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September 28, 2010

Jill Dean
Office of Water
U.S. Environmental Protection Agency
1200 Pennsylvania Ave., NW
Mailcode 4606M
Washington, DC 20460

Re: Comments on the Proposed Criteria for Selecting Case Studies and Proposed Study Design for EPA's Hydraulic Fracturing Study.

Dear Ms. Dean:

Riverkeeper, Inc. is an environmental watchdog organization dedicated to protecting the Hudson River and the 2,000-square-mile New York City Watershed that supplies unfiltered drinking water to more than nine million New Yorkers. For decades, Riverkeeper has worked with local, state and federal agencies on a variety of enforcement and permitting issues to further our mission to protect water quality. We are a founding member of the Waterkeeper Alliance, a global environmental movement uniting more than 190 Waterkeeper organizations around the world.

For the past two years we have been engaged in the issue of high-volume hydraulic fracturing and horizontal drilling. The more we learn about industrial gas production, the more we are concerned about impacts to groundwater, surface water, and drinking water resources, along with threats to air quality, landscapes, and human health.

We commend EPA's decision to study potential risks posed by all aspects of hydraulic fracturing by analyzing impacts through the entire natural gas production cycle. A full

life cycle analysis is needed because it is imperative that we comprehensively evaluate the full range of potential environmental impacts from gas exploration and production, including hydraulic fracturing, and identify practices to prevent impacts before they occur. Unfortunately, most states have allowed extensive industrial gas production operations to proceed without attempting to study and/or mitigate environmental impacts.

The approach taken by most states thus far flies in the face of the Precautionary Principle, a fundamental and globally recognized scientific and legal policy that underlies nearly all of our nation's environmental laws. The Precautionary Principle dictates that where there is scientific uncertainty concerning a proposed action, the proponent of such action bears the burden of proving that the activity will not be harmful. In such instances, the role of decision makers is to err on the side of protecting public health and the environment and to respond aggressively to low probability, high-impact events. Taking lead out of gasoline is the classic domestic example.[1] At a minimum, the Precautionary Principle is about prudent decision making. Therefore, studying potential impacts to drinking water before employing specific technologies on a grand scale is the proper course of action. We urge EPA to highlight the benefits of this approach in the course of its study of hydraulic fracturing.

Pursuant to a Federal Register Notice published June 21, 2010 (75 Fed. Reg. 35024),[2] we hereby submit written information to evaluate and comment on the EPA Office of Research and Development's (ORD) planned research study of the potential public health and environmental protection issues that may be associated with hydraulic fracturing. EPA called for comments on two documents, the "Proposed Criteria for Selecting Case Studies for the EPA Hydraulic Fracturing Study" and the "Proposed Study Design for the EPA Hydraulic Fracturing Study."[3] Each document seeks specific input by presenting several questions. Accordingly, the undersigned organizations offer the following comments on EPA's proposed hydraulic fracturing research study for the Science Advisory Board's (SAB) consideration.

I. Proposed Study Design for the EPA Hydraulic Fracturing Study

As a preliminary matter, we support EPA's research approach to analyze how the entire process of hydraulic fracturing may impact groundwater and surface water drinking supplies. The procedure of hydraulic fracturing, during which water, sand and toxic chemicals are injected into natural gas reserves under high pressure, is but one way in which the entire hydraulic fracturing process can impact groundwater and surface waters. Rather than narrowly focusing solely on the limited process of injecting fluids and sand

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[1] *Ethyl Corp. v. EPA*, 541 F.2d 1, (D.C. Cir. 1976) (court acknowledged the high degree of scientific uncertainty, but upheld EPA's decision to regulate lead in gasoline). "Man's ability to alter his environment has developed far more rapidly than his ability to foresee with certainty the effects of his alterations." *Id.* at 6.

[2] *See* Informational Public Meetings for Hydraulic Fracturing Research Study, *available at* http://edocket.access.gpo.gov/2010/pdf/2010-14897.pdf.

[3] *See* Stakeholder Involvment Strategy, *available at* http://water.epa.gov/type/groundwater/uic/class2/hydraulicfracturing/wells_hydroout.cfm.

under high pressure, it is imperative to use a broad, comprehensive lifecycle assessment approach when researching the process and impacts of hydraulic fracturing. Specifically, it is necessary to consider storage and disposal of hydraulic fracturing fluids, wastewater and solid wastes – including the use and contents of open air pits, on-site burial of drilling cuttings – and all potential pathways for environmental impacts from the use of these technologies, including all facets of the exploration, production, and post-production activities.

A. Can you suggest additional pathways of exposure that could impact drinking water resources from the hydraulic fracturing process?

The impacts to drinking water resources are not the only impacts of hydraulic fracturing that should be considered. Case studies have demonstrated impacts to groundwater, surface water, air, and soil. These impacts result from deforestation, road-building, water withdrawals, improper cementing and casing of wells, over-pressurized wells, gas migration from new and abandoned wells, the inability of wastewater treatment plants to treat flowback and produced water, underground injection of brine wastewater, improper erosion and sediment controls, truck traffic, compressor stations, the burial of drilling cuttings, and accidents and spills. All of these potential pathways should be examined.

B. In your experience, what are the most important processes and pathway(s) of exposure that would adversely impact drinking water resources?

Several pathways of exposure have resulted in adverse impacts to drinking water resources. Gas migration, spills, faulty storage and improper disposal of produced water, and inadequate erosion and sediment controls are among the most important pathways. Each hydraulic fracturing process and each potential pathway of exposure should be studied and regulated to prevent adverse impacts to water resources.

Land disturbance and its associated stormwater impacts must be considered when studying the impacts of hydraulic fracturing to surface water quality in potentially impacted surface water resources. The substantial truck traffic, stormwater runoff, wastewater treatment and disposal, on-site spills and leaks, large well pads, and other activities make hydraulic fracturing a significant threat to unfiltered surface drinking water supplies. The addition of impervious surfaces to create access roads in watershed lands adversely impacts water quality, aquatic ecosystems, stormwater control, streambank stabilization, soils, vegetation, and human health. Stormwater impacts associated with the addition of impervious surfaces for access roads, well pads and appurtenances also must be considered. Furthermore, the substantial trucking activity and its potential impacts to surface drinking water supplies must be studied; this includes increased stormwater runoff and the potential for spills when hauling wastewater away from a well pad.[4]

[4] *See*: Riverkeeper, Comments on the New York State Department of Environmental Conservation 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 (hereinafter "Riverkeeper DSGEIS

In its comments on the NY DSGEIS, the New York City Department of Environmental Protection (NYCDEP) reported that "casing or grouting failures, existing subsurface fractures, and fractures created during stimulation that propagate beyond the target formation can create or enhance hydraulic pathways between previously isolated [shale] formations. These pathways can allow drilling and fracturing chemicals or formation material (e.g., hydrocarbons or saline water) to contaminate shallow groundwater and surface water resources."[5] The NY DSGEIS also conceded that "[r]easonably anticipated water resources impacts relate to water withdrawals for hydraulic fracturing; stormwater runoff; surface spills, leaks and pit or surface impoundment failures…"[6] and "[s]pills or releases can occur as a result of tank ruptures, equipment or surface impoundment failures, overfills, vandalism, accidents (including vehicle collisions), ground fires, or improper operations. Spilled, leaked or released fluids could flow to a surface water body or infiltrate the ground, reaching subsurface soils and aquifers."[7]

In addition, withdrawal of surface water or groundwater for high volume hydraulic fracturing can impact the recharging capacity of wetland resources. "It is therefore important to understand the hydrologic relationship between the surface water, groundwater, and wetlands within a watershed to appropriately manage rates and quantities of water withdrawal."[8]

C. What current practices in your region do you think pose the most threat to drinking water resources from hydraulic fracturing?

The transportation, injection and disposal of fracturing fluid pose a major threat to drinking water resources. Hydraulic fracturing can require up to five million gallons of water per hydrofrack, and typically each well is fractured many times. Operators must truck in water and chemicals, store them on-site, and properly dispose of the waste (much of the injected fracturing fluid returns to the surface, along with produced water containing significant contaminants including brines, heavy metals, radionuclides and organics.) Even though the gas industry claims that toxic chemicals represent less than 1% of the fracturing fluid, the U.S. Geological Survey explains that a typical three-million-gallon hydrofrack results in 15,000 gallons of chemical waste.[9] In existing

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Comments") (December 28, 2009), *available at* http://www.riverkeeper.org/wp-content/uploads/2010/01/Riverkeeper-DSGEIS-Comments-12-28-09.pdf. *See also*, NRDC Comments on Draft Supplemental Generic Environmental Impact Statement on the Oil, Gas, and Solution Mining Regulatory Program (December 31, 2009) (hereinafter "NRDC DSGEIS Comments"), *available at* http://docs.nrdc.org/energy/files/ene_10010401a.pdf

[5]New York City Department of Environmental Protection, Rapid Impact Assessment Report (2009), at ES-3, hereinafter "DEP Report," *available at*, http://www.nyc.gov/html/dep/pdf/natural_gas_drilling/rapid_impact_assessment_091609.pdf.

[6] NY DSGEIS at 6-3.

[7] *See id.* at 6-16.

[8] *See id.* at 6-7.

[9] USGS, Water Resources and Natural Gas Production from the Marcellus Shale (2009), *available at* http://md.water.usgs.gov/publications/fs-2009-3032/fs-2009-3032.pdf .

Marcellus shale wells outside of New York this waste is stored on-site in large holding ponds until trucks haul it away.[10] In New York State, the Department of Environmental Conservation estimates that up to 1,340 truckloads will be required for each drilling operation;[11] for multi-well pads, up to 8,900 truckloads.[12]

Oversight and enforcement problems regarding hydraulic fracturing are also a major threat to drinking water resources. According to an August 2010 report based on Pennsylvania Department of Environmental Protection (PA DEP) records, 1,435 violations of Pennsylvania state oil and gas laws occurred during gas drilling operations in the Marcellus Shale within a two-and-a-half-year period.[13] This figure does not include the 669 traffic citations and 818 written warnings issued to trucks hauling drilling wastewater.[14] These violations included improper construction of wastewater impoundments, faulty pollution prevention practices, discharges of industrial waste, improper well-casing and construction, and improper blowout prevention.[15]

Furthermore, a six-month Scranton Times-Tribune investigation showed a lack of oversight and significant environmental problems as a result of industrial gas drilling.[16] The paper found: (i) hundreds of spills at gas wells over the past five years, most of which the Pennsylvania Department of Environmental Protection (PA DEP) did not publicize; (ii) industrialization of the shale has left a permanent scar on the landscape and communities; (iii) industry's disclosure of chemicals used in its processes is incomplete and insufficient; and (iv) a "growing chorus of scientists" is arguing that not enough is known of the impacts to justify the intense development pace.[17]

D. Can you provide data, studies, reports, or other information to help us assess the relative importance of these potential impacts?

Attached to these comments is a report entitled *Fractured Communities* that documents case studies from across the country where state and federal regulators indentified industrial gas drilling, including operations that utilize hydraulic fracturing, as the known or suspected cause of groundwater, drinking water, and surface water contamination.

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[10] Where to dispose of this wastewater is also an unanswered question. In Pennsylvania there have been well documented high brine and TDS discharges into the Monongahela River – a drinking water source for over 350,000 people – as a result of the inability of wastewater treatment plants to process industrial gas drilling wastewater.

[11] NY DSGEIS at 6-138, *available at* http://www.dec.ny.gov/energy/58440.html .

[12] *See id.* at 6-142.

[13] Pennsylvania Land Trust Association, Marcellus Shale Drillers in Pennsylvania Amass 1614 Violations since 2008 (September 1, 2010), *available at* http://conserveland.org/uploaded_files/0000/0608/report_10sep01.pdf .

[14] *Id.*; *See also* PA DEP, State Enforcement Blitz Focuses on Trucks Hauling Drilling Waste Water (June 23, 2010), *available at* http://www.portal.state.pa.us/portal/server.pt/community/newsroom/14287?id=12375&typeid=1 .

[15] Pennsylvania Land Trust Association, *supra* note 7.

[16] Laura Legere, Troubled Promise: Little Oversight, Looming Problems for PA Gas Industry, (June 20, 2010), *available at* http://thetimes-tribune.com/news/troubled-promise-little-oversight-looming-problems-for-pa-gas-industry-1.855759 .

[17] *Id.*

Specifically, the report documents:

- More than 20 cases of drinking water contamination in Pennsylvania;
- More than 30 cases of groundwater and drinking water contamination in Colorado and Wyoming;
- More than 10 cases of surface water spills of drilling fluid in the Marcellus Shale region;
- More than 30 investigations of stray gas migration from new and abandoned wells in Pennsylvania;
- Dozens of illegal operations and permit violations by gas drilling companies;
- Five explosions that occurred between 2006 and 2010 that contaminated groundwater and/or surface water.

We recommend that EPA consider all of the case studies highlighted in *Fractured Communities*, as well as others, in its current study.

II. Criteria for Selecting Case Studies

A. Are the proposed selection and prioritization criteria appropriate?

The proposed selection and prioritization criteria seem appropriate, with the potential exception of one criterion: site access. We are concerned that site access restrictions will prevent data collection and study at critical sites. It is critical that the EPA study not be limited to a review of existing literature and data. The analysis must include actual field study of the full range of lifecycle impacts associated with gas drilling. The study should be designed to include substantial field monitoring of actual gas drilling operations, including geological and hydrological monitoring. In addition, follow-up monitoring and evaluation of water quality in both surface and subsurface drinking water resources should be included.

Furthermore, cumulative impacts need to be evaluated. Analyzing the impacts of hydraulic fracturing operations on a site-by-site basis – even in the context of a lifecycle assessment – ignores the cumulative impacts of multiple wells on a single pad and thousands of wells and pads across a given region. This invites a tragedy of the commons, which exemplifies the cumulative impacts issue and is particularly relevant to industrial gas production. While even one industrial gas well may pose problems in and of itself, hundreds or thousands of wells only compound the problems. For example, one well may use 5 million gallons of water in the fracturing process while a thousand wells would use 5 billion gallons of water and would present substantial issues regarding water withdrawals and disposal of wastewater from these wells.

There is a broad range of cumulative impacts associated with gas development during the lifecycle of hydraulic fracturing operations.[18] For example, NYCDEP concluded that the "cumulative impact from [truck] trips to tens or hundreds of wells in an area could cause substantial additional stress on transportation infrastructure, resulting in increased erosion, repair costs for damage to DEP-maintained roads or bridges, and potential access problems to DEP facilities."[19]

Other cumulative impacts include but are not limited to: existing water consumption and new withdrawals, wastewater disposal, air pollution, stormwater, waste management failures, disposal wells, and viewshed impacts. All of these issues must be analyzed on site-specific, local and regional bases to properly assess their impacts during the lifecycle of hydraulic fracturing operations.

B. Would you suggest revised or additional criteria to better identify, screen, and prioritize sites for field investigations and case studies?

In addition to considering the potential impacts to subsurface aquifers and drinking water wells, consideration of impacts to surface water supplies is critical. Accordingly, this study should be expanded to include impacts on surface water, air, soil and landscapes.

C. Are there other research questions that a case study approach would be uniquely able to address?

In addition to the foregoing recommendations, our groups suggest the following additional parameters to ensure a well-designed study:

- Evaluation of the availability, current usage and effectiveness of non-toxic drilling and fracturing fluids.
- Evaluation of viable best management practices that should be incorporated into federal and/or state regulatory frameworks for hydraulic fracturing.
- Examination of air impacts related to hydraulic fracturing, including impacts from evaporation of toxic substances from open wastewater storage pits, truck traffic for hauling water and chemicals for fracturing and wastewater, and fossil-fuel burning equipment used in the production process.
- Analysis of how current hydraulic fracturing operations intersect with abandoned and/or poorly constructed wells, faults and fractures to alter the expected impacts on air, water, soil, and human health.
- Evaluation of the utilization of Best Management Practices (BMPs) and whether implementation of BMPs may reduce contamination.

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[18] *See*: Riverkeeper DSGEIS Comments, *available at* http://www.riverkeeper.org/wp-content/uploads/2010/01/Riverkeeper-DSGEIS-Comments-12-28-09.pdf; *See also* NRDC DSGEIS Comments, *available at* http://docs.nrdc.org/energy/files/ene_10010401a.pdf.

[19] DEP Report at ES-3, 41.

- Discussion of what strategies and analytical methods could be used to identify potential impacts on water bodies and watersheds from which water for hydraulic fracturing is being diverted.

D. Are you aware of potential candidate sites or case studies that would be useful for this study? If so, what are the characteristics that would make the candidates appropriate for this study on the relationship between HF and drinking water resources? Please provide additional supporting information.

See I. D. above. Each case study in the *Fractured Communities* report should be included in EPA's research study. Each case study addresses criteria that EPA has proposed, as well as additional important criteria outlined above. In addition to demonstrating a relationship between hydraulic fracturing and contamination of drinking water resources, the case studies demonstrate relationships between hydraulic fracturing and air pollution, surface water pollution, soil contamination and impacts to landscapes.

III. Other Recommendations for EPA Action

In conjunction with EPA's Science Advisory Board study, we recommend the following actions for EPA staff:

A. All EPA Regional Offices, as well as EPA Headquarters, should immediately bring all resources to bear to stem the growing tide of pollution resulting from resource extraction.[20] EPA Region III recently created a Resource Extraction Task Force that is exploring options to use targeted enforcement and other strategies to impose stricter environmental standards on fossil fuel extraction. According to Inside EPA, "the task force may be a precursor to broader EPA efforts to strengthen environmental protection requirements for the controversial practice of shale gas hydraulic fracturing, known as fracking, and clarify its authority to enforce environmental standards for the sector, despite efforts by Congress to limit the agency's regulatory authority."[21] We support such steps and encourage action agency-wide.

B. The office of the EPA Inspector General should resume its investigation into the potential mishandling of information associated with the agency's 2004 study of fracturing and coalbed methane which has been widely criticized as politically motivated and scientifically flawed.[22]

C. EPA should revisit its 1988 study of oil and gas industry exemptions from RCRA, which was used as the basis for exempting the industry from regulation under this critical law. According to an EPA official at the time, EPA exempted the industry

[20] Inside EPA, 08/20/2010.
[21] *Id.*
[22] *See* NRDC, *Drilling Down* (October 2007), *available at*: http://www.nrdc.org/land/use/down/contents.asp.

from RCRA regulation "for solely political reasons, despite a scientific determination of the hazardousness of the waste."[23]

IV. Conclusion

EPA must ensure that its current study of hydraulic fracturing remains scientifically sound, unbiased and free of political pressure from any special interest. The agency should stand by its commitment to use a lifecycle analysis approach in order to measure the diverse range of impacts that result from gas drilling and the current study should lead the way for other long-term scientific assessments on this and other important environmental issues.

Thank you for your consideration and ongoing dedication and commitment to environmental protection and scientific excellence.

Sincerely,

Craig Michaels, Watershed Program Director
William Wegner, Staff Scientist
Hilary Atkin, Legal Intern

Riverkeeper, Inc.

On behalf of:

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Capulin, CO

Eliza Smith Steinmeier, Baltimore Harbor Waterkeeper
Baltimore, MD

Nelson Brooke, Black Warrior Riverkeeper
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Julie Barrett O'Neill, Buffalo Niagara Riverkeeper
Buffalo, NY

Myra Crawford, Cahaba Riverkeeper
Birmingham, AL

[23] *Id*.

John Weisheit, Colorado Riverkeeper
Moab, UT

Christopher Len, Hackensack Riverkeeper
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