



Cabot Oil & Gas Corporation

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U.S. Environmental Protection Agency
1200 Pennsylvania Ave. NW.
Washington, DC 20460

Re: Assessment of the Potential Impacts of Hydraulic Fracturing for Oil and Gas on
Drinking Water Resources, (May 2015 External Review Draft, EPA/600/R-15/047)
Docket ID No. EPA-HQ-OA-2015-0245

To Whom it May Concern:

Cabot Oil & Gas Corporation (“Cabot”) appreciates the opportunity to submit comments related to the Scientific Advisory Board (“SAB”) Hydraulic Fracturing Research Advisory Panel’s peer review of the U.S. Environmental Protection Agency’s (EPA) draft report entitled: “Assessment of the Potential Impacts of Hydraulic Fracturing for Oil and Gas on Drinking Water Resources” (the “External Review Draft”).

Cabot has been involved in oil and gas production for over 125 years and, since 2008, we have been a leader in the exploration, development and production of natural gas from the Marcellus Shale in Northeast Pennsylvania through the use of advanced technologies that include horizontal drilling and hydraulic fracturing. During this time, Cabot has worked side-by-side with the citizens and communities of Pennsylvania to responsibly produce the abundant natural gas resources of the Marcellus Shale and to market this resource for productive use both in the state and beyond. As a result of these efforts, and those of other companies, Pennsylvania’s natural gas production is contributing to the growth of jobs and economic activity both in the region and beyond; the enhanced energy security of the Nation; and efforts to reduce emissions of greenhouse gases.

EPA’s finding in the report that shale development has not led to “widespread, systemic” problems with drinking water reflects the tireless commitment of companies like Cabot and our industry partners to protecting the environment and the health of the communities in the vicinity of our production sites. In support of this finding, and as part of the SAB Panel’s review of the External Review Draft, we would like to share with you our experience and perspective on some of the issues relevant to the EPA report, including: (1) the question of water quality in the context of hydraulic fracturing; (2) the presence of background methane in Pennsylvania geology; (3) drinking well standards in the Commonwealth; and (4) our company’s close cooperation with the communities in which we operate.

1. Water Quality and Hydraulic Fracturing Operations

The view that hydraulic fracturing activities have not led to “widespread, systemic” impacts to drinking water resources has been independently corroborated by a consensus of highly credible government, academic and nonprofit organizations, including the National Academy of Sciences (“NAS”), the U.S. Geological Survey (“USGS”), the Susquehanna River Basin Commission (“SRBC”), the Massachusetts Institute of Technology (“MIT”), the Government Accountability Office (“GAO”) and the Groundwater Protection Council (“GWPC”). A brief summary of these findings is set out below.

- **The National Academy of Sciencesⁱ**, led by researchers at Yale University, demonstrated in their Oct. 27, 2015 study that little credible evidence exists to substantiate “direct communication” between shallow drinking water wells and shale plays. NAS explains that “this result is encouraging because it implies there is some degree of temporal and spatial separation between injected fluids and the drinking water supply.” Researchers also found that the amount of dangerous compounds present was “well below” drinking water standards that would cause concern for public health. This study is of particular note because its authors include Dr. Robert Jackson of Stanford University and Dr. Avner Vengosh of Duke University, authors of an earlier Duke report that discussed alleged contamination from shale development.ⁱⁱ
- **The U.S. Geological Survey** has released a slew of analyses regarding water quality in the Marcellus Shale and across the United States. In its analysis of the Marcellus, USGS compared historical water quality data with current samples, taken after the region saw a large increase in natural gas development utilizing horizontal drilling and hydraulic fracturing. The researchers collected data from 147 wells, 75 of which were horizontal.ⁱⁱⁱ Researchers found “no significant difference” between “groundwater survey data and historical data.”

Another 2013 USGS study found similar results when assessing baseline groundwater quality from 20 domestic wells in Sullivan County, Pennsylvania.^{iv}

Finally, two additional USGS studies show that these same conclusions obtain in other shale plays as well. The first study addresses the Tongue, Power, Cheyenne and Belle Fourche River Drainage Basins in Wyoming and Montana.^v In the second, USGS examined 127 shallow domestic wells in the Fayetteville Shale and found no groundwater contamination associated with gas production. These results were part of a robust data collection process dating back to 1951 and involving independent scientific assessment.^{vi}

- **The Susquehanna River Basin Commission**, a federal-interstate compact between three U.S. states (Pennsylvania, New York and Maryland) and the federal government created to manage the water resources of the Susquehanna River, released a report that conclusively shows that drilling in the Marcellus Shale has had no negative effect on water quality in the river basin. In 2010, SRBC began a real-time, continuous water quality monitoring network comprised of 59 stations. These stations collect macroinvertebrates, often used as indicators of ecosystem health, to produce a

comprehensive data set. Macroinvertebrate Index of Biological Integrity, or IBI, scores demonstrated absolutely “no correlation to drilled wells or well pad densities.”^{vii}

- **The Massachusetts Institute of Technology**^{viii} researchers examined the general environmental record of recent shale gas development, which includes over 20,000 wells drilled in the last 10 years, and found that it is generally positive. Researchers posit that these trends can be explained by “good oil-field practice and existing legislation” and “substantial vertical separation between the freshwater aquifers and the fracture zones in the major shale plays.”
- **The Government Accountability Office**^{ix} conducted a review of the literature regarding hydraulic fracturing and groundwater contamination. GAO’s review was inclusive of a diverse set of studies and found that little data supports a linkage between hydraulic fracturing and groundwater contamination. As an example, the review cites a study by the Center for Rural Pennsylvania which analyzed 48 private water wells in the Marcellus Shale and found “no statistically significant increases in pollutants.” These results also were also shown to be true in New York’s Utica Shale and the Barnett Shale in Texas.
- **The Groundwater Protection Council**,^x a nonprofit 501(c)(6) organization whose members consist of state ground water regulatory agencies that work toward the protection of the nation’s ground water supplies, conducted a nationwide study of the issue. The study explains that “states have substantially improved ground-water protection laws and regulations governing oil and natural gas productions,” while articulating the myriad practices adopted by oil- and gas-producing states to enhance transparency, efficiency and effectiveness in regulatory implementation.

Additional data and study exists specific to Cabot’s operations in Northeast Pennsylvania in the course of intensive review conducted by federal, state and local authorities to assess potential impacts on local drinking water. On this question, EPA water testing data confirmed that the levels of contaminants found do not possess a threat to human health and the environment. Such findings are further supported by thousands of pages of water quality data accumulated by state and local authorities and by Cabot.

As with the other findings, EPA did not indicate that any contaminants that were detected bore any relationship to oil and gas development in the Dimock, PA area. In addition, in 2011, the Pennsylvania Department of Environmental Protection (“PADEP”) conducted extensive groundwater sampling in the vicinity of Cabot’s operations in Susquehanna County. Based on a testing of a range of constituents, PADEP concluded that levels of contaminants found do not pose a threat to human health and the environment, and that the water is, in fact, safe for drinking. The 2011 PADEP data is also available on the Cabot website at www.cabotog.com.^{xi}

2. Background on Methane Presence in Pennsylvania

When considering impacts of shale gas production on drinking water, another critically important factor to consider is the presence of background methane in Pennsylvania. Naturally occurring methane in groundwater is particularly prevalent due to Pennsylvania’s geography and offers a persuasive explanation for any groundwater contamination that may be detected. The

scholarly evidence to support this contention is similarly robust. A brief summary of this support is as follows:

- **USGS^{xii}** researchers, in coordination with the Pike County Conservation District, looked at groundwater in Pike County, PA. The study found that 80 percent of the wells in the area tested positive for concentrations of methane. However, Pike County has had no oil and gas development for over four years due to a moratorium issued by the Delaware River Basin Commission (“DRBC”). The study established that methane is more likely than not to be naturally occurring as a result of “organic material within glacial deposits that overlie bedrock aquifers;”
- ***Groundwater*ⁱ** researchers tested 1,701 water wells in northeastern Pennsylvania and found that methane is “ubiquitous in groundwater.” The article explains that “on a regional scale, methane concentrations are best correlated to topographic and hydrogeologic features, rather than shale-gas extraction.” The results show that gases in Dimock Township (an area in which Cabot has ongoing operations) are more consistent with Middle and Upper Devonian gases sampled in the annular spaces of local gas wells, as opposed to Marcellus production gases.^{xiii}
- **Cornell University^{xiv}** researchers published a study that looked at 113 water well samples during the spring of 2012 in Chenango County, New York, which sits atop the Marcellus Shale. These researchers looked at baseline groundwater quality prior to the development of conventional natural gas shale wells and found a pre-existing presence of methane that was “not significantly correlated to the proximity to gas wells.”

3. Well Standards in Pennsylvania

Based on our experience operating in the region, we believe any review of local drinking water impacts should also evaluate and address the lack of regulatory standards for drinking water wells in Pennsylvania. This regulatory gap leaves a large population of individuals exposed to sub-standard water infrastructure.

More than three million individuals in Pennsylvania rely on private drinking water systems for their daily water use. In fact, the number of Pennsylvanians reliant on private drinking water wells is far greater than the U.S. population on average. EPA estimates that 15% of Americans rely on private drinking water wells for their water supply^{xv}; in Pennsylvania, approximately 27% of residents rely on private wells.^{xvi}

Yet despite the reliance of such a high percentage of its citizens on private drinking water wells, Pennsylvania remains one of the few states in the U.S. that lacks mandated standards for their construction. Further, there are no processes in place to identify and register approved water drillers and maintenance companies, nor do regulations for shutting and abandoning drinking water systems exist in state codes.

ⁱ *Groundwater*® is a leading technical publication for groundwater hydrogeologists. Each issue of the journal contains peer-reviewed scientific articles on pertinent groundwater subjects.

These issues, combined with a general lack of knowledge of landowners about approved sources of information, testing procedures and background knowledge on water tables in their region, ultimately leave a large population of individuals exposed to sub-standard water infrastructure. In fact, recent studies have found that 50% of the private drinking water wells in Pennsylvania fail at least one primary drinking water standard, and over 30% of private wells fail two or more primary drinking water standards.^{xvii}

4. Cabot and its Commitment to the Communities in Which We Operate

As a leader in the oil and gas exploration and production industry for over 125 years and a long-standing member of the communities in which we operate, Cabot has amassed a strong legacy of conducting its business with respect and care for individuals and the environment.

On the issue of water quality, Cabot's water policies meet or exceed current state regulations governing water use and protection, and incorporate a robust set of protections to help safeguard the health and safety of all those potentially impacted by our operations. For example, all landowners within a minimum of 3,000 feet of a proposed surface location are notified of Cabot's intent to drill a well during the permit application process. At this time, such landowners are given the option of allowing Cabot to test all water sources at our own expense. These landowners are then provided a copy of the results within ten days of Cabot receiving them.

Cabot has also struck an exemplary posture in its commitment to the use and recycling of water associated with the process of natural gas development. Specifically, we strive to recycle every ounce of the approximately 3.9 million gallons of water required in the process of hydraulic fracturing. The recycled water is in turn used to fracture new wells in the vicinity, thus reducing the environmental impact of our operations.

Our company also uses the natural gas we produce to power our own operations. For example, Cabot constructed a compressed natural gas ("CNG") fueling station in Susquehanna County to fuel company vehicles, many of which have been converted or procured to run on CNG. In addition, Cabot has made great strides utilizing drilling and fracturing equipment that run on the natural gas that the company produces, further reducing our environmental footprint.

Finally, Cabot's commitment to the community includes direct support of valuable resources throughout the Susquehanna County region. Cabot is a strong supporter of the Lackawanna College School of Petroleum and Natural Gas Technology, a newly developed program that teaches the technical skills needed for individuals to take advantage of the tremendous employment opportunities available in today's energy industry. Cabot also provides equipment to assist in training during education, as well as positions in the field where students can acquire hands-on training and skills development.

Cabot's direct financial support is by no means constrained to the industry. In the area of healthcare, for example, Cabot provided a significant endowment to support Endless Mountains Health System, a small hospital in a rural community, helping it construct a brand new facility with state-of-the-art resources and far greater physical capacity to meet substantial local demand. In addition, Cabot has worked closely with the Dennis Farm, a 153-acre farm founded by free

African Americans in 1793 and owned continuously by members of the same family, on historic preservation projects of importance to the state.

Conclusion

As the preceding discussion and key literature make clear, no linkage between hydraulic fracturing activities and damage to drinking water resources can be established as widespread or systemic.

Cabot intends to continue to work diligently to protect the environment and the health of the communities in which we operate. As a result of Cabot's efforts, along with many other companies, Pennsylvania's natural gas supplies are not only contributing to substantial economic growth, but are also providing sustained environmental benefits. As experts on the SAB Panel are doubtless aware, affordable and reliable natural gas production contributes meaningfully both to reduced particulate air pollution and greenhouse gas emissions. In fact, data from the Energy Information Administration ("EIA") shows that power sector carbon dioxide emissions reached a 27-year low in April, 2015.^{xviii} Dr. Michael Greenstone, professor of environmental economics at MIT, even explained that, "There's a strong case that people in the U.S. are already leading longer lives as a consequence of the fracking revolution."^{xix}

Cabot hopes to accelerate progress in meeting energy and environmental objectives by ensuring that the benefits of natural gas production can be maintained, while guaranteeing the individual and environmental health of the communities in which we operate.

In conclusion, Cabot would like to reiterate its appreciation for the opportunity to submit comments to the SAB Panel. We welcome any follow up questions that any members of the Panel may have.

Sincerely,



Kevin Cunningham

ⁱ Proceedings of the National Academy of Sciences of the United States, Brian D. Drollettea, Kathrin Hoelzerb, Nathaniel R. Warnerc, Thomas H. Darrahd, Osman Karatume, Megan P. O'Connore, Robert K. Nelsonf, Loretta A. Fernandezg, Christopher M. Reddyf, Avner Vengoshh, Robert B. Jacksoni, Martin Elsnerb, and Desiree L. Plataa, "Elevated levels of diesel range organic compounds in groundwater near Marcellus gas operations are derived from surface activities," October 27, 2015. Available at: <http://www.pnas.org/content/112/43/13184.abstract?tab=author-info>

ⁱⁱ Environment Science and Technology, Avner Vengosh*, Robert B. Jackson, Nathaniel Warner, Thomas H. Darrah, and Andrew Kondash, "A Critical Review of the Risks to Water Resources from Unconventional Shale Gas Development and Hydraulic Fracturing in the United States," 2014. Available at: <http://pubs.acs.org/doi/abs/10.1021/es405118y?journalCode=esthag>

ⁱⁱⁱ United States Geological Survey, Douglas B. Chambers, Mark D. Kozar, Terence Messinger, Michon L. Mulder, Adam J. Pelak, and Jeremy S. White, "Water Quality of Groundwater and Stream Base Flow in the Marcellus Shale Gas Field of the Monongahela River Basin, West Virginia, 2011–12," April 21, 2015. Available at: <http://pubs.usgs.gov/sir/2014/5233/pdf/sir2014-5233.pdf>

^{iv} United States Geological Survey, Ronald A. Sloto, "Baseline Groundwater Quality from 20 Domestic Wells in Sullivan County, Pennsylvania, 2012. Available at: <http://pubs.usgs.gov/sir/2013/5085/support/sir2013-5085.pdf>

^v United States Geological Survey, Melanie L. Clark, "Water-Quality Characteristics and Trend Analyses for the Tongue, Powder, Cheyenne, and Belle Fourche River Drainage Basins, Wyoming and Montana, for Selected Periods, Water Years 1991 through 2010," 2012. Available at: <http://pubs.usgs.gov/sir/2012/5117/sir2012-5117.pdf>

^{vi} United States Geological Survey, Timothy M. Kresse, Nathaniel R. Warner, Phillip D. Hays, Adrian Down, Avner Vengosh, Robert B. Jackson, "Shallow Groundwater Quality and Geochemistry in the Fayetteville Shale Gas-Production Area, North-Central Arkansas, 2011," 2012. Available at: <http://pubs.usgs.gov/sir/2012/5273/sir2012-5273.pdf>

^{vii} Susquehanna River Basin Commission, Data Report of Baseline Conditions for 2010 — 2013, Publication No. 297, June 2015. Available at: http://mdw.srbcc.net/remotewaterquality/assets/downloads/pdf/RWQMN_datareport_2010-2013.PDF

^{viii} Massachusetts Institute of Technology, Ernest J. Moniz, et al. "The Future of Natural Gas An Interdisciplinary," 2010, Available at: http://web.mit.edu/ceepr/www/publications/Natural_Gas_Study.pdf

^{ix} Government Accountability Office, "Information on Shale Resources, Development, and Environmental and Public Health Risks," September 2012. Available at: <http://www.gao.gov/assets/650/647791.pdf>

^x Groundwater Protection Council, "State Oil and Gas Regulations Designed to Protect Water Resources." Available at: <http://www.gwpc.org/sites/default/files/files/Oil%20and%20Gas%20Regulation%20Report%20Hyperlinked%20Version%20Final-rfs.pdf>

^{xi} Reporting on the Environmental Protection Agency's ("EPA") data. International Business Times, April 9, 2012. Available at: <http://www.ibtimes.com/new-epa-results-fracking-has-not-contaminated-water-pennsylvania-435172>

^{xii} United States Geological Survey, Lisa A. Senior, "A Reconnaissance Spatial and Temporal Baseline Assessment of Methane and Inorganic Constituents in Groundwater in Bedrock Aquifers, Pike County, Pennsylvania, 2012–13," 2014. Available at: <http://pubs.usgs.gov/sir/2014/5117/support/sir2014-5117.pdf>

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^{xv} EPA, "Private Drinking Water Wells." Available at: <http://water.epa.gov/drink/info/well/>

^{xvi} Journal of Environmental Health, Bryan R. Swistock, M.S., Stephanie Clemens, M.S. and William E. Sharpe, "The Influence of Well Construction on Bacterial Contamination of Private Water Wells In Pennsylvania." Available at: <http://extension.psu.edu/food/safety/farm/resources/water/the-influence-of-well-construction-on-bacterial-conatmination-of-private-water-wells-in-pennsylvania>

^{xvii} The Center for Rural Pennsylvania, Bryan R. Swistock, M.S., Stephanie Clemens, M.S. and William E. Sharpe, Ph.D., School of Forest Resources and Institutes of Energy and the Environment, Pennsylvania State University, "Drinking Water Quality in Rural Pennsylvania and the Effect of Management Practices," Available at: http://www.rural.pa.legislature.us/drinking_water_quality.pdf

^{xviii} Energy Information Administration, "Monthly power sector carbon dioxide emissions reach 27-year low in April", Available at: <http://www.eia.gov/todayinenergy/detail.cfm?id=22372>

^{xix} Associated Press, Kevin Begos, "Fracking health project puts numbers to debate," Available at: <http://bigstory.ap.org/article/fracking-health-project-puts-numbers-debate>