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# SCIENTIFIC METHOD / SCIENCE & EXPLORATION

## How the EPA linked “fracking” to contaminated well water

An investigation by the US Environmental Protection Agency at a site in ...

by Scott K. Johnson - Dec 9 2011, 2:00pm EST

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Photograph by Bosc d'Anjou

Hydraulic fracturing (more commonly referred to as “fracking”) involves the injection of fluid at high pressure into a well, opening or widening fractures in the rock below that free up the flow of natural gas. Domestic natural gas production has been booming as a result, but opponents claim the technique contaminates drinking water, causing serious health effects.

Rigorous studies on fracking have been sparse, and the impassioned debate has raged on. A new investigation by the US Environmental Protection Agency (EPA) at a site in Wyoming is one of the first to look thoroughly at the potential link between fracking operations and groundwater contamination. The agency’s report was released yesterday—and it provides a clear link between fracking and water supply problems.

### The need to frack

Hydraulic fracturing itself is not a new technology, but widespread use for natural gas production didn’t kick in until around 2000, after which it took off in a big way. Rising demand for natural gas combined with impressive technological advances in directional drilling opened the door to vast stores of natural gas locked in shale layers, which otherwise hold onto the gas too tightly for it to flow into production wells.

Burning natural gas for energy produces less pollution and less greenhouse warming than coal. It’s been proposed as a bridge towards renewable domestic energy production, most notably by Texas oil (and natural gas) billionaire T. Boone Pickens. If we want to kick the fossil fuel habit, the argument goes, natural gas is our nicotine patch.

As production grew, however, reports of groundwater contamination began to draw attention. Fracking injection fluid contains a variety of chemicals that alter the viscosity of the liquid and protect the well from corrosion, among other things. Some of those chemicals would be harmful if they found their way into groundwater, but the fracking industry denies that there is any danger of that occurring.

The emotionally powerful stories in the 2010 documentary *Gasland* fueled the controversy; so did YouTube [videos](#) of [homeowners turning their kitchen faucets into flamethrowers](#). The controversy has pitted cleaner-burning domestic fuel against poisoned water, with both sides boldly claiming high stakes.

Garden hose flamethrower

### Lifting regulations

In 2004, the EPA took a look at fracking for the first time. [That initial study](#) focused on coal bed methane layers because they’re typically much shallower than shale gas layers, making groundwater

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more susceptible to contamination. The study concluded that there was no definitive link between coal bed methane fracking operations and contamination of drinking water.

As part of the investigation, EPA learned that many companies were using diesel fuel as a component of fracking fluids. This was judged to be a concern due to the known health effects associated with diesel components such as benzene. As a result, EPA coordinated a voluntary agreement with the three largest fracking contractors (Halliburton, BJ Services, and Schlumberger), who promised to stop using diesel fuel.

In 2005, Congress passed the Energy Policy Act. Citing the recent EPA study as justification, the act amended the definition of “underground injection” in the Safe Drinking Water Act and added an exemption for fracking operations.

As a result of the fracking exemption, any chemicals injected as fracking fluid would not be regulated, on the basis that this is only a temporary injection—most of the fluid is pumped right back out of the ground again. Later on, it became apparent that fracking in some locations can leave as much as 80 percent of the fluid in the ground. This leaves the regulatory lines rather blurry—injection for fracking is not regulated, but injection of spent fluid for long-term disposal *is*. The exemption had its own exemption—the injection of diesel fuel for fracking *would* be regulated, due to the EPA’s early concerns.



Antifracking sentiment in New York has led to a moratorium on the process there.

Owen Crowley

### What’s in a frack?

Representatives Henry Waxman (D-CA), Edward Markey (D-MA), and Diana DeGette (D-CO) sent [a letter to the EPA](#) in January 2011, which revealed that diesel use had not ceased. The letter stated, “Between 2005 and 2009, oil and gas service companies injected 32.2 million gallons of diesel fuel or hydraulic fracturing fluids containing diesel fuel in wells in 19 states.” Most of that was done by the same 3 companies that signed the Memorandum of Agreement with the EPA in 2004.

Industry officials said that, while it was true that the EPA was given regulatory authority over diesel use, there were no specific rules in place requiring the companies to report it. And, in fact, they tend not to

report anything about what's being injected; when asked, they have largely refused to answer on the grounds that their mixtures are proprietary. The development of an ideal fracking fluid is an expensive process, they argue, and they shouldn't be forced to disclose their ingredients.

Regulators and researchers have expressed frustration with this situation. From their point of view, it's difficult to evaluate the link between fracking and water contamination without knowing what chemicals are used. In some cases, the compounds would be missed by standard screening, so you can't find them unless you know to look for them.

A 2009 Congressional bill that required complete disclosure of fracking chemicals—dubbed the Frac Act—failed to gain traction, but similar bills soon popped up at the state level. Perhaps surprisingly, Texas became the first state to pass disclosure legislation. Some laws are stricter than others (the Texas law doesn't kick in until 2013, while Wyoming's immediately requires detailed records for each well), but none can force companies to name compounds that they deem "proprietary."

In the meantime, the EPA has sought voluntary disclosure nation-wide, and some companies have begun to comply. Halliburton was the only company that ignored the EPA's request, and it was served a high-profile subpoena late last year. At that point, Halliburton responded, posting a partial list of ingredients on a website and promising further compliance. It is unclear how much information the EPA has received as a result of this effort.

Efforts by other researchers and government officials have resulted in some publicly available lists of chemicals. Representatives Waxman, Markey, and DeGette released a report in April listing 750 compounds voluntarily disclosed by 14 companies. (A little over 10 percent of the fracking fluid used by volume between 2005 and 2009 contained proprietary compounds that were not divulged.) Of the 750 substances listed, 29 are either known human carcinogens, regulated under the Safe Drinking Water Act, or listed as air pollutants under the Clean Air Act.

Currently, we're at a critical point that could determine the future of domestic natural gas production. The EPA is in the middle of the first national review of fracking safety concerns. The final report isn't due until 2014, but the initial results should be released before the end of 2012.

Meanwhile, states are charting their own courses. New York has placed a moratorium on fracking in the state while it reviews the practice; concern about impacts on New York City's water supply drove that move. The state is currently considering regulations that would allow fracking only outside the New York City and Syracuse watersheds. New Jersey, too, issued a moratorium in August. Big decisions are coming, and lobbying has reached a fever pitch—all of which makes the new EPA report that much more explosive.

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