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Durham Bull

EID takes a closer look at the top five problems with Duke's new paper on methane migration in Pennsylvania

You wouldn't have known it by looking at all those headlines this morning, but spend some time wading through [the report](#) and (admittedly limited) data set issued by researchers at Duke University over the weekend, and you'll come across a number of things that opponents of responsible natural gas development in the Marcellus aren't likely to repeat. Or like. One bit.

For starters, the researchers basically admit that [hydraulic fracturing](#) itself is not responsible for methane migration into water wells, additionally conceding in their paper that neither brine nor fracturing fluids were detected in any of the water wells they sampled, even in areas where development operations are most active.

They were also forced to admit that methane is a natural, common constituent found in just about every water well across the entire region (85 percent of them, to be exact), with thermogenic methane – as opposed to the biogenic stuff – identified in the vast majority of those, even in areas where no development has taken place. How does thermogenic gas migrate upward in areas of zero Marcellus development? Geology, it turns out, has plenty of answers to offer on this question. But the authors of this report aren't geologists, so they chose to ignore that question in its entirety.

Of course, neither a lack of expertise nor a frighteningly small data set had the effect of slowing down one bit the researchers' aggressive campaign to generate as many hits as they could in the media – up to and including the placement of an op-ed by Duke's Rob Jackson [in this morning's Philadelphia Inquirer](#).

In truth, it's a campaign that started late last week, with a reporter in Quebec (of all places) sending us a media advisory from Mr. Jackson trumpeting the release of a new paper that "attributes contamination to gas extraction technologies." As mentioned, the report itself doesn't actually say that – in fact, Jackson says the exact opposite in an interview [with Bloomberg TV today](#). But as it turns out, putting out a paper calling for updated state well-casing standards isn't quite as sexy as putting out a paper calling for an EPA take-over of the fracturing process itself, is it?

Below, we take a closer look at the central "findings" of the [Duke report](#), along the way identifying several errors, inconsistencies and problems that, taken together, raise serious doubts about the rigor, veracity and statistical significance of the project.

Problem #1: The data itself: Small data set, no random sampling, and no baseline information whatsoever.

- "[Duke's Robert] Jackson **concedes that the study does not have baseline data** and said he expected the criticism." ([NY Times/E&E News](#), May 9, 2011)
- "[Professional hydrogeologist John] Conrad also criticized the study for not starting with 'baseline tests for the wells they sampled' ... 'While they point to higher methane concentrations, **we don't know what the original water quality was before drilling occurred,**' he said. '**That's a data gap that could be very significant** for this study.'" ([Philadelphia Inquirer](#), May 10, 2011)

- No random sampling; authors appear to have simply cherry-picked water wells previously known to have high concentrations of methane, although they never actually mention in the report which wells they sampled or where they're located: "Jackson said the study was indeed **not random**, but that was because they needed homeowners permission to test their water." ([CNN](#), May 9, 2011).
- Outrageously small data set; authors tested 68 wells in a state where more than 20,000 new water wells are drilled every year: "**I'm not sure you can take 68 wells over a very broad geographic area and make any statistical conclusion**," [Conrad] said. 'Methane types and methane concentrations can vary radically over very short distances.'" ([Bloomberg News](#), May 9, 2011)

Problem #2: Authors intentionally down-play the fact that thermogenic methane was found in nearly every well they sampled – even in wells in areas with no natural gas development to be found.

- From the paper itself: "Methane concentrations were detected generally in 51 of 60 drinking-water wells (85%) across the region, **regardless of gas industry operations** ... " (Osborn, et al., [Duke Univ.](#), May 9, 2011)
- But data on page 3 of the paper takes that concession even one step further – indicating the presence of thermogenic methane (not just biogenic) **in all but one of the wells** that were found to have some quantity of methane. Only in one of the non-active-area wells was purely biogenic methane detected; all the rest featured a mix of the two, or thermogenic alone.
- Why is this important? Quite simply, the **researchers offer no response** to why thermogenic methane was found in so many wells in non-active development areas. Of course, in cases where thermogenic methane was detected in active development areas, the authors are quick to blame natural gas operations for the occurrence.
- Presence of thermogenic methane in non-active areas elicits questions from other scientists: "John Conrad ... said that because the researchers also found methane in areas where no drilling is occurring, **it was insupportable** to say the methane was in the water due to hydrofracking. 'Based on the limited amount of data they have, **that is a stretch**,' he said." ([Philadelphia Inquirer](#), May 10, 2011)

Problem #3: Authors concede that hydraulic fracturing likely had zero impact on water wells – but you'd never know by the paper's title, or by the [op-ed](#) they ran in today's Philadelphia Inquirer.

- "The Duke researchers said the gas they found in water **is not coming up through rocks from the pressure of fracturing** but coming up through the wellbore. The study also found that not all water wells close to drilling operations had methane, suggesting that the methane leakage is not an inevitable side effect of drilling ... " ([NY Times/E&E News](#), May 9, 2011)
- From the paper itself: "Methane migration [via fracturing] through the 1- to 2-km-thick geological formations that overlie the Marcellus and Utica shales **is less likely as a mechanism** for methane contamination than leaky well casings ... " (Osborn, et al., [Duke Univ.](#), May 9, 2011)
- More from the paper: "Based on our data (Table 2), **we found no evidence for contamination of the shallow wells** near active drilling sites **from deep brines and/or fracturing fluids**." (*ibid*)
- Duke researcher on [Bloomberg TV](#): "I think the most likely explanation is that there are gas well casings that are leaking. I think that's more likely than the mass movement of gas or liquids thousands of feet underground. **It's important to remember that the Marcellus Shale is five, six, seven thousand feet underground** in many cases, and a typical homeowner's well is only a couple hundred feet underground. ... Again, we did not find any evidence for contamination from [fracturing fluids]."
- Authors reiterate this position in accompanying [background document](#): "When gas wells are thousands of feet deep – and [far below the shallow aquifers](#) that typically provide drinking water – contamination is often stated to be impossible due to the distance between the well and the

drinking water. Although this seems reasonable **in most (and possibly all) cases**, field and modeling studies should be undertaken to confirm this assumption.” (Research and Policy Recommendations for Hydraulic Fracturing and Shale-Gas Extraction, [Duke Univ.](#), May 9, 2011) [**Note:** Modeling studies have already been done on this phenomenon, [and have confirmed](#) adequate separation.]

- So if hydraulic fracturing isn't to blame for methane migration, and no brines or fracturing fluids were detected in any of the wells sampled, why is the study [entitled](#) “*Methane contamination of drinking water accompanying gas-well drilling and hydraulic fracturing*”? And why does the op-ed submitted to the Philadelphia Inquirer by Mr. Jackson make several references to hydraulic fracturing? “Environmental scientists often have the unpleasant task of exposing the drawbacks of different technologies, and this study shows one downside of fracking.” (Jackson op-ed, [Philadelphia Inquirer](#), May 10, 2011)
- Even environmental groups recognize that hydraulic fracturing is not to blame: “The Duke research bolsters the argument that most drilling-related pollution comes from poor well construction, **not from fracturing**, Scott Anderson, a senior policy adviser for the New York-based Environmental Defense Fund, said in an interview.” ([Bloomberg News](#), May 9, 2011)
- Buried deep in his Philadelphia Inquirer op-ed, Duke professor admits that none of his research suggests hydraulic fracturing should be prohibited: “**It would be inaccurate and unfair to say our study proves that fracking should be banned.**” (Jackson op-ed, [Philadelphia Inquirer](#), May 10, 2011)

Problem #4: Authors blame methane migration on failures in well-casing (without any supporting evidence) – but don't include anything about well-casing in their recommendations section.

- Authors use the recommendations portion of their study to call for passage of the FRAC Act, but fail to indicate how that legislation is related to the improvement of well-casings.
- Authors also fail to acknowledge the fact that Pennsylvania employs **some of the most stringent well-casing regulations in the entire country**, recently updating those rules to mandate additional casing strings and performance testing requirements: <http://www.pacode.com/secure/data/025/chapter78/chap78toc.html>
- In advocating for passage of the FRAC Act, researchers cite the Environmental Working Group – a vocal and persistent critic of shale development – in making the claim that the composition of fracturing fluids is unknown to regulators: “Natural gas companies are not required to disclose the identity of the chemical constituents in hydraulic fracturing fluid under federal law or most state law and guard the makeup of hydraulic fracturing fluids as a trade secret.” (Research and Policy Recommendations for Hydraulic Fracturing and Shale-Gas Extraction, [Duke Univ.](#), May 9, 2011)
- This claim is directly rebutted by the Pennsylvania [Dept. of Environmental Protection](#): “Drilling companies must disclose the names of all chemicals to be stored and used at a drilling site in the Pollution Prevention and Contingency Plan that must be submitted to DEP ... These plans contain copies of material safety data sheets for all chemicals ... This information is on file with DEP and is available to landowners, local governments and emergency responders.” (PA DEP [Marcellus FAQ](#), accessed May 10, 2011)
- Additional context, from actual geologists: “There are a number of purely geological reasons why this concentration may be higher in some areas. The production may be geared to a richer part of the basin and areas where there are more structural complexities allowing methane to migrate naturally. We often explore in these areas as we have evidence of methane in the area via natural seeps, although we hope to encounter a trapped reservoir. **It is not at all geologically surprising to find ancient and ongoing naturally occurring oil and natural gas migration paths in areas in which are now exploring.**”

Problem #5: Once again, politics plays a central role in guiding the direction and recommendations of the paper.

- “William H Schlesinger, who selected the study's outside reviewers ... **has supported moratoriums** in New York on hydraulic fracturing permits until its effects are completely understood.” ([Bloomberg News](#), May 10, 2011)
- Schlesinger sits on the Board of Trustees for the **Natural Resource Defense Council (NRDC)**, one of the most active anti-shale activist groups in the country. (Full list of NRDC board members available [here](#).)
- NRDC's Schlesinger was one of the only commenters to rush to the defense of [widely debunked Cornell study](#): “I think this is a hugely provocative study ... If someone said switching from coal to natural gas was a way to do that, I'd look at this study and think twice.” ([New York Times](#), April 12, 2011)
- Schlesinger also wants to see quick passage of the FRAC Act, mistakenly citing a “loophole” in “the Clean Water Act” as something that needs to be fixed: “To date, corporations have been reluctant to divulge the exact ingredients in fracking fluid. ... And sadly, groundwater pollution by fracking fluids is currently **exempt from the Clean Water Act [sic.]**, due to a loophole put in place in 2005.” (Schlesinger letter to the [Poughkeepsie Journal](#), Jan. 2, 2011)
- Duke researchers finally get to the point and tell us all what they're really after in penultimate paragraph of Philadelphia Inquirer op-ed: “[W]e would like to see shale gas become **largely unnecessary**, along with coal and oil. The faster we develop and adopt renewable energy technologies, the less we will have to worry about whether it's safe for people to drink their water.” (Jackson op-ed, [Philadelphia Inquirer](#), May 10, 2011)

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