

Technical and Scientific Resources Regarding Well Stimulation Treatments

GROWING SCIENTIFIC KNOWLEDGE REGARDING RISKS OF FRACKING

- Peer-reviewed scientific literature assessment in 2016 showed that the body of science evaluating the risks and actual impacts of fracking (specifically natural gas) has grown significantly, particularly since 2013.¹
- This review showed that of the nearly 700 peer-reviewed scientific studies on this issue, 84% showed public health hazards, 69% showed potential or actual water contamination, and 87% showed elevated air pollutant emissions.²
- The US Environmental Protection Agency also completed a study regarding high-pressure fracking, citing 1,200 difference sources of data and information. While there are still data gaps acknowledged, the report found that fracking can impact drinking water resources under certain conditions. Some of the more severe or consistent impacts they found dealt with consumptive water withdraws, chemical or fluid spills surface spills, structural failures with oil wells that allowed liquids to move into groundwater resources, or the discharge of wastewater.³
- UCLA study regarding the use of matrix acidizing found that the chemicals are similar to those used in hydraulic fracturing and that use of this treatment comes with similar pathways for contamination. The study also emphasized additional risks specific to matrix acidizing due to the concentration of the chemicals.⁴

CONTAMINATION RISK TO WATER SUPPLIES

- **During Construction:** For well stimulation processes, the well bore is typically drilled through the Underground Source of Drinking Water (USDW) in order to access the oil and gas deposits. Vibrations and pressure pulses associated with drilling can cause short-term impacts to groundwater quality, including changes in color, turbidity, and odor.⁵ While there are state standards set by the Florida Administrative Code for casing and integrity of wells, if the well bore is not properly sealed and cased, chemicals and other compounds can escape the well bore and into groundwater resources.

¹ Hays & Shonkoff, 2016. Toward an Understanding of the Environmental Public Health Impacts of Unconventional Natural Gas Development: A Categorical Assessment of the Peer-Reviewed Scientific Literature, 2009-2015.

² *Ibid.*

³ US Environmental Protection Agency, 2016. Hydraulic Fracturing for Oil and Gas: Impacts from the Hydraulic Fracturing Water Cycle on Drinking Water Resource in the United States.

⁴ Abdullah, 2016. Acidizing Oil Wells, a Sister Technology to Hydraulic Fracturing: Risks, Chemicals, and Regulations.

⁵ Groat & Grimshaw, 2012. Fact-Based Regulation for Environmental Protection in Shale Gas Development, Summary of Findings. Energy Institute, The University of Texas at Austin.

- Water Well Contamination: To date, there have been thousands of water contamination cases from well stimulation techniques reported across the country including 340 cases reported in Colorado, 161 cases reported in Pennsylvania, and 763 cases reported in New Mexico.⁶

In 2009, in Dimmock, Pennsylvania, the Department of Environmental Protection conducted an investigation into the methane contamination and determined that Cabot Oil and Gas Company was responsible for polluting 18 residential drinking water wells.⁷

- Surface Spills: Over a 10 year period assessed in a recent study, there have been 6,638 spills from unconventional oil and gas production in four states alone (Colorado, New Mexico, North Dakota and Pennsylvania).⁸ That is an average of 55 spills for every 1,000 wells each year; this number vastly exceeds the 457 spills estimated by the EPA.⁹

This is because the EPA only accounted for spills during the hydraulic fracturing stage itself, rather than the entire process of unconventional oil and gas production.

- Additional Conduits to Contamination:

Old, abandoned wells can also potentially serve as migration pathways for contaminants to enter groundwater systems.¹⁰ States have estimated that there are roughly 150,000 undocumented and abandoned oil and gas wells in the United States.¹¹ (For example, there are 2 abandoned wells very close to the Collier-Hogan well in Collier County).

Additionally, it has been noted that natural underground fractures as well as those that are created during well stimulation treatments could also serve as conduits for migration of contaminants into groundwater.¹²

WASTE OF DRINKING WATER SUPPLY

- In addition to the potential risks of contamination from these operations, well stimulation techniques allow for the inappropriate consumptive use of fresh water. Between 2000 and 2014,

⁶ Ridlington & Rumpler, 2013. "Fracking by the Numbers." Environment America. Pg 9-10.

⁷ Pennsylvania Department of Environmental Protection (PA DEP), 2010. Modification to Consent Order and Agreement Dated November 4th, 2009. http://www.marcellusshale.us/pdf/Cabot_Consent-Mod_4-15-2010.pdf

⁸ Patterson, et al., 2017. Unconventional Oil and Gas Spills: Risks, Mitigation Priorities, and State Reporting Requirements. Environmental Science & Technology, February 2017, DOI: 10.1021/acs.est.6b05749.

⁹ Study of fracking in four states uncovers over 6,600 spills. (2017). ResearchGate. <https://www.researchgate.net/blog/post/study-of-fracking-in-four-states-uncovers-over-6600-spills>

¹⁰ US Environmental Protection Agency, 2016. Hydraulic Fracturing for Oil and Gas: Impacts from the Hydraulic Fracturing Water Cycle on Drinking Water Resource in the United States. Executive Summary. P. 28.

¹¹ Interstate Oil and Gas Compact Commission, 2008. Protecting Our Country's Resources: The States' Case. Orphaned Well Plugging Initiative. Department of Energy National Energy Technology Laboratory.

¹² Myers, 2012. Potential Contaminant Pathways from Hydraulically Fractured Shale to Aquifers. Ground Water.

water volumes used to hydraulically fracture wells increased up to 19,425 m³ per well; the water use for vertical wells remained below 2,600 m³ per well.¹³

- In Collier County, the Collier Hogan well was permitted to use 280.32 millions of gallons of fresh water each year for 5 years from the lower Tamiami aquifer, which is easily accessible potable water through shallow wells.¹⁴ This water is cheaper to access and treat than water located in the brackish or salty aquifers found deeper underground.¹⁵ Yet Collier County obtains 59% of its drinking water from deeper, more expensive, and harder to access saltier/brackish aquifers to meet its needs.¹⁶
- When this fresh water is used in well stimulation projects, it is injected below ground and only a small percentage is returned. This water cannot be recycled back into drinking water due to use of toxic chemicals, presence of naturally-occurring radioactive materials from deep underground, and the resulting saltiness of the wastewater.

PUBLIC HEALTH ISSUES

- Over 75% of chemicals used in well stimulation treatments are proven harmful to the skin, eyes, other sensory organs, as well as the respiratory system, and digestive system. Between 40-50% of the chemicals used could the brain/nervous system functions, immune and cardiovascular systems, as well as the kidneys. An additional 37% of the chemicals utilized could affect endocrine systems and a quarter of them cause cancer and mutations.¹⁷
- In a study conducted by the New York State Department of Health (DOH) to determine the public health risks of hydraulic fracturing, the agency recommended that all hydraulic fracturing operations should no longer proceed in the state. DOH found that existing studies of hydraulic fracturing raised substantial questions regarding whether the activity was sufficiently understood, and therefore, adequately managed. With that in mind, DOH found that there were significant uncertainties about the kinds of adverse health impacts associated with hydraulic fracturing, and the public health impacts could be significantly broader than just those locations where the activities are taking place, and so the potential risks are expanded across the state.¹⁸
- There are about 200 specific chemicals used in the treatment, “with at least 28 of them being F-graded hazardous chemicals, which are known carcinogens, mutagens, reproductive toxins, developmental toxins, endocrine disruptors, or high acute toxicity chemicals.” Most of the chemicals used in acidizing are similar to hydraulic fracking.¹⁹

¹³ Gallegos, et al., 2015. Hydraulic Fracturing Water Use Availability in the United States and Potential Environmental Implications. *Water Resources Research*, 51, P. 5839-5845. Doi: 10.1002/2015WR017278.

¹⁴ South Florida Water Management District, 2017. Water Use Permit NO. 11-03415-W. Collier County.

¹⁵ South Florida Water Management District, 2007. Water Supply Cost Estimation Study.

¹⁶ South Florida Water Management District, 2012. Lower West Coast Water Supply Plan Update

¹⁷ Colborn, T., Kwiatkowski, C., Schultz, K., & Bachran, M. (2011). Natural gas operations from a public health perspective. *Human and ecological risk assessment: An International Journal*, 17(5), 1039-1056.

¹⁸ A Public Health Review of High Volume Hydraulic Fracturing for Shale Gas Development. New York State Department of Health. December 2014.

¹⁹ Abdullah, 2016. Acidizing Oil Wells, a Sister Technology to Hydraulic Fracturing: Risks, Chemicals, and Regulations.

ECONOMIC IMPACTS

- **Tourism** Environmental disasters have an enormous impact on Florida's tourism-based economy. There are a total of 1.4 million jobs in Florida that depend on the tourism industry.²⁰ This is easy to see from the most recent algal bloom in the Caloosahatchee this past summer- the entire state is impacted economically, not just in the local or regional area of the ecological disaster. To cite, in the 4 counties that were placed under a state of emergency in 2016 due to this algal bloom, there was four billion dollars of economic impact to marine industries and 37,000 individual employees were directly impacted.²¹
- **Home Value**: Studies have shown that homes with private drinking wells within 1 kilometer of a fracking operation lose up to 22% of their property value.²²
- **Energy Reserves**: The oil obtained from Florida accounts for less than 1/10th of 1% of all of the United States oil reserves.²³ Given the potential environmental impacts that could impact our tourism- and real estate-based economy, well stimulation is not worth the risk to public resources for such little return.
- **Mineral Rights**: The proposed ban on well stimulation treatments does not preclude regular cleaning of wells, nor does it preclude conventional oil drilling to obtain oil and gas deposits. Only use of well stimulation treatments (fracking and matrix acidizing) would be prohibited.

CLIMATE CHANGE AND AIR QUALITY IMPACTS

- Emissions of carbon dioxide and methane contribute to climate change. Methane warms the climate at least 80 times more than an equal amount of carbon dioxide over a 20-year period.²⁴ Well stimulation techniques contribute to methane emissions at least 30% more than conventional gas.²⁵ Studies have shown that oil and gas operations are actually making a larger contribution to climate change than previously thought.²⁶
- Studies have found associations between air pollutants that are present at oil and gas production sites and health impacts observed in nearby communities.²⁷

²⁰Employment data from the Florida Department of Economic

Opportunity (as reported by Visit Florida.org) <http://www.visitflorida.org/about-us/what-we-do/>

²¹ These are Florida's Waters. This is Their Destruction. Everglades Coalition Fact Sheet. 23 February 2017.

²² McMahan, 2014. "Pollution Fears Crush Home Prices Near Fracking Wells." Forbes.com, 10 Apr 2014.

²³ Hernandez, 2015. "Energy Pro: Florida Is Not A Big Oil State. So Why Drill?" Wlrn.org, 17 Aug 2015.

²⁴ Srebotnjak & Rotkin-Ellman, 2014. "Fracking Fumes: Air Pollution from Hydraulic Fracturing Threatens Public Health and Communities." Natural Resources Defense Council.

²⁵ Howarth et al., 2010. Methane and the Greenhouse-Gas Footprint of Natural Gas from Shale Formations. Climate Change DOI 10.1007/s10584-011-0061-5.

²⁶ Srebotnjak & Rotkin-Ellman, 2014. "Fracking Fumes: Air Pollution from Hydraulic Fracturing Threatens Public Health and Communities." Natural Resources Defense Council.

²⁷ McKenzie et al., 2012. "Human Health Risk Assessment of Air Emissions from Development of Unconventional Natural Gas Resources." Science of the Total Environment 424: 79–87, doi:10.1016/j.scitotenv.2012.02.018; McKenzie et al., 2014. "Birth Outcomes and Maternal Residential Proximity to Natural Gas Development in Rural Colorado," Environmental Health Perspectives. doi:http://dx.doi.org/10.1289/ehp.1306722.