GMA-12 Meeting
August 10, 2010
Milano Community and Civic Center

Post Oak Savannah GCD Desired Future Conditions for Brazos Alluvium Aquifer and Yegua-Jackson Aquifer

On May 11, the POSGCD DFC committee recommended and the POSGCD board subsequently adopted DFCs for the Yegua-Jackson aquifer and the Brazos Alluvium Aquifer.

Brazos Alluvium Aquifer

For Milam County, the DFC is a decrease of 5 ft in the average saturated thickness over the period from 2010 to 2060. The baseline average saturated thickness for 2010 is estimated at 24.5 feet and is based on an analysis of historical water level data and well depth values.

For Burleson County, the DFC is a decrease of 6 ft in the average saturated thickness over the period from 2010 to 2060. The baseline average saturated thickness for 2010 is estimated at 38.5 feet and is based on an analysis of historical water level data and well depth values.

Yegua-Jackson Aquifer

For Burleson County, the preliminary DFC is an average drawdown of 100 feet over the period of 2010 to 2060 with the constraint that the average drawdown in the unconfined portion of the Yegua-Jackson Aquifer is no more than 15 feet. The unconfined portion of the aquifer is represented by the saturated thickness in model layer 1 in the Yegua-Jackson GAM (Deeds and others, 2010).

Deeds, N. E., Yan, T, Singh, A, Jones, T. J., Kelley, V.A., Knox, P. R., and Young, S.C., 2010. Final Report Groundwater Availability Model for the Yegua-Jackson Aquifer, prepared by INTERA Incorporated, prepared for the Texas Water Development Board, Austin, TX

Estimates of Desired Future Conditions for Brazos Valley Groundwater Conservation District

Introduction

The Brazos Valley Groundwater Conservation District (BVGCD) has been working within Groundwater Management Area 12 (GMA-12) to develop estimates of desired future conditions (DFCs). This effort has occurred over the past approximately 7 months regarding the Yegua-Jackson aquifer in cooperation with other groundwater conservation districts within GMA-12.

Considerations During Formulation of Yegua-Jackson Aquifer DFCs

The development of DFCs take into consideration previous estimates of groundwater availability within the BVGCD and surrounding counties provided by the Texas Water Development Board and the Region G Planning Group. The effects of pumping from the Yegua-Jackson aquifer were considered along with results obtained from the utilization of the Yegua Jackson Groundwater Availability Model (GAM) to simulate the future effects of groundwater withdrawal, both locally and regionally. The effects of groundwater pumping on existing groundwater users were also considered in developing DFCs. Based on the principal of using the GAM as a planning tool and the fact that the GAM predictions contain uncertainty, the BVGCD considers the DFCs to be physically possible, and acceptable if the difference between model simulation drawdown results and DFC drawdown targets are within 5 feet or 5 percent, whichever is greater, of the DFC drawdown targets.

Recommended Preliminary Desired Future Conditions

Desired future conditions were estimated for the Yegua and Jackson aquifers for the period up through year 2060. Groundwater model runs with the GAM were used as a tool in estimating the desired future conditions. The desired future conditions were estimated on an average drawdown basis for the BVGCD.

Jackson Aquifer

The average drawdown by the year 2060 of the hydraulic head in the Jackson aquifer within the District shall not exceed 70 feet when compared to the year 2010 average head.

Yegua Aquifer

The average drawdown by the year 2060 of the hydraulic head in the Yegua aquifer within the District shall not exceed 110 feet when compared to the year 2010 average head.

August 9, 2010

Fayette County Groundwater Conservation District

255 Svoboda Lane, Room 115
La Grange, Texas 78945
Telephone: (979) 968-3135
Fax: (979) 968-3194

Revisions to the Desired Future Conditions for the Aquifers within the Fayette County Groundwater Conservation District as Approved by the Board of Directors on August 2, 2010

On August 2, 2010, our Board of Directors approved the following revisions to the desired future conditions previously submitted to GMA 12 for consideration on May 26, 2010. These revisions stem from comments received by the TWDB at a meeting of the GMA 12 consultants on July 16, 2010 and, for the Yegua Jackson, based on recommendations by our consulting geologist dated July 27, 2010.

Carrizo Aquifer – No change from the May 26, 2010 submittal. Limit the drawdown of the water levels to an average of 60 feet for the year 2000 conditions.

Queen City Aquifer – Revised. Limit the drawdown to an average of 60 feet of the year 2000 conditions.

Sparta Aquifer – Revised. Limit the drawdown to an average of 60 feet of the year 2000 conditions.

Yegua Jackson Aquifer – Revised. Limit the drawdown to an average of 75 feet based on available conditions.

Colorado Alluvium – Remove desired future condition statements as this is not a designated aquifer and deemed non-relevant at this time.

David A. Van Dresar, General Manager

INITIALLY PROPOSED DESIRED FUTURE CONDITIONS (DFCs)- LOST PINES GROUNDWATER CONSERVATION DISTRICT

June 24, 2009
Revised February 10, 2010
Revised May 26, 2010
Revised August 11, 2010

Introduction

GMA 12 has decided to specify a single value of allowable drawdown throughout each district for each aquifer within GMA 12 as the Desired Future Conditions (DFC). Managed Available Groundwater (MAG) will then be determined by the TWDB or by the GMA, with confirmation by the TWDB. The MAG provides the basis for issuing permits within each district. The DFC, established by the GMA, however, is the basis for managing groundwater within each district. DFCs have to be physically possible, individually and collectively, if different DFCs are stated for different geographic areas overlying an aquifer or subdivision of an aquifer.

While DFCs must be a set of conditions of the aquifers within the GMA that the districts believe are desirable, there has to be some basis for setting or arriving at those DFCs, especially one that will stand up through the petition process. Simply to say that no amount of drawdown is acceptable is unacceptable, because it is impossible to produce groundwater without inducing drawdowns. Given enough time and pumpage, drawdowns related to pumpage from the confined portions of the aquifer can become rather widespread. While it is viewed by some as "reverse engineering" the DFCs must protect the existing users and yet consider the future demands for groundwater within the district; where will the water come from to meet growing demands if it doesn't come from within the district. Good conservation will mitigate the amount of demands, but demands are bound to grow as the population within the district grows. The district has no control over growth. Approximately 90% of the LPGCD is served by rural water supply corporations, which are legally obligated to meet the demands within their CCNs.

Considerations LPGCD Took Into Account

The LPGCD has used the municipal and non-municipal water demand projections for 2000-2060 that were obtained from the 2006 Regional Water Plans for Regions K and G. However, at the time the original model file was developed, only the Initially Prepared Plan (IPP) was available for Region G and those demand projections were used to develop the original LPGCD model file. There are minor differences in a couple of the demand categories between the 2006 Region G IPP and the approved 2006 Region G plan. These differences are at most 6% for a given decade and are well within an acceptable range of accuracy as determined by LPGCD.

The 2006 Regional Water Plans were used to develop the 2007 State Water Plan. However, the 2007 State Water Plan tabulates concisely only in-GCD demands. To determine out-of-GCD demands from the State Water Plan would be very difficult, and it might not be possible unless one knew every single potential destination of groundwater sourced from a GCD. That would be possible only if the

groundwater source were properly referenced by the receiving county. Nonetheless, LPGCD has used the 2007 State Water Plan demand estimates as a basis for projecting demands for groundwater within Bastrop and Lee counties and as a basis for setting the initial DFCs for consideration by GMA-12. These estimates of future demands are largely related to entities that already withdraw groundwater from within the district; out of district transfers or speculative demands included in the 2007 State Water Plan demand estimates compose a relatively small amount of the estimated pumpage. No amount of demand was allocated for potential water marketers beyond that in the state's demand estimates. No currently existing or pending non-exempt well permits in LPGCD were specifically used to determine LPGCD's DFC numbers; there has been an analysis of the relationship between non-exempt and exempt pumpage within the district as compared to the 2007 State Water Plan numbers.

The Colorado River alluvium is not modeled separately in the currently available GAM; no springs are modeled, nor can they be with the currently available GAM. Most of the upland springs are related to the hard pans that occur in the sandy soils and on which there is perched groundwater; the perched water is not simulated in the GAM. The model does simulate discharge to major surface water courses, but does a poor job; the amounts and timing are not considered reliable or accurate. Nevertheless, these amounts and particular changes in the amounts are being evaluated to discern trends.

The Yegua-Jackson GAM has just been released by the TWDB in the last week or so. LPGCD is not aware of any groundwater wells within the District that are completed in any of the aquifer formations included in this newly released GAM. Therefore, LPGCD will not be setting DFCs for the Yegua-Jackson Aquifers as the aquifers are considered non-relevant for this district.

Process Taken Within LPGCD

As stated, LPGCD has used the 2006 Regional Water Plans for Regions K and G and subsequently the 2007 State Water Plan estimates as a basis for anticipated water demands in the district through 2060. The State Water Plan demand estimates do not distinguish between surface and groundwater usage; however, the distinction is relatively simple for the LPGCD and only estimated demands for groundwater were incorporated into the Queen City/Sparta GAM model. ArcGIS was used to extract the drawdowns following a method suggested by Shirley Wade at TWDB. Based on the location of the centroid of each model grid cell, the model cells were assigned to a GCD and to a county. The model grid cell assignments provided by the Texas Water Development Board are available at http://www.twdb.state.tx.us/Gam/qc_sp/qc_sp.htm.

Originally, when the GMA12_3b pumping file was used by LPGCD to determine the DFCs, all cells were included in the methodology to determine average drawdown including zero cells and negative cells except as follows:

- There were 2 cells in Bastrop County in Layer 8 (Hooper) (out of 1455 cells total) that apparently went dry (values of the drawdowns were on the order of -99500). The large negative drawdowns were not included in the averaging of drawdowns by county and within the district as a whole. Similarly, large negative drawdowns occurred in layers 1 (Sparta, 2 cells) and 7 (Simsboro, 3 cells) in Bastrop County were excluded. The number of these cells is so small that the impact is not significant.
- There were 5 cells that appeared to be part of Lee County in Layers 7 and 8 (Simsboro and Hooper) that were attributed by the TWDB to Post Oak Savannah GCD. The discrepancy may be an artifact of the GCD cell assignments used by TWDB for the ArcGIS analysis. For the purpose

of determining drawdowns and to be consistent with the TWDB, these cells were assigned to POSGCD.

- Zero cells reported in Layer 7 (Simsboro) for Bastrop County were not included in the average drawdown calculation. Inspection showed that there were no zero drawdowns in Bastrop County. The zero values that appeared in the model output corresponded to cell locations that were inactive. Except as described above, however, negative values, were included in the averaging.

After LPGCD had run the GAM with the GMA12_3b pumping file from December 31, 2000 through December 31, 2060 and used ArcGIS to determine the modeled drawdowns at the end of 2060, LPGCD's DFC committee met to review the model outputs and to discuss any possible modifications to the direct model drawdown outputs. In most cases, the modeled county-wide average drawdown in 2060 was simply rounded to the next whole number and that rounded number is LPGCD's proposed DFC. One exception to this methodology is Layer 7 (Simsboro) in Lee County. As there is already significant demand both in the LPGCD and neighboring districts for groundwater from the confined part of the Simsboro, LPGCD wanted to take a more conservative stance with this aquifer.

After discussions with the TWDB, the GMA 12 managers and consultants decided that GMA-wide methodologies must be employed to continue the DFC determination process. These GMA-12-wide directives include using the time periods of January 1, 2000 to January 1, 2060 to calculate drawdowns, employing a method (comparable to the GIS method described above) to calculate drawdown for every model cell which results in cells assigned to the same counties as TWDB would assign them. The consultants in GMA12 initially decided to use the elevation of the base of the cell as the head in dry cells and use that head for the drawdown calculation. However, the total number of dry cells within the Lost Pines GCD is very small; at most, there are five dry cells in a single layer (the Sparta) which amounts to 0.8% of the total number of cells for this layer. Layers 3, 5, and 6 have no dry cells and Layers 7 and 8 have 1 and 2 dry cells, respectively, which amount to 0.1% of the total cells for each of these layers. Since the number of dry cells is so small, there is a negligible difference between counting them and ignoring them. Therefore, for the sake of simplicity, they were ignored in the actual calculation in LPGCD.

Continued communication and work between members of GMA-12 allowed for a new, updated model well file called GMA12_910 or GMA12_7a. The outputs from the GMA12_910 well file indicated that initially there was some disparity between LPGCD's proposed DFCs and those of neighboring POSGCD's DFCs, especially in the Simsboro Aquifer. As a compromise, LPGCD's Board of Directors voted in April 2010 to increase the recommended 2060 DFC for the Simsboro from 212 ft (average drawdown as compared to 2000) to 237 ft (average drawdown as compared to 2000). This adjustment allows POSGCD to achieve their DFC of 300 ft (average drawdown as compared to 2000). In turn, POSGCD adjusted their proposed DFCs in the Carrizo Aquifer to meet LPGCD's DFCs in the Carrizo Aquifer.

Additionally, Lost Pines GCD will not be recommending DFCs for the District for the Yegua-Jackson Aquifer. While the Yegua Jackson Aquifer does receive recharge from direct precipitation, this aquifer is not known to be used by either exempt or nonexempt wells within the District, therefore, LPGCD considers the Yegua Jackson Aquifer to be a non-relevant aquifer at this time.

As LPGCD and the surrounding districts monitor water levels and learn about how the Simsboro aquifer responds to pumping, especially in the confined portion, LPGCD anticipates that its recommended DFCs are likely to change somewhat over time with the objective of achieving sustainability in perpetuity as stated in the district's Management Plan.

Recommendations of LPGCD DFCs

The numbers LPGCD is presenting for DFCs are county-wide and district-wide average drawdowns in feet in 2060 for each aquifer unit. Drawdowns are calculated as compared to 2000 measured water levels.

Geologic Unit/Aquifer Unit	County	Calculated District-wide LPGCD DFC in 2060 (Average drawdown in ft)	Recommended DFC in 2060 (County-wide Average drawdown in ft)
Sparta	Bastrop Lee	7 -	7 7
Queen City	Bastrop Lee	13 -	10 15
Carrizo	Bastrop Lee	47 -	30 60
Calvert Bluff	Bastrop Lee	99 -	65 135
Simsboro	Bastrop Lee	237 -	145 345
Hooper	Bastrop Lee	129 -	90 180

Within its district, LPGCD proposes the 2060 district-wide drawdown numbers be adopted as initial DFCs by GMA-12, and then LPGCD plans to further divide the recommended DFCs by county in the District's Management Plan; LPGCD feels that this will better handle the major difference in geologic units in the two counties (*i.e.*, Lee County has a much thicker confined part of the Carrizo-Wilcox aquifer than Bastrop County). Additionally, DFCs will be further divided in Bastrop and Lee counties to reflect different numbers for the outcrop (the water table part of the aquifer) and the confined portion of each aquifer. These subdivisions of the proposed DFCs will be reflected in LPGCDs Management Plan. It is also likely that LPGCD will create a ramp up schedule so that it can reach the final 2060 number at a set rate and not all up front at one time and to better allow the district to achieve its Management Plan goal of sustainability in perpetuity. It is anticipated that the ramp up schedule will correspond to the decadal MAGs provided by the TWDB in its MAG report to GMA 12.

LPGCD is assembling a system of monitoring wells that will be used to assess conformance with whatever DFCs are established. The district has already conceptualized how this will be done, with each monitoring well representing a specified area. As more monitoring wells are brought into LPGCD's monitoring system, the area represented by each monitoring well will be changed to refine the area it represents. The currently available GAM is calibrated to water levels in each of the aquifers; therefore, DFCs must reflect allowable changes in those water levels. We must play to the strengths of the model, not its weaknesses. The bottom line for LPGCD is that if by monitoring the water levels it feels that the aquifer is responding differently than the GAM predicted, the district has the opportunity to revisit the DFC numbers every 5 years. LPGCD is confident that with more valuable water level data monitoring, it will be able to protect its valuable groundwater resource.

Yegua-Jackson Aquifer Desired Future Conditions for the Mid East Texas Groundwater Conservation District

11 August 2010

Introduction

As decided by all member districts in GMA12, the Mid East Texas Groundwater Conservation District (METGCD) Desired Future Conditions (DFCs) will be stated as average drawdowns throughout the entire district per aquifer from 2000 to 2060. Estimates of current Yegua-Jackson pumping within the district, historical groundwater level data, and the Yegua-Jackson Groundwater Availability Model (YJGAM) were used to estimate present drawdowns from current use and predict potential future drawdowns within the district. The procedures and results are presented below.

Considerations and Procedure Used

Historic Data

The original YJGAM simulates groundwater flow and water levels in the aquifer from the years 1900 through 1997. The total pumping in METGCD built into the final year of the model is 1,121 acft/yr, with all but 4 acft/yr in Madison County. Estimates of current pumping from the Yegua-Jackson aquifer in METGCD, based on 2010 population estimates and assuming per-capita water usage of 100 to 140 gallons per day, range from about 460 to 650 acft/yr, suggesting that the pumping inputs in the model are reasonable and conservative. The population in Madison County has experienced an almost negligible 3% growth over the previous decade, suggesting that groundwater use has not changed much over that period. A review of historical water level data from the TWDB water well database (see Figure 1) indicates that water levels in Yegua-Jackson wells in Madison County have remained steady over the past decade, suggesting that current pumping rates have resulting in negligible drawdowns throughout the district.

Model Results

The pumping rates and pumping distribution in the final stress period of the YJGAM were extended out to model year 2060, and the model was run to calculate drawdowns over that period. Average model-calculated drawdowns in METGCD from 2000 to 2060, using the original well pumping inputs, are negligible (see Table 1).

METGCD Proposed Desired Future Conditions

Based on the model results and water level trends over the last decade, the Mid East Texas Groundwater Conservation District proposes a Yegua-Jackson Aquifer DFC of **zero average district-wide drawdown** over the predictive period of 2000-2060. Based on predictive uncertainty of the model, METGCD considers the DFCs to be compatible and physically possible if the difference between modeled drawdown results and the DFC drawdown targets are within 5 feet or 5 percent of the DFC drawdown targets.

Table 1. YJGAM-calculated average drawdowns (in ft) by county and for the entire district with the original TWDB well file.

County/GCD	Avg. Drawdown
Leon	0.2
Madison	0.1
Entire District	0.1

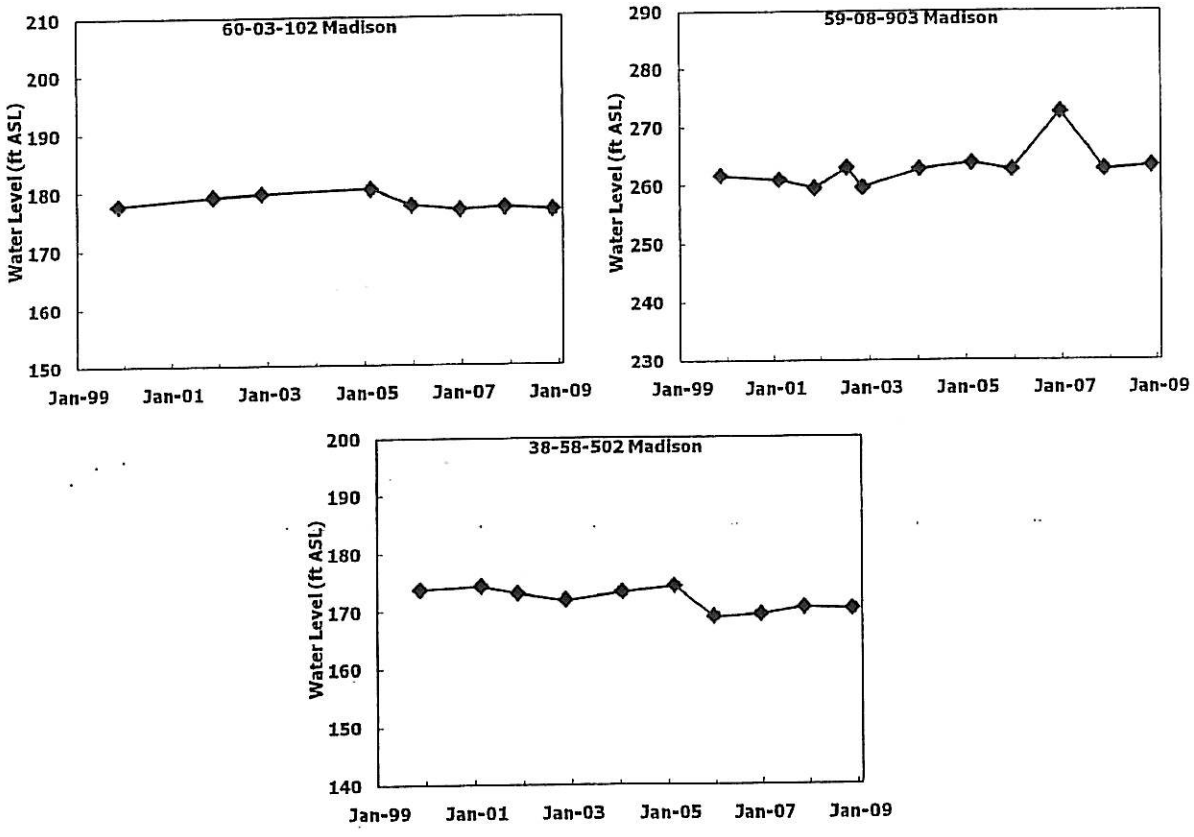

Figure 1. Water levels in Madison County wells completed in the Yegua-Jackson Aquifer