefits the overall cost of water to the user since this repair cost is avoided. On the assumption that a public supply well in this area averages \$1.2 million, the secondary costs associated with the undepreciated assets of this system are approximately \$21.6 million.

## Annual Costs

Annual costs are a sum of the cost to repay the construction loan debt (debt service), the O&M cost of the system, and the pumping energy cost. Debt service constitutes the majority of the annual cost and is dependent on the interest rate and the funding mechanism. The O&M costs are, for planning purposes, figured as a percentage of construction cost. Pumping energy costs are system specific and depend on pipeline sizes, system layout, and the volume of water delivered.

Tables 28 and 29 show the annual costs for the Lake Conroe and Southeast systems, respectively. The debt service costs are based on a conventional 30-year loan at 6 percent interest.

**Table 28. Annual Cost Summary – Lake Conroe System**

Description	Cost (millions)			
	2013	2020	2030	2040
Debt service	\$14.1	\$17.8	\$25.8	\$27.3
Operation & maintenance	\$2.8	\$4.3	\$6.0	\$6.9
Pumping energy costs	\$0.7	\$1.0	\$2.9	\$3.5
<b>Total Annual Cost</b>	<b>\$17.6</b>	<b>\$23.1</b>	<b>\$34.7</b>	<b>\$37.7</b>

**Table 29. Annual Cost Summary – Southeast System**

Description	Cost (millions)			
	2013	2020	2030	2040
Debt service	--	--	\$8.6	\$11.4
Operation & maintenance	--	--	\$1.2	\$3.3
Pumping energy costs	--	--	\$0.2	\$0.8
<b>Total Annual Cost</b>	<b>\$0.0</b>	<b>\$0.0</b>	<b>\$10.0</b>	<b>\$15.5</b>

An alternative funding mechanism is the TWDB State Participation Program. This program allows an entity to build a system with more capacity than is initially needed by providing funding for that additional capacity that is repaid on a deferred timetable. The idea is to defer payment of the principal and a portion of the interest on

additional capacity until such time that the customer base grows into the added capacity. The program is funded by the state legislature, can fund up to 80 percent of costs for projects creating a new water supply, and is limited to the portion of the project designated as excess capacity.

Table 30 shows a repurchase payment schedule based on the maximum financing life of 34 years. The benefits of the program as outlined by TWDB are:

1. Payments are deferred until the customer base grows into the added capacity facilitated, which will augment the applicant's ability to make payments to the TWDB.
2. The TWDB does not accrue interest on the deferred interest portion, thereby reducing the overall carrying cost of the applicant's facility.
3. Optimizing regional projects reduces the necessity and added expense to local governments of building new structures or replacing undersized structures in the future.

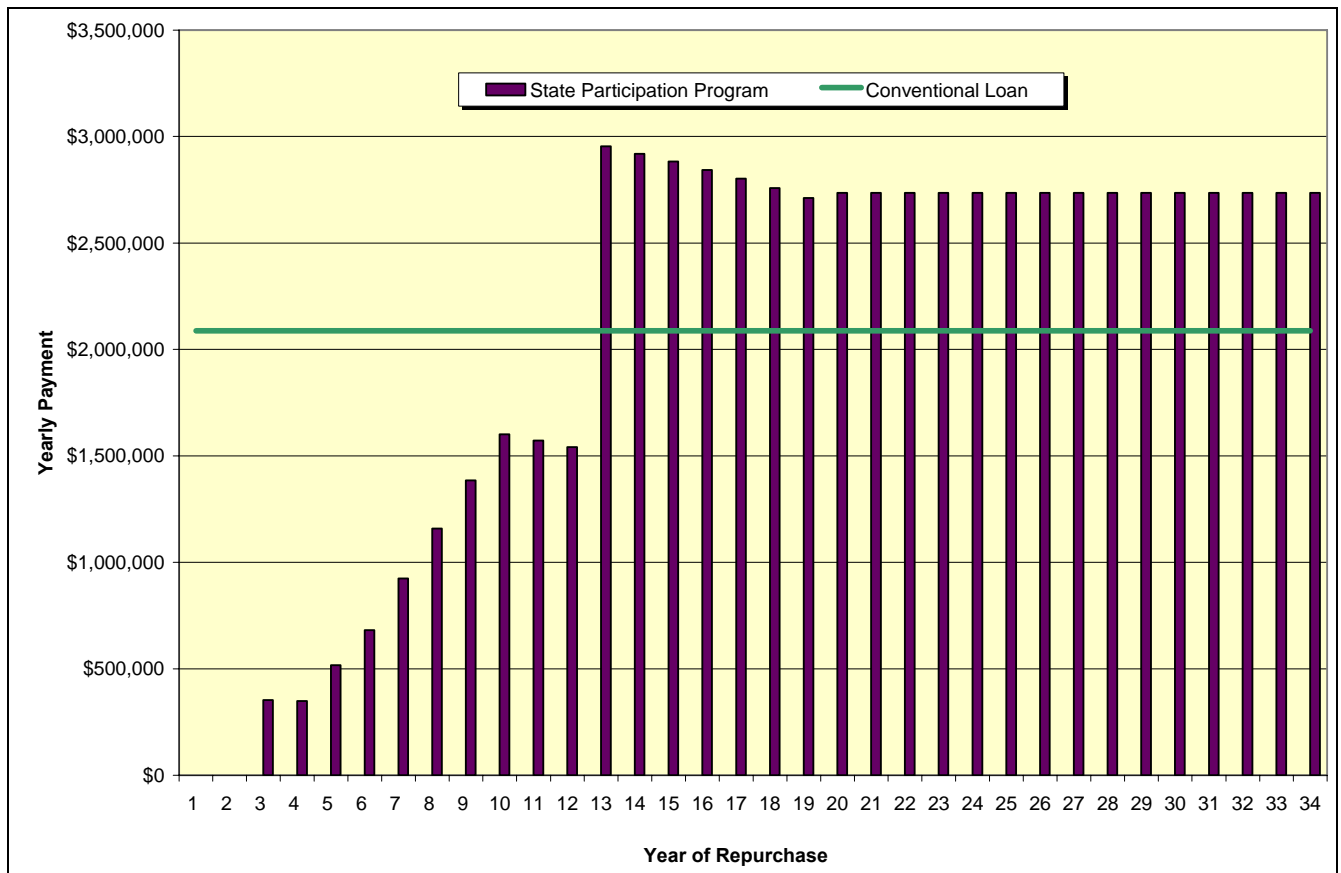
**Table 30. TWDB State Participation Program Repayment Purchase Schedule**

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

Source: Texas Water Development Board  
 (www.twdb.state.tx.us/assistance/financial/fin\_infrastructure/StateParticipation.asp)

The initial Lake Conroe system, proposed for 2013, would be eligible for the TWDB State Participation Program. The system is sized for 2040 flows, and the cost of the excess capacity is the difference between the cost of a system sized for 2040 flows and the cost of a system sized for 2013 flows. This difference is approximately \$30 million. Figure 47 shows what the yearly payments would be for \$30 million under the State Participation Program versus a conventional loan. Over the first 12 years the applicant would pay approximately \$10.1 million under the State Participation Program versus \$25.1 million for a conventional loan. Starting at year 13, the applicant starts to pay back deferred interest, and beginning at year 20, pays back deferred principal, resulting in roughly level debt service. Since the State Participation Program only covers the excess capacity cost, the cost to build the system sized for 2013 would have to be funded by other means.

**Figure 47. State Participation Program Repurchase Schedule**



### District Water Rates

Wholesale water rates will be structured to allow the entity implementing the surface water system to retire the debt and to pay for O&M. This section focuses on the cost of water for the initial 2013 system. The cost of surface water in this discussion is the total annual cost to deliver treated water to the districts—it does not include the cost for storage, booster pumps, and the retail distribution system of each district. The cost of groundwater debt service plus O&M is assumed to be \$0.80 per 1,000 gallons. The total costs of the system include the direct costs as previously defined and the secondary costs associated with reducing the use of the current groundwater facilities.

The water rates charged to any given customer, customer in this case being a water district or other PWS, will depend on the management zone, the source of water, and how the annual costs of a surface water system are distributed. Options include:

- Option 1: Only the customers receiving surface water pay for the system.
- Option 2: The customers in the management zone receiving surface water share equally the cost of the system.

Option 3: All customers throughout the county share equally the cost of the system.<sup>1</sup>

Option 1 results in the greatest impact on water rates, but only customers receiving surface water are impacted—there is no impact to customers within the same zone on 100 percent groundwater or to customers in other zones. Option 2 results in customers within the zone receiving surface water to pay the same amount regardless of their source of water—there is no impact to customers in other zones. Option 3 affects all customers, but the cost is spread throughout the county, resulting in the smallest impact on any one district’s water rate.

Table 31 shows the total cost of water under Option 1. In this scenario, only the districts converting to surface water are paying for the surface water system. They are still using some groundwater, so the overall cost of water is less than the cost for surface water only.

**Table 31. Option 1 Water Rates for 2013**

Total Cost (in \$ millions)	\$195	
Annual Cost of SW (in \$ millions)	\$17.6	
Annual SW Treated	7,300 mg	(60% conversion in service area)
Annual GW Used	4,815 mg	
Cost of Raw Water (1,000 gal)	\$0.23	
SW Cost/1,000 gallons	\$2.63	
GW Cost/1,000 gallons	\$0.80	
<b>Total Cost of Water/1,000 gal in surface water system service area</b>	<b>\$1.90</b>	$(\$2.63 * 60\% + \$0.80 * 40\% = \$1.90)$
<b>Average Cost/1,000 gal in rest of zone and in other zones/1,000 gal</b>	<b>\$0.80</b>	

Under Option 2, all customers in the Southwest zone share the cost of the surface water system. The other zones continue to pay the same rate for water. Within the Southwest zone, there are customers who are on surface water only, a combination of surface water and groundwater, and groundwater only. Under this option they will pay the same rate regardless of the source of water. For users of groundwater, there will be a payment to the entity operating the system that makes up the difference between the average cost of all water, regardless of source, and the cost of groundwater production. These concepts are illustrated in Table 32.

<sup>1</sup> Another variation that could be considered in implementation for Options 2 or 3 would be for all customers within the same groundwater permit class within the management zone or throughout the county to share the cost of the system equally so that new growth under Operating Permits in zones where demand exceeds groundwater availability would be assessed a higher rate for groundwater than holders of Historic Use Permits and/or then-existing Operating Permits within that zone, and Historic and Operating Permit holders in zones where there is still excess groundwater availability.

**Table 32. Option 2 Water Rates for 2013**

Total Cost (in \$ millions)	\$195	
Annual Cost (in \$ millions)	\$17.6	
Annual SW Treated	7,300 mg	(46% conversion in zone)
Annual GW Used	8,600 mg	
Cost of Raw Water (1,000 gal)	\$0.23	
SW Cost/1,000 gallons	\$2.63	
GW Cost/1,000 gallons	\$0.80	
<b>Total Cost of Water/1,000 gal in Southwest zone</b>	<b>\$1.64</b>	$(\$2.63 * 46\% + \$0.80 * 54\% = \$1.64)$
<b>Average Cost/1,000 gal in other zones/1,000 gal</b>	<b>\$0.80</b>	

Under Option 3, all customers throughout the county share the cost. *Table 33* shows that the average countywide rate is \$1.29/1,000 gallons. For customers on groundwater, \$0.80/1,000 gallons goes toward the cost of groundwater and \$0.49/1,000 gallons goes to the entity funding the surface water system.

**Table 33. Option 3 Water Rates for 2013**

Total Cost (in \$ millions)	\$195	
Annual Cost (in \$ millions)	\$17.6	
Annual SW Treated	7,300 mg	(27% conversion countywide)
Annual GW Used	19,500 mg	
Cost of Raw Water (1,000 gal)	\$0.23	
SW Cost/1,000 gallons	\$2.63	
GW Cost/1,000 gallons	\$0.80	
<b>Total Cost of Water/1,000 gal throughout county</b>	<b>\$1.29</b>	$(\$2.63 * 27\% + \$0.80 * 73\% = \$1.29)$

It is important to note that the system costs and water rates presented herein are based on a conceptual system. As such the rates will vary between \$1.25 and \$1.50 per 1,000 gallons for Option 3, depending on the final system configuration and water districts served. The final rate will be determined on the basis of a more detailed study.

## Residential Water Rates

A survey of year 2005 residential water rates was conducted for various cities, municipal utility districts (MUDs), and water supply corporations in Montgomery County. The survey was not intended to be comprehensive: it focuses on water users who are in areas of significant historical water level declines and who might be subject to surface water conversion requirements.

*Table 34* shows the 2005 residential fee charged per 1,000 gallons for usage of 10,000 gallons per month (column labeled "2005 Fee per 1,000 gallons") and the estimated rate that would be charged after conversion to surface water (column labeled "Post-conversion Fee per 1,000 gallons"). The water providers are cities that responded to the Texas Municipal League (TML) 2005 water and wastewater rate survey, the eleven MUDs operating in The Woodlands, the City of Houston, and several providers who are top volume users in the county. The 2005 rates for these providers vary from \$1.08/1,000 gallons in Montgomery County MUD #40 to \$3.75/1,000 gallons in the City of Montgomery. The average rate for 2005 (excluding the City of Houston) is

\$1.82/1,000 gallons. After conversion to surface water the average rate for these providers (excluding the City of Houston) is \$2.31 per 1,000 gallons. The increase in rate is due to the increased cost of delivering surface water over that of delivering groundwater to the final distribution system.

**Table 34. Survey of Residential Water Rates**

<b>Water Provider</b>	<b>2005 Fee per 1,000 gallons</b>	<b>Source</b>	<b>Post-Conversion Fee per 1,000 gallons</b>
City of Conroe	\$2.15	TML 2005 survey	\$2.64
City of Houston/Kingwood	\$2.96	www.publicworks.cityofhouston.gov	\$2.96
City of Montgomery	\$3.75	TML 2005 survey	\$4.24
City of Oak Ridge North	\$1.30	www.oakridgenorth.com	\$1.79
City of Panorama Village	\$2.21	TML 2005 survey	\$2.70
City of Shenandoah	\$1.10	www.ci.shenandoah.tx.us	\$1.59
City of Splendora	\$3.47	TML 2005 survey	\$3.96
City of Willis	\$3.42	TML 2005 survey	\$3.91
Montgomery County MUD #36	\$1.28	Woodlands Joint Power Agency	\$1.77
Montgomery County MUD #39	\$1.33	Woodlands Joint Power Agency	\$1.82
Montgomery County MUD #40	\$1.08	Woodlands Joint Power Agency	\$1.57
Montgomery County MUD #46	\$1.28	Woodlands Joint Power Agency	\$1.77
Montgomery County MUD #47	\$1.28	Woodlands Joint Power Agency	\$1.77
Montgomery County MUD #6	\$1.33	Woodlands Joint Power Agency	\$1.82
Montgomery County MUD #60	\$1.25	Woodlands Joint Power Agency	\$1.74
Montgomery County MUD #67	\$1.28	Woodlands Joint Power Agency	\$1.77
Montgomery County MUD #7	\$1.28	Woodlands Joint Power Agency	\$1.77
Woodlands Metro Center MUD	\$1.30	Woodlands Joint Power Agency	\$1.79
Southern Montgomery County MUD	\$2.46	Southern Montgomery County MUD	\$2.95
Porter SUD	\$2.55	Porter SUD	\$3.04
Woodlands MUD #2	\$1.28	Woodlands Joint Power Agency	\$1.77

The 2005 retail rates in the table above generally include the annual costs associated with groundwater production, as well as the costs associated with distributing that water to the tap. It should be noted that these rates do not necessarily reflect the true cost of retail water: various strategies are employed by various districts in



which a portion of the cost is paid through ad valorem taxes. For example, the water rates in each of the eleven Woodlands MUDs (MUDs 2, 6, 7, 36, 39, 40, 46, 47, 60, 67, and Woodlands Metro Center) are artificially low due to each MUD levying an ad valorem maintenance tax which subsidizes to various extents the cost of water in those service areas. The tax rate varies from \$0.01 to \$0.22 per \$100 valuation. In general it is not feasible in the scope of this study to break out each component of these retail water rates, but typically the cost for groundwater production is around \$0.80 per 1,000 gallons. The post-conversion fee assumes that the surface water system cost would be distributed countywide (Option 3). The increase in fee going from groundwater to surface water is then the difference between \$1.29 (see *Table 33*) and \$0.80 (the average cost of producing groundwater).

The impact on wholesale water rates of implementing a surface water system depends on the same factors applicable to water districts (see District Water Rates section above). *Table 35* shows the possible impacts to wholesale water rates in each zone for the three system repayment options. The column "Post-Conversion Cost per 1,000 gal" is the estimated cost in each zone for each repayment option. The column "Additional cost of water per 1,000 gal" is the difference between the wholesale cost of surface water for that zone and the average wholesale cost of groundwater (\$0.80 per 1,000 gal).

**Table 35. Impact of a Surface Water System on Wholesale Water Rates**

Option	Management Zone/ Sub-Zone	Post-Conversion Cost per 1,000 gal	Additional Cost of Water per 1,000 gal
1 - Users of surface water pay	Northeast	\$0.80	\$0
	Northwest	\$0.80	\$0
	Southeast	\$0.80	\$0
	Southwest - Surface water service area	\$1.90	\$1.10
	Southwest - Portion of zone on 100% groundwater	\$0.80	\$0
2 - Southwest zone pays	Northeast	\$0.80	\$0
	Northwest	\$0.80	\$0
	Southeast	\$0.80	\$0
	Southwest - Surface water service area	\$1.64	\$0.84
	Southwest - Portion of zone on 100% groundwater	\$1.64	\$0.84
3 - Entire county pays	Northeast	\$1.29	\$0.49
	Northwest	\$1.29	\$0.49
	Southeast	\$1.29	\$0.49
	Southwest - Surface water service area	\$1.29	\$0.49
	Southwest - Portion of zone on 100% groundwater	\$1.29	\$0.49

## Takings Impact

In accordance with the Texas Government Code, Chapter 2007, and the Attorney General's guidelines adopted pursuant to §2007.041, Texas Government Code, the District and SJRA conducted an extensive review of the nature of the planning actions contemplated under this joint regional facility plan to determine whether they may be subject to a takings impact assessment (TIA) and, if so, whether there is the potential for a takings. Based upon the project scope set forth in this Regulatory Study and Facilities Implementation Plan, a legal review was conducted to determine whether the regional surface water facilities contemplated implicate a taking or would even require a TIA. The conclusion was that none of the items set forth in the scope of work contemplated by this plan would be a statutory nor a constitutional taking of private real property. The scope of work does not affect a landowner's rights in private real property, in whole or in part, temporarily or permanently, because it does not burden, limit, or restrict the owner's right to property and reduce its value by 25 percent or more beyond that which would otherwise exist in the absence of this project. Therefore, a taking under Texas Government Code, Chapter 2007, is not implicated.

# Management Authority

## Review of Existing Authorities

There are only two conservation and reclamation districts in Montgomery County with countywide jurisdiction that regulate or manage the existing water resources in the area: the SJRA and the LSGCD. The following is a review of those two entities and their powers, which will serve as a baseline later in the paper for purposes of comparison to a consensus model management authority for the area to own, operate, or otherwise participate in the regional facilities contemplated by this study.

### San Jacinto River Authority

The surface water resources in the Montgomery County area are part of the San Jacinto River Basin. Pursuant to the provisions of Article XVI, Section 59, of the Texas Constitution, the Texas Legislature created the SJRA in 1937 to conserve and manage the water resources of the San Jacinto River Basin.<sup>2</sup> The defined boundaries of the SJRA include all of Montgomery County. The powers and duties of the SJRA were originally established in the SJRA's enabling act and such powers and duties have been amended in subsequent legislative enactments.<sup>3</sup>

Through its enabling act, the SJRA has been granted numerous powers to engage in water supply, wastewater treatment, and water quality activities. The following is a summary of the powers of the SJRA that are pertinent to this particular inquiry:

- to provide water for domestic, municipal, commercial, industrial, and mining purposes both inside and outside the watershed of the San Jacinto River Basin and, in connection with such water supply efforts, the power to construct or otherwise acquire water transportation, treatment, and distribution facilities and supplemental sources of supply;<sup>4</sup>
- to appropriate the waters of the San Jacinto River and its tributaries, to construct dams and other facilities for the impoundment, conservation, diversion and utilization of such waters, and to devote such waters to municipal, domestic, agricultural, commercial, industrial, mining, and other beneficial uses, both inside and outside the watershed of the San Jacinto River Basin;<sup>5</sup>
- to store, control, and conserve the storm and flood waters of the watershed of the San Jacinto River and its tributaries, and to prevent the escape of any such waters through every practical means,<sup>6</sup>
- to provide through every practical means for the control, utilization, and coordination of regulation of the waters of the San Jacinto River and its tributaries;<sup>7</sup>
- to acquire or construct facilities for the gathering, transporting, treating, and disposing of sewage and industrial waste and effluent;<sup>8</sup>

<sup>2</sup> Tex. Const. art XVI, § 59.

<sup>3</sup> Tex. Rev. Civ. Stat. Ann. art. 8280-121 (Vernon 1959) or Chapter 426, Acts of the 45<sup>th</sup> Legislature, 1937; Spec. L. pg. 1097, Acts of the 46<sup>th</sup> Legislature, 1939; Chapter 480, Acts of the 47<sup>th</sup> Legislature, 1941; Chapter 613, Acts of the 47<sup>th</sup> Legislature, 1941; Chapter 371 Acts of the 48<sup>th</sup> Legislature, 1943; Chapter 366, Acts of the 52<sup>nd</sup> Legislature, 1951; Chapter 367, Acts of the 52<sup>nd</sup> Legislature, 1951; Chapter 547, Acts of the 60<sup>th</sup> Legislature, 1967; Chapter 698, Acts of the 72<sup>nd</sup> Legislature, 1991; Chapter 847, Acts of the 78<sup>th</sup> Legislature, 2003.

<sup>4</sup> Id. at §3.

<sup>5</sup> Id.

<sup>6</sup> Id.

<sup>7</sup> Id.

<sup>8</sup> Id.

- to construct and otherwise acquire and to repair, improve, extend, operate, and maintain all works, plants and other facilities necessary or useful in the furtherance of any power granted by law to the SJRA, including, but not limited to, water storage reservoirs, dams, canals, waterways, and water transportation facilities of all kinds, water treatment facilities, municipal water supply facilities, facilities for the treatment of sewage and industrial waste and effluent, and all other necessary and useful structures, facilities, and equipment;<sup>9</sup>

- to enter into any and all necessary and proper contracts with other Federal and State agencies, districts, and corporate and political bodies, and others necessary or useful in the furtherance of any power granted by law to the SJRA, including the power to pledge its funds and its other assets or any part thereof;<sup>10</sup>

- to acquire any properties necessary for any of its purposes by purchase, by condemnation, or by gift, and to acquire property by lease or other contract as approved by the SJRA's Board;<sup>11</sup>

- to operate the water and sewage properties and facilities of other public bodies or political subdivisions in connection with the supplying by the SJRA of any water or sewage or waste disposal or other services;<sup>12</sup>

- to enter into contracts with municipalities, or other corporate bodies or persons, public or private, for the purpose of establishing and collecting, and to otherwise establish and collect, rates and other charges for the sale or use of water, water transmission, treatment, or connection facilities, sewage, or industrial, or other waste disposal services and facilities of all types, and any other services sold, furnished, or supplied by the SJRA, which fees and charges shall be sufficient to produce adequate revenue as prescribed in the SJRA's enabling act;<sup>13</sup>

- to authorize by its contracts any other districts, agencies, and corporate or political bodies and individuals to participate in the joint construction, operation, and maintenance of all of said water storage reservoirs, dams, canals, waterways, and water lines and all other structure, facilities, and equipment in connection therewith or in connection with sewage or waste facilities of all types, and the SJRA may by such contracts allow such other agencies, districts, and corporate and political bodies and others to receive such portion of the revenues derived from the sale of water or furnishing sewage and waste facilities and services;<sup>14</sup>

- the SJRA Board is authorized to make or cause to be made surveys and engineering investigations for the information of the SJRA and to determine the plans necessary to the accomplishment of the purposes for which the SJRA is created, and may employ engineers, attorneys, and all other technical and non-technical assistants or employees and fix and provide the amount and manner of their compensation for the making of such surveys, the preparation of plans, and the collection of data essential to the determination of the character, extent, and cost of all improvements essential in the exercise of any power granted herein or any other law applicable to the SJRA and for expenditures found essential in the maintenance and administration of the SJRA;<sup>15</sup>

- all bonds issued by the SJRA shall be legal and authorized investments for banks, savings, banks, trust companies, building and loan associations, insurance companies, fiduciaries and trustees, and for any

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<sup>9</sup> Id.  
<sup>10</sup> Id.  
<sup>11</sup> Id.  
<sup>12</sup> Id.  
<sup>13</sup> Id.  
<sup>14</sup> Id.  
<sup>15</sup> Id. at §4.

sinking funds of cities, towns, villages, counties, school districts, and other political corporations and subdivisions of the State of Texas;<sup>16</sup>

- the SJRA shall have the authority and is authorized to issue its negotiable revenue bonds for the purpose of making investigations and assembling data; for the purposes of purchasing, acquiring, and/or condemning lands, easements, rights-of-way and other properties; and for the purpose of constructing, repairing, improving and extending any structures, dams, reservoirs, transmission facilities, water treatment, water supply, sewage and other waste gathering, transmission, treatment, and disposal facilities, and for the purposes of acquiring, constructing, improving, repairing, and extending any other properties and facilities deemed appropriate by the SJRA Board in the exercise of powers granted the SJRA;<sup>17</sup>

- the SJRA Board may adopt and enforce rules to preserve and protect the sanitary condition and prevent waste or unauthorized use of water owned and controlled by the SJRA;<sup>18</sup> and

- the SJRA Board shall have all powers, both express and implied, to do and perform any and all acts for or on behalf of the SJRA which are authorized by the Constitution and laws of the United States and the State of Texas for the purpose of the achievement of the plans and purposes intended in the creation of the SJRA and in the exercise of all powers elsewhere granted to the SJRA.<sup>19</sup>

## Lone Star Groundwater Conservation District

The groundwater resources of the Montgomery County area are managed and regulated by the LSGCD. The LSGCD was established by the Texas Legislature in 2001 and derives its powers and duties from its enabling act and Chapter 36 of the Texas Water Code.<sup>20</sup>

The enabling act for the LSGCD states that the LSGCD has, among others, the following rights, authority, powers, and duties:

- all powers granted to groundwater conservation districts by Chapter 36 of the Texas Water Code;<sup>21</sup>
- the ability to assess production fees based on the amount of water authorized by permit to be withdrawn from a well or the amount actually withdrawn;<sup>22</sup>
- to use revenues generated by production fees for any LSGCD purpose;<sup>23</sup>
- to enter into contracts with any person or any public or private entity for any purpose otherwise authorized by law;<sup>24</sup>
- to adopt different rules under Section 36.116 of the Texas Water Code for each aquifer, subdivision of an aquifer, geographic area, or geologic stratum located in whole or in part within the boundaries of the LSGCD;<sup>25</sup>

<sup>16</sup> Id.

<sup>17</sup> Id. at §10b

<sup>18</sup> Id. at §8C

<sup>19</sup> Id. at §7.

<sup>20</sup> Act of June 16, 2001, 77th Leg., R.S., ch. 1321, 2001 Tex. Gen. Laws 3246, as amended.

<sup>21</sup> Id. at §5.

<sup>22</sup> Id. at §11.

<sup>23</sup> Id.

<sup>24</sup> Id. at §12.

<sup>25</sup> Id. at §5A.

- to establish zones within the boundaries of the LSGCD for the purposes of groundwater management and regulation;<sup>26</sup>
- to place more restrictions on the production of groundwater under certain conditions;<sup>27</sup>
- to establish metering requirements for nonexempt wells;<sup>28</sup>
- to initiate and enforce a water use fee structure based on the total amount of groundwater authorized to be produced annually under a permit;<sup>29</sup> and
- to protect the existing and historic use of groundwater in the district.<sup>30</sup>

Pursuant to the language of the LSGCD's enabling act, the LSGCD may also exercise the powers and authority granted to all groundwater conservation districts (GCDs) by Chapter 36 of the Texas Water Code.<sup>31</sup> Section 36.0015 of the Water Code states that the purpose of GCDs is

to provide for the conservation, preservation, protection, recharging and prevention of waste of groundwater, and of groundwater reservoirs or their subdivisions, and to control subsidence caused by withdrawal of water from those groundwater reservoirs or their subdivisions, consistent with the objectives of Section 59, Article XVI, Texas Constitution.<sup>32</sup>

While Chapter 36 provides GCDs with numerous powers and duties, the powers that are pertinent to this inquiry are as follows:

- to make and enforce rules, including rules which limit groundwater production;<sup>33</sup>
- to build, acquire, or obtain by any lawful means any property necessary for the LSGCD to carry out its purpose and the provisions of this chapter;<sup>34</sup>
- to acquire land to erect dams or to drain lakes, draws, and depressions;<sup>35</sup>
- to construct dams;<sup>36</sup>
- to provide necessary facilities for water conservation purposes;<sup>37</sup>
- to purchase, sell, transport, and distribute surface water or groundwater;<sup>38</sup>
- to exercise the power of eminent domain to acquire by condemnation a fee simple or other interest in property if that property interest is: (1) within the boundaries of the LSGCD; and (2) necessary for conservation purposes, including recharge and reuse;<sup>39</sup>

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<sup>26</sup> Id.

<sup>27</sup> Id.

<sup>28</sup> Id.

<sup>29</sup> Id.

<sup>30</sup> Id. at §5B.

<sup>31</sup> Id. at §5; Texas Water Code §36.001, et al (West 2000).

<sup>32</sup> Id. at §36.0015.

<sup>33</sup> Id. at §36.101(a).

<sup>34</sup> Id. at §36.103(a).

<sup>35</sup> Id. at §36.103(b)(1).

<sup>36</sup> Id. at §36.103(b)(2).

<sup>37</sup> Id. at §36.103(b)(5).

<sup>38</sup> Id. at §36.104.

<sup>39</sup> Id. at §36.105.

- to make surveys of groundwater reservoirs and of facilities in order to determine the quantity of groundwater available for production and use and to determine the improvements, development, and recharging needed by such reservoirs;<sup>40</sup>
- to carry out any research projects deemed necessary by the LSGCD Board;<sup>41</sup>
- to require a permit for the drilling, equipping, operating, or completing of wells or for substantially altering the size of wells or well pumps;<sup>42</sup>
- to regulate the spacing and production of wells;<sup>43</sup>
- to make or accept grants, gratuities, advances, or loans in any form to or from any source approved by the LSGCD Board, including any governmental entity, and may enter into contracts, agreements, and covenants in connection with grants, gratuities, advances or loans;<sup>44</sup>
- to set fees for administrative acts of the LSGCD and assess production fees based on the amount of water authorized by permit to be withdrawn from a well or the amount actually withdrawn (LSGCD may not charge production fees for an annual period greater than \$1 per acre-foot for water used for agricultural or horticultural use or 17 cents per thousand gallons for water used for any other purpose);<sup>45</sup>
- to issue and sell bonds and notes in the name of the district for any lawful purpose of the LSGCD (the LSGCD may not issue bonds, other than refunding bonds, unless the TCEQ determines that the project to be financed by the bonds is feasible and issues an order approving the issuance of the bonds. Bonds and notes issued by the LSGCD must be submitted to the Texas Attorney General for approval and must be registered with the Texas Comptroller);<sup>46</sup>
- to provide for the payment of principal of and interest on the bonds and notes from fees, by pledging all or any part of the designated revenues from the ownership or operation of the LSGCD's works improvements, and facilities, and from the sale, transportation, and distribution of water; or from a combination of these sources;<sup>47</sup>
- to employ or contract with all persons, firms, partnerships, corporations, or other entities, public or private, deemed necessary by the LSGCD Board for the conduct of the affairs of the LSGCD, including but not limited to, engineers, attorneys, financial advisors, operators, bookkeepers, tax assessors and collectors, auditors, and administrative staff;<sup>48</sup>
- to purchase all materials, supplies, equipment, vehicles, and machinery needed by the LSGCD to perform its purposes;<sup>49</sup> and
- to contract, and be contracted with, in the name of the LSGCD.<sup>50</sup>

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<sup>40</sup> Id. at §36.106.

<sup>41</sup> Id. at §36.107.

<sup>42</sup> Id. at §36.113.

<sup>43</sup> Id. at §36.116.

<sup>44</sup> Id. at §36.158.

<sup>45</sup> Id. at §36.205(a), (d).

<sup>46</sup> Id. at §36.171-181.

<sup>47</sup> Id. at §36.174.

<sup>48</sup> Id. at §36.057(a).

<sup>49</sup> Id. at §36.057(g).

<sup>50</sup> Id. at §36.067(a).



## Consensus Model Management Authority

The participants in this contract have reviewed the make-up and powers of several existing entities in the state of Texas that provide a water supply on a regional basis. Taking into consideration the circumstances and the nature of the existing regional water supply entities, the participants have prepared the following list of the powers and features of a consensus model management authority (Authority), which, importantly, could exist either as a stand-alone new entity, modification of the powers of an existing entity, or through coordinated management through interlocal agreements or other legal means between existing entities, with or without modification to their existing powers.

The significant powers and features of a consensus model management authority (Authority) would be as follows:

**Regulation of Groundwater** – The Authority should have the powers to carry out the purposes of a groundwater conservation district as established in Section 36.0015 of the Texas Water Code. The Authority should be able "to provide for the conservation, preservation, protection, recharge, and prevention of waste of groundwater" and for the reduction of groundwater withdrawals, in a manner consistent with Section 59, Article 16 of the Texas Constitution. Specifically, the Authority should be authorized to establish fees for the production and use of groundwater, as well as fees which will serve as a disincentive to produce groundwater and regulate the production of groundwater in a manner so as to achieve groundwater to surface water conversion. The Authority should be able to utilize revenues derived from such fees to finance the planning, design, construction, and operation of surface water facilities, including the purchase of water and system capacity, and for any other purpose to facilitate groundwater to surface water conversion.

**Acquisition of Surface Water and Groundwater Supplies** – The Authority must have the power to acquire and develop surface water and groundwater supplies from sources located both inside and outside the boundaries of the Authority by purchase, lease, or condemnation.

Operation, Transportation and Coordination of Water Services – The Authority must have the ability to conserve, store, transport, treat, purify, distribute, sell, deliver and reuse surface water and groundwater and/or any by-product from the Authority's operations. These powers for the Authority should include the power to maintain, operate, lease or sell a water treatment or supply system, or any other works, plants, improvements, or facilities necessary or convenient to accomplish the purposes of the Authority that the Authority constructs or acquires inside of or outside of the Authority's boundaries. The Authority's power to sell surface water and groundwater and any by-product produced from the Authority's operations includes the sale of such substances on a retail and wholesale basis.

**Plan, Construct, and Acquire Improvements, Works and Facilities** – The Authority should have the power to acquire and provide by purchase, gift, lease, contract or any other legal means, a water treatment or supply system, or any other works, plants, improvements, or facilities necessary or convenient to accomplish the purposes of the Authority or any interest in those assets, located inside or outside of the Authority's boundaries. These powers for the Authority include the ability to design, finance, or construct a water treatment or supply system, or any other supply systems or any other works, plants, improvements, or facilities necessary or convenient to accomplish the purposes of the Authority, including dams and reservoirs.

**Contract Authority** – It is necessary for the Authority to have the power to enter into contracts with persons, including political subdivisions of the state or other legal entities, for the performance of the rights, powers, and authority it is granted, including any person to operate or maintain a water treatment or supply system the person owns.

**Authority to Jointly Own Facilities** – Depending upon its ultimate actual structure, the Authority may benefit from powers that allow the Authority to join with public and private entities as co-tenants or co-owners to plan, finance, acquire, construct, own, operate, or maintain facilities, improvements, plants, and



equipment or appliances necessary to carry out the purposes of the Authority, including water treatment or water supply purposes. Each entity that is a participating entity with the Authority in a facility should be authorized to use its own funds to plan, acquire, construct, own, operate, and maintain its interest in the facility or contract for the use of funds of another participating entity.

**Bond, Note and Loan Authority** – The Authority should be able to issue revenue bonds, notes, revenue anticipation notes, bond anticipation notes, short-term obligations, refunding bonds, or other obligations for any of its purposes without an election and on those terms that the governing body of the Authority determines to be appropriate. The Authority must be able to obtain any necessary loans from public or private entities to enable the Authority to carry out its purposes.

**Authority to Establish Rates Charges and Fees** – The Authority must have the power to establish rates, charges and fees and classifications of fee and rate payers as needed to carry out the purposes of the Authority, including fees to serve as a disincentive to produce groundwater, and use revenues derived from such rates, charges, and fees for any lawful purpose of the Authority, including without limitation the payment of the principal of and interest on the bonds and notes issued or sold by the Authority.

**Eminent Domain Authority** – The Authority must be authorized to exercise the power of eminent domain both inside and outside the boundaries of the Authority to acquire property, including a fee simple or other interest in surface water or groundwater, plants, facilities, or improvements of any kind to further the purposes of the Authority.

**Rulemaking and Enforcement Authority** – The Authority should be provided with the power to adopt and enforce rules reasonably required to carry out its purposes.

**Cooperation with and Assistance of Other Governmental Entities** – The Authority should be authorized to cooperate with and request the assistance of the Texas Water Development Board, the Texas Commission on Environmental Quality, the United States Geological Survey, other local governments, and other agencies of the United States and the State of Texas, including obtaining loans from such entities. The authority to accept gifts and grants from the aforementioned entities should be included in the powers granted to the Authority.

**Authority to Hire Consultants and Technical Assistance** – The Authority should be given the ability to employ or contract with all persons, firms, partnerships, corporations, or other entities, public or private, deemed necessary by its governing body for the conduct of the affairs of the Authority, including, but not limited to, engineers, attorneys, financial advisors, operators, bookkeepers, tax assessors and collectors, auditors, and administrative staff.

**Water Conservation** – The Authority should be able to exercise its powers, including its fee and rulemaking authority, to achieve water conservation, and prevent the waste of both groundwater and surface water.

**Water Quality** – The Authority should be authorized to adopt and enforce rules for the protection of water quality in and flowing to or from the areas in or surrounding lakes, reservoirs, aquifers, and other sources of water supply owned, operated, controlled or regulated by the Authority.

The participants in this study evaluated the powers and composition of several entities in the state of Texas, including entities in North Texas and in the Greater Houston metropolitan area, which provide regional water supply services. The regional entities that were reviewed have many of the aforementioned powers and features of the consensus model management authority, although none have all such powers and features.

The first entity analyzed by the participants is the Upper Trinity Regional Water District (UTRWD), which was created by the Texas Legislature in 1989 to provide regional wholesale water and wastewater services in the

Denton County area.<sup>51</sup> The UTRWD is comprised of cities and utilities and initially allowed its members to be Participating Members or Contract Members within an initial two-year sign-up period. Contract Members could contract with the UTRWD within two years after the effective date of the UTRWD's enabling act to preserve the option to become a Participating Member in the following ten-year period. The Contract Members agreed to pay an annual pro rata share of the administrative and planning costs of the UTRWD that are unrelated to the capital projects to be financed by the UTRWD. Ultimately, 25 entities decided to execute contracts to become part of the UTRWD.

Under the UTRWD's statutory scheme, a Participating Member can contract with the UTRWD for the construction of and payment for the water or wastewater projects to be financed by the UTRWD. The enabling act for the UTRWD established a weighted vote procedure for votes concerning the authorization of and financial commitments for capital projects.<sup>52</sup> Each Participating Member that is receiving or that has contracted to receive service or capacity, including that service or capacity to be received as a result of the capital project then under construction, is provided one vote for a certain volume of water treatment service or capacity.<sup>53</sup> Each Participating Member with a population of 50,000 or more is entitled to one extra vote during weighted voting procedures.<sup>54</sup>

In preparation of the information for this inquiry, the participants also evaluated the North Harris County Regional Water Authority (NHCRWA) established by the Texas Legislature in 1999.<sup>55</sup> The genesis for the NHCRWA was the need of the water providers in northern Harris County to meet the mandatory groundwater reduction requirements established by the HGCSO. One of the primary purposes of the NHCRWA is to provide an alternative water supply to the 160 political subdivisions and additional independent well owners who own or operate groundwater wells within the boundaries of the NHCRWA. The NHCRWA has entered into a contract with the City of Houston to purchase capacity in the raw water, treatment, and transmission system facilities either owned or contracted for by the City of Houston. As part of its long term plans, the NHCRWA intends to deliver water from the City of Houston's metered point of delivery to the NHCRWA's ground storage tanks. The NHCRWA's designs anticipate the NHCRWA will construct a primary distribution system and for each MUD to establish a connection to the NHCRWA's primary distribution system.

Another entity evaluated by the participants is the North Fort Bend Regional Water Authority (NFBRWA). The NFBRWA was recently created by the Texas Legislature during the 79th Regular Session in 2005 for purposes similar to the NHCRWA.<sup>56</sup> The water providers of Fort Bend County are in need of a method to develop alternative water supplies to decrease their dependence on groundwater to comply with the requirements of the Fort Bend County Subsidence District. The NFBRWA was created to address this need. The NFBRWA has many of the same powers and features of the NHCRWA but does have the unique power of imposing special assessments on certain property to fund an improvement project or services. The legislation that created the NFBRWA establishes a procedure which authorizes the NFBRWA to impose special assessments on all property within the NFBRWA or specifically within defined areas which will receive a special benefit from an improvement project or service to fund the project or service.<sup>57</sup>

In its effort to review statutory provisions relevant and pertinent to this study, the participants analyzed the provisions of Chapter 422 of the Texas Local Government Code.<sup>58</sup> Chapter 422 provides for the creation of "public utility agencies" to render water or sewer services.<sup>59</sup> Chapter 422 establishes a procedure by which two or

<sup>51</sup> Chapter 1053, Acts of the 71st Legislature, 1989 as amended by Chapter 494, Acts of the 74th Legislature, 1995; Chapter 46, Acts of the 77th Legislature, 2001.

<sup>52</sup> Id.

<sup>53</sup> Id. at §7.

<sup>54</sup> Id.

<sup>55</sup> Chapter 1029, Acts of the 76th Legislature, 1999 as amended by the 77th, 78th, and 79th Legislatures.

<sup>56</sup> Act of May 30, 2005, 79th Leg., R.S., S.B. 1798.

<sup>57</sup> Id.

<sup>58</sup> Tex. Loc. Gov't. Code §422.001, et al (West 2005).

<sup>59</sup> Id.

more public entities that have the authority to provide water or wastewater services may "join together as covenants or co-owners to plan, finance, acquire, construct, own, operate, or maintain facilities."<sup>60</sup> The public utility agency may be created by the passage of concurrent ordinances by the public entities which are interested in the formation of such agency. The provisions of Chapter 422 also state that the public utility agency is a separate agency, a political subdivision of the state of Texas, and a political entity and a corporate body.<sup>61</sup> The public utility agency may issue obligations to accomplish the purposes of the agency and must charge rates sufficient to produce adequate revenue to meet certain specified obligations. Further, the public utility agency may enter into contracts, leases, or agreements with departments and agencies of the United States and the state of Texas, and may enter into contracts with the public entities which created the agency for water and wastewater services.

## Comparison of Model Authority to Existing Area Authorities

### San Jacinto River Authority

During the participants' comparison of the SJRA to the consensus management authority (Authority), the participants identified several powers and areas of authority that the SJRA currently lacks or which require clarification to serve as the Authority. Most notably, the SJRA does not presently have any authority to regulate the production of groundwater, including the power to assess fees based on the volume of groundwater production. Further, the SJRA does not have any express authority to implement water conservation efforts. While the SJRA does have some rulemaking authority, the participants believe that the SJRA would need to be granted rulemaking authority that is much more comprehensive to cover all of the necessary activities. In addition, some powers of the SJRA would need to be clarified and made more explicit, such as the SJRA's power to acquire groundwater resources.

### Lone Star Groundwater Conservation District

Based on the comparison of LSGCD's current powers and those contemplated for the Authority, there are multiple powers that would need to be granted to the LSGCD, or be expanded or made more explicit, to enable it to become a regional water provider such as envisioned for the Authority. Most prominent would be the ability to assess groundwater use and/or disincentive fees at rates that would likely facilitate groundwater to surface water conversion, and to use such fees to finance any and all aspects of the conversion, including without limitation as a dedicated revenue stream to support bonded indebtedness. Also, the LSGCD's power to plan, design, construct, own or operate water supply or treatment facilities would need to be strengthened. The LSGCD also does not have the express authority to jointly own water supply or treatment facilities. Moreover, the LSGCD would need increased rulemaking authority to govern any additional responsibilities that the LSGCD could be granted related to the provision of wholesale water service and rates related to that service. Also, the ability of the LSGCD to exercise its eminent domain powers under all circumstances and the ability of the LSGCD to contract with the necessary public and private entities for the purposes contemplated would need to be strengthened. To become a regional water provider, the bonding and borrowing authority of the LSGCD would benefit from additional specification and/or expansion to enable the LSGCD to use its recommended revenue and financial mechanisms to fund any and all activities contemplated by this plan.

## Cost Savings and Other Benefits From Modification of Existing Authorities

The participants have not identified any existing authority in Montgomery County which has been granted all of the aforementioned powers and features of a consensus model management authority. During the participants' evaluation of existing authorities, one of the key inquiries was the jurisdiction of the authorities. Only two authorities, the SJRA and the LSGCD, have jurisdictions that extend over all of Montgomery County. While the SJRA and LSGCD would need to be granted additional powers to serve cooperatively as the consensus model

<sup>60</sup> Id.

<sup>61</sup> Id. at §422.052.

management authority, the participants do not believe the creation of a new authority would be as logical or appropriate as such a coordinated approach between these existing entities. The participants anticipate that substantial bureaucratic costs would be generated both in the creation of a new authority with all of the powers and features of the consensus model management authority and in the daily administration of the new authority. The participants believe that significant cost savings could result to the citizens and other water users of Montgomery County simply by modifying the powers of the two existing countywide authorities, the SJRA and LSGCD, to enable them to jointly and/or cooperatively exercise the powers necessary to accomplish the projects contemplated by this study and to have the ability to structure legal relationships with other existing water-using persons and entities.

Perhaps the most compelling argument for this approach, however, is the participants' belief that a critical element to the success of the groundwater to surface water conversion project contemplated in this study and the creation of the regional surface water treatment and distribution facilities to underpin that conversion project is the ability to utilize fees assessed for the use of groundwater on a countywide basis for the subsidization of the conversion to surface water of those water users or areas of use that are required to convert in whole or in part pursuant to regulatory plan implementation. Because the LSGCD is charged with the regulation of groundwater and the appurtenant assessment of regulatory fees, and because SJRA owns and controls the only surface water available in the county, the wisdom of pursuing an implementation strategy that involves a cooperative effort between the LSGCD and SJRA to finance and provide wholesale surface water to converting water users is easy to see. As discussed earlier, however, both the LSGCD and the SJRA may need additional statutory powers to pursue such a joint effort in a manner that will be financially and legally secure, as well as cost-efficient and equitable for all Montgomery County water users.

## **Modifying Authority of Existing Management Entities**

With regard to water conservation and reclamation districts, the legal mechanism most often used to modify an existing entity or to create a new entity is legislation enacted by the Texas Legislature. The participants would need to work with the appropriate state senators and state representatives to achieve the changes that the participants have identified. The participants and the state legislators involved in the modification or creation effort are required to provide the proper notice of the filing of the pertinent legislation in the manner required by the Texas Constitution. The participants would then need to assist the state legislators in the drafting of the necessary legislation and any amendments which could be needed. It is important that the participants and other stakeholders be involved in the legislative process. Both the SJRA and the LSGCD are legislatively created, and amendatory legislation to the enabling acts of each would be the appropriate and lawful method to modify their powers to serve individually or cooperatively as the Authority.

## **Appendices**



## **Appendix A**





## **APPENDIX A – SCOPE OF SERVICES**

### **Task 1: Data Collection and Analysis**

- A. Gather water usage data of existing utility districts and other water supply entities not currently available from the Texas Water Development Board (TWDB) Region H Regional Water Plan.
- B. Develop water demand projections for the existing utility districts and other water supply entities not currently available from the TWDB Region H Regional Water Plan for planning years 2010, 2020, 2030, 2040.
- C. Develop clusters, where applicable based on the information gathered above, of concentrated water demand for use in developing regional water facilities.
- D. Gather information currently available associated with groundwater supply in the region including existing monitoring wells, United States Geological Survey (USGS) water surface elevations, and TWDB Region H Regional Water Plan to evaluate the available groundwater supply in the region.
- E. Review groundwater supply projections and allocations for the area for planning years 2010, 2020, 2030, 2040.
- F. Obtain and review existing information, data, and reports associated with water quality in the area.
- G. Obtain and review water service rates for area utilities within the area.
- H. Obtain Information from Local Economic Development Organizations, Municipalities, Metropolitan Planning Organizations, (HGAC) and Counties regarding future growth and development patterns.

### **Task 2: Regulatory Plan Development**

- A. Develop a definition of management zones within the Lone Star Groundwater Conservation District.
- B. Estimate the groundwater availability within each designated management zone established above.
- C. Estimate the amount of groundwater reduction, if any, required within each management zone established above.
- D. Define stratigraphic and/or geographic limitations and or constraints within each management zone established above.
- E. Determine areas where conversion to alternative sources of water may be required based on the projected water demand and supplies.
- F. Develop detailed permit conditions and constraints to assist in facilitating the conversion to alternative water sources, where applicable, for each management zone.
- G. Compare the allocation of existing supplies to the reductions scheduled in the District's regulatory plan and determine the magnitude of additional supply that must be provided in each regulatory area based solely on the reduction in availability of groundwater.

### **Task 3: Facilities Plan Development**

- A. Prepare an alternative water source facility plan analysis to evaluate probable sources of alternative water supplies both for the areas already shown as Water User Groups in the current regional plan as well as for those identified segments of County Other Municipal for areas that would meet the criteria for conversion under the Regulatory Plan developed above including:
  - 1. Surface water supplies as noted in the current Region H plan.

2. Wastewater effluent reuse as noted in the current Region H plan.
  3. Imported groundwater supplies only to the extent that they are proposed by others.
- B. Based on projected water demands and supplies and the Regulatory Plan developed above, develop facility plans for bringing alternative sources of water to each area where conversion is required.
  - C. Assess the likely location(s) for water supply facilities including surface water treatment plants, water pumping facilities, and water storage facilities.
  - D. Develop an alignment of regional water transmission lines to deliver alternative sources of water to areas of need from the point of supply.
  - E. Size water transmission lines to accommodate projected water demand capacities and needed pressures for each area in need of alternative water supplies.
  - F. Size water treatment, storage, and pumping facilities.

#### **Task 4: Financial Analysis and Management Authority Development**

- A. Develop estimates of probable cost associated with the proposed regional facilities for planning years 2010, 2020, 2030, 2040.
- B. Develop information relative to a takings impact assessment.
- C. Develop estimates of debt service associated with proposed regional facilities based on alternative financing mechanisms including TWDB State Revolving Funds (SRF) Drinking Water program, TWDB State Participation program, and other loans and grant programs.
- D. Evaluate impact of regional facilities to local water utilities and rate payers in terms of increased water service rates.
- E. Review existing authorities in the area to determine whether they have the requisite powers and duties to effectively administer regional systems for the area.
- F. Develop a consensus model management authority from the participants' viewpoint and compare it to the existing authorities. The purpose of the new or existing authority is to finance and/or own and/or operate the necessary regional facilities.
- G. Review legal authority to modify the authority of an existing management entity or to create a model management authority if existing authorities cannot be so modified.

#### **Task 5: Communication and Administration**

- A. Submit public notice and hold a kickoff public meeting about the regional water facility study.
- B. Hold three (3) scheduled status meetings to discuss progress of the study with plan participants.
- C. Publish notice of public hearing and develop a presentation for public hearing and present results of above investigations.
- D. After public hearing, submit draft report to TWDB with participant's comments for review and comment.
- E. Incorporate public's review comments and TWDB comments and submit final report to TWDB and regional facility plan participants.
- F. Prepare twelve (12) monthly progress reports to the grant administrator and TWDB.

## **Appendix B**



## **APPENDIX B – PUBLIC COMMENTS**

This appendix contains written comments received by either Lone Star GCD, San Jacinto River Authority, or TCB throughout the duration of this study, as well as verbal comments offered during the final public presentation given on June 14, 2006.

Public presentations were given frequently throughout this process and input from interested parties has been welcomed. The written comments contained herein are in response to the information presented in these public meetings. Most of the topics discussed are not part of the scope of services detailed in Appendix A and are not addressed individually in this report. The issues raised and the suggestions provided, while not addressed herein, are important and will ultimately be addressed as the District moves forward into the next phase of this project.

A list of the public meetings held for this study is on the following page.



**Public Meetings for  
Regulatory Study and Facilities Implementation Plan for Lone Star Groundwater  
Conservation District and San Jacinto River Authority  
January 1, 2004 – June 14, 2006**

**June 8, 2004 – Planning Focus Committee Meeting**

Present: Orval Love, Jim Adams, Jim Stinson, David Kleimann, Scott Weisinger, Jackie Chance, Jerry Lovelady, Richard Tramm, Jeannie Hargis, Billy Wood, K. Jones, Alan Potok, Bill Thaman, David Parkhill, and members of the public.

**July 13, 2004 – Public Hearing re: Regulatory Plan Development**

Present: Jim Adams, B. Creighton, J. Hargis, D. Kleimann, O. Love, J. Stinson, R. Tramm, B. Wood, K. Jones, J. Johnson, M. Brewer, R. Owen, T. Metcalf, W. Melder, A. Potok, B. Thaman, B. Roberts (TWDB), and members of the public.

**March 23, 2005 – Planning Focus Committee Works Session regarding Groundwater Regulatory Plan and Facilities Implementation Plan.**

Present: Jim Adams, Orval Love, David Kleimann, Scott Weisinger, Jackie Chance, Jerry Lovelady, Mike Heimer, Jerry McGuire, Rigby Owen, Billy Wood, Kathy Jones, Alan Potok, Bill Thaman, and members of public.

**May 5, 2005 – Committee Meeting**

Present: Jim Adams, Orval Love, J. Stinson, David Kleimann, Scott Weisinger, Jackie Chance, Jerry Lovelady, Mike Heimer, Jerry McGuire, Jeannie Hargis, Kathy Jones, Alan Potok, Bill Thaman, Mark Lowrey, and members of public.

**June 27, 2005 – Committee Meeting re GRP**

Present: Jim Adams, Orval Love, David Kleimann, Scott Weisinger, Jackie Chance, Jerry Lovelady, Jerry McGuire, Kathy Jones, Marla, Brewer, Alan Potok, Bill Thaman, Brian Sledge (phone), and members of public.

**July 20, 2005 – Committee Meeting**

Present: Jim Adams, Orval Love, J. Stinson, David Kleimann, Scott Weisinger, Jackie Chance, Jerry Lovelady, Jerry McGuire, Jeannie Hargis, Rigby Owen, Billy Wood, Kathy Jones, Marla, Brewer, Alan Potok, Bill Thaman, Brian Sledge (phone), and members of public.

**August 16, 2005 – Committee Meeting**

Present: Jim Adams, Orval Love, David Kleimann, Mike Heimer, Jackie Chance, Jerry Lovelady, Jerry McGuire, Jeannie Hargis, B. Creighton, R. Tramm, Billy Wood, Kathy Jones, Marla, Brewer, Alan Potok, Bill Thaman, Brian Sledge (phone), and members of public.

**October 4, 2005 – Committee Meeting**

Present: Orval Love, Jim Stinson, Mike Heimer, Jackie Chance, Jerry Lovelady, Jerry McGuire, Scott Weisinger, R. Owen, Billy Wood, Kathy Jones, Marla, Brewer, Alan Potok, Bill Thaman and members of public.

**June 14, 2006 – Final Public Hearing re: Regulatory Study and Facility Implementation Plan**

Present: Orval Love, Scott Weisinger, Rigby Owen, Billy Wood, Kathy Jones, Alan Potok and members of public.







**SIERRA  
CLUB**  
FOUNDED 1892

Houston Regional Group  
P. O. Box 3021  
Houston, Texas 77253-3021  
713-895-9309  
<http://texas.sierraclub.org/houston/>

July 16, 2004

Ms. Kathy Jones  
General Manager  
Lone Star Groundwater Conservation District  
P.O. Box 2467  
332 North Main  
Conroe, Texas 77305

Dear Kathy,

Enclosed are the comments of the Houston Sierra Club (HSC) regarding the Groundwater Regulatory Plan and Facilities Implementation Plan (GRPFIP) that will be prepared via a grant between the Texas Water Development Board (TWDB), San Jacinto River Authority (SJRA), and the Lone Star Groundwater Conservation District (LSGCD).

- 1) The HSC requests a hard copy of the slides that were presented by Turner, Collie, and Braden (TC&B) about the proposed GRPFIP.
- 2) In order to facilitate public participation the HSC recommends that evening and or weekend public hearings/meetings be held for the GRPFIP. This important issue needs adequate public input.
- 3) In order to facilitate public education the HSC recommends that a summary document be made available before and at public hearings/meetings.
- 4) After the public hearing on July 13, 2004, I spoke with the project manager at TC&B for the GRPFIP, Mr. William Thaman. Mr. Thaman stated there was very little environmental analysis included in the GRPFIP scope of work. The HSC is concerned that the environmental feasibility of any surface water alternatives that are designed to replace groundwater will be ignored during the GRPFIP. When environmental feasibility is reviewed the momentum for one or more alternatives will be so great that it will be difficult to turn down these alternatives based on environmental feasibility. The HSC recommends that environmental feasibility of alternatives be a make/break criterion when looking at the feasibility of alternatives to groundwater for the GRPFIP.
- 5) The HSC mentioned at the July 13, 2004 public hearing and in previous correspondence to the LSGCD, its concerns about protecting Sam Houston National Forest (SHNF), seepage areas, springs, seepage streams, and seepage flow to streams.

*"When we try to pick out anything by itself, we find it hitched to everything else in the universe." John Muir*

Our concerns about these areas are biological, ecological, scientific, educational, spiritual, and recreational. The LSGCD's Groundwater Management Plan has the goal of protecting water resources for the benefit of the citizens, economy and environment of Montgomery County. This includes protecting SHNF, seepage areas, springs, seepage streams, and seepage flow to streams. The GRPFIP should address how these resources will be protected by each alternative.

6) The GRPFIP should include a map that documents where all water wells are in Montgomery County. All water well users should be documented on this map including agricultural, commercial, industrial, municipal, mineral, single family, and any other water well users.

7) The GRPFIP should include a map that has all sensitive environmental areas. Some of these sensitive areas include SHNF, seepage areas, springs, seepage streams, seepage flow to streams, streams that are connected to aquifers, wildlife management areas, aquifer recharge areas, Lake Houston State Park, scout or church camps, Jones State Forest, Cooks Branch Conservancy, etc.

8) The GRPFIP should include a map all shallow water aquifers that are not part of the Chicot, Evangeline, and Jasper Aquifers. The LSGCD should ensure that these important water resources are also monitored and protected.

9) The GRPFIP should include how the LSGCD will coordinate with surrounding counties regarding groundwater protection. These counties include, at a minimum, Grimes, Harris, Liberty, San Jacinto, Waller, and Walker.

10) The GRPFIP should address how recharge areas for the Evangeline, Chicot, Jasper, and other minor aquifers will be protected to ensure that both water quality and quantity are not affected by development. If impacts have already occurred then mitigation measures should be addressed to reduce these impacts. If additional authority is needed from the Texas Legislature then the GRPFIP should outline what this authority is and why it is needed.

11) The GRPFIP should look at alternatives to groundwater that include significant mandatory water conservation programs for all users; mandatory drought contingency plans, stringent water leak detection and repair programs; increasing block rate water use program for all users; wastewater reuse, etc.

12) The HSC is concerned about any alternatives that transfer water from another Region and transfers it to Region H. In particular we are concerned about any proposal that transfers Sabine River Water to Region H and Montgomery County. Some of the negative impacts that may occur due to this interbasin transfer would occur in, but are not limited to, Big Thicket National Preserve, Sam Houston National Forest, Trinity River National Wildlife Refuge,

bottomland hardwood and riparian forests, wetlands, sensitive areas, the Neches River, instream flows, bays and estuaries, and cause coastal erosion.

13) The GRPFIP should contain an alternative that makes all lands within Sam Houston National Forest a groundwater management zone. This groundwater management zone should be operated to maximize protection for Sam Houston National Forest as an important regional amenity and ecosystem.

14) The GRPFIP should determine what impacts alternatives will have on Sam Houston Nation Forest. For instance, while it makes sense to bring water from Lakes Conroe or Livingston to developed areas, what impacts will the conveyance systems and associated equipment have on the recreational, biological, ecological, and spiritual resources of Sam Houston National Forest and what mitigation is needed to reduce or eliminate these impacts.

15) The GRPFIP should address the problem of inefficiencies in water use and infrastructure that development causes if not planned in areas where current infrastructure can easily be connected to or which is located near existing more dense development to supply economy of scale uses and equipment. It is much cheaper and ecologically sound if people and businesses are located where the water already exists.

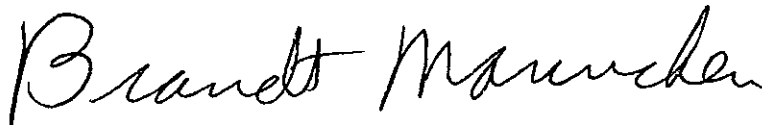
16) The GRPFIP should recognize that the current TWDB population projection for 2040 is a projection and not a goal to attain. How can the GRPFIP address supplying water to those who need it while not unnecessarily attracting population and growth that cannot be environmentally and economically supported and sustained? This is a key concept to carrying capacity which ensures that we do not overshoot our financial, social, and environmental capabilities to deliver the best Quality of Life for the citizens of Montgomery and surrounding counties.

17) The GRPFIP must be compatible and coordinated with the Region H water plan.

The HSC appreciates this opportunity to comment. Thank you.

Sincerely,

Brandt Mannchen  
Chair, Forestry Subcommittee  
Houston Sierra Club  
Lone Star Chapter  
5431 Carew  
Houston, Texas 77096  
H713-664-5962







Porter Water Supply Corp.  
22162 Water Well Road  
Porter, Texas 77365-5381

Ph: (281) 354-5922  
Fax (281) 354-5050

March 25, 2005

Mr. Bill Thaman, P.E.  
Project Manager  
Turner Collie & Braden Inc.  
P.O. Box 130089  
Houston, Texas 77219

RE: "Groundwater Management Plan" – Lone Star Groundwater Conservation District  
Water Quality Issue – Radioactive Constituents

Dear Mr. Thaman:

As I pointed out in a recent Meeting of the *Focus Planning Committee*, there is strong evidence that Radioactive Constituents will be a major water quality factor that may significantly influence groundwater withdrawals from the Gulf Coast Aquifer.

And as I stated at the last Meeting, there are at least two situations that provide a basis for concern in this matter:

- In 2004, the Porter WSC had to shut-down Well # 4 because the Gross Alpha Activity was at 17.0 pCi/L, versus the MCL of 15.0 pCi/L. Crystal Springs Water Company (an adjacent water service area) has also had to shut-down one of their wells.
- At a recent TRWA Seminar in Austin, a TCEQ Representative gave a presentation on Radionuclides, and it was clear to see, based on his discussion of this topic and his map of Texas Aquifers, that the Gulf Coast Aquifer had the most representation as regarding Radioactive Materials.

Therefore, I respectfully recommend that additional research be pursued on this particular water quality issue, and that it be incorporated into the Study for the proposed "Groundwater Regulatory Plan/Facilities Implementation."

Thank you for your assistance. I am at your disposal if you have any questions or comments.

Sincerely,

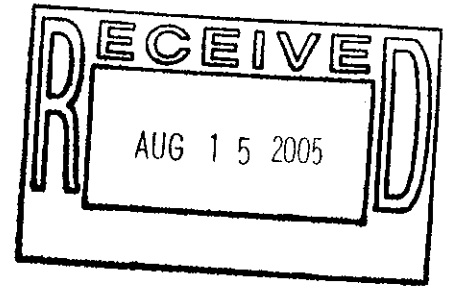
Jerry Lovelady  
General Manager

cc: Jim Adams  
Kathy Jones





JOHNSON RADCLIFFE  
PETROV & BOBBITT PLLC



August 12, 2005

**VIA FACSIMILE 1.936.494.3438 AND REGULAR MAIL**

Mr. James Adams, P.E.  
Chairman, Focus Planning Committee  
Lone Star Groundwater Conservation District  
P.O. Box 2467  
Conroe, Texas 77305

Re: Developing a Groundwater Management (Regulatory) Plan for Montgomery County

Dear Mr. Adams:

As an attorney who has worked in the water industry for almost 20 years, first for the Texas Water Commission and now for numerous water utilities, I want to emphasize my personal support for the goals of the Lone Star Groundwater Conservation District (the "LSGCD"). Likewise, as the attorney for the Porter Special Utility District (the "Porter SUD"), I want to emphasize that the Porter SUD supports adopting measures that will promote water conservation in Montgomery County and regulations that will prevent harmful depletion of the groundwater aquifers that underlie Montgomery County and extend under other counties. I understand that your committee is working to develop a groundwater regulatory plan for Montgomery County and, with this perspective in mind, I hope to offer some helpful comments in order to assist in the development of such plan.

A first general observation is that, to be effective, regulations must have the support of the regulated, and in order to obtain the support of those you regulate, regulations must not be perceived as arbitrary. Rather, they must be perceived to be fair and practical. I cannot emphasize the word "perceived" enough. I have personally participated in the development of numerous regulations and my experience has been that, even though a regulation may be scientifically and technically supported, unless the perception is that its development is fair and practical, implementing will be a problem.

Some agencies make the mistake of rushing to develop rules. My experience has been that it is important to develop significant amounts of data to support new regulations. The public meetings you are having are also a good step toward building public perception. However, as a member of the regulated community, I can truthfully say there is still little understanding of what the LSGCD is trying to accomplish. Meetings and public forums should be continued for at least a year as draft rules are distributed for comment. In addition, it is extremely important that comments be accepted and incorporated into drafts. Some regulatory agencies believe that they

know what is good for the community and are therefore, reluctant to amend rules that they propose. Not only is such a position generally wrong, as there is often more than one way to skin a cat, but worse is the perception that results from such action. If an agency is unwilling to amend proposed rules, then all of its public meetings become a sham and are simply a waste of time for all involved. It is through distributing drafts and redrafts that an agency builds consensus and support.

A second general observation, as underscored by recent legislation (HB 1763), is that groundwater agencies that regulate the same aquifer system should cooperate in establishing practical regulations that best serve the well-being of the entire aquifer system and the overall welfare of the citizens represented by these agencies. Groundwater in an aquifer does not know when it crosses the county line and a regulation that results in a shifting of groundwater pumpage from one side of a county line to another, without reducing overall pumpage, produces no benefit for anyone. This issue must be addressed as part of the regulatory plan, and as illustrated below, is a very real possibility.

With respect to coordination, you may remember that I serve on the Board of Directors of the Harris-Galveston Coastal Subsidence District (the "Subsidence District"). I have heard from the Subsidence District's General Manager, Mr. Ron Neighbors, that the LSGCD has visited with him and I applaud your coordination to date. I encourage you to continue such coordination and offer my services as a Board member to facilitate future coordination should the need ever arise.

A third general observation has to do with reality. A regulatory plan must not only be supported, it must also be realistic. Obviously, any meaningful regulatory plan will necessitate the conversion from groundwater usage to surface water usage in Montgomery County. I have heard that the year 2013 may be proposed as the initial conversion target date, with various conversion percentage rates depending on the management zone scenario, and I believe it would be fair to say that the professionals, like myself, who work in the water industry, both expect and support the conversion to surface water. Nevertheless, it is apparent, when looking at this situation from the point of view of a realist, that some areas of Montgomery County may easily receive surface water supplies, while other portions of Montgomery County will find it extremely difficult, if not impossible, to convert to surface water under such a schedule. A regulation becomes arbitrary and serves no purpose if it is not realistic to expect a regulated entity to be able to comply with the regulation based on location, economics, water supplies or some other factor.

To illustrate two of the points above, I would like to share with you the result of the efforts that I have made and the efforts of Porter SUD's Engineer, Bill Kotlan, P.E., and Porter SUD's General Manager, Jerry Lovelady, in regard to obtaining surface water from the City of Houston, the entity that Porter SUD will be required to look to for surface water. We have discussed and met with City of Houston representatives on several different occasions regarding this issue. The bottom line is this, based on the City of Houston's most recent response, it will be approximately 20 years, or 2025, before the City of Houston brings surface water from their nearest surface water source (Highway 59/Beltway 8) into the Kingwood area. Furthermore, in



Mr. James Adams, P.E.

August 12, 2005

Page No. 3

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order for the City of Houston to meet the proposed groundwater withdrawal reductions of the LSGCD, they plan to simply decrease pumpage from their Montgomery County wells and increase pumpage from their Harris County wells (across the county line), with no overall benefit to the aquifer system shared by Montgomery and Harris Counties. Obviously, significant additional coordination with the City of Houston is necessary in order to ensure that proposed regulations are both effective in reducing overall pumpage of the aquifer and realistically attainable for those entities that will need to purchase surface water.

I know that you and the LSGCD have already spent a considerable amount of time and effort toward developing a workable regulatory plan and I am sure that you understand the complexities of such a task. Again, I want to emphasize our support for your goals and I hope that the above-observations prove helpful. As you continue with this process, should there be anything that we can do to assist the LSGCD, please feel free to let me know.

Very truly yours,

A handwritten signature in black ink, appearing to read 'Alan P. Petrov', with a long horizontal flourish extending to the right.

Alan P. Petrov

cc: Board of Directors, Porter SUD  
Mr. Jerry Lovelady  
Ms. Kathy Jones  
Mr. Brian Sledge



# Porter Special Utility District

August 15, 2005

TO: Jim Adams, P.E., Chairman  
Focus Planning Committee  
Lone Star Groundwater Conservation District

FROM: Jerry Lovelady, Member  
Citizens Advisory Group  
Focus Planning Committee

SUBJECT: Groundwater Management in Montgomery County

The Porter Special Utility District appreciates the efforts of the Lone Star Groundwater Conservation District in the development of a *Groundwater Management (Regulatory) Plan* for Montgomery County; in order to prevent the depletion of the underlying groundwater aquifers, this Plan will ultimately place further regulations and restrictions on groundwater withdrawals. Furthermore, we applaud the District's initiative in furnishing information to the Public on the Status of this *Groundwater Management Plan*, and we hope that the Lone Star Groundwater Conservation District will solicit public participation and seriously consider all public input related to this important Plan.

As you are aware, the majority of the Residents of Montgomery County receive their water supply from a local Public Water Utility (City of Montgomery, City of Conroe, City of Splendora, New Caney MUD, City of Cleveland, The Woodlands, Porter SUD, etc.). It is these Public Water Utilities that will feel the initial and direct brunt of all Regulations and Restrictions affecting Groundwater Withdrawals in Montgomery County, but all Customers of these Utilities (the majority of County Residents) will ultimately be affected by these Regulations and they will pay the costs for these regulations and restrictions through higher water rates... Subsequently, there will be few citizens of Montgomery County that will be unaffected by this *Groundwater Management Plan*, and therefore, all County Residents must be involved in the planning process – especially all County Water Utilities.

No matter the water supply situation, Water Utilities must meet the water supply demands of their customers and the mandatory Texas Commission on Environmental Quality (TCEQ) Capacity Requirements (water production = 0.6 GPM per Connection); nevertheless, in Montgomery County, Water Utilities are primarily limited to three (3) main options for obtaining additional water supplies to meet their customer water demands and TCEQ capacity requirements related to population growth; i.e., Mining of Local Groundwater Aquifers, Surface Water Supplies, and Water Conservation.

(1) Mining of Local Groundwater Aquifers: The depletion of County groundwater aquifers is, of course, unacceptable to most County Residents and Utilities, and overdrafting of the aquifers has already caused subsidence in several areas of the County. However, although complete depletion of our aquifers is not a reasonable option, it may be possible to "mine" the aquifers to a certain degree without causing subsidence or undue harm to the environment (i.e., mining refers to groundwater withdrawals that exceed groundwater recharge), and it is this short-term option – the mining of local aquifers – that should be seriously investigated by the Lone Star Groundwater Conservation District.

(2) Surface Water Supplies: The conversion from Groundwater Supplies to Surface Water Supplies is a viable option for some portions of Montgomery County – for those areas that can more readily obtain Surface Water Supplies via the San Jacinto River Authority (SJRA) from Lake Conroe (for example, the City of Conroe and The Woodlands). Unfortunately, some Water Utilities (Cleveland, New Caney MUD, Splendora, Porter SUD, and others) cannot easily connect to the SJRA surface water supply system, and therefore, the City of Houston has been named as an alternate source for surface water. However, the Porter SUD has had recent discussions with City representatives, and the latest response from Houston is this: The City of Houston has no plans to bring surface water supplies into the Kingwood area for at least twenty (20) years (about 2025).

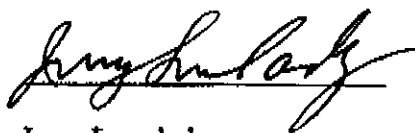
(3) Water Conservation: The very essence of Water Conservation is the elimination of wasted water – not just during periods of drought, but on a day-to-day basis. Water Conservation is the least expensive method for assuring additional water supply availability. Aggressive Water Conservation measures (e.g., penalty-oriented regulations prohibiting water waste, improvements in landscape irrigation efficiency, replacement of water-wasting fixtures, and other similar measures) can reduce customer water demand by twenty to thirty percent (20% - 30%). Any long-term Plan for Groundwater Management should place a strong emphasis on this vital option -- Water Conservation.

Based on data supplied by the Lone Star Groundwater Conservation District, it seems obvious that measures must be taken to conserve our precious groundwater resources and prevent the depletion of our local aquifers; the Groundwater Conservation District's *Groundwater Management Plan* is a vital step for implementing those measures.

In summary, there are three (3) main options for ensuring adequate water supplies to Montgomery County Water Utilities and their Customers: (1) Mining of Local Groundwater Aquifers, (2) Surface Water Supplies, and (3) Water Conservation. For those Utilities that can easily obtain surface water supplies from the SJRA, they should pursue this option. For those Utilities that cannot reasonably obtain current surface water supplies, they should be allowed to mine the groundwater aquifers on a short-term basis – until surface water supplies are readily available. And for both these aforementioned groups, aggressive water conservation should be a mandatory companion to other water supply strategies.

I respectfully submit that it would be beneficial if the Lone Star Groundwater Conservation District seriously considers these water supply/water conservation options as outlined above; additionally, it would also be helpful if the District would provide assistance in implementing these options. Furthermore, I recommend that the Lone Star Groundwater Conservation District form a "Water Conservation Task Force," comprised of Water Utilities and various other representatives from Montgomery County, to develop water conservation measures most applicable to the County and to create "Model Water Conservation Regulations" that can be adopted and implemented by County Water Utilities.

Respectfully submitted,



Jerry Lovelady



Porter Special Utility District  
22162 Water Well Road  
Porter, Texas 77365-5381

Ph: (281) 354-5922  
Fax: (281) 354-5050

August 22, 2005

Board of Directors  
Lone Star Groundwater  
Conservation District  
Conroe, Texas

RE: Groundwater Management (Regulatory) Plan under development by the  
Lone Star Groundwater Conservation District

The Porter SUD Board Members applaud the efforts of the Lone Star Groundwater Conservation District in the District's development of a Groundwater Management Plan for Montgomery County. Our Board of Directors understands the importance of conserving and protecting our precious groundwater supplies, and as of October 1, 2005, the Porter SUD will enact stricter Water Conservation Measures and increase the Cost of Water in the higher Tiers of it Inclining Block (conservation) Water Rates, in order to positively impact water conservation and affect water demand reductions in our service area.

Aggressive water conservation efforts can reduce water consumption by twenty to thirty percent (20 – 30%), and in conjunction with your Groundwater Management Plan, Conservation Credits should be issued by the Lone Star Groundwater Conservation District to Water Utilities that demonstrate measurable and quantifiable reductions in customer water consumption (which means, of course, reductions in groundwater withdrawals). Conjunctively, gallons of groundwater consumption per metered service connection (residential and commercial) is the accurate means of measurement, and should be instituted within Montgomery County by the Lone Star Groundwater Conservation District. Lone Star GCD should also establish a "Water Conservation Task Force" to enhance the water conservation efforts across the County.

Furthermore, we hope that the realities of water supply in Montgomery County are driving your impending Regulations, and that your proposed Management Plan is not already carved in stone, impervious to public input and viable suggestions. Without serious consideration of input and suggestions, the Regulations will be labeled as arbitrary and unfair, and subsequently, will be difficult to implement.

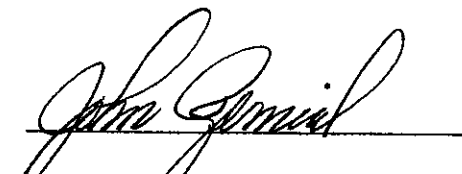
And as relating to the reality of water supply in our County, it would have seemed to be the better path to effective groundwater management planning if the City of Houston, as the designated provider of surface water to Southeast Montgomery County, would have been involved in the Lone Star GCD planning process at its earliest stages; i.e., based on the Porter SUD's latest conversations with the City of Houston, Houston has no intention to supply surface water to this area for another twenty (20) years! This response from the City of Houston is not compatible with the message we have been receiving from the Lone Star Groundwater Conservation District.

Please do not misunderstand the Porter SUD Board of Directors, and its General Manager and Consultants, in regard to the development of your Conservation District's *Groundwater Management Plan*; we want this effort to be successful, as it benefits all County Water Utilities and County Residents if we are able to prevent the depletion of our local aquifers. Nevertheless, we are presenting certain recommendations and suggestions that we believe will enhance these forthcoming Regulations and improve their palatability to the Stakeholders that will ultimately be required to meet the Management Plan elements:

- Regulations should be driven by the realities of the Montgomery County water supply situation
- Public input and suggestions (as related to the *Groundwater Management Plan*) should be welcomed and seriously considered by the Lone Star Groundwater Conservation District
- Emphasis should be placed on Water Conservation (with both "hard" and "soft" water conservation measures) for a substantial water consumption reduction across the County
- Conservation Credits should be issued by the Lone Star GCD to Water Utilities that achieve measurable and quantifiable water supply reductions
- Water Consumption (as related to water conservation) should be measured in Montgomery County on a per-metered-service-connection basis
- A "Water Conservation Task Force" (with Members from Water Utilities and from the general population) should be established by the District to assist in the County's water conservation efforts
- The District should immediately establish formal lines of communication with the City of Houston as related to provision of surface water supplies to Southeast Montgomery County
- The Regulations of the District should not favor one section of the County over a different section of the County, as all of Montgomery County will benefit from conservation and protection of the County's groundwater resources
- The District Regulations should ensure a fair distribution of costs across Montgomery County for Management Plan implementation: For example, the Southeast Zone should not pay for City of Houston costs for surface water and also for SJRA surface water costs (and vice versa)

The Porter SUD Board of Directors respectfully submits these suggestions and recommendations to the Board of Directors of the Lone Star Groundwater Conservation District. We are at your disposal for any assistance that we may be able to provide in your development of this important *Groundwater Management Plan*.

Sincerely,



John Zernial, Board President  
Porter Special Utility District

Kathy Jones  
*General Manager*

**Board of  
Directors**

Orval R. Love, PE  
*President*

C. Brandon Creighton  
*Vice-President*

Richard J. Tramm  
*Secretary*

Paula J. Hargis  
*Treasurer*

James R. Adams, PE

David Kleimann

Rigby Owen, Jr.

Jim Stinson, PE

W. B. Wood

August 30, 2005

Mr. John Zernial, Board President  
Porter Special Utility District  
22162 Water Well Road  
Porter, Texas 77365-5381

Dear Mr. Zernial

The Board of Directors of the Lone Star GCD appreciates your letter of August 22<sup>nd</sup> expressing your viewpoints on the District's efforts on groundwater regulation planning. Copies have been sent to all Board of Directors and we will take your points under appropriate advisement. I do want to take the opportunity to clarify the District's activities and address several of the points of concern in your letter.

Having Porter SUD's general manager participating in the Planning Focus Committee (PFC) meetings for the past 6 months, you are aware that the District is examining several alternative concepts for establishing a Regulatory Plan to manage the groundwater resources in the county. This is a significant issue. The population and economic growth of Montgomery County are dependent on a sustainable water supply.

It appears very evident that we are near or exceeding the sustainable recharge capability of the aquifer system today. Over the next 40 years, indications are we will have a very severe shortage of water supply unless alternative methods are implemented to reduce the demand on groundwater. These methods are anticipated to include water conservation, reclaimed water and surface water use.

Even if we act today, it would take us a minimum of eight years before we would see any measurable reduction in groundwater demand. Based on the projected growth in water demand, we expect to see some dramatic declines in the water levels in the aquifer as it is over pumped.

As a citizen's advisory representative to the PFC for the past six months, Porter SUD has been providing input to the formulation of the regulatory plan. In addition to the public presentations made at the PFC meetings, we have conducted presentations in front of water districts in southern Montgomery County, the Lake Conroe area, and the east Montgomery County area. Over the next 90 days, we hope to intensify our public outreach by making additional presentations to stakeholder groups. The fundamental purpose of these meetings is to summarize the problem facing us, present the alternatives we are considering and to get public feedback.

We are in fact, seeking a great deal of public input prior to defining the form of the final Regulatory Plan that will be put in place. We have presented alternatives that represent the "goals" for reducing groundwater demand. We have **not** stipulated how the individual water users will meet those goals. Of six alternatives for management zones presented to date, none have stipulated how to achieve the necessary goals. That will, in fact, be left up to the water user.

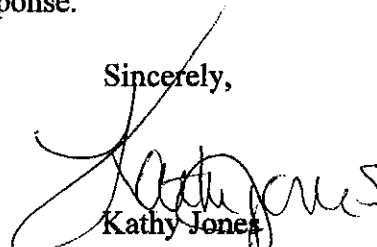
Our consultant is of the opinion that surface water will be a part of that solution. Given the facts presented, that likely will be the case. Notably, all of the solutions suggest a groundwater reduction of 24,000 ac-ft in, at the earliest, 2013. But, 2013 has not been established as an official timeline. Merely it is the earliest that he believes anything substantial could be accomplished. Moreover, the 24,000 ac-ft is within the current owned resources of surface water owned by the San Jacinto River Authority. It is feasible, therefore, that an entity is available to implement a surface water program of that amount.

Of the six alternatives considered, I, after conversations with the consultant and the attorney, have recommended a preferred plan to the PFC for consideration. That plan assumes four management zones in the county. This recommendation is intended to begin to focus on a solution and let the public know the direction we are thinking. In that way, they can begin to develop more focused responses that will allow us to decide how to modify the recommendation. So, in response to your inquiry, the current planning is not fixed and we do intend to make appropriate modifications after receiving public comment.

I would like to point out that the plan I recommended suggests a 14 % reduction in groundwater demand by 2013. This is far less than the 20-30% you indicate can be achieved through water conservation. Under those conditions, no need for surface water from the City of Houston would even be required. But, I wish to repeat, the LSGCD will establish the "Goals" for reducing groundwater demand. How the water users accomplish those goals will be their prerogative, subject to some approval mechanism by the LSGCD.

Thank you again for your response.

Sincerely,



Kathy Jones  
General Manager

cc: LSGCD Board of Directors  
Mr. Alan Petrov, Attorney at Law  
Mr. Brian L. Sledge  
Mr. Alan J. Potok





Porter Special Utility District  
22162 Water Well Road  
Porter, Texas 77365-5381

Ph: (281) 354-5922  
Fax: (281) 354-5050

September 9, 2005

Ms. Kathy Jones  
General Manager  
Lone Star GCD  
P.O. Box 2467  
Conroe, Texas 77305

RE: Your 08-30-05 Response to the Letter from John Zernial, PSUD Board President

Dear Ms. Jones:

The Porter Special Utility District appreciates your recent letter. I will pass it on to Mr. Zernial and the other Porter SUD Board Members.

It is true that I have been a member of the Citizens Advisory Group and have attended the Meetings of the Planning Focus Committee on a regular basis; subsequently, the Porter SUD Board of Directors, as reflected in Mr. Zernial's letter, are acutely aware of the groundwater situation in Montgomery County. And although I have attempted to provide positive input during the planning process, it has not always been welcomed with the alacrity that I would expect from an organization that has been created – by the citizens of Montgomery County - to protect and conserve our valuable groundwater resources.

As indicated by Porter SUD Board President John Zernial, the SUD realizes that the development of the LSGCD Management Plan is a worthwhile endeavor, but we have concerns over its current construction and we are submitting suggestions that will make it more practical for those that are tasked with meeting its regulations – and suffering its penalties if we do not meet its "goals."

Additionally, we seriously believe that Water Conservation can play a vital role in meeting the water needs of Montgomery County, but (1) It must be "aggressive" water conservation, and (2) It must be vigorously pursued on a county-wide basis; (therefore, the Lone Star GCD should be the lead Agency in both these matters).

We realize that the SJRA is available to supply surface water to Conroe and the Woodlands; nevertheless, we are concerned about Regulations that would mandate Groundwater Withdrawal Restrictions for Southeast Montgomery County, when there is no Entity available in this part of the County to supply surface water on the suggested timeline (2013). Porter SUD believes that these type Regulations, under these circumstances, will not stand up to serious legal scrutiny.

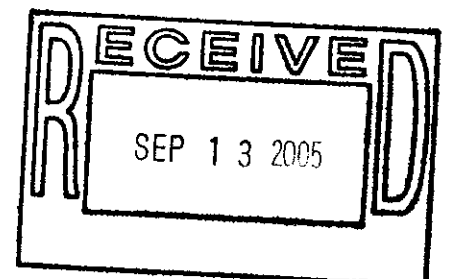
It is hoped that all the comments made by Mr. Zernial will be seriously considered by the LSGCD Board of Directors, and that they will respond on a comment-by-comment basis. Thank you.

Sincerely,

A handwritten signature in black ink, appearing to read "Jerry Lovelady".

Jerry Lovelady  
General Manager

cc: Distribution







Porter Special Utility District  
22162 Water Well Road  
Porter, Texas 77365-5381

Ph: (281) 354-5922  
Fax: (281) 354-5050

September 20, 2005

Mr. Jim Adams, P.E.  
Chairman  
Focus Planning Committee  
Lone Star G C D  
P.O. Box 2467  
Conroe, Texas 77305

RE: Porter SUD Water Conservation Efforts

Dear Mr. Adams:

Based on the declining water levels in Montgomery County groundwater aquifers and the need to conserve these vital groundwater resources, the Board of Directors of the Porter Special Utility District has taken steps toward aggressive water conservation measures within the Porter SUD's water service boundaries by the enactment of Stage 2 of the PSUD Drought Contingency Plan (please see enclosed Newsletter).

Nevertheless, there are some questions that need to be answered by the Focus Planning Committee and the Lone Star Groundwater Conservation District, and hopefully these issues will be addressed at the next Committee Meeting:

- What will be the "baseline" for the calculations of groundwater reductions required under the "Management Plan" of the Lone Star GCD?
- Is there a reason why groundwater reductions are not measured on a per-service-connection basis (residential, commercial, etc.)?
- Although Montgomery County Water Supply Agencies should be rewarded for undertaking aggressive water conservation measures, will they – in reality – be penalized by the LSGCD for reducing water consumption during the current time period?
- I had suggested a "One Zone" solution for Montgomery County, as it would aid in the implementation of county-wide water conservation measures... Why is there opposition to this concept? And is there any legal mandate that would prevent the Lone Star Groundwater Conservation District in pursuing more vigorous water conservation activities?

Thank you for your consideration of these matters. I am at your disposal if you have any questions or comments.

Sincerely,

A handwritten signature in black ink, appearing to read "Jerry Lovelady".

Jerry Lovelady  
General Manager



# PORTER SPECIAL UTILITY DISTRICT

22162 Water Well Road Porter, Texas 77365 (281) 354-5922

## WATER CONSERVATION NEWS

SEPTEMBER 2005

### **PORTER SUD BOARD OF DIRECTORS ENACTS STAGE 2 of the PSUD DROUGHT CONTINGENCY PLAN**

Due to the periods of dry weather we have experienced during the summer months and due to the fact that one of the District's wells is out of service, and because of the necessity of increased water conservation due to groundwater withdrawals exceeding recharge in the local aquifers, the Board of Directors of the Porter Special Utility District has Enacted STAGE 2 of the District's Drought Contingency Plan, with an effective date of October 1, 2005...

#### **STAGE 2. "WATER WATCH" (Moderate Water Shortage Conditions)**

- A. Target Water Demand Reduction Goal: 11% - 15%**
- B. Triggering Mechanisms:**
1. Dry year, with Moderate Drought Conditions.
  2. Loss or damage to PSUD water production or water distribution appurtenances or facility that would decrease water system capability by 11 to 15 percent.
  3. Short-term or long-term situation requiring a 11% to 15% reduction in water consumption.
- C. Porter SUD Actions**  
*In addition to Actions of Stage 1:*
1. Establish mandatory water consumption restrictions and actions to be taken by District Water Customers (Retail and Wholesale Water Users).
  2. The Board of Directors may adopt and authorize the implementation of a Surcharge for water consumption in excess of a specified amount, and/or the Board may modify Water Rates to encourage efforts toward Water Conservation.
  3. All water taken from Fire Hydrants, other than that for Fire Fighting Purposes, shall be metered, and the District shall charge for this water in accordance with the current rate schedule of the Porter Special Utility District.
- D. Water Customer (Water User) Actions and Restrictions**  
*In addition to the Actions / Restrictions listed under Water Conservation Stage 1:*
1. Restriction (Retail and Wholesale Customers): Due to higher evaporation losses, Water Customers shall not water their lawns and landscapes between the hours of 8:00 a.m. and 5:00 p.m.
  2. Restriction (Retail Customers): All lawn and landscape irrigation should be done in an efficient manner and the wasting of water from lawn and landscape irrigation shall be prohibited, and wasted irrigation water shall not flow in the street or gutter past the property from which this water originated, nor shall it pond in street or gutter.
  3. Restriction (Retail Customers): Water usage through an ornamental fountain shall not be allowed unless such water is recycled, except for the make-up water that is associated with water lost to evaporation.
  4. Restriction (Retail Customers): Washing of sidewalks and driveways is not allowed under Stage 2 of the Drought Contingency Plan.
  5. Restriction (Retail and Wholesale Customers): Customers shall be provided with a "Leak Notice," for leaks (or possible leaks) discovered on private property and customers should initiate leak repair activities 72 hours of receipt of this Notice.

6. Restriction (Wholesale Customers): Wholesale Customers shall reduce water consumption until such consumption is no more than eighty-five percent (85%) of the amount consumed in a previous drought period.

**E. Penalties:**

1. First and Second Violation within twelve-month period: Written Warning mailed to customer (retail or wholesale) by first class U.S. postage, with copy of warning maintained on file in the PSUD office for a twelve-month period.
2. Third Violation within twelve-month period: A Penalty shall be imposed in an amount equal to ten percent (10%) of the most current bill of the violating retail or wholesale customer.
3. Fourth Violation within twelve-month period: A Penalty shall be imposed in an amount equal to fifteen percent (15%) of the most current bill of the violating retail or wholesale customer.
4. Fifth Violation within twelve-month period: The District shall impose a Penalty in an amount equal to twenty percent (20%) of the most current bill of the violating retail or wholesale customer.
5. Subsequent Violations within twelve-month period: The Wholesale Customer and Retail Customer shall be charged a Penalty of thirty percent (30%) of the Customer's most current bill.

**These regulations and penalties will be enforced after October 1, 2005.**

**COSTS FOR WATER RATE TIERS # 4 AND # 5 INCREASED IN ORDER TO ENCOURAGE WATER CONSERVATION:** The Costs for the highest Tiers of the Water Rate Schedule have been increased, with Tiers # 1, # 2, # 3 remaining at the same low levels.

TIER # 4	25,001 - 35,000 gallons	=	\$3.50 per thousand gallons
TIER # 5	35,001 and greater gallons	=	\$4.00 per thousand gallons

**INCREASE IN TAP FEES AND IMPACT FEES:** Tap Fees are charged for the physical connection of a water service line to the PSUD water system, and vary according to the size of the water meter to be installed. Impact Fees are charged to new customers connecting to the Porter SUD water system, and are associated with the cost of construction of new facilities (wells, etc.) to replace the facilities and system capacity utilized by the new customer; these Fees are based on the meter size (i.e., capacity) requested by the new customer. **NOTE:** The Tap Fees and Impact Fees were increased due to the rising labor costs and cost of new facilities.

For additional information on STAGE 2 and the Increase in these Fees (effective September 1<sup>st</sup>) and Rates (effective October 1<sup>st</sup>), contact the Porter SUD office at # (281) 354-5922.

**PORTER SPECIAL UTILITY DISTRICT  
22162 Water Well Road  
Porter, Texas 77365**

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**NEW WATER CONSERVATION MEASURES TO BE ENACTED ON OCTOBER 1, 2005**



Porter Special Utility District  
22162 Water Well Road  
Porter, Texas 77365-5381

Ph: (281) 354-5922  
Fax: (281) 354-5050

October 27, 2005

Ms. Kathy Jones  
General Manager  
Lone Star G C D  
P.O. Box 2467  
Conroe, Texas 77305

certified mail

RE: Aggressive Water Conservation Efforts

Dear Ms. Jones:

It is not my intention to harass the Lone Star Groundwater Conservation District when I bring up the subject of Aggressive Water Conservation for Montgomery County; on the contrary, I am only emphasizing this proven method of increasing available water supplies within the County, and I am hoping that the Groundwater Conservation District would lend its Authority in the promotion of consistent County-wide Water Conservation Policies (this makes it much easier to implement aggressive water conservation measures by each Water Utility).

By this letter, I am reiterating the Porter SUD's requests for LSGCD assistance with these important issues: (1) Establishment of a County-wide "Water Conservation Task Force," (2) Promulgation and promotion of a County-wide Water Conservation Policy (developed by the Task Force), and (3) Written Confirmation by the Lone Star Groundwater Conservation District that Montgomery County Water Supply Agencies will not be penalized for water conservation efforts prior to the Period designated by the LSGCD for reductions in groundwater withdrawals.\*

\*The Porter SUD has already implemented aggressive water conservation measures (Stage 2 of Drought Contingency Plan), and as of January 1, 2006, PSUD will provide Low-Flow Toilet Rebates (up to \$100) and Low-Flow Showerheads (no charge).

The Porter SUD appreciates your consideration of these matters, and we hope that the Lone Star Groundwater Conservation District will take the necessary and appropriate actions.

Sincerely,

A handwritten signature in cursive script, appearing to read "Jerry Lovelady".

Jerry Lovelady  
General Manager

cc: Distribution







Porter Special Utility District  
22162 Water Well Road  
Porter, Texas 77365-5381

Ph: (281) 354-5922  
Fax: (281) 354-5050

November 1, 2005

Ms. Kathy Jones  
General Manager  
Lone Star G C D  
P.O. Box 2467  
Conroe, Texas 77305

A.H.A. Adams

RE: "TWDB finds funds to save municipal conservation unit"  
(article from *Texas H<sub>2</sub>O*)

Dear Ms. Jones:

I came across this interesting article in the *Texas H<sub>2</sub>O*, a magazine of the Texas Section of the American Water Works Association (AWWA), and I am enclosing a copy. The article deals with TWDB (Texas Water Development Board) funding of Water Conservation in Texas and also mentions funding of Groundwater Conservation Districts.

The fact that the TWDB has managed to transfer funds to the Water Conservation effort underscores the importance of conservation in the strategies for water management in Texas. The TWDB Board Chairman, Rod Pittman, made this statement: "You've got an unanimous commitment for conservation. We know it's important; we want it to continue."

It was also noted, by Texas AWWA Legislative Chair, Carole Baker, that all regional planning groups are required to consider municipal water conservation strategies first, before they can adopt any other strategy.

It is my request, based on the fact that Water Conservation is an extremely important issue for the State of Texas and for Montgomery County, that an Item ("Water Conservation in Montgomery County") be added to the Agenda for the next Focus Planning Committee. Please contact me if you have any comments or questions. Thank you.

Sincerely,

A handwritten signature in cursive script, appearing to read "Jerry Lovelady".

Jerry Lovelady  
General Manager

enclosure

cc: Distribution

That gave a start to the legislatively mandated ground-water effort and allowed the municipal water conservation program to continue another year.

"You've got a unanimous commitment for conservation," Board Chair Rod Pittman told supporters after the vote, "We know it's important; we want it to continue."

The vote, in an early morning board work session, followed a broad discussion on the importance of water conservation.

Board Member James Herring observed, "Never before have I received as many letters and so much consternation about this issue of water conservation."

Board Member Jack Hunt bristled a bit when he noted, "It appears that most of the energy [in favor of TWDB municipal water conservation] went into letter-writing, not finding matching money. I'm kind of frustrated with that."

Hunt said that the same energy that went to save the TWDB program should be directed to the Legislature to persuade lawmakers to pay for municipal water conservation.

"This shouldn't happen again," he said. If the Legislature fails to make an appropriation for the program next time, he said, TWDB won't shift funds to keep it going. "The \$169,000 won't be there," he said.

Ward observed that both water sellers and environmental interests agree on the need for conservation.

"Sooner or later the public is going to have to pay the real cost of water, and when they do, [water sellers] will regret that they didn't exert the public to save more," Ward said.

Labatt said that conservation becomes attractive for growing municipalities because they can serve more people with less water. The state government should exercise leadership in promoting conservation, he said.

TAWWA Legislative Chair Carole Baker, a widely respected conservation advocate, noted all the regional planning groups are required to consider municipal water conservation strategies first, before they can adopt any other strategy.

"It's inconceivable to me that we lose this [municipal conservation] program with what's happened over the past few years," she told the TWDB board. She noted that the TWDB guided development of the regional plans and became the first place small and medium-sized water supplier go for information about conservation. "You are the only 'go-to place' for water conservation," she said.

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**Kathy Jones**

---

**From:** Kathy Jones [kjones@lonestargcd.org]  
**Sent:** Wednesday, November 09, 2005 5:10 PM  
**To:** 'Jerry Lovelady'  
**Cc:** 'Orval R. Love'; 'Jim Adams'  
**Subject:** November 1, 2005 correspondence

Jerry,

Thank you for your letter and article on possible TWDB funding available for municipal conservation available. This information will be shared with the Board.

In response to your request for an agenda item ("Water Conservation in Montgomery County") to be included for the next Focus Planning Committee – at this time a date has not been scheduled for the committee. When the committee does meet again, your request will be considered at that time.

Thank you,

Kathy

*Kathy Jones, General Manager*

LONE STAR GROUNDWATER  
CONSERVATION DISTRICT  
PO Box 2467  
Conroe, Texas 77305  
936/494-3436 ~ fax: 936/494-3438  
[kjones@lonestargcd.org](mailto:kjones@lonestargcd.org)  
[www.lonestargcd.org](http://www.lonestargcd.org)

11/9/2005



FROM : PATRICK F TIMMONS JR ATTORNEY PHONE NO. : 7134659527

Jan. 30 2006 05:17PM P2

**PATRICK F. TIMMONS, JR.**

ATTORNEY AT LAW

8556 KATY FREEWAY, SUITE 120  
HOUSTON, TX 77024MEMBER  
COLLEGE OF THE STATE BAR OF TEXASTELEPHONE: (713) 465-7638  
TELECOPY: (713) 465-9527  
EMAIL: p.timmons@earthlink.net

January 30, 2006

**Via facsimile (936) 494-3438**  
**and Regular U.S. Mail**Members of the Board of Directors  
Lone Star Groundwater Conservation District  
207 W. Phillips, Suite 300  
Conroe, Texas 77301**Members of the Board:**

As you know, I represent the HMW Special Utility District of Harris and Montgomery Counties ("HMW"). I am writing to express the views of HMW's board of directors on Lone Star's evolving management zone approach to groundwater regulation, HMW's pending applications for historic use permits, and another matter that pertains to Lone Star's governance.

On the first issue, it is well known that Lone Star is giving strong consideration to four geographic management zones in which the zone of both heaviest regulation and most stringent requirement for surface water conversion will include Conroe, the Woodlands, the nearby I-45 corridor and the remainder of southwest Montgomery County. HMW's service areas in Montgomery County are in this portion of the county, well away from I-45, in both smaller cities and dispersed suburban neighborhoods.

As a regulatory approach, the four zone plan achieves two purposes, i.e. the concentration of surface water conversion in the area of heaviest future water demand, and proximity of the high demand area to the San Jacinto River as a surface water source.

Nevertheless, Lone Star's approach does not yet address the differing issues that affect water suppliers and users in the other areas of the proposed southwest zone, including HMW. In particular, it sets forth neither the means whereby the southwest zone's conversion percentage will be achieved, nor the surface water source, infrastructure and financing through which suppliers and users subject to conversion are to achieve that objective. That is the case despite the clear reality that it is not possible to achieve surface water conversion in most of the southwest zone by any of the conversion dates under discussion by Lone Star.

FROM : PATRICK F TIMMONS JR ATTORNEY PHONE NO. : 7134659527

Jan. 30 2006 05:17PM P3

In addition, HMW has the following unique characteristics that further affect its ability to comply with Lone Star's evolving regulatory concept:

1. As a water district without taxing authority, it must pass along all of its operating and regulatory costs to its retail water customers.
2. Unlike most water districts, it serves a diverse customer base that is widely-scattered geographically, consisting largely of long-established residential neighborhoods.
3. On a per household basis, its water usage is relatively stable over time.
4. Its customers and water systems are remotely located from all of the potentially available surface water sources, and in most cases fifteen to twenty miles from both the Conroe/I-45 corridor and the San Jacinto River.
5. As a practical matter, its customers will be dependent on water well production for both existing water demand and future growth for several decades into the future.
6. In general, its systems are twenty five to thirty years old.
7. Based on these and other realities, it is making a substantial investment in upgrades and repairs to its well-related infrastructure at numerous of its Montgomery County water well systems. The financing therefor was approved by the Texas Water Development Board, which further determined that the proposed improvements were consistent with the Region H segment of the ongoing Texas water planning process.

For HMW, both its current position and future planning are further complicated by Lone Star's failure, to date, to finalize HMW's historic use permits. Under Lone Star's regulatory scheme, those permits will become the planning baseline for HMW's ability to serve its existing customers in Montgomery County, and to respond to applications for new water service in areas of continued growth.

Lone Star must provide prompt approval for HMW's historic use permits. Further, such approvals must be realistically based on the proven usual and drought period usage by HMW's long-established water customers. Such approvals must also recognize that HMW's multiple individual systems, each of which will ultimately receive a permit, will have little ability to effectively "trade" for additional water usage capacity under any scheme through which Lone Star permits such trades to occur.

FROM : PATRICK F TIMMONS JR ATTORNEY PHONE NO. : 7134659527

Jan. 30 2006 05:18PM P4

In addition to approval of the historic use permits, HMW asserts that Lone Star's regulatory scheme cannot be effectively implemented unless and until the following events occur:

1. Lone Star's formal acknowledgment that most water producers in the southwest zone are unable to convert to surface water as their means of water production.
2. The designation of the water producers and users who can and must convert to surface water, in order to attain the required conversion percentage by the date Lone Star selects.
3. The creation of a financing scheme to fund the infrastructure required to achieve the required surface water conversion.
4. The creation of an equitable plan for sharing the cost of surface water conversion, where required, that also accounts for the necessity for many water suppliers to maintain and invest in water well systems in large areas of Montgomery County. HMW believes that such cost-sharing must occur on a county-wide basis because the overall plan of regulation proposed by Lone Star is intended to benefit, and will benefit, all of Montgomery County. County-wide cost sharing should also facilitate the funding of future infrastructure needs as areas other than the Conroe/Woodlands corridor are eventually required to convert to surface water sources.

As you know, HMW already participates in such an overall plan of regulation, applicable to its Harris County systems, through its participation in the Groundwater Reduction Plan of the North Harris County Regional Water Authority. It is prepared to support an equitable plan for Montgomery County that achieves similar results, which Lone Star is authorized to implement under its statutory rulemaking authority. Nevertheless, such a plan must contain the features noted above.

One additional issue requires your attention. Whether by the wording of Section 7(a) (8) of Lone Star's enabling legislation or the board's interpretation of its meaning, HMW and other water districts that are not municipal utility districts have been excluded from participation in the selection of the Lone Star board member for the area that represents their interests. As such, a significant number of Montgomery County water suppliers and users are excluded from representation on Lone Star's board of directors. In the case of HMW, this means that fifty subdivisions, 2,560 water customers and approximately 7,800 county residents are thereby deprived of representation. These figures equal or exceed the comparable numbers for most municipal utility districts in the county.

Nevertheless, all of HMW's Montgomery County subdivisions and customers (a) are subject to Lone Star's groundwater regulatory scheme, (b) are and will be subject to Lone Star's water well permit requirements, and (c) pay Lone Star's mandatory well production assessments. To summarize, the water users of HMW and similarly situated districts represent a substantial Lone Star constituency

FROM : PATRICK F TIMMONS JR ATTORNEY PHONE NO. : 7134659527

Jan. 30 2006 05:18PM P5

with much at stake in its ongoing activity, but have no opportunity for representation on its board of directors, either directly or through the other constituencies named by the enabling statute.

Regardless of how this circumstance developed, its lawfulness is questionable. Clearly, it is an example of imposing regulation and its attendant costs on a group of affected citizens who have no representation in the arm of government making the rules. Whether by internal practice or an amendment of the enabling statute, Lone Star's board should act promptly to correct this clear inequity.

HMW is looking forward to discussing these matters and other aspects of evolving groundwater regulation in Montgomery County at the presentation by Lone Star representatives on February 21, 2006. We invite as many members as possible from Lone Star's board to attend this meeting, to which HMW's area water users have also been invited.

Finally, a copy of this letter has been provided to the Texas Water Development Board in connection with the joint grant application by Lone Star and the San Jacinto River Authority, together with HMW's letter of support for that application.

Sincerely,



Patrick F. Timmons, Jr.

PFT/sjw

cc: HMW Special Utility District  
San Jacinto River Authority  
Texas Water Development Board,  
Water Resources Planning Division



FROM : PATRICK F TIMMONS JR ATTORNEY PHONE NO. : 7134659527

Jan. 30 2006 05:19PM P6

**PATRICK F. TIMMONS, JR.**

ATTORNEY AT LAW

8556 KATY FREEWAY, SUITE 120  
HOUSTON, TX 77024MEMBER  
COLLEGE OF THE STATE BAR OF TEXASTELEPHONE: (713) 465-7638  
TELECOPY: (713) 465-9327  
EMAIL: p.timmons@earthlink.net

January 30, 2006

**Via facsimile (512) 475-2053**  
**and Regular U.S. Mail**Ms. Carolyn Brittin  
Director  
Water Resources Planning  
Texas Water Development Board  
1700 N. Congress Avenue  
Austin, Texas 78701

Dear Ms. Brittin:

This office represents the HMW Special Utility District of Harris and Montgomery Counties ("HMW").

On behalf of HMW, I am writing to express the support of its board of directors for the application for facility planning grant assistance of the Lone Star Groundwater Conservation District of Montgomery County ("Lone Star").

While HMW supports the Lone Star request for planning assistance, it has also provided the enclosed letter to Lone Star's board of directors, and to your office, which provides comments on several issues relevant to Lone Star's planning process and developing regulatory approach. HMW believes that the issues set forth in the enclosure must be addressed in the long-range water planning for Montgomery County for which Lone Star has requested state assistance. As appropriate, HMW requests that the points in its letter be considered in conjunction with Lone Star's grant application and/or any review of the Lone Star planning effort.

FROM : PATRICK F TIMMONS JR ATTORNEY PHONE NO. : 7134659527

Jan. 30 2006 05:19PM P7

Please contact this office with any questions or if you require additional information.

Sincerely,

A handwritten signature in black ink, appearing to read "Patrick F. Timmons, Jr.", with a long horizontal flourish extending to the right.

Patrick F. Timmons, Jr.

PFT/sjw  
Enclosure

cc: Lone Star Groundwater  
Conservation District

HMW Special Utility District



# TEXAS WATER DEVELOPMENT BOARD



E. G. Rod Pittman, *Chairman*  
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J. Kevin Ward  
*Executive Administrator*

Jack Hunt, *Vice Chairman*  
Thomas Weir Labatt III, *Member*  
James E. Herring, *Member*

May 1, 2006

Ms. Kathy Jones  
General Manager  
Lone Star Groundwater Conservation District  
P.O. Box 2467  
Conroe, Texas 77305

**RE: Regional Facility Planning Contract between the Texas Water Development Board (BOARD) and Lone Star Groundwater Conservation District and the San Jacinto River Authority (PARTIES), Comments on Draft Report for TWDB Contract No. 2004-483-521**

Dear Ms. Jones:

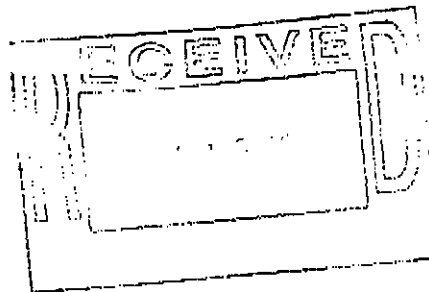
Staff members of the Board have completed a review of the draft report under TWDB Contract No. 2004-483-521. The review comments are enclosed. As stated in the above-referenced contract, the Contractor will consider incorporating review comments from the EXECUTIVE ADMINISTRATOR (shown in Attachment 1), as well those of other reviewers into the Final Report. The Contractor 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), and nine (9) bound double-sided copies.

If you have any questions concerning this contract, please contact Mr. Bill Roberts, the Board's designated contract manager for this study, at (512) 936-0853.

Sincerely,

William F. Mullican, III  
Deputy Executive Administrator  
Office of Planning



Enclosure

c: Bill Roberts, TWDB

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## **ATTACHMENT 1**

### **Draft Report Entitled "Regulatory Study and Facilities Implementation Plan for Lone Star Groundwater Conservation District and San Jacinto River Authority"**

1. Page 1, 4<sup>th</sup> Paragraph, 6<sup>th</sup> Line: Change "2005 state water plan" to "2007 State Water Plan".
2. Page 3, 1<sup>st</sup> Paragraph, 3<sup>rd</sup> Line: Change "2005 state water plan" to "2007 State Water Plan".
3. Page 4, Table 1: Include Porter WSC in the list of WUGs.
4. Page 61, Table 10: Shortage in 2040 is shown as 90,363 AFY. Region H 2006 water plan, page 4-3, lists the shortage as 79,866 AFY. Please resolve this apparent contradiction or explain why the numbers differ.
5. The final report should contain documentation of public participation throughout the study, including all comments from TWDB and those received at all public meetings, along with responses to the comments.

# LONE STAR GROUNDWATER CONSERVATION DISTRICT

TWDB Contract No. 2004-483-521

## Final Public Meeting Presentation of Regulatory Plan and Conjunctive Use Study

Wednesday, June 14, 2006

### 1. Presentation of Regulatory Plan and Conjunctive Use Study – Kathy Jones, GM, Lone Star GCD; Alan Potok, TCB

The Lone Star Groundwater Conservation District in conjunction with the San Jacinto River Authority entered into a contract with the Texas Water Development Board to conduct a study on potential groundwater regulation and the introduction of a wholesale surface water supply system to meet future water needs in Montgomery County. The scope of this study includes projections of the growth in water demand within Montgomery County through the planning period 2040 and what impact this will have on the Gulf Coast aquifer system. The study addresses alternative strategies to conserve groundwater withdrawal, examines surface water supply options to augment the use of groundwater, provides estimates of cost for implementing a wholesale surface water supply system, and discusses options on regulation and management to implement these conservation programs.

### 2. Public Comment. *(Public comment is limited to a maximum of 3 minutes per speaker.)*

#### 1<sup>st</sup> Comment / Question

Kent Margrret, (Woodlands MUD representative)

Question: How is Harris County implementing their plan of converting 30% by 2013?

Alan Potok (Turner, Collie, & Braden) answers, Harris County considered all factors including how the plan would affect the Public Water Systems. They decided on the most cost effective plan. Major surface water infrastructure is being constructed.

Jim Adams (Lone Star GCD) comments that Southern parts of Harris County have already converted to 90% surface water.

#### 2<sup>nd</sup> Comment / Question

Jackie Chance (Montgomery County WCID #1)

Comments: Lake Conroe is an economic engine for Montgomery County. Mr. Chance expressed concern after witnessing the effects of the low lake levels in Lake Conroe recently and how it has affected the economy around the lake. How do we get a marriage that we don't affect the economics benefits of the county of providing surface water without hindering growth with the consumption? Does see how it will be economically feasible to produce all the water from the lake.

Jim Adams (Lone Star GCD) explains that Lake Conroe is capable of yielding 90 million gallons per day for the duration of the drought of record. That is why the lake was constructed. The concern here is water supply and that is the purpose for the lake. Adams agrees that the lake is an economic engine for the area and we do want to protect it as well. Our project is to supply water supply as necessary to supplement the groundwater so that we don't mine the aquifers and cause other economic disadvantages for the county. He explains that Lake Houston will supply a portion of the needed water to the southeast portion of Montgomery County as well.

Alan Potok (Turner Collie, & Braden) also adds, the quantity of water we needed from Lake Conroe for projected supplies, would be significantly less than the amounts released from the lake following Hurricane Rita. The lake has a sustainable yield during the drought of record, just like the aquifer has a sustainable yield.

### **3<sup>rd</sup> Comment / Question**

Ron Sanders – Montgomery

Question: What are the plan for reuse and water conservation at this time?

Kathy Jones (General Manager LSGCD) answers, at May 9<sup>th</sup> board of directors meeting; the District authorized a Water Reuse and Conservation Study. The study will focus on quantifying the extent to which reclaimed water is currently being used for irrigation/industrial use; opportunities to use gray water productively to reduce groundwater demands; incentives; and options for how the District can participate in potential projects.

Alan Potok (Turner Collie, & Braden). The water demand projections that were used in the study anticipate water demand reduction of 15% due to water conservation which is also included in the Regional Water Plan for Region H.

### **4<sup>th</sup> Comment / Question**

Jim Bustin – MUD #9, Walden

Question: If everyone pays higher rate, who will supplement costs for repairs on aging wells?

Jim Adams (Lone Star GCD) answers; procedures and still being developed and designed. As with all public supply facilities, maintenance and repairs is a cost of operation whether presently or in the future.

Jim Bustin added, if he does have to pay a higher rate he would like some help.

### **5<sup>th</sup> Comment / Question**

Abel Bautista (Aqua Texas)

Comment: withdraw request

### **6<sup>th</sup> Comment / Question**

Bob Smith (River Plantation MUD)

Question: Are there plans to pull water from other reservoirs, for instance Lake Creek?  
Possibilities for additional reservoirs?

Jim Adams (Lone Star GCD) answers; when plans were looked at for Lake Creek in 1989, the cost to build it would be \$189 million and would have yielded less than 1/3 of what Lake Conroe yields. When looking at Spring Creek, it would only yield 1 million gallons per day compared to Lake Conroe's 90 million. Since these are not feasible sources we will continue to work on reuse plans and water conservation. There has been no public response and or commitment from water supplies entities for the advanced purchase of water. As a result, plans for additional reservoirs were put on the shelf. As the area has developed, it is not possible to feasible and the cost to construct in today's dollars would be over \$300 million. Still a viable possibility but very cost prohibitive.

**Written Comments submitted by Jerry Lovelady (Porter Special Utility District)**  
(see letter attached to these minutes)

### 3. **Adjourn**

Without further comments from the public and there being no further business, the public meeting was adjourned at 4:15 p.m.







Porter Special Utility District  
22162 Water Well Road  
Porter, Texas 77365-5381

Ph: (281) 354-5922  
Fax: (281) 354-5050

June 14, 2006

TO: LONE STAR GROUNDWATER CONSERVATION DISTRICT (LSGCD)

FROM: Jerry Lovelady, General Manager  
Porter Special Utility District

SUBJECT: Written Comments: "Regulatory Study and Facilities Implementation Plan  
For Lone Star Groundwater Conservation District and San Jacinto  
River Authority"

I am respectfully presenting comments on this Study, in conjunction with the meeting on "Presentation of Regulatory Plan and Conjunctive Use Study," held on June 14, 2006.

1. WATER CONSERVATION. Unfortunately, although it should be a major theme of any comprehensive Water Management Strategy, there is only a brief mention of Water Conservation throughout the Study, *and it is made in conjunction with the need to meet the water demands of the water users in the Southeastern Zone while they are awaiting surface water conversion (which will not be available until 2040)*. However, Water Conservation is a viable option for reducing water demand and it should be a mandatory program for ALL Water Purveyors in Montgomery County – especially those in the high-demand areas of Conroe and the Woodlands.

As I have mentioned in the past, it would be beneficial: (1) If the Lone Star Groundwater Conservation District actively supported and promoted a comprehensive, aggressive, and consistent Water Conservation Program throughout Montgomery County; (2) If the Lone Star Groundwater Conservation promulgated consistent water conservation program requirements and regulations on ALL Montgomery County water purveyors; and (3) If the Lone Star Groundwater Conservation District established a "Water Conservation Task Force" (primarily consisting of Representatives from Public Water Systems in Montgomery County) to formulate a common water conservation policy for all Montgomery County water utilities.

2. MUNICIPAL WATER DEMAND. As indicated on page 5 of the Study, it is the Municipal Water Utilities [Cities, Water Districts (MUDs, SUDs, WSCs, etc.), and Private Water Companies] that exert the greatest demand on the Montgomery County aquifers [e.g., 68,638 AF/year in 2010 (89.4% of Total Water Demand)], and subsequently, it is these entities that have the greatest opportunity for enacting aggressive and successful Water Conservation Practices. This is especially true for those entities that have a higher than average "gallons-per-capita-per-day" (gpcd) water demand, such as The Woodlands.
3. "ALTERNATE SOURCE OF WATER IS NOT READILY AVAILABLE..." Southeastern Montgomery County does not have an alternate source of surface water



that is readily available for its use [i.e., as associated with LSGCD Rule 4.4 subsection (f)]. And in discussions with the City of Houston, the Porter Special Utility District was told that Houston Surface Water would not be available to the Kingwood and Porter area (and adjacent areas) until 2025 or beyond, as substantial water conveyance facilities would have to be constructed, at a huge cost, in order to transport Surface Water to these aforementioned areas.

Furthermore, there is no existing Southeastern Montgomery County Agency or Authority that has the ability to construct a local infrastructure, perform administrative functions, and act as the Regional Water Provider for those Water Utilities (Porter SUD, New Caney MUD, City of Splendora, etc.) located in this portion of the County, and the SJRA, the San Jacinto River Authority (in the Conroe area), has not expressed an interest in being that Provider.

4. **TRADING OF HISTORIC USE PERMITS.** The Trading of Historic Use Permits (HUPs) within a single zone is listed as an advantage of the "Single Management Zone" described on page 31 of the Study. Nevertheless, this advantage is not carried forward to the other Management Zone Alternatives (2 zones, 3 zones, and 4 zones), due to a LSGCD Rule that prohibits transfer of HUPs across zone boundaries.

If, however, the SJRA is wholly focused on delivering surface water to Conroe and The Woodlands (and adjacent areas), and is unwilling to convey surface water to the other portions of the County (e.g., Southeastern Montgomery County), then it is logical and equitable that these Historic Use Permit transfers be allowed across Management Zones to areas that cannot readily obtain surface water supplies; i.e., the Rules of the Lone Star Groundwater Conservation District are not sacrosanct and can be amended by Board action.

5. **DISTRIBUTION OF SURFACE WATER COSTS.** It is not clear in your Section on "Financial Analysis" (page 77) how the distribution of Surface Water costs will be implemented for those Water Utilities in the Southeastern portion of Montgomery County; i.e., if these Utilities must seek a Surface Water Provider outside of Montgomery County (the City of Houston) and pay a substantial facilities cost and surface water cost to obtain these alternate supplies, must these Water Utilities also be burdened with the costs incurred by the San Jacinto River Authority to supply surface water to Conroe and The Woodlands? This would not be an equitable situation, and hopefully it is not being contemplated by the Lone Star Groundwater Conservation District and the San Jacinto River Authority.

Respectfully submitted,



Jerry Lovelady, General Manager  
Porter Special Utility District