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Oil or Water? Midland Says Disposal Wells Could Threaten Water Supply

As oil and gas companies struggle to dispose of their wastewater in the Permian Basin, the city of Midland is challenging applications for disposal wells near one of its drinking water sources.



By Martha Pskowski

November 12, 2023

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Attorneys for the city of Midland, the oil capital of Texas, made an unusual request to regulators this year: Could they please be allowed to challenge drilling permits?

Midland isn't contesting permits to drill for oil. The city is challenging applications by Pilot Water Solutions to inject oil and gas wastewater deep underground adjacent to the T-Bar Ranch, where Midland gets about 30 percent of its drinking water. City leaders worry that Pilot's disposal wells could jeopardize their long-term water supply.

The Railroad Commission of Texas, which regulates oil and gas drilling and disposal wells, agreed in June to give Midland standing to challenge the permits. The case will go before a Railroad Commission administrative judge in January 2024. The dispute highlights two rising challenges in West Texas: where to dispose of billions of barrels of toxic oil and gas wastewater and how to get enough freshwater to keep the taps flowing.

Midland Mayor Lori Blong, herself the co-owner of the oil and gas company Octane Energy, traveled to Austin in June to appeal to the Railroad Commission in an open meeting.

"Midland has an independent and friendly relationship with the oil and gas industry," Blong told the commissioners, adding disposal wells are "essential" to that industry.

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“However, I also understand that all SWD [saltwater disposal] well construction procedures and applications are not created equal, and across Texas, they must demonstrate that groundwater is protected,” Blong said.

Zachary Neal, Pilot Water Solutions executive vice president, said the company has introduced multiple layers of protection in the proposed wells and will take groundwater samples to monitor the safety of the community's water supply. Neal said these steps “exceed regulatory requirements.”

Water Demand and Disposal Demand at Odds

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Midland's water woes are nothing new. In 1965, the city of Midland bought the 20,229-acre T-Bar Ranch in Winkler County, a rural part of the Permian Basin near the New Mexico state line, for future water supply.

That decision proved prescient after the drought of 2011 in the Permian Basin. That year reservoirs dipped lower and lower and Midland and Odessa **introduced water restrictions** for the first time. Midland, the quintessential oil boom town, acknowledged that development would grind to a halt if there wasn't enough water to go around.

After squeaking through 2011, Midland decided it was time to tap into the T-Bar Ranch water. A 67-mile pipeline was completed by May 2013 at a cost of over \$200 million to connect the T-Bar Ranch to Midland. The T-Bar Ranch was also designated as Midland's emergency water supply.

That's why a series of permit applications to drill wastewater wells adjacent to the T-Bar Ranch caught the attention of Midland officials. According to Midland's protest letter, the city owns the groundwater under Sections 15 and 16, Block C-23, which are adjacent to the T-Bar Ranch and where Pilot intends to drill the wells.

Between June and Nov. 2022, Pilot Water Solutions applied for permits to drill 18 disposal wells there with a combined capacity of up to 567 million gallons of produced water per month. Disposal wells, also known as injection wells, receive the huge volumes of produced water that come up alongside oil and gas in the drilling process.

Fracking a single oil or gas well can require tens of millions of gallons of water. According to its website, Pilot, based in Houston, operates 126 disposal wells and more than 850 miles of water pipelines.

On Dec. 2, 2022, attorneys for the city of Midland protested the applications for five of the wells with the Railroad Commission. Pilot was proposing to inject up to 24,900 barrels of produced water per day, per well, within 1,000 feet of Midland’s water wells, according to the city.

The lawyers wrote that the City of Midland has completed 42 water wells in the T-Bar Ranch area that provide between 30 and 35 percent of the city’s freshwater supply.

“The City of Midland is entitled to protest as an affected person in order to protect its critical water supply and long-term investment of the water supply distribution system,” they wrote.

The Railroad Commission at first rejected Midland’s request for standing in the case. But after Mayor Blong appealed to the commissioners in June, the city was allowed to challenge the permits.

“Accidents Happen”

Disposal well design has evolved dramatically over the years. The wellbore passes through an aquifer and continues through a “confining layer” before reaching the layer where the wastewater—which can contain drilling chemicals and toxins such as arsenic and benzene—is disposed. This confining layer and the wellbore casing are designed to prevent the wastewater from entering the freshwater aquifer. Even so, evidence of disposal wells leaking into aquifers have been documented.

Midland’s lawyers laid out the crux of their argument in a filing this summer. They acknowledged that Pilot has proposed three strings of casing on the wellbores and a sufficient distance between the water supply aquifer and the injection depths to protect groundwater.

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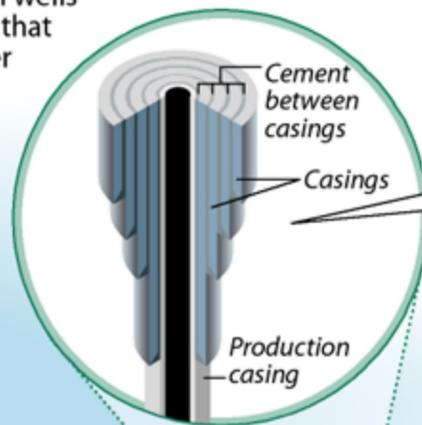
Potential Problems with Disposal Wells

Saltwater, or produced water, injection wells must be drilled deep enough to ensure that wastewater is far below drinking water supplies. Increased underground pressure from disposal wells can cause abandoned wells to leak. In Texas, regulators require that all abandoned wells within a quarter mile of a disposal well must be properly plugged to prevent leaks.

WHEN THINGS GO WRONG

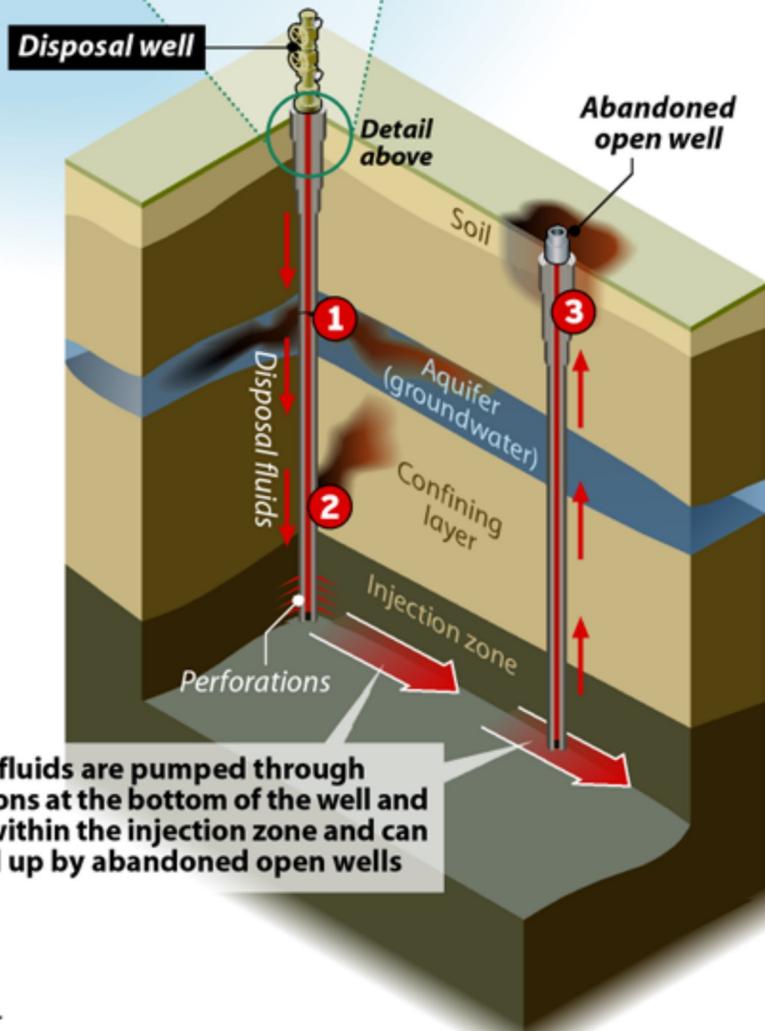
Fracking water is pumped into a disposal well with the intention the saltwater will stay trapped in the injection zone. But problems can occur:

- 1** A crack or rupture in the well casing can allow disposed produced water to leak into the soil and groundwater.
- 2** Likewise, fluids can move through vertical channels in faulty cement and leach into the earth.
- 3** Disposal wells increase underground pressure which can cause abandoned wells to become conduits for produced water to leave the disposal well. This leak can stay underground or reach the top of an abandoned well, causing a surface spill.



WELL CASING

Disposal or injection wells have several layers of protection to prevent groundwater contamination. A typical disposal well shaft is encased in several metal sheaths separated by cement. The production casing extends several thousand feet down.



NOTE: Illustration is diagrammatic and not to scale.

SOURCES: Ronald Green, Southwest Research Institute; Aresco LP; U.S. Government Accountability Office; ICN research

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“However, Pilot has the burden to prove that the Amended Applications will not harm groundwater...,” the lawyers wrote. “Moreover, accidents happen. And an accident resulting in the contamination of the T-Bar Well Field would be disastrous.”

The City of Midland and its attorneys declined to comment on the pending case.

A Railroad Commission spokesperson said that its permitting rules protect ground and freshwater and make sure that wells are properly constructed “to ensure that the fluid is confined to the proposed injection or disposal interval.”

Groundwater hydrologist Ronald Green is on a mission to get more people in Texas to pay attention to disposal wells. “You can’t undo the past,” Green said. “But you can do things to try to mitigate for the future.”

Green said the Railroad Commission’s minimum standards for preventing pollution from disposal wells assume “everything works exactly as designed.”

“But these are man-made engineered systems, and they are going to fail,” Green said.

Green said wells should be designed with redundancies to prevent contamination. But he warned that even a well-designed disposal well can cause problems if there are deteriorating or abandoned wells nearby. These compromised wells can become a conduit for the wastewater to enter a freshwater aquifer or even reach the surface.

Laura Capper, the principal consultant for EnergyMakers Advisory Group in Houston and an expert on disposal wells, agreed.

“I think the dangerous part of the architecture is not so much the disposal well,” she said. “It’s probably old aging infrastructure that

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Green has represented several groundwater districts challenging disposal wells before the Railroad Commission. While many of the wells ultimately are drilled, he said these administrative hearings force regulators to scrutinize applications more thoroughly.

“That’s going to raise that standard a little bit more,” he said.

Neal of Pilot Water Solutions said that the proposed wells were designed with three strings of steel casing, which are each protected by cement to the surface. Pilot will also install wellhead automation to monitor for leaks and shut in injection if any leaks are detected.

“Pilot is continuing to do its part and working with the City of Midland and the surrounding communities to address any concerns they may have,” Neal said in a statement.

Neal said Pilot identified and studied all wellbores within a half-mile radius of the proposed disposal wells, including abandoned or plugged wells. He said the Railroad Commission verified “there were no concerns that any abandoned wells within a 1/4 mile radius were not adequately plugged.”

The Railroad Commission spokesperson did not confirm whether or not abandoned wells have been identified within a quarter mile radius of the proposed Pilot disposal wells but acknowledged any such wells must be “properly plugged.”

The administrative hearing for Midland’s challenge to Pilot’s permit applications is currently scheduled for Jan. 8-11 in Austin. Two Railroad Commission administrative judges will decide whether to deny or modify the permits or approve them as is.

Waste Disposal Industry on Shaky Ground

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While proposed disposal wells in Winkler County have raised concerns about groundwater, they are outside the highest risk areas for another disposal hazard: earthquakes.

On Nov. 8, a **5.2 magnitude earthquake** shook West Texas from its epicenter in the Permian Basin near the town of Mentone. It was the second 5.0 magnitude or above earthquake in the area in less than a year.

An increase in earthquakes in the Permian Basin that seismologists linked to disposal wells lead the Railroad Commission to introduce **new regulations** beginning in 2021 that restricted deep injection in favor of shallow injection and limit wells in certain high-seismicity zones, called seismic response areas. The T-Bar Ranch area is outside the seismic response areas, but adjacent to freshwater supplies.

Capper said earthquakes and other hazards have led to increased scrutiny of disposal wells, both from regulators and within the industry.

“I’ve seen situations where operators are going and even suggesting to the Railroad Commission that the restrictions could be tighter,” Capper said. “It’s a different environment than it was five years ago where you were waiting for Big Brother to police you.”

With more restrictions on disposal wells because of seismic risk, companies are struggling to dispose of their produced water. The cost and logistics of injecting produced water is forcing companies to slow down oil and gas drilling. Chevron CEO Mike Wirth acknowledged these challenges in the company’s third quarter earnings call Oct. 27.

“Produced water is becoming an issue [in the Permian],” Wirth said. “The reinjection of that and doing that in a way that minimizes the incidences of induced seismicity. We’ve got some more produced water handling infrastructure spend.”

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Katie Smye, a geoscientist at the University of Texas, Austin's Bureau of Economic Geology, said the new regulations are having a marked impact on the economics of disposal wells.

"We absolutely see evidence, particularly near seismic response areas, that [drillers] are not bringing wells online because they don't have disposal capacity," she said. "It's not just what you can produce. It's also how much you can inject and where you can inject it."

Oil and gas companies are recycling more produced water to reuse in the drilling process. Texas is considering alternatives to disposal wells for produced water, including permitting **discharges into surface water, treating the water** for reuse and applying it to agricultural land. But for now injecting the waste underground is still the most cost-effective option.

"Injection seems to be the baseline for taking most of the water produced in the Permian Basin region, and it doesn't seem that that will change in the very near term," Smye said. "So this is a challenge that we see potentially increasing over time and not going away."

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And as long as the oil and gas industry has more produced water and fewer options of where to inject it, conflicts like the one between Midland and Pilot Water are likely to arise.

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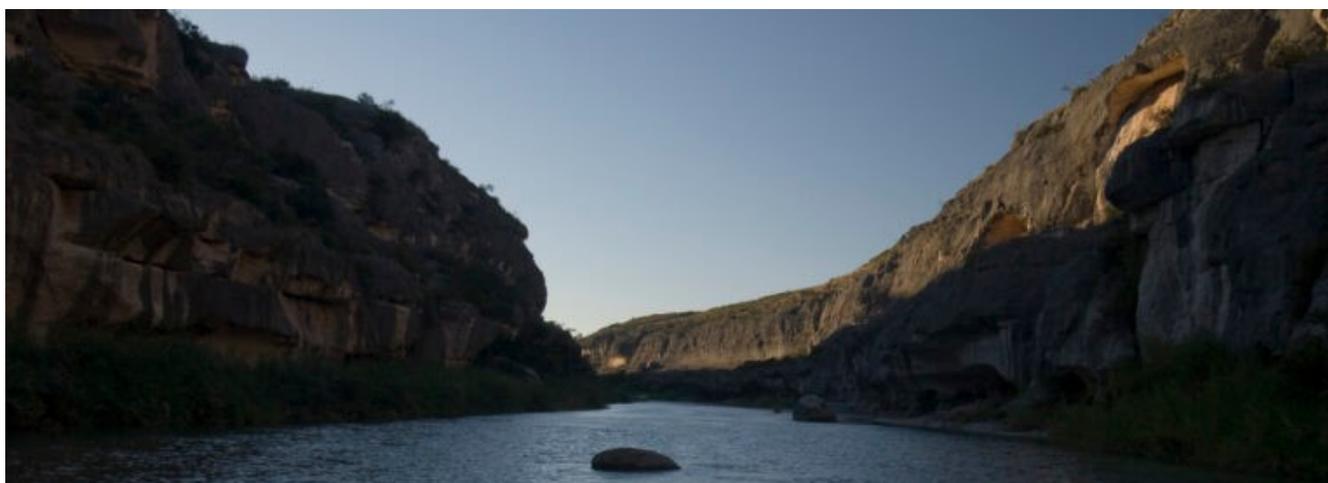
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By Martha Pskowski

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