

**Lone Star Groundwater Conservation District  
Strategic Planning for  
Groundwater Management and Development**

**Introduction**

The Lone Star Groundwater Conservation District (LSGCD) is conducting a strategic evaluation of potential opportunities for additional development of groundwater resources while ensuring long-term viability of aquifers located in Montgomery County. The evaluation/planning process will include a review of the adequacy of the groundwater monitoring program to monitor and assess current aquifer conditions and the effects of the initial conversion to Alternative Water Supplies in 2016. The evaluation will also include a review of the total estimated recoverable storage (TERS) estimates released by the Texas Water Development Board (TWDB) and their possible implications to groundwater management in the District. The evaluation of potential opportunities for a redistribution or increase in groundwater pumping within the District is another part of the study. Opportunities for public input during the performance of this strategic evaluation will be essential to the overall support and success of this study and resulting recommendations.

A Scope of Work has been developed dividing the study into four (4) tasks with each task representing a subdivision of the overall study. The following Scope of Work includes a description of the work items to be performed in each task and the deliverables to be produced as a result of the effort in each task. Task 0 will occur throughout the study and encompass project communications and stakeholder meetings. It is envisioned that Tasks 1 and 2 will be performed simultaneously and that Task 3 will begin after Tasks 1 and 2 are partially completed.

## EXHIBIT A-1

### **A. Task 0. Project Communications**

1. Throughout the execution of all phases of the study, it is recommended that the LSGCD Board of Directors establish and maintain a stakeholder input process to ensure timely and effective communications of efforts and results regarding the study. Periodic meetings (probably quarterly) with stakeholders will be held to provide status reports and results from ongoing efforts. A formal comment period for stakeholders will be implemented for all draft results and reports, with responses to comments included in all final reports or memoranda.

### **B. Task 1. Groundwater Production and Water-Level Monitoring Program Assessment**

1. Collect groundwater production and water-level data for at least the last ten years from the U.S. Geological Survey, the LSGCD, published scientific literature, and private sources. Data will be collected for the Chicot, Evangeline, Jasper and Catahoula aquifers within and extending about 10 miles outside the boundaries of the LSGCD.
2. Review and evaluate the adequacy of the areal coverage of monitoring wells, available water-level data, and groundwater production data for the four aquifers, considering both temporal and spatial variability of the water-level data. Perform a statistical analysis of the spatial coverage of water-level data for each aquifer.
3. Compile and analyze available water level and groundwater production information from the North Harris County Regional Water Authority service area collected both prior to and after initial surface water use in 2010. Provide results regarding impacts to the aquifers resulting from the reduction in groundwater production.
4. Prepare a draft technical memorandum on the results of the review of the existing LSGCD monitoring program and of the aquifers response, mainly in Harris County, to the introduction of surface water in parts of north Harris

## EXHIBIT A-1

County in 2010. Meet with and provide a presentation to the Findings and Review Committee and the Board of Directors regarding the technical memorandum.

5. In coordination with the LSGCD staff, schedule and facilitate a stakeholder meeting during which results from the monitoring program review included in the draft technical memorandum are presented. Obtain, compile, and address stakeholder comments prior to finalizing technical memorandum.
6. Develop and provide recommendations for improvements to the LSGCD monitoring program. Recommendations shall include any necessary changes to the design, procedures and protocols of the monitoring program and the groundwater production reporting program. These recommendations will be provided for the Chicot, Evangeline and Jasper aquifers with sufficient lead time so that necessary changes may be implemented to measure the effects of conversion to Alternative Water Supplies in 2016 and beyond. Recommendations will be provided in a draft technical memorandum.
7. Develop and provide recommendations for expanding or adjusting the groundwater production reporting program and well water-level monitoring program for the Catahoula Aquifer.
8. In coordination with the LSGCD staff, schedule and facilitate a stakeholder meeting during the development of recommendations for improvements to the monitoring program. Obtain, compile and address stakeholder comments.
9. Present recommendations from the study to the LSGCD Board of Directors and finalize technical memorandum.
10. After the conversion scheduled for January 1, 2016, review groundwater production and monitoring data using the LSGCD's revised pumping inventory and well water-level monitoring program initiated in 2015.

## EXHIBIT A-1

Provide results regarding aquifer response due to the conversion one to two years following conversion.

### **C. Task 2. Total Estimated Recoverable Storage (TERS) Published by the Texas Water Development Board (TWDB)**

1. Evaluate the procedures and data sources utilized by the TWDB in the calculation of total estimated storage and TERS for the Gulf Coast Aquifer System in the LSGCD. In particular, the applicability of 25 and 75 percent bounds established by the TWDB as practical estimates, in terms of artesian head/water-level declines and subsidence, of the amount of TERS that might be recovered from the Gulf Coast Aquifer will be evaluated.
2. Evaluate the potential volumes of fresh and brackish groundwater in the TERS volume within the LSGCD. Utilize data from fresh and brackish groundwater studies performed by governmental entities, published scientific literature, private entities, and electric logs of water wells and oil and gas test holes assembled for the LSGCD area.
3. Using the LSGCD water well database and data from other sources, information in permits, well logs, and other records regarding well screening information for existing wells in the LSGCD, as needed, identify and assign current groundwater production amounts by well for the Chicot, Evangeline, Jasper and Catahoula aquifers to supplement data in the LSGCD database.
4. Identify and evaluate options for estimating the amount of water that is removed from storage by pumping in the LSGCD. This effort will include the use of analytical tools.
5. With the analytical tools identified as part of the effort in Item 4, review past groundwater pumping in the LSGCD and potential aquifer storage changes. Develop qualitative, and if possible, quantitative estimates of storage change for the HAGM simulations performed through 2009 as part of the GMA 14 planning.

## EXHIBIT A-1

6. Assemble data regarding artesian head declines, pumping lift changes and any water quality changes that have occurred as a result of past pumping. Data will be collected from the LSGCD, USGS, TWDB, published literature, well monitoring service companies and stakeholders.
7. Develop estimates of subsidence in the LSGCD based on pumping through 2009. A combination of available HAGM results and subsidence measured at monitoring locations in the county will be utilized.
8. Prepare a draft technical memorandum on the results of the study including evaluation of the TWDB TERS estimate, water quality variations in the LSGCD within the TERS estimate, estimates of changes in water in storage through 2009 and artesian head and subsidence response of the Chicot, Evangeline and Jasper aquifers and of wells constructed in the aquifers.
9. Present results of the study to the Findings and Review Committee and subsequently to the Board of Directors.
10. In coordination with LSGCD staff, schedule and facilitate a stakeholder meeting during which results from the study are presented. Obtain and compile stakeholder comments.
11. Revise the draft technical memorandum and include responses to comments in the final technical memorandum.

### **D. Task 3. Future Groundwater Availability**

1. Evaluate the results of Task 2 and their applicability to the long-term development of groundwater in the LSGCD.
2. Utilizing assembled Catahoula Aquifer production data from the LSGCD and water-level data from the USGS and municipal utility districts, assess the Catahoula Aquifer response to groundwater pumping to date. Utilize available empirical data and analytical calculations to estimate aquifer response to an increase in pumping resulting from the 2016 conversion

## EXHIBIT A-1

with the rate of increase decided after review of Catahoula Aquifer pumping history and water level changes.

3. Evaluate Catahoula Aquifer water quality data available from well owners to help assess areal differences in water quality. This analysis will include a description of the relationships between Catahoula Aquifer water quality to near- and long-term (40 years) water availability.
4. Utilize groundwater flow modeling results from the current GMA 14 effort to illustrate the artesian head changes and the areal distribution of those changes resulting from currently planned future pumping distribution between the aquifers after 2016.
5. Evaluate pumping options for Chicot, Evangeline and Jasper aquifers in areas outside the areas of substantial measured artesian head declines, or future predicted head substantial declines. Evaluation to include review of aquifers hydraulic properties, current artesian heads, water quality in the aquifers, and proximity of the areas to current urban expansion. Perform up to three (3) model simulations using the HAGM for pumping options that could occur after the conversion to Alternative Water Supplies in 2016. Pumping options would be developed collaboratively by the consultants and the LSGCD and submitted to the LSGCD prior to performing simulations. Evaluate results regarding effects on Chicot, Evangeline and Jasper aquifer artesian heads and subsidence. In addition, identify any potential changes that may result in water quality.
6. Provide recommendations for the additional development of groundwater in the LSGCD. During development of the recommendations, consideration is to be given to population projections, water demand projections and water supply availability analysis included in the most recently adopted Region H Regional Water Plan. As part of this effort, previous LSGCD considerations involving the creation of management zones will be re-evaluated based on current conditions to determine possible viability in future regulatory considerations. The recommendations will be developed

**EXHIBIT A-1**

utilizing established stakeholder participation, as prescribed in Task O. The impacts of any recommended expansion of the use of groundwater resources on neighboring counties will be estimated. The recommendations shall be applicable for the Chicot, Evangeline, Jasper and Catahoula aquifers and will be provided in a draft version and a final report.

EXHIBIT A-1

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Budget

Task	Budget
Task 0 - Project Communications	\$41,800
Task 1 - Groundwater Production and Water-Level Data Assessment	\$62,400
Task 2 - Total Estimated Recoverable Storage (TERS) Review	\$65,300
Task 3 - Future Groundwater Availability	\$71,400
<b>Total</b>	<b>\$240,900</b>

The services will be performed on a unit rate plus actual expenses basis utilizing the unit rates on file with the LSGCD.

Schedule

Task

Task 0 will last for the entire length of the project.

Task 1 should be completed in about 8 months, except the evaluation of aquifer response after surface water conversion beginning on January 1, 2016, which should last until about February of 2017.

Task 2 should be completed within about eight months after the start of the project.

Task 3 should begin near the end of Task 2 and be completed about 12 months thereafter.

EXHIBIT A-1

**LBG-GUYTON ASSOCIATES  
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**2014 – 2016 FEE SCHEDULE FOR CONSULTING SERVICES**

<b>Principal</b>	<b>\$170 to \$230/hour</b>
<b>Senior Consultants</b>	<b>\$150 to \$200/hour</b>
<b>Senior Associates</b>	<b>\$150 to \$180/hour</b>
<b>Associates</b>	<b>\$120 to \$180/hour</b>
<b>Senior Hydrogeologists, Senior Environmental Engineers Senior Environmental Scientists</b>	<b>\$85 to \$155/hour</b>
<b>Hydrogeologists II, Environmental Engineers II Environmental Scientists II</b>	<b>\$80 to \$115/hour</b>
<b>Hydrogeologists I, Environmental Engineers I Environmental Scientists I</b>	<b>\$65 to \$90/hour</b>
<b>Senior Technicians</b>	<b>\$75 to \$90/hour</b>
<b>Technicians</b>	<b>\$60 to \$90/hour</b>
<b>CAD Operators/Draftspersons</b>	<b>\$92/hour</b>
<b>Clerical</b>	<b>\$72 to \$78/hour</b>

We require reimbursement for actual expenses incurred, including computer time. The use of personal cars in the field would be billed at the IRS approved rate per mile. An administrative charge of 5-percent is affixed to actual expenses and 10-percent for subcontractors. A 2-percent charge on services will be included to cover telephone, facsimile and in-house printing costs.

Invoices are payable upon receipt; accounts unpaid more than 60 days after the billing date are subject to 1.25-percent interest per month (15-percent annual rate) from the invoice date.

Fees for pretrial conferences and expert-witness testimony are as quoted above, with no premium fees.

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