Docket ID: EPA-HQ-OA-2015-0245

Comments of Partnership for Policy Integrity on EPA's Draft Assessment of the Potential Impacts of Hydraulic Fracturing for Oil and Gas on Drinking Water Resources

August 28, 2015

Thank you for the opportunity to comment on the EPA's Draft Assessment of the Potential Impacts of Hydraulic Fracturing for Oil and Gas on Drinking Water Resources. The Partnership for Policy Integrity provides science and legal support so that citizen groups, environmental organizations, and policymakers can better understand energy development impacts on air quality, water quality, ecosystems, and the climate.

We have a decade of experience researching oil and natural gas drilling and hydraulic fracturing including impacts of these energy extraction techniques on water quality.

While the EPA's draft study contains a significant amount of valuable information for citizens, scientists, media outlets and policymakers seeking a better understanding of hydraulic fracturing's impacts on drinking water supplies, the study can be significantly improved. In the final report, EPA should:

1. Rewrite the sentence which concludes about the various elements of hydraulic fracturing that EPA examined: "we did not find evidence that these mechanisms have led to widespread, systemic impacts on drinking water resources in the United States." This sentence is misleading and does not reflect the findings of the study.
2. Include an assessment of the risks from underground injection of wastewater from hydraulic fracturing operations. The agency provides evidence that this wastewater contains toxic chemicals and that more than 98 percent of it is injected for disposal in underground wells.*(see below) EPA, itself, has previously found that migration of such wastewater from these wells has contaminated groundwater. Analysis of this pollution pathway would significantly add to information about risks to drinking water posed by hydraulic fracturing.
3. Revisit the decision to limit the analysis of spills and leaks to those that occur on or near the well pad and include in the final report all spills and leaks related to bringing materials to the well pad or hauling wastes away from the well pad. This decision to limit the analysis of spills and leaks appears to be arbitrary and inconsistent considering that the agency analyzes other elements of hydraulic fracturing that occur some distance from well pads such as disposal of wastewater in wastewater treatment plants. As a result of this methodology, thousands of relevant spills may have been excluded from the study.
4. Require chemical companies to provide more specific generic names of hydraulic fracturing chemicals that companies keep hidden from the public.
5. Revisit the decision to list only the public water sources within one mile of a hydraulically fractured well and consider listing water sources within a greater distance of water wells. The U.S. Geological Survey noted that in some cases in New York state, fracking operations could impact water sources within five square miles.

6. Analyze the risks to water of chemicals used during the drilling process that must necessarily precede hydraulic fracturing.
7. Make clear that this study is only a starting point and follow this study with on-the-ground research on a statistically significant sample of wells to fill data gaps. If such research is rendered impossible due to lack of drilling industry cooperation, document and publish such lack of cooperation. The lack of such on-the-ground science in this study is disappointing. According to reporting by Inside Climate News, it was largely the result of failure to cooperate by the drilling industry.

1. EPA should rewrite the sentence which concludes about the various elements of hydraulic fracturing that EPA examined: "we did not find evidence that these mechanisms have led to widespread, systemic impacts on drinking water resources in the United States." The sentence implies that there is available evidence that enabled EPA to make such a conclusion, however the agency states multiple times throughout the draft study that while a variety of risks and harms to water from hydraulic fracturing are documented, there are too many data gaps to draw broad conclusions about the scope or frequency of pollution. For example, the agency writes that

- "Factors affecting the frequency and severity of impacts to drinking water resources from surface spills include size and type of operation, employee training and experience, standard operating procedures, quality and maintenance of equipment, type and volume of chemical spilled, environmental conditions, proximity to drinking water resources, spill prevention practices, and spill mitigation measures. Due to the limitations of available data and the scope of this assessment, it is not possible to provide a detailed analysis of all of the factors listed above. Data limitations also preclude a quantitative analysis of the likelihood or magnitude of chemical spills or impacts."[1]
- "The EPA evaluated data from FracFocus 1.0, a national hydraulic fracturing chemical registry used and relied upon by some states, industry groups and non-governmental organizations. A company submitting a disclosure to FracFocus may choose to not report the identity of a chemical it considers CBI [confidential business information]. As part of the EPA's analysis, more than 39,000 FracFocus 1.0 disclosures over the period January 1, 2013 to March 1, 2013 were analyzed and more than 70% of disclosures contained at least one chemical designated as CBI. Of the disclosures containing CBI chemicals, there was an average of five CBI chemicals per disclosure (U.S. EPA, 2015a). The prevalence of CBI claims in FracFocus 1.0 limits completeness of the data set."[2]
- "Spills of hydraulic fracturing fluids have occurred across the country and have affected the quality of drinking water resources (U.S. EPA, 2015n; Brantley et al., 2014; COGCC, 2014; Gradient, 2013). Spills may infiltrate drinking water resources by reaching surface water, or by leaching into the ground water. Potential impacts depend upon a variety of factors including the chemical spilled, environmental conditions, and actions taken in response to the spill. However, due to a lack of available data, little is known about the prevalence and severity of actual drinking water impacts.[3]"

[1] U.S. Environmental Protection Agency, Draft Assessment of the Potential Impacts of Hydraulic Fracturing for Oil and Gas on Drinking Water Resources at 5-2 [hereinafter EPA Draft].
[2] EPA Draft at 5-15.
[3] Id. at 5-42.

- "Figure 5-15 presents the number of chemical or fracturing fluid spills that reached environmental receptors, by receptor type….The data contain few post-spill analyses, so ground water contamination may have occurred but have not been identified. Additionally, several years may be required for a spilled fluid to leach into the ground water and therefore impact on a ground water receptor may not be immediately apparent."[4]
- "There has been limited peer-reviewed research investigating the fate and transport of chemicals spilled at hydraulic fracturing sites."[5]
- "The lack of information regarding the composition of chemical additives and fracturing fluids, containment and mitigation measures in use, and the fate and transport of spilled fluids greatly limits our ability to assess potential impacts to drinking water resources."[6]
- "In general, then, we are limited in our ability to fully assess potential impacts to drinking water resources from chemical spills, based on available current information."[7]
- "There are other cases in which production wells associated with hydraulic fracturing are alleged to have caused drinking water contamination. Data limitations in most of those cases (including the unavailability of information in litigation settlements resulting in sealed documents) make it impossible to definitively assess whether or not hydraulic fracturing was a cause of the contamination in these cases."[8]
- "Generally, less is known about the occurrence of (or potential for) impacts of injection-related pathways in the subsurface than for other components of the hydraulic fracturing water cycle, which can be observed and measured at the surface. Furthermore, while there is a significant amount of information available on production wells in general, there is little information that is specific to hydraulic fracturing operations and much of this data is not readily accessible, i.e., in a centralized, national database."[9]
- "Although it is collected in some cases, there is also no systematic collection, reporting, or publishing of empirical baseline (pre-drilling and/or pre-fracturing) and post-fracturing monitoring data that could indicate the presence or absence of hydraulic fracturing-related fluids in shallow zones and whether or not migration of those fluids has occurred. Ideally, data from ground water monitoring are needed to complement theories and modeling on potential pathways and fluid migration."[10]
- "The limited amount of information hinders our ability to evaluate whether—or how frequently—drinking water impacts are occurring (or the potential for these impacts to occur) or to tie possible impacts to specific well construction, operation, or maintenance practices. This also significantly limits our ability to evaluate the aggregate potential for hydraulic fracturing operations to affect drinking water resources or to identify the

[4] Id. at 5-46.
[5] Id. at 5-66.
[6] Id. at 5-73.
[7] Id. at 5-74.
[8] Id. at 6-53.
[9] Id. at 6-55.
[10] Id. at 6-56.

potential cause of drinking water contamination or suspected contamination in areas where hydraulic fracturing occurs."[11]

- "Nationwide data on spills of flowback and produced water are limited in two primary ways: the completeness of reported data cannot be determined, and individual states' reporting requirements differ (U.S. EPA, 2015n). Despite various studies, the total number of spills occurring in the United States, their release volumes and associated concentrations, can only be roughly estimated because of underlying data limitations."[12]
- "There is limited information regarding the influents and effluents from facilities that treat wastewater from hydraulic fracturing operations."[13]
- "Across the industrial landscape, thousands of chemicals are used commercially that lack toxicity data (Judson et al., 2009). Similarly, major knowledge gaps exist regarding the toxicity of most chemicals used in hydraulic fracturing fluids or detected in flowback/produced water, impeding the assessment of human health risks associated with drinking water resources affected by hydraulic fracturing."[14]
- "The EPA has identified 1,173 chemicals used or detected in the hydraulic fracturing water cycle. Toxicity-based chronic RfVs [reference values] and/or OSFs [oral slope factors] from sources meeting selection criteria are not available for the large majority (87%) of these chemicals. In addition, 56% of these chemicals do not have physicochemical property data. Furthermore, 36% of the chemicals used in hydraulic fracturing fluids lack data on their nationwide frequency of use, and very few studies have analyzed the chemical composition of flowback and produced water. Given the large number of chemicals used or detected in various stages of the hydraulic fracturing water cycle, as well as the large number of hydraulic fracturing wells nationwide, this missing chemical information represents a significant data gap. Because of these large data gaps for drinking water resources, it remains challenging to fully understand the toxicity and potential health impacts for single chemicals as well as mixtures of chemicals associated with hydraulic fracturing processes."[15]
- "However, there are limited data on the composition of hydraulic fracturing wastewater, particularly for organic constituents. It is unknown whether advanced treatment systems are effective at removing constituents that are generally not tested for."[16]

EPA should simply state that in addition to finding incidents of pollution, there are too many data gaps to draw broad conclusions about whether impacts on drinking water resources in the United States from hydraulic fracturing are widespread or systemic. More research is needed.

2. EPA should include in the final study an assessment of the risks from underground injection of wastewater from hydraulic fracturing operations. The agency provides evidence that this wastewater can contain toxic chemicals including carcinogenic benzene and radioactive

[11] Id. at 6-57.
[12] Id. at 7-45.
[13] Id. at 8-74.
[14] Id. at 9-35.
[15] Id. at 9-39.
[16] Id. at 10-16.

materials.[17] In addition, data indicate that drilling companies generate as much as hundreds of billions of gallons of wastewater per year from drilling and fracking[18] and that more than 98 percent of this wastewater is injected for disposal in underground wells.[19]*(see below) Therefore, there might be great potential for water contamination if this wastewater were to migrate into underground sources of drinking water following injection. EPA, itself, has previously found that such contamination has occurred. In a 1987 report to Congress on oil and natural gas wastes, EPA provided several examples of groundwater contamination from injection disposal wells and explained how such contamination might occur. [20] A 1985 report from the Texas Department of Agriculture found similar cases of pollution.[21] In 1989, the General Accounting Office (now the Government Accountability Office) reported additional cases of groundwater pollution from underground injection of oil and natural gas drilling wastewater, several of them severe.[22]

More recently, the news organization, ProPublica conducted an investigation suggesting that groundwater contamination problems from injecting oil and natural gas drilling and fracking wastewater underground have continued into the present day. The news organization reported that when it comes to all types of injection disposal wells including those used for oil and natural gas drilling and fracking wastewater, the agency "has not counted the number of cases of waste migration or contamination in more than 20 years." ProPublica also found that "between 2008 and 2011, state regulators reported 150 instances of what the EPA calls 'cases of alleged contamination,' in which waste from injection wells purportedly reached aquifers. In 25 instances, the waste came from Class 2 wells [used to dispose of oil and natural gas drilling and fracking wastewater]. The EPA did not respond to requests for the results of investigations into those incidents or to clarify the standard for reporting a case."[23]

Given the risks and evidence for harm, EPA should include an analysis of risks from the underground injection of hydraulic fracturing wastes in its final report. It is unclear why EPA would analyze risks from other means of wastewater disposal while omitting such an analysis of underground injection that accounts for disposal of the vast majority of wastewater.

3. EPA should revisit its decision to limit the analysis of spills and leaks to those that occur on or near well pads and should include in the final report all spills related to bringing materials to the well pad or hauling wastes away from the well pad. EPA deserves credit for analyzing the hydraulic fracturing process from acquisition of water to the disposal of wastewater. However,

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[17] Id. at 7-46 and 7-47.
[18] Id. at 8-4, 8-20.
[19] Id. at 8-20, 8-68.
[20] U.S. Environmental Protection Agency, Report to Congress: Management of Wastes from the Exploration, Development and Production of Crude Oil, Natural Gas, and Geothermal Energy (December 1987) at III-39; III-47,48; IV-40; IV-46; IV-53,54; IV 65, 66.
[21] Texas Department of Agriculture, Agricultural Land and Water Contamination from Injection Wells, Disposal Pits, and Abandoned Wells Used in Oil and Gas Production (1985) at 10-15.
[22] General Accounting Office, Safeguards Are Not Preventing Contamination From Injected Oil and Gas Wastes (1989) http://www.gao.gov/products/RCED-89-97.
[23] Abrahm Lustgarten, Injection Wells: The Poison Beneath Us, ProPublica (June 21, 2012). Accessed online August 28, 2015 at http://www.propublica.org/article/injection-wells-the-poison-beneath-us.

EPA's decision to limit the spills analyzed in the report appears to be arbitrary and inconsistent with this approach considering that the agency analyzes other elements of the hydraulic fracturing process such as disposal of wastewater in wastewater treatment plants or spreading of wastewater on roads that occur some distance from well pads. As a result of this methodology, thousands of spills were likely excluded from this study, at least some of which might have polluted drinking water. EPA reported that it used data from nine states that showed 36,000 spills between 2006 and 2012, apparently in oil and gas operations generally. The agency said that it winnowed that number to 457 "occurring on or near the well pad before or during the injection of hydraulic fracturing fluids or during the post-injection recovery of fluids."[24] This methodology excludes spills in the transport of chemicals or wastewater to and from well sites, spills of drilling fluids, spills at underground injection disposal wells and spills of diesel fuel that are required to operate machinery on site. These quantities of diesel can be extremely large and spills of diesel have occurred at well sites. The methodology should be expanded to encompass spills that are inherently related to hydraulic fracturing from obtaining the water to inject into the well and transporting chemicals and diesel fuel to the well to hauling away and disposing of wastewater. In general, EPA should assess all aspects of the hydraulic fracturing process that could pollute drinking water so that citizens and policymakers can have as clear an understanding as possible about the risks to drinking water.

4. EPA should require chemical companies to provide more specific generic names of hydraulic fracturing chemicals that companies keep hidden from the public. Chemical companies are allowed to protect the identities of their chemicals as confidential business information under certain conditions, one of which is that the company make public a generic name of the chemical. EPA states that in such cases, "this name should be only as generic as is necessary to protect the confidential chemical identity, and should reveal the chemical identity of the substance to the maximum extent possible… If the name seems more generic than necessary, EPA will contact you to develop an adequate name." As an example, EPA writes that "hydrogenated palm-oil fatty acids, esters with D-mannitol, ethoxylated, could become: hydrogenated fatty acids, esters with hexahydroxyalkane, ethoxylated."[25] A review of the generic names of the chemicals used in hydraulic fracturing fluids provided to EPA as part of the study shows many names that appear too generic. This list includes at least:[26]

Alcohols
Alkanes/alkenes
Alkenes
Biocide
Cationic polymer
Carbohydrates
Ceramic
Common white
Complex carbohydrate

[24] EPA Draft at 5-42, 5-43.
[25] U.S. Environmental Protection Agency, Instruction Manual for Reporting Under the TSCA § 5 New Chemicals Program, at 42-43. Accessed online August 28, 2015 at http://www.epa.gov/oppt/newchems/pubs/tscaman2.pdf.
[26] EPA Draft at Appendix A, Table A-3.

Emulsifier
Enzyme
Epoxy
Epoxy resin
Essential oils
Esters
Ether compound
Fatty acids
Inorganic chemical
Inorganic particulate
Inorganic salt
Low toxicity base oils
Metal salt
Metal salt solution
Organic polymer
Organic salt
Plasticizer
Polymer
Polysaccharide
Polysaccharide blend
Potassium chloride substitute
Resin
Quaternary compound
Quaternary salt
Salts
Secondary alcohol
Silicone emulsion
Substituted alcohol
Substituted alkene
Substituted alklyamine
Substituted alkyne
Sulfate
Sulfonate
Surfactant blend
Surfactants
Synthetic copolymer
Synthetic polymer

5. EPA should revisit its decision to list only the public water systems within a one-mile radius of a hydraulically fractured well[27] and should consider adding a separate list of public water systems within a greater distance from hydraulically fractured wells, perhaps within a radius of five miles. In comments on New York state's draft plan for high-volume hydraulic fracturing for natural gas in the Marcellus shale, the U.S. Geological Survey noted that in some cases in New

[27] Id. at 3-7.

York, fracking operations could impact water sources within five square miles. "Additional protection should be considered for those upland watersheds that contribute water directly to public groundwater supplies," the agency wrote. "Ideally, these watersheds should be afforded the same protection as hillside areas. Exclusion of well pads in contributing tributary watersheds less than 5 mi^2 or the lower 5 mi^2 of larger tributary watersheds would provide a reasonable degree of public-water-supply protection."[28] EPA should list the public water systems within a distance from hydraulic fracturing operations that might provide cause for concern.

6. EPA should analyze the risks to water of chemicals used during the drilling process that must necessarily precede hydraulic fracturing. As EPA suggests, when wells are drilled, the drilling often goes directly through groundwater sources before any steel casing or cement can be installed that would seal off groundwater sources from chemicals in the well.[29] Drilling companies use chemicals during the drilling process that could impact these underground water sources.[30] Such an analysis would illuminate risks and could help policymakers pinpoint safety measures to reduce risks of water contamination.

7. EPA should make clear that this study is only a starting point and follow this study with on-the-ground research on a statistically significant sample of wells. EPA has emphasized how many data gaps there are in our knowledge of risks to drinking water from hydraulic fracturing. A priority for the agency ought to be closing these gaps so that EPA and others can adopt science-based policies to protect water supplies. If such research is rendered impossible due to lack of drilling industry cooperation, as was reported by Brooklyn-based Inside Climate News, EPA should document and publish such lack of cooperation.[31]

Thank you for the opportunity to comment. Please contact me if you have any questions.

Sincerely,

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* Added post-submission: This sentence should be corrected to say that "billions of gallons of fracking wastewater are likely injected for disposal in underground wells" rather than using the

[28] U.S. Geological Survey, New York Water Science Center Comments on the Revised Draft Supplemental Generic Environmental Impact Statement (2011), at 6.
[29] EPA Draft at 2-10.
[30] EPA Draft at 2-10.
[31] Neela Banerjee, Can Fracking Pollute Drinking Water? Don't Ask EPA, Inside Climate News (Mar. 2, 2015). Accessed online Aug. 28, 2015 at http://insideclimatenews.org/news/02032015/can-fracking-pollute-drinking-water-dont-ask-epa-hydraulic-fracturing-obama-chesapeake-energy.

98 percent figure. The 98 percent figure, from a study cited by EPA, refers to produced water from onshore wells that was already in the oil or gas formation before drilling began.[32] This water comes to the surface during drilling and fracking operations and is treated as waste. In this case, produced water is distinct from, and additional to, flowback, the portion of the fracking fluid injected into the well for hydraulic fracturing that comes to the surface as waste when the fracturing is complete.[33] The authors of the study from which the 98 percent figure was taken estimate that about 60 percent of the produced water was reinjected into wells for enhanced oil recovery and 40 percent was injected into underground disposal wells.[34] Their estimates may include significant amounts of produced water from wells that were not fractured and thus their estimates may not be directly relevant to EPA's study.[35] Based on 1) EPA's estimates that the number of fractured wells was likely 25,000 to 30,000 per year between 2011 and 2014,[36] 2) data that a significant percentage of all wells are fractured,[37] 3) that such wells produce at least hundreds of thousands of gallons of wastewater,[38] and that a significant percentage of this wastewater is injected for disposal in underground wells,[39] it is likely that billions of gallons of wastewater are injected into underground wells for disposal.

[32] C.E. Clark and J.A. Veil. Produced Water Volumes and Management Practices in the United States, U.S. Department of Energy, Office of Fossil Energy, National Energy Technology Laboratory (Sept. 2009).
[33] Id. at 18-19.
[34] Id. at 8.
[35] EPA Draft Study at 8-4.
[36] Id. at 2-33.
[37] Id. at 2-27 and 2-28.
[38] Id. at 7-4 through 7-6.
[39] Id. at 8-12.