Oral Testimony of Tracy Carluccio, Delaware Riverkeeper Network
Before the Science Advisory Board Hydraulic Fracturing Research Advisory Panel
Regarding the review of the U.S. Environmental Protection Agency
Draft Assessment Report on Hydraulic Fracturing
October 28, 2015

Delaware Riverkeeper Network presents this testimony here today to highlight the comment we already submitted in writing in August 2015 and emphasize some of our concerns. We request that U.S. Environmental Protection Agency **(**EPA) **not issue a final assessment based on this draft, withdraw its conclusion, and start over with a more inclusive scope**, all necessary data, and on-the-ground studies that will provide the information needed for an accurate and reliable assessment.

We will focus on what we consider to be two key areas of failure in the draft **Environmental Assessment of the Potential Impacts of Hydraulic Fracturing for Oil and Gas on Drinking Water Resources** (the report).

First, the environmental impacts of hydraulic fracturing (fracking) are ignored in the report; only drinking water effects are assessed **and how the impacts to water supplies were measured is extremely limited** and the parameters unjustified. While we agree that water supply impacts are crucial, the report fails to meet the charge given by Congress due to the narrowed scope EPA adopted and fails to recognize the inextricable connection between drinking water and the contributing environment. The blind eye shown by the agency to environmental impacts led to several areas of inadequate review.

- The lack of groundwater monitoring severely limits the ability to fully assess the impacts of fracking. EPA acknowledges that too little of what happens underground, out-of-sight, is actually known, and should require extensive groundwater monitoring systems to detect contamination of aquifers, and then use that data in a data-intense assessment before issuing any conclusions about the potential impacts.
- EPA concludes that fracking causes no widespread, systemic impacts on drinking water resources in the United States. This conclusion does not follow from a review of the data presented in the EPA report. EPA themselves acknowledge they do not have the data to prove this conclusion. Furthermore, they did not execute a plan to analyze for such impacts and there is too little pre- and post-fracking water quality data, few long-term systematic studies, and much of the needed information is inaccessible.
    - Too much data is proprietary and therefore cannot be monitored.

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- Many examples of contamination are sealed in litigation settlements.
- Contamination may take time to move through the environment – such as through groundwater – so may not be detected within a limited timeline. There are few long-term systematic monitoring programs of groundwater or surface water so this crucial data is not available. But "*the absence of evidence is not the evidence of absence*", as explored by John Locke and other thinkers.
- Contamination due to fracking may be difficult to track because the causes are transitory and mixed with other industrial pollution sources. This undermines EPA's conclusion that there is no widespread, systemic impacts because EPA did not conduct a complex analysis of robust data sets.
- Contaminant transport properties are highly variable depending on the chemical and environmental conditions; EPA considered sources within a mile of a fracked well but does not justify that arbitrary limit. By not considering wells or fracking pollution sources in a watershed above a water supply that are greater than a mile away, the potential for pollution from a great many sources is ignored.

- By not considering the environmental impacts of the entire fracking process, EPA has reached a falsely broad conclusion that is based on an extremely limited scope – specifically ignoring the impacts of well pad development and related land use changes; infrastructure development and operations; transport of chemicals for fracking; sand mining and transport; site reclamation; the fate of closed wells; impacts of produced drill cuttings and other waste outside of wastewater; the injection of frack wastewater into disposal wells; fracking or injection well induced earthquakes; and human health effects. These all have direct impacts on water resources and the environment; if considered, EPA's conclusion of no wide or systemic impacts would be clearly wrong on its face due to available reports and data sets.

  For instance, according to Dr. Anthony R. Ingraffea, the Dwight C. Baum Professor of Engineering Emeritus at Cornell University and Weiss Presidential Teaching Fellow at Cornell University, and Founding and Past President of PSE Healthy Energy, Inc., there are over 580 peer-reviewed science, engineering, and public health publications on the actual impacts of shale gas development. A review of those 580 publications in the key categories of impacts to human health, to air, and to water reveals that 94% find harmful impacts to human health, 69% find harmful impacts on water quality, and 88% find harmful impacts to air quality. How can EPA ignore this available science?

Second, even in the areas EPA does address, reliance on poorly documented information or industry-supplied information and the use of built-in assumptions that are not justified plagues the credibility of the report and its conclusion.

In several key areas of examination, EPA accepted industry statistics without critique. For instance, in EPA's examination of chemical mixing, it should be pointed out that about 2% of the fluid (and in some instances more) of fracking fluid is chemicals with up to 8% being proppant such as silica sand. In a four million gallon frack job (this is the average used according to studies), 2% is 80,000 gallons and could be a concentration up to 20,000 mg/L. Depending on the toxicity of the chemicals, one frack job could be highly toxic yet this is not considered. Another example is EPA's documentation that 9% and 64% of fracking fluid spills reach surface water and soils yet they show none reaching groundwater. How is this possible? This lack of effect on groundwater likely reflects the longer travel time (seepage through soil) or is due to poor site assessment, not an actual absence of impact. Yet EPA uses this flawed information in reaching its conclusion.

EPA has made several false assumptions in assessing well injection and the potential for contamination from this key part of the fracking process.

- EPA (and industry) relies on the distance between the target formation and shallow groundwater to protect that groundwater. This assurance is misleading for many reasons. These include: in some areas, fracking occurs very near the base of shallow aquifers[1] or in parts of aquifers; out-of-formation fractures provide pathways for fracking fluid to leave the target formation and reach formations closer to shallow groundwater in more transmissive formations, increasing the potential pathways to groundwater. EPA assumes few out of formation fractures occur but offers no data to support this.
- EPA ignores the potential changes that injection causes on a regional basis because it considers just the effects of developing one well. Permeability could change over large areas due to fracking and other environmental factors, changing groundwater flow, including allowing large-scale brine movement upward toward shallow groundwater.
- Wells that are re-fractured, or which undergo fracking for a second time, present a host of additional issues regarding groundwater contamination that EPA does not address and assumes are not a problem.

EPA has ignored some of the most potent problems related to wastewater treatment and disposal, sidestepping issues that are emerging as top water quality issues.

- It is acknowledged that Marcellus Shale contains naturally occurring radioactive material (NORM) at concentrations much higher than at background at the earth's surface. The radium-226 in the shale itself on average can be 30 times more radioactive; the interstitial liquids within the shale, the brine, can be up to 25,000 picoCuries per liter (pCi/L), compared to the drinking water standard[2], 5 pCi/L. In Pennsylvania, Raduim-226 concentrations in unfiltered samples were elevated, ranging from 40.5 to 26,600 pCi/L. Radium-228 concentrations were also elevated, ranging from 26.0 to 1900 pCi/L (PADEP 2014). EPA has set federal air limits, cleanup standards, and a maximum contaminant level for radium 226 and 228 under the Safe Drinking Water Act due to serious human health hazards.[3] EPA has the authority to regulate all Naturally Occurring Radioactive Materials (NORM), but generally has not done so but should step up to this task for this report.

  EPA started to address radioactivity concerns in 2011. In a letter to PA Department of Environmental Protection, EPA highlighted the presence of radionuclides, along with other contaminants, in wastewater resulting from gas drilling operations and emphasized the importance of investigating the presence of radionuclides in public water supplies and their persistence in wastewater effluent.[4] EPA pointed out that this information is essential to the development of controls to protect public health and aquatic life in receiving water bodies.[5]

  The treatment provided at industrial facilities removes suspended solids but not the radium, yet it is not accounted for. A study by Duke University scientists showed that Radium 226 concentrations

[1] Between 2009 and 2010, 20% of 23,000 fracked wells, or 4600 wells, were less than 2000 feet below shallow groundwater aquifers.
[2] 40 CFR 141.66(b)
[3] http://www.epa.gov/radiation/radionuclides/radium.html#inbody
[4] USEPA letter from Shawn M. Garvin, Regional Administrator to The Honorable Michael Krancer, Acting Secretary, PADEP, 3.7.11.
[5] Ibid.

were 200 times greater than upstream and background sediments in a stream below a Pennsylvania natural gas wastewater treatment facility discharge, violating the threshold of radioactive waste disposal regulations.[6] EPA does not examine or acknowledge the dangers of not knowing the ultimate disposition of these hazardous radioactive materials, despite the known dangerous consequences for human health, other species, and the environment.

- Some dangerous constituents in fracking wastewater, such as bromide, are not easily removed by existing treatment systems nor are they easily treated at water treatment plants, posing water quality supply problems that are not quantified or addressed by EPA. Many others pass through current treatment systems into the environment, posing substantial individual and cumulative impacts.

- On site "reuse" or "recycling" facilities that use fracking wastewater do not require National Pollution Discharge Elimination System permits but should because they are point discharges of pollutants. EPA has the authority to insist on adequate regulation and oversight of these reuse facilities which have become more common in states such as Pennsylvania, but takes hands-off approach to this hole in wastewater treatment accountability and monitoring data generation, as well as not giving due attention to this practice as a potential contamination source in the report.

There are many other examples of how EPA sidestepped or glossed over the facts as detailed in our written comment submitted in August containing expert reports by Tom Myers, PhD., hydrogeologist, and Marvin Resnikoff, PhD., radioactive waste expert.

We respectfully request that EPA withdraw its unsubstantiated conclusion and not issue a final assessment based on this draft.

Thank you for the opportunity to comment on behalf of the members of Delaware Riverkeeper Network.

[6] http://pubs.acs.org/doi/abs/10.1021/es402165b?journalCode=esthag