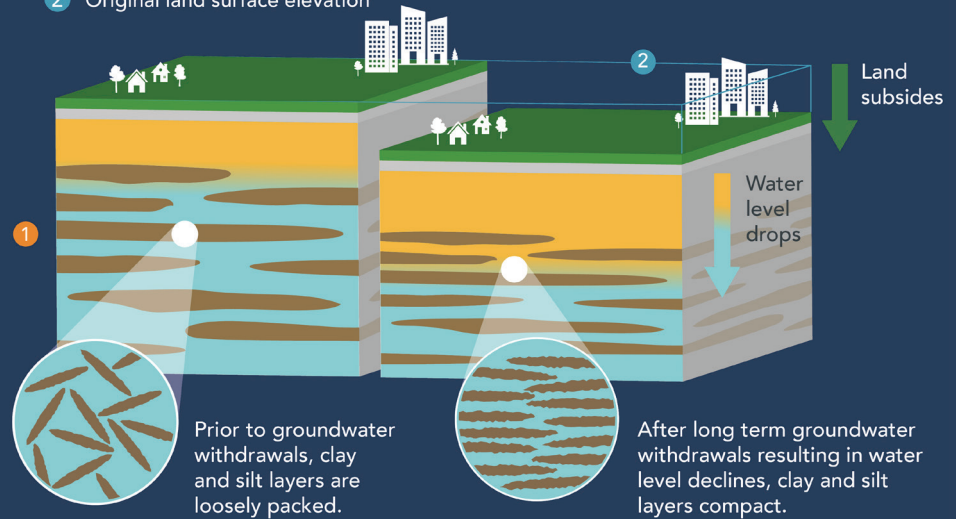




How Subsidence Occurs

- 1 The Gulf Coast Aquifer is comprised of silty sand and clays.
- 2 Original land surface elevation



If Subsidence Is Left Unchecked The only way to stop subsidence? Curb groundwater use.

Kelsey Seeker, Communications Specialist, Harris-Galveston Subsidence District

The Harris-Galveston Subsidence District is a regulatory agency that works with regional water authorities and government entities to mitigate the risk of subsidence and provides key data and insights that help drive alternative water infrastructure projects.

Subsidence, the sinking of land, is caused by excessive groundwater withdrawal which results in the lowering of the aquifer water level (an indication of depressurization of the aquifer) that causes the aquifers to compact. This compaction is seen at the surface as subsidence and can cause damage to roads, infrastructure and contribute to flooding.

Every year, the District collects and publishes data that examines aquifer water levels, groundwater usage, and subsidence rates in Harris and Galveston counties.

The annual rates of subsidence observed in Regulatory Areas One and Two are generally stable since both areas have reached their full regulatory conversion level (1990 and 1995, respectively). This level is set by the District based on reasonable regulations informed by research and data. The Chicot/Evangeline aquifer water levels have risen up to 242 feet from their historic benchmarks.

Based on the data from the District's GPS network, areas in northwest/west Harris County are still facing higher subsidence rates until that conversion process is completed. Subsidence rates are generally above 0.5 centimeters (cm) per year



Reviewing documents at a Subsidence Monitoring GPS Station

throughout Regulatory Area Three where the West Harris County Regional Water Authority is located.

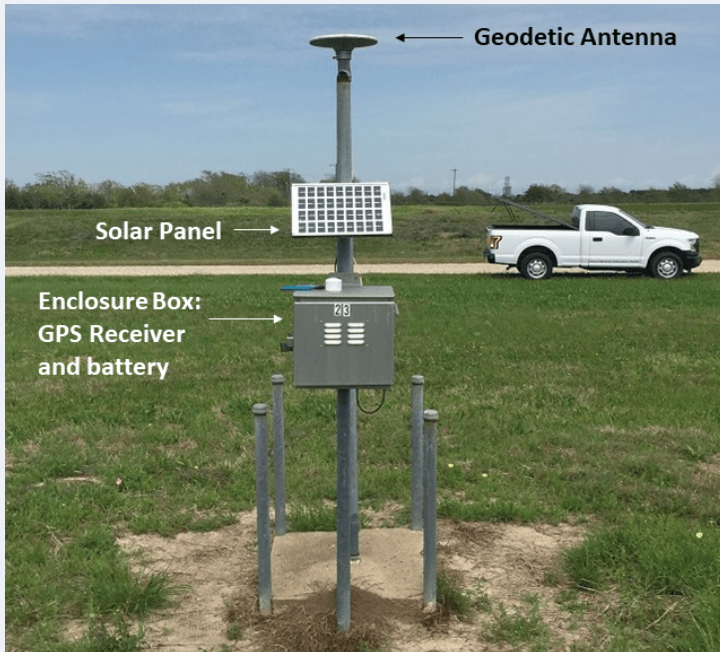
If regulations and the conversion process had not been implemented in Area 1 and 2, the subsidence rates could have exceeded 2.0 cm per year and approximately one foot of subsidence or more every 15 years.

However, this assumes there would be no population changes or new development in the area. Data has shown that as population and groundwater

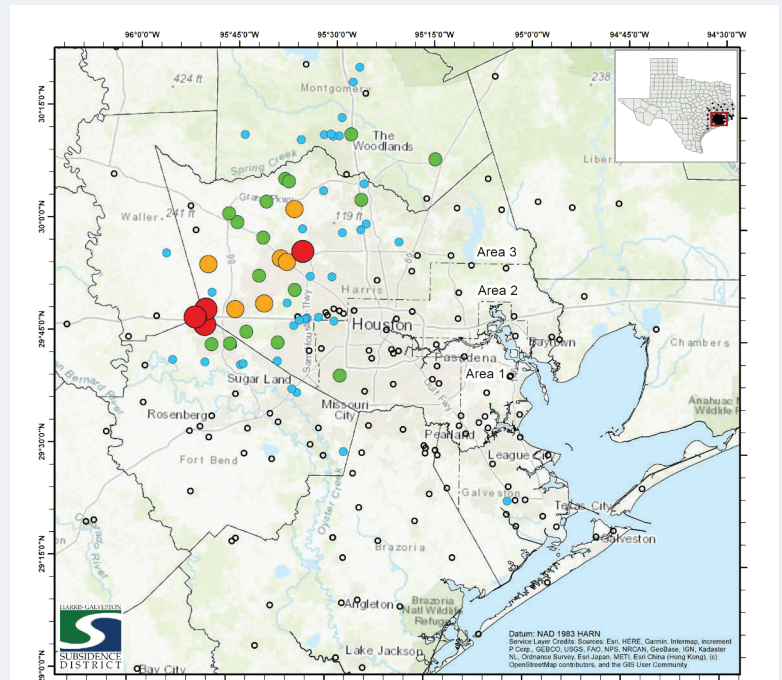
use increases, so do subsidence rates. The potential rate of subsidence could have been much greater, along with its effects like infrastructure damages and increased flooding.

In addition to constantly monitoring subsidence rates, the District regularly invests in additional research such as an upcoming study on flooding impacts related to subsidence in the Spring Creek watershed, which borders Harris and Montgomery Counties.

Ensuring the longevity of alternative water resources is necessary for the region's growth and resiliency. Investing in alternative water infrastructure – like the WHCRWA is doing – will protect communities from subsidence in the decades to come.



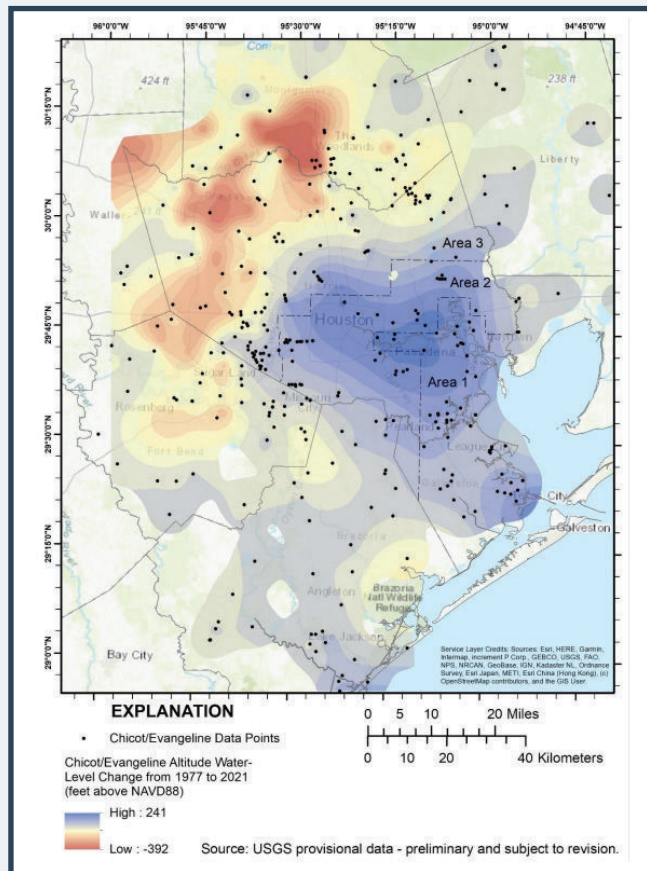
Example of a Permanent GPS Station



EXPLANATION
 Subsidence Rate (cm/yr) from 2016 to 2020

- Greater than or equal to 2.0
- <2.0 - 1.5
- <1.5 - 1.0
- <1.0 - 0.5
- Less than 0.5 or period of record less than 3 years

Visit HGSD's interactive map showing subsidence rates in Harris, County and surrounding areas.
whcrwa.net/subsidence-rates



Aquifer water levels have risen in areas with reasonable groundwater regulation and declined where groundwater is the primary source of water. This map depicts water level changes since 1977.

For more information visit hgsubsidence.org.