
News

West Texas quakes track with oil boom

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For the people in the West Texas town of Stanton, the earthquake that rumbled on the evening of Jan. 3 felt like a pickup had slammed into their homes.

"We had several people (who said) it knocked stuff off the walls, shook stuff, knocked things down off of their shelves or walls," said Mayor Sally Poteet of the community of about 3,100 that lies near the midpoint between Big Spring and Midland along Interstate 20. "We're used to sandstorms. We're not used to earthquakes."

The quake, which according to the seismic monitoring organization Earthquake Track registered a magnitude of 4.6, was the largest quake in the United States so far in January and one of more than 3,000 to strike Texas over the past year, many of them occurring in the oil-rich Permian Basin.

The Texas Railroad Commission, which regulates the state's booming oil and gas industry, last week sent a team of inspectors to the Permian Basin in an effort to gain a better understanding of the seismic events, which are increasing in both frequency and intensity. That follows last month's order that operators cease pumping the wastewater needed in oil extraction deep into the earth's surface, which is seen as contributing to the upswing in earthquakes.

The commission could not say when the inspectors' findings would be made public.

Scott Tinker, director the University of Texas **Bureau of Economic Geology**, said that federal and state researchers have concluded that seismic activity in the Permian Basin has been increasing over the past decade.

And so has oil production, and the increase has been staggering. According to the U.S. Energy Information Administration, the Permian Basin in 2012 was pumping crude oil out of the ground at rate of about 1 million barrels per day. By December 2021, output had mushroomed to nearly 5 million barrels a day.

A 2019 report by the Independent Petroleum Association of America concluded the Permian Basin was the "highest producing oilfield in the world."

Several earthquakes struck in North Texas during the height of the hydraulic fracturing boom in the natural gas-rich Barnett Shale from 2009 through 2012. Some studies suggested that the quakes were linked to the intense pressure of water, and chemicals needed to blast the gas from the deep underground rock formations.

However, the U.S. Geological Survey said deep disposal of post-drilling wastewater, not fracking, are the likely source of what it calls "induced earthquakes."

"The recent increase in earthquakes in the central United States is primarily caused by disposal of waste fluids that are a byproduct of oil production," the agency said.

Tinker, whose organization at UT oversees the state's seismic monitoring program called TexNet, said nearly all of the recent earthquakes in the Permian Basin have been so mild – many with a magnitude of 3.0 or less – and have occurred in regions so remote that they "have not been felt by humans." And sometimes the region is hit by several quakes a day.

However, Tinker said that since December 2020, at least 16 quakes have struck the region with a magnitude of 4.0 or higher. That is close to the strength that struck Stanton. However, even though such seismic events can be felt, quakes with magnitudes less than 5.0 seldom cause significant damage to buildings.

"Frequency and magnitude are difficult to predict," Tinker said. "Frequency is somewhat correlated to production of oil and gas, and the associated water that must be disposed of into geologic formations."

Todd Staples, a former Texas agriculture commissioner who now is president of the Texas Oil and Gas Association, said halting deep wastewater disposal will likely not instantly slow the pace of seismic activity in the Permian Basin.

"Most of the scientists agree that it will have a positive impact," Staples said. "They also point out, though, that it may not be immediate, because these geologic formations and the pressurization sometimes need to stabilize. And so while the commission has taken actions, you may not see an immediate corresponding change, but the scientists indicated it will be positive results."

Ben Shepperd, president of the Permian Basin Petroleum Association, said the quakes themselves are unlikely to cause any interruption of drilling activity. The halt of deep underground disposal of the wastewater, called "produced water" in industry parlance, presents a challenge, but one that so far appears to be manageable, he said.

"Operators are needing to, and are well on their way of identifying other avenues for their produced water rather than deep disposal," Shepperd said. "Some of them are seeking to move to shallower, less active zones. Some are needing to truck their water further away from the vicinity."

The prohibition against deep pumping – about 2 miles below the earth's surface – of the used wastewater so far is limited to a comparatively small section of the Permian Basin. Therefore, Shepperd said, any disruption will likely be minimized.

However, finding new disposal sites or doing more recycling of the wastewater could add to the expense of oil production, he said.

"The cost of either disposal or recycling is a concern," Shepperd said. "But it is one that over the last seven, eight years and with the emphasis on research and development of recycling technologies and uses, I think the costs continue to come down."

Conserving water in oil production is considered key in the dry climate of West Texas, which means increased recycling of wastewater could be an unforeseen yet beneficial byproduct on the quakes. According to the oil industry, hydraulic fracturing an average Permian Basin oil well requires 275,000 to 325,000 barrels of water per day. Each barrel contains 42 gallons of water.

The Legislature in 2021 established the Texas Produced Water Consortium at Texas Tech University to find recycling or reuse opportunities for oilfield wastewater "in a way that is economic and efficient and protects public health and the environment."

"Industry and academia are working together like never before to identify new uses new technologies and uses for produce water," Shepperd said.

Stanton and its nearby surrounding areas have been hit by at least 14 quakes in the past month and according to Earthquake Track, more than 230 over the past year. Nearly all went unnoticed by residents.

Poteet, the town's mayor, said a vibrant oil industry is key to the economic vitality of her community, which saw a nearly 25% population increase driven by activity in the Permian Basin between 2010 and 2020. But she added that it could definitely do without disruptive seismic activity.

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