



**Executive Summary:  
Review and Recommendations on  
“Subsidence Investigations – Phase 1” Report**

Prepared by the  
Groundwater Science Advisory Committee

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The Groundwater Science Advisory Committee  
is an initiative of the Regional Groundwater Science Partnership

February 5th, 2021

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**Regional Groundwater Science Partnership**

The *Regional Groundwater Science Partnership* was created to enable science-based review, community education, and outreach activities in support of regional data and studies relating to groundwater supply, groundwater demand, and land subsidence in Montgomery and Harris counties, Texas. The work of the Partnership is financially supported by the *Groundwater Research Consortium*, comprised of special-use districts in the greater Houston-Galveston Region interested in independent, science-based groundwater and subsidence research and data analysis. The *Groundwater Science Advisory Committee (SAC)*, comprised of leading researchers from institutions around Texas, have come together to analyze and share a rich array of scientifically informed data about groundwater resources and regional subsidence.

HARC held a series of introductory conversations with a variety of entities, such as community organizations, local groundwater districts, river authorities, subsidence districts, utility districts, local elected officials, chambers of commerce, and municipalities. A common theme from stakeholder conversations included a request to review a recently published technical memorandum prepared for the Lone Star Groundwater Conservation District titled, “Subsidence Investigations – Phase 1 Assessment of Past and Current Investigations” (“Phase 1 Report”).

**SAC Summary of Phase 1 Findings**

- The current state of the science on the Jasper Aquifer supports that it is likely susceptible to compaction. It is important to verify this conclusion with further study and monitoring of the Jasper Aquifer.
- The GULF 2023 model, currently under development, will provide a more accurate representation of the compaction potential of the Jasper Aquifer. GULF 2023 results should be used to guide future assessments. The known limitations of the previous model, the Houston Area Groundwater Model, result in a low and conservative estimate that produces a very limited compaction potential of the Jasper Aquifer.
- The SAC has concerns about suggestions that Harris County is responsible for 80-90% of subsidence in Montgomery County. While pumping impacts do not stop at county lines, water levels and subsidence are generally most affected by the heaviest use in the immediate area (i.e., greatest sustained drawdown over the longest period), the lowest historical water level, and the clay content of the pumped aquifer unit in that immediate area.
- Drought and its impacts on water levels and subsidence were not discussed in the Phase 1 Report. Potential drought impacts should be addressed because water demand increases significantly under drought conditions.

***Groundwater Research Consortium***

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- The possible effects of subsidence from petroleum production are not discussed in the Phase 1 Report. While the magnitude of subsidence from petroleum production will not be the same as that from groundwater production, the SAC recommends it be considered to determine impacts.
- The Phase 1 Report focuses on the greater Houston-Galveston region. Further studies would benefit from a focus on Montgomery County and should address questions such as:
  - What do the data show for land subsidence that has occurred historically in Montgomery County?
  - How have subsidence rates and rates of fault movement changed following the recent conversion from groundwater to surface water?
  - How susceptible is each aquifer to compaction in Montgomery County, and what data are available to support these conclusions?

## **SAC Recommendations for Phase 2**

The Phase 1 Report discusses possible tasks for a Phase 2 study. It is encouraging to see that plans for monitoring and research are included and will include a cooperative effort with the Harris-Galveston Subsidence District (HGSD). The SAC encourages decision-makers to work with area scientists and experts on data collection, data analysis, and regional studies. The SAC makes the following recommendations for the proposed Phase 2 study.

- *Expand the GPS network into Montgomery County, integrating water level measurements*  
Existing GPS datasets provide information about ongoing subsidence in Montgomery County; however, the coverage is sparse. LSGCD should consider partnering with HGSD to establish a dense GPS network within Montgomery County. As a part of this network, the SAC suggests installation of at least twenty new continuous GPS stations co-located or closely spaced with Jasper Aquifer groundwater wells and regular water level monitoring. Within three years, residents and decision-makers would have new insights into ongoing subsidence.
- *Install an extensometer for the Jasper Aquifer, integrating with GPS*  
The SAC strongly supports installing an extensometer to measure subsidence of the formations that make up the Jasper Aquifer. The integrated extensometer and GPS system installed near Katy, TX by the US Geological Survey and HGSD serves as a cost-effective model to differentiate shallow and deep compaction within different aquifers. The SAC recommends assessing this approach for application in Montgomery County.
- *Consider InSAR to fill in data gaps and help site GPS and extensometers*  
Interferometric Synthetic Aperture Radar (InSAR) was mentioned in the Phase 1 report. It is used in other areas and could have some applicability in this region. While GPS and extensometers provide precise measurements of subsidence, their coverage is spatially limited. InSAR, while not as precise, covers a larger area to fill in gaps between existing measurement points and provides a basis for siting future GPS and extensometers. Together, the techniques provide a more complete picture of subsidence. The SAC will review InSAR to make more specific recommendations.
- *Incorporate flood impacts using Spring Creek subsidence and flooding study methods and results*  
The Phase 1 report states that the Phase 2 study will include evaluating models to assess flooding and subsidence. The SAC recommends closely following the results of the Spring Creek subsidence and flooding study conducted by HGSD and the Harris County Flood Control District. The methods and results of the Spring Creek study could help Montgomery County better understand the potential impacts of subsidence on flooding and the approaches that would work best in county watersheds.