

January xx, 2015

Senate President Thomas V. Mike Miller, Jr.
State House, H-107
Annapolis, MD 21401 – 1991

House Speaker Michael E. Busch
State House, H-101
Annapolis, MD 21401 - 1991

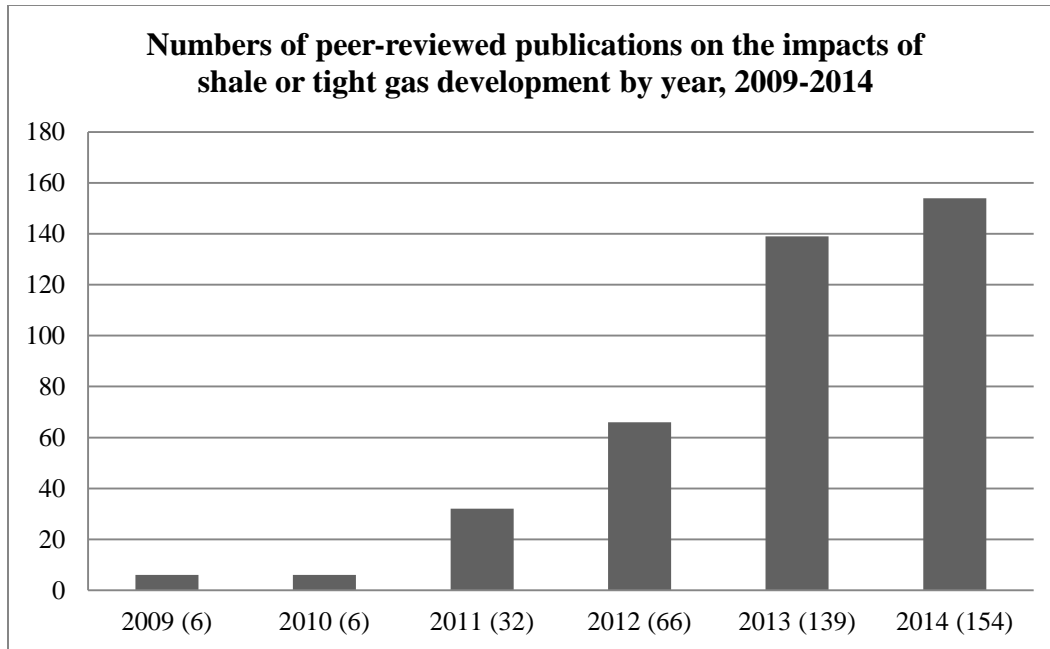
Dear President Miller and Speaker Busch,

We, the undersigned public health professionals, clinicians, and researchers, write to update you concerning trends in recent health research on unconventional natural gas development and production, enabled by hydraulic fracturing and commonly referred to as “fracking.” The scientific literature now includes 400+ peer-reviewed studies on the public health, climate, and environmental dimensions of this type of unconventional gas development, the vast majority of which suggest that high-volume hydraulic fracturing technologies pose threats to human and animal health and safety via contamination of air, water, and soil. There is little evidence that these threats can be sufficiently mitigated through regulatory frameworks.

We ask for your leadership in redirecting Maryland toward a more conservative and precautionary path by calling for a long-term moratorium on high-volume hydraulic fracturing in our state. We are well aware of the three years of analysis carried out by Governor O’Malley’s agencies as part of the Marcellus Shale Safe Drilling Initiative; however, the decision to move forward with regulations was made without sufficient regard for hazards identified by the Initiative and without adequate scientific support for the “best management practices” which underpin those regulations.

Research examining impacts of shale development is emerging rapidly, as the chart below demonstrates. A preliminary analysis of the peer reviewed literature on shale gas development (PSE Healthy Energy 2014) reveals that:

- 96 percent of all papers published on **health impacts** indicate potential risks or adverse health outcomes.
- 87 percent of original research studies published on **health outcomes** indicate potential risks or adverse health outcomes.
- 95 percent of all original research studies on **air quality** indicate elevated concentrations of air pollutants.
- 72 percent of original research studies on **water quality** indicate potential, positive association, or actual incidence of water contamination.
- **73 percent of all available scientific peer-reviewed papers have been published in the past 24 months, with a current average of one paper published each day.**



Toward an understanding of the environmental and public health impacts of shale gas development: an analysis of the peer-reviewed scientific literature, 2009-2014
 [PSE Healthy Energy (PSE), 2014]
http://psehealthyenergy.org/data/Database_Analysis_FINAL2.pdf

While most attention has been focused on gas development and production in the western portion of Maryland, we are also aware that the associated infrastructure extends beyond the drilling sites and will affect residents in other regions of Maryland as well. The public health risks caused by air pollution, explosions, chemical spills, noise and stress apply to communities near compressor stations, like the one in Myersville, and to communities near LNG export terminals, like the one at Cove Point. Given that other shale plays are found throughout the state of Maryland, more Maryland residents may one day be exposed to many of the health hazards discussed below. This is a statewide issue and deserves a comprehensive statewide assessment of public health risks.

Outlined below are **specific findings of concern on life-cycle impacts** of unconventional natural gas development and production enabled by hydraulic fracturing technologies.

- 1) **Air-quality impacts are among the most direct and immediate sources of risk to public health.** Air pollution results from each phase of gas development and production, including transportation of materials to and from the drill sites, the drilling and fracking processes themselves, and the processing, delivery, and end-use of the gas. Fracking-related air pollutants include silica dust, benzene, formaldehyde, hydrogen sulfide and a wide range of other compounds, many of which are known to cause cancers, neurologic diseases, birth defects, and other debilitating illnesses. Of critical importance, some of these substances have now been documented at distances that exceed setback distances proposed for Maryland [1].

Protecting the public from this type of air pollution is particularly challenging. Local topography and meteorological conditions affect pollutant dispersion, making it difficult to define health-protective setbacks. Current monitoring technologies underestimate human health risks, as they fail to accurately detect and monitor potential spikes in air pollutant emissions over short time intervals, vital for understanding links to health-related symptoms and disease processes. Intermittent spikes in emissions may pose a health risk for nearby communities, but may not influence regional air quality. Furthermore, presumed “safe levels” of exposure to specific pollutants usually apply to single substances, not complex mixtures that may have synergistic effects. Children and pregnant women are especially vulnerable to hazardous air pollutants due to physiologic differences; the concept of “safe levels” may not even apply and hazardous exposures can lead to life-long consequences.

Recent research out of Uintah Basin in Utah demonstrates how significantly a rural region can be transformed. Formerly pristine and sparsely populated, this region is now listed among the nation’s 25 most polluted counties due to extremely high ozone levels [2]. It is estimated that total volatile organic compound emissions from oil and gas sites in this region are comparable to emissions from approximately 100 million cars [3]. There has been an alarming increase in the stillbirth and infant mortality rates in this region in recent years, raising concerns about a possible relationship to oil and gas development [4]. Research findings from rural Colorado in 2014 revealed a significant association between congenital heart defects and neural tube defects in babies, and density and proximity to gas wells [5]. Until comprehensive studies can be completed, we believe it would be unethical to expose the residents of Garrett, Allegany, or any other Maryland counties to these potential risks.

- 2) **Linkages between water contamination and fracking-related activities are now confirmed.** Despite years of public assurances from industry that few or no aquifers or bodies of surface water had been contaminated, the State of Pennsylvania finally released reports last summer of 243 cases of drinking well contamination between 2008-2014 related to oil and gas activities [6,7]. Contamination events occur due to vulnerabilities at various stages in fracking operations, including casing or cement failures in the wells themselves, spills during transport, or improper treatment of wastewaters. Contamination of ground and surface waters has now been documented in multiple states including Colorado, Wyoming, and Pennsylvania. The result is potential exposure to a wide array of hazardous substances, including methane, radium-226, arsenic, strontium, benzene, toluene and potential endocrine-disrupting compounds [8,9,10,11,12]. It may take years for health effects to become evident from exposure to some of these substances. Until comprehensive epidemiologic studies can be completed in states where fracking is underway, it is both unwise and unnecessary to expose Maryland residents to these risks.
- 3) **The structural integrity of wells is impossible to guarantee over time, which presents a fundamental flaw in high-volume hydraulic fracturing technology that cannot be adequately resolved through regulation.** According to industry data, 5% of wells leak almost immediately after construction; that number rises to over 40% by fifteen years and 60% by thirty years [13]. Pennsylvania Department of Environmental Protection data show similar rates, as 6-9% of wells were documented to have structural integrity issues in 2010-2012 [14]. More recently, even after tighter regulations for well construction were implemented in 2011, well impairment rates for these newer wells remained unacceptably high at almost 8% [15]. The high pressures and volumes of

fluids associated with the newer horizontal drilling techniques, together with basic material science and engineering limitations, pose challenges that industry has not been able to overcome, despite years of trying. All materials deteriorate over time. Unfortunately, the consequences of these leaks can include contamination of drinking water supplies, emissions of methane (a potent greenhouse gas) and non-methane volatile organic compounds into the atmosphere, and explosion risks to workers and community members. These risks may persist well beyond the productive lifecycle of a well and affect future generations.

- 4) **The disposal of toxic, potentially radioactive flowback and produced water is an unresolved challenge for which there is, thus far, no acceptable solution.** While the Maryland Department of the Environment has suggested that deep-well injection of fracking waste will not take place in Maryland, a wise prohibition in light of studies linking earthquakes to deep-well injection [16], the agency has offered no clear explanation as to how the wastes will be managed. Transporting such wastes out of state carries risks of toxic spills, contributes to air pollution, and shifts these health and environmental hazards of shale gas development to communities outside Maryland, an unacceptable solution. Open storage pits, indefinite closed-container storage, and processing at wastewater treatment facilities all pose contamination hazards [17]. Until the waste storage problem is resolved, we believe that no fracking wastes should be generated in Maryland.
- 5) **Industry secrecy is delaying researchers' abilities to fill in gaps in our understanding of the health and environmental risks associated with fracking.** A number of industry practices impede research by blocking access to important data. Among these are the refusal to disclose all chemicals and their concentrations used in fracking-related processes and the frequent use of non-disclosure agreements with those who have claimed harm from fracking [18,19]. A particularly egregious practice adopted in several other states and present in proposed regulations for Maryland is the use of confidentiality agreements ("gag clauses") that create barriers to open communication and sharing of information among health care providers, researchers, and the public.
- 6) **Multiple stressors to local communities have been documented.** Among such impacts are car and truck accidents, increased crime rates, increased sexually-transmitted disease rates, worker injuries and deaths, prolonged noise and light exposures which can disrupt sleep patterns, conflicts among neighbors, property devaluations, and numerous other stressors [20]. Chronic stress can affect immunologic function and may contribute to a wide spectrum of additional illness. These community-wide impacts also create economic burdens for local communities.

We, as public health professionals, clinicians, and researchers, call upon you to protect the residents of Maryland from unnecessary risks to health, safety and well-being. It is clear that time is on our side and there is no compelling reason to allow fracking to begin any time soon in our state. We know that:

- Current research clearly shows significant risks to public health from shale gas development and production [21,22]. Gaps remain in our understanding of the likelihood

and severity of adverse impacts and in the effectiveness, if any, of mitigation efforts. Studies are currently under way in neighboring states and many more will undoubtedly be initiated in the next few years. Longitudinal epidemiologic studies, by definition, take many years to complete, as some of the potential negative health risks, such as cancers and neurologic diseases, develop over long lag times. **We, in Maryland, must await those results.**

- Studies on the effectiveness of environmental and public health hazard mitigation remain in their infancy. A recent study out of Northeastern Colorado found that despite tightened air pollutant emission regulations from upstream oil and gas development since 2008, emissions have actually increased [23]. **Until there are proven technological fixes that sufficiently reduce environmental and public health hazards associated with shale gas development, there should be a moratorium on the practices.**
- To truly protect the public interest, a comprehensive systems approach should be used to determine health and economic risks and benefits of the entirety of this new fossil fuel infrastructure associated with unconventional natural gas development and production. This should include a **comparative analysis of health and economic risks and benefits of alternatives to unconventional gas development.**
- Given that recent and major global economic shifts make new drilling far less appealing financially, and that recent political changes at the state and federal levels make proceeding with fracking in Maryland far more risky, **now is the ideal time to institute a long-term moratorium on fracking in Maryland.**

Until independent scientific research can provide sufficient information to determine the nature and level of public health risks and whether those risks can be managed effectively, it is vital for the General Assembly to protect the health of Maryland residents by preventing unconventional gas development and production from beginning prematurely in our state.

Respectfully,

References:

- [1] Macey, G.P., Breech, R., Chernaik, M., Cox, C., Larson, D., Thomas, D., Carpenter, D.O. (2014). Air concentrations of volatile compounds near oil and gas production: a community-based exploratory study. *Environmental Health*, 13(82). doi: 10.1186/1476-069X-13-82
- [2] American Lung Association (2014) <http://www.stateoftheair.org/2014/assets/ALA-SOTA-2014-Full.pdf>
- [3] Lockwood, D. (2014). Harmful pollutants build up near oil and gas fields. *Chemical & Engineering News* <http://cen.acs.org/articles/92/web/2014/03/Harmful-Air-Pollutants-Build-Near.html>
- [4] Schlanger, Z. (2014). In Utah Boom Town, a Spike in Infant Deaths Raises Questions. *Newsweek* <http://www.newsweek.com/2014/05/30/utah-boom-town-spike-infant-deaths-raises-questions-251605.html>
- [5] McKenzie, L. M., Guo, R., Witter, R. A., Savitz, D. A., Newman, L. S., & Adgate, . L. (2014) Birth outcomes and maternal residential proximity to natural gas development in rural Colorado. *Environmental Health Perspectives*, 122(4), 412-417.
- [6] Begos, K. (2014) Report: Fracking contaminated drinking water wells in PA <http://wivb.com/2014/08/28/243-cases-in-pa-where-fracking-contaminated-wells/>
- [7] Legere, L. (2014). 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*. <http://powersource.post-gazette.com/powersource/policy-powersource/2014/09/09/DEP-releases-details-on-water-contamination/stories/201409090010>
- [8] Darrah, T.,Vengosh, A.,Jackson, R.,Warner, N., Poreda, R., (2014) Noble gases identify the mechanisms of fugitive gas contamination in drinking-water wells overlying the Marcellus and Barnett Shales. www.pnas.org/cgi/content/short/1322107111
- [9] Jackson, R., Vengosh, A., Carey, J., Davies, R., Darrah, T.,O'Sullivan, F., Petron, G. (2014) The Environmental Costs and Benefits of Fracking <http://www.annualreviews.org/doi/abs/10.1146/annurev-environ-031113-144051>
- [10] Fontenot, B. E., Hunt, L. R., Hildenbrand, Z. L., Carlton, D. D., Oka, H., Walton, J. L., . . . Schug, K. A. (2013). An evaluation of water quality in private drinking water wells near natural gas extraction sites in the Barnett Shale formation. *Environmental Science & Technology*, 47(17), 10032-10040.
- [11] Board, G. (2014) Report: DEP: September Drilling Accident Contaminated Water in Doddridge County <http://wvpublic.org/post/dep-september-drilling-accident-contaminated-water-doddridge-county>
- [12] Kassotis, C. D., Tillitt, D. E., Davis, J. W., Hormann, A. M., & Nagel, S. C. (2014). Estrogen and androgen receptor activities of hydraulic fracturing chemicals and surface and ground water in a drilling-dense region *Endocrinology*, 155(3), 897-907
- [13] Brufatto, C., Cochran, J., Conn, L., Power, D., El-Zeghaty, S. Z. A. A., Fraboulet, B., . . . Rishmani, L. (2003). From Mud to Cement – Building Gas Wells. *Oilfield Review*, 15, 62-76.
- [14] Ingraffea, A. R. (2013). Some scientific failings within high volume hydraulic fracturing proposed regulations. http://www.psehealthyenergy.org/data/NYS_DEC_Proposed_REGS_comments_Ingraffea_Jan_2013.pdf.

- [15] Santoro, R., Ingraffea, A.R.. from PSE in comments provided to MDE November 2014 (Re: Draft Assessment of Risks from Unconventional Gas Well Development in the Marcellus Shale of Western Maryland)
- [16] Sumy, D. F., Cochran, E. S., Keranen, K. M., Wei, M., & Abers, G. A. (2014). Observations of static Coulomb stress triggering of the November 2011 M5.7 Oklahoma earthquake sequence. *Journal of Geophysical Research*, 119(3), 1904-1923.
- [17] Warner, N. R., Christie, C. A., Jackson, R. B., & Vengosh, A. (2013) Impacts of shale gas wastewater disposal on water quality in western Pennsylvania. *Environmental Science and Technology*, 47(20), 11849-11857.
- [18] Robinson, P. (2014). Fracking fluid survey shows missing information. *Scientific American* <http://www.scientificamerican.com/article/fracking-fluid-survey-shows-missing-information/>
- [19] Efstathiou, J., Jr. and Drajem, M. (2013) Drillers Silence Fracking Claims With Sealed Settlements <http://www.bloomberg.com/news/2013-06-06/drillers-silence-fracking-claims-with-sealed-settlements.html>
- [20] Maryland Institute for Applied Environmental Health (MIAEH), School of Public Health, University of Maryland, College Park. (2014) *Potential public health impacts of natural gas development and production in the Marcellus shale of western Maryland*. http://www.marcellushealth.org/uploads/2/4/0/8/24086586/final_report_08.15.2014.pdf
- [21] Concerned Health Professionals of New York. (2014, December 11). Compendium of scientific, medical, and media findings demonstrating risks and harms of fracking (unconventional gas and oil extraction) (2nd ed.). <http://concernedhealthny.org/wp-content/uploads/2014/07/CHPNY-Fracking-Compendium.pdf>
- [22] Shonkoff SB, Hays J, Finkel ML. 2014. Environmental Public Health Dimensions of Shale and Tight Gas Development. *Environmental Health Perspectives* 122; doi:10.1289/ehp.1307866.
- [23] Thompson, C. R., Heuber, J., & Helmig, D. (2014) Influence of oil and gas emissions on ambient atmospheric non-methane hydrocarbons in residential areas of Northeastern Colorado. *Elementa*, 2: 000035., doi: 10.12952/journal.elementa.000035