Capital Area Ground Water Conservation Commission

Plan for Management of the Southern Hills Aquifer System in the Baton Rouge Area

September 19, 2017

Purpose and Scope

The Southern Hills Aquifer System (aquifer system) is a renewable groundwater resource that extends from Vicksburg, Mississippi, south to Baton Rouge, west through West Baton Rouge and Pointe Coupee parishes, thence east through the eight Florida Parishes to the Pearl River. The aquifer system supplies southeast Louisiana with a large quantity of water that is used for domestic, agricultural, light business, and industrial purposes. Approximately 150 million gallons of water per day is drawn from the aquifer system in East Baton Rouge Parish, primarily for public supply and industrial use. In the Baton Rouge area the aquifer system consists of 10 individual sands (aquifers) that are named according to depth.

In the Baton Rouge area, pumping limits put in place by the Capital Area Ground Water Conservation Commission (CAGWCC) in the 1970's, 1990's, and in 2013, should assure adequate water levels, hence groundwater availability. Under pumping patterns that have developed over the past 80 years, declines in water levels near the Baton Rouge fault, a leaky hydrologic barrier, are allowing movement of saltwater from south of the fault to the north into freshwater sands. Saltwater has reached some pumping wells in a portion of East Baton Rouge Parish near the fault, primarily in two of the aquifer system's 10 individual sands.

This saltwater encroachment is directed at two major pumping centers. In the 2,000-foot sand the pumping center is located in the industrial district north of downtown Baton Rouge. In the 1,500-foot sand the pumping center is located at a public supply well field further southeast. It is the goal of the CAGWCC to effectively reduce and manage this saltwater encroachment in these two affected sands and to manage groundwater withdrawals to assure fresh groundwater availability from all 10 sands for the future. The purpose of this management plan is to describe the methods employed by the CAGWCC to achieve that goal.

Management Authority of the Capital Area Ground Water Conservation Commission

The Capital Area Ground Water Conservation District (District) was created in 1974, to promote the orderly development and conservation of the District's groundwater resources. The District is composed of the parishes of East Baton Rouge, East Feliciana, Pointe Coupee, West Baton Rouge and West Feliciana, and is governed by the CAGWCC, which is appointed by the Governor and includes members representing the various user groups (industry, public supply, and agriculture) as well as from parish governments and state agencies, including the Office of Conservation, and the Department of Environmental Quality. The CAGWCC has wide authority to

manage the District's groundwater resources through groundwater pumpage reporting, usage fees, well permitting, pumping limits and restrictions, and other regulatory tools.

Planning Goals of the CAGWCC, Including New Scientific Models of the Aquifer System

To meet its goals of managing saltwater encroachment in affected sands and managing groundwater withdrawals to assure future availability for all 10 individual sands, the CAGWCC has endorsed a strong plan of action based on sound and objective science, including:

1. Collecting and analyzing chloride, water level and water use data,

2. Pumping reductions from specific sands in specific areas,

3. Restrictions by use for particular sands in the District,

4. Supporting the installation of a saltwater "scavenger well" in the 1,500-foot sand, and potentially another in the 2,000-foot sand,

5. Development of a long-term scientific model of the aquifer system through a contract with the U.S. Geological Survey (USGS), and

6. Continued use of sound and objective science to determine other necessary management measures, including but not limited to the potential movement of wells and well fields to reduce and/or redistribute pumping in specific sands.

This section describes the planning process that the CAGWCC uses to evaluate data drawn from the aquifer system model in order to manage groundwater levels in such a way to assure long term availability of the resource, and manage saltwater encroachment in affected sands. Provided below are:

1. A review of how the CAGWCC collects and processes scientific information,

2. The prioritized schedule for the aquifer system model, and

3. The schedule for data evaluation and management response for individual sands.

NOTE: This plan is intended to be flexible and responsive to new information; dates and priorities may change as the CAGWCC gains more knowledge about the aquifer system in the Baton Rouge area.

How the CAGWCC Processes Information about the Aquifer System

The CAGWCC collects monthly pumpage data from wells in the District and, through a cooperative program with the USGS, collects data to monitor groundwater conditions in the District. These data include water levels and chloride concentrations from wells in selected areas in the District. The USGS presents water level trends and chloride concentration trends annually to the CAGWCC.

The CAGWCC monitors modeling as it progresses through the USGS, and monitors relevant data from other resources as well. Other available resources include professional engineering firms and academic researchers that investigate specific aquifer-related questions.

Upon the establishment of credible, actionable evidence based on the collected data and modeling for an individual sand, the CAGWCC prepares a list of alternatives to manage water levels and/or saltwater migration in that sand. Various pumping scenarios are modeled by the USGS to simulate future aquifer responses to ascertain availability and/or management of saltwater migration.

To manage saltwater migration in a sand, the CAGWCC compiles a list of alternative management techniques that could be used to control saltwater movement, including but not limited to:

- **Freshwater Pumping Reductions** - This option uses modeling to depict a pumping scenario that controls saltwater movement, ultimately returning pumping conditions to the state where hydraulic pressure is higher on the north side of the Baton Rouge fault than on the south side, thereby halting saltwater migration northward.

- **Freshwater Injection** - This option would inject freshwater on the north side of the fault to raise hydraulic pressure so that saltwater does not migrate from south to north.

- **Saltwater Removal South of the Baton Rouge Fault** - This option pumps massive amounts of saltwater from the south side of the fault so that the hydraulic pressure is lower on that side, thereby halting northward migration.

- **Saltwater Scavenging** - This option removes saltwater from the sand at a rate that modeling indicates would halt northward movement. This option can include lines of small capacity well points or one or more high capacity wells.

- **Combination of Saltwater Scavenging with some Fresh Water Pumping Reductions** - This option would limit or offset water level declines to assure continued availability along with the effective management of saltwater encroachment.

Based on a review of available alternatives and practical considerations, such as land acquisition, legal issues, cost/benefits analyses, permitting and disposition of excess saltwater, among others, the CAGWCC develops and then implements a management strategy for that sand.

At the end of the modeling period the CAGWCC will have the ability to set pumping limits for individual sands so that current and potential users know the resource's availability and vulnerability to saltwater encroachment.

Process for Developing a Management Plan for Individual Sands

1. Work with the USGS to clarify data collection and investigative priorities.

2. Review the USGS modeling results (including preliminary results as available).

3. If model results indicate a threat to the long term use of the groundwater, identify options to manage the threat.

4. Evaluate the viability of the options. Model scenarios as required.

5. Develop and implement a management strategy.

6. Monitor effectiveness of the plan implementation using collected data and make adjustments as needed.

Current Prioritized Schedule for Scientific Modeling of the Aquifer System

In September 2012, the CAGWCC entered a 10-year agreement with the USGS to model the remaining sands within the Southern Hills Aquifer System in the Baton Rouge area after completing such models for the 1,500-foot and 2,000-foot sands. Funding for this work is provided by the CAGWCC, the Public Works and Water Resources Division of the Louisiana Department of Transportation and Development, the USGS, and the City of Baton Rouge and Parish of East Baton Rouge. These parties agreed on a priority ranking to schedule the work for individual sands based on identified saltwater encroachment, and need to ascertain water availability.

Modeling Schedule (Subject to Change Based on Above Criteria)

1,500-foot Sand	Availability Model complete 2014
2,000-foot Sand	Availability and Saltwater-Vulnerability Models complete 2014
1,200-foot Sand	Availability and Saltwater-Vulnerability Models complete 2015
2,400-foot Sand	2018
2,800-foot Sand	2018
400-foot Sand	2019
600-foot Sand	2019
800-foot Sand	2019
1,000-foot Sand	2019
1,700-foot Sand	2021
2,000-foot Sand	Revised structure 2021

Management Schedule and Actions for Individual Sands

1,500-foot Sand: Modeling results for the 1,500-foot sand were published in December 2013 and updated in 2014. The CAGWCC received updates on the draft results during calendar year 2013, and approved a management plan setting total annual water withdrawal limits from that sand in East Baton Rouge Parish. Modeling results indicate these withdrawal limits will sustain water levels. The CAGWCC reviews quarterly pumping information at each Technical Committee meeting to ensure these annual pumping limits are met. The District Director reviews each permit for new production wells and will not approve new production over the established limit. The Technical Committee will begin the periodic review of water level and trend data presented by the USGS to determine if this data shows water levels expected by the model outcomes for this sand, the 2,000-foot sand, and other sands as they are modeled.

In 2014, the Baton Rouge Water Company (BRWC) installed a scavenger well system south of the Lula Street pumping station to address saltwater encroachment in this sand. This system was performing well through mid 2017. The CAGWCC will continue to review water levels and the results from the scavenger well and will evaluate further management actions if required.

2,000-foot Sand: Modeling results for the 2,000-foot sand were published in December 2013 and updated in 2014. The CAGWCC received updates on the draft results during calendar year 2013, and approved a management plan setting annual water withdrawal limits from that sand in East Baton Rouge Parish and in the industrial area north of Chippewa Street. The CAGWCC reviews quarterly pumping information at each Technical Committee meeting to ensure these annual pumping limits are met. The model shows water levels to be relatively stable. It also shows saltwater moving towards the industrial district pumping center and a public supply well field at Government Street.

A scavenger well combined with fresh water pumping reductions was modeled by the USGS and appears to be the preferable initial approach to manage this saltwater migration. The structure of the 2,000-foot sand in the area where a scavenger well system would be located is poorly documented. The CAGWCC recommends that a test boring (or multiple borings) be completed in that area of Baton Rouge to document the thickness of the sand and confirm the presence of saltwater and at what concentration. Information gained from the test holes will be used to locate a scavenger well(s).

CAGWCC increased pumpage fees to $10.00 per million gallons in 2016, with $5.00 per million gallons dedicated to finance geophysical test holes/wells to be used to locate a scavenger well(s) to remove salt water from the “2,000-foot” sand. Upon location of suitable sites, detailed engineering can proceed through preparation of a definitive estimate, followed by securing funds and installation. The CAGWCC will develop a plan to locate specific property for such test holes, secure preliminary access agreements, and determine costs and payment options, in anticipation of work moving forward.

1,200-foot Sand: Preliminary modeling results for the 1,200-foot sand were published in September 2016. This sand has saltwater near the Baton Rouge fault at a public supply well. The

CAGWCC moved this modeling work forward to further evaluate pumping scenarios involving an increase in industrial pumping in this sand as a replacement for current and future use in the 2,000-foot sand. The CAGWCC completed its evaluation of this information in 2016, and recommends continued monitoring of the water levels and salinity in this sand.

2,400-foot Sand: Model results should be published in 2018. Saltwater occurs in this sand along the Baton Rouge fault and in southeast Baton Rouge. About 12 percent of the total groundwater use in East Baton Rouge is from the 2,400-foot sand. The CAGWCC will complete its evaluation of the model results and develop a management plan, if required, by the end of 2018.

2,800-foot Sand: Model results should be published in 2018. This sand contains saltwater as far north as the industrial district. This saltwater was present before the development of the resource. Thus, the CAGWCC anticipates that the USGS will need to spend additional time setting the model parameters. This sand has a high degree of use in the industrial district and for public supply areas at Baker and Zachary. The CAGWCC will complete its evaluation of the model results and develop a management plan by the end of 2019.

400-foot Sand: Modeling results should be published in 2019. Water levels are stable and there is no significant saltwater encroachment. CAGWCC will complete its evaluation of the model results by and develop a management plan, if required, by the end of 2020.

600-foot Sand: Model results should be published in 2019. This sand has a large saltwater area in the downtown Baton Rouge area. The 600-foot sand is pumped at about 10 million gallons a day, 70 percent of which is used by industry. The 600-foot and 400-foot sands were modeled in 1989 for flow parameters, with flow direction centered in the industrial district. Future use of this sand is important in the long term management strategy for the overall aquifer system at Baton Rouge as an option to increase industrial pumping in that sand while decreasing industrial pumping in deeper sands. The CAGWCC will complete its evaluation of the model results and develop a management plan by the end of 2020.

800-foot Sand: Modeling results should be published in 2019. Water levels are stable and there is only minor saltwater encroachment. CAGWCC will complete its evaluation of the model results and develop a management plan, if required, by the end of 2020.

1,000-foot Sand: Modeling results should be published in 2019. Saltwater occurs in this sand along the Baton Rouge fault and in southeast Baton Rouge. Pumping is about 10 million gallons a day, almost all from public supply. Water levels are declining in this sand. CAGWCC will complete its evaluation of the model results and develop a management plan, if required, by the end of 2020.

1,700-foot Sand: Modeling results should be published in 2021. This sand does not have a significant saltwater issue, but the water level is declining. It may have some connection with the 1,500-foot sand in East Baton Rouge Parish. As the pumping rates change in other sands, the 1,700-foot sand may contribute more total production if water levels can be sustained. The CAGWCC will

complete its evaluation of the model results and develop a management plan, if required, by the end of 2022.