

The Fracking Chronicles

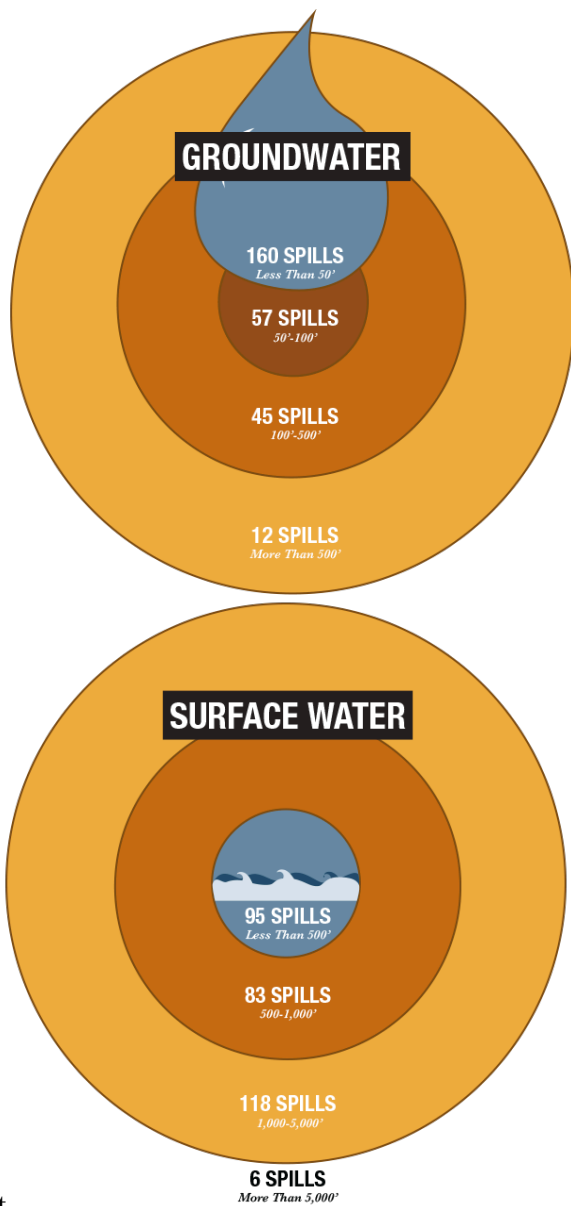
No. 1 • Water Contamination • Jan. 2015

Not only is the statement “*there are no documented cases of fracking contamination of water supplies*” insidiously ignorant of the published facts, but it is also a criminally negligent misrepresentation of the proven, documented reality of the fracking process.



52 Documented Cases of Fracking Water Contamination in Colorado Between January and September 2014.

Between January and September 2014, 484 hydraulic fracturing industry-related chemical spills were reported to the Colorado Oil and Gas Conservation Commission [COGCC]. **11% of these spills resulted in water contamination** with 49 spills contaminating groundwater and 3 spills contaminating surface water. Of the 484 total spills, 28 spills occurred in within 1,500 feet of cows, pigs, sheep, or other livestock; 148 spills occurred within 1,500 feet of a building; and 274 spills were the result of equipment failure or human error. This data is recorded and reported on the Colorado Toxic Release Tracker website, located at <http://westernpriorities.org/colorado-toxic-release-tracker>.



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Drilling/Fracking Operations Contaminated Or Impacted 243 Private Water Supplies in Pennsylvania Over the Past 7 Years

A review of Pennsylvania Department of Environmental Protection files on fracking-related damage to drinking water revealed that 243 private water supplies in 22 counties had been contaminated or had lost flow and dried up as a result of nearby drilling and fracking operations in the past seven years. Pollutants included methane, metals, and salts as well as carbon-based compounds (ethylene glycol and 2-butoxyethanol) that are known to be constituents of fracking fluid.

[Pennsylvania Department of Environmental Protection. \(2014 August 29\). Water supply determination letters. Retrieved from http://files.dep.state.pa.us/OilGas/BOGM/BOGMPortalFiles/OilGasReports/Determination_Letters/Regional_Determination_Letters.pdf](http://files.dep.state.pa.us/OilGas/BOGM/BOGMPortalFiles/OilGasReports/Determination_Letters/Regional_Determination_Letters.pdf)

As reported by the Pittsburgh Post-Gazette, this tally—which came as a response to multiple lawsuits and open-records requests by media sources—was the first time the agency “explicitly linked a drilling operation to the presence of industrial chemicals in drinking water.”

[Legere, L. \(2014, September 9\). DEP releases updated details on water contamination near drilling sites: some 240 private supplies damaged by drilling in the past 7 years. Pittsburgh Post-Gazette. Retrieved from http://powersource.post-gazette.com/powersource/policy-powersource/2014/09/09/DEP-releases-details-on-watercontamination/stories/201409090010](http://powersource.post-gazette.com/powersource/policy-powersource/2014/09/09/DEP-releases-details-on-watercontamination/stories/201409090010)

106 Confirmed Well Contamination Cases In PA 2005 to 2012

In January 2014 Pennsylvania confirmed at least 106 water-well contamination cases since 2005, out of more than 5,000 new wells. There were five confirmed cases of water-well contamination in the first nine months of 2012, 18 in all of 2011 and 29 in 2010. The Associated Press noted that their analysis “casts doubt on industry view that it rarely happens.”

[Begos, K. \(2014, January 5\). 4 states confirm water pollution from drilling. USA Today. Retrieved from www.usatoday.com/story/money/business/2014/01/05/some-states-confirm-water-pollution-fromdrilling/4328859/](http://www.usatoday.com/story/money/business/2014/01/05/some-states-confirm-water-pollution-fromdrilling/4328859/)

Methane Contamination Found in Drinking Water Wells in 8 Areas Related to Fracking

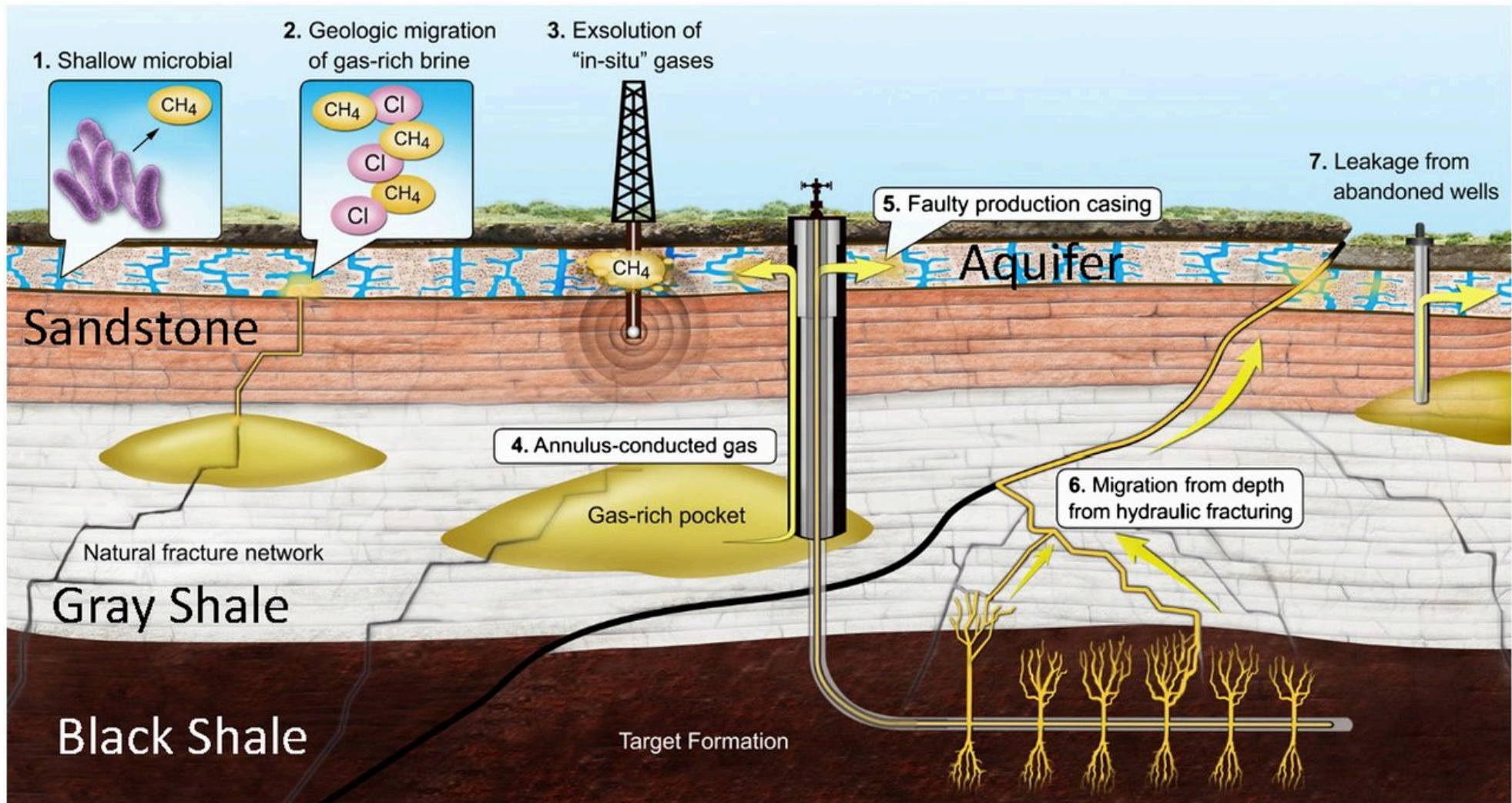
An interdisciplinary team of researchers found methane contamination in drinking water wells located in eight areas above the Marcellus Shale in Pennsylvania and the Barnett Shale in Texas, with evidence of declining water quality in the Barnett Shale area. The results implicate leaks through cement well casings as well as via naturally occurring cracks and fissures in the surrounding rock.

[Darrah, T.H., Vengosh, A., Jackson, R.B., Warner, N.R., and Poreda, R.J. \(2014\). Noble gases identify the mechanisms of fugitive gas contamination in drinking-water wells overlying the Marcellus and Barnett Shales. Proceedings of the National Academy of Sciences, 111 \(39\), 14076-14081. Retrieved from www.pnas.org/content/111/39/14076.full](http://www.pnas.org/content/111/39/14076.full)

WV Confirmed Contamination of 3 Private Wells Due to Fracking

In November 2014 the West Virginia Department of Environmental Protection confirmed that three private drinking water wells were contaminated when Antero Resources mistakenly drilled into one of its own gas

Seven scenarios that can create elevated hydrocarbon gas levels in shallow aquifers



- (1) in situ microbial methane production;
- (2) natural in situ presence or tectonically driven migration over geological time of gas-rich brine from an underlying source formation [e.g., Marcellus or Barnett formation (Fm.)] or gas-bearing formation of intermediate depth (e.g., Lock Haven/Catskill Fm. or Strawn Fm.);
- (3) exsolution of hydrocarbon gas already present in shallow aquifers following scenario 1 or 2, driven by vibrations or water level fluctuations from drilling activities;
- (4) leakage from the target or intermediate-depth formations through a poorly cemented well annulus;
- (5) leakage from the target formation through faulty well casings (e.g., poorly joined or corroded casings);
- (6) migration of hydrocarbon gas from the target or overlying formations along natural deformation features (e.g., faults, joints, or fractures) or those initiated by drilling (e.g., faults or fractures created, reopened, or intersected by drilling or hydraulic fracturing activities); and
- (7) migration of target or intermediate-depth gases through abandoned or legacy wells.

(Darrah et al, 2014)

wells. Benzene, a human carcinogen, and toluene, a reproductive toxicant, were detected in the drinking water at concentrations four times the legal maximum limit.

Board, G. (2014, November 3). September drilling accident contaminated water in Doddridge County. *West Virginia Public Broadcasting*. Retrieved from <http://wvpublic.org/post/dep-september-drilling-accident-contaminated-water-doddridge-county>

Pipeline Leaked 3 Million Gallons of Fracking Wastewater In ND

Three million gallons of fracking wastewater, a toxic byproduct of oil and natural gas production spilled from a leaking pipe in western North Dakota. State officials say it's the worst spill of its kind since the fracking boom began in the state. Duke geochemist [Avner Vengosh](#) sampled the frack wastewater and has found that it is "10 times saltier than the ocean, that endangers aquatic life and trees, and it has ammonium and radioactive elements."

[Spear, S.](#) (2015, January 23). Worst Fracking Wastewater Spill in North Dakota Leaks 3 Million Gallons Into River. *Ecowatch.com*. Retrieved from <http://ecowatch.com/2015/01/23/fracking-wastewater-spill-north-dakota/>

Fracking Company Fined \$4.15 million in Pennsylvania for Contaminating Groundwater

During September 2014 Range Resources was fined a record \$4.15 million by the Pennsylvania Department of Environmental Protection for contaminating groundwater and soil with releases of flowback water. The culprits were six leaking pits in Washington County that each held millions of gallons of fracking wastewater.

[Hopey, D.](#) (2014, September 18). Range resources to pay \$4.15M penalty. *Pittsburgh Post-Gazette*. Retrieved from www.post-gazette.com/local/2014/09/18/DEP-orders-Range-Resources-to-pay-4-million-fine/stories/201409180293

Seven Companies Ordered in California to Stop Injecting Fracking Waste Into Aquifers

On July 7, 2014 California Department of Gas, Oil, and Geothermal Resources ordered seven energy companies to cease and desist injecting liquid fracking waste into aquifers that could be a source of drinking water, and stating that their waste disposal "poses danger to life, health, property, and natural resources."

[Lustgarten, A.](#) (2014, July 18). California halts injects of fracking waste, warning it may be contaminating aquifers. *ProPublica*. Retrieved from www.propublica.org/article/ca-halts-injection-fracking-waste-warning-may-be-contaminating-aquifers

Fracking Company Ordered to Pay PA Woman \$60,000 After Contaminating Water with 1,300- 2,000 Times Baseline Methane Level

A Pennsylvania court found in February 2014 Chesapeake Appalachia LLC fracking company guilty of contaminating a woman's drinking water well in Bradford County and ordered them to pay her \$60,000. Methane levels after fracking were 1,300 to 2,000 times higher than baseline, according to the court brief. Iron levels and turbidity had also increased. The brief stated, "In short, Jacqueline Place lived for ten months deprived

totally of the use of her well, and even after its 'restoration,' has been burdened with a water supply with chronic contamination, requiring constant vigilance and ongoing monitoring."

[Gibbons, B.](#) (2014, February 19). Woman wins case against Chesapeake. Jacqueline Place of Terry Township to receive compensation for well contamination. *TheDailyReview.com*. Retrieved from <http://thedailyreview.com/news/woman-wins-case-against-chesapeake-jacqueline-place-of-terry-township-to-receive-compensation-for-well-contamination-1.1636832>

Nearly 3 Billion Gallons of Toxic Fracking Wastewater Dumped into California Aquifers

In October 2014 it was revealed that the California State Water Resources Board sent a letter to the EPA confirming that at least nine fracking wastewater injection well sites dumped nearly 3 billion gallons of wastewater contaminated with fracking fluids and other pollutants into aquifers protected by state law and the federal Safe Drinking Water Act. [Gaworecki, J.](#) (2014, October 7). Confirmed: California Aquifers Contaminated With Billions Of Gallons of Fracking Wastewater. *DeSmogBlog.com*. Retrieved from www.desmogblog.com/2014/10/07/central-california-aquifers-contaminated-billions-gallons-fracking-wastewater

Fracking Company Admits to Dumping Hundreds of Thousands of Gallons of Fracking Wastewater into River

Ben Lupo, the owner of a Youngstown oil- and gas-drilling company, pleaded guilty to ordering employee Michael Guesman to dump tens of thousands of gallons of fracking waste into a tributary of the Mahoning River. On at least 20 occasions between November 1, 2012 and January 31, 2013, Guesman ran a hose from the 20,000-gallon storage tanks to a nearby storm-water drain and dumped the polluted wastewater (a slurry of toxic oil-based drilling mud, containing benzene, toluene and other hazardous pollutants), which eventually reached the Mahoning River.

[McCarty, J.F.](#) (2014, March 14). Fracking company owner pleads guilty to ordering toxic waste dumped into Mahoning River. *Cleveland.com*. Retrieved from www.cleveland.com/court-justice/index.ssf/2014/03/fracking_company_owner_pleads.html

An Alarming Percentage of Fracking Wells Are Leaking: Could Be As High As 75%

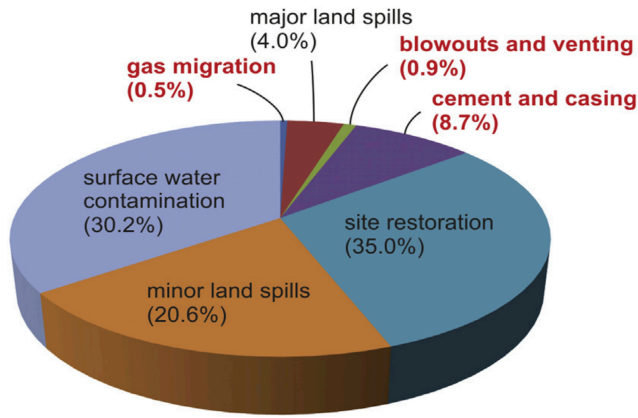
In March 2014 an industry-funded study of oil and gas well integrity found that more than six percent of wells in a major shale exploration region in Pennsylvania showed evidence of leaking and conceded that this number is likely an underestimate. Researchers concluded that the percentage of wells with some form of well barrier or integrity failure is highly variable and could be as high as 75 percent. A separate analysis in the same study found 85 examples of cement or casing failures in Pennsylvania wells monitored 2008- 2011.

[Davies, R. J., Almond, S., Ward, R. S., Jackson, R. B., Adams, C., Worrall, F., Whitehead, M. A.](#) (2014). Oil and gas wells and their integrity: Implications for shale and unconventional resource exploitation. *Marine and Petroleum Geology*, 56, 239-254. Retrieved from http://www.fraw.org.uk/files/extreme/davies_2014.pdf

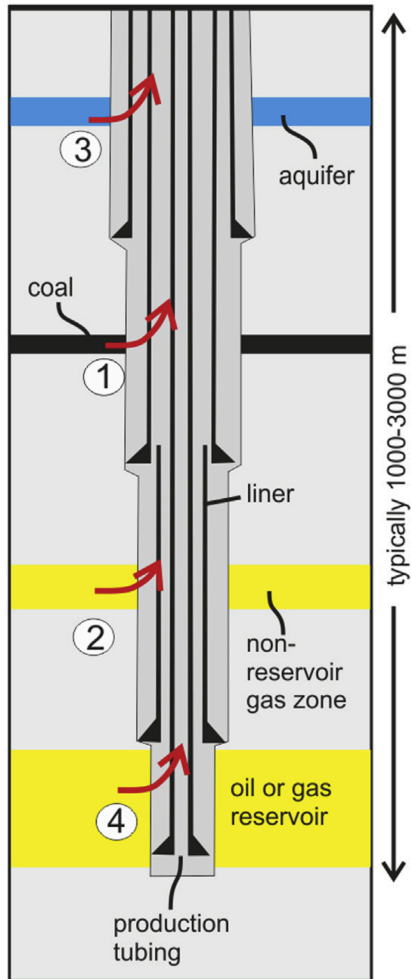
Breakdown of 1,144 notices of violations from 3,533 wells in Pennsylvania from 2008 to 2011.

Red font indicates those related to well barrier and integrity failure.

All graphics on this page from Davies et al, 2014.



Typical sources of fluid that can leak through a hydrocarbon well: (1) gas-rich formation such as coal; (2) non-producing, gas- or oilbearing permeable formatoin; (3) biogenic or thermogenic gas in shallow aquifer; and (4) oil or gas from an oil or gas reservoir.



Routes for fluid leak in a cemented wellbore. (1) between cement and surrounding rock formations, (2) between casing and surrounding cement, (3) between cement plug and casing or production tubing, (4) through cement plug, (5) through the cement between casing and rock formation, (6) across the cement outside the casing and then between this cement and the casing, (7) along a sheared wellbore.

