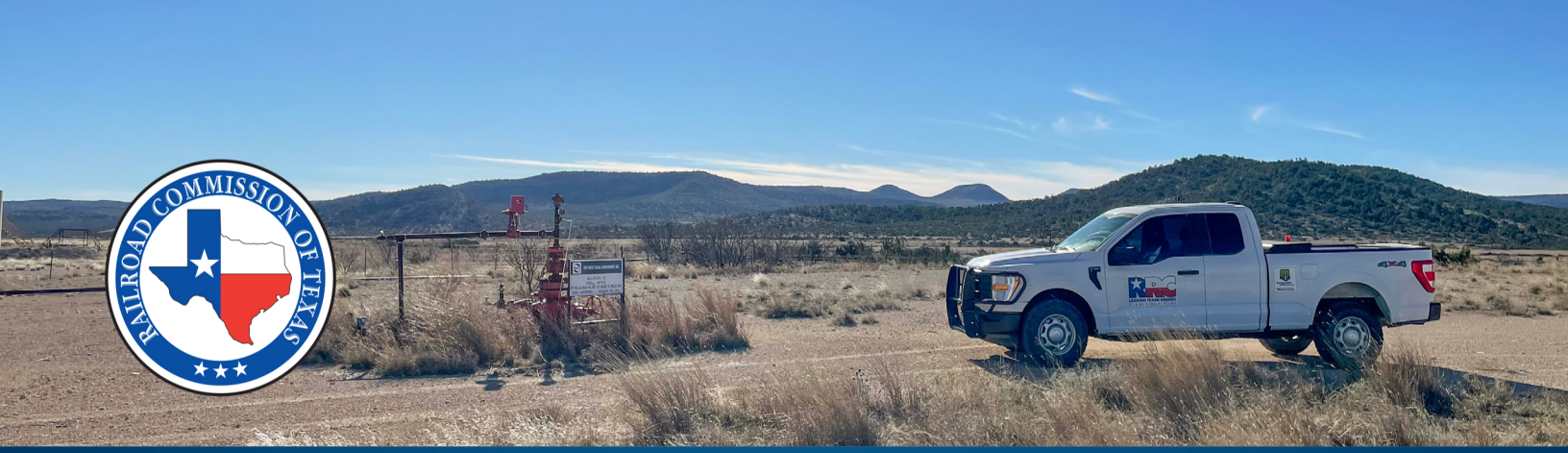


Mitigating Texas Earthquakes

Certain regions in Texas have experienced an increase in seismic activity correlated with the underground injection of produced water, a byproduct of oil and gas production, into saltwater disposal wells (SWDs). While this disposal process is vital to the industry, it presents significant challenges due to its potential to induce seismic events. The Railroad Commission of Texas (RRC) recognizes that ongoing research, effective monitoring and adaptive regulatory practices are essential to managing these seismic risks while ensuring the safe extraction of oil and gas. The RRC is committed to collaborating with operators and other state entities to address these risks.

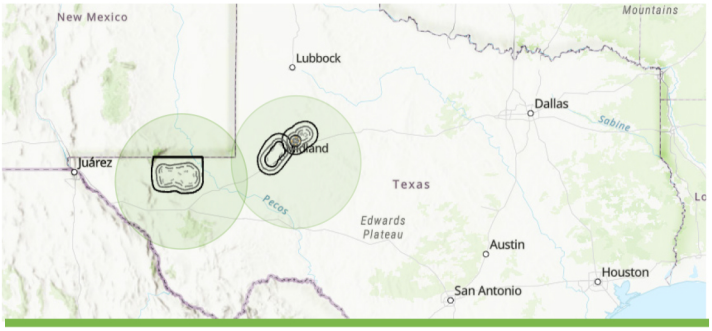
To ensure the protection of Texans and the surrounding environment, the RRC has implemented active measures to reduce seismicity related to injection wells.

How Does the RRC Respond to Seismicity?

When earthquakes of magnitude 3.5 or greater occur, the RRC takes immediate action to mitigate seismic activity potentially linked to underground injection of produced water in SWDs. RRC inspectors are dispatched to disposal wells within two miles of the earthquake location and, depending on the findings from inspections and seismicity data analysis, actions may include suspending injection permits or curtailing disposal volumes to minimize stress on geological formations. There are more than 375 seismometers, which record ground motion during an earthquake, in the state.

Monitoring and Data Collection

To help mitigate induced seismicity in regions of oil and gas production that have experienced a series of earthquakes, the RRC has established three seismic response areas (SRAs) where it is necessary to limit produced water disposal. These SRAs were designed based on comprehensive data collection and analysis, evaluating the correlation between injection activities and seismicity. The RRC works closely with operators in the SRAs and regularly updates response plans, which are available to the public on the Railroad Commission website.



The SRAs include Northern Culberson-Reeves SRA in the Delaware Basin, Gardendale SRA in Ector, Martin and Midland Counties in the Midland Basin and Stanton SRA in the Midland Basin.

The Commission has partnered with academic groups, such as the Bureau of Economic Geology and the Center for Injection and Seismicity Research, whose assistance has contributed to the decreasing trend of magnitude 3.0+ earthquakes in Texas.

SWD Permitting Assessments

The RRC has adopted guidelines for permitting SWDs in seismically active areas, which include volume and pressure limits, and consideration of the number, severity and proximity of earthquakes as well as geologic conditions.

We continuously improve our methods based on the latest scientific research and operational data. The Commission regularly reviews and updates its produced water injection well program using advanced technology and data analysis to ensure effective regulation.

Utilizing Technology to Help Mitigate Earthquakes

The RRC is leveraging technology to help our mission to tackle seismicity.

For example, the Railroad Commission uses automation and machine learning to optimize the time the agency's technical analysts spend on seismicity reviews. Seismicity reviews are conducted by the Underground Injection Control (UIC) Unit for produced water disposal well permits in areas susceptible to earthquakes. UIC staff developed a machine learning algorithm to efficiently process and analyze large volumes of data, enabling technical analysts to work more quickly and make well-informed decisions during each seismic review.

The RRC also collaborates with academia to develop better risk assessment methods. The University of Texas Bureau of Economic Geology /TexNet Seismic Monitoring Program staff developed a web-tool that enables operators to file daily injection volumes and pressures for SWDs in seismic areas.

RRC staff —as well as industry and academia— use this tool to better understand the relationship between SWD activity and seismicity. The RRC's State Seismologist works with our partners on the program and is a member of the Governor's TexNet Technical Advisory Committee.

Recognized for Excellence

The RRC has been recognized with multiple awards for taking innovative steps to address seismicity around the state. These accolades reflect the RRC's commitment to excellence, innovation and dedication to our mission of protecting human health and the environment.

GROUNDWATER PROTECTION COUNCIL

Excellence in UIC Award
May 2022

The Bruno Hanson/Midland College Environmental Excellence Award
May 2022

Midland College

In a letter dated June 13, 2023, the Environmental Protection Agency (EPA) commended the Commission's efforts to address the potential for seismic activity related to disposal injection.

"We wish to thank you and your staff for your work in protecting underground sources of drinking water from underground injection activities under your authority. We appreciate the continued attention to issues related to permitting disposal wells in seismically active areas of the Permian Basin and the continued attention on problematic areas in East Texas resulting in a consistent system for evaluating seismic hazards near disposal wells and application of appropriate permitting conditions."

About the Railroad Commission

Our mission is to serve Texas by our stewardship of natural resources and the environment, our concern for personal and community safety, and our support of enhanced development and economic vitality for the benefit of Texans. The Commission has a long and proud history of service to both Texas and to the nation, including more than 100 years regulating the oil and gas industry. The Commission also has jurisdiction over alternative fuels safety, natural gas utilities, surface mining and intrastate pipelines. Established in 1891, the Railroad Commission of Texas is the oldest regulatory agency in the state. To learn more, please visit https://www.rrc.texas.gov/about-us/.