PO Box 103
Fremont Center, NY 12736

November 10, 2010

Lt. General Robert Van Antwerp
Chief of Engineers
Headquarters, US Army Corps of Engineers
441 G. Street, NW
Washington, DC 20314–1000

Dear General Van Antwerp:

As I am sure you are aware, the Army Corps of Engineers is one of five voting members on the Delaware River Basin Commission. In that capacity, it has a critical role to play in protecting the seventeen million Americans who rely on the Upper Delaware River Basin for their drinking water.

Despite the region's crucial importance, it is now targeted for shale gas extraction that would rely on an inherently dangerous procedure known as high-volume hydraulic fracturing (HVHF). "Fracking" even a single horizontal shale gas well entails injecting millions of gallons of toxic fluid into the ground[1] and has already been associated with over a thousand instances of water contamination and public health problems in other parts of the country.[2]

If shale gas extraction is permitted in Upper Delaware Basin, it's no exaggeration to say that literally trillions of gallons of toxic fluid may be injected underground and never recovered. [3] Proponents of "fracking claim that the underground injection of toxic fluids does not pose a threat to drinking water supplies because the Marcellus Shale is thousands of feet beneath aquifers and ground water. This assertion, however, has no basis in science. The federal Environmental Protection Agency is currently undertaking the first credible study of hydraulic fracturing and drinking water safety, but the results of this peer-reviewed research will not be known until 2012. [4]

In perhaps the most thorough consideration of the subject to date, the environmental engineering firm of Hazen & Sawyer prepared a report for the New York City Department of Environmental Protection that included the following conclusion:

> Subsurface migration of fracturing fluids or formation water and pressures could present risks to potable water supplies if such fluids

> were to intercept a shallow fresh water aquifer . . . *Potential migration pathways include migration of fracturing and formation fluids along the well bore as well as migration across and out of the penetrated and hydraulically fractured strata.*[5] (Emphasis added.)

The report also described the geological conditions that were encountered during the construction of the city's water tunnels, portions of which lie within the Delaware Basin.

> Brittle geological features such as faults, fractures and crushed zones were encountered during water supply tunnel construction. Groundwater inflows were also encountered at numerous locations during tunnel construction, and in several cases, these align with mapped faults, fractures or linear features. More importantly saline, methane, and hydrogen sulfide seeps were encountered as well. These seeps are considered to be indicative of a hydraulic connection to naturally-occurring pressurized groundwater/fluids from much deeper strata. Existing connections to deeper strata can transmit pressurized fluids (e.g., saline and/or radioactive formation water and residual hydrofracturing chemicals) upward to the vicinity of the fresh water aquifer . . . (and to the surface).[6]

In addition to the risk associated with the underground injection of toxic fracturing fluids, there are a number of other consequences associated with shale gas extraction that may adversely impact drinking water supplies.

Currently, wastewater disposal associated with fracking is a problem without a satisfactory solution. In addition to the spent fracking fluid that is recovered from fractured wells, vast quantities of so-called "produced water" are disgorged along with the natural gas. Produced water is a naturally occurring solution that contains high levels of chlorides, total dissolved solids (TDS), toxic metals such as cadmium, and radioactive material including radon and radium.[7] At present there is not a single wastewater treatment plant in the Delaware Basin, or anywhere else in New York State or Pennsylvania, that is capable of removing all these contaminants so that drilling wastewater can be safely discharged into our rivers and streams.

In 2008, the disposal of partially treated wastewater contributed to high levels of pollutants in the Monongahela River, and that in turn led the Pennsylvania Department of Environmental Protection to formulate new disposal regulations that will go into effect in January 2011. While these new regulations may do more to protect our water resources, the natural gas industry has expressed doubts that it will be able to comply with them. Mr. Louis D'Amico, executive director of the Pennsylvania Independent Oil and Gas Association, has said "I am not sure that we (the natural gas industry) can reach that standard. It all but excludes any kind of stream discharge." [8] It appears that regulatory compliance will entail transporting wastewater to disposal wells in Ohio—and the thousands upon thousands of long-distance truck trips necessary to haul wastewater to disposal sites (and to deliver millions of gallons of fresh water to wellpads) is just one of the reasons why Cornell Professor Robert W. Howarth has

concluded that shale gas may produce even more greenhouse emissions than coal when extraction and gas transportation are factored into the equation.[9]

Second, the cumulative impact of tens of thousands of hydraulically fractured gas wells in the Delaware Basin may degrade the basin's water resources *even if the extraction process is well regulated and proceeds without mishap.* Mr. David Velinsky, Ph.D., vice president for environmental research at the Academy of Natural Sciences, recently testified before the Philadelphia City Council's Joint Committees on the Environment and Transportation & Public Utilities that:

> there is very little information available as to the impacts of long-term exposure of a watershed to Marcellus Shale drilling activities . . . nor do we know if there is a cumulative impact of drilling activity . . .—and in particular of possible exposure to water with elevated TDS—on the ecosystem services of a small watershed.
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> Let me be clear on this point. The question we believe needs to be addressed is whether there is a threshold point past which a certain density of drilling activity has an impact on the ecological health and services of the watershed regardless of how carefully drilling is conducted. Past studies that have looked at particular well sites or particular incidents fail to give a picture of the chronic impacts that might be expected from drilling and especially hydraulic fracturing. We are saying that *regardless of the practices being followed by drillers, there may be a point at which drilling will have a definite signal in the ecological function of a watershed.* (Emphasis added.)

Dr. Velinsky offered a preliminary assessment of the cumulative impact based on research in nine small watersheds. Three indicators were considered:

> The conductivity of the water, the abundance of certain sensitive insects (also called an EPT index) and the abundance of salamanders. This last measure is particularly important, as amphibians are especially vulnerable to changes in the environment and absence of amphibians is often an ecological "early warning system."
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> For each of the measures, there was a significant difference between high-density drilling locations and locations with no or low-density drilling. Water conductivity was almost twice as high in the high density sites as it was in the low density and reference sites, while numbers of both salamanders and sensitive insects were approximately 25% reduced. Statistical analysis indicates that there is a less than 5% probability that these differences were the result of random chance.
>
> This suggests that there is indeed a threshold at which drilling—regardless of how it is practiced—will have a significant impact on an ecosystem.

After hearing Dr. Velinsky's testimony, it is clear why the Philadelphia City Council issued a Resolution imploring the DRBC to conduct a cumulative impact study before permitting HVHF in the Basin. The New York City Council also passed a similar Resolution. Through their elected representatives, ten million Americans have appealed to the DRBC to undertake a cumulative impact study *before* permitting fracking in the Delaware Basin.

Despite the obvious inherent dangers associated with hydraulic fracturing, the lack of satisfactory solutions to problems such as wastewater disposal, the dearth of fundamental scientific data, the lack of a cumulative impact study and the urgent appeals of the citizens of New York City and Philadelphia, the Army Corps of Engineers, as well as several other directors of the DRBC, seem prepared to permit drilling in the Delaware Basin. To permit drilling in this region without first obtaining the basic information that is necessary to formulate sound and responsible regulations would be a profound violation of the public trust. It is extremely important to the millions who rely on the waters of the Upper Delaware Basin that the Army Corps of Engineers oppose hydraulic fracturing until there are scientific studies supporting its safety.

I urge you to carefully consider the points made in this letter, and to use your authority to chart a course protecting the public today and into the future.

Thank you for your consideration.

Sincerely,

Jill Wiener
Catskill Citizens for Safe Energy

1. At a Commons Waters Meeting in Narrowsburg, NY, on February 10, 2010, Brian Grove, director of Corporate Development for Chesapeake Energy stated that his company's Marcellus wells in Pennsylvania require, on average, five million gallons of fracking fluid.

   Dr. Theo Coburn has identified over five hundred chemicals that are used in "fracking fluid," including many that are neurotoxins or carcinogens. See "Chemicals Used in Natural Gas Extraction and Delivery," http://www.endocrinedisruption.com/home.php.

2. "A series of investigations by ProPublica found that fracturing is the common thread in more than 1,000 cases of water contamination across seven states." *EPA Launches National Study of Hydraulic Fracturing* ProPublica, March 18, 2010.

3. Many tens of thousands of HVHF wells are projected to be drilled in the Delaware Basin, and fluid recovery rates are between ten and fifty percent. Mr. Grove stated that four of the five million gallons of fluid that Chesapeake uses to develop a Marcellus well are never recovered. The wastewater treatment company ProChem Tech, in a report entitled *Marcellus Gas Well Fracture Wastewater Recycle and Water Supply,* estimates that 60 to 90% of injected fluids are recovered. In 2008, the New York Department of Environmental Conservation collected information from drillers on the hydraulic fracturing of shale formations. Data supplied by the gas companies showed recovery rates of between 20 and 50%, meaning that 50% to 80% of the fracking fluid remains unrecovered. In a private communication on September 15, 2009 Brad Gill, executive director of the New York Oil and Gas Association states " . . . on the order of 10 to 30% initial recovery is being seen. Then, as the well is produced, additional fluids can be recovered . . ."

4. A cursory 2004 EPA study was discredited because damaging material was redacted and because there were obvious conflicts of interest with members of the review panel.

5. *Final Impact Assessment Report: Impact Assessment of Natural Gas Production in the New York City Watershed,* Hazen & Sawyer Environmental Engineers and Scientists, December 2009, page 57.

6. Ibid., page 54.

7. See a discussion of radioactivity and the Marcellus Shale by Cornell Professor Peter J. Davies. http://catskillcitizens.org/learnmore/Radioactivity.pdf.

8. "DEP guidelines to challenge natural gas extractors," by Joe Napsha, The *Pittsburgh Tribune-Review*, Friday, October 29, 2010.

9. Preliminary Assessment of the Greenhouse Gas Emissions from Natural Gas obtained by Hydraulic Fracturing, by Robert W. Howarth, Ph.D., April 1, 2010 (Draft).