



New Northeastern Pennsylvania Shallow Groundwater Methane Study Blows Prior Duke Studies Out of the Water?

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A new study of subsurface geology in Northeastern Pennsylvania shows that methane from deep shale formations, like the Marcellus, has been found as a natural condition in the shallow drinking water aquifer system of the region. The peer-reviewed study, "A Geochemical Context for Stray Gas Investigations in the N. Appalachian Basin: Implications of Analyses of Natural Gases from Neogene-through-Devonian-Age Strata," was published this month in the *Bulletin* of the American Association of Petroleum Geologists. The research shows that Marcellus-type gas has migrated over geologic time and has mixed with shallow, less thermally mature methane.

The study's authors are Fred Baldassare, a senior geoscientist, Mark McCaffrey, Ph.D, a petroleum geochemist, and John Harper, a Ph.D. recently retired from the Pennsylvania Geologic Survey. Baldassare is a former state geologist who was the lead author for Pennsylvania's Oil & Gas regulations (25 Pa. Code Ch. 78, §§78, 89) for stray gas incident response and he has been a researcher on the application of isotope geochemistry, *i.e.*, "chemical fingerprinting," to identify the origin of hydrocarbons since 1992. His experience as an investigator and researcher on the application of

isotope geochemistry exceeds most, if not all, scientists in the Appalachian Basin. Baldassare is now a principal of Echelon Applied Geochemistry Consulting located in Murrysville, PA.

Northeastern Pennsylvania has been the world's ground-zero of the drilling-methane debate since 2009 when 15 families in Dimock, Susquehanna County alleged that drilling operations were the cause of methane in their groundwater. Enter Duke University, who, in 2010 and 2013, made headlines for itself by publishing two studies that focused on "chemical fingerprinting" of Marcellus deep gas versus shallow non-Marcellus gas to establish the supposed relationship between drilling operations and methane in shallow groundwater wells. Those studies attempted to point the finger for shallow well methane at drilling operations. Indeed, the first study was deceptively titled, "Methane Contamination of Drinking Water Accompanying Gas-Well Drilling and Hydraulic Fracturing." However, those studies were based on very limited data sampling and, in fact, samples that had been provided "off the shelf" by the impacted landowners themselves. Also, the authors of the Duke study had already confessed their strong personal animus against shale gas development in a May 10, 2011 *Philadelphia Inquirer* article

deceptively titled, “Strong Evidence That Shale Drilling Is Risky” by commenting that “we would like to see shale gas drilling become largely unnecessary.”

This new study, on the other hand, is based upon the largest sample size and database of any previous effort to date, and also focuses on chemical fingerprinting. The study analyzed 2,300 gas and water samples from 234 gas wells during actual drilling as well as 67 private groundwater wells for baseline groundwater quality comparison in a five-county region in Northeastern Pennsylvania. Conclusion:

“Evaluation of this geochemical database reveals that microbial, mixed microbial and thermogenic, and thermogenic gases of different thermal maturities occur in shallow aquifer systems, and throughout the stratigraphy above the Marcellus Formation. The gas occurrences pre-date Marcellus Formation drilling activity.”

Translation: methane, including methane from as deep in the geologic formation as the Marcellus, as well as shallow methane, is found as a naturally-occurring phenomenon in the shallow groundwater in the area. The study also determined that thermogenic methane (*i.e.*, Marcellus fingerprint) was found in 88 percent of the 67 water supply wells evaluated and, importantly, that its presence pre-dated drilling in the Marcellus formation.

This is a key detail because, to date, many have hastily concluded that the presence of thermogenic methane in shallow groundwater in the vicinity of drilling activities means that the methane contamination is caused by the drilling operations. This study shows that this is not necessarily so. The 2013 Duke study went so far as to allege that Marcellus gas was found in the groundwater in the Dimock area. Baldassare’s study reveals that this is not the case. The Baldassare study data demonstrate that gases that have the same geochemistry as the Marcellus occur naturally in formations above the Marcellus.

Further adding to the credibility and technical gravitas of this study is the fact that it was performed at the request of Chesapeake Energy, who had no editorial or technical input into the sampling or sampling protocols, and who first saw the results when it was released for peer review. Baldassare designed the sampling protocol for the 234 gas wells and performed several audits throughout the study.

This is very topical right now as Pennsylvanians consider whether to adopt basic technical standards for private water well construction. Pennsylvania is second only to Michigan in the number of its citizens (more than three million) who rely on private drinking water wells. However, Pennsylvania and Alaska remain the only two states in the country with no statewide siting and technical standards for the construction of private water wells. Consequently, more than three million citizens remain unprotected by statewide water well standards. The Center for Rural Pennsylvania, a bipartisan bicameral legislative agency of the Pennsylvania Legislature, has documented that 41 percent of Pennsylvania’s private water wells have experienced some failure of at least one federal drinking water standard at some point in time.

The Pennsylvania House of Representatives Consumer Affairs Committee held a hearing in 2012 on the topic of private water well construction standards. The House is currently considering a bipartisan bill that would establish private water well construction standards. House Bill 343, which has bipartisan sponsorship, is pending in the House Environmental Resources and Energy Committee.

Elected public officials of all stripes are taking note, too. Just last week in testimony before the Senate Appropriations Committee, Democrat State Auditor General Eugene DePasquale was reported as saying:

“There have been a lot of water problems in Pennsylvania for decades...I don’t know if people understood that. In recent years because of the additional drilling, I think there’s been much more awareness by the public about the importance of water safety. The drillers have gotten blamed for some stuff that they had nothing to do with. I will tell you that we are seeing some evidence of that and I just will leave it at that right now.”

What does this all mean? Clearly, simplistic fingerprinting, as we have seen from the Duke studies, makes little sense from scientific, policy-making, or enforcement standpoints. As the Baldassare *et al.* study says, “[a]lleged incidents of stray gas migration require investigations at the site-specific level and evaluation and synthesis of multiple data types to determine the source of the stray gas.”

The new study is significant with respect to on-going litigation in Pennsylvania regarding methane contamination

in drinking water supplies. A few of the cases that originated in the Northeastern part of the Commonwealth are scheduled for trial in 2014 and 2015 in federal court in the Middle District of Pennsylvania. Any plaintiffs ought to be rethinking their case, if there is a credible case, and rethinking their expert testimony to support their case.

There is no question that Pennsylvania needs and has strong natural gas well drilling construction standards. Those standards need to be enforced, and the Department of Environmental Protection (“DEP”) is doing that. In the instances where faulty well construction has led to methane migration, the DEP has responded and will continue to do so. Measures can and have been implemented to mitigate any problem expeditiously and effectively. Indeed, the Environmental Protection Agency (“EPA”) reported after its lengthy water well testing program in the Dimock area, which ran from January to July 2012, that “there are no levels of contaminants present that would require additional

action by the Agency.” This is a fact, by the way, that the DEP had known for months before the EPA alarmed everyone and then concluded its lengthy and expensive process with its Emily Litella-esque: “Nevermind.”

Baldassare’s study is also quite compelling in the face of the debate, which so far has been dominated more by celebrities than scientists, about hydraulic fracturing and our nation’s energy future. On a fundamental level, it is now apparent that hard science shows that methane contamination in shallow groundwater drinking water is a far more complex issue than what anti-fracturing politics and activists have led the public to believe. Movie directors, chefs, and celebrities can no longer pull the wool over the public’s eyes. This red-herring issue cannot credibly be used anymore by ideological opponents as a scare tactic or a knee-jerk excuse to attempt to roadblock the responsible and safe development of shale gas as part of our nation’s energy future.

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