GROUNDWATER MANAGEMENT PLAN

Re-Adopted November 12, 2013

LONE STAR GROUNDWATER CONSERVATION DISTRICT MANAGEMENT PLAN

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District Mission

The Lone Star Groundwater Conservation District (the "District") is committed to managing and protecting the groundwater resources of Montgomery County and to working with others to ensure a sustainable, adequate, high quality, and cost effective supply of water. The District will strive to develop, promote, and implement water conservation, augmentation, and management strategies to protect water resources for the benefit of the citizens, economy, and environment of Montgomery County. The preservation of this most valuable resource can be managed in a prudent and cost-effective manner through conservation, education, management, and permitting. Any action taken by the District shall only be after full consideration and respect has been afforded to the individual property rights of all citizens of Montgomery County.

Purpose of the Lone Star Groundwater Conservation District Management Plan

With the passage of House Bill 162 by the 51st Texas Legislature in 1949[1], the landmark legislation commonly referred to as the Underground Water Conservation Act that established the original process for creating and establishing groundwater conservation districts in Texas, the requirement for preparation of management plans that included management goals was first established. House Bill 162, Section 3(c)(B)(8) states that groundwater conservation districts must "develop comprehensive plans, for the most efficient use of underground waters, and for the control and prevention of waste of such waters; which plans shall specify in such detail as may be possible, the Acts, procedure, performance and avoidances which are or may be necessary for the effectuation of such plans, including specification of engineering operations, and methods of irrigation and to publish such plans and information and bring them to the notice and attention of the owners of land within the district."[2] Thus, even before creation of the first groundwater conservation district, the need for management plans was established.

Almost 50 years later, the 75th Texas Legislature in 1997 enacted Senate Bill 1[3] to establish a new comprehensive statewide water planning process. In particular, Senate Bill 1 contained provisions that enhanced the requirement that groundwater conservation districts prepare management plans in order to develop and adopt management goals, objectives, and performance standards for prescribed efforts such as, but not limited to, providing the most efficient use of groundwater, controlling and preventing the waste of groundwater, and controlling and preventing subsidence.

Subsequently, the Texas Legislature enacted Senate Bill 2 in 2001[4], House Bill 1763 in 2005[5], and Senate Bill 660 in 2011[6], each of which amended the statutory requirements for management plans to be developed and adopted by groundwater conservation districts.

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[1] Act of May 23, 1949, 51st Leg., R.S., ch. 306, 1949 Tex. Gen. Laws 559.
[2] *Id.*
[3] Act of June 2, 1997, 75th Leg., R.S., ch. 1010, 1997 Tex. Gen. Laws 3610.
[4] Act of May 27, 2001, 77th Leg., R.S., ch. 966, 2001 Tex. Gen. Laws 1991.
[5] Act of May 24, 2005, 79th Leg., R.S., ch. 970, 2005 Tex. Gen. Laws 3247.
[6] Act of May 29, 2011, 82nd Leg., R.S., ch. 1233, 2011 Tex. Gen. Laws 3287.

Texas groundwater law is clear in establishing the sequence that a groundwater conservation district is to follow in accomplishing statutory responsibilities related to the conservation and management of groundwater resources. The three primary steps, each of which must occur at least once every five years, are the following: (1) to adopt desired future conditions (Texas Water Code Section 36.108(c)), (2) to develop and adopt a management plan that includes goals designed to achieve the desired future conditions (Texas Water Code Section 36.1071(a)(8)), and (3) to amend and adopt rules necessary to achieve goals included in the management plan (Texas Water Code Section 36.101(a)(5)).

The District's management plan satisfies the statutory requirements of Texas Water Code Section 36.1071 and the administrative requirements of the Texas Water Development Board's ("TWDB's") rules set forth in 31 Texas Administrative Code Chapter 356.

Lone Star Groundwater Conservation District Information

The following information is presented here to provide helpful background information regarding the creation of the District, the location and extent of the District, the background and makeup of the District's Board of Directors, and the authority and regulatory framework of the District.

Creation

In 2001, the creation of the District was authorized by the 77th Texas Legislature through House Bill 2362.[7] The creation of the District was confirmed by the voters of Montgomery County on November 6, 2001, with 73.85 percent of the voters casting favorable ballots. As required by 31 Texas Administrative Code Section 356.3, the District's original management plan was adopted and submitted to the TWDB within two years of the confirmation election and then amended and re-adopted on October 14, 2008. As such, this update to the District's management plan represents the third management plan since creation of the District in 2001.

Location and Extent

The District is located in Montgomery County in southeastern Texas. The boundaries of the District are coterminous with the boundaries of Montgomery County, Texas. The District is bordered by Walker County on the north, San Jacinto and Liberty Counties on the east, Harris County on the south, and Waller and Grimes Counties on the west (Figures 1 and 2). Peach Creek forms the boundary with San Jacinto County, and Spring Creek forms most of the boundary with Harris County. The District comprises an area of approximately 1,090 square miles.

[7] Chapter 1321, Acts of the 77th Legislature, Regular Session, 2001.

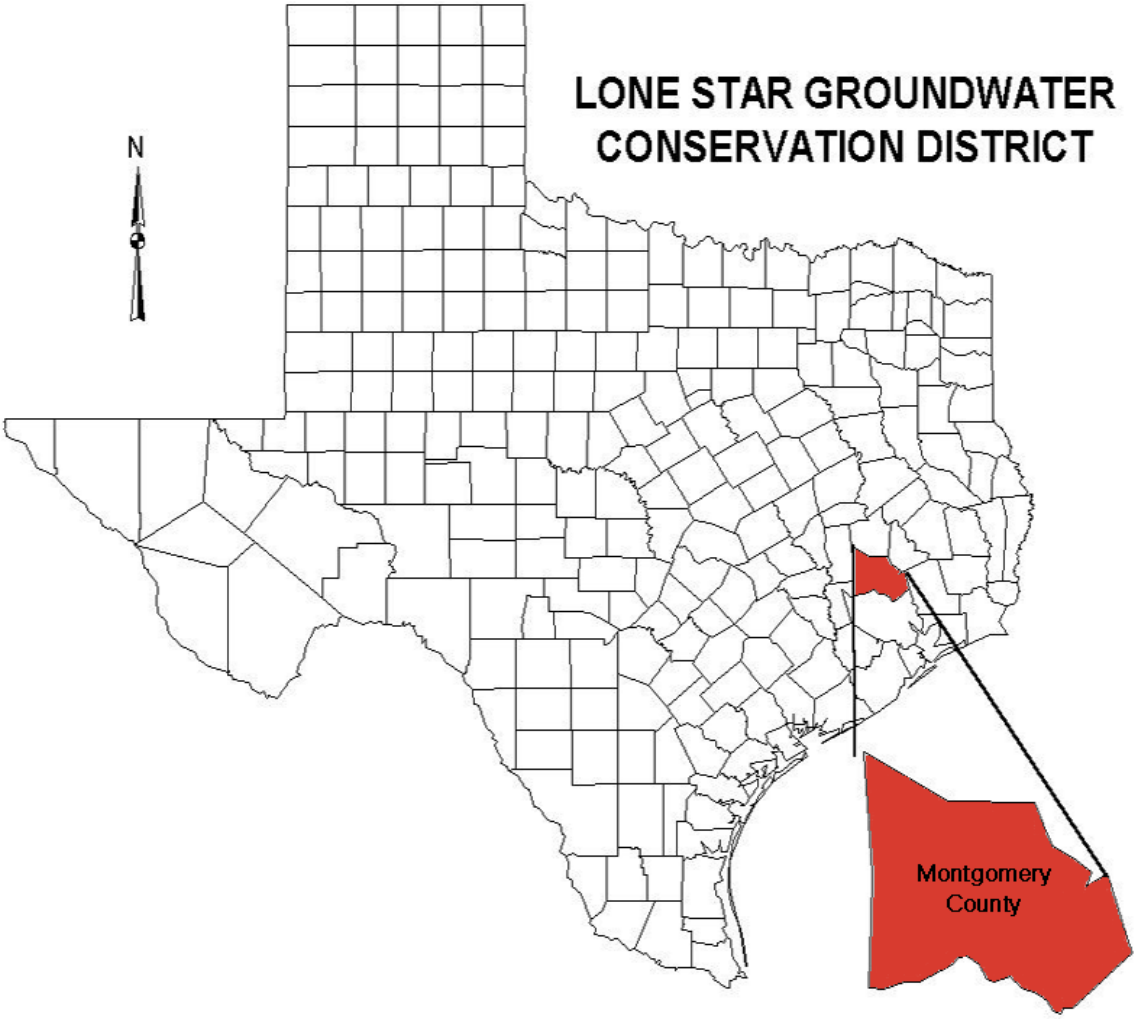

Figure 1 – Lone Star Groundwater Conservation District location map (state).

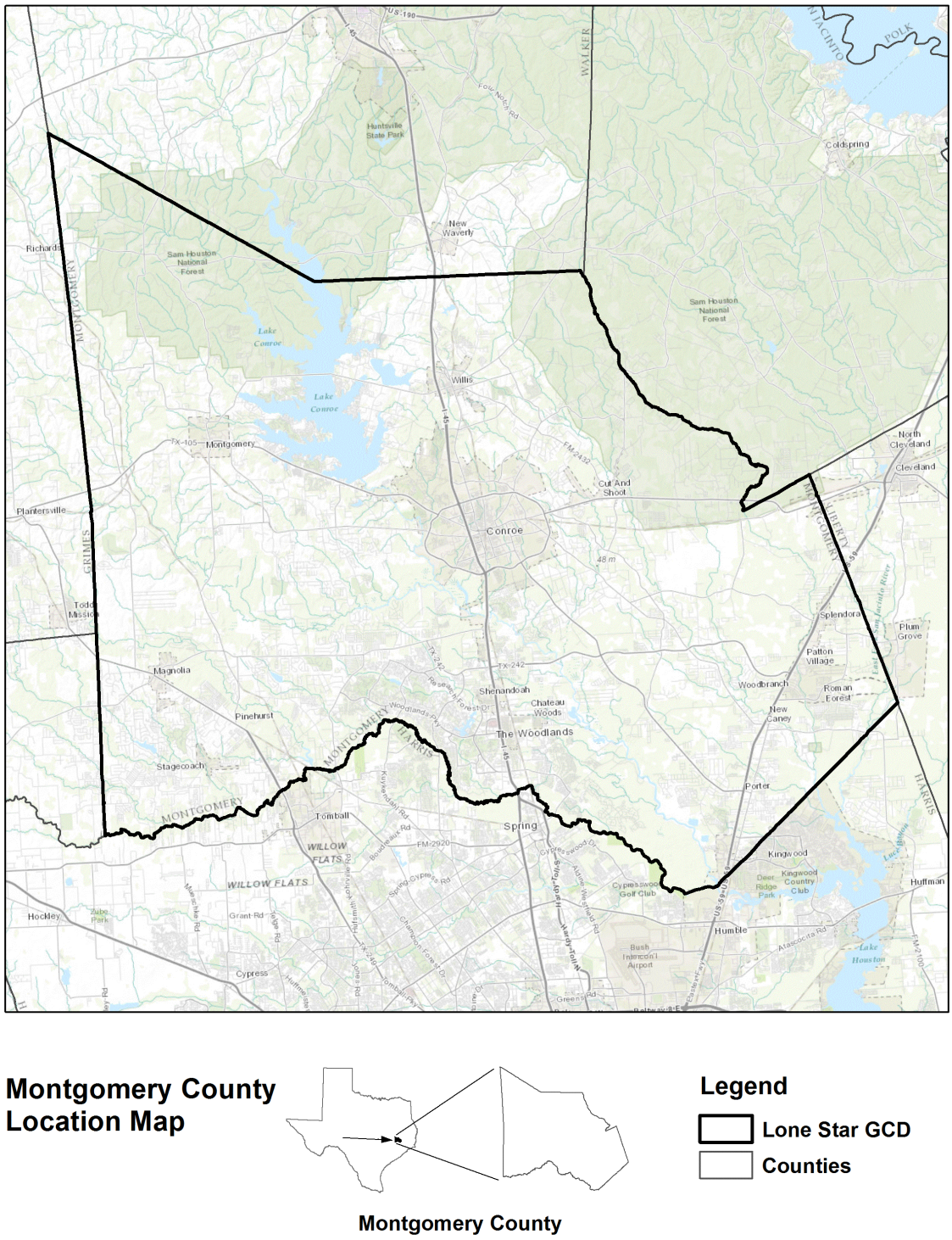

Figure 2 – Detailed location map of Lone Star Groundwater Conservation District.

Background

The Board of Directors for the District consists of nine members. The Board of Directors is made up of the following members:

- two members appointed by the Commissioners Court of Montgomery County;
- one member appointed by the Board of Directors of the Montgomery County Soil and Water Conservation District;
- one member appointed by the Board of Directors of the San Jacinto River Authority;
- one member appointed by the Mayor of the City of Conroe;
- one member appointed by the mayors of all of the incorporated municipalities, other than the City of Conroe, located in whole or in part in Montgomery County;
- one member appointed by the Board of Trustees of the Woodlands Joint Powers Agency;
- one member appointed by the boards of directors of all of the municipal utility districts located in whole or in part in Montgomery County that are not members of the Woodlands Joint Powers Agency and the district boundaries of which are located primarily to the east of Interstate Highway 45; and
- one member appointed by the boards of directors of all of the municipal utility districts located in whole or in part in Montgomery County that are not members of the Woodlands Joint Powers Agency and the district boundaries of which are located primarily to the west of Interstate Highway 45.

Authority / Regulatory Framework

During preparation of this management plan, the District has followed all procedures and satisfied all requirements required by Texas Water Code Chapter 36 and 31 Texas Administrative Code Chapter 356. The District exercises the powers expressly granted by Chapter 1321, Acts of the 77th Legislature, Regular Session, 2001, Chapter 994, Acts of the 78th Legislature, Regular Session, 2003, and Texas Water Code Chapter 36.

Planning Period

This management plan will remain in effect from the date of approval by the Executive Administrator at the TWDB until the plan is readopted. In accordance with the provisions of Texas Water Code Chapter 36, the District's management plan shall be reviewed annually and readopted with or without revisions at least once every five years.

Management of Groundwater Resources in the Lone Star Groundwater Conservation District

The Texas Legislature has established that groundwater conservation districts ("districts"), such as the Lone Star Groundwater Conservation District, are the state's preferred method of groundwater management. The Texas Legislature codified its policy decision in Section 36.0015 of the Texas Water Code in 1997, which establishes that districts will manage groundwater resources through rules developed and implemented in accordance with Chapter 36 of the Texas Water Code ("Chapter 36"). Chapter 36 gives directives to districts and the statutory authority to carry out

such directives, so that districts are given the proper tools to protect and manage the groundwater resources within their boundaries.

In addition to the statutory authority provided to districts in Chapter 36, the District has the powers expressly granted to the District by Chapter 1321, Acts of the 77th Legislature, Regular Session, 2001, and Chapter 994, Acts of the 78th Legislature, Regular Session, 2003 (collectively "the District Act"). In accordance with Chapter 36 and the District Act, the District implemented a claims process in which the District required existing or historic users of groundwater to obtain a historic use permit, wherein an existing or historic user was required to prove the maximum annual amount of groundwater that the user put towards a beneficial use during the period from January 1, 1992, to the date of first adoption of the District Rules, August 26, 2002. Pursuant to Sections 36.116(b) and 36.113(e) of the Texas Water Code, the District Act, the District Rules, the claims process and the existing and historic use period, preserve existing and historic use to the maximum extent practicable consistent with the District's management plan.

Another significant management tool that the District is authorized to utilize by the District Act and Chapter 36 is the use of management zones. The District may establish management zones within the boundaries of the District in order to better manage and regulate the groundwater resources of Montgomery County. The District may use the management zones to adopt different rules under Section 36.116 of the Texas Water Code for each aquifer, subdivision of an aquifer, or geologic stratum located in whole or in part within the boundaries of the District, or different geographic areas of an aquifer or subdivision of an aquifer located in whole or in part within the boundaries of the District. Management zones serve as areas for which the District may determine total water availability, authorize total production, implement proportional reduction of production among classes of users, and within which the District shall allow the transfer of the right to produce groundwater, as set forth in the District Rules.

Pursuant to the District Rules and this management plan, the District shall seek to limit production of groundwater from the resources within its boundaries to a sustainable level, so that the groundwater resources of Montgomery County are not depleted for future generations. For purposes of this plan, the word "sustainable" means limiting total groundwater production in the District or in a management zone designated by the District to an amount that does not exceed the amount of effective deep aquifer recharge available in the District or the management zone, as applicable, when averaged over a term of years to be determined by the District. To the extent that groundwater use in a particular management zone exceeds groundwater availability in that zone, the District shall implement proportional adjustment regulations to reduce overall production in that zone to a level that does not exceed availability when averaged over time. The regulatory scheme for proportional adjustment is set forth in the District Rules and the District Regulatory Plan. The District Rules also expressly recognize that, in establishing or implementing any proportional adjustment regulations that contemplate the reduction of authorized production or a prohibition on authorization for new or increased production, the District shall consider the time necessary for water users to secure alternate sources of water, including surface water, by economically feasible means. This consideration may necessitate that the District authorize total production to exceed availability, either within a particular management zone or in the District as a whole, for a period of time to be determined by the District until economically feasible alternative water sources may reasonably be expected to be available to such groundwater users,

and nothing in this plan shall be construed to limit the ability of the District to utilize that regulatory flexibility.

An important part of the District Rules is the registration and permitting process instituted by the District. The District Rules created a process by which groundwater users are required to register their groundwater wells with the District. If the groundwater users and their wells met certain criteria, then the user is required to obtain either a Historic Use Permit ("HUP") or an Operating Permit ("OP"). Non-exempt groundwater users who used water for a beneficial purpose during the Existing and Historic Use Period established in the District Rules (January 1, 1992, through August 26, 2002) were eligible to file an application for an HUP. All non-exempt groundwater users who commenced beneficially using groundwater after the Existing and Historic Use Period were and continue to be required to obtain an OP. Some wells, such as some small wells used for domestic and livestock purposes, are exempt from the permitting process altogether.

In 2004, the District commenced joint planning activities with the San Jacinto River Authority ("SJRA") under a grant provided by the TWDB through its State Regional Facilities Planning Grant Program. After completion of the joint planning activities, the District and the SJRA generated the *Regulatory Study and Facilities Implementation Plan for Lone Star Groundwater Conservation District and San Jacinto River Authority* (June 2006) ("TWDB Study"). The TWDB Study, which is incorporated herein by reference, provides substantial regulatory, hydrogeological and technical information, including regulatory options available to the District.

After extensive analysis of the technical and scientific data available for Montgomery County, the District decided to manage the groundwater resources within its jurisdiction on a sustainable basis. The District believes it is important to protect and preserve the groundwater resources of Montgomery County for future generations by preventing the long-term depletion of the aquifers located within Montgomery County and working towards the continued sustainability and viability of such aquifers. Based on this decision, the District Management Plan designated the total amount of groundwater to be available for production and use in the District as the amount of effective annual recharge to the Gulf Coast Aquifer located within Montgomery County. In other words, the District decided that the amount of groundwater that the District would authorize for withdrawal through its permitting process, after taking into account an estimate of groundwater produced by exempt users, would equal the sustainable recharge rate, which the District has determined to be 64,000 acre-feet per year based upon the best available science.

Upon completion of the District's HUP permitting process, the District determined the total volume that could be authorized for withdrawal under HUPs is in excess of 56,483 acre-feet. Further, the total amount of volume authorized by the District for use under the OPs the District granted as of October 2009 was approximately 30,732 acre-feet per year. It is important to note that the total amount of volume of use authorized under OPs continues to increase as the District issues new OPs each month. While the total amount of permitted groundwater use under OPs and HUPs is approximately 87,215 acre-feet per year as of October 2009 as indicated by District records, the District must also take the groundwater used by exempt domestic and livestock wells into consideration to determine the total amount of groundwater authorized to be produced within the county. The District commissioned a study that estimated that exempt use accounted for approximately 7,700 acre-feet per year as of 2010. Therefore, the total amount of groundwater authorized for use in Montgomery County as of October 2009 was estimated at around 95,000

acre-feet per year when adding together the total amount of permitted groundwater use and the total amount of exempt groundwater use. The total volume of groundwater produced and used within Montgomery County, therefore, already exceeded in 2009 the amount of groundwater use the District determined would achieve the sustainability of the Gulf Coast Aquifer within its jurisdiction by approximately 31,000 acre-feet per year and the amount of groundwater use permitted by the District under OPs and HUPs by close to 23,200 acre-feet per year.

Based on the volumes of groundwater use set forth above and the water demand realities facing the District, the District formally adopted a multi-phased regulatory plan, the District Regulatory Plan ("DRP"), designed to require a comprehensive conversion effort to reduce total annual groundwater production within Montgomery County to a level that does not exceed, on average, the sustainable recharge rate of 64,000 acre-feet of groundwater per year for the Gulf Coast Aquifer. In December 2006, the District adopted Phase I of the DRP to commence the process of facilitating the conversion from groundwater use to surface water and other alternative water supplies. In the 2006 DRP Phase I, after considering the time reasonably necessary for water users in the District to secure alternative sources of water by economically feasible means, as set forth in the TWDB Study, the District established January 1, 2015, as the deadline by which total annual groundwater production within Montgomery County had to be reduced to an amount equal to or less than the sustainable recharge rate of the Gulf Coast Aquifer in the District. All past, current, and future users of groundwater in Montgomery County were put on notice by Phase 1 of the DRP that the District would curtail both new and historic use of groundwater as necessary by January 1, 2015, to reduce total production and use of groundwater in the District to an amount equal to or less than 64,000 acre-feet per year.

The District recognizes the need for long-term water planning based upon the significant periods of time it takes to bring alternative water supplies on-line on a retail basis. The process of obtaining new alternative water supplies and constructing the necessary infrastructure to deliver such supplies to the intended water users takes years to complete.

Because of these time considerations and the impending groundwater reduction deadline established under Phase 1 of the DRP, the District adopted Phase II (A) of the DRP in February 2008, which required certain specified large volume groundwater users ("LVGUs") to demonstrate incremental progress towards conversion to alternative water supplies by preparation of a Water Resources Assessment Plan ("WRAP") to be submitted to the District. Phase II(A) defined a Large Volume Groundwater User to be any non-exempt and non-agricultural groundwater producer subject to the District's regulatory jurisdiction that, through a single well or a combination of wells, actually produced or was authorized by any permit issued by the District to produce 10 million gallons or more of groundwater annually on or after January 1, 2008. The use of groundwater by LVGUs accounted for approximately 92 percent of total permitted production in Montgomery County. The WRAPs submitted by LVGUs identified each LVGU's current and future water demands and supplies to meet those demands, including detailed supporting information.

After considering the information in the WRAPs and other information, the District adopted Phase II(B) of the DRP in November 2009, which was subsequently amended in April 2010. Phase II(B) sets forth the actual regulatory requirements for achieving a long-term sustainable rate of groundwater production within Montgomery County—beginning with an initial conversion effort

that is required to be met by 2016. The District determined that the year of initial groundwater reduction and conversion should be changed from calendar year 2015 to 2016, because of the delay in the originally anticipated time frame for adoption of these actual regulatory requirements and the need for LVGUs to have a corresponding increment of time to implement them.

Pursuant to Phase II(B) of the DRP, each LVGU in the District is required by 2016 to meet its Initial Conversion Obligation, which means each LVGU must (1) have reduced its groundwater production to no more than 70 percent of its Total Qualifying Demand, which is based upon the LVGU's 2009 permitted authorization, and (2) actually met not less than 30 percent of its Total Qualifying Demand by implementing water conservation measures and/or using an alternative water source. To account for groundwater reduction efforts and to ensure necessary progress, Phase II(B) requires each LVGU in the District to submit a Groundwater Reduction Plan ("GRP"), either individually or jointly with other LVGUs, to the District that provides the LVGU's plan of action to meet its Initial Conversion Obligation. Prior to the 2016 deadline, Phase II(B) establishes various regulatory milestones designed to allow for the initial phase of conversion from groundwater to an alternative water source, generally consistent with the underlying conversion assumptions set out in Phases I and II(A) of the DRP.

Phase II(B) of the DRP contemplates that the District could require further groundwater reductions and conversions in the future in order to manage groundwater resources on a sustainable basis in order to account for the continued growth in Montgomery County and continued improvements in the best science available related to the hydrogeologic characteristics and management of those groundwater resources.

Goals, Management Objectives, and Performance Standards

The cornerstone of the District Management Plan are the goals, management objectives, and performance standards that are adopted by the District in order to either directly or indirectly work in an integrated process to achieve the District's desired future conditions. Texas Water Code Section 36.1071(a)(1-9) requires that all management plans address the following management goals, as applicable:

- addressing the desired future conditions adopted by the District;
- providing the most efficient use of groundwater;
- controlling and preventing waste of groundwater;
- controlling and preventing subsidence;
- conjunctive surface water management issues;
- natural resource issues;
- drought conditions; and
- conservation, recharge enhancement, rainwater harvesting, precipitation enhancement, or brush control, where appropriate and cost-effective.

Goals, management objectives, and performance standards included in this management plan have been developed and adopted to ensure the management and conservation of groundwater resources within the District's jurisdiction.

Goal 1 – Addressing the desired future conditions adopted by the District under Texas Water Code Section 36.108

The District seeks to protect the Gulf Coast Aquifer, the economy and environment of Montgomery County, and private property rights for today's constituents and for future generations. Therefore, the umbrella goal for the District, to which all other goals in this management plan are linked, is to manage the groundwater resources so that, in the near future, the amount of groundwater produced from the Gulf Coast Aquifer is no more than the average annual effective recharge to the Gulf Coast Aquifer System. Only upon achievement of this equilibrium will the water resources for Montgomery County be managed on a truly sustainable basis.

In order to achieve sustainability in the use of the Gulf Coast Aquifer in Montgomery County, the District has adopted Phase II (B) of the District Regulatory Plan (DRP). The DRP Phase II (B) is designed to provide the actual regulatory requirements for achieving a long-term sustainable rate of groundwater production within Montgomery County—beginning with an initial groundwater reduction and conversion effort that is required to be met by 2016. As part of those requirements, Phase II (B) requires each Large Volume Groundwater User (those using 10 million gallons per year and above) ("LVGU") in the District to submit a Groundwater Reduction Plan ("GRP"), either individually or jointly with other LVGUs. It also establishes regulatory milestones designed to allow for the initial phase of conversion from groundwater to an alternative water source, generally consistent with the underlying conversion assumptions set out in Phases I and II (A) of the DRP.

The primary purpose of a District Management Plan is to develop goals, management objectives, and performance standards that, when successfully implemented, will work together to achieve the adopted desired future conditions ("DFCs") for a district. In this management plan, the District's second management plan update, goals 2 through 8 directly and/or indirectly support Goal 1. DFCs adopted for the Gulf Coast Aquifer System for the District are described below. A 50-year planning horizon (2010 – 2060) was used in setting the DFCs. Throughout the joint planning process, the District actively worked with the other member districts and stakeholders within Groundwater Management Area 14 ("GMA 14") to determine the DFCs for each aquifer located within each district. Pursuant to Texas Water Code Section 36.108(b), during the joint planning process for GMA 14, the district representatives considered groundwater availability models ("GAMs") and other data, including information from the 2006 regional water plans and the 2007 Texas State Water Plan,[8] throughout the DFCs development process. As part of this planning effort, the TWDB developed and published GAM Run 10-023[9] and GAM Run 10-038 MAG (also see Appendix D). [10]

[8] Texas Water Development Board, Water for Texas – 2007: The State Water Plan, Vol. I and II, variously paginated.
[9] Oliver, W., 2010, GAM Run 10-023, Texas Water Development Board 32 pg.
[10] Hassan, M. M., 2010, GAM Run 10-038 MAG, Texas Water Development Board 19 pg.

The following DFCs were adopted by the district representatives in GMA 14 on August 25, 2010, for Montgomery County and are summarized in Table 1:

- From estimated year 2008 conditions, the average draw down of the Chicot Aquifer should not exceed approximately 3 feet after 8 years.
- From estimated year 2016 conditions, the average draw down of the Chicot Aquifer should not exceed approximately 6 feet after 44 years.
- From estimated year 2008 conditions, the average draw down of the Evangeline Aquifer should not exceed approximately 13 feet after 8 years.
- From estimated year 2016 conditions, the average draw down of the Evangeline Aquifer should not exceed approximately 25 feet after 44 years.
- From estimated year 2008 conditions, the average draw down of the Burkeville Confining Unit should not exceed approximately 10 feet after 8 years.
- From estimated year 2016 conditions, the average draw down of the Burkeville Confining Unit should not exceed approximately 23 feet after 44 years.
- From estimated year 2008 conditions, the average draw down of the Jasper Aquifer should not exceed approximately 61 feet after 8 years.
- From estimated year 2016 conditions, the average draw down of the Jasper Aquifer should not exceed approximately -38 feet after 44 years.

Aquifer	Drawdown (2008 - 2016)	Drawdown (2016 - 2060)
Chicot	3	6
Evangeline	13	25
Burkeville	10	23
Jasper	61	-38*

*Negative value indicates a water-level rise

Table 1 – DFCs for the District.

These DFCs were adopted for the District because they are the projected aquifer conditions that will result once groundwater production is managed on a fully sustainable basis, based on the best available science as required by Texas Water Code Section 36.108(b). The corresponding estimates of modeled available groundwater (note the original term "managed available groundwater" was amended to "modeled available groundwater" in Senate Bill 660 by the 2011 Texas Legislature) were provided by the TWDB in GAM Run 10-038 MAG. These estimates, presented in acre-feet per year, are presented in Table 2.

Aquifer	Year					
	2010	2020	2030	2040	2050	2060
Chicot	1,482	1,722	1,722	1,722	1,722	1,722
Evangeline	39,381	38,293	38,293	38,293	38,293	38,293
Burkeville Confining Unit	0	0	0	0	0	0
Jasper	32,401	21,614	21,614	21,614	21,614	21,614
Gulf Coast Aquifer Total	*73,264*	*61,629*	*61,629*	*61,629*	*61,629*	*61,629*

Table 2 – Estimates of modeled available groundwater for the District based on adopted DFCs.

Estimates of modeled available groundwater include both non-exempt (or permitted use) and exempt use for the District. These estimates represent a reduction in pumpage from 73,264 acre-feet per year in 2010 to 61,629 acre-feet per year in 2060 for the Gulf Coast Aquifer in the District. Once this level of production is achieved, then the District anticipates that groundwater production will be at a level approximately equal to or slightly less than the effective rate of recharge. This equates to an 18.9 percent reduction in modeled available groundwater in the District over the 50-year planning horizon. This reduction is illustrated graphically in Figure 3.

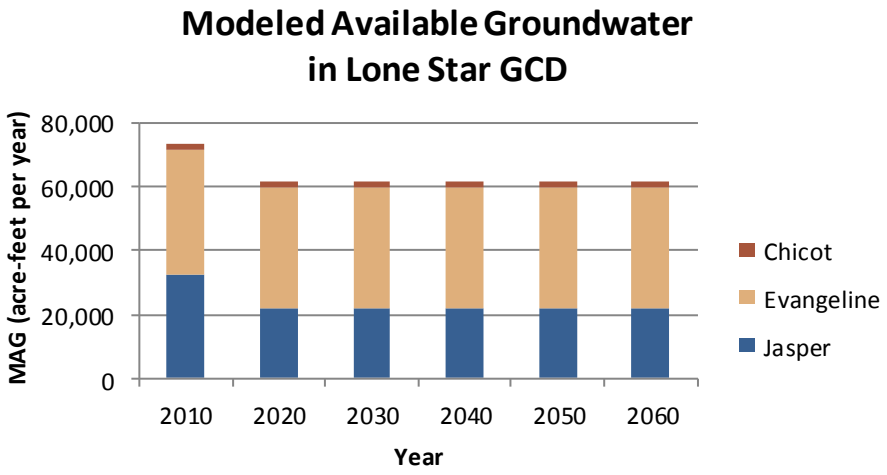

Figure 3 – Estimates of modeled available groundwater for the District from 2010 – 2060.

DFCs and corresponding estimates of modeled available groundwater for the Chicot and Evangeline aquifers in the District fluctuate only slightly over the 50-year planning horizon. However, as documented in Table 2 and Figure 3, there is a significant change in DFCs and estimates of modeled available groundwater between 2010 and 2020 in the Jasper Aquifer. During this time period (starting in 2016), the goal is to reduce pumping sufficiently to achieve an average increase in water level elevations in the Jasper Aquifer of 38 feet from 2016 to 2060. To achieve this DFC for the Jasper Aquifer, between 2016 and 2020, estimates of modeled available groundwater for pumping for both exempt and non-exempt use will need to be reduced from 32,401 acre-feet per year in 2010 to 21,614 acre-feet per year in 2020, approximately equivalent to a 33 percent reduction in pumping from the Jasper Aquifer. This reduction in groundwater production will be accomplished through the full implementation of the District Regulatory Plan

(see *Management of Groundwater Resources in the Lone Star Groundwater Conservation District* section for additional information on the District Regulatory Plan).

Objective 1.1

Soon after creation, the District committed to managing water in the Gulf Coast Aquifer on a sustainable basis, and it remains equally committed to this management principle today. This commitment is reflected in this updated District Management Plan. The sustainable yield of the Gulf Coast Aquifer is thus an important regulatory marker for the District. The District's permitting program allows the District to track water use and water levels in the Gulf Coast Aquifer. It also provides for the major funding source for the operations of the District, allowing it to continue to monitor the Gulf Coast Aquifer, to routinely participate in the development of the ever improving science of the Gulf Coast Aquifer, both specific to Montgomery County and as necessary on a regional basis, to introduce new technologies to acquire data, and to educate the public about water conservation and the need for alternative water supplies. It is the objective of the District to provide a permitting process that is straightforward, transparent, and easy for the permit-holder to access through the Internet. The District Board of Directors, General Manger, and legal counsel routinely review the District's permitting process in order to identify any procedural changes or amendments necessary to meet this objective. All substantive changes to the District's permitting process will be communicated through the District's website throughout any rulemaking process and will be summarized in the Annual Report submitted by the General Manager to the Board of Directors of the District.

Performance Standard 1.1

Draft rules, public meeting and hearing announcements, and available supporting materials will be included prior to rulemaking activities by the District on the District's website at lonestargcd.org.

Performance Standard 1.2

A summary of any amendments to District rules that are adopted throughout the calendar year will be included in the Annual Report submitted by the General Manager to the Board of Directors of the District.

Goal 2 – Providing the most efficient use of groundwater

Since the District's creation in 2001, the District has operated on the core principle (or goal) that groundwater should be used as efficiently as possible for beneficial purposes. In order to achieve this goal, the District maintains a qualified staff to assist water users in protecting, preserving, and conserving groundwater resources. The Board of Directors has in the past and continues today to base its decisions on the best data available to treat all water users as equitably as possible. Once data is collected, the District utilizes a wide variety of forums to provide important information to water users throughout the District so that sound decisions regarding the efficient use of groundwater can be made. The following management objectives and performance standards have been developed and adopted to ensure the efficient use of groundwater.

Objective 2.1

Each year, the District will require all new exempt or permitted wells that are constructed within the boundaries of the District to be registered or permitted with the District in accordance with the District Rules.

Performance Standard 2.1

The number of exempt wells registered and non-exempt wells permitted by the District for the year will be incorporated into the Annual Report submitted by the General Manager to the Board of Directors of the District.

Objective 2.2

The District will work to ensure the efficient use of groundwater by maintaining qualified staff and technical consultants necessary to execute and maintain the District's well registration and permitting system. This effort includes the timely processing and technical reviews of permit applications. Each year, the District will regulate the production of groundwater by maintaining a system of permitting the use and production of groundwater within the boundaries of the District in accordance with the District Rules.

Performance Standard 2.2

Each year the District will accept, process, and review applications for the permitted use of groundwater in the District in accordance with the permitting process established by District Rules. The number and type of applications made for the permitted use of groundwater in the District and the number and type of permits issued by the District will be included in the Annual Report submitted by the General Manager to the Board of Directors of the District.

Goal 3 – Controlling and preventing waste of groundwater

As with Goal 2 above, the District also constantly strives to prevent the waste of water resources in Montgomery County. The prevention of waste of groundwater is one of the core responsibilities for groundwater conservation districts, dating back to the original legislation authorizing the creation of groundwater conservation districts in 1949 (House Bill 162). The District works to control and prevent the waste of groundwater through the adopted District Rules and Regulatory Plan.

To this end, the District has developed standard usage numbers for the majority of use categories included in the District permittees. Each request for a new permit or a permit amendment is scrutinized based on these standard usage factors. For wells providing makeup water to impoundments, the District maintains records of the amount of evaporation measured by the San Jacinto River Authority at Lake Conroe. Permit amendments are only allowed to use the measured evaporation rate plus 10 percent for losses through the bottom and sides of the impoundment. Similarly, the District maintains records of evapotranspiration rates to guide permit amendment requests for irrigation water. Standards are also applied to single and multi-family residential usage as well as commercial usage. Requests for water in excess of the standards for these latter uses must provide additional justification for these requests.

As a practical matter, it is sometimes difficult to differentiate Goal 3 from Goal 2. For example, certain objectives such as Objective 2.1 and Objective 2.2 above could also be viewed as strategies to prevent and control the waste of groundwater, in addition to the stated goal of providing the most efficient use of groundwater.

Objective 3.1

In order to increase public awareness of the need to control and prevent the waste of groundwater in Montgomery County, the District operates a waste prevention outreach strategy. This outreach strategy currently focuses on enhancing the use of the District's website to provide resources

applicable to the prevention of waste of groundwater. The District website provides a routinely updated link containing a *Best Management Practices Guide* (published by the Texas Water Advisory Council in partnership with the TWDB). The District will work to identify outreach opportunities with regional and local water providers so as to increase public awareness for the prevention of groundwater waste.

Performance Standard 3.1

The District provides and will routinely update the link on District's website to Best Management Practices, which includes helpful tips to control and prevent the waste of groundwater is maintained on the District's website.

Objective 3.2

Each year, the District will make an evaluation of the District rules to determine whether any amendments are recommended to decrease the amount of waste of groundwater within the District.

Performance Standard 3.2

The District will include a discussion of the annual evaluation of the District Rules and the determination of whether any amendments to the rules are recommended to prevent the waste of groundwater in the Annual Report submitted by the General Manager to the Board of Directors of the District.

Objective 3.3

Each year, the District will apply a water use fee structure to the permitted use of groundwater in the District to encourage the elimination and reduction of waste of groundwater.

Performance Standard 3.3

Each year, with the exception of wells exempt from permitting, the District will apply a water use fee to the permitted use of groundwater in the District pursuant to District Rules. The amount of fees generated by the water use fee structure and the amount of water used for each type of permitted use of groundwater will be included in the Annual Report submitted by the General Manager to the Board of Directors of the District.

Goal 4 – Controlling and Preventing Subsidence

Subsidence is geologic term used to describe the sinking of the land surface. Subsidence may occur as a result of natural causes or from man-induced or anthropogenic causes. Subsidence, especially in low lying coastal areas may cause significant damage due to flooding and also structural damage to roads and buildings. Subsidence in the Gulf Coast region has been caused by removal of oil and gas minerals as well as groundwater from the subsurface. Subsidence may also result from the removal of other minerals in the subsurface such as salt and sulfur. This is because these fluids are pressurized and, therefore, when naturally occurring, act to hold up the loosely consolidated sedimentary particles in the subsurface (clays, silts, and sands). Due to the inelastic nature of the sediments, in particular the clays, in areas where subsidence occurs, the subsidence is permanent. Flooding resulting from subsidence in the Harris/Galveston area has resulted in major losses to land and property over the past 50 plus years. The District, in cooperation with the Harris-Galveston Subsidence District, maintains a network of 8 subsidence monitor stations to continually measure subsidence. To date, minor subsidence of approximately 0.5 foot has been measured at monitoring stations located in the southern portion of the District.

Objective 4.1

Each year, the District will hold a joint conference with the Harris-Galveston Subsidence District and the Fort Bend Subsidence District focused on sharing information regarding subsidence and the control and prevention of subsidence through the regulation of groundwater production.

Performance Standard 4.1

Each year, a summary of the joint conference on subsidence issues will be included in the Annual Report submitted by the General Manager to the Board of Directors of the District.

Objective 4.2

The District is now participating with the Harris-Galveston Subsidence District in the collection of subsidence data from dedicated stations located in the District. Data from these subsidence monitor stations will be discussed during the joint conference described in Objective 4.1 above.

Performance Standard 4.2

Results from the subsidence monitor stations will be noted in the summary of the joint conference on subsidence described in Performance Standard 4.1 and included in the Annual Report submitted by the General Manager to the Board of Directors of the District.

Goal 5 – Addressing conjunctive surface water management issues

As demands for water supplies continue to increase, the importance of addressing groundwater and surface water management issues conjunctively will continue to increase. From its inception, the District has worked with public water suppliers, other stakeholders, and the sole surface water management entity in the District, the San Jacinto River Authority, to conduct studies and evaluate options regarding the conjunctive use and availability of groundwater and surface water resources in the District. These stakeholders have representation on the District's board of directors, which has helped to engender and ensure ongoing communication and coordination between the entities. This coordination eventually led to the development and adoption of the DRP, which encourages water users in the District to develop surface water supplies and other alternative water supplies through its requirements to reduce groundwater production and develop detailed plans identifying future water demands and supplies to meet those demands. In addition, through the District's designated representative(s), the District actively participates in a number of planning forums including the regional water planning process. It is through this commitment to participation in a broad mix of water-related forums that pertinent issues related to conjunctive surface water management issues will be addressed.

Objective 5.1

Each year, the District's designated representative will participate in the regional planning process by attending at least 75 percent of the Region H – Regional Water Planning Group meetings in order to encourage the development of surface water supplies to meet the needs of water user groups in the District.

Performance Standard 5.1

The participation and attendance of the District's designated representative at each Region H Regional Water Planning Group will be noted in the Annual Report submitted by the General Manager to the Board of Directors of the District.

Goal 6 – Addressing Natural Resource Issues

The District understands the important nexus between water resources and natural resources. The exploration and production of natural resources such as oil and gas in Montgomery County clearly illustrate this nexus. These activities, along with related issues such as waste disposal utilizing underground injection wells clearly represent potential management issues for the District. Improperly plugged oil and gas wells may provide a conduit for various hydrocarbon and drilling fluids to potentially migrate and contaminate groundwater resources in the District.

Objective 6.1

In order to monitor, as appropriate, waste injection activities associated with the exploration and production of oil and gas in Montgomery County, the District will monitor permit applications and permit amendment applications for Class II injection wells filed with the Railroad Commission of Texas and Class I and Class V injection well permit applications and permit amendment applications filed with the Texas Commission on Environmental Quality. District staff will review these notices and brief the Board of Directors as appropriate. A summary of injection well permit activity and any actions taken by the District in response will be included in the Annual Report submitted by the General Manager to the Board of Directors of the District.

Performance Standard 6.1

Beginning with the 2014 Annual Report, a summary of injection well permit activity at the Railroad Commission of Texas and the Texas Commission on Environmental Quality along with any actions taken by the District in response will be included in the Annual Report submitted by the General Manager to the Board of Directors of the District.

Goal 7 – Addressing Drought Conditions

Recurring drought conditions that climaxed in 2011 continue to serve as a reminder of how dependent we are on precipitation. Droughts occur and reoccur in the area, as do cycles of above average precipitation. A well informed public can best respond to developing drought conditions by adopting best management practices appropriate for drought conditions.

Objective 7.1

An important objective of the District is to provide ongoing and relevant drought-related meteorological information. Beginning in 2014, the District will make available through the District's website easily accessible drought information with an emphasis on developing droughts and on any current drought conditions. At least one of the following links will be provided; updates to the Palmer Drought Severity Index ("PDSI") map for the region, the Drought Preparedness Council Situation Report, and the TWDB Drought Page at http://www.twdb.texas.gov/data/drought/ .

Performance Standard 7.1

Current drought conditions information from at least one of the following multiple resources, including the PDSI map for the region and the Drought Preparedness Council Situation Report, will continue to be available to the public on the District's website by the end of the first quarter of 2014 and noted in the Annual Report submitted by the General Manager to the Board of Directors of the District.

Goal 8 - Addressing Conservation, Recharge Enhancement, Rainwater Harvesting, Precipitation Enhancement, or Brush Control Where Appropriate and Cost Effective

Conservation and rainwater harvesting have been determined to be appropriate goals for the District. As with Goals 2 and 3, the successful implementation of an effective water conservation program is a cornerstone to the efforts of the District. As part of this effort, the District sponsoring and participating in water conservation programs such as the Lone Star/Montgomery County Water Efficiency Network, Water IQ, Serve Water On Request Only, and the Home Water Works.

A visit to the District's new headquarters is all that is required to realize the commitment of the District to rainwater harvesting. The entire comprehensive water conservation demonstration facility was designed as a demonstration to the citizens of Montgomery County of the positive benefits of rainwater harvesting in reducing water consumption from the Gulf Coast Aquifer. The design and subsequent construction of the various rainwater harvesting and water conservation techniques integrated into the new District headquarters have not only caught the attention of local residents, but recently, the District was awarded the 2012 Texas Rain Catcher Award from the Texas Water Development Board for the innovation demonstrated by the design of the new comprehensive water conservation demonstration facility.

After review by the Board of Directors, the General Manager, and the District's technical consultants, it has been determined that recharge enhancement, precipitation enhancement, and brush control are not appropriate groundwater management strategies for the District. This evaluation is based on costs of operating and maintaining these programs, lack of neighboring programs in which to participate, and probable lack of effectiveness of these programs, due to the climate, hydrogeology, and physiography of the District.

Objective 8.1

The District seeks to promote water conservation through an active water conservation awareness program. As part of this program, the District will maintain links to recognized water conservation awareness programs such as the Gulf Coast/Montgomery County Water Efficiency Network, Water IQ, Serve Water On Request Only, and the Home Water Works programs on the District's website.

Performance Standard 8.1

Links to at least one of the water conservation awareness programs such as the Gulf Coast/Montgomery County Water Efficiency Network, Water IQ, Serve Water On Request Only, and the Home Water Works programs will be provided on the District's website and noted in the Annual Report submitted by the General Manager to the Board of Directors of the District.

Objective 8.2

Educational materials specific to rainwater harvesting have been developed to highlight the various water conservation techniques that are incorporated into the design of the new District headquarters. This information will be available at the main entrance to the District headquarters for visitors to take and review for potential use in homes and businesses in Montgomery County.

Performance Standard 8.2

Information on the District's new headquarters and rainwater harvesting capabilities will be made available during business hours for use by visitors to the facilities. A summary of this educational

opportunity will be included in the Annual Report submitted by the General Manager to the Board of Directors of the District

Objective 8.3

The District has recently added an important new tool at its comprehensive water conservation demonstration facility that will collect weather data 24/7 in collaboration with Texas A&M Agrilife Extension experts. The objective of installing this new equipment is to generate an Evapotranspiration ("ET") number to help residents use their irrigation systems more efficiently by knowing the ideal amount of water needed to sustain a healthy lawn. The District will be rolling out the information part of the new program to enable commercial and residential "users" to regulate their irrigation system controllers so that they deliver only the amount of water necessary. Current measurements of ET will be maintained on the District's website.

Performance Standard 8.3

Current measurements of ET will continue to be maintained on the District's website throughout the active growing season each year and noted in the Annual Report submitted by the General Manager to the Board of Directors of the District.

Groundwater Resources of Montgomery County

The principal source of useable groundwater in Montgomery County is the Gulf Coast Aquifer. The Gulf Coast Aquifer consists of four subdivisions, three of which are water-bearing and recognized as aquifers in their own right: the Chicot Aquifer, the Evangeline Aquifer, and the Jasper Aquifer. The Burkeville Confining Zone separates the Evangeline and Jasper aquifers. Although publications such as the Oden and Truini (2013)[11] also include portions of the Catahoula Sandstone as part of the Gulf Coast Aquifer, for regulatory purposes the District considers the Catahoula Sandstone to be a separate hydrogeologic system (the Catahoula Confining System) and manages it accordingly.

The water-bearing subdivisions of the Gulf Coast Aquifer consists of semi-consolidated or unconsolidated sands with interbedded clays from one or more geologic formations. Clay zones may separate the water-bearing zones in each subdivision of the Gulf Coast Aquifer. The Burkeville Confining Zone is the largest of the clay zones separating water-bearing units in the Gulf Coast Aquifer. In some areas, however, this subdivision consists of clay with interbedded sands that allow the passage of water. The Chicot Aquifer is the youngest of the Gulf Coast Aquifer subdivisions, followed by the Evangeline Aquifer and the Burkeville Confining Zone. The Jasper Aquifer is the oldest of the Gulf Coast Aquifer subdivisions located in the District (see Table 3 and Figure 4).

Each of these Gulf Coast Aquifer subdivisions occurs in outcrop in Montgomery County. The outcrop pattern is a series of belts, which are generally parallel to the coastline. The younger units occur nearest the coast and form a terraced plain. The successively older units crop out progressively further inland at higher elevations and form cuestas or sand hills.

[11] Oden, T. D., and Truini, M., 2013, Estimated rates of groundwater recharge to the Chicot, Evangeline, and Jasper aquifers by using environmental tracers in Montgomery and adjacent counties, Texas, 2008 and 2011: U. S. Geological Survey, Scientific Investigations Report No. 2013-5024, 49 p.

The geologic structure of the Gulf Coast Aquifer dips from the inland areas into the subsurface towards the coast at an angle greater than the slope of the land surface. The geologic units composing the Gulf Coast Aquifer generally thicken towards the coast in the down-dip direction. The rate of dip, measured in feet per mile, increases with depth below land surface. The base of the Chicot Aquifer dips at approximately 10 feet per mile, while the rate of dip for the Catahoula Sand below the Jasper Aquifer is approximately 90 feet per mile. The increased rate of dip with depth is caused by the thickening of geologic units towards the coast. [12]

System	Series	Geologic Unit	Hydrologic Unit
Quaternary	Holocene	Alluvium	Chicot Aquifer
	Pleistocene	Beaumont Clay Lissie/Alta Loma	
Tertiary	Pliocene	Willis Sand	
	Miocene	Goliad Sand	Evangeline Aquifer
		Fleming Formation (Legarto)	Burkeville Confining Unit
		Fleming Formation (Oakville)	Jasper Aquifer
	Oligocene	Catahoula Sandstone	Catahoula Aquifer

Table 3 – Geologic and Hydrologic Units of the Gulf Coast Aquifer in Montgomery County (as modified from Baker (1979)[13] and Young and others (2012)[14]).

[12] Popkin, B. P., 1971, Groundwater resources of Montgomery County, Texas: Texas Water Development Board Report 136, 143 pg.
[13] Baker, E. T., Jr., 1979, Stratigraphic and hydrogeologic framework of part of the Coastal Plain of Texas: Texas Department of Water Resources Report 236, 43 p.
[14] Young, S.C, Ewing, T, Hamlin, S., Baker, E., and Lupton, D., 2012. Final Report: Updating the Hydrogeologic Framework for the Northern Portion of the Gulf Coast Aquifer, (prepared for the Texas Water Development Board). , 285 p.

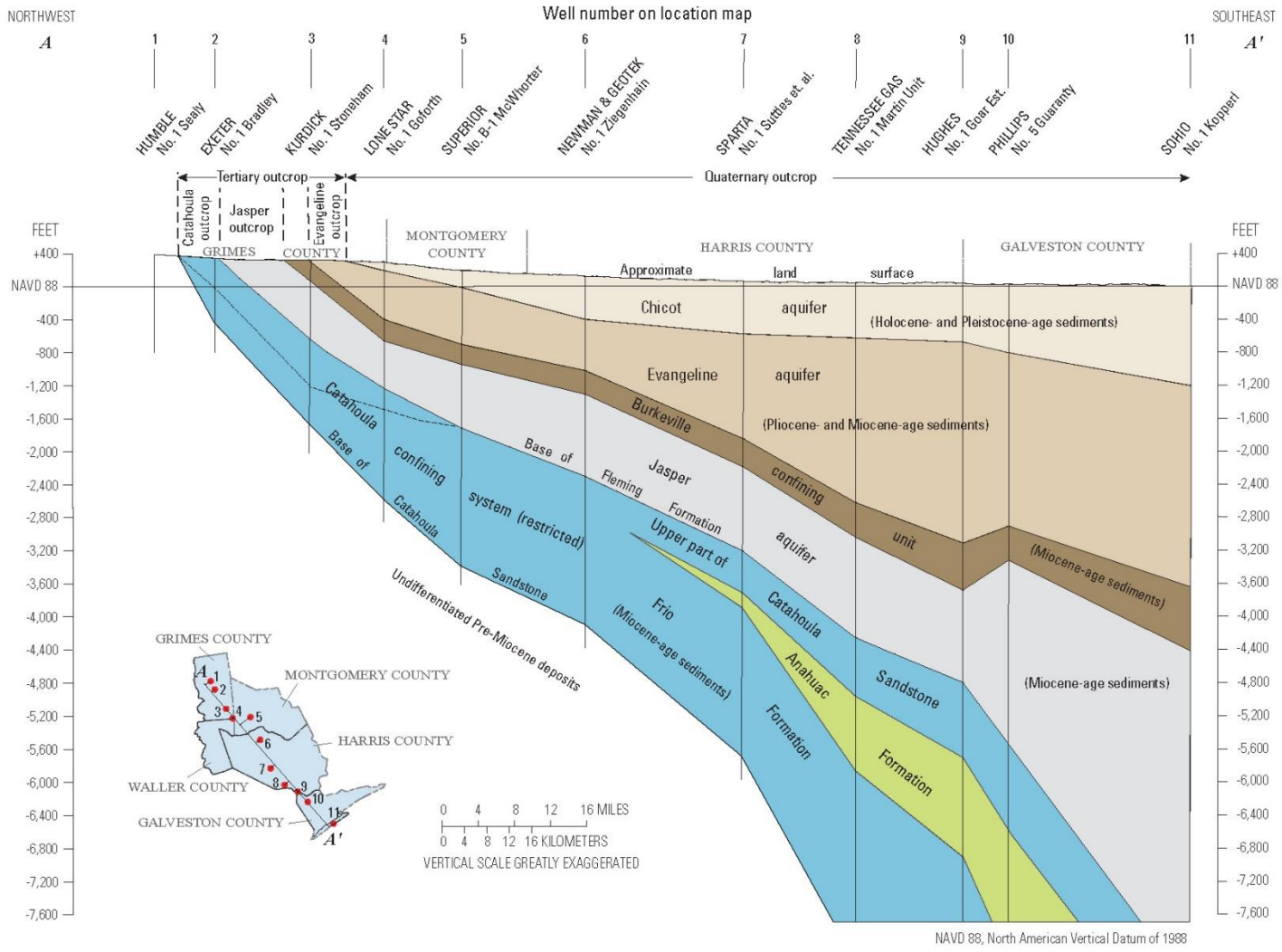

Figure 4 – Geologic cross section of the Gulf Coast Aquifer in the area of Montgomery County (as modified from Baker (1979)[13] and Oden and Truini (2013) [11]).

Topography and Drainage

The topographic surfaces vary from almost flat near the larger streams and in the southern part of the county to hilly in the northern part. Altitudes range from about 45 feet above mean sea level in the southeastern corner of the county to about 440 feet above mean sea level in the northwestern corner.

The county is in the San Jacinto River drainage basin in which the primary drainage trends from northwest to southeast. The larger streams are the West Fork San Jacinto River, Peach, Spring, Stewart, and Caney creeks. Secondary drainage which is roughly west to east is principally by Lake and Spring creeks. The primary drainage is controlled by the southeasterly slope of the land surface while the secondary drainage is controlled to a large extent by the occurrence of alternating outcrops of sand and clay.

Historical Groundwater Use in Lone Star Groundwater Conservation District

During the development of this management plan update, the most current groundwater use information from the TWDB's Water Use Survey, for which results are presented in the TWDB Water Use Database, was utilized. Table 4 and Figures 5 and 6 present summary information regarding groundwater use in Montgomery County from 2006 through 2010. Over this period, groundwater use represents from 95.4 percent in 2006 to 94.8 percent in 2010 of total water use in Montgomery County. The rapidly changing demography of Montgomery County is well illustrated by Figures 5 and 6. Total water use has increased by more than a factor of six from 13,137 acre-feet in 1974 to 83,994 acre-feet in 2010, with the vast majority of groundwater use going to the municipal water use sector. For a more detailed breakdown of historical water use, by year, and by sector, as required by Texas Water Code Section 36.1071(e)(3)(b), please refer to Appendix B.

Year	Total Groundwater Use	Total Surface Water Use	Total Water Use
2006	64,323	3,096	67,419
2007	73,812	2,434	76,246
2008	69,164	3,018	72,182
2009	72,841	4,791	77,632
2010	79,654	4,340	83,994

Table 4 – Water use in Montgomery County from 2006 – 2010, in acre-feet per year (AFY), (from the TWDB Water Use Database).

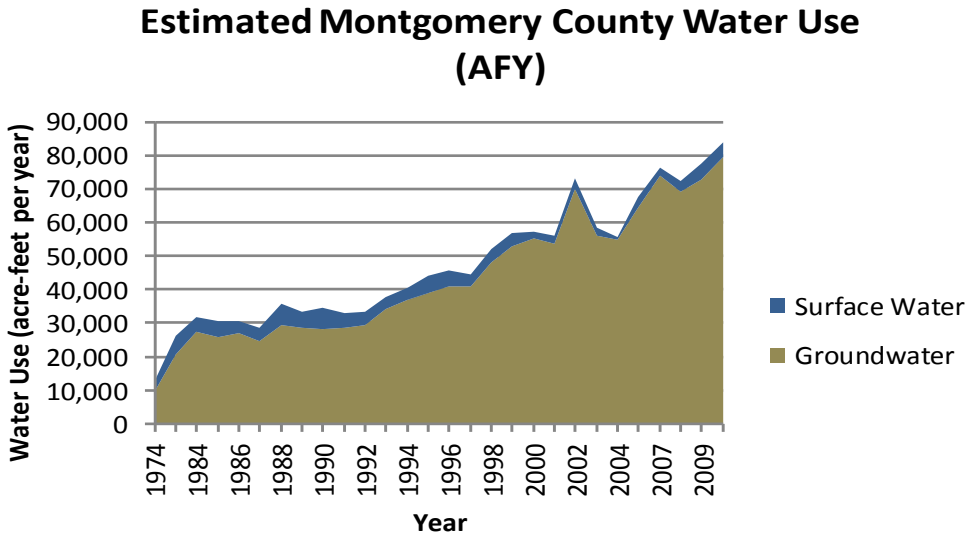

Figure 5 – Water use trends in Montgomery County from 1974 – 2010, in AFY (from the TWDB Water Use Database).

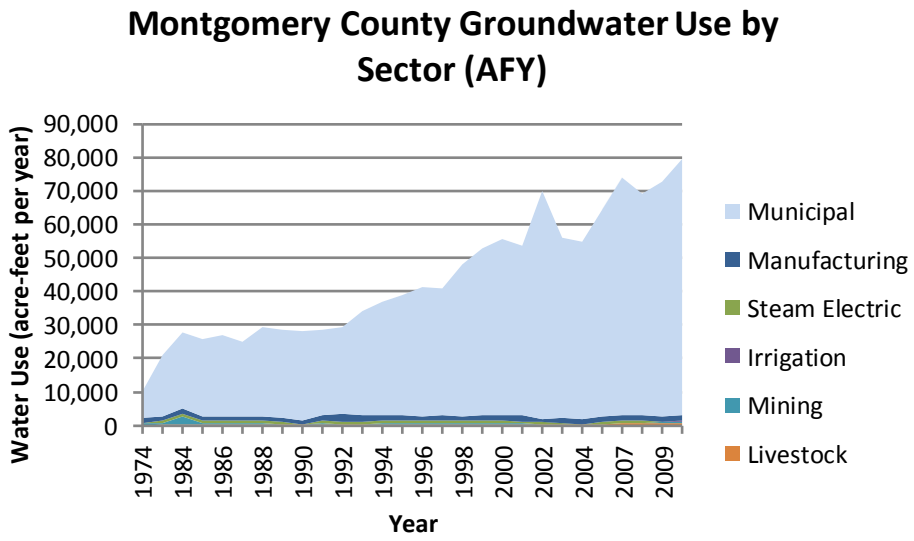

Figure 6 – Water use by sector in Montgomery County from 1974 to 2010, in AFY (from TWDB Water Use Database).

Water Budgets for Lone Star Groundwater Conservation District

Fundamental to the management of groundwater resources is an understanding of the water budgets for the area. The Texas Water Code requires that as part of developing and adopting a management plan, information pertaining to estimates of recharge, discharge, and cross-formational flow for relevant aquifers are to be presented. Over the recent past, the District has invested significant time and resources in efforts to better understand the various processes effecting the water budget of aquifers providing groundwater resources in Montgomery County. The following water budget information is one of the products of the Texas GAM Program (Table 5). Specifically, this information relative to Montgomery County was provided in GAM Run 13-007[15] (see Appendix C for entire report) and GAM Run 11-012[16] (see Appendix E for entire report). These estimates of the movement of groundwater into and out of the Gulf Coast Aquifer are important factors for the District during efforts to achieve sustainable groundwater production in Montgomery County. Note that while this table includes estimates of groundwater flow from the "Catahoula Formation portion of the Gulf Coast" into underlying units, for regulatory purposes as discussed above in the Groundwater Resources of Montgomery County section, the Catahoula is considered to not be part of the Gulf Coast Aquifer.

[15] Kohlrenken, W., 2013, GAM Run 13-007: Lone Star Groundwater Conservation District Management Plan: Texas Water Development Board, 9p

[16] Shi, J., 2012, GAM Run 11-012: Modeled water budget for the Gulf Coast Aquifer in Montgomery County: Texas Water Development Board, 36 p.

Management Plan Requirement	Aquifer	Result (acre-feet per year)
Estimated annual amount of recharge from precipitation to the district	Gulf Coast Aquifer	30,913
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Gulf Coast Aquifer	882
Estimated annual volume of flow into the district within each aquifer in the district	Gulf Coast Aquifer	19,159
Estimated annual volume of flow out of the district within each aquifer in the district	Gulf Coast Aquifer	61,787
Estimated net annual volume of flow between each aquifer in the district	From the Catahoula Formation portion of the Gulf Coast into underlying units	599*

*Calculated using the groundwater availability model for the Yegua-Jackson Aquifer.

Table – 5 Water budget estimates provided by the TWDB in GAM Run 13-007.

Projected Surface Water Supplies in Montgomery County

The District participates as a member of the Region H Water Planning Group, which is responsible for the development of long-range (50 year) water supply plans for the northern Gulf Coast region. As part of the Texas regional water supply planning process, estimates of water supply, water demands, water supply needs, and water management strategies to meet water supply needs are developed for a wide variety of water user groups. To ensure that groundwater conservation districts consider the comprehensive nature of the water supply landscape during development of their management plans, consideration of the planning estimates listed above are included herein.

The estimates of projected surface water supplies are taken from the 2012 State Water Plan. Summary information on projected surface water supplies are included in Table 6 and also included in Appendix B[17]. The primary surface water supply in Montgomery County is Lake Conroe, which currently supplies 8,721 acre-feet per year, and some limited local stock tanks for livestock which is estimated to provide 510 acre-feet per year. While these numbers may be confusing to those expecting a much higher estimate for the water supplies in Lake Conroe, in the Texas regional and state water planning process, for a surface water source to be counted as a supply, all necessary permits and infrastructure must first be in place. As a result, the yield of the ongoing San Jacinto River Authority surface water project is not accounted for under "water supplies" in the planning process. .

[17] Allen, S., 2013, Estimated historical use and 2012 State Water Plan datasets: Lone Star Groundwater Conservation District: Texas Water Development Board, 18 p.

Water User Group	Source Name	2010 through 2060
Irrigation	Lake Conroe	880
Livestock	Livestock Local Supply	510
Steam Electric Power	Lake Conroe	7,841
Total		**9,231**

Table 6 – Estimates of projected surface water supplies in Montgomery County included in the 2012 State Water Plan.

Projected Water Demands in Montgomery County

Also as part of the Texas regional and state water planning process, estimates of water demands during drought conditions are developed on a decadal basis for the 50-year planning horizon. A summary of water demand projections for Montgomery County is included in Table 7 and provided in detail in Appendix B. The demographic outlook for Montgomery County is one of growth and opportunity. Recently released population projections for Montgomery County, to be utilized in the next round of regional water planning (2020 – 2070), estimates an increase in the population from 455,746 in the 2010 census to 1,946,063 in 2070, equating to a 427 percent increase in population.[18] This increase in population, along with the associated increases in industrial and other water demands, increases water demands from 83,018 acre-feet per year in 2010 to 240,475 acre-feet per year in 2060, or an approximate 290 percent increase.

	Projected Total Demand for Water					
Year	2010	2020	2030	2040	2050	2060
Montgomery County	83,018	110,901	135,888	162,727	198,439	240,475

Table 7 – Projected total water demands for Montgomery County included in the 2012 State Water Plan.

Projected Water Supply Needs in Montgomery County

During the Texas regional water planning process, after projections of water supply and water demands have ben quantified, the need for additional water supplies is determined on a water user group basis and a wholesale water supply basis. The difference in projections between demands and supplies is illustrated in Figure 7 below. Estimates of water supply needs for water user groups in Montgomery County are summarized in Table 8 below and provided in detail in Appendix B. Estimates of projected needs are from the 2012 State Water Plan. The increase in projected water supply needs in Montgomery County from 17,728 acre-feet per year in 2010 to 165,162 acre-feet per year in 2060 represents a truly remarkable increase in water supply needs in Montgomery County.

[18] Draft populations for Montgomery County from 2010 – 2070 obtained from the Texas Water Development Board Water Planning website at http://www.twdb.texas.gov/waterplanning/data/projections/2017/demandproj.asp

Projected Water Supply Needs						
Year	2010	2020	2030	2040	2050	2060
Montgomery County	-17,728	-47,619	-69,513	-81,350	-120,398	-165,162

Table 8 – Water supply needs in the 2012 State Water Plan for Montgomery County.

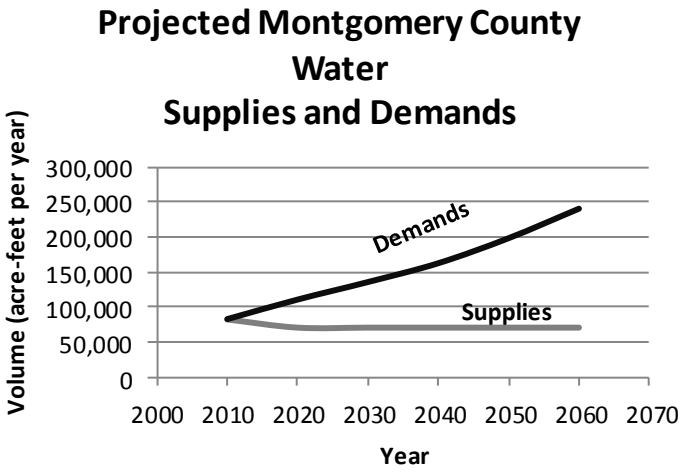

Figure 7 – Comparison of water supply demands and supplies in Montgomery County reported in the 2012 State Water Plan.

Water Management Strategies Recommended to Meet Water Supply Needs in Montgomery County

To meet the needs of water user groups in the Montgomery County, the 2012 State Water Plan includes a variety of water management strategies that, when implemented, will meet the projected water supply needs. For a complete list of water management strategies see Appendix B. Important water management strategies included in the 2012 State Water Plan for Montgomery County include water conservation, San Jacinto River Authority Water Resources Assessment Plan, wastewater reuse, the Lake Livingston/Wallisville Reservoir project, and interim expanded use of groundwater.

Actions, Procedures, Performance, and Avoidance Necessary to Effectuate the Management Plan

In order to achieve the goals, management objectives, and performance standards adopted in this management plan, the District continually works to develop, maintain, review, and update rules and procedures for the various programs and activities contained in the management plan. As a means to monitor performance, (a) the General Manager routinely meets with staff to track progress on the various goals, management objectives and performance standards adopted in this management plan, and (b) on an annual basis, the General Manager prepares and submits an annual report documenting progress made towards implementation of the management plan to the Board of Directors for their review and approval. In addition, the District's staff reviews District Rules to ensure that all provisions necessary to implement the management plan are contained in

the rules. The rules are reviewed annually and on an as needed basis. The District Board of Directors will make revisions to the rules as needed to manage and conserve groundwater resources within the District more effectively and to ensure that the duties prescribed in the Texas Water Code and other applicable laws are carried out. A copy of this management plan and the District Rules may be found on the District website at www.lonestargcd.org. The District will encourage cooperation and coordination in the implementation of this plan. All operations and activities of the District will be performed in a manner that best encourages cooperation with the appropriate state, regional, or local water entity.

Appendix A - Groundwater Conservation District Management Plan Checklist from the Texas Water Development Board

Texas Water Development Board

Groundwater Conservation District Management Plan Checklist, effective December 6, 2012

District name: ☐ Official review ☐ Pre-review

Date plan received: October 8, 2013

Reviewing staff: **Date plan reviewed:**

A management plan shall contain, unless explained as not applicable, the following elements, 31 TAC §356.52(a):

	Citation of rule	Citation of statute	Present in plan and administratively complete	Source of data	Evidence that best available data was used	Notes
Is a paper hard copy of the plan available?	31 TAC §356.53(a)(1)					Yes
Is an electronic copy of the plan available?	31 TAC §356.53(a)(2)					Yes
1. Is an estimate of the modeled available groundwater in the District based on the desired future condition established under Section 36.108 included?	31 TAC §356.52(a)(5)(A)	TWC §36.1071(e)(3)(A)				p.11-12
2. Is an estimate of the amount of groundwater being used within the District on an annual basis for at least the most recent five years included?	31 TAC §356.52(a)(5)(B); §356.10(2)	TWC §36.1071(e)(3)(B)				p.22
For sections 3-5 below, each district must use the groundwater availability modeling information provided by the TWDB in conjunction with available site-specific information provided by the district when developing the required estimates, 31 TAC §356.52(c):						
3. Is an estimate of the annual amount of recharge from precipitation, if any, to the groundwater resources within the District included?	31 TAC §356.52(a)(5)(C)	TWC §36.1071(e)(3)(C)				p.24
4. For each aquifer in the district, is an estimate of the annual volume of water that discharges from the aquifer to springs and any surface water bodies, including lakes, streams and rivers, included?	31 TAC §356.52(a)(5)(D)	TWC §36.1071(e)(3)(D)				p.24
5. Is an estimate of the annual volume of flow	31 TAC §356.52(a)(5)(E)	TWC §36.1071(e)(3)(E)				
a) into the District within each aquifer,						p.24
b) out of the District within each aquifer,						p.24
c) and between aquifers in the District,						p.24
if a groundwater availability model is available, included?						
6. Is an estimate of the projected surface water supply within the District according to the most recently adopted state water plan included?	31 TAC §356.52(a)(5)(F)	TWC §36.1071(e)(3)(F)				p.24-25, Appendix B
7. Is an estimate of the projected total demand for water within the District according to the most recently adopted state water plan included?	31 TAC §356.52(a)(5)(G)	TWC §36.1071(e)(3)(G)				p. 25, Appendix B
8. Did the District consider and include the water supply needs from the adopted state water plan?		TWC §36.1071(e)(4)				p.25-26, Appendix B
9. Did the District consider and include the water management strategies from the adopted state water plan?		TWC §36.1071(e)(4)				p.26, Appendix B
10. Did the district include details of how it will manage groundwater supplies in the district	31 TAC §356.52(a)(4)					p.5
11. Are the actions, procedures, performance, and avoidance necessary to effectuate the management plan, including specifications and proposed rules, all specified in as much detail as possible, included in the plan?		TWC §36.1071(e)(2)				p.26
12. Was evidence that the plan was adopted, after notice and hearing, included? Evidence includes the posted agenda, meeting minutes, and copies of the notice printed in the newspaper(s) and/or copies of certified receipts from the county courthouse(s).	31 TAC §356.53(a)(3)	TWC §36.1071(a)				Appendix G p. 122
13. Was evidence that, following notice and hearing, the District coordinated in the development of its management plan with regional surface water management entities?	31 TAC §356.51	TWC §36.1071(a)				Appendix H p. 129
14. Has any available site-specific information been provided by the district to the executive administrator for review and comment before being used in the management plan when developing the estimates required in subsections 31 TAC §356.52(a)(5)(C),(D), and (E) ?	31 TAC §356.52(c)	TWC §36.1071(h)				p.NA

Mark an affirmative response with YES Mark a negative response with NO
Mark a non-applicable checklist item with N/A

Management goals required to be addressed unless declared not applicable	**Management goal** (time-based and quantifiable) 31 TAC §356.51	**Methodology for tracking progress** 31TAC §356.52(a)(4)	**Management objective(s)** (specific and time-based statements of future outcomes) 31 TAC §356.52 (a)(2)	**Performance standard(s)** (measures used to evaluate the effectiveness of district activities) 31 TAC §356.52 (a)(3)	**Notes**
Providing the most efficient use of groundwater 31 TAC 356.52(a)(1)(A); TWC §36.1071(a)(1)	15)	16)	17)	18)	p.13
Controlling and preventing waste of groundwater 31 TAC 356.52(a)(1)(B); TWC §36.1071(a)(2)	19)	20)	21)	22)	p.14
Controlling and preventing subsidence 31 TAC 356.52(a)(1)(C); TWC §36.1071(a)(3)	23)	24)	25)	26)	p.15
Addressing conjunctive surface water management issues 31 TAC 356.52(a)(1)(D); TWC §36.1071(a)(4)	27)	28)	29)	30)	p.16
Addressing natural resource issues that impact the use and availability of groundwater and which are impacted by the use of groundwater 31 TAC 356.52(a)(1)(E); TWC §36.1071(a)(5)	31)	32)	33)	34)	p.17
Addressing drought conditions 31 TAC 356.52(a)(1)(F); TWC §36.1071(a)(6)	35)	36)	37)	38)	p.17
Addressing	39)	40)	41)	42)	
a) conservation,	39a)	40a)	41a)	42a)	p.18
b) recharge enhancement,	39b)	40b)	41b)	42b)	p.NA
c) rainwater harvesting,	39c)	40c)	41c)	42c)	p.18
d) precipitation enhancement, and	39d)	40d)	41d)	42d)	p.NA
e) brush control	39e)	40e)	41e)	42e)	p.NA
where appropriate and cost effective 31 TAC 356.52(a)(1)(G); TWC §36.1071(a)(7)					
Addressing the desired future conditions established under TWC §36.108. 31 TAC 356.52(a)(1)(H); TWC §36.1071(a)(8)	43)	44)	45)	46)	p.10
Does the plan identify the performance standards and management objectives for effecting the plan? 31 TAC §356.52(a)(2)&(3); TWC §36.1071(e)(1)			47)	48)	Yes

Mark required elements that are present in the plan with YES
Mark any required elements that are missing from the plan with NO
Mark plan elements that have been indicated as not applicable to the district with N/A

Appendix B - Estimated Historical Water Use and 2012 State Water Plan Datasets for Lone Star Groundwater Conservation District - Provided by the Texas Water Development Board

Estimated Historical Water Use And 2012 State Water Plan Datasets:

Lone Star Groundwater Conservation District

by Stephen Allen
Texas Water Development Board
Groundwater Resources Division
Groundwater Technical Assistance Section
stephen.allen@twdb.texas.gov
(512) 463-7317
June 25, 2013

GROUNDWATER MANAGEMENT PLAN DATA:

This package of water data reports (part 1 of a 2-part package of information) is being provided to groundwater conservation districts to help them meet the requirements for approval of their five-year groundwater management plan. Each report in the package addresses a specific numbered requirement in the Texas Water Development Board's groundwater management plan checklist. The checklist can be viewed and downloaded from this web address:

http://www.twdb.state.tx.us/groundwater/doc/GCD/GMPChecklist0113.pdf

The five reports included in part 1 are:

1. Estimated Historical Water Use (checklist Item 2)
   from the TWDB Historical Water Use Survey (WUS)
2. Projected Surface Water Supplies (checklist Item 6)
3. Projected Water Demands (checklist Item 7)
4. Projected Water Supply Needs (checklist Item 8)
5. Projected Water Management Strategies (checklist Item 9)
   reports 2-5 are from the 2012 State Water Plan (SWP)

Part 2 of the 2-part package is the groundwater availability model (GAM) report. The District should have received, or will receive, this report from the Groundwater Availability Modeling Section. Questions about the GAM can be directed to Dr. Shirley Wade, shirley.wade@twdb.texas.gov, (512) 936-0883.

DISCLAIMER:

The data presented in this report represents the most updated Historical Water Use and 2012 State Water Planning data available as of 6/25/2013. Although it does not happen frequently, neither of these datasets are static and are subject to change pending the availability of more accurate data (Historical Water Use data) or an amendment to the 2012 State Water Plan (2012 State Water Planning data). District personnel must review these datasets and correct any discrepancies in order to ensure approval of their groundwater management plan.

The Historical Water Use dataset can be verified at this web address:

http://www.twdb.texas.gov/waterplanning/waterusesurvey/estimates/

The 2012 State Water Planning dataset can be verified by contacting Wendy Barron (wendy.barron@twdb.texas.gov or 512-936-0886).

For additional questions regarding this data, please contact Stephen Allen (stephen.allen@twdb.texas.gov or 512-463-7317) or Rima Petrossian (rima.petrossian@twdb.texas.gov or 512-936-2420).

Estimated Historical Water Use
TWDB Historical Water Use Survey (WUS) Data

Groundwater and surface water historical use estimates are currently unavailable for calendar years 2005, 2011 and 2012. TWDB staff anticipates the calculation and posting of these estimates at a later date.

MONTGOMERY COUNTY

All values are in acre-feet/year

Year	Source	Municipal	Manufacturing	Steam Electric	Irrigation	Mining	Livestock	Total
1974	GW	7,759	1,659	0	0	552	58	10,028
	SW	0	0	2,609	0	0	500	3,109
1980	GW	18,039	1,188	810	0	652	139	20,828
	SW	98	0	5,231	0	0	179	5,508
1984	GW	22,455	1,547	812	13	2,533	201	27,561
	SW	201	1	3,595	0	13	302	4,112
1985	GW	22,989	1,391	810	50	347	166	25,753
	SW	138	2	4,500	0	13	249	4,902
1986	GW	24,086	1,346	810	50	396	151	26,839
	SW	215	2	3,410	0	7	227	3,861
1987	GW	22,148	1,161	810	50	452	158	24,779
	SW	2	3	3,473	0	6	237	3,721
1988	GW	26,779	1,152	812	50	435	177	29,405
	SW	155	1	5,996	0	5	266	6,423
1989	GW	26,564	1,072	808	19	61	155	28,679
	SW	223	2	4,198	0	6	232	4,661
1990	GW	26,630	1,327	0	20	61	160	28,198
	SW	221	3	5,921	0	6	241	6,392
1991	GW	25,653	1,548	810	20	383	163	28,577
	SW	224	14	3,792	0	6	244	4,280
1992	GW	26,106	2,065	810	20	204	168	29,373
	SW	224	13	3,312	0	6	252	3,807
1993	GW	31,004	1,976	810	0	204	163	34,157
	SW	224	0	3,177	0	6	244	3,651
1994	GW	33,756	1,784	810	0	319	179	36,848
	SW	197	0	3,088	0	6	268	3,559
1995	GW	35,852	1,647	810	0	330	192	38,831
	SW	235	0	4,932	0	11	288	5,466
1996	GW	38,430	1,375	816	0	330	159	41,110
	SW	0	0	4,170	0	11	238	4,419
1997	GW	37,978	1,661	810	0	313	163	40,925
	SW	13	0	3,222	0	11	244	3,490
1998	GW	45,457	1,458	810	0	266	206	48,197
	SW	228	0	3,447	0	11	309	3,995
1999	GW	49,982	1,612	810	0	266	234	52,904
	SW	162	0	3,358	0	11	350	3,881
2000	GW	52,333	1,587	810	66	403	204	55,403
	SW	0	0	1,697	0	11	306	2,014
2001	GW	50,508	1,952	481	66	389	197	53,593
	SW	287	0	1,915	0	14	296	2,512

2002	GW	68,168	715	667	66	65	198	69,879
	SW	277	0	2,652	0	2	297	3,228
2003	GW	53,822	1,388	390	50	67	212	55,929
	SW	135	0	1,551	311	2	318	2,317
2004	GW	53,042	1,409	84	50	68	212	54,865
	SW	161	0	334	138	2	317	952
2006	GW	61,775	1,383	727	0	4	434	64,323
	SW	155	66	2,316	536	0	23	3,096
2007	GW	70,919	1,443	657	244	3	546	73,812
	SW	156	341	1,752	156	0	29	2,434
2008	GW	66,077	1,779	620	186	3	499	69,164
	SW	155	51	2,235	551	0	26	3,018
2009	GW	70,130	1,694	2	129	387	499	72,841
	SW	395	43	3,343	571	413	26	4,791
2010	GW	76,444	1,745	3	467	392	603	79,654
	SW	0	51	3,255	583	419	32	4,340

Projected Surface Water Supplies
TWDB 2012 State Water Plan Data

MONTGOMERY COUNTY All values are in acre-feet/year

RWPG	WUG	WUG Basin	Source Name	2010	2020	2030	2040	2050	2060
H	IRRIGATION	SAN JACINTO	CONROE LAKE/RESERVOIR	880	880	880	880	880	880
H	LIVESTOCK	SAN JACINTO	LIVESTOCK LOCAL SUPPLY	510	510	510	510	510	510
H	STEAM ELECTRIC POWER	SAN JACINTO	CONROE LAKE/RESERVOIR	7,841	7,841	7,841	7,841	7,841	7,841
	Sum of Projected Surface Water Supplies (acre-feet/year)			**9,231**	**9,231**	**9,231**	**9,231**	**9,231**	**9,231**

Projected Water Demands
TWDB 2012 State Water Plan Data

Please note that the demand numbers presented here include the plumbing code savings found in the Regional and State Water Plans.

MONTGOMERY COUNTY

All values are in acre-feet/year

RWPG	WUG	WUG Basin	2010	2020	2030	2040	2050	2060
H	CONROE	SAN JACINTO	11,262	14,588	18,512	22,987	28,860	35,846
H	CUT AND SHOOT	SAN JACINTO	210	235	285	348	430	529
H	MAGNOLIA	SAN JACINTO	439	604	800	1,015	1,302	1,643
H	PANORAMA VILLAGE	SAN JACINTO	654	682	710	743	776	811
H	PATTON VILLAGE	SAN JACINTO	87	88	101	115	136	165
H	ROMAN FOREST	SAN JACINTO	544	839	1,192	1,568	2,073	2,677
H	SHENANDOAH	SAN JACINTO	1,746	2,024	2,358	2,721	3,205	3,792
H	THE WOODLANDS	SAN JACINTO	14,671	26,596	28,330	28,197	28,063	28,063
H	WILLIS	SAN JACINTO	568	649	816	1,024	1,296	1,626
H	WOODBRANCH	SAN JACINTO	183	202	225	249	284	330
H	COUNTY-OTHER	SAN JACINTO	22,913	27,163	38,401	51,881	71,391	94,064
H	MANUFACTURING	SAN JACINTO	2,045	2,332	2,608	2,883	3,126	3,392
H	STEAM ELECTRIC POWER	SAN JACINTO	5,046	8,537	9,981	11,741	13,886	16,502
H	MINING	SAN JACINTO	480	509	526	543	559	573
H	IRRIGATION	SAN JACINTO	66	66	66	66	66	66
H	LIVESTOCK	SAN JACINTO	510	510	510	510	510	510
H	CONSUMERS WATER INC	SAN JACINTO	222	243	305	371	470	583
H	CRYSTAL SPRNGS WATER COMPANY	SAN JACINTO	606	704	933	1,208	1,586	2,026
H	EAST PLANTATION UD	SAN JACINTO	471	551	734	952	1,244	1,584
H	MONTGOMERY COUNTY MUD #18	SAN JACINTO	1,871	2,377	3,518	4,869	6,653	8,726
H	MONTGOMERY COUNTY MUD #8	SAN JACINTO	842	1,095	1,325	1,397	1,381	1,369
H	MONTGOMERY COUNTY MUD #9	SAN JACINTO	796	1,074	1,369	1,504	1,526	1,541
H	MONTGOMERY COUNTY UD #3	SAN JACINTO	485	504	560	629	728	849
H	MONTGOMERY COUNTY UD #4	SAN JACINTO	981	970	958	947	947	947
H	NEW CANEY MUD	SAN JACINTO	1,460	1,647	2,156	2,708	3,507	4,436
H	PORTER WSC	SAN JACINTO	1,944	2,156	2,697	3,347	3,317	3,317
H	RAYFORD ROAD MUD	SAN JACINTO	2,309	2,288	2,268	2,268	2,268	2,268
H	SOUTHWEST UTILITIES	SAN JACINTO	254	281	352	432	542	675
H	SPRING CREEK UD	SAN JACINTO	537	612	800	1,025	1,335	1,696
H	STANLEY LAKE MUD	SAN JACINTO	744	904	898	892	892	892
H	MONTGOMERY	SAN JACINTO	249	1,019	1,497	1,970	2,442	2,927
H	STAGECOACH	SAN JACINTO	79	106	144	194	265	365
H	OAK RIDGE NORTH	SAN JACINTO	683	748	897	1,067	1,297	1,573
H	MONTGOMERY COUNTY MUD #19	SAN JACINTO	459	452	448	444	444	444
H	MONTGOMERY COUNTY UD #2	SAN JACINTO	559	552	545	538	538	538
H	POINT AQUARIUS MUD	SAN JACINTO	734	908	1,303	1,762	2,377	3,092
H	HOUSTON	SAN JACINTO	190	253	375	516	704	926
H	SPLENDORA	SAN JACINTO	188	224	297	383	502	640

H	H M W SUD	SAN JACINTO	1,696	1,864	2,282	2,768	3,434	4,208
H	MONTGOMERY COUNTY WCID #1	SAN JACINTO	499	519	577	651	756	885
H	RIVER PLANTATION MUD	SAN JACINTO	835	824	812	801	798	798
H	SOUTHERN MONTGOMERY COUNTY MUD	SAN JACINTO	1,901	2,402	2,417	2,493	2,523	2,581
	Sum of Projected Water Demands (acre-feet/year)		**83,018**	**110,901**	**135,888**	**162,727**	**198,439**	**240,475**

Projected Water Supply Needs
TWDB 2012 State Water Plan Data

Negative values (in red) reflect a projected water supply need, positive values a surplus.

MONTGOMERY COUNTY

All values are in acre-feet/year

RWPG	WUG	WUG Basin	2010	2020	2030	2040	2050	2060
H	CONROE	SAN JACINTO	-2,584	-6,181	-9,761	-10,193	-16,483	-23,761
H	CONSUMERS WATER INC	SAN JACINTO	-51	-103	-161	-226	-319	-430
H	COUNTY-OTHER	SAN JACINTO	-5,261	-11,516	-20,786	-33,264	-50,557	-71,563
H	CRYSTAL SPRNGS WATER COMPANY	SAN JACINTO	-139	-299	-495	-743	-1,122	-1,564
H	CUT AND SHOOT	SAN JACINTO	-48	-99	-150	-149	-236	-338
H	EAST PLANTATION UD	SAN JACINTO	-108	-234	-385	-418	-720	-1,070
H	H M W SUD	SAN JACINTO	-390	-790	-1,200	-1,186	-1,888	-2,692
H	HOUSTON	SAN JACINTO	-12	-75	-197	-338	-526	-748
H	IRRIGATION	SAN JACINTO	865	852	845	840	835	832
H	LIVESTOCK	SAN JACINTO	393	293	239	199	161	132
H	MAGNOLIA	SAN JACINTO	-101	-266	-463	-678	-966	-1,308
H	MANUFACTURING	SAN JACINTO	-469	-988	-1,384	-1,756	-2,129	-2,504
H	MINING	SAN JACINTO	-110	-216	-279	-331	-382	-425
H	MONTGOMERY	SAN JACINTO	-57	-827	-1,306	-1,779	-1,931	-2,450
H	MONTGOMERY COUNTY MUD #18	SAN JACINTO	-430	-1,007	-2,080	-2,551	-4,352	-6,446
H	MONTGOMERY COUNTY MUD #19	SAN JACINTO	-105	-192	-236	-190	-245	-285
H	MONTGOMERY COUNTY MUD #8	SAN JACINTO	-193	-464	-703	-692	-827	-927
H	MONTGOMERY COUNTY MUD #9	SAN JACINTO	-182	-461	-757	-743	-912	-1,042
H	MONTGOMERY COUNTY UD #2	SAN JACINTO	-128	-234	-289	-328	-367	-399
H	MONTGOMERY COUNTY UD #3	SAN JACINTO	-111	-214	-297	-270	-401	-544
H	MONTGOMERY COUNTY UD #4	SAN JACINTO	-225	-411	-509	-407	-523	-610
H	MONTGOMERY COUNTY WCID #1	SAN JACINTO	-114	-220	-306	-397	-515	-653
H	NEW CANEY MUD	SAN JACINTO	-335	-699	-1,144	-1,648	-2,389	-3,321
H	OAK RIDGE NORTH	SAN JACINTO	-156	-317	-471	-456	-714	-1,005
H	PANORAMA VILLAGE	SAN JACINTO	-150	-289	-373	-318	-427	-520
H	PATTON VILLAGE	SAN JACINTO	-20	-37	-53	-70	-92	-122
H	POINT AQUARIUS MUD	SAN JACINTO	-168	-385	-739	-1,198	-1,815	-2,532
H	PORTER WSC	SAN JACINTO	-446	-914	-1,431	-2,038	-2,257	-2,449
H	RAYFORD ROAD MUD	SAN JACINTO	-530	-971	-1,194	-975	-1,254	-1,460
H	RIVER PLANTATION MUD	SAN JACINTO	-191	-349	-432	-489	-545	-592
H	ROMAN FOREST	SAN JACINTO	-125	-421	-774	-1,151	-1,657	-2,262
H	SHENANDOAH	SAN JACINTO	-401	-858	-1,239	-1,164	-1,761	-2,426
H	SOUTHERN MONTGOMERY COUNTY MUD	SAN JACINTO	-436	-1,018	-1,271	-1,069	-1,391	-1,657
H	SOUTHWEST UTILITIES	SAN JACINTO	-58	-119	-187	-263	-368	-497
H	SPLENDORA	SAN JACINTO	-43	-95	-157	-239	-358	-496
H	SPRING CREEK UD	SAN JACINTO	-123	-260	-420	-438	-750	-1,120
H	STAGECOACH	SAN JACINTO	-18	-45	-83	-133	-204	-305

H	STANLEY LAKE MUD	SAN JACINTO	-170	-383	-477	-382	-492	-574
H	STEAM ELECTRIC POWER	SAN JACINTO	6,683	3,189	1,739	-27	-2,181	-4,809
H	THE WOODLANDS	SAN JACINTO	-3,368	-15,302	-16,776	-12,063	-15,437	-17,975
H	WILLIS	SAN JACINTO	-130	-275	-429	-438	-712	-1,038
H	WOODBRANCH	SAN JACINTO	-42	-85	-119	-152	-193	-243
	Sum of Projected Water Supply Needs (acre-feet/year)		**-17,728**	**-47,619**	**-69,513**	**-81,350**	**-120,398**	**-165,162**

Projected Water Management Strategies
TWDB 2012 State Water Plan Data

MONTGOMERY COUNTY

WUG, Basin (RWPG) — All values are in acre-feet/year

Water Management Strategy	Source Name [Origin]	2010	2020	2030	2040	2050	2060
CONROE, SAN JACINTO (H)							
EXPANDED USE OF GW	GULF COAST AQUIFER [MONTGOMERY]	0	0	37	359	626	858
INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	1,870	0	0	0	0	0
MUNICIPAL CONSERVATION - LARGE WUG	CONSERVATION [MONTGOMERY]	714	925	1,174	1,457	1,830	2,273
SJRA TO WUG CONTRACT	LIVINGSTON-WALLISVILLE LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	2,165	9,786	17,812
SJRA WRAP	GULF COAST AQUIFER [MONTGOMERY]	0	-7,593	-8,219	-9,004	-9,249	-9,456
SJRA WRAP PARTICIPATION	CONROE LAKE/RESERVOIR [RESERVOIR]	0	12,849	16,769	15,216	13,490	12,274
CONSUMERS WATER INC, SAN JACINTO (H)							
INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	38	0	0	0	0	0
MUNICIPAL CONSERVATION - MEDIUM WUG	CONSERVATION [MONTGOMERY]	13	14	18	22	28	35
SJRA WRAP PARTICIPATION	GULF COAST AQUIFER [MONTGOMERY]	0	89	143	204	291	395
COUNTY-OTHER, SAN JACINTO (H)							
EXPANDED USE OF GW	GULF COAST AQUIFER [MONTGOMERY]	0	0	406	2,740	5,360	7,371
INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	3,989	0	0	0	0	0
MUNICIPAL CONSERVATION - SMALL WUG	CONSERVATION [MONTGOMERY]	1,272	1,508	2,131	2,879	3,962	5,221
SJRA TO WUG CONTRACT	LIVINGSTON-WALLISVILLE LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	537	8,580	25,585
SJRA WRAP PARTICIPATION	CONROE LAKE/RESERVOIR [RESERVOIR]	0	0	375	4,087	12,079	17,836
SJRA WRAP PARTICIPATION	GULF COAST AQUIFER [MONTGOMERY]	0	10,308	16,122	19,183	13,789	5,335
WASTEWATER RECLAMATION FOR MUN. IRRIGATION	DIRECT REUSE [MONTGOMERY]	0	0	1,752	3,838	6,787	10,215
CRYSTAL SPRNGS WATER COMPANY, SAN JACINTO (H)							
EXPANDED USE OF GW	GULF COAST AQUIFER [MONTGOMERY]	0	0	0	8	45	72
INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	103	0	0	0	0	0
MUNICIPAL CONSERVATION - MEDIUM WUG	CONSERVATION [MONTGOMERY]	36	42	56	72	95	121

SJRA WRAP PARTICIPATION	GULF COAST AQUIFER [MONTGOMERY]	0	257	439	663	982	1,371

CUT AND SHOOT, SAN JACINTO (H)

INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	36	0	0	0	0	0
MUNICIPAL CONSERVATION - SMALL WUG	CONSERVATION [MONTGOMERY]	12	13	16	19	24	29
SJRA TO WUG CONTRACT	LIVINGSTON-WALLISVILLE LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	33	147	265
SJRA WRAP	GULF COAST AQUIFER [MONTGOMERY]	0	0	-127	-136	-138	-139
SJRA WRAP PARTICIPATION	CONROE LAKE/RESERVOIR [RESERVOIR]	0	0	261	233	203	183
SJRA WRAP PARTICIPATION	GULF COAST AQUIFER [MONTGOMERY]	0	86	0	0	0	0

EAST PLANTATION UD, SAN JACINTO (H)

EXPANDED USE OF GW	GULF COAST AQUIFER [MONTGOMERY]	0	0	0	11	38	59
INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	82	0	0	0	0	0
MUNICIPAL CONSERVATION - SMALL WUG	CONSERVATION [MONTGOMERY]	26	31	41	53	69	88
SJRA TO WUG CONTRACT	LIVINGSTON-WALLISVILLE LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	91	426	794
SJRA WRAP	GULF COAST AQUIFER [MONTGOMERY]	0	0	-326	-372	-399	-418
SJRA WRAP PARTICIPATION	CONROE LAKE/RESERVOIR [RESERVOIR]	0	0	670	635	586	547
SJRA WRAP PARTICIPATION	GULF COAST AQUIFER [MONTGOMERY]	0	203	0	0	0	0

H M W SUD, SAN JACINTO (H)

INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	282	0	0	0	0	0
MUNICIPAL CONSERVATION - LARGE WUG	CONSERVATION [MONTGOMERY]	108	118	145	175	218	267
SJRA TO WUG CONTRACT	LIVINGSTON-WALLISVILLE LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	261	1,164	2,091
SJRA WRAP	GULF COAST AQUIFER [MONTGOMERY]	0	0	-1,012	-1,083	-1,099	-1,107
SJRA WRAP PARTICIPATION	CONROE LAKE/RESERVOIR [RESERVOIR]	0	0	2,067	1,833	1,605	1,441
SJRA WRAP PARTICIPATION	GULF COAST AQUIFER [MONTGOMERY]	0	672	0	0	0	0

HOUSTON, SAN JACINTO (H)

EXPANDED USE OF GW	GULF COAST AQUIFER [MONTGOMERY]	0	62	173	305	481	689
MUNICIPAL CONSERVATION - LARGE WUG	CONSERVATION [MONTGOMERY]	12	13	24	33	45	59

MAGNOLIA, SAN JACINTO (H)

EXPANDED USE OF GW	GULF COAST AQUIFER [MONTGOMERY]	0	11	39	61	82	99
INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	77	0	0	0	0	0
MUNICIPAL CONSERVATION - SMALL WUG	CONSERVATION [MONTGOMERY]	24	34	44	56	72	91
SJRA WRAP PARTICIPATION	GULF COAST AQUIFER [MONTGOMERY]	0	221	380	561	812	1,118

MANUFACTURING, SAN JACINTO (H)

INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	469	0	0	0	0	0
SJRA WRAP PARTICIPATION	GULF COAST AQUIFER [MONTGOMERY]	0	988	1,384	1,756	2,129	2,504

MINING, SAN JACINTO (H)

INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	110	0	0	0	0	0
SJRA WRAP PARTICIPATION	GULF COAST AQUIFER [MONTGOMERY]	0	216	279	331	382	425

MONTGOMERY, SAN JACINTO (H)

EXPANDED USE OF GW	GULF COAST AQUIFER [MONTGOMERY]	0	396	513	583	596	587
INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	43	0	0	0	0	0
MUNICIPAL CONSERVATION - SMALL WUG	CONSERVATION [MONTGOMERY]	14	57	83	109	136	162
SJRA TO WUG CONTRACT	LIVINGSTON-WALLISVILLE LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	0	835	1,467
SJRA WRAP	GULF COAST AQUIFER [MONTGOMERY]	0	0	0	0	-787	-777
SJRA WRAP PARTICIPATION	CONROE LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	1,151	1,011
SJRA WRAP PARTICIPATION	GULF COAST AQUIFER [MONTGOMERY]	0	374	710	1,087	0	0

MONTGOMERY COUNTY MUD #18, SAN JACINTO (H)

EXPANDED USE OF GW	GULF COAST AQUIFER [MONTGOMERY]	0	0	215	473	704	880
INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	318	0	0	0	0	0
MUNICIPAL CONSERVATION - MEDIUM WUG	CONSERVATION [MONTGOMERY]	112	142	210	290	397	520
SJRA TO WUG CONTRACT	LIVINGSTON-WALLISVILLE LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	461	2,265	4,354
SJRA WRAP	GULF COAST AQUIFER [MONTGOMERY]	0	0	0	-1,909	-2,136	-2,308
SJRA WRAP PARTICIPATION	CONROE LAKE/RESERVOIR [RESERVOIR]	0	0	0	3,236	3,122	3,000
SJRA WRAP PARTICIPATION	GULF COAST AQUIFER [MONTGOMERY]	0	865	1,655	0	0	0

MONTGOMERY COUNTY MUD #19, SAN JACINTO (H)

INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	80	0	0	0	0	0
MUNICIPAL CONSERVATION - SMALL WUG	CONSERVATION [MONTGOMERY]	25	25	25	25	25	25

SJRA TO WUG CONTRACT	LIVINGSTON-WALLISVILLE LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	42	152	222
SJRA WRAP	GULF COAST AQUIFER [MONTGOMERY]	0	0	-199	-173	-141	-115
SJRA WRAP PARTICIPATION	CONROE LAKE/RESERVOIR [RESERVOIR]	0	0	410	296	209	153
SJRA WRAP PARTICIPATION	GULF COAST AQUIFER [MONTGOMERY]	0	167	0	0	0	0

MONTGOMERY COUNTY MUD #8, SAN JACINTO (H)

INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	143	0	0	0	0	0
MONTGOMERY MUD 8/9 INDIRECT REUSE	INDIRECT REUSE [MONTGOMERY]	0	332	401	534	534	534
MUNICIPAL CONSERVATION - MEDIUM WUG	CONSERVATION [MONTGOMERY]	50	65	79	83	82	82
SJRA TO WUG CONTRACT	LIVINGSTON-WALLISVILLE LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	149	361	493
SJRA WRAP	GULF COAST AQUIFER [MONTGOMERY]	0	0	0	-546	-441	-358
SJRA WRAP PARTICIPATION	CONROE LAKE/RESERVOIR [RESERVOIR]	0	51	63	583	407	295
SJRA WRAP PARTICIPATION	GULF COAST AQUIFER [MONTGOMERY]	0	16	160	0	0	0

MONTGOMERY COUNTY MUD #9, SAN JACINTO (H)

EXPANDED USE OF GW	GULF COAST AQUIFER [MONTGOMERY]	0	6	31	0	0	0
INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	138	0	0	0	0	0
MONTGOMERY MUD 8/9 INDIRECT REUSE	INDIRECT REUSE [MONTGOMERY]	0	325	415	586	586	586
MUNICIPAL CONSERVATION - SMALL WUG	CONSERVATION [MONTGOMERY]	44	60	76	83	85	86
SJRA TO WUG CONTRACT	LIVINGSTON-WALLISVILLE LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	160	400	558
SJRA WRAP	GULF COAST AQUIFER [MONTGOMERY]	0	0	0	-589	-488	-404
SJRA WRAP PARTICIPATION	CONROE LAKE/RESERVOIR [RESERVOIR]	0	51	64	633	453	335
SJRA WRAP PARTICIPATION	GULF COAST AQUIFER [MONTGOMERY]	0	19	171	0	0	0

MONTGOMERY COUNTY UD #2, SAN JACINTO (H)

INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	97	0	0	0	0	0
MUNICIPAL CONSERVATION - SMALL WUG	CONSERVATION [MONTGOMERY]	31	31	30	30	30	30
SJRA WRAP PARTICIPATION	GULF COAST AQUIFER [MONTGOMERY]	0	203	259	298	337	369

MONTGOMERY COUNTY UD #3, SAN JACINTO (H)

INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	82	0	0	0	0	0

MUNICIPAL CONSERVATION - MEDIUM WUG	CONSERVATION [MONTGOMERY]	29	30	33	37	43	51
SJRA TO WUG CONTRACT	LIVINGSTON-WALLISVILLE LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	60	248	423
SJRA WRAP	GULF COAST AQUIFER [MONTGOMERY]	0	0	0	-245	-232	-222
SJRA WRAP PARTICIPATION	CONROE LAKE/RESERVOIR [RESERVOIR]	0	0	0	418	342	292
SJRA WRAP PARTICIPATION	GULF COAST AQUIFER [MONTGOMERY]	0	184	264	0	0	0

MONTGOMERY COUNTY UD #4, SAN JACINTO (H)

INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	167	0	0	0	0	0
MUNICIPAL CONSERVATION - MEDIUM WUG	CONSERVATION [MONTGOMERY]	58	58	57	56	56	56
SJRA TO WUG CONTRACT	LIVINGSTON-WALLISVILLE LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	90	322	473
SJRA WRAP	GULF COAST AQUIFER [MONTGOMERY]	0	0	0	-369	-300	-245
SJRA WRAP PARTICIPATION	CONROE LAKE/RESERVOIR [RESERVOIR]	0	0	0	630	445	326
SJRA WRAP PARTICIPATION	GULF COAST AQUIFER [MONTGOMERY]	0	353	452	0	0	0

MONTGOMERY COUNTY WCID #1, SAN JACINTO (H)

INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	84	0	0	0	0	0
MUNICIPAL CONSERVATION - MEDIUM WUG	CONSERVATION [MONTGOMERY]	30	31	34	39	45	53
SJRA WRAP PARTICIPATION	GULF COAST AQUIFER [MONTGOMERY]	0	189	272	358	470	600

NEW CANEY MUD, SAN JACINTO (H)

EXPANDED USE OF GW	GULF COAST AQUIFER [MONTGOMERY]	0	0	0	0	5	55
INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	266	0	0	0	0	0
MUNICIPAL CONSERVATION	CONSERVATION [MONTGOMERY]	69	153	200	252	326	412
SJRA WRAP PARTICIPATION	GULF COAST AQUIFER [MONTGOMERY]	0	546	944	1,396	2,058	2,854

OAK RIDGE NORTH, SAN JACINTO (H)

INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	115	0	0	0	0	0
MUNICIPAL CONSERVATION - MEDIUM WUG	CONSERVATION [MONTGOMERY]	41	45	53	64	77	94
SJRA TO WUG CONTRACT	LIVINGSTON-WALLISVILLE LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	101	442	784
SJRA WRAP	GULF COAST AQUIFER [MONTGOMERY]	0	0	-398	-418	-414	-414
SJRA WRAP PARTICIPATION	CONROE LAKE/RESERVOIR [RESERVOIR]	0	0	816	709	609	541

SJRA WRAP PARTICIPATION	GULF COAST AQUIFER [MONTGOMERY]	0	272	0	0	0	0

PANORAMA VILLAGE, SAN JACINTO (H)

INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	114	0	0	0	0	0
MUNICIPAL CONSERVATION - SMALL WUG	CONSERVATION [MONTGOMERY]	36	38	39	41	43	45
SJRA TO WUG CONTRACT	LIVINGSTON-WALLISVILLE LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	71	265	406
SJRA WRAP	GULF COAST AQUIFER [MONTGOMERY]	0	0	-315	-290	-247	-211
SJRA WRAP PARTICIPATION	CONROE LAKE/RESERVOIR [RESERVOIR]	0	0	649	496	366	280
SJRA WRAP PARTICIPATION	GULF COAST AQUIFER [MONTGOMERY]	0	251	0	0	0	0

PATTON VILLAGE, SAN JACINTO (H)

INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	15	0	0	0	0	0
MUNICIPAL CONSERVATION - SMALL WUG	CONSERVATION [MONTGOMERY]	5	5	6	6	8	9
SJRA WRAP PARTICIPATION	GULF COAST AQUIFER [MONTGOMERY]	0	32	47	64	84	113

POINT AQUARIUS MUD, SAN JACINTO (H)

EXPANDED USE OF GW	GULF COAST AQUIFER [MONTGOMERY]	0	0	48	127	201	257
INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	124	0	0	0	0	0
MUNICIPAL CONSERVATION - MEDIUM WUG	CONSERVATION [MONTGOMERY]	44	54	78	105	142	184
SJRA WRAP PARTICIPATION	GULF COAST AQUIFER [MONTGOMERY]	0	331	613	966	1,472	2,091

PORTER WSC, SAN JACINTO (H)

INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	323	0	0	0	0	0
MUNICIPAL CONSERVATION - LARGE WUG	CONSERVATION [MONTGOMERY]	123	137	171	212	210	210
SJRA WRAP PARTICIPATION	GULF COAST AQUIFER [MONTGOMERY]	0	777	1,260	1,826	2,047	2,239

RAYFORD ROAD MUD, SAN JACINTO (H)

INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	384	0	0	0	0	0
MUNICIPAL CONSERVATION - LARGE WUG	CONSERVATION [MONTGOMERY]	146	145	144	144	144	144
SJRA TO WUG CONTRACT	LIVINGSTON-WALLISVILLE LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	214	769	1,127
SJRA WRAP	GULF COAST AQUIFER [MONTGOMERY]	0	0	-1,005	-884	-719	-587
SJRA WRAP PARTICIPATION	CONROE LAKE/RESERVOIR [RESERVOIR]	0	0	2,055	1,501	1,060	776
SJRA WRAP PARTICIPATION	GULF COAST AQUIFER [MONTGOMERY]	0	826	0	0	0	0

RIVER PLANTATION MUD, SAN JACINTO (H)

EXPANDED USE OF GW	GULF COAST AQUIFER [MONTGOMERY]	0	0	16	0	0	0
INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	141	0	0	0	0	0
MUNICIPAL CONSERVATION - MEDIUM WUG	CONSERVATION [MONTGOMERY]	50	49	48	48	48	48
RIVER PLANTATION GRP (REUSE)	DIRECT REUSE [MONTGOMERY]	168	368	368	368	368	368
SJRA TO WUG CONTRACT	LIVINGSTON-WALLISVILLE LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	76	272	398

ROMAN FOREST, SAN JACINTO (H)

EXPANDED USE OF GW	GULF COAST AQUIFER [MONTGOMERY]	0	65	142	198	250	293
INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	93	0	0	0	0	0
MUNICIPAL CONSERVATION - MEDIUM WUG	CONSERVATION [MONTGOMERY]	32	50	71	93	124	160
SJRA WRAP PARTICIPATION	GULF COAST AQUIFER [MONTGOMERY]	0	306	561	860	1,283	1,809

SHENANDOAH, SAN JACINTO (H)

INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	297	0	0	0	0	0
MUNICIPAL CONSERVATION - MEDIUM WUG	CONSERVATION [MONTGOMERY]	104	121	141	162	191	226
SJRA TO WUG CONTRACT	LIVINGSTON-WALLISVILLE LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	258	1,091	1,892
SJRA WRAP	GULF COAST AQUIFER [MONTGOMERY]	0	0	-1,046	-1,064	-1,025	-996
SJRA WRAP PARTICIPATION	CONROE LAKE/RESERVOIR [RESERVOIR]	0	0	2,144	1,808	1,504	1,304
SJRA WRAP PARTICIPATION	GULF COAST AQUIFER [MONTGOMERY]	0	737	0	0	0	0

SOUTHERN MONTGOMERY COUNTY MUD, SAN JACINTO (H)

INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	315	0	0	0	0	0
MUNICIPAL CONSERVATION - LARGE WUG	CONSERVATION [MONTGOMERY]	121	152	153	158	160	164
SJRA TO WUG CONTRACT	LIVINGSTON-WALLISVILLE LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	235	856	1,282
SJRA WRAP	GULF COAST AQUIFER [MONTGOMERY]	0	0	-1,072	-974	-804	-673
SJRA WRAP PARTICIPATION	CONROE LAKE/RESERVOIR [RESERVOIR]	0	0	2,190	1,650	1,179	884
SJRA WRAP PARTICIPATION	GULF COAST AQUIFER [MONTGOMERY]	0	866	0	0	0	0

SOUTHWEST UTILITIES, SAN JACINTO (H)

INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	43	0	0	0	0	0
MUNICIPAL CONSERVATION - MEDIUM WUG	CONSERVATION [MONTGOMERY]	15	17	21	26	32	40
SJRA WRAP PARTICIPATION	GULF COAST AQUIFER [MONTGOMERY]	0	102	166	237	336	457

SPLENDORA, SAN JACINTO (H)							
EXPANDED USE OF GW	GULF COAST AQUIFER [MONTGOMERY]	0	0	0	6	17	25
INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	33	0	0	0	0	0
MUNICIPAL CONSERVATION - SMALL WUG	CONSERVATION [MONTGOMERY]	10	12	16	21	28	36
SJRA WRAP PARTICIPATION	GULF COAST AQUIFER [MONTGOMERY]	0	83	141	212	313	435
SPRING CREEK UD, SAN JACINTO (H)							
EXPANDED USE OF GW	GULF COAST AQUIFER [MONTGOMERY]	0	0	0	0	17	37
INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	91	0	0	0	0	0
MUNICIPAL CONSERVATION - MEDIUM WUG	CONSERVATION [MONTGOMERY]	32	36	48	61	80	101
SJRA TO WUG CONTRACT	LIVINGSTON-WALLISVILLE LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	97	455	846
SJRA WRAP	GULF COAST AQUIFER [MONTGOMERY]	0	0	-355	-401	-428	-447
SJRA WRAP PARTICIPATION	CONROE LAKE/RESERVOIR [RESERVOIR]	0	0	727	681	626	583
SJRA WRAP PARTICIPATION	GULF COAST AQUIFER [MONTGOMERY]	0	224	0	0	0	0
STAGECOACH, SAN JACINTO (H)							
EXPANDED USE OF GW	GULF COAST AQUIFER [MONTGOMERY]	0	0	7	15	24	36
INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	14	0	0	0	0	0
MUNICIPAL CONSERVATION - SMALL WUG	CONSERVATION [MONTGOMERY]	4	6	8	11	15	20
SJRA WRAP PARTICIPATION	GULF COAST AQUIFER [MONTGOMERY]	0	39	68	107	165	249
STANLEY LAKE MUD, SAN JACINTO (H)							
INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	126	0	0	0	0	0
MUNICIPAL CONSERVATION - MEDIUM WUG	CONSERVATION [MONTGOMERY]	44	54	54	53	53	53
SJRA TO WUG CONTRACT	LIVINGSTON-WALLISVILLE LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	84	304	445
SJRA WRAP	GULF COAST AQUIFER [MONTGOMERY]	0	0	0	-348	-284	-231
SJRA WRAP PARTICIPATION	CONROE LAKE/RESERVOIR [RESERVOIR]	0	0	0	593	419	307
SJRA WRAP PARTICIPATION	GULF COAST AQUIFER [MONTGOMERY]	0	329	423	0	0	0
STEAM ELECTRIC POWER, SAN JACINTO (H)							
EXPANDED USE OF GW	GULF COAST AQUIFER [MONTGOMERY]	0	1,037	811	728	588	502
SJRA WRAP PARTICIPATION	GULF COAST AQUIFER [MONTGOMERY]	0	0	0	0	1,593	4,307
THE WOODLANDS, SAN JACINTO (H)							

EXPANDED USE OF GW	GULF COAST AQUIFER [MONTGOMERY]	0	4,038	2,033	0	0	0
INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	2,438	0	0	0	0	0
MUNICIPAL CONSERVATION - LARGE WUG	CONSERVATION [MONTGOMERY]	930	1,686	1,796	1,788	1,779	1,779
SJRA TO WUG CONTRACT	LIVINGSTON-WALLISVILLE LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	2,653	9,514	13,948
SJRA WRAP	GULF COAST AQUIFER [MONTGOMERY]	0	-13,848	-12,584	-11,041	-8,974	-7,359
SJRA WRAP PARTICIPATION	CONROE LAKE/RESERVOIR [RESERVOIR]	0	23,426	25,536	18,663	13,118	9,607
WILLIS, SAN JACINTO (H)							
INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	96	0	0	0	0	0
MUNICIPAL CONSERVATION - MEDIUM WUG	CONSERVATION [MONTGOMERY]	34	39	49	61	77	97
SJRA TO WUG CONTRACT	LIVINGSTON-WALLISVILLE LAKE/RESERVOIR SYSTEM [RESERVOIR]	0	0	0	97	442	811
SJRA WRAP	GULF COAST AQUIFER [MONTGOMERY]	0	0	-362	-401	-415	-429
SJRA WRAP PARTICIPATION	CONROE LAKE/RESERVOIR [RESERVOIR]	0	0	742	681	608	559
SJRA WRAP PARTICIPATION	GULF COAST AQUIFER [MONTGOMERY]	0	236	0	0	0	0
WOODBRANCH, SAN JACINTO (H)							
INTERIM STRATEGIES - TEMPORARY OVERDRAFT	GULF COAST AQUIFER [MONTGOMERY]	32	0	0	0	0	0
MUNICIPAL CONSERVATION - SMALL WUG	CONSERVATION [MONTGOMERY]	10	11	12	14	16	18
SJRA WRAP PARTICIPATION	GULF COAST AQUIFER [MONTGOMERY]	0	74	107	138	177	225
Sum of Projected Water Management Strategies (acre-feet/year)		**17,896**	**49,024**	**70,329**	**82,295**	**120,781**	**165,622**

Appendix C - GAM Run 13-007: Lone Star Groundwater Conservation District Management Plan

GAM Run 13-007: Lone Star Groundwater Conservation District Management Plan

by William Kohlrenken
Texas Water Development Board
Groundwater Resources Division
Groundwater Availability Modeling Section
(512) 463-8279
February 25, 2013

Cynthia K. Ridgeway is the Manager of the Groundwater Availability Modeling Section and is responsible for oversight of work performed by William Kohlrenken under her direct supervision. The seal appearing on this document was authorized by Cynthia K. Ridgeway, P.G. 471 on February 25, 2013.

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GAM RUN 13-007: LONE STAR GROUNDWATER CONSERVATION DISTRICT MANAGEMENT PLAN

by William Kohlrenken
Texas Water Development Board
Groundwater Resources Division
Groundwater Availability Modeling Section
(512) 463-8279
February 25, 2013

EXECUTIVE SUMMARY:

Texas State Water Code, Section 36.1071, Subsection (h), states that, in developing its groundwater management plan, a groundwater conservation district shall use groundwater availability modeling information provided by the executive administrator of the Texas Water Development Board (TWDB) in conjunction with any available site-specific information provided by the district for review and comment to the executive administrator. Information derived from groundwater availability models that shall be included in the groundwater management plan includes:

- the annual amount of recharge from precipitation to the groundwater resources within the district, if any;
- for each aquifer within the district, the annual volume of water that discharges from the aquifer to springs and any surface water bodies, including lakes, streams, and rivers; and
- the annual volume of flow into and out of the district within each aquifer and between aquifers in the district.

This report (Part 2 of a two-part package of information from the TWDB to Lone Star Groundwater Conservation District) fulfills the requirements noted above. Part 1 of the 2-part package is the Historical Water Use/State Water Plan data report. The District should have received, or will receive, this data report from the Groundwater Technical Assistance Section. Questions about the data report can be directed to Mr. Stephen Allen, Stephen.Allen@twdb.texas.gov, (512)463-7317. The groundwater management plan for the Lone Star Groundwater Conservation District should be adopted by the district on or before December 25, 2013 and submitted to the executive administrator of the TWDB on or before January 24, 2014. The current management plan for the Lone Star Groundwater Conservation District expires on March 25, 2014.

This report discusses the method, assumptions, and results from model runs using the groundwater availability models for the northern portion of the Gulf Coast Aquifer as well as the Yegua-Jackson Aquifer (to determine groundwater flows from the Catahoula Formation into underlying formations). Table 1 summarizes the groundwater availability model data required by the statute, and figure 1 shows the area of the model from which the values in the table were extracted. This model run replaces the results of GAM Run 08-36 (Chowdhury, 2008). GAM Run 13-007 meets current standards set after the release of GAM Run 08-36 and it is based on the most current groundwater district boundaries and water budget extraction methods. If after review of the figure, Lone Star Groundwater Conservation District determines that the district boundary used in the assessment does not reflect current conditions, please notify the TWDB immediately.

METHODS:

The groundwater availability model for the northern portion of the Gulf Coast Aquifer was run for this analysis. Water budgets for 1980 through 1999 were extracted using ZONEBUDGET Version 3.01 (Harbaugh, 2009) and the average annual water budget values for recharge, surface water outflow, inflow to the district, outflow from the district, net inter-aquifer flow (upper), and net inter-aquifer flow (lower) for the portions of the aquifers located within the district are summarized in this report.

The groundwater availability model for the northern portion of the Gulf Coast Aquifer uses MODFLOW's General Head Boundary Package to simulate groundwater recharge and groundwater-surface water interaction. The general head boundary was assigned over the outcrop areas of the aquifer. To estimate groundwater recharge and groundwater-surface water interaction separately, we zoned the surface water courses separate from the remainder of the outcrop areas in ArcGIS. We then calculated the water budget of these zones using ZONEBUDGET Version 3.01 (Harbaugh, 2009). This approach is different than those used in the past in that we are using a different program to extract the data from the model. We are also using two separate analyses to perform the budget calculations. In one analysis we calculate aquifer flows. In the second analysis we calculate discharge to streams and recharge from the general head boundary flows.

PARAMETERS AND ASSUMPTIONS:

Gulf Coast Aquifer (northern portion)

- We used version 2.01 of the groundwater availability model for the northern portion of the Gulf Coast Aquifer for this analysis. See Kasmarek and Robinson (2004) for assumptions and limitations of the model.
- The model has four layers which represent the Chicot Aquifer in layer one, the Evangeline Aquifer in layer two, the Burkeville confining unit in layer 3, and the Jasper Aquifer and parts of the Catahoula Formation in direct hydrologic communication with the Jasper Aquifer in layer 4.
- Water budgets for the district were determined for the Gulf Coast Aquifer (Layers 1 through 4).
- The model was run with MODFLOW-96 (Harbaugh and MacDonald, 1996).
- We also used version 1.01 of the groundwater availability model for the Yegua-Jackson Aquifer, run with MODFLOW-2000 (Harbaugh and others, 2000), to investigate groundwater flows from the Catahoula Formation into underlying formations. See Deeds and others (2010) for assumptions and limitations of the groundwater availability model.

RESULTS:

A groundwater budget summarizes the amount of water entering and leaving the aquifer according to the groundwater availability model. Selected groundwater budget components listed below were extracted from the model results for the aquifers located within the district and averaged over the period 1980 through 1999 in the district. The components of the modified budget shown in table 1 include:

- Precipitation recharge—the areally distributed recharge sourced from precipitation falling on the outcrop areas of the aquifers (where the aquifer is exposed at land surface) within the district.
- Surface water outflow—the total water discharging from the aquifer (outflow) to surface water features such as streams, reservoirs, and springs.
- Flow into and out of district—the lateral flow within the aquifer between the district and adjacent counties.
- Flow between aquifers—the flow between aquifers or confining units. This flow is controlled by the relative water levels in each aquifer or confining

unit and aquifer properties of each aquifer or confining unit that define the amount of leakage that occurs.

The information needed for the district's management plan is summarized in table 1. It is important to note that sub-regional water budgets are not exact. This is due to the size of the model cells and the approach used to extract data from the model. To avoid double accounting, a model cell that straddles a political boundary, such as district or county boundaries, is assigned to one side of the boundary based on the location of the centroid of the model cell. For example, if a cell contains two counties, the cell is assigned to the county where the centroid of the cell is located (see figure 1).

TABLE 1: SUMMARIZED INFORMATION FOR THE NORTHERN PORTION OF THE GULF COAST AQUIFER THAT IS NEEDED FOR LONE STAR GROUNDWATER CONSERVATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST 1 ACRE-FOOT.

Management Plan requirement	*Aquifer or confining unit*	*Results*
Estimated annual amount of recharge from precipitation to the district	Gulf Coast Aquifer	30,913
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Gulf Coast Aquifer	882
Estimated annual volume of flow into the district within each aquifer in the district	Gulf Coast Aquifer	19,159
Estimated annual volume of flow out of the district within each aquifer in the district	Gulf Coast Aquifer	61,787
Estimated net annual volume of flow between each aquifer in the district	From the Catahoula Formation portion of the Gulf Coast into underlying units.	599[1]

[1] Calculated using the groundwater availability model for the Yegua-Jackson Aqufier.

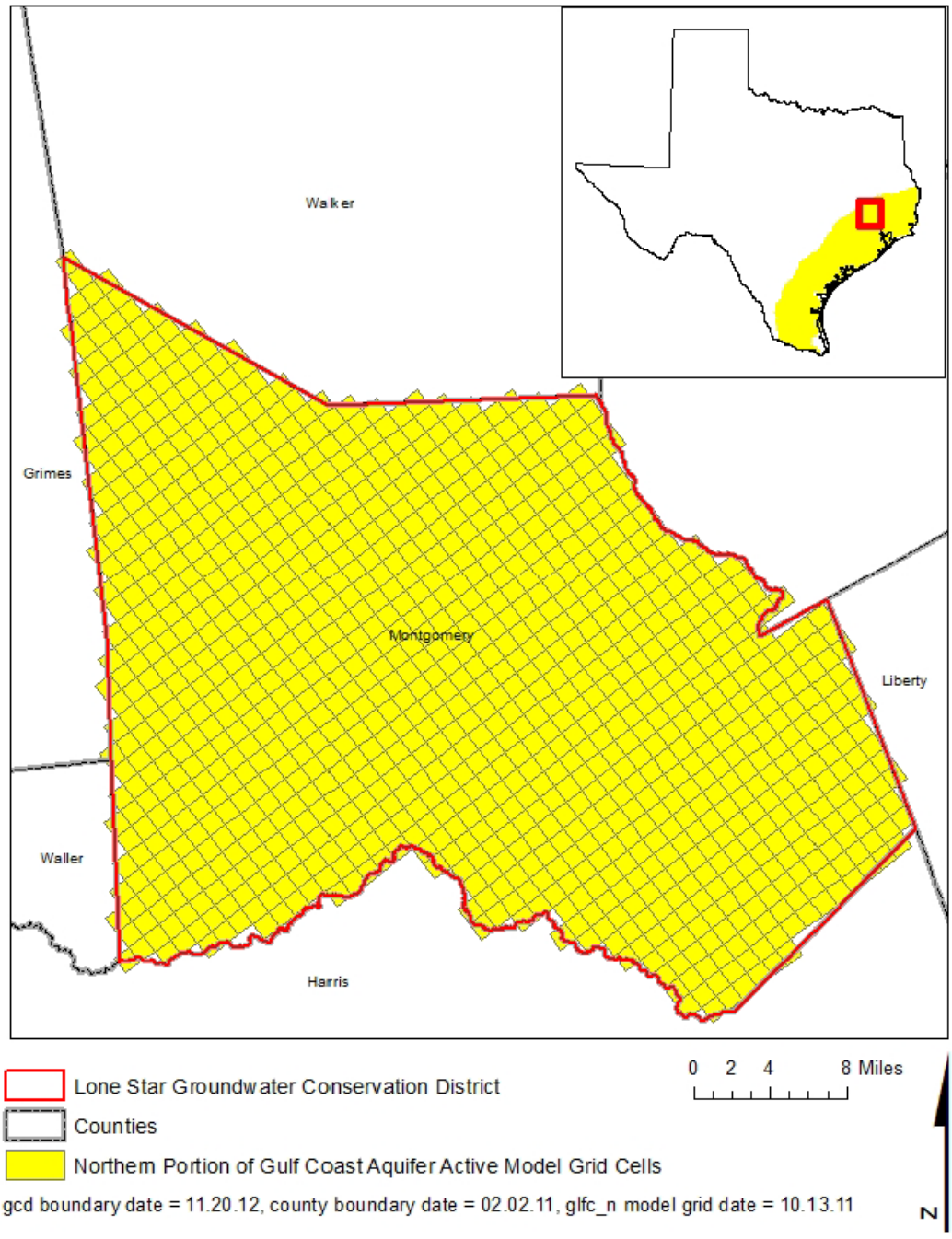

FIGURE 1: AREA OF ACTIVE MODEL CELLS FOR THE NORTHERN PORTION OF THE GULF COAST AQUIFER IN LONE STAR GROUNDWATER CONSERVATION DISTRICT FROM WHICH THE INFORMATION IN TABLE 1 WAS EXTRACTED (THE AQUIFER EXTENT WITHIN THE DISTRICT BOUNDARY).

LIMITATIONS:

The groundwater model(s) used in completing this analysis is the best available scientific tool that can be used to meet the stated objective(s). To the extent that this analysis will be used for planning purposes and/or regulatory purposes related to pumping in the past and into the future, it is important to recognize the assumptions and limitations associated with the use of the results. In reviewing the use of models in environmental regulatory decision making, the National Research Council (2007) noted:

> "Models will always be constrained by computational limitations, assumptions, and knowledge gaps. They can best be viewed as tools to help inform decisions rather than as machines to generate truth or make decisions. Scientific advances will never make it possible to build a perfect model that accounts for every aspect of reality or to prove that a given model is correct in all respects for a particular regulatory application. These characteristics make evaluation of a regulatory model more complex than solely a comparison of measurement data with model results."

A key aspect of using the groundwater model to evaluate historic groundwater flow conditions includes the assumptions about the location in the aquifer where historic pumping was placed. Understanding the amount and location of historic pumping is as important as evaluating the volume of groundwater flow into and out of the district, between aquifers within the district (as applicable), interactions with surface water (as applicable), recharge to the aquifer system (as applicable), and other metrics that describe the impacts of that pumping. In addition, assumptions regarding precipitation, recharge, and streamflow are specific to a particular historic time period.

Because the application of the groundwater model was designed to address regional scale questions, the results are most effective on a regional scale. The TWDB makes no warranties or representations relating to the actual conditions of any aquifer at a particular location or at a particular time.

It is important for groundwater conservation districts to monitor groundwater pumping and overall conditions of the aquifer. Because of the limitations of the groundwater model and the assumptions in this analysis, it is important that the groundwater conservation districts work with the TWDB to refine this analysis in the future given the reality of how the aquifer responds to the actual amount and location of pumping now and in the future. Historic precipitation patterns also need to be placed in context as future climatic conditions, such as dry and wet year precipitation patterns, may differ and affect groundwater flow conditions.

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Chowdhury, A. H., 2008, GAM Run 08-36: Texas Water Development Board, GAM Run 08-36 Report, 5 p., http://www.twdb.texas.gov/groundwater/docs/GAMruns/GR08-36.pdf.

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Kasmarek, M.C., and Robinson, J.L., 2004, Hydrogeology and Simulation of Groundwater Flow and Land-Surface Subsidence in the Northern Part of the Gulf Coast Aquifer System, Texas: United States Geological Survey Scientific investigations Report 2004-5102, 111 p., http://www.twdb.texas.gov/groundwater/models/gam/glfc_n/GLFC_N_Full_Report.pdf.

National Research Council, 2007, Models in Environmental Regulatory Decision Making Committee on Models in the Regulatory Decision Process, National Academies Press, Washington D.C., 287 p.

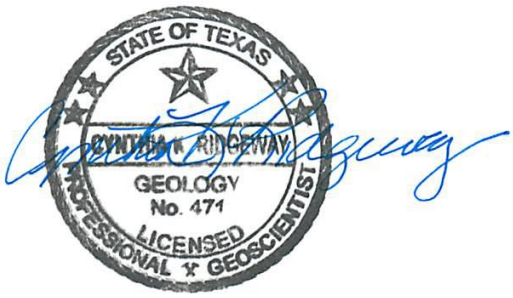
Appendix D Modeled Available Groundwater GAM Run 10-038 MAG for Groundwater Management Area 14

GAM Run 10-038 MAG

By Mohammad Masud Hassan, P.E.

Edited and finalized by Shirley Wade to reflect statutory changes effective September 1, 2011

Texas Water Development Board
Groundwater Availability Modeling Section
(512) 936-0883
November 18, 2011



Cynthia K. Ridgeway, the Manager of the Groundwater Availability Modeling Section and Interim Director of the Groundwater Resources Division, is responsible for oversight of work performed by employees under her direct supervision. The seal appearing on this document was authorized by Cynthia K. Ridgeway, P.G. 471 on November 18, 2011.

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EXECUTIVE SUMMARY:

The modeled available groundwater for the Gulf Coast Aquifer as a result of the desired future conditions adopted by the members of Groundwater Management Area 14 declines from approximately 978,000 acre-feet per year to 844,000 acre-feet per year between 2010 and 2060. This is shown divided by county, regional water planning area, and river basin in Table 2 for use in the regional water planning process. Modeled available groundwater is summarized by county, regional water planning area, river basin, and groundwater conservation district for each unit of the Gulf Coast Aquifer in tables 3 through 18. The estimates were extracted from Groundwater Availability Modeling Run 10-023, Scenario 3, which meets the desired future conditions adopted by Groundwater Management Area 14.

REQUESTOR:

Mr. Lloyd Behm of the Bluebonnet Groundwater Conservation District on behalf of Groundwater Management Area 14

DESCRIPTION OF REQUEST:

In a letter dated August 25, 2010, Mr. Lloyd Behm provided the Texas Water Development Board (TWDB) with the desired future conditions of the Gulf Coast Aquifer adopted by the members of Groundwater Management Area 14. As shown in Resolution No. 2010-01, the desired future conditions for the Gulf Coast Aquifer within Groundwater Management Area 14 were stated as average water-level declines (drawdowns) over a specified time period. The average drawdowns (in feet) specified as desired future conditions for Groundwater Management Area 14 are shown in Table 1.

Table 1: Desired future conditions (average drawdown in feet) for the Gulf Coast Aquifer in Groundwater Management Area 14. Negative values indicate a water level rise.

County	Austin	Brazoria	Brazos	Chambers	Grimes	Hardin	Jasper	Jefferson	Liberty
Duration (years)	52	52	52	52	52	52	52	52	52
	Base year 2008								
Chicot Aquifer	17	45	-	43	0	17	10	25	32
Evangeline Aquifer	10	40	-	36	5	27	23	26	37
Burkeville Confining Unit	11	-	-	-	10	23	24	-	28
Jasper Aquifer	20	-	7	-	28	37	21	-	64

Table 1: Continued.

County	Montgomery		Newtown	Orange	Polk	San Jacinto	Tyler	Walker	Waller	Washington
Duration (years)	8	44	52	52	52	52	52	52	52	52
	Base year 2008	Base year 2016	Base year 2008							
Chicot Aquifer	3	6	9	14	4	5	3	-	7	-
Evangeline Aquifer	13	25	20	19	4	7	16	10	8	1
Burkeville Confining Unit	10	23	22	-	20	18	19	5	9	17
Jasper Aquifer	61	-38	18	-	41	72	33	33	25	20

In response to receiving the adopted desired future conditions, the Texas Water Development Board has estimated the modeled available groundwater in Groundwater Management Area 14. Since the desired future conditions were divided by unit within the Gulf Coast Aquifer (Chicot Aquifer, Evangeline Aquifer, Burkeville Confining Unit, and Jasper Aquifer), modeled available groundwater is presented separately for each unit.

METHODS:

The Texas Water Development Board previously completed several predictive groundwater availability model simulations of the Gulf Coast Aquifer to assist the members of Groundwater Management Area 14 in developing desired future conditions. The location of Groundwater Management Area 14, the Gulf Coast Aquifer, and the groundwater availability model cells that represent the aquifer are shown in Figure 1. As described in Resolution No. 2010-01, the management area considered Scenario 3 of GAM Run 10-023 when developing desired future conditions for the Gulf Coast Aquifer (Oliver, 2010). Since each of the above desired future conditions is met in Scenario 3 of GAM Run 10-023, the estimated pumping for Groundwater Management Area 14 presented here was taken directly from that simulation. The pumping was then divided by county, regional water planning area, river basin, and groundwater conservation district (Figure 2).

PARAMETERS AND ASSUMPTIONS:

The parameters and assumptions for the model run using the groundwater availability model for the northern portion of the Gulf Coast Aquifer are described below:

- The results presented in this report are based on Scenario 3 in GAM Run 10-023 (Oliver, 2010). See GAM Run 10-023 for a full description of the methods, assumptions, and results for the groundwater availability model run.
- We used version 2.01 of the groundwater availability model for the northern portion of the Gulf Coast Aquifer. See Kasmarek and Robinson (2004) and Kasmarek and others (2005) for assumptions and limitations of the model.
- The model includes four layers representing the Chicot Aquifer (Layer 1), the Evangeline Aquifer (Layer 2), the Burkeville Confining Unit (Layer 3), and the

Jasper Aquifer, which includes the more transmissive portions of the Catahoula Formation (Layer 4).

- Cells were assigned to individual counties, river basins, regional water planning areas, and groundwater conservation districts as shown in the August 12, 2010 version of the file that associates the model grid with political and natural boundaries for the Gulf Coast Aquifer.

Modeled Available Groundwater and Permitting

As defined in Chapter 36 of the Texas Water Code, "modeled available groundwater" is the estimated average amount of water that may be produced annually to achieve a desired future condition. This is distinct from "managed available groundwater," shown in the draft version of this report dated December 29, 2010, which was a permitting value and accounted for the estimated use of the aquifer exempt from permitting. This change was made to reflect changes in statute by the 82nd Texas Legislature, effective September 1, 2011.

Groundwater conservation districts are required to consider modeled available groundwater, along with several other factors, when issuing permits in order to manage groundwater production to achieve the desired future condition(s). The other factors districts must consider include annual precipitation and production patterns, the estimated amount of pumping exempt from permitting, existing permits, and a reasonable estimate of actual groundwater production under existing permits. The estimated amount of pumping exempt from permitting, which the Texas Water Development Board is now required to develop after soliciting input from applicable groundwater conservation districts, will be provided in a separate report.

RESULTS:

The modeled available groundwater for the Gulf Coast Aquifer in Groundwater Management Area 14 as a result of the desired future conditions declines from approximately 978,000 acre-feet per year in 2010 to 844,000 acre-feet per year in 2060. This has been divided by county, regional water planning area, and river basin for each decade between 2010 and 2060 for use in the regional water planning process (Table 2).

The modeled available groundwater for the four units of the Gulf Coast Aquifer is also summarized by county (tables 3 through 6), regional water planning area (tables 7 through 10), river basin (tables 11 through 14), and groundwater conservation district (tables 15 through 18). In tables 15 through 18, the modeled available groundwater both excluding and including areas outside of a groundwater conservation district is shown.

LIMITATIONS:

The groundwater model used in developing estimates of modeled available groundwater is the best available scientific tool that can be used to estimate the pumping that will achieve the desired future conditions. Although the groundwater model used in this analysis is the best available scientific tool for this purpose, it, like all models, has limitations. In reviewing the use of models in environmental regulatory decision-making, the National Research Council (2007) noted:

> "Models will always be constrained by computational limitations, assumptions, and knowledge gaps. They can best be viewed as tools to help inform decisions rather than as machines to generate truth or make decisions. Scientific advances will never make it possible to build a perfect model that accounts for every aspect of reality or to prove that a given model is correct in all respects for a particular regulatory application. These characteristics make evaluation of a regulatory model more complex than solely a comparison of measurement data with model results."

A key aspect of using the groundwater model to develop estimates of modeled available groundwater is the need to make assumptions about the location in the aquifer where future pumping will occur. As actual pumping changes in the future, it will be necessary to evaluate the amount of that pumping as well as its location in the context of the assumptions associated with this analysis. Evaluating the amount and location of future pumping is as important as evaluating the changes in groundwater levels, spring flows, and other metrics that describe the condition of the groundwater resources in the area that relate to the adopted desired future condition(s).

Given these limitations, users of this information are cautioned that the modeled available groundwater numbers should not be considered a definitive, permanent description of the amount of groundwater that can be pumped to meet the adopted desired future condition. Because the application of the groundwater model was designed to address regional scale questions, the results are most effective on a regional scale. The TWDB makes no warranties or representations relating to the actual conditions of any aquifer at a particular location or at a particular time.

It is important for groundwater conservation districts to monitor future groundwater pumping as well as whether or not they are achieving their desired future conditions. Because of the limitations of the model and the assumptions in this analysis, it is important that the groundwater conservation districts work with the TWDB to refine the modeled available groundwater numbers given the reality of how the aquifer responds to the actual amount and location of pumping now and in the future.

REFERENCES:

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Table 2: Modeled available groundwater for the Gulf Coast Aquifer in Groundwater Management Area 14. Results are in acre-feet per year and are divided by county, regional water planning area, and river basin.

County	Regional Water Planning Area	River Basin	Year					
			2010	2020	2030	2040	2050	2060
Austin	H	Brazos	6,585	6,585	6,585	6,585	6,585	6,585
		Brazos-Colorado	15,608	15,608	15,608	15,608	15,608	15,608
		Colorado	121	121	121	121	121	121
Brazoria	H	Brazos	6,658	6,658	6,658	6,658	6,658	6,658
		Brazos-Colorado	11,648	11,648	11,648	11,648	11,648	11,648
		San Jacinto-Brazos	32,090	32,090	32,090	32,090	32,090	32,090
Brazos	G	Brazos	1,189	1,189	1,189	1,189	1,189	1,189
Chambers	H	Neches-Trinity	9,527	9,527	9,527	9,527	9,527	9,527
		San Jacinto-Brazos	0	0	0	0	0	0
		Trinity	10,112	10,112	10,112	10,112	10,112	10,112
		Trinity-San Jacinto	2,068	2,068	2,068	2,068	2,068	2,068
Fort Bend	H	Brazos	60,217	52,923	43,673	43,189	42,862	42,953
		Brazos-Colorado	20,633	22,023	18,095	17,715	17,043	17,077
		San Jacinto	9,723	9,524	9,043	8,809	8,642	8,650
		San Jacinto-Brazos	23,356	24,235	21,266	22,457	23,765	23,810
Galveston	H	Neches-Trinity	0	0	0	0	0	0
		San Jacinto-Brazos	4,774	5,257	5,867	5,841	5,814	5,815
		Trinity-San Jacinto	0	0	0	0	0	0
Grimes	G	Brazos	10,889	10,889	10,889	10,889	10,889	10,889
		San Jacinto	2,197	2,197	2,197	2,197	2,197	2,197
		Trinity	764	764	223			
Hardin	I	Neches	34,821	34,821	34,821	34,821	34,821	34,821
		Trinity	138	138	138	138	138	138
Harris	H	San Jacinto	293,855	249,851	197,553	197,326	196,992	197,270
		San Jacinto-Brazos	4,801	7,202	6,798	7,563	8,428	8,440
		Trinity-San Jacinto	6,894	5,893	5,026	5,141	5,259	5,266
Jasper	I	Neches	37,659	37,620	37,541	37,541	37,541	37,541
		Sabine	29,953	29,953	29,953	29,953	29,953	29,953
Jefferson	I	Neches	804	804	804	804	804	804
		Neches-Trinity	1,641	1,641	1,641	1,641	1,641	1,641
Liberty	H	Neches	5,074	5,074	5,074	5,074	5,074	5,074
		Neches-Trinity	364	364	364	364	364	364
		San Jacinto	5,852	5,852	5,852	5,852	5,852	5,852
		Trinity	22,887	22,887	22,887	22,887	22,887	22,887
		Trinity-San Jacinto	8,856	8,856	8,856	8,856	8,856	8,856

Table 2: Continued.

County	Regional Water Planning Area	River Basin	Year					
			2010	2020	2030	2040	2050	2060
Montgomery	H	San Jacinto	73,264	61,629	61,629	61,629	61,629	61,629
Newton	I	Neches	176	176	176	176	176	176
		Sabine	34,001	34,001	33,963	33,963	33,963	33,963
Orange	I	Neches	3,925	3,925	3,925	3,925	3,925	3,925
		Neches-Trinity	256	256	256	256	256	256
		Sabine	15,832	15,832	15,832	15,832	15,832	15,832
Polk	H	Trinity	21,830	21,830	21,830	21,783	21,783	21,783
		Neches	14,912	11,886	11,886	11,886	11,276	11,224
San Jacinto	H	San Jacinto	10,368	10,368	10,368	10,368	10,368	10,368
		Trinity	10,611	8,811	8,811	8,811	8,811	8,811
Tyler	I	Neches	38,199	38,199	38,156	38,156	38,156	38,156
Walker	H	San Jacinto	9,139	9,116	9,116	9,116	9,116	9,116
		Trinity	8,873	8,873	8,873	8,797	8,797	8,797
Waller	H	Brazos	14,933	14,933	14,933	14,933	14,933	14,933
		San Jacinto	26,694	26,694	26,694	26,694	26,694	26,694
Washington	G	Brazos	12,972	12,972	12,972	12,604	12,604	12,604
		Colorado	73	73	73	73	73	73
Total			**977,816**	**913,948**	**843,660**	**843,666**	**843,820**	**844,244**

Table 3: Modeled available groundwater for the Chicot Aquifer portion of the Gulf Coast Aquifer summarized by county in Groundwater Management Area 14 for each decade between 2010 and 2060. Results are in acre-feet per year.

County	Year					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**
Austin	1,300	1,300	1,300	1,300	1,300	1,300
Brazoria	48,125	48,125	48,125	48,125	48,125	48,125
Chambers	21,328	21,328	21,328	21,328	21,328	21,328
Fort Bend	83,006	75,916	61,657	61,004	60,061	60,177
Galveston	4,303	4,697	5,233	5,194	5,152	5,153
Grimes	0	0	0	0	0	0
Hardin	1,263	1,263	1,263	1,263	1,263	1,263
Harris	70,219	68,839	56,850	58,641	61,185	61,272
Jasper	10,835	10,835	10,835	10,835	10,835	10,835
Jefferson	2,345	2,345	2,345	2,345	2,345	2,345
Liberty	14,576	14,576	14,576	14,576	14,576	14,576
Montgomery	1,482	1,722	1,722	1,722	1,722	1,722
Newton	501	501	501	501	501	501
Orange	18,809	18,809	18,809	18,809	18,809	18,809
Polk	0	0	0	0	0	0
San Jacinto	0	0	0	0	0	0
Tyler	0	0	0	0	0	0
Walker	0	0	0	0	0	0
Waller	300	300	300	300	300	300
Total	**278,392**	**270,556**	**244,844**	**245,943**	**247,502**	**247,706**

Table 4: Modeled available groundwater for the Evangeline Aquifer portion of the Gulf Coast Aquifer summarized by county in Groundwater Management Area 14 for each decade between 2010 and 2060. Results are in acre-feet per year.

County	Year					
	2010	2020	2030	2040	2050	2060
Austin	20,013	20,013	20,013	20,013	20,013	20,013
Brazoria	2,271	2,271	2,271	2,271	2,271	2,271
Chambers	379	379	379	379	379	379
Fort Bend	30,923	32,789	30,420	31,166	32,251	32,313
Galveston	471	560	634	647	662	662
Grimes	3,002	3,002	3,002	3,002	3,002	3,002
Hardin	33,696	33,696	33,696	33,696	33,696	33,696
Harris	234,977	193,759	152,256	151,126	149,225	149,435
Jasper	40,755	40,755	40,755	40,755	40,755	40,755
Jefferson	100	100	100	100	100	100
Liberty	27,669	27,669	27,669	27,669	27,669	27,669
Montgomery	39,381	38,293	38,293	38,293	38,293	38,293
Newton	21,288	21,288	21,288	21,288	21,288	21,288
Orange	1,204	1,204	1,204	1,204	1,204	1,204
Polk	8,311	8,311	8,311	8,311	8,311	8,311
San Jacinto	8,178	8,178	8,178	8,178	8,178	8,178
Tyler	20,592	20,592	20,592	20,592	20,592	20,592
Walker	2,001	2,001	2,001	2,001	2,001	2,001
Waller	41,027	41,027	41,027	41,027	41,027	41,027
Washington	3,239	3,239	3,239	3,239	3,239	3,239
Total	**539,477**	**499,126**	**455,328**	**454,957**	**454,156**	**454,428**

Table 5: Modeled available groundwater for the Burkeville Confining Unit portion of the Gulf Coast Aquifer summarized by county in Groundwater Management Area 14 for each decade between 2010 and 2060. Results are in acre-feet per year.

County	Year					
	2010	2020	2030	2040	2050	2060
Austin	0	0	0	0	0	0
Fort Bend	0	0	0	0	0	0
Grimes	0	0	0	0	0	0
Hardin	0	0	0	0	0	0
Harris	335	329	256	249	254	254
Jasper	1	1	1	1	1	1
Liberty	0	0	0	0	0	0
Montgomery	0	0	0	0	0	0
Newton	0	0	0	0	0	0
Polk	744	744	744	744	744	744
San Jacinto	2,699	899	899	899	899	899
Tyler	1	1	1	1	1	1
Walker	0	0	0	0	0	0
Waller	0	0	0	0	0	0
Washington	368	368	368	0	0	0
Total	**4,148**	**2,342**	**2,269**	**1,894**	**1,899**	**1,899**

Table 6: Modeled available groundwater for the Jasper Aquifer portion of the Gulf Coast Aquifer summarized by county in Groundwater Management Area 14 for each decade between 2010 and 2060. Results are in acre-feet per year.

County	Year					
	2010	2020	2030	2040	2050	2060
Austin	1,001	1,001	1,001	1,001	1,001	1,001
Brazos	1,189	1,189	1,189	1,189	1,189	1,189
Fort Bend	0	0	0	0	0	0
Grimes	10,848	10,848	10,307	10,084	10,084	10,084
Hardin	0	0	0	0	0	0
Harris	19	19	15	14	15	15
Jasper	16,021	15,982	15,903	15,903	15,903	15,903
Liberty	788	788	788	788	788	788
Montgomery	32,401	21,614	21,614	21,614	21,614	21,614
Newton	12,388	12,388	12,350	12,350	12,350	12,350
Polk	27,687	24,661	24,661	24,614	24,004	23,952
San Jacinto	10,102	10,102	10,102	10,102	10,102	10,102
Tyler	17,606	17,606	17,563	17,563	17,563	17,563
Walker	16,011	15,988	15,988	15,912	15,912	15,912
Waller	300	300	300	300	300	300
Washington	9,438	9,438	9,438	9,438	9,438	9,438
Total	**155,799**	**141,924**	**141,219**	**140,872**	**140,263**	**140,211**

Table 7: Modeled available groundwater for the Chicot Aquifer portion of the Gulf Coast Aquifer summarized by regional water planning area in Groundwater Management Area 14 for each decade between 2010 and 2060. Results are in acre-feet per year.

Regional Water Planning Area	Year					
	2010	2020	2030	2040	2050	2060
G	0	0	0	0	0	0
H	244,639	236,803	211,091	212,190	213,749	213,953
I	33,753	33,753	33,753	33,753	33,753	33,753
Total	**278,392**	**270,556**	**244,844**	**245,943**	**247,502**	**247,706**

Table 8: Modeled available groundwater for the Evangeline Aquifer portion of the Gulf Coast Aquifer, summarized by regional water planning area in Groundwater Management Area 14 for each decade between 2010 and 2060. Results are in acre-feet per year.

Regional Water Planning Area	Year					
	2010	2020	2030	2040	2050	2060
G	6,241	6,241	6,241	6,241	6,241	6,241
H	412,014	371,663	327,865	327,494	326,693	326,965
I	121,222	121,222	121,222	121,222	121,222	121,222
Total	**539,477**	**499,126**	**455,328**	**454,957**	**454,156**	**454,428**

Table 9: Modeled available groundwater for the Burkeville Confining Unit portion of the Gulf Coast Aquifer summarized by regional water planning area in Groundwater Management Area 14 for each decade between 2010 and 2060. Results are in acre-feet per year.

Regional Water Planning Area	Year					
	2010	2020	2030	2040	2050	2060
G	368	368	368	0	0	0
H	3,660	1,854	1,781	1,774	1,779	1,779
I	120	120	120	120	120	120
Total	**4,148**	**2,342**	**2,269**	**1,894**	**1,899**	**1,899**

Table 10: Modeled available groundwater for the Jasper Aquifer portion of the Gulf Coast Aquifer, summarized by regional water planning area in Groundwater Management Area 14 for each decade between 2010 and 2060. Results are in acre-feet per year.

Regional Water Planning Area	Year					
	2010	2020	2030	2040	2050	2060
G	21,475	21,475	20,934	20,711	20,711	20,711
H	77,102	66,292	66,288	66,164	66,165	66,165
I	57,222	54,157	53,997	53,997	53,387	53,335
Total	**155,799**	**141,924**	**141,219**	**140,872**	**140,263**	**140,211**

Table 11: Modeled available groundwater for the Chicot Aquifer portion of the Gulf Coast Aquifer, summarized by river basin in Groundwater Management Area 14 for each decade between 2010 and 2060. Results are in acre-feet per year.

River Basin	Year					
	2010	2020	2030	2040	2050	2060
Brazos	56,046	48,386	40,433	39,803	39,240	39,305
Brazos-Colorado	33,286	34,676	30,748	30,368	29,696	29,730
Colorado	0	0	0	0	0	0
Neches	15,293	15,293	15,293	15,293	15,293	15,293
Neches-Trinity	11,751	11,751	11,751	11,751	11,751	11,751
Sabine	19,368	19,368	19,368	19,368	19,368	19,368
San Jacinto	66,403	63,365	51,927	52,931	54,591	54,665
San Jacinto-Brazos	50,045	51,558	49,627	50,634	51,578	51,604
Trinity	17,646	17,646	17,646	17,646	17,646	17,646
Trinity-San Jacinto	8,554	8,513	8,051	8,149	8,339	8,344
Total	**278,392**	**270,556**	**244,844**	**245,943**	**247,502**	**247,706**

Table 12: Modeled available groundwater for the Evangeline Aquifer portion of the Gulf Coast Aquifer, summarized by river basin in Groundwater Management Area 14 for each decade between 2010 and 2060. Results are in acre-feet per year.

River Basin	Year					
	2010	2020	2030	2040	2050	2060
Brazos	36,717	37,083	35,786	35,932	36,168	36,194
Brazos-Colorado	14,527	14,527	14,527	14,527	14,527	14,527
Colorado	23	23	23	23	23	23
Neches	78,653	78,653	78,653	78,653	78,653	78,653
Neches-Trinity	37	37	37	37	37	37
Sabine	44,700	44,700	44,700	44,700	44,700	44,700
San Jacinto	317,937	275,930	234,666	233,209	231,042	231,254
San Jacinto-Brazos	14,976	17,226	16,394	17,317	18,519	18,551
Trinity	22,643	22,643	22,643	22,643	22,643	22,643
Trinity-San Jacinto	9,264	8,304	7,899	7,916	7,844	7,846
Total	**539,477**	**499,126**	**455,328**	**454,957**	**454,156**	**454,428**

Table 13: Modeled available groundwater for the Burkeville Confining Unit portion of the Gulf Coast Aquifer, summarized by river basin in Groundwater Management Area 14 for each decade between 2010 and 2060. Results are in acre-feet per year.

River Basin	Year					
	2010	2020	2030	2040	2050	2060
Brazos	368	368	368	0	0	0
Brazos-Colorado	0	0	0	0	0	0
Colorado	0	0	0	0	0	0
Neches	119	119	119	119	119	119
Sabine	1	1	1	1	1	1
San Jacinto	335	329	256	249	254	254
San Jacinto-Brazos	0	0	0	0	0	0
Trinity	3,325	1,525	1,525	1,525	1,525	1,525
Trinity-San Jacinto	0	0	0	0	0	0
Total	**4,148**	**2,342**	**2,269**	**1,894**	**1,899**	**1,899**

Table 14: Modeled available groundwater for the Jasper Aquifer portion of the Gulf Coast Aquifer, summarized by river basin in Groundwater Management Area 14 for each decade between 2010 and 2060. Results are in acre-feet per year.

River Basin	Year					
	2010	2020	2030	2040	2050	2060
Brazos	20,312	20,312	20,312	20,312	20,312	20,312
Brazos-Colorado	76	76	76	76	76	76
Colorado	171	171	171	171	171	171
Neches	41,505	38,440	38,318	38,318	37,708	37,656
Sabine	15,717	15,717	15,679	15,679	15,679	15,679
San Jacinto	46,417	35,607	35,603	35,602	35,603	35,603
San Jacinto-Brazos	0	0	0	0	0	0
Trinity	31,601	31,601	31,060	30,714	30,714	30,714
Trinity-San Jacinto	0	0	0	0	0	0
Total	**155,799**	**141,924**	**141,219**	**140,872**	**140,263**	**140,211**

Table 15: Modeled available groundwater for the Chicot Aquifer portion of the Gulf Coast Aquifer, summarized by groundwater conservation district (GCD) in Groundwater Management Area 14 for each decade between 2010 and 2060. Results are in acre-feet per year.

Groundwater Conservation District	Year					
	2010	2020	2030	2040	2050	2060
Bluebonnet GCD	1,600	1,600	1,600	1,600	1,600	1,600
Brazoria County GCD	48,125	48,125	48,125	48,125	48,125	48,125
Brazos Valley GCD	0	0	0	0	0	0
Lone Star GCD	1,482	1,722	1,722	1,722	1,722	1,722
Lower Trinity GCD	0	0	0	0	0	0
Southeast Texas GCD	12,599	12,599	12,599	12,599	12,599	12,599
Total (groundwater conservation districts)	**63,806**	**64,046**	**64,046**	**64,046**	**64,046**	**64,046**
Fort Bend Subsidence District	83,006	75,916	61,657	61,004	60,061	60,177
Harris-Galveston Coastal Subsidence District	74,522	73,536	62,083	63,835	66,337	66,425
No District	57,058	57,058	57,058	57,058	57,058	57,058
Total (all areas)	**278,392**	**270,556**	**244,844**	**245,943**	**247,502**	**247,706**

Table 16: Modeled available groundwater forthe Evangeline Aquifer portion of the Gulf Coast Aquifer, summarized by groundwater conservation district (GCD) in Groundwater Management Area 14 for each decade between 2010 and 2060. Results are in acre-feet per year.

Groundwater Conservation District	Year					
	2010	2020	2030	2040	2050	2060
Bluebonnet GCD	66,043	66,043	66,043	66,043	66,043	66,043
Brazoria County GCD	2,271	2,271	2,271	2,271	2,271	2,271
Brazos Valley GCD	0	0	0	0	0	0
Lone Star GCD	39,381	38,293	38,293	38,293	38,293	38,293
Lower Trinity GCD	16,489	16,489	16,489	16,489	16,489	16,489
Southeast Texas GCD	116,331	116,331	116,331	116,331	116,331	116,331
Total (groundwater conservation districts)	**240,515**	**239,427**	**239,427**	**239,427**	**239,427**	**239,427**
Fort Bend Subsidence District	30,923	32,789	30,420	31,166	32,251	32,313
Harris-Galveston Coastal Subsidence District	235,448	194,319	152,890	151,773	149,887	150,097
No District	32,591	32,591	32,591	32,591	32,591	32,591
Total (all areas)	**539,477**	**499,126**	**455,328**	**454,957**	**454,156**	**454,428**

Table 17: Modeled available groundwater for the Burkeville Confining Unit portion of the Gulf Coast Aquifer, summarized by groundwater conservation district (GCD) in Groundwater Management Area 14 for each decade between 2010 and 2060. Results are in acre-feet per year.

Groundwater Conservation District	Year					
	2010	2020	2030	2040	2050	2060
Bluebonnet GCD	0	0	0	0	0	0
Brazoria County GCD	0	0	0	0	0	0
Brazos Valley GCD	0	0	0	0	0	0
Lone Star GCD	0	0	0	0	0	0
Lower Trinity GCD	3,443	1,643	1,643	1,643	1,643	1,643
Southeast Texas GCD	2	2	2	2	2	2
Total (groundwater conservation districts)	**3,445**	**1,645**	**1,645**	**1,645**	**1,645**	**1,645**
Fort Bend Subsidence District	0	0	0	0	0	0
Harris-Galveston Coastal Subsidence District	335	329	256	249	254	254
No District	368	368	368	0	0	0
Total (all areas)	**4,148**	**2,342**	**2,269**	**1,894**	**1,899**	**1,899**

Table 18: Modeled available groundwater for the Jasper Aquifer portion of the Gulf Coast Aquifer, summarized by groundwater conservation district (GCD) in Groundwater Management Area 14 for each decade between 2010 and 2060. Results are in acre-feet per year.

Groundwater Conservation District	Year					
	2010	2020	2030	2040	2050	2060
Bluebonnet GCD	28,160	28,137	27,596	27,297	27,297	27,297
Brazoria County GCD	0	0	0	0	0	0
Brazos Valley GCD	1,189	1,189	1,189	1,189	1,189	1,189
Lone Star GCD	32,401	21,614	21,614	21,614	21,614	21,614
Lower Trinity GCD	37,789	34,763	34,763	34,716	34,106	34,054
Southeast Texas GCD	46,015	45,976	45,816	45,816	45,816	45,816
Total (groundwater conservation districts)	**145,554**	**131,679**	**130,978**	**130,632**	**130,022**	**129,970**
Fort Bend Subsidence District	**0**	**0**	**0**	**0**	**0**	**0**
Harris-Galveston Coastal Subsidence District	**19**	**19**	**15**	**14**	**15**	**15**
No District	10,226	10,226	10,226	10,226	10,226	10,226
Total (all areas)	**155,799**	**141,924**	**141,219**	**140,872**	**140,263**	**140,211**

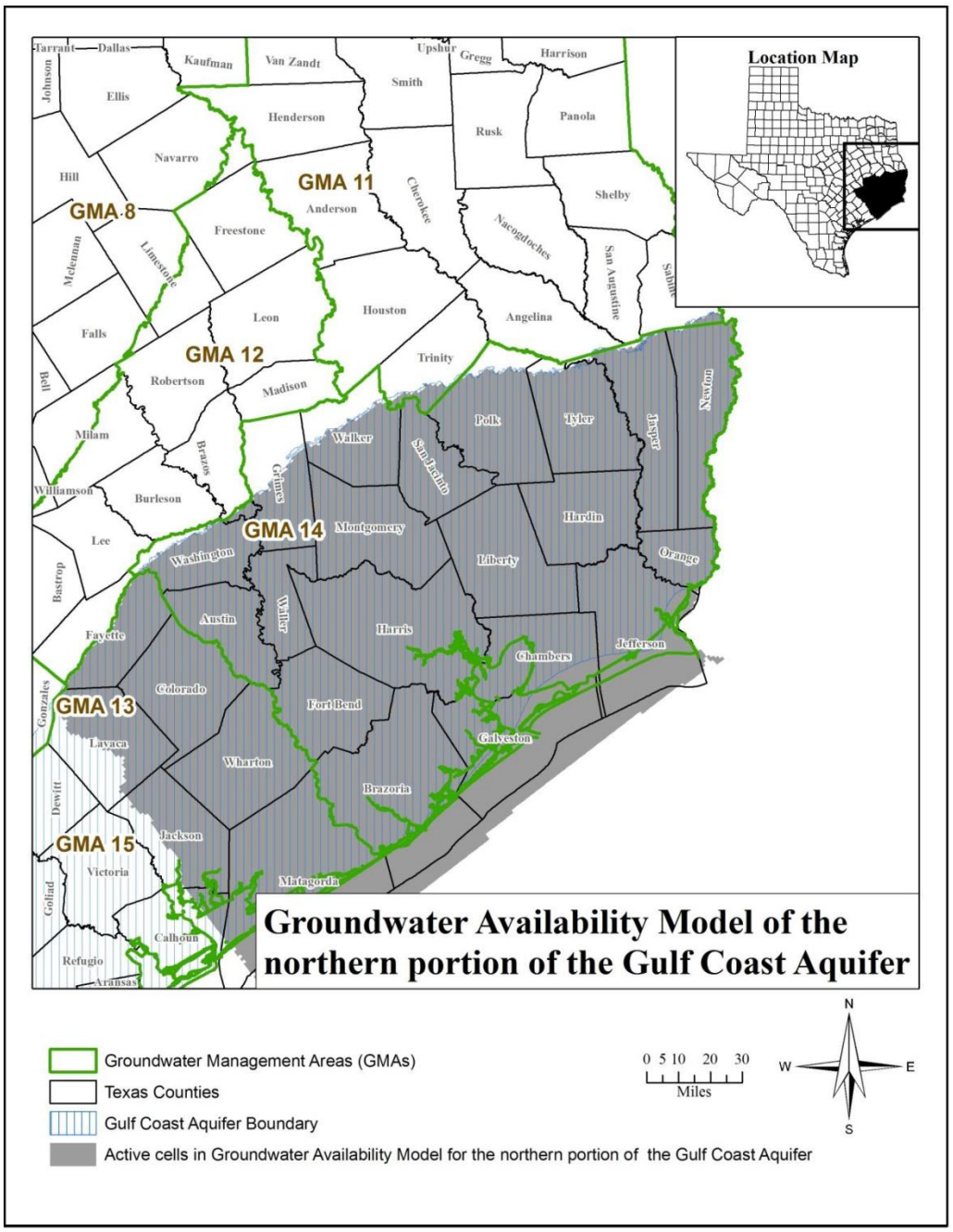

Figure 1: Map showing the areas covered by the groundwater availability model for the northern portion of the Gulf Coast Aquifer.

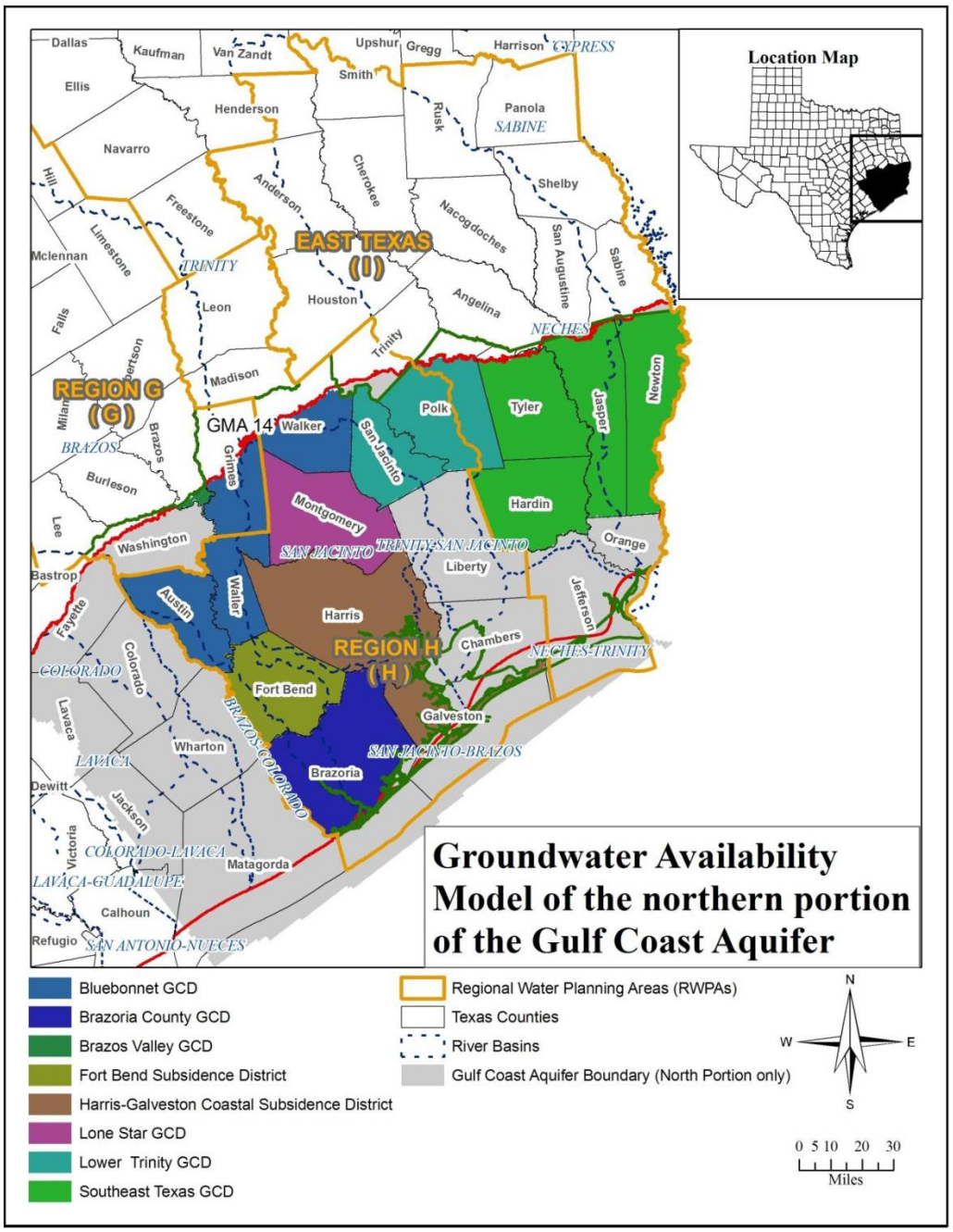

Figure 2: Map showing regional water planning areas (RWPAs), groundwater conservation districts (GCDs), subsidence districts, counties, and river basins in Groundwater Management Area 14.

Appendix E - GAM Run 11-012: Modeled Water Budget in Lone Star GCD from GAM Run 10-038 MAG

GAM RUN 11-012: MODELED WATER BUDGET FOR THE GULF COAST AQUIFER IN MONTGOMERY COUNTY

by Jerry Shi, Ph.D.
Texas Water Development Board
Groundwater Resources Division
Groundwater Availability Modeling Section
(512) 463-5076
August 17, 2012

The seal appearing on this document was authorized of Jianyou (Jerry) Shi, P.G. 11113 on August 17, 2012.

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EXECUTIVE SUMMARY:

This report documents the water budget information for the northern portion of the Gulf Coast Aquifer in Montgomery County (the sole county in the Lone Star Groundwater Conservation District) from the groundwater availability model run documented in GAM Run 10-038 MAG. This model run incorporates the desired future conditions in Groundwater Management Area 14 for the Chicot, Evangeline, Burkeville, and Jasper layers of the Gulf Coast Aquifer. (The desired future conditions for Montgomery and other counties in Groundwater Management Area 14 can be found in Hassan (2011)) The water budgets include lateral flow between Montgomery and adjacent counties, vertical flow between overlying and underlying units, and the change in the volume of water stored in each unit. The water budgets also account for groundwater recharge due to precipitation, interaction with surface water and groundwater release related to aquifer subsidence.

BACKGROUND AND METHODS:

On July 27, 2011, Ms. Kathy Turner Jones, General Manager of Lone Star Groundwater Conservation District, submitted the following request by e-mail to the Texas Water Development Board:

> "For GAM Run 10-038 MAG, within Montgomery County and for each layer in the model (Chicot, Evangeline, Burkeville and Jasper), please provide an annual accounting of:
>
> - Each inflow component

- Each outflow component
- Change in storage

The annual accounting should cover the historical and predictive portion of the simulation. Please identify each inflow component from County of origin and each outflow component into County receiving water."

In response to this request, water budget information from GAM Run 10-038 MAG (Hassan, 2011) was extracted from the groundwater availability model. This was then summarized for Montgomery County as requested above in draft form in September 2011. This document represents the final submittal of the water budget to satisfy the request made by the Lone Star Groundwater Conservation District. For certain groundwater flow components, flows into and out of simulated hydrogeologic units are presented as net flows. In addition, flows from stress periods with monthly intervals are averaged to obtain annual flows.

PARAMETERS AND ASSUMPTIONS:

- Version 2.01 of the groundwater availability model for the northern portion of the Gulf Coast Aquifer was used for this analysis. See Kasmarek and Robinson (2004) and Kasmarek and others (2005) for assumptions and limitations of the groundwater availability model.

- The results in this report are based on the model run documented in GAM Run 10-038 MAG (Hassan, 2011), which is also reported as Scenario 3 of GAM Run 10-023 (Oliver, 2010). See Hassan (2011) and Oliver (2010) for additional details about the methods and assumptions of the model run.

- The model run contains 129 transient stress periods. Stress Period 1 has a length of 10,000 days to simulate the pseudo-steady state, pre-development water levels (prior to 1891). Stress Periods 2 through 15 represent the early historical period 1891 through 1979 with limited pumping data available. Stress Periods 16 through 65 represent the historical calibration period 1980 through 1996. Stress Periods 66 through 77 represent the interim period 1997 through 2008 described in Oliver (2010) with the original pumping rates adjusted to better match measured water levels. Stress periods 78 through 129 represent the predictive period 2009 through 2060.

- The groundwater availability model includes four layers which generally correspond to the following units (from top to bottom):

- the Chicot Aquifer (Layer 1),
- the Evangeline Aquifer (Layer 2),
- the Burkeville Confining Unit (Layer 3), and
- the Jasper Aquifer including parts of the Catahoula Formation (Layer 4).

- The model grid file dated June 2, 2011 was used to associate the model grid to political and natural boundaries for the northern portion of the Gulf Coast Aquifer.
- The recharge used for the model run represents average recharge as described in Kasmarek and Robinson (2004) and Kasmarek and others (2005).

RESULTS:

As requested, details of the individual flow components are summarized in tables with average values for the historical calibration period (1980 through 1996) and predictive period (2009 through 2060) presented at the end of each table. The historical period (1980 through 1996) is selected representing a timeframe when relatively reliable pumping data was available. Positive values represent net flow into Montgomery County or an individual hydrogeologic unit. Negative values represent net flow out of Montgomery County or an individual hydrogeologic unit. Additional details about each of the components of the water budget are included below

- Head Dependent Boundary - this is the net inflow or outflow that occurs to/from the aquifer in outcrop areas (where the aquifer is exposed at land surface) due to recharge from precipitation, inflows from surface water features such as rivers and streams, outflows to surface water features, spring flow, direct evaporation, or plant transpiration. In the groundwater availability model for the northern portion of the Gulf Coast Aquifer these components are modeled collectively using the MODFLOW General Head Boundary package.
- Wells - water produced from wells in each aquifer. This component is always shown as a negative value since it is outflow from the aquifer. Wells are simulated in the model using the MODFLOW Well package.
- Subsidence - describes the water made available to the flow system due to compaction of clay layers. This is separate from the change in storage term

described below. This compaction, and subsequent loss of storage volume in the aquifer, is considered to be largely permanent. A positive value for subsidence indicates that subsidence is occurring and that volume of water is made available to the flow system. Subsidence is simulated in the groundwater availability model using the MODFLOW Interbed Storage package.

- Lateral flow (indicated by county name) - describes the net lateral flow within each unit of the aquifer between Montgomery County and a neighboring county.

- Vertical leakage (indicated by hydrogeologic unit name) - describes the vertical flow, or leakage between two aquifers. This interaction can take place with both the overlying and underlying units and show either a net upward or downward flow. The direction and amount of flow is controlled by the water levels in each aquifer and the aquifer properties that define the amount of leakage that can occur.

- Change in Storage - the net change in the water stored in the aquifer. A positive value indicates that water is added to storage (that is, water levels rise. A negative value indicates that water is removed from storage (that is, water levels fall).

The water budgets for each of the units of the Gulf Coast Aquifer in Montgomery County are described below:

Chicot Aquifer

Figure 1 shows the cells in the groundwater availability model representing the Chicot Aquifer in and around Montgomery County. The water budget for the Chicot Aquifer in Montgomery County is presented in Table 1. The water budget for the Chicot Aquifer in Montgomery County is described below:

Inflow - The modeled groundwater flow into the Chicot Aquifer in Montgomery County is primarily through the head dependent boundaries for both the historical (1980 through 1996) and predictive (2009 through 2060) periods. Head dependent boundaries occur in the outcrop area and allow both inflows and outflows including groundwater recharge due to precipitation, groundwater loss to evapotranspiration and springs, and groundwater/surface water interaction. The average inflows through head dependent boundaries are approximately 40,000 and 59,000 acre-feet per year for the historical and predictive periods, respectively. If it is assumed that recharge

and evapotranspiration do not change significantly, the net groundwater inflow increase from the historical to predictive periods through the head dependent boundaries likely comes from reduced flow to springs and enhanced leakage from surface water bodies. Average inflows due to aquifer subsidence and from Liberty, San Jacinto, and Waller counties range from approximately 200 to 1,000 acre-feet per year. Average inflows from Grimes and Walker counties are predicted to be minimal with little changes between the historical and predictive periods (Table 1).

Outflow - The main outflow components for the Chicot Aquifer in Montgomery County are predicted to be downward flow to the Evangeline Aquifer and lateral flow to Harris County. The average outflow to the Evangeline Aquifer is predicted to increase from approximately 19,000 acre-feet per year during the historical period to 34,000 acre-feet per year during the predictive period. The outflow to Harris County decreases from approximately 41,000 to 33,000 acre-feet per year during the same simulated timeframe. The modeled average groundwater withdrawal due to pumping increases from approximately 280 acre-feet per year during the historical period to 1,700 acre-feet per year during the predictive period (Table 1).

Storage - The aquifer storage loss for the Chicot Aquifer is predicted to decrease from an average of approximately 19,000 acre-feet per year during the historical period to 6,800 acre-feet per year during the predictive period (Table 1).

Evangeline Aquifer

Figure 2 shows the cells in the groundwater availability model representing the Evangeline Aquifer in and around Montgomery County. The water budget for the Evangeline Aquifer in Montgomery County is presented in Table 2. The water budget of the Evangeline Aquifer in Montgomery County is described below:

Inflow - The modeled groundwater flow into the Evangeline Aquifer in Montgomery County is predominated by the downward flow from the Chicot Aquifer and, to a lesser degree, by water released due to aquifer subsidence. Note that subsidence is shown as an inflow inTable 2. This is because water released as clay units are compacted is made available to the aquifer flow system. The average inflow from the Chicot Aquifer is predicted to increase from approximately 19,000 acre-feet per year during the historical period to 34,000 acre-feet per year during the predictive period. The water released due to aquifer subsidence, however, slightly decreases from approximately 6,100 to 4,000 acre-feet per year over the same time periods. Average groundwater flow from San Jacinto and Waller counties is predicted to be approximately 1,100 to 1,200 acre-feet per year. Head dependent boundaries

(representing outcrop flow components such as recharge, evapotranspiration, and surface water interaction), Grimes County, Liberty County, and Walker County each contributes less than 1,000 acre-feet per year (Table 2).

Outflow - The main outflow components for the Evangeline Aquifer in Montgomery County are predicted to be groundwater pumping and lateral flow to Harris County. The average groundwater pumping in the Evangeline Aquifer in the simulation increases from approximately 18,000 acre-feet per year during the historical period to 39,000 acre-feet per year during the predictive period, while the average outflow to Harris County declines from approximately 13,000 to 4,800 acre-feet per year over the same timeframe (Table 2).

In the simulation, groundwater primarily flows from the Burkeville confining unit into the Evangeline Aquifer during the historical period. Though this flow direction is reversed during the predictive period, the amount of groundwater involved may be insignificant (Table 2).

Storage - The average aquifer storage loss for the Evangeline Aquifer ranges from approximately 1,700 during the historical period to 1,600 acre-feet per year during the predictive period (Table 2).

Burkeville Confining Unit

Figure 3 below shows the cells in the groundwater availability model representing the Burkeville confining unit in and around Montgomery County. The water budget for the Burkeville confining unit in Montgomery County is presented in Table 3. The water budget of the Burkeville confining unit in Montgomery County is described below:

Overall, groundwater flow through the Burkeville confining unit is predicted to be vertical and relatively small. On average, the groundwater flow direction is upward from the Jasper Aquifer to the Burkeville confining unit and to the Evangeline Aquifer during the historical period. This flow direction is reversed and becomes downward from the Evangeline Aquifer to the confining unit and to the Jasper Aquifer during the predictive period. The average vertical flow through the Burkeville confining unit is estimated less than 1,000 acre-feet per year (Table 3).

Storage - The average storage losses are predicted to be small at approximately 150 acre-feet per year during both the historical and predictive periods (Table 3).

Jasper Aquifer

Figure 4 below shows the cells in the groundwater availability model representing the Jasper Aquifer (and parts of the Catahoula Formation) in and around Montgomery County. The water budget information for the Jasper Aquifer in Montgomery County is presented in Table 4. The water budget of the Jasper Aquifer in Montgomery County is described below:

Inflow -The modeled groundwater flow into the Jasper Aquifer in Montgomery County is dominated by lateral flow from Walker County. On average, inflow from Walker County is approximately 5,000 acre-feet per year during the historical period and 10,000 acre-feet per year during the predictive period. Other surrounding counties and release of water due to subsidence also contribute groundwater to Montgomery County, ranging from 160 to 2,600 acre-feet per year. Vertical inflow from the Burkeville confining unit is predicted to be less than 1,000 acre-feet per year during the predictive period (Table 4).

Outflow - The main outflow component for the Jasper Aquifer in Montgomery County is groundwater pumping, averaging approximately 11,000 acre-feet per year during the historical period and 23,000 acre-feet per year during the predictive period. A small amount of vertical leakage to the Burkeville confining unit also occurs during the historical period (Table 4).

Storage - The average aquifer storage losses are predicted to be approximately 3,600 acre-feet per year during the historical period and 3,300 acre-feet per year during the predictive period (Table 4).

Summary

The groundwater availability model for the northern portion of the Gulf Coast Aquifer suggests the groundwater flow in Montgomery County is primarily impacted by pumping and the Burkeville confining unit. As simulated in the model, the pumping primarily occurs in the Evangeline and Jasper aquifers, separated by the Burkeville confining unit. As a result, groundwater recharge due to precipitation and leakage from surface water bodies received by the Chicot Aquifer in the outcrop area will likely move downward to the Evangeline Aquifer and be collected by groundwater pumping. The Burkeville confining unit is predicted to limit the groundwater vertical flow. Thus, the pumping in the Jasper Aquifer tends to withdraw groundwater from surrounding counties (especially Walker County). In addition, changes in pumping rate also influence groundwater flow direction and magnitude. For instance, an

increase of pumping in the Evangeline Aquifer may induce more vertical flow from the Chicot Aquifer and reduce lateral flow from Montgomery to Harris counties in the Evangeline Aquifer. For the Jasper Aquifer, the increase of pumping in Montgomery County may also induce more lateral flow from the surrounding counties and, for the case of Harris County, to reverse the groundwater flow from outflow to inflow. To illustrate the overall groundwater flow relationships in Montgomery County, a simplified conceptual model is presented on Figure 5.

It is important for the Lone Star Groundwater Conservation District to monitor future groundwater pumping and overall conditions of the aquifer, and work with the TWDB to refine this analysis as available data enable an improved understanding of how the aquifer responds to the actual amount and location of current and future pumping.

LIMITATIONS:

Although the groundwater flow model used in this analysis is the best available scientific tool for this purpose, it, like all models, has limitations. In reviewing the use of models in environmental regulatory decision-making, the National Research Council (2007) noted:

> "Models will always be constrained by computational limitations, assumptions, and knowledge gaps. They can best be viewed as tools to help inform decisions rather than as machines to generate truth or make decisions. Scientific advances will never make it possible to build a perfect model that accounts for every aspect of reality or to prove that a given model is correct in all respects for a particular regulatory application. These characteristics make evaluation of a regulatory model more complex than solely a comparison of measurement data with model results."

Parameters related to this specific groundwater flow model include aquifer geometry and properties, pumping rates and locations, and the use of a general head boundary to represent lumped impacts of recharge, evapotranspiration, and groundwater/surface water interaction. During model development, certain assumptions have to be made regarding these parameters. Uncertainty of the parameters will cause non-uniqueness of model predictions. As a result, users of this information are cautioned that the magnitude and change of each modeled groundwater component should not be considered definitive and permanent. The TWDB makes no warranties or representations relating to the actual conditions of any aquifer/confining unit at a particular location or at a particular time.

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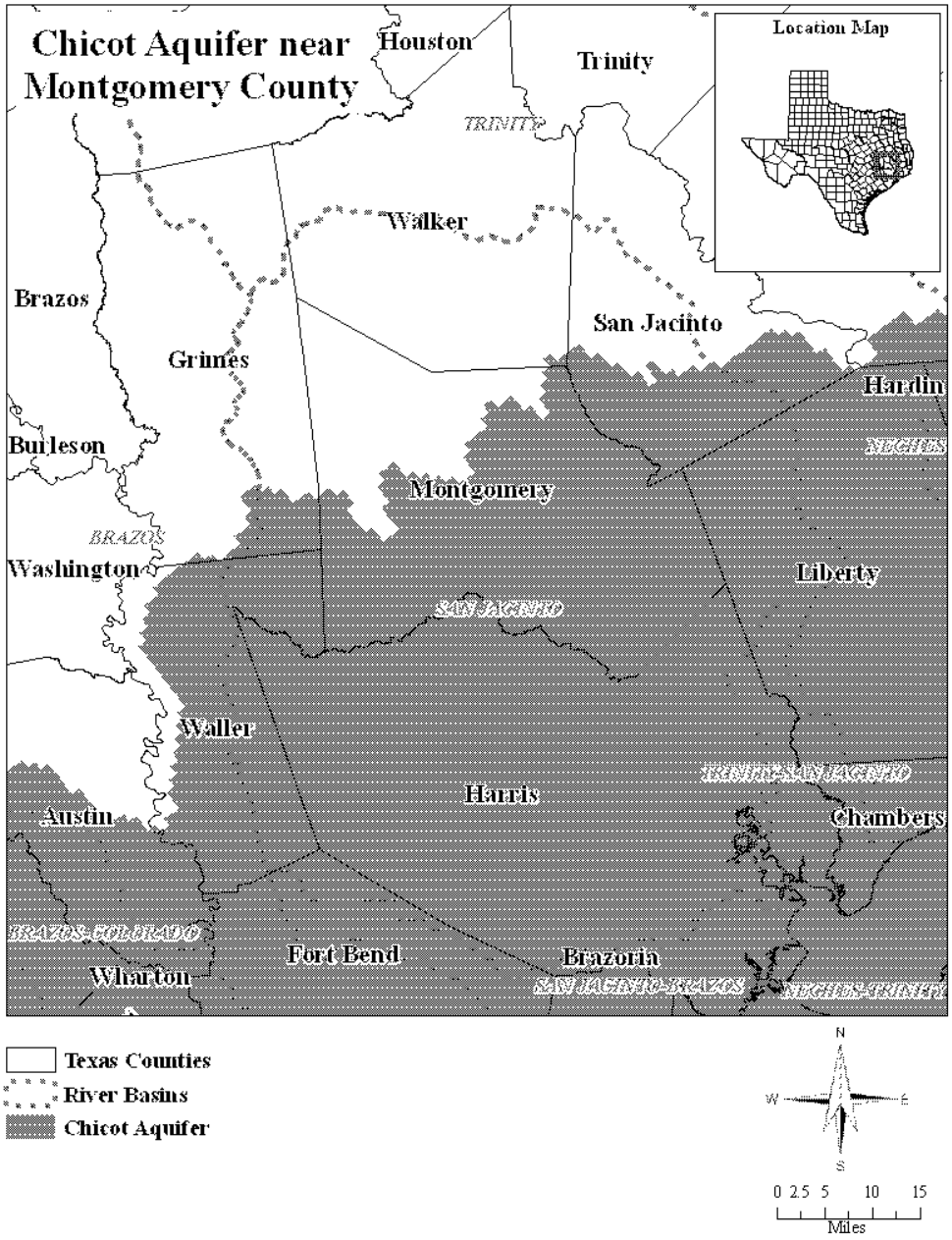


FIGURE 1. GROUNDWATER AVAILABILITY MODEL CELLS REPRESENTING THE CHICOT AQUIFER IN MONTGOMERY COUNTY AND NEARBY AREAS.

TABLE 1: SIMULATED WATER BUDGET OF THE CHICOT AQUIFER IN MONTGOMERY COUNTY. POSITIVE VALUES REPRESENT GROUNDWATER FLOW INTO THE CHICOT AQUIFER IN MONTGOMERY COUNTY. NEGATIVE VALUES REPRESENT GROUNDWATER FLOW OUT OF THE CHICOT AQUIFER IN MONTGOMERY COUNTY. ALL VALUES ARE IN ACRE-FEET PER YEAR.

Year	*Head Dependent Boundary*	*Subsidence*	*Well*	*Evangeline Aquifer*	*Grimes County*	*Harris County*	*Liberty County*	*San Jacinto County*	*Walker County*	*Waller County*	*Storage Change*
Pre-1891	10,597	0	0	-880	5	-10,426	-106	169	1	640	0
1891-1900	11,425	12	0	-1,969	5	-12,510	-83	170	1	644	-2,300
1901-1930	13,510	4	0	-2,661	5	-13,078	-36	174	1	657	-1,358
1931-1940	15,864	36	-1	-4,539	5	-19,293	25	177	1	663	-7,062
1941-1945	17,152	31	-1	-5,254	5	-20,157	63	177	1	668	-7,312
1946-1953	20,518	51	-1	-8,079	5	-25,630	141	182	1	662	-12,151
1954-1960	23,903	53	-224	-10,029	5	-28,890	203	186	1	664	-14,129
1961-1962	24,877	55	-187	-10,754	5	-29,646	226	188	1	662	-14,575
1963-1970	28,966	54	-193	-12,058	5	-32,784	312	194	1	665	-14,839
1971-1973	30,570	60	-251	-13,068	5	-34,248	342	196	1	676	-15,717
1974-1975	31,693	63	-278	-13,594	5	-35,440	360	197	1	685	-16,307
1976	32,235	61	-294	-13,477	5	-35,523	363	198	1	689	-15,741
1977	32,804	65	-304	-13,917	5	-36,103	367	199	1	693	-16,191
1978	33,390	66	-315	-14,454	5	-36,723	373	201	1	696	-16,762
1979	33,988	67	-326	-14,784	5	-37,263	381	201	1	700	-17,030

TABLE 1: SIMULATED WATER BUDGET OF THE CHICOT AQUIFER IN MONTGOMERY COUNTY. POSITIVE VALUES REPRESENT GROUNDWATER FLOW INTO THE CHICOT AQUIFER IN MONTGOMERY COUNTY. NEGATIVE VALUES REPRESENT GROUNDWATER FLOW OUT OF THE CHICOT AQUIFER IN MONTGOMERY COUNTY. ALL VALUES ARE IN ACRE-FEET PER YEAR.

Year	*Head Dependent Boundary*	*Subsidence*	*Well*	*Evangeline Aquifer*	*Grimes County*	*Harris County*	*Liberty County*	*San Jacinto County*	*Walker County*	*Waller County*	*Storage Change*
1980	34,309	71	-209	-14,948	5	-37,558	388	201	1	701	-17,039
1981	35,227	114	-210	-16,226	5	-38,404	405	203	1	708	-18,178
1982	35,580	118	-208	-16,523	5	-38,784	402	204	1	711	-18,495
1983	36,566	125	-284	-17,314	5	-39,594	416	205	1	720	-19,155
1984	37,251	141	-199	-17,839	5	-40,120	430	206	1	727	-19,397
1985	37,936	181	-206	-18,314	5	-40,658	445	207	1	733	-19,671
1986	38,632	226	-331	-18,849	5	-41,085	468	208	1	739	-19,987
1987	39,308	255	-286	-18,850	5	-41,502	485	210	1	744	-19,631
1988	39,660	272	-374	-18,838	5	-41,743	493	210	1	745	-19,569
1989	40,632	296	-288	-19,683	5	-42,282	513	211	1	751	-19,843
1990	41,314	298	-311	-20,287	5	-42,562	531	212	1	756	-20,044
1991	41,972	298	-350	-20,338	5	-42,661	544	213	1	761	-19,557
1992	42,613	349	-297	-20,758	5	-42,730	557	214	1	766	-19,281
1993	43,274	361	-233	-21,316	5	-43,017	570	215	1	773	-19,365
1994	43,957	416	-308	-22,372	5	-43,191	587	216	1	779	-19,909
1995	44,642	454	-314	-22,970	5	-43,314	605	218	1	786	-19,888
1996	45,350	508	-308	-24,032	5	-43,513	626	219	1	792	-20,354
1997	45,923	581	-76	-22,919	5	-43,419	641	220	1	798	-18,245
1998	46,465	845	-77	-23,100	5	-43,624	654	221	1	804	-17,805
1999	46,999	986	-77	-23,419	5	-43,896	673	222	1	809	-17,696
2000	47,475	1,344	-1,363	-24,841	5	-43,884	715	221	1	815	-19,510
2001	47,833	637	-1,385	-25,858	5	-41,318	754	222	1	821	-18,287
2002	48,227	476	-1,407	-26,867	5	-40,197	783	224	1	827	-17,928

TABLE 1: SIMULATED WATER BUDGET OF THE CHICOT AQUIFER IN MONTGOMERY COUNTY. POSITIVE VALUES REPRESENT GROUNDWATER FLOW INTO THE CHICOT AQUIFER IN MONTGOMERY COUNTY. NEGATIVE VALUES REPRESENT GROUNDWATER FLOW OUT OF THE CHICOT AQUIFER IN MONTGOMERY COUNTY. ALL VALUES ARE IN ACRE-FEET PER YEAR.

Year	*Head Dependent Boundary*	*Subsidence*	*Well*	*Evangeline Aquifer*	*Grimes County*	*Harris County*	*Liberty County*	*San Jacinto County*	*Walker County*	*Waller County*	*Storage Change*
2003	48,662	441	-1,428	-27,776	5	-39,529	806	225	1	834	-17,761
2004	49,082	306	-1,450	-28,222	5	-38,514	824	226	1	841	-16,901
2005	49,561	379	-1,471	-29,246	5	-38,489	841	227	1	849	-17,344
2006	50,024	322	-1,492	-29,689	5	-37,885	855	228	1	857	-16,775
2007	50,442	209	-1,513	-29,839	5	-36,899	867	230	1	865	-15,632
2008	50,841	163	-1,513	-30,008	5	-36,091	878	230	1	873	-14,620
2009	51,325	217	-1,542	-31,773	5	-36,358	844	233	1	879	-16,168
2010	51,841	341	-1,482	-32,075	5	-36,645	816	235	1	886	-16,077
2011	52,365	516	-1,519	-32,685	5	-36,782	794	235	1	892	-16,176
2012	52,893	612	-1,555	-33,259	5	-36,846	778	236	1	899	-16,234
2013	53,423	701	-1,591	-33,794	5	-36,835	764	237	1	905	-16,182
2014	53,952	766	-1,627	-34,311	5	-36,759	754	237	1	911	-16,072
2015	54,625	1,036	-2,359	-38,509	5	-36,505	767	239	1	922	-19,779
2016	55,161	864	-1,722	-34,712	5	-36,422	753	239	1	927	-14,905
2017	55,639	842	-1,722	-34,503	5	-36,219	743	239	1	932	-14,044
2018	56,086	806	-1,722	-34,357	5	-36,003	735	238	1	937	-13,274
2019	56,505	778	-1,722	-34,213	5	-35,780	728	238	1	942	-12,517
2020	56,898	732	-1,722	-34,068	5	-35,545	722	238	1	946	-11,793
2021	57,269	676	-1,722	-33,987	5	-35,305	716	239	1	950	-11,159
2022	57,617	617	-1,722	-33,908	5	-35,058	711	238	1	954	-10,545
2023	57,943	561	-1,722	-33,842	5	-34,801	706	238	1	958	-9,953
2024	58,248	500	-1,722	-33,776	5	-34,535	701	238	1	962	-9,376
2025	58,534	431	-1,722	-33,703	5	-34,256	697	238	1	966	-8,810

TABLE 1: SIMULATED WATER BUDGET OF THE CHICOT AQUIFER IN MONTGOMERY COUNTY. POSITIVE VALUES REPRESENT GROUNDWATER FLOW INTO THE CHICOT AQUIFER IN MONTGOMERY COUNTY. NEGATIVE VALUES REPRESENT GROUNDWATER FLOW OUT OF THE CHICOT AQUIFER IN MONTGOMERY COUNTY. ALL VALUES ARE IN ACRE-FEET PER YEAR.

Year	*Head Dependent Boundary*	*Subsidence*	*Well*	*Evangeline Aquifer*	*Grimes County*	*Harris County*	*Liberty County*	*San Jacinto County*	*Walker County*	*Waller County*	*Storage Change*
2026	58,801	360	-1,722	-33,630	5	-33,966	692	238	1	969	-8,252
2027	59,048	299	-1,722	-33,557	5	-33,666	688	238	1	972	-7,695
2028	59,277	242	-1,722	-33,482	5	-33,357	685	237	1	974	-7,139
2029	59,485	193	-1,722	-33,402	5	-33,042	681	237	1	978	-6,586
2030	59,674	154	-1,722	-33,317	5	-32,720	677	237	1	980	-6,030
2031	59,851	128	-1,722	-33,299	5	-32,456	673	237	1	983	-5,598
2032	60,018	111	-1,722	-33,295	5	-32,240	669	237	1	985	-5,230
2033	60,177	99	-1,722	-33,299	5	-32,057	665	238	1	987	-4,905
2034	60,328	90	-1,722	-33,306	5	-31,901	662	238	1	988	-4,615
2035	60,472	84	-1,722	-33,317	5	-31,764	658	238	1	991	-4,357
2036	60,609	82	-1,722	-33,333	5	-31,646	654	237	1	993	-4,120
2037	60,739	77	-1,722	-33,350	5	-31,542	651	237	1	994	-3,908
2038	60,865	74	-1,722	-33,368	5	-31,449	649	237	1	995	-3,713
2039	60,985	72	-1,722	-33,389	5	-31,367	645	237	1	997	-3,537
2040	61,099	71	-1,722	-33,411	5	-31,293	642	237	1	998	-3,372
2041	61,209	69	-1,722	-33,424	5	-31,224	639	237	1	999	-3,210
2042	61,315	67	-1,722	-33,435	5	-31,162	637	237	1	999	-3,056
2043	61,416	66	-1,722	-33,446	5	-31,104	634	237	1	1,000	-2,911
2044	61,513	65	-1,722	-33,458	5	-31,052	632	237	1	1,001	-2,776
2045	61,605	66	-1,722	-33,468	5	-31,004	630	237	1	1,002	-2,647
2046	61,695	65	-1,722	-33,478	5	-30,960	628	237	1	1,003	-2,525
2047	61,780	67	-1,722	-33,487	5	-30,918	626	237	1	1,003	-2,409
2048	61,861	67	-1,722	-33,498	5	-30,880	625	237	1	1,004	-2,300

TABLE 1: SIMULATED WATER BUDGET OF THE CHICOT AQUIFER IN MONTGOMERY COUNTY. POSITIVE VALUES REPRESENT GROUNDWATER FLOW INTO THE CHICOT AQUIFER IN MONTGOMERY COUNTY. NEGATIVE VALUES REPRESENT GROUNDWATER FLOW OUT OF THE CHICOT AQUIFER IN MONTGOMERY COUNTY. ALL VALUES ARE IN ACRE-FEET PER YEAR.

Year	*Head Dependent Boundary*	*Subsidence*	*Well*	*Evangeline Aquifer*	*Grimes County*	*Harris County*	*Liberty County*	*San Jacinto County*	*Walker County*	*Waller County*	*Storage Change*
2049	61,939	68	-1,722	-33,508	5	-30,844	622	238	1	1,004	-2,196
2050	62,014	72	-1,722	-33,519	5	-30,811	621	238	1	1,005	-2,096
2051	62,086	72	-1,722	-33,540	5	-30,780	620	238	1	1,005	-2,016
2052	62,155	75	-1,722	-33,563	5	-30,752	618	238	1	1,005	-1,941
2053	62,220	78	-1,722	-33,586	5	-30,726	617	238	1	1,005	-1,870
2054	62,284	80	-1,722	-33,610	5	-30,703	615	238	1	1,005	-1,806
2055	62,345	81	-1,722	-33,634	5	-30,680	615	238	1	1,006	-1,745
2056	62,404	84	-1,722	-33,657	5	-30,660	614	238	1	1,006	-1,686
2057	62,461	85	-1,722	-33,681	5	-30,639	613	238	1	1,006	-1,634
2058	62,516	87	-1,722	-33,705	5	-30,622	612	238	1	1,006	-1,583
2059	62,570	88	-1,722	-33,729	5	-30,605	611	238	1	1,006	-1,536
2060	62,622	91	-1,722	-33,752	5	-30,591	610	238	1	1,006	-1,491
Average (1980-1996)	39,895	264	-277	-19,380	5	-41,336	498	210	1	747	-19,374
Average (1999-2060)	59,265	281	-1,715	-33,642	5	-32,920	676	237	1	974	-6,838

Note: Head dependent boundary includes groundwater flow related to recharge, evapotranspiration, springs, and surface water bodies.

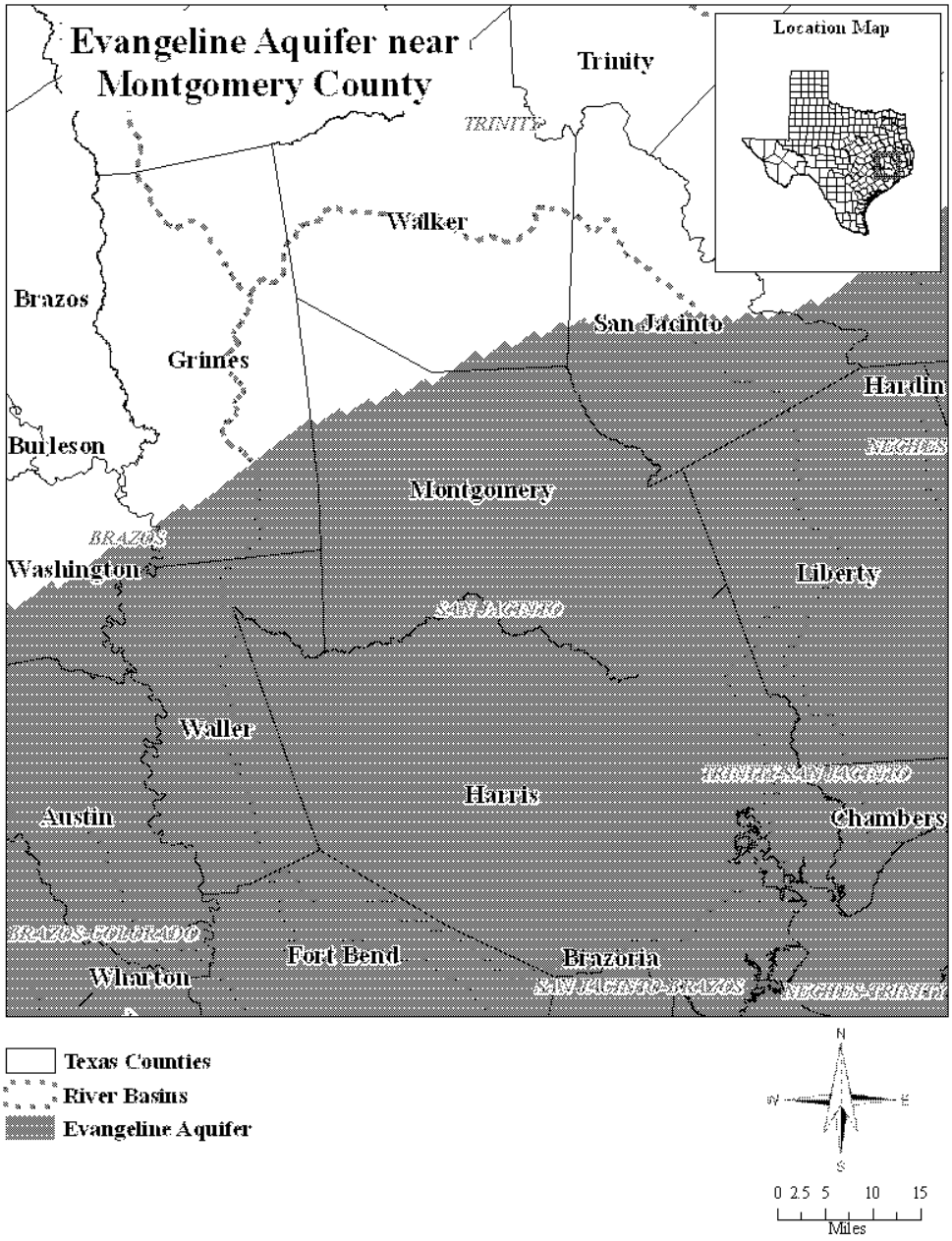


FIGURE 2. GROUNDWATER AVAILABILITY MODEL CELLS REPRESENTING EVANGELINE AQUIFER IN MONTGOMERY COUNTY AND NEARBY AREAS.

TABLE 2: SIMULATED WATER BUDGET FOR THE EVANGELINE AQUIFER IN MONTGOMERY COUNTY. POSITIVE VALUES REPRESENT GROUNDWATER FLOW INTO THE EVANGELINE AQUIFER IN MONTGOMERY COUNTY. NEGATIVE VALUES REPRESENT GROUNDWATER FLOW OUT OF THE EVANGELINE AQUIFER IN MONTGOMERY COUNTY. ALL VALUES ARE IN ACRE-FEET PER YEAR.

Year	*Head Dependent Boundary*	*Subsidence*	*Well*	*Chicot Aquifer*	*Burkeville Confining Unit*	*Grimes County*	*Harris County*	*Liberty County*	*San Jacinto County*	*Walker County*	*Waller County*	*Storage Change*
Pre-1891	-367	0	0	880	409	96	-2,460	-110	703	62	786	0
1891-1900	-350	14	-1,047	1,969	411	98	-2,771	-79	721	63	804	-166
1901-1930	-292	13	-1,849	2,661	402	99	-2,812	-49	763	68	831	-154
1931-1940	-266	38	-2,793	4,539	410	100	-4,058	13	785	70	853	-307
1941-1945	-248	47	-3,547	5,254	386	102	-4,188	40	804	71	870	-411
1946-1953	-212	176	-4,913	8,079	320	103	-5,991	123	838	74	877	-524
1954-1960	-89	704	-6,931	10,029	390	104	-7,012	179	877	77	938	-733
1961-1962	-81	854	-7,843	10,754	399	106	-7,104	209	891	77	921	-818
1963-1970	-33	1,011	-8,823	12,058	398	107	-7,764	287	937	81	959	-781
1971-1973	10	1,610	-10,134	13,068	411	108	-8,362	327	959	82	1,010	-911
1974-1975	34	1,966	-10,838	13,594	411	109	-8,695	347	974	83	1,029	-987
1976	54	2,512	-11,296	13,477	419	110	-8,771	314	983	84	1,010	-1,104
1977	70	2,772	-12,124	13,917	430	111	-8,772	323	993	85	1,011	-1,183
1978	86	2,925	-12,246	14,454	439	112	-9,471	337	1,004	85	1,014	-1,260
1979	99	3,300	-12,773	14,784	446	112	-9,775	354	1,015	86	1,041	-1,310

TABLE 2: SIMULATED WATER BUDGET FOR THE EVANGELINE AQUIFER IN MONTGOMERY COUNTY. POSITIVE VALUES REPRESENT GROUNDWATER FLOW INTO THE EVANGELINE AQUIFER IN MONTGOMERY COUNTY. NEGATIVE VALUES REPRESENT GROUNDWATER FLOW OUT OF THE EVANGELINE AQUIFER IN MONTGOMERY COUNTY. ALL VALUES ARE IN ACRE-FEET PER YEAR.

Year	*Head Dependent Boundary*	*Subsidence*	*Well*	*Chicot Aquifer*	*Burkeville Confining Unit*	*Grimes County*	*Harris County*	*Liberty County*	*San Jacinto County*	*Walker County*	*Waller County*	*Storage Change*
1980	183	5,030	-14,570	14,948	455	113	-10,167	345	1,019	87	1,029	-1,528
1981	322	4,573	-15,384	16,226	418	114	-10,517	387	1,041	88	1,067	-1,664
1982	356	4,955	-15,752	16,523	433	115	-10,839	399	1,046	89	1,067	-1,609
1983	422	5,215	-16,660	17,314	402	117	-11,238	406	1,067	91	1,110	-1,754
1984	455	5,664	-17,027	17,839	350	118	-11,828	441	1,079	92	1,114	-1,704
1985	484	5,864	-17,263	18,314	333	118	-12,297	477	1,089	93	1,120	-1,668
1986	509	6,003	-17,808	18,849	352	119	-12,538	495	1,100	94	1,139	-1,687
1987	529	5,993	-17,345	18,850	323	119	-12,909	475	1,107	95	1,143	-1,620
1988	539	5,940	-16,472	18,838	307	118	-13,449	475	1,105	95	1,107	-1,397
1989	561	6,144	-17,566	19,683	301	120	-13,827	496	1,126	97	1,158	-1,708
1990	576	6,201	-17,920	20,287	297	120	-14,183	508	1,137	98	1,163	-1,715
1991	591	6,085	-18,141	20,338	316	120	-13,887	517	1,145	99	1,182	-1,633
1992	606	6,207	-18,485	20,758	282	121	-14,108	529	1,156	100	1,195	-1,640
1993	620	6,375	-19,434	21,316	287	122	-14,103	546	1,171	101	1,234	-1,766
1994	637	7,270	-21,544	22,372	287	124	-14,314	582	1,192	102	1,246	-2,047
1995	654	7,462	-22,432	22,970	303	125	-14,376	600	1,210	103	1,284	-2,096
1996	673	7,883	-23,478	24,032	298	128	-14,991	639	1,229	105	1,271	-2,212
1997	685	6,068	-19,749	22,919	274	123	-15,073	770	1,208	106	1,278	-1,389
1998	696	6,325	-19,749	23,100	288	123	-15,643	784	1,215	106	1,287	-1,468
1999	707	6,384	-19,749	23,419	294	123	-16,052	799	1,220	107	1,268	-1,481
2000	554	16,382	-32,717	24,841	319	108	-13,989	827	1,230	106	1,275	-1,064
2001	560	11,229	-33,742	25,858	251	105	-9,306	870	1,247	105	1,305	-1,520
2002	656	10,623	-34,767	26,867	175	104	-9,033	898	1,259	104	1,336	-1,779

TABLE 2: SIMULATED WATER BUDGET FOR THE EVANGELINE AQUIFER IN MONTGOMERY COUNTY. POSITIVE VALUES REPRESENT GROUNDWATER FLOW INTO THE EVANGELINE AQUIFER IN MONTGOMERY COUNTY. NEGATIVE VALUES REPRESENT GROUNDWATER FLOW OUT OF THE EVANGELINE AQUIFER IN MONTGOMERY COUNTY. ALL VALUES ARE IN ACRE-FEET PER YEAR.

Year	*Head Dependent Boundary*	*Subsidence*	*Well*	*Chicot Aquifer*	*Burkeville Confining Unit*	*Grimes County*	*Harris County*	*Liberty County*	*San Jacinto County*	*Walker County*	*Waller County*	*Storage Change*
2003	800	10,313	-35,790	27,776	103	103	-8,920	923	1,269	103	1,363	-1,958
2004	965	9,530	-36,812	28,222	26	103	-7,790	937	1,281	101	1,390	-2,049
2005	1,147	10,203	-37,834	29,246	-19	102	-8,845	965	1,291	100	1,409	-2,238
2006	1,351	9,556	-38,855	29,689	-85	102	-7,849	978	1,302	99	1,437	-2,277
2007	494	8,964	-38,329	29,839	-151	101	-6,703	989	1,313	98	1,452	-1,935
2008	497	8,529	-38,329	30,008	-205	101	-6,376	993	1,319	97	1,462	-1,903
2009	512	9,733	-40,188	31,773	-227	101	-7,892	902	1,484	86	1,474	-2,244
2010	528	9,052	-39,381	32,075	-311	100	-8,162	878	1,464	79	1,481	-2,197
2011	548	9,434	-40,555	32,685	-392	99	-7,981	879	1,466	75	1,498	-2,243
2012	568	9,753	-41,727	33,259	-473	99	-7,689	881	1,469	72	1,513	-2,275
2013	588	10,039	-42,900	33,794	-552	99	-7,335	885	1,473	69	1,528	-2,313
2014	609	10,298	-44,072	34,311	-628	99	-6,941	890	1,477	67	1,540	-2,349
2015	667	12,256	-52,772	38,509	-600	99	-6,153	1,103	1,634	65	1,689	-3,503
2016	680	4,639	-38,293	34,712	-715	99	-6,880	913	1,496	64	1,573	-1,712
2017	695	4,452	-38,293	34,503	-658	97	-6,654	906	1,498	62	1,577	-1,814
2018	708	4,318	-38,293	34,357	-613	97	-6,415	900	1,499	61	1,582	-1,800
2019	721	4,196	-38,293	34,213	-576	97	-6,175	894	1,501	60	1,586	-1,774
2020	736	4,079	-38,293	34,068	-546	97	-5,930	889	1,504	58	1,590	-1,748
2021	748	4,001	-38,293	33,987	-522	97	-5,796	885	1,507	58	1,596	-1,732
2022	760	3,925	-38,293	33,908	-503	97	-5,655	881	1,509	57	1,601	-1,713
2023	772	3,834	-38,293	33,842	-488	97	-5,508	878	1,513	56	1,606	-1,691
2024	784	3,743	-38,293	33,776	-477	97	-5,359	877	1,515	56	1,610	-1,673
2025	795	3,660	-38,293	33,703	-468	97	-5,207	874	1,519	55	1,614	-1,652

TABLE 2: SIMULATED WATER BUDGET FOR THE EVANGELINE AQUIFER IN MONTGOMERY COUNTY. POSITIVE VALUES REPRESENT GROUNDWATER FLOW INTO THE EVANGELINE AQUIFER IN MONTGOMERY COUNTY. NEGATIVE VALUES REPRESENT GROUNDWATER FLOW OUT OF THE EVANGELINE AQUIFER IN MONTGOMERY COUNTY. ALL VALUES ARE IN ACRE-FEET PER YEAR.

Year	*Head Dependent Boundary*	*Subsidence*	*Well*	*Chicot Aquifer*	*Burkeville Confining Unit*	*Grimes County*	*Harris County*	*Liberty County*	*San Jacinto County*	*Walker County*	*Waller County*	*Storage Change*
2026	806	3,574	-38,293	33,630	-461	97	-5,050	871	1,523	55	1,618	-1,632
2027	816	3,488	-38,293	33,557	-456	96	-4,888	868	1,525	54	1,621	-1,612
2028	827	3,401	-38,293	33,482	-453	96	-4,724	864	1,529	53	1,624	-1,592
2029	837	3,319	-38,293	33,402	-450	96	-4,557	861	1,533	53	1,627	-1,573
2030	847	3,238	-38,293	33,317	-449	96	-4,386	858	1,536	53	1,629	-1,555
2031	855	3,195	-38,293	33,299	-447	96	-4,328	856	1,539	53	1,632	-1,546
2032	864	3,147	-38,293	33,295	-446	96	-4,279	853	1,542	52	1,635	-1,533
2033	873	3,101	-38,293	33,299	-445	96	-4,234	851	1,546	52	1,637	-1,520
2034	882	3,055	-38,293	33,306	-445	96	-4,195	849	1,549	52	1,640	-1,506
2035	890	3,012	-38,293	33,317	-446	96	-4,160	847	1,553	52	1,642	-1,492
2036	898	2,968	-38,293	33,333	-446	96	-4,128	846	1,556	51	1,644	-1,479
2037	905	2,925	-38,293	33,350	-447	96	-4,100	844	1,559	51	1,645	-1,466
2038	913	2,885	-38,293	33,368	-449	96	-4,072	842	1,562	51	1,647	-1,452
2039	920	2,843	-38,293	33,389	-450	96	-4,047	840	1,565	51	1,648	-1,439
2040	927	2,802	-38,293	33,411	-452	96	-4,025	839	1,568	51	1,650	-1,426
2041	934	2,755	-38,293	33,424	-454	96	-3,983	837	1,571	51	1,650	-1,411
2042	941	2,712	-38,293	33,435	-456	96	-3,943	836	1,574	51	1,651	-1,398
2043	947	2,669	-38,293	33,446	-458	96	-3,905	834	1,577	51	1,652	-1,385
2044	954	2,629	-38,293	33,458	-461	96	-3,869	834	1,580	51	1,652	-1,370
2045	960	2,590	-38,293	33,468	-464	96	-3,835	833	1,583	51	1,652	-1,359
2046	967	2,553	-38,293	33,478	-467	96	-3,800	832	1,585	51	1,653	-1,346
2047	973	2,515	-38,293	33,487	-469	96	-3,767	831	1,588	50	1,653	-1,335
2048	978	2,478	-38,293	33,498	-472	96	-3,734	830	1,591	50	1,653	-1,324

TABLE 2: SIMULATED WATER BUDGET FOR THE EVANGELINE AQUIFER IN MONTGOMERY COUNTY. POSITIVE VALUES REPRESENT GROUNDWATER FLOW INTO THE EVANGELINE AQUIFER IN MONTGOMERY COUNTY. NEGATIVE VALUES REPRESENT GROUNDWATER FLOW OUT OF THE EVANGELINE AQUIFER IN MONTGOMERY COUNTY. ALL VALUES ARE IN ACRE-FEET PER YEAR.

Year	*Head Dependent Boundary*	*Subsidence*	*Well*	*Chicot Aquifer*	*Burkeville Confining Unit*	*Grimes County*	*Harris County*	*Liberty County*	*San Jacinto County*	*Walker County*	*Waller County*	*Storage Change*
2049	984	2,442	-38,293	33,508	-475	96	-3,701	829	1,593	50	1,653	-1,312
2050	990	2,407	-38,293	33,519	-477	96	-3,669	829	1,596	50	1,653	-1,301
2051	996	2,380	-38,293	33,540	-480	96	-3,659	828	1,598	50	1,653	-1,292
2052	1,001	2,353	-38,293	33,563	-483	96	-3,649	828	1,601	50	1,653	-1,282
2053	1,006	2,325	-38,293	33,586	-485	95	-3,640	827	1,603	50	1,653	-1,271
2054	1,012	2,299	-38,293	33,610	-488	95	-3,630	827	1,606	50	1,653	-1,260
2055	1,016	2,273	-38,293	33,634	-491	95	-3,621	827	1,608	50	1,653	-1,250
2056	1,022	2,246	-38,293	33,657	-494	95	-3,612	825	1,612	51	1,653	-1,240
2057	1,026	2,218	-38,293	33,681	-497	95	-3,603	825	1,614	51	1,653	-1,230
2058	1,031	2,192	-38,293	33,705	-500	95	-3,594	825	1,616	51	1,653	-1,220
2059	1,035	2,167	-38,293	33,729	-503	95	-3,587	825	1,618	51	1,653	-1,211
2060	1,040	2,143	-38,293	33,752	-506	95	-3,579	825	1,620	51	1,652	-1,200
Average (1980-1996)	513	6,051	-18,075	19,380	338	119	-12,916	489	1,119	96	1,155	-1,732
Average (1999-2060)	852	3,975	-38,938	33,642	-482	97	-4,832	859	1,551	56	1,620	-1,601

Note: Head dependent boundary includes groundwater flow related to recharge, evapotranspiration, springs, and surface water bodies.

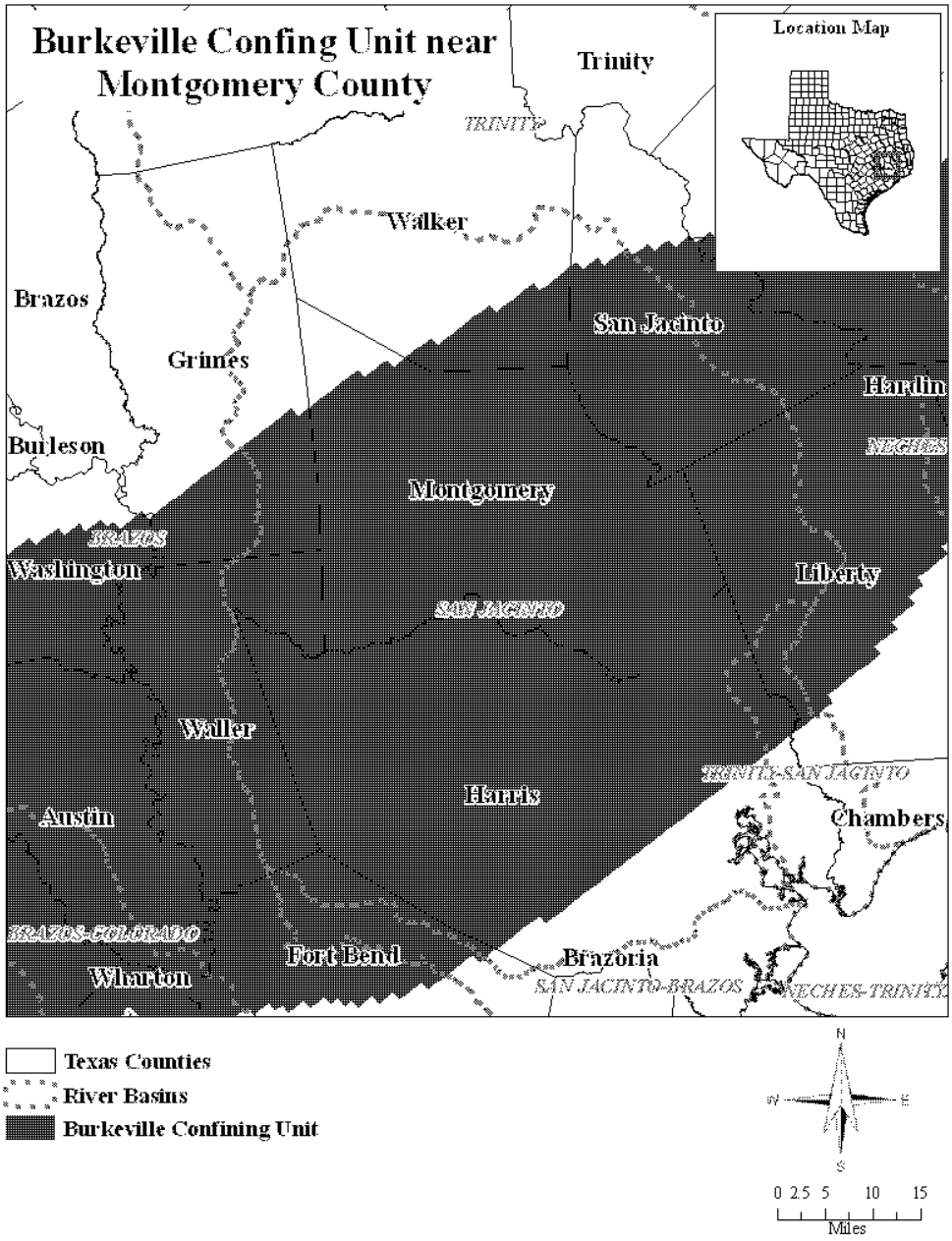


FIGURE 3. GROUNDWATER AVAILABILITY MODEL CELLS REPRESENTING THE BURKEVILLE CONFINING UNIT IN MONTGOMERY COUNTY AND NEARBY AREAS.

TABLE 3: SIMULATED WATER BUDGET FOR THE BURKEVILLE CONFINING UNIT IN MONTGOMERY COUNTY. POSITIVE VALUES REPRESENT GROUNDWATER FLOW INTO THE BURKEVILLE CONFINING UNIT IN MONTGOMERY COUNTY. NEGATIVE VALUES REPRESENT GROUNDWATER FLOW OUT OF THE BURKEVILLE CONFINING UNIT IN MONTGOMERY COUNTY. ALL VALUES ARE IN ACRE-FEET PER YEAR.

Year	*Head Dependent Boundary*	*Subsidence*	*Well*	*Evangeline Aquifer*	*Jasper Aquifer*	*Grimes County*	*Harris County*	*Liberty County*	*San Jacinto County*	*Walker County*	*Waller County*	*Storage Change*
Pre-1891	1	0	0	-409	402	3	-1	0	2	1	1	0
1891-1900	1	0	0	-411	393	3	-2	0	2	1	1	-12
1901-1930	1	0	0	-402	384	3	-2	0	3	1	1	-10
1931-1940	1	0	0	-410	371	3	-2	0	3	1	1	-33
1941-1945	1	0	0	-386	339	3	-3	0	3	1	1	-41
1946-1953	1	0	-1	-320	254	3	-3	0	3	1	1	-62
1954-1960	1	0	-1	-390	313	3	-4	0	3	1	1	-74
1961-1962	1	0	-2	-399	322	3	-4	0	3	1	1	-74
1963-1970	1	0	-2	-398	321	3	-4	0	3	1	1	-74
1971-1973	1	0	-2	-411	323	3	-5	0	3	1	1	-86
1974-1975	1	0	-2	-411	318	3	-5	0	3	1	1	-90
1976	1	0	-1	-419	319	3	-5	0	3	1	1	-97
1977	1	0	-1	-430	328	3	-5	0	3	1	1	-101
1978	1	0	-1	-439	333	3	-6	0	3	1	1	-103
1979	1	0	-1	-446	341	3	-6	0	3	1	1	-103

TABLE 3: SIMULATED WATER BUDGET FOR THE BURKEVILLE CONFINING UNIT IN MONTGOMERY COUNTY. POSITIVE VALUES REPRESENT GROUNDWATER FLOW INTO THE BURKEVILLE CONFINING UNIT IN MONTGOMERY COUNTY. NEGATIVE VALUES REPRESENT GROUNDWATER FLOW OUT OF THE BURKEVILLE CONFINING UNIT IN MONTGOMERY COUNTY. ALL VALUES ARE IN ACRE-FEET PER YEAR.

Year	*Head Dependent Boundary*	*Subsidence*	*Well*	*Evangeline Aquifer*	*Jasper Aquifer*	*Grimes County*	*Harris County*	*Liberty County*	*San Jacinto County*	*Walker County*	*Waller County*	*Storage Change*
1980	1	0	-1	-455	332	3	-6	0	3	1	1	-121
1981	1	0	-25	-418	308	3	-7	0	3	1	1	-131
1982	1	0	0	-433	298	3	-7	0	3	1	1	-132
1983	1	0	0	-402	262	3	-7	0	3	1	1	-138
1984	1	0	-16	-350	243	3	-8	0	3	1	1	-122
1985	1	0	-24	-333	229	3	-8	0	3	1	1	-127
1986	1	0	0	-352	221	3	-8	0	3	1	1	-129
1987	1	0	-19	-323	213	3	-9	0	3	1	1	-128
1988	1	0	-200	-307	210	3	-9	0	3	1	1	-296
1989	1	0	-20	-301	193	3	-10	0	3	1	1	-129
1990	1	0	-21	-297	183	3	-10	0	3	1	1	-136
1991	1	0	0	-316	174	3	-10	0	3	1	1	-142
1992	1	0	-20	-282	165	3	-10	0	3	1	1	-137
1993	1	0	-10	-287	155	3	-10	0	3	1	2	-142
1994	1	0	-20	-287	144	3	-11	0	3	1	2	-164
1995	1	0	0	-303	136	3	-11	0	3	1	2	-168
1996	1	0	0	-298	128	3	-11	0	4	1	2	-170
1997	1	0	0	-274	141	2	-12	0	3	1	2	-136
1998	1	0	0	-288	147	2	-12	0	4	1	2	-142
1999	1	0	0	-294	153	2	-13	0	4	1	2	-144
2000	1	0	0	-319	131	2	-12	0	4	1	2	-192
2001	1	0	0	-251	51	2	-13	0	4	1	2	-204
2002	1	0	0	-175	-32	2	-14	0	4	1	2	-212

TABLE 3: SIMULATED WATER BUDGET FOR THE BURKEVILLE CONFINING UNIT IN MONTGOMERY COUNTY. POSITIVE VALUES REPRESENT GROUNDWATER FLOW INTO THE BURKEVILLE CONFINING UNIT IN MONTGOMERY COUNTY. NEGATIVE VALUES REPRESENT GROUNDWATER FLOW OUT OF THE BURKEVILLE CONFINING UNIT IN MONTGOMERY COUNTY. ALL VALUES ARE IN ACRE-FEET PER YEAR.

Year	Head Dependent Boundary	Subsidence	Well	Evangeline Aquifer	Jasper Aquifer	Grimes County	Harris County	Liberty County	San Jacinto County	Walker County	Waller County	Storage Change
2003	1	0	0	-103	-110	2	-14	0	4	1	2	-216
2004	1	0	0	-26	-182	2	-12	0	4	1	2	-213
2005	1	0	0	19	-245	2	-13	0	4	1	2	-229
2006	1	0	0	85	-305	2	-13	0	4	1	2	-223
2007	1	0	0	151	-362	1	-12	0	4	1	2	-214
2008	1	0	0	205	-412	1	-12	0	4	2	2	-209
2009	1	0	0	227	-468	1	-12	0	4	2	2	-244
2010	1	0	0	311	-545	1	-12	0	4	2	2	-237
2011	1	0	0	392	-629	1	-12	0	4	2	2	-241
2012	1	0	0	473	-714	1	-12	0	3	2	2	-244
2013	1	0	0	552	-796	1	-11	0	3	2	2	-246
2014	1	0	0	628	-875	1	-11	0	3	2	2	-249
2015	1	0	0	600	-907	1	-10	0	4	2	2	-308
2016	1	0	0	715	-883	1	-9	0	3	2	2	-169
2017	1	0	0	658	-830	1	-9	0	4	2	2	-172
2018	1	0	0	613	-781	1	-9	0	4	2	2	-169
2019	1	0	0	576	-741	1	-8	0	4	2	2	-165
2020	1	0	0	546	-709	1	-8	0	4	2	2	-162
2021	1	0	0	522	-683	1	-8	0	4	2	2	-160
2022	1	0	0	503	-662	1	-7	0	4	2	2	-158
2023	1	0	0	488	-645	1	-7	0	4	2	2	-156
2024	1	0	0	477	-632	1	-7	0	4	2	2	-153
2025	1	0	0	468	-621	1	-7	0	4	2	2	-151

TABLE 3: SIMULATED WATER BUDGET FOR THE BURKEVILLE CONFINING UNIT IN MONTGOMERY COUNTY. POSITIVE VALUES REPRESENT GROUNDWATER FLOW INTO THE BURKEVILLE CONFINING UNIT IN MONTGOMERY COUNTY. NEGATIVE VALUES REPRESENT GROUNDWATER FLOW OUT OF THE BURKEVILLE CONFINING UNIT IN MONTGOMERY COUNTY. ALL VALUES ARE IN ACRE-FEET PER YEAR.

Year	*Head Dependent Boundary*	*Subsidence*	*Well*	*Evangeline Aquifer*	*Jasper Aquifer*	*Grimes County*	*Harris County*	*Liberty County*	*San Jacinto County*	*Walker County*	*Waller County*	*Storage Change*
2026	1	0	0	461	-612	1	-7	0	4	2	2	-148
2027	1	0	0	456	-605	1	-7	0	4	2	2	-146
2028	1	0	0	453	-600	1	-6	0	4	2	2	-144
2029	1	0	0	450	-595	1	-6	0	4	2	2	-141
2030	1	0	0	449	-592	1	-6	0	4	2	2	-139
2031	1	0	0	447	-590	1	-6	0	4	2	2	-139
2032	1	0	0	446	-588	1	-6	0	4	2	2	-138
2033	1	0	0	445	-586	1	-6	0	4	2	2	-136
2034	1	0	0	445	-585	1	-6	0	4	2	2	-136
2035	1	0	0	446	-585	1	-6	0	4	2	2	-135
2036	1	0	0	446	-584	1	-6	0	4	2	2	-134
2037	1	0	0	447	-584	1	-6	0	4	2	2	-132
2038	1	0	0	449	-585	1	-6	0	4	2	2	-131
2039	1	0	0	450	-585	1	-6	0	4	2	2	-130
2040	1	0	0	452	-586	1	-6	0	4	2	2	-129
2041	1	0	0	454	-587	1	-6	0	4	2	2	-128
2042	1	0	0	456	-588	1	-5	0	4	2	2	-127
2043	1	0	0	458	-590	1	-5	0	4	2	2	-126
2044	1	0	0	461	-591	1	-5	0	4	2	2	-125
2045	1	0	0	464	-593	1	-5	0	4	2	2	-124
2046	1	0	0	467	-594	1	-5	0	4	2	2	-122
2047	1	0	0	469	-596	1	-5	0	4	2	2	-122
2048	1	0	0	472	-598	1	-5	0	5	2	2	-120

TABLE 3: SIMULATED WATER BUDGET FOR THE BURKEVILLE CONFINING UNIT IN MONTGOMERY COUNTY. POSITIVE VALUES REPRESENT GROUNDWATER FLOW INTO THE BURKEVILLE CONFINING UNIT IN MONTGOMERY COUNTY. NEGATIVE VALUES REPRESENT GROUNDWATER FLOW OUT OF THE BURKEVILLE CONFINING UNIT IN MONTGOMERY COUNTY. ALL VALUES ARE IN ACRE-FEET PER YEAR.

Year	*Head Dependent Boundary*	*Subsidence*	*Well*	*Evangeline Aquifer*	*Jasper Aquifer*	*Grimes County*	*Harris County*	*Liberty County*	*San Jacinto County*	*Walker County*	*Waller County*	*Storage Change*
2049	1	0	0	475	-600	1	-5	0	5	2	2	-120
2050	1	0	0	477	-602	1	-5	0	5	2	2	-119
2051	1	0	0	480	-604	1	-5	0	5	2	2	-118
2052	1	0	0	483	-606	1	-5	0	5	2	2	-117
2053	1	0	0	485	-608	1	-5	0	5	2	2	-116
2054	1	0	0	488	-610	1	-5	0	5	2	2	-115
2055	1	0	0	491	-612	1	-5	0	5	2	2	-115
2056	1	0	0	494	-614	1	-5	0	5	2	2	-114
2057	1	0	0	497	-617	1	-5	0	5	2	2	-113
2058	1	0	0	500	-619	1	-5	0	5	3	2	-112
2059	1	0	0	503	-621	1	-5	0	5	3	2	-112
2060	1	0	0	506	-623	1	-5	0	5	3	2	-111
Average (1980-1996)	1	0	-22	-338	211	3	-9	0	3	1	1	-148
Average (1999-2060)	1	0	0	482	-636	1	-7	0	4	2	2	-150

Note: Head dependent boundary includes groundwater flow related to recharge, evapotranspiration, springs, and surface water bodies.

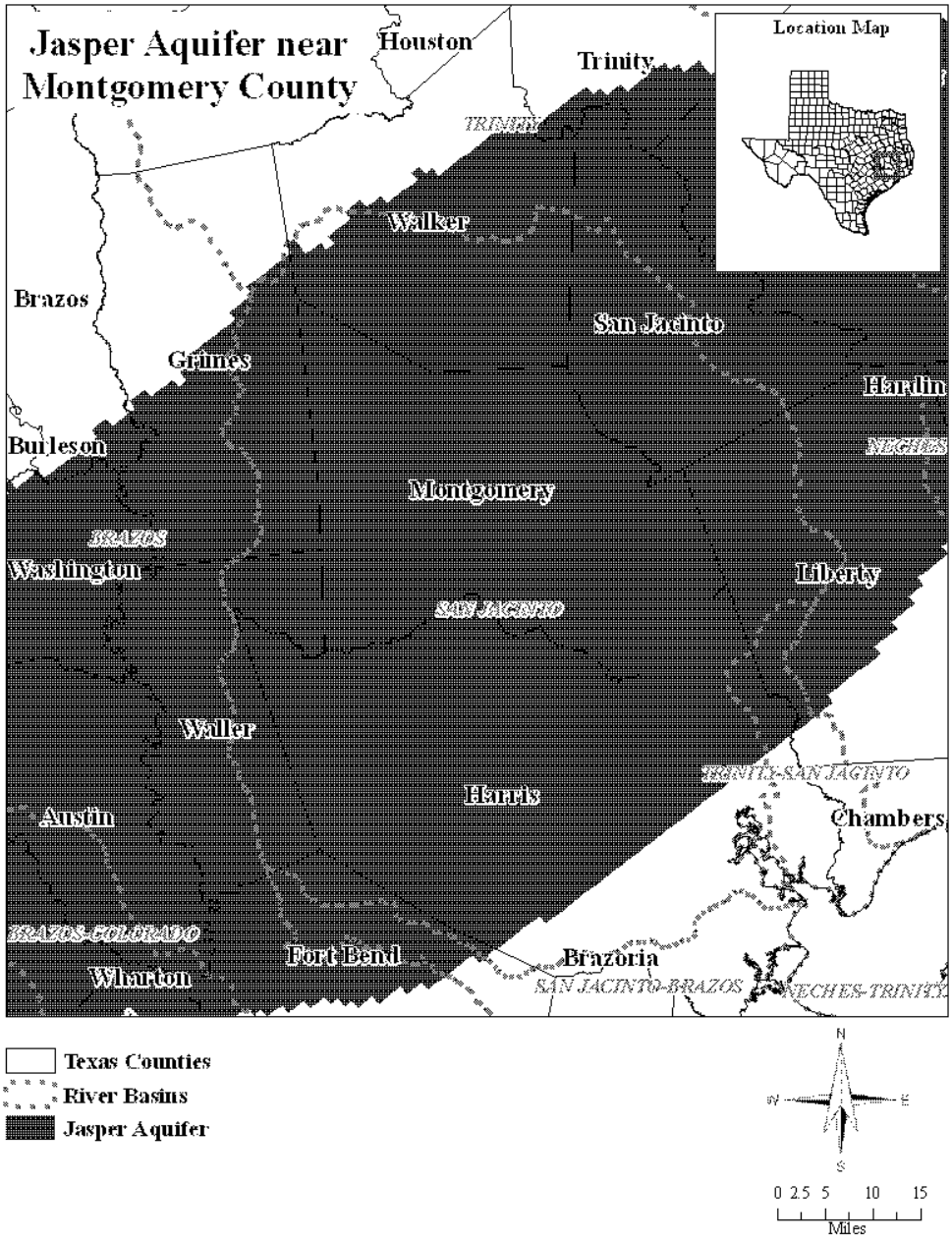


FIGURE 4. GROUNDWATER AVAILABILITY MODEL CELLS REPRESENTING THE JASPER AQUIFER IN MONTGOMERY COUNTY AND NEARBY AREAS. NOTE: THE JASPER INCLUDES PARTS OF THE CATAHOULA FORMATION.

TABLE 4: SIMULATED WATER BUDGET FOR THE JASPER AQUIFER IN MONTGOMERY COUNTY. POSITIVE VALUES REPRESENT GROUNDWATER FLOW INTO THE JASPER AQUIFER IN MONTGOMERY COUNTY. NEGATIVE VALUES REPRESENT GROUNDWATER FLOW OUT OF THE JASPER AQUIFER IN MONTGOMERY COUNTY. ALL VALUES ARE IN ACRE-FEET PER YEAR. NOTE: THE JASPER INCLUDES PARTS OF THE CATAHOULA FORMATION.

Year	*Head Dependent Boundary*	*Subsidence*	*Well*	*Burkeville Confining Unit*	*Grimes County*	*Harris County*	*Liberty County*	*San Jacinto County*	*Walker County*	*Waller County*	*Storage Change*
Pre-1891	316	0	0	-402	351	-639	-202	-194	730	39	0
1891-1900	320	0	-712	-393	411	-588	-188	-122	977	54	-237
1901-1930	341	0	-1,106	-384	468	-574	-174	-77	1,131	68	-271
1931-1940	352	0	-2,112	-371	548	-512	-145	65	1,510	99	-565
1941-1945	364	0	-3,874	-339	684	-403	-120	222	2,060	131	-1,262
1946-1953	385	0	-6,089	-254	829	-162	-38	629	3,003	211	-1,472
1954-1960	396	0	-3,625	-313	713	-487	-55	381	2,240	180	-570
1961-1962	398	0	-3,693	-322	707	-511	-53	399	2,242	179	-651
1963-1970	411	0	-4,282	-321	757	-509	-30	496	2,481	203	-790
1971-1973	415	0	-4,516	-323	771	-516	-24	539	2,548	210	-895
1974-1975	419	0	-5,021	-318	803	-508	-19	586	2,710	219	-1,128
1976	422	0	-3,685	-319	674	-536	-4	465	2,522	203	-259
1977	424	0	-3,878	-328	663	-585	-16	432	2,444	185	-659
1978	426	0	-4,325	-333	677	-618	-26	443	2,500	180	-1,075
1979	429	0	-4,668	-341	818	-634	-28	458	2,574	190	-1,201

TABLE 4: SIMULATED WATER BUDGET FOR THE JASPER AQUIFER IN MONTGOMERY COUNTY. POSITIVE VALUES REPRESENT GROUNDWATER FLOW INTO THE JASPER AQUIFER IN MONTGOMERY COUNTY. NEGATIVE VALUES REPRESENT GROUNDWATER FLOW OUT OF THE JASPER AQUIFER IN MONTGOMERY COUNTY. ALL VALUES ARE IN ACRE-FEET PER YEAR. NOTE: THE JASPER INCLUDES PARTS OF THE CATAHOULA FORMATION.

Year	*Head Dependent Boundary*	*Subsidence*	*Well*	*Burkeville Confining Unit*	*Grimes County*	*Harris County*	*Liberty County*	*San Jacinto County*	*Walker County*	*Waller County*	*Storage Change*
1980	431	0	-8,858	-332	937	-614	-43	668	3,145	209	-4,458
1981	439	0	-9,160	-308	1,082	-469	-4	818	3,765	250	-3,584
1982	442	0	-9,403	-298	1,102	-429	-35	863	3,868	251	-3,640
1983	451	0	-10,332	-262	1,196	-302	117	960	4,199	289	-3,682
1984	457	0	-11,227	-243	1,235	-222	121	1,091	4,532	304	-3,922
1985	463	0	-10,826	-229	1,263	-182	127	1,116	4,616	315	-3,324
1986	470	0	-9,948	-221	1,285	-194	126	1,018	4,549	319	-2,603
1987	476	0	-10,443	-213	1,291	-216	134	1,055	4,551	325	-3,031
1988	479	0	-11,024	-210	1,277	-220	140	1,118	4,597	328	-3,516
1989	488	0	-11,398	-193	1,346	-193	198	1,191	4,900	334	-3,323
1990	495	0	-11,954	-183	1,383	-174	219	1,240	5,030	345	-3,594
1991	501	0	-11,915	-174	1,405	-162	224	1,266	5,095	356	-3,370
1992	508	0	-12,245	-165	1,430	-150	242	1,327	5,188	365	-3,486
1993	515	0	-12,929	-155	1,476	-128	259	1,381	5,441	376	-3,760
1994	522	0	-13,378	-144	1,545	-104	277	1,399	5,627	389	-3,861
1995	531	0	-13,606	-136	1,591	-90	291	1,429	5,693	398	-3,876
1996	540	0	-14,363	-128	1,643	-78	306	1,480	5,931	407	-4,249
1997	546	0	-12,418	-141	1,553	-115	309	1,432	5,719	412	-2,702
1998	552	0	-12,418	-147	1,552	-152	320	1,434	5,675	416	-2,768
1999	559	0	-12,418	-153	1,555	-181	325	1,440	5,660	417	-2,794
2000	561	0	-21,658	-131	1,501	1,717	426	1,756	6,245	491	-9,062
2001	564	0	-22,572	-51	1,725	2,241	547	2,168	7,189	625	-7,562
2002	569	0	-23,489	32	1,895	2,542	671	2,462	7,980	737	-6,589

TABLE 4: SIMULATED WATER BUDGET FOR THE JASPER AQUIFER IN MONTGOMERY COUNTY. POSITIVE VALUES REPRESENT GROUNDWATER FLOW INTO THE JASPER AQUIFER IN MONTGOMERY COUNTY. NEGATIVE VALUES REPRESENT GROUNDWATER FLOW OUT OF THE JASPER AQUIFER IN MONTGOMERY COUNTY. ALL VALUES ARE IN ACRE-FEET PER YEAR. NOTE: THE JASPER INCLUDES PARTS OF THE CATAHOULA FORMATION.

Year	*Head Dependent Boundary*	*Subsidence*	*Well*	*Burkeville Confining Unit*	*Grimes County*	*Harris County*	*Liberty County*	*San Jacinto County*	*Walker County*	*Waller County*	*Storage Change*
2003	575	0	-24,406	110	2,036	2,731	771	2,681	8,667	820	-5,999
2004	581	0	-25,324	182	2,160	2,858	850	2,872	9,198	885	-5,738
2005	587	0	-26,243	245	2,272	2,946	914	3,037	9,700	938	-5,592
2006	594	0	-27,164	305	2,378	3,014	969	3,184	10,212	984	-5,513
2007	603	0	-28,085	362	2,478	3,075	1,018	3,327	10,692	1,026	-5,500
2008	611	0	-28,085	412	2,538	3,133	1,063	3,407	10,867	1,059	-4,993
2009	620	0	-29,684	468	2,615	3,149	894	3,049	11,224	1,086	-6,573
2010	630	0	-32,401	545	2,664	3,701	900	3,048	11,590	1,130	-8,183
2011	640	0	-33,612	629	2,761	4,128	950	3,161	12,001	1,193	-8,139
2012	650	0	-34,825	714	2,861	4,497	1,010	3,297	12,380	1,259	-8,144
2013	661	0	-36,037	796	2,961	4,833	1,073	3,442	12,738	1,326	-8,195
2014	673	0	-37,250	875	3,058	5,150	1,139	3,590	13,083	1,392	-8,278
2015	685	0	-29,614	907	3,256	3,273	1,168	3,394	13,896	1,410	-1,626
2016	695	0	-21,614	883	2,972	2,490	1,070	2,794	11,815	1,294	2,376
2017	705	0	-21,614	830	2,804	2,020	943	2,492	11,002	1,178	356
2018	713	0	-21,614	781	2,708	1,731	851	2,340	10,536	1,103	-874
2019	722	0	-21,614	741	2,649	1,563	789	2,252	10,242	1,056	-1,622
2020	730	0	-21,614	709	2,613	1,470	749	2,197	10,046	1,025	-2,098
2021	739	0	-21,614	683	2,588	1,421	720	2,161	9,907	1,005	-2,414
2022	747	0	-21,614	662	2,571	1,400	701	2,135	9,802	991	-2,624
2023	755	0	-21,614	645	2,560	1,395	686	2,117	9,721	980	-2,766
2024	763	0	-21,614	632	2,552	1,401	674	2,104	9,657	972	-2,865
2025	771	0	-21,614	621	2,546	1,412	666	2,093	9,603	966	-2,935

TABLE 4: SIMULATED WATER BUDGET FOR THE JASPER AQUIFER IN MONTGOMERY COUNTY. POSITIVE VALUES REPRESENT GROUNDWATER FLOW INTO THE JASPER AQUIFER IN MONTGOMERY COUNTY. NEGATIVE VALUES REPRESENT GROUNDWATER FLOW OUT OF THE JASPER AQUIFER IN MONTGOMERY COUNTY. ALL VALUES ARE IN ACRE-FEET PER YEAR. NOTE: THE JASPER INCLUDES PARTS OF THE CATAHOULA FORMATION.

Year	*Head Dependent Boundary*	*Subsidence*	*Well*	*Burkeville Confining Unit*	*Grimes County*	*Harris County*	*Liberty County*	*San Jacinto County*	*Walker County*	*Waller County*	*Storage Change*
2026	779	0	-21,614	612	2,542	1,427	659	2,085	9,559	961	-2,986
2027	787	0	-21,614	605	2,540	1,445	653	2,080	9,521	957	-3,022
2028	795	0	-21,614	600	2,538	1,463	649	2,075	9,487	954	-3,048
2029	802	0	-21,614	595	2,538	1,481	644	2,072	9,457	952	-3,067
2030	810	0	-21,614	592	2,539	1,500	641	2,069	9,431	950	-3,078
2031	818	0	-21,614	590	2,538	1,518	638	2,066	9,406	948	-3,083
2032	825	0	-21,614	588	2,539	1,533	636	2,064	9,383	947	-3,088
2033	833	0	-21,614	586	2,540	1,548	633	2,062	9,362	946	-3,090
2034	841	0	-21,614	585	2,542	1,563	632	2,061	9,342	945	-3,091
2035	848	0	-21,614	585	2,543	1,576	630	2,060	9,323	944	-3,090
2036	856	0	-21,614	584	2,545	1,589	629	2,060	9,305	944	-3,088
2037	863	0	-21,614	584	2,546	1,600	629	2,059	9,287	943	-3,086
2038	871	0	-21,614	585	2,549	1,611	627	2,059	9,272	943	-3,082
2039	878	0	-21,614	585	2,551	1,621	627	2,059	9,256	943	-3,077
2040	886	0	-21,614	586	2,553	1,631	627	2,059	9,241	943	-3,072
2041	893	0	-21,614	587	2,555	1,641	626	2,059	9,227	943	-3,065
2042	900	0	-21,614	588	2,558	1,649	627	2,060	9,213	944	-3,059
2043	909	0	-21,614	590	2,560	1,659	626	2,060	9,200	944	-3,052
2044	916	0	-21,614	591	2,562	1,667	626	2,060	9,187	944	-3,044
2045	923	0	-21,614	593	2,565	1,674	626	2,062	9,175	945	-3,037
2046	930	0	-21,614	594	2,567	1,681	627	2,062	9,162	945	-3,028
2047	938	0	-21,614	596	2,571	1,688	626	2,063	9,150	946	-3,020
2048	945	0	-21,614	598	2,573	1,695	627	2,064	9,140	946	-3,004

TABLE 4: SIMULATED WATER BUDGET FOR THE JASPER AQUIFER IN MONTGOMERY COUNTY. POSITIVE VALUES REPRESENT GROUNDWATER FLOW INTO THE JASPER AQUIFER IN MONTGOMERY COUNTY. NEGATIVE VALUES REPRESENT GROUNDWATER FLOW OUT OF THE JASPER AQUIFER IN MONTGOMERY COUNTY. ALL VALUES ARE IN ACRE-FEET PER YEAR. NOTE: THE JASPER INCLUDES PARTS OF THE CATAHOULA FORMATION.

Year	*Head Dependent Boundary*	*Subsidence*	*Well*	*Burkeville Confining Unit*	*Grimes County*	*Harris County*	*Liberty County*	*San Jacinto County*	*Walker County*	*Waller County*	*Storage Change*
2049	952	0	-21,614	600	2,576	1,702	628	2,065	9,127	947	-3,003
2050	959	0	-21,614	602	2,578	1,708	628	2,066	9,117	947	-2,986
2051	966	0	-21,614	604	2,581	1,714	628	2,066	9,107	948	-2,978
2052	973	0	-21,614	606	2,583	1,719	628	2,067	9,096	949	-2,969
2053	980	0	-21,614	608	2,586	1,725	629	2,067	9,086	949	-2,959
2054	987	0	-21,614	610	2,588	1,729	630	2,069	9,076	950	-2,950
2055	994	0	-21,614	612	2,591	1,735	630	2,069	9,066	951	-2,942
2056	1,001	0	-21,614	614	2,593	1,739	630	2,071	9,056	951	-2,933
2057	1,008	0	-21,614	617	2,595	1,745	632	2,071	9,047	952	-2,924
2058	1,015	0	-21,614	619	2,598	1,749	632	2,072	9,037	953	-2,922
2059	1,022	0	-21,614	621	2,601	1,754	632	2,073	9,029	954	-2,905
2060	1,029	0	-21,614	623	2,603	1,758	633	2,073	9,019	954	-2,896
Average (1980-1996)	483	0	-11,353	-211	1,323	-231	159	1,142	4,749	327	-3,605
Average (1999-2060)	839	0	-23,193	636	2,624	1,967	714	2,269	9,850	1,011	-3,276

Note: Head dependent boundary includes groundwater flow related to recharge, evapotranspiration, springs, and surface water bodies.

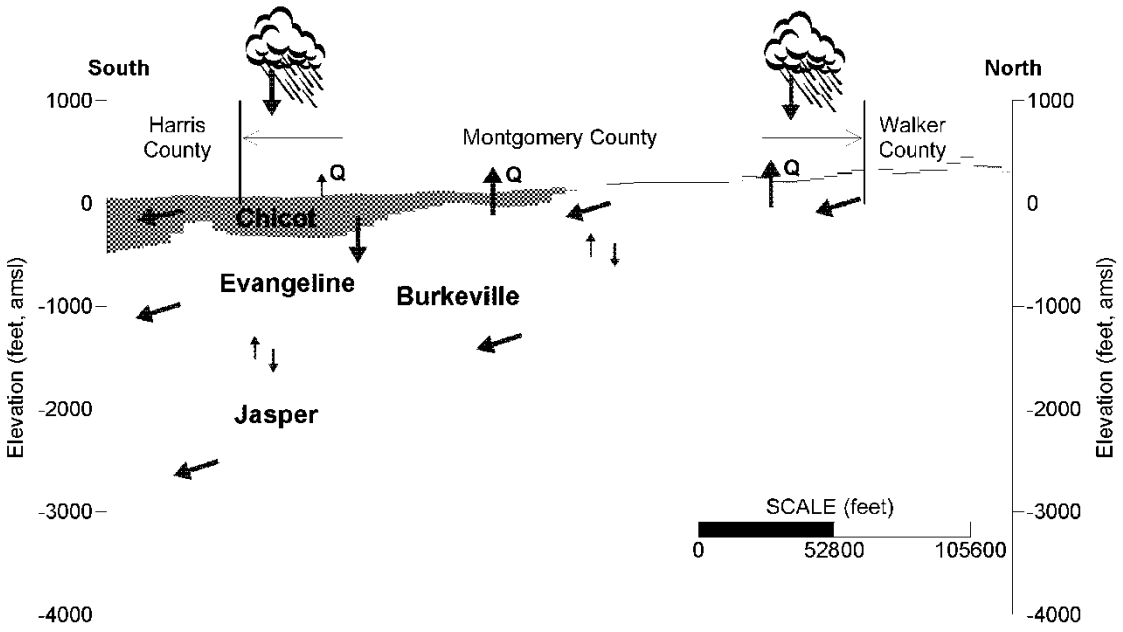


FIGURE 5. CONCEPTUAL MODEL OF GROUNDWATER FLOW IN MONTGOMERY COUNTY. NOTE: THE JASPER INCLUDES PARTS OF THE CATAHOULA FORMATION.

Appendix F – Certified copy of the Lone Star Groundwater Conservation District Resolution Adopting This Management Plan

RESOLUTION NO. #13-008

RESOLUTION OF THE BOARD OF DIRECTORS OF THE LONE STAR GROUNDWATER CONSERVATION DISTRICT READOPTING DISTRICT GROUNDWATER MANAGEMENT PLAN

THE STATE OF TEXAS §
§
LONE STAR GROUNDWATER CONSERVATION DISTRICT §

WHEREAS, the Lone Star Groundwater Conservation District ("District") was created by the Texas Legislature through the enactment of House Bill 2362, Chapter 1321, Acts of the 77th Legislature, Regular Session, 2001 (the "Act"), pursuant to the authority of Article XVI, § 59 of the Texas Constitution, as a groundwater conservation district operating under Chapter 36, Texas Water Code, Section 59, Article XVI of the Texas Constitution, and the Act;

WHEREAS, the creation of the District was confirmed by the voters of Montgomery County on November 6, 2001, and as required by Chapter 356 of Title 31 of the Texas Administrative Code as in effect at the time, the District's original Management Plan was adopted and submitted to the Texas Water Development Board within two years of the confirmation election and subsequently amended and re-adopted on October 14, 2008;

WHEREAS, Senate Bill 660, as passed during the 82nd Regular Session of the Texas Legislature, modified the statutory requirements for management plans to be developed and adopted by groundwater conservation districts;

WHEREAS, Section 36.1072(e) of the Texas Water Code requires the District to review and readopt its Management Plan with or without revisions at least once every five years;

WHEREAS, under the direction of the District Board of Directors ("Board"), the District's staff, legal counsel, and geoscientists reviewed, analyzed, and revised the District's Management Plan in accordance with the statutory requirements provided by Section 36.1071 of the Texas Water Code and the administrative requirements provided by Chapter 356 of Title 31 of the Texas Administrative Code;

WHEREAS, prior to November 12, 2013, a copy of the proposed Management Plan was provided to the Texas Water Development Board ("TWDB") for a preliminary and courtesy review, and all recommendations offered by TWDB staff were considered and incorporated into the revised Management Plan;

WHEREAS, the District issued notice in the manner required by state law and held a public hearing on November 12, 2013, to receive public and written comments on the revised Management Plan;

WHEREAS, based on written and public comments received by the District, the proposed Management Plan was non-substantially changed;

WHEREAS, the District will coordinate with the appropriate surface water management entities after the public hearing and readoption of its Management Plan to afford surface water

management entities within the boundaries of the District the opportunity to review and provide comments to the District on its Management Plan;

WHEREAS, the Board finds that the revised Management Plan meets all of the requirements of Chapter 36, Texas Water Code, and 31 Texas Administrative Code Chapter 356; and

WHEREAS, the Board finds that the readoption of its Management Plan at its November 12, 2013, meeting will restart the five-year statutory time period by which the District must readopt its Management Plan.

NOW, THEREFORE, BE IT ORDERED BY THE BOARD OF DIRECTORS OF THE LONE STAR GROUNDWATER CONSERVATION DISTRICT THAT:

1. The above recitals are true and correct;

2. The Board of Directors hereby readopts its revised Management Plan as the Management Plan of the District, including any revisions made based on comments received from the public at the public hearing or Board meeting, or based on recommendations from the District Board, staff, legal counsel, geoscientist, or TWDB;

3. The Board of Directors, District staff, and the District's legal counsel and geoscientist are further authorized to take all steps necessary to implement this resolution and submit the revised Management Plan to the TWDB for its approval; and

4. The Board of Directors, the District staff, and the District's legal counsel and geoscientist are further authorized to take any and all action necessary to coordinate with the TWDB as may be required in furtherance of TWDB's approval pursuant to the provisions of Section 36.1072 of the Texas Water Code.

AND IT IS SO ORDERED.

PASSED AND ADOPTED on this 12th day of November 2013.

LONE STAR GROUNDWATER CONSERVATION DISTRICT.

By: _____
Board President

ATTEST:

Acting Samantha Reiter
Board Secretary

CERTIFICATION

I, Kathy Turner Jones, am the General Manager and Custodian of Records for the Lone Star Groundwater Conservation District ("District"). I certify that the attached resolution is a true and correct copy of a document on file in the District's records.

Sincerely,

Kathy Turner Jones
General Manager and
Custodian of Records

11-12-13
Date

Attest: Samantha Reiter
Samantha Reiter
Assistant Secretary, LSGCD

LONE STAR GROUNDWATER CONSERVATION DISTRICT
(SEAL)
TEXAS
MONTGOMERY COUNTY, TEXAS

Appendix G – Evidence of Management Plan Adoption after Notice and Hearing

Doc# 13-1619

POSTED
10/21/2013 3:32PM
Talisa Caldwell
MARK TURNBULL, COUNTY CLERK
MONTGOMERY COUNTY, TEXAS

LONE STAR GROUNDWATER CONSERVATION DISTRICT
NOTICE OF HEARING ON RE-ADOPTION OF DISTRICT MANAGEMENT PLAN
November 12, 2013

NOTICE IS HEREBY GIVEN to all interested persons within Montgomery County, Texas:

That the Board of Directors of the Lone Star Groundwater Conservation District (District) will hold a hearing and may take action on the proposed re-adoption of the District Management Plan as required by Chapter 36 of the Texas Water Code and Chapter 356 of the Texas Water Development Board's ("TWDB's") rules contained in Title 30 of the Texas Administrative Code.

This hearing will be held on Tuesday, November 12, 2013, beginning at 10:00 a.m., at the District office in the James B. "Jim" Wesley Board Room located at 655 Conroe Park North Drive, Conroe, Texas 77303. Any person who desires to appear at the hearing and present comment or other information on the proposed Management Plan may do so in person, by legal representative, or both. Limits may be placed on the amount of time that each person is allowed to present verbal comments. Without any additional notice, the proposed Management Plan may be adopted at the conclusion of the hearing, or any time or date thereafter, in the form presented or as amended based upon comments received from the public, the TWDB, District staff, attorneys, or engineers, or members of its Board of Directors. The hearing posted in this notice may be recessed from day to day or continued where appropriate.

The District is committed to compliance with the Americans with Disabilities Act (ADA). Any person with a disability who needs special accommodations should contact the District at (936) 494-3436 at least 24 hours in advance of the hearing if accommodation is needed.

A copy of the proposed Management Plan may be requested by email at info@lonestargcd.org, will be made available at the District's website at www.lonestargcd.org, and may be reviewed or copied at the District office at 655 Conroe Park North Drive, Conroe, Texas. Any person who wishes to receive more detailed information on this notice should contact the District's General Manager, Kathy Turner Jones, at (936) 494-3436.

END OF AD

Kathy Turner Jones, General Manager
Lone Star Groundwater Conservation District
655 Conroe Park North Drive
Conroe, Texas 77303
(936) 494-3436
(936) 494-3438 (fax)

Doc# 13-161402

POSTED
10/21/2013 1:44PM
Talisa Caldwell
MARK TURNBULL, COUNTY CLERK
MONTGOMERY COUNTY, TEXAS

NOTICE OF HEARING
OF THE BOARD OF DIRECTORS OF THE
LONE STAR GROUNDWATER CONSERVATION DISTRICT
To be held on Tuesday, November 12, 2013
Lone Star GCD – James B. "Jim" Wesley Board Room
655 Conroe Park North Drive
Conroe, Texas 77303

NOTICE OF PUBLIC HEARING

TUESDAY, NOVEMBER 12, 2013, AT 10:00 A.M.

PUBLIC HEARING ON PROPOSED RE-ADOPTION OF GROUNDWATER MANAGEMENT PLAN

1. Call to Order and Declare Hearing Open to the Public.
2. Roll Call.
3. Presentation and discussion of the District Groundwater Management Plan proposed for re-adoption as required by Chapter 36 of the Texas Water Code and Chapter 356 of the Texas Water Development Board's ("TWDB's") rules contained in Title 30 of the Texas Administrative Code.
4. Public comment on the Groundwater Management Plan proposed for re-adoption.
5. Discussion, consideration, and possible action approving the proposed Groundwater Management Plan for re-adoption.
6. Adjourn.

At the conclusion of the hearing or any time or date thereafter, the proposed Management Plan may be adopted in the form presented or as amended based upon comments received from the public, the TWDB, District staff, attorneys, consultants, or members of the Board of Directors without any additional notice.

The above agenda schedules for the meetings and hearings of the District represent an estimate of the order for the indicated items and are subject to change at any time.

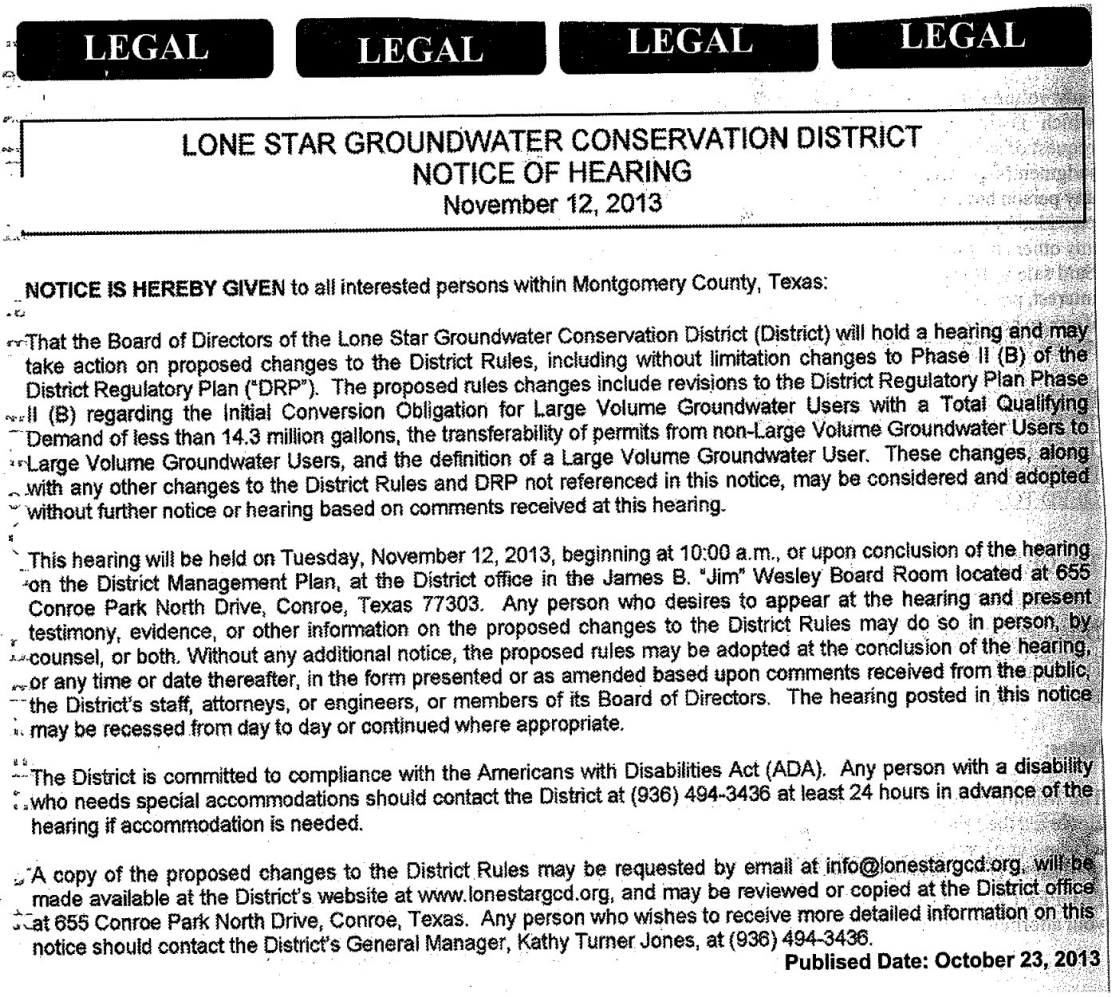
These public hearings and meetings are available to all persons regardless of disability. If you require special assistance to attend the meeting or hearing, please contact the Lone Star GCD at 936/494-3436 at least 24 hours in advance of the meeting.

At any time during one the above meetings or hearings and in compliance with the Texas Open Meetings Act, Chapter 551, Government Code, Vernon's Texas Codes, Annotated, the Lone Star Groundwater Conservation District Board may meet in executive session on any of the above agenda items for consultation concerning attorney-client matters (§551.071); deliberation regarding real property (§551.072); deliberation regarding prospective gift (§551.073); personnel matters (§551.074); and deliberation regarding security devices (§551.076). Any subject discussed in executive session may be subject to action during an open meeting.

Certification

I, the undersigned authority, do hereby certify that on October 21, 2013, at or before 5:00 p.m., I posted and filed the above notices of meeting(s) and hearing(s) with the Montgomery County Clerk's office and also posted a copy in the front window of the Lone Star GCD office in a place convenient and readily accessible to the general public all times and that it will remain so posted continuously for at least 72 hours preceding the scheduled time of said meeting in accordance with the Texas Government Code, Chapter 551.

Kathy Turner Jones, General Manager
Lone Star Groundwater Conservation District



LEGAL LEGAL LEGAL LEGAL

LONE STAR GROUNDWATER CONSERVATION DISTRICT
NOTICE OF HEARING
November 12, 2013

NOTICE IS HEREBY GIVEN to all interested persons within Montgomery County, Texas:

That the Board of Directors of the Lone Star Groundwater Conservation District (District) will hold a hearing and may take action on proposed changes to the District Rules, including without limitation changes to Phase II (B) of the District Regulatory Plan ("DRP"). The proposed rules changes include revisions to the District Regulatory Plan Phase II (B) regarding the Initial Conversion Obligation for Large Volume Groundwater Users with a Total Qualifying Demand of less than 14.3 million gallons, the transferability of permits from non-Large Volume Groundwater Users to Large Volume Groundwater Users, and the definition of a Large Volume Groundwater User. These changes, along with any other changes to the District Rules and DRP not referenced in this notice, may be considered and adopted without further notice or hearing based on comments received at this hearing.

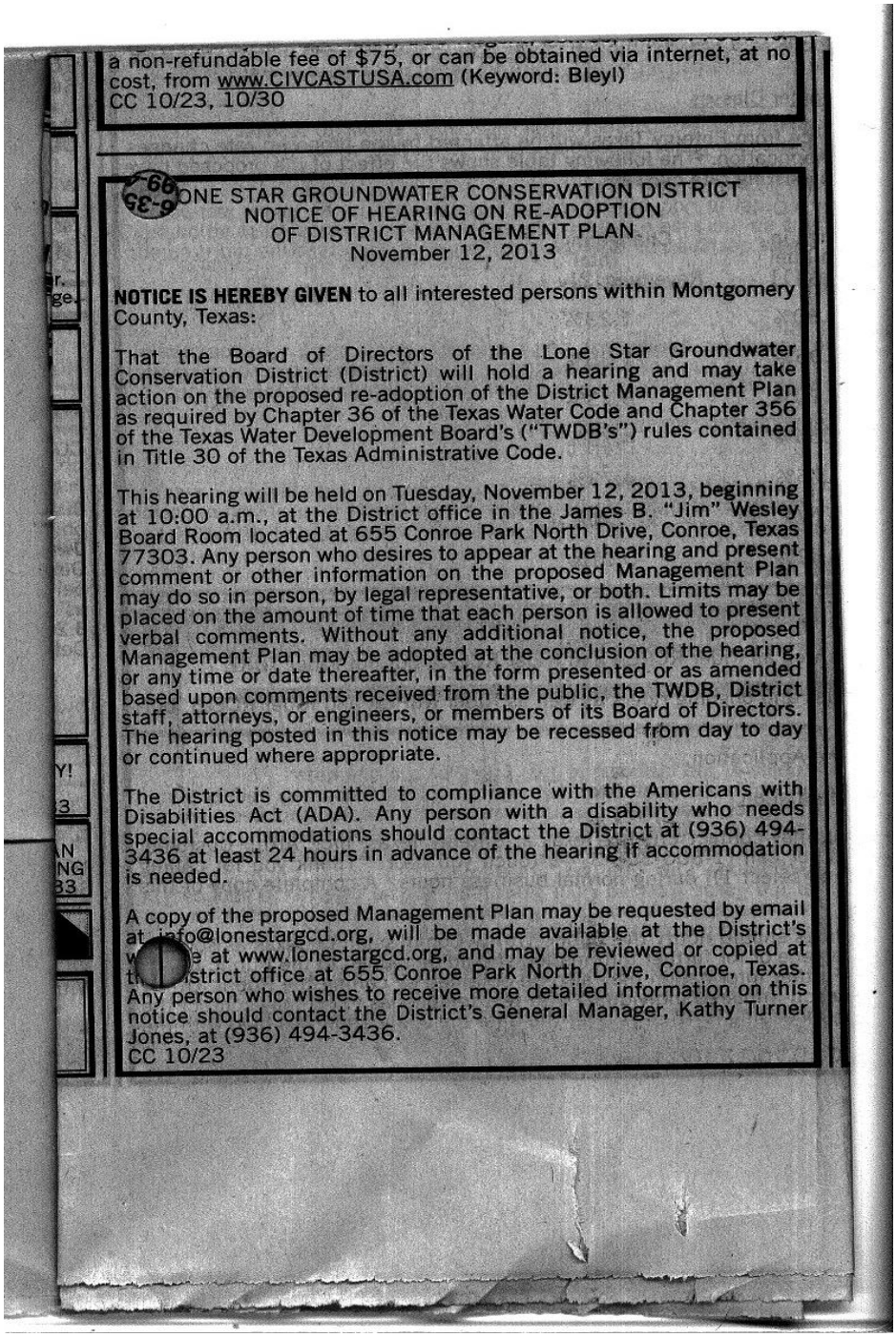
This hearing will be held on Tuesday, November 12, 2013, beginning at 10:00 a.m., or upon conclusion of the hearing on the District Management Plan, at the District office in the James B. "Jim" Wesley Board Room located at 655 Conroe Park North Drive, Conroe, Texas 77303. Any person who desires to appear at the hearing and present testimony, evidence, or other information on the proposed changes to the District Rules may do so in person, by counsel, or both. Without any additional notice, the proposed rules may be adopted at the conclusion of the hearing, or any time or date thereafter, in the form presented or as amended based upon comments received from the public, the District's staff, attorneys, or engineers, or members of its Board of Directors. The hearing posted in this notice may be recessed from day to day or continued where appropriate.

The District is committed to compliance with the Americans with Disabilities Act (ADA). Any person with a disability who needs special accommodations should contact the District at (936) 494-3436 at least 24 hours in advance of the hearing if accommodation is needed.

A copy of the proposed changes to the District Rules may be requested by email at info@lonestargcd.org, will be made available at the District's website at www.lonestargcd.org, and may be reviewed or copied at the District office at 655 Conroe Park North Drive, Conroe, Texas. Any person who wishes to receive more detailed information on this notice should contact the District's General Manager, Kathy Turner Jones, at (936) 494-3436.

Publised Date: October 23, 2013

Published in the Montgomery News on October 23, 2013



a non-refundable fee of $75, or can be obtained via internet, at no cost, from www.CIVCASTUSA.com (Keyword: Bleyl)
CC 10/23, 10/30

LONE STAR GROUNDWATER CONSERVATION DISTRICT
NOTICE OF HEARING ON RE-ADOPTION
OF DISTRICT MANAGEMENT PLAN
November 12, 2013

NOTICE IS HEREBY GIVEN to all interested persons within Montgomery County, Texas:

That the Board of Directors of the Lone Star Groundwater Conservation District (District) will hold a hearing and may take action on the proposed re-adoption of the District Management Plan as required by Chapter 36 of the Texas Water Code and Chapter 356 of the Texas Water Development Board's ("TWDB's") rules contained in Title 30 of the Texas Administrative Code.

This hearing will be held on Tuesday, November 12, 2013, beginning at 10:00 a.m., at the District office in the James B. "Jim" Wesley Board Room located at 655 Conroe Park North Drive, Conroe, Texas 77303. Any person who desires to appear at the hearing and present comment or other information on the proposed Management Plan may do so in person, by legal representative, or both. Limits may be placed on the amount of time that each person is allowed to present verbal comments. Without any additional notice, the proposed Management Plan may be adopted at the conclusion of the hearing, or any time or date thereafter, in the form presented or as amended based upon comments received from the public, the TWDB, District staff, attorneys, or engineers, or members of its Board of Directors. The hearing posted in this notice may be recessed from day to day or continued where appropriate.

The District is committed to compliance with the Americans with Disabilities Act (ADA). Any person with a disability who needs special accommodations should contact the District at (936) 494-3436 at least 24 hours in advance of the hearing if accommodation is needed.

A copy of the proposed Management Plan may be requested by email at info@lonestargcd.org, will be made available at the District's website at www.lonestargcd.org, and may be reviewed or copied at the District office at 655 Conroe Park North Drive, Conroe, Texas. Any person who wishes to receive more detailed information on this notice should contact the District's General Manager, Kathy Turner Jones, at (936) 494-3436.
CC 10/23

Legal notice published in the Conroe Courier on October 23, 2013

Approved minutes from the November 12, 2013 Public Hearing and Public Meeting during which the Lone Star Groundwater Conservation District adopted the updated management plan provided to the Texas Water Development Board as a separate transmittal.

Appendix H – Evidence of Coordination with Surface Water Management Entities

655 Conroe Park North Drive • Conroe, Texas 77303
local 936/494-3436 • metro 936/441-3437 • fax 936/494-3438
e-mail: lsgcd@consolidated.net • www.lonestargcd.org

November 13, 2013

VIA: Certified Mail Return Receipt

Mr. Mark Evans
Region H Water Planning Group
PO Box 329
Conroe, Texas 77305

RE: Proposed LSGCD Groundwater Management Plan

Dear Chairman Evans:

As required by Section 36.1071 of the Texas Water Code, we respectfully submit to you the enclosed review copy of the Lone Star Groundwater Conservation District management plan as adopted by the Board of Directors on November 12, 2013.

Please note that Appendix G is incomplete, as the Board of Directors has yet to approve minutes from the public hearing on the management plan and the regular Board of Directors meeting in which the plan was adopted. Both meetings were held November 12, 2013. The minutes will be approved at the next regular Board of Directors meeting scheduled for December 10, 2013, and provided at that time to the Texas Water Development Board to complete the administrative review.

Please contact our office at (936) 494-3436 if you have any questions or comments about this plan.

Sincerely,

Kathy Turner Jones

KJ

Enclosure

655 Conroe Park North Drive • Conroe, Texas 77303
local 936/494-3436 • metro 936/441-3437 • fax 936/494-3438
e-mail: lsgcd@consolidated.net • www.lonestargcd.org

November 13, 2013

VIA: Certified Mail Return Receipt

Mr. Jace Houston, General Manager
San Jacinto River Authority
PO Box 329
Conroe, Texas 77305

RE: LSGCD Groundwater Management Plan

Dear Jace:

As required by Section 36.1071 of the Texas Water Code, we respectfully submit to you the enclosed review copy of the Lone Star Groundwater Conservation District management plan as adopted by the Board of Directors on November 12, 2013.

Please note that Appendix G is incomplete, as the Board of Directors has yet to approve minutes from the public hearing on the management plan and the regular Board of Directors meeting in which the plan was adopted. Both meetings were held November 12, 2013. The minutes will be approved at the next regular Board of Directors meeting scheduled for December 10, 2013, and provided at that time to the Texas Water Development Board to complete the administrative review.

Please contact our office at (936) 494-3436 if you have any questions or comments about this plan.

Sincerely,

Kathy Turner Jones

KJ

Enclosure

655 Conroe Park North Drive • Conroe, Texas 773
local 936/494-3436 • metro 936/441-3437 • fax 936/494-34
e-mail: lsgcd@consolidated.net • www.lonestargcd.o

November 13, 2013

VIA: Certified Mail Return Receipt

CITY OF HOUSTON
Department of Public Works and Engineering
Attn: Mr. Mark L. Loethan, P.E., Deputy Director
Planning and Development Services Division
PO Box 1562
Houston, Texas 77251-1562

RE: LSGCD Groundwater Management Plan

Dear Mr. Loethan:

As required by Section 36.1071 of the Texas Water Code, we respectfully submit to you the enclosed review copy of the Lone Star Groundwater Conservation District management plan as adopted by the Board of Directors on November 12, 2013.

Please note that Appendix G is incomplete, as the Board of Directors has yet to approve minutes from the public hearing on the management plan and the regular Board of Directors meeting in which the plan was adopted. Both meetings were held November 12, 2013. The minutes will be approved at the next regular Board of Directors meeting scheduled for December 10, 2013, and provided at that time to the Texas Water Development Board to complete the administrative review.

Please contact our office at (936) 494-3436 if you have any questions or comments about this plan.

Sincerely,

Kathy Turner Jones

KJ

Enclosure

Appendix I – Professional Geoscientist Seal