Rattled daily, Oklahomans ponder a 'big one'

Mike Soraghan, Environment & Energy Publishing, 4-6-15

GUTHRIE, Okla. -- Oklahomans might be getting used to being the earthquake capital of the country, not that they particularly like it. But what they're worried about now is the big one.

People here offer a knowing look, sometimes even a chuckle, when asked about the daily rattling from small to midsized quakes. But without prompting, they'll add that their real fear is shaking that might knock buildings down on them.

"If a big one hits, this town would be destroyed," said Walter Koball, a retired cement truck driver, sitting down to a pancake breakfast at Katie's Diner in Guthrie. "Half of these buildings have rotten mortar."

A few tables over, retiree Mary LaNoy noted that homes here aren't built to withstand earthquakes.

"If there's a [magnitude] 5 or a 6, there's going to be a lot of damage," she said.

Martha Ledwig, who attended an earthquake forum in her hometown of Medford last month, wanted to know what would happen if a big quake were to hit a natural gas plant nearby. Several years ago, Medford was evacuated for a leak at the plant.

"Do they have any concern about allowing that to blow up?" she said.

There have been big quakes in Oklahoma before. Around 1,300 years ago, a magnitude-7 rupture of the Meers Fault rocked southwest Oklahoma. More recently, a magnitude-5.7 quake east of Oklahoma City damaged 14 homes, injured two people and was felt from Texas to Illinois in November 2011.

Most seismologists attribute the 2011 quake, and most of the hundreds since then, to the state's oil and gas activity, specifically disposal of wastewater from production.

Many people in Oklahoma, along with most political leaders here, reject the link between oil and gas and earthquakes.

But many do see a link, and the Oklahoma Corporation Commission, which regulates oil and gas and disposal, has implicitly accepted such a connection by ramping up its scrutiny of disposal wells. Kansas regulators, dealing with quakes just across the border, have made a more explicit connection and put restrictions on the amount that companies can inject underground.

Since the 2011 quake and its aftershocks, though, the shaking hasn't risen above magnitude 4.5, according to U.S. Geological Survey data. Most temblors have been about magnitude 2.5, though magnitude-3 and higher earthquakes are a daily occurrence around here.

But like the people who live and work here, seismologists are worried that the quakes will get bigger.

Building toward a 'damaging' quake

A recent study reaffirmed a point that seismologists have made for years: The more small earthquakes there are, the greater the chance of a big one that could knock down buildings and kill people.

"The increased rate and occurrence of earthquakes ... has raised the earthquake hazard in central

Oklahoma and increased the probability for a damaging earthquake," stated the study, authored by USGS geophysicist Daniel McNamara, Oklahoma Geological Survey seismologist Austin Holland and others.

The study said central Oklahoma is chock-full of faults "optimally aligned" to be set off. Many of those faults are in or near the geologic zone where most wastewater is injected.

Since late 2009, the study said, the earthquake rate has been 300 times higher than before. Last year, Oklahoma had 585 earthquakes of magnitude 3 or greater, an average of 1.6 a day. That was three times as many as California.

If the current trend of 2.4 quakes a day holds for the rest of 2015, there would be 891 earthquakes of magnitude 3 or greater.

But how strong will they be?

Most of the earthquakes since the 2011 quake have been around magnitude 2.5. On its own, a magnitude 2.5 is an oddity that won't do much more than rattle dishes. But when such ruptures happen over and over again, and occasionally reach up past magnitude 4, they can crack sheetrock and put fractures in cement and mortar.

Beyond that, they fray nerves. Many people in earthquake zones can point to zigzag cracks in the bricks outside their homes. They recount being awakened by shaking in the middle of the night. And they play the California-style parlor game of trying to guess the magnitude before the official report comes in.

Magnitude 3 is the strength at which most earthquakes can be felt, though they can be recorded much lower, even at negative values. According to a USGS description of magnitude and intensity, magnitude-3 quakes are often felt only by a few people, particularly those on upper floors of buildings.

A magnitude-5 quake would be 1,000 times stronger than a 3. Every whole number jump in the logarithmic magnitude scale represents the release of about 31.6 times more energy. A 2-point jump represents the release of 1,000 (31.6 x 31.6) times more energy.

That magnitude-5 quake would be felt by pretty much anyone around, move furniture and knock plaster from the ceilings. A magnitude-6 jolt would cause "considerable damage" to poorly built structures and probably knock down chimneys, although damage should be negligible in well-built buildings.

At magnitude 7, there would be considerable damage, even partial collapse in "ordinary, substantial" buildings. Factory stacks, columns, monuments and walls are prone to falling, and damage would be "great" among poorly built structures.

The McNamara study found several faults "of particular concern" because they're big enough to cause earthquakes of magnitude 5 to 6. Those areas are near Langston, Cushing, Medford and Stillwater.

Holland, the state seismologist, told a crowd in Medford last month that a magnitude-7 quake was possible, pointing to the Meers rupture 1,300 years ago.

"We know that we're capable of having a magnitude 6 or 7," Holland said.