August 26, 2015

Submitted to U.S. Environmental Protection Agency re. Environmental Assessment of the Potential Impacts of Hydraulic Fracturing for Oil and Gas on Drinking Water Resources:

Delaware Riverkeeper Network submits these comments and the attached expert reviews of the U.S. Environmental Protection Agency's (EPA) report on the potential impacts of Hydraulic Fracturing. Delaware Riverkeeper Network commissioned these reports for submission to EPA during the agency's public comment period on the Environmental Assessment of the Potential Impacts of Hydraulic Fracturing for Oil and Gas on Drinking Water Resources by the Environmental Protection Agency. The reports are entitled:

Technical Memorandum: Review of Assessment of the Potential Impacts of Hydraulic Fracturing for Oil and Gas on Drinking Water Resources, Tom Myers, PhD., August 2015.

Technical Review Memorandum: Environmental Assessment of the Potential Impacts of Hydraulic Fracturing for Oil and Gas on Drinking Water Resources by the Environmental Protection Agency, Marvin Resnikoff, Ph.D., Radioactive Waste Management Associates, August 2015.

Also attached is a report produced with funding from the Delaware Riverkeeper Network that examines the potential impacts of shale gas development should the moratorium in the Delaware River Watershed be lifted. The report is entitled:

The Potential Environmental Impact from Fracking in the Delaware River Basin, Steven Habicht, Lars Hanson and Paul Faeth, CNA, August 2015.

The primary conclusions that DRN reached based on these reports are:

There is enough known about the hydraulic fracturing (fracking) process to know that water resources are at risk from the development of natural gas by fracking. Millions of gallons of toxic fluid are injected into the ground, some very near groundwater resources or near pathways that will connect to groundwater resources. Naturally occurring deep geology pollutants are disturbed and mobilized by the fracking process, including highly dangerous radium and other hazardous materials, as well as methane. The process significantly changes the hydrogeology of the formations so that natural flow patterns will change.

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The process also significantly changes the geochemistry of the fluids, rendering some very toxic. Flow along pathways may take a long time (or can occur quickly) but once contaminants reach water supplies and surface water ecosystems the effects could be devastating. Contamination of water sources has been documented where fracking occurs.
http://files.dep.state.pa.us/OilGas/BOGM/BOGMPortalFiles/OilGasReports/Determination_Letters/Regional_Determination_Letters.pdf

Stray migration of methane and other gases to groundwater and to the surface are a known problem and can happen immediately or over time.
http://www.portal.state.pa.us/portal/server.pt/document/1472044/2013_oil_and_gas_annual_report_pdf?qid=94516901&rank=1 P 21.

There is simply no planning or even acknowledgement by the industry or EPA regarding these long-term effects. EPA does not examine the impacts of incidents of contamination and pollution releases on water resources from a cumulative point of view (only looks at one well at a time). EPA does not examine the impacts of incidents of contamination and pollution releases on water resources with a broad view (such as impacts outside of 1 mile from a gas well), and does not take a long term look (such as over a period of time that can accurately track the migration and ultimate fate of contaminants). Pollutants, depending on their mobility, persistence, and level of toxicity, can move both slowly and in slugs through groundwater, requiring monitoring at various times and locations and for a long period to assess the individual as well as cumulative impacts and synergistic effects of gas wells on aquifers. In water and air and on soil, vegetation and land surfaces, contaminants must be monitored from point and time of release to final end point and over time to accomplish a reliable assessment.

Contaminants in produced water "…can include, but are not limited to: salts (chlorides, bromides, and sulfides of calcium, magnesium, and sodium); metals (including barium, manganese, iron, and strontium); oil, grease, and dissolved organics (including benzene and toluene); naturally occurring radioactive materials; and production chemicals from hydraulic fracturing…Exposure to these contaminants at high levels may pose risks to human health and the environment" (U.S. Dept. of Energy, Argonne National Laboratory, "A White Paper Describing Produced Water from Production of Crude Oil, Natural Gas, and Coal Bed Methane", January 2004).

For example, radioactivity is naturally high in many shales, especially the Marcellus (US General Accountability Office, "Information on the Quantity, Quality, and Management of Water Produced During Oil and Gas Production", GAO-12-56, January 2012). This results in produced water with high concentrations of radioactivity (New York State Department of Environmental Conservation, "Revised Draft Supplemental Generic Environmental Impact Statement on the Oil, Gas, and Solution Mining Regulatory Program, Well Permit Issuance for Horizontal Drilling and High-Volume Hydraulic Fracturing to Develop the Marcellus Shale and other Low-Permeability Gas Reservoirs", September 2011, Ch 5).

This produced water has high concentrations of radium-226 and its decay products. 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, 5 pCi/L (40 CFR 141.66(b)). 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 does not address the danger of bringing these radioactive elements to the surface or acknowledge the health effects; radium concentrates in bone and increases the likelihood of cancers like leukemia. The radioactive decay product of radium is radon, which is very dangerous and is the second leading cause of lung cancer in the United States http://www.epa.gov/radiation/radionuclides/radium.html#inbody.

EPA does not track these dangerous radioactive materials from their source (wastewater produced by fracking shale) to their end point (including landfills, processing facilties, centralized wastewater treatment plants, land application or burial, air dispersion, and deep well injection). This failure to following the waste stream from start to finish is a fatal flaw of EPA's assessment. For example, centralized wastewater treatment plants do not capture radium and yet we do not know where that radium has gone. It cannot disappear once it is brought to the surface by fracking; it remains in the environment. Some forms, such as radium 226, the longest lived isotope of radium with a half-life of 1600 years, are extremely durable and pose long-term exposure problems for human health and the environment. EPA must perform a full radium audit in order for the report to be considered complete.

There is simply too little known about the fracking process to have widespread assurance that it is by any measure safe. Large-scale groundwater and surface water monitoring networks are necessary, with a recognition that long flow times may cause contamination to occur far into the future. Details of what happens underground during fracking should be studied with more emphasis on hydrogeology, not just engineering properties.

To understand the potential and actual impacts of fracking, the chemicals that are used in fracking and drilling must be fully disclosed and their properties known and understood. Only 8% of the 1076 chemicals identified in HF fluid have published toxicological values in any source, federal or international (EPA p 10-8). Only 7% of them have toxicological values published in U.S. federal sources (Id.). The identification of toxicological properties of fracking chemicals should be required for all chemicals being injected; without this information, EPA cannot accurately assess the potential impacts. EPA should also provide the toxicity properties of the chemicals they know are being used, which would help to assess their impacts and potential health effects.

Two other important areas of analysis that should have been included in the EPA report but were not add to the reasons the EPA assessment is incomplete and invalid.

First, the connection between land use changes and water quality is well established by scientific literature and studies by EPA. Yet EPA does not consider the inescapable disturbance of the environment that fracking requires and the impacts this has on water resources. The attached report "The Potential Environmental Impact from Fracking in the Delaware River Basin" provides an analysis based on data from Marcellus Shale well development in Pennsylvania that explains the impacts to water quality that result from land cover changes, among other things (CNA, 2015). The analysis is based on current data, on the assumptions that all regulations are followed and all management practices correctly implemented. The degradation to water resources is forecasted to be substantial and, in many crucial aspects, permanent.

There are other related activities that have impacts on water that are an inextricable part of the fracking process but are not considered by EPA including sand-mining, water withdrawals and depletion, transport and storage of materials, and essential infrastructure development. It is difficult to understand why EPA does not include these impacts and the knock-on effects they have on water resources. The CNA report examines some of these impacts (CNA, 2015). EPA's assessment is simply not complete without these components.

Second, the lack of any inclusion of the health effects of fracking is a major oversight that cripples the report and undermines its credibility. 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.

The CNA report documents the health risks of fracking to populations within certain distances from gas wells, based on scientific literature (CNA 2015). EPA should have assessed health effects based on the studies that are emerging on actual health data and reports in areas undergoing fracking, many of which are referenced in the CNA report and are available on the PSE website www.psehealthyenergy.org.

Delaware Riverkeeper Network advocates that EPA reexamine the scope of this assessment, which is far too narrow to result in an accurate and reliable conclusion regarding the potential impacts of fracking. For instance, the critical before and after analysis of fracking and its impacts that were to be done at an actual fracked gas well was never done. It was disclosed by EPA almost two years ago that due to a lack of agreement with Range Resources, where the *in situ* analysis was to be conducted, the groundwater portion of the assessment would not be done prior to the release of the report. It was unclear if it would ever be conducted as planned. The report simply should not have been issued without that key analysis. Certainly, no conclusions about the potential for groundwater impacts could be drawn without that analysis and a full examination of the hydrogeologic effects of fracking.

Additionally, the lack of access to essential data such as chemical formulas used in fracking, monitoring and sampling results at all stages of fracking and well development (including the waste stream), and uniformly reported facts about fracked wells from all states in the nation, cripples this effort and yields a fatally flawed assessment. It is puzzling why EPA draws a conclusion about "systemic" impacts when no systemic analysis has been done.

Delaware Riverkeeper Network submits these attached reports which address these issues in great detail. These reports examine data that undermine the conclusions drawn by EPA in this assessment. The reports also provide input regarding the data and information that is missing or poorly analyzed in the EPA assessment. We request that EPA not issue a final assessment based on this draft and instead start over with a more reliable scope, all necessary data, and on-the-ground studies that will provide the information needed for an accurate and reliable assessment.

This task is of great importance to our nation, the communities that are being and will be impacted by fracking, and the current and future quality of our environment and water resources. We respectfully request that an assessment be conducted that provides what we all need to know to inform the highly consequential and long-lived decisions that are being made regarding fracking for shale gas in the United States.

Respectfully submitted,

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Attachments loaded separately to web portal:

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