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PAUL V. RUSH



Rush

The Threat From Hydrofracking

Drilling for natural gas using high-volume hydraulic fracturing, or hydrofracking, is all over the news in New York these days. Hardly a day goes by when there isn't an article in the paper, a rally in Albany, or the announcement of a public information session from one point of view or another. Politicians are fully engaged on the issue and legislation is pending in both houses at the state level as well as in Congress. State and local jurisdictions are revising environmental reviews, updating regulations, and conducting studies. In just more than two years, hydrofracking has gone from obscure oil industry jargon to perhaps the greatest threat the New York City water supply faces today.

New York City's water supply provides high-quality drinking water to nearly half the population of New York state—more than 8 million people in New York City and another million people in upstate counties. The New York City Department of Environmental Protection (DEP) is the city agency with primary responsibility for overseeing the operation, maintenance, and management of the water supply infrastructure and the protection of the 1,969-square-mile watershed. The Marcellus Shale, currently a prime target for natural gas drilling, underlies the entire

portion of the New York City water supply located west of Hudson, N.Y. This west-of-Hudson area typically supplies 90% of the city's drinking water and is of such high quality that the water does not require filtration.

NATURAL GAS DEVELOPMENT SPARKS CONTROVERSY IN 2008

In early 2008, the city first learned of natural gas leases within the watershed and that the state was considering modifying regulations governing natural gas exploration and development that would facilitate the use of hydrofracking. The issue became quickly polarized, with some groups perceiving this as the most serious threat to the environment in a generation and others viewing it as a much-needed boost for the local economy. The city quickly determined there was a need for a balanced, objective assessment that carefully evaluated realistic impacts on the water supply with a focus on water quality, water quantity, and the water supply infrastructure. Thus, a one-year study was commissioned and conducted through a joint venture of Hazen & Sawyer and Legett, Brashears & Graham. This assessment was completed in December 2009 and has been used to evaluate the supplemental environ-



In 2009, marketed production of natural gas reached 21.9 trillion cubic feet, the highest recorded total since 1973. This increase in production is largely the result of more efficient and cost-effective drilling techniques, notably in the production of natural gas from shale formations.

mental review conducted by New York State and to support the city's position on natural gas drilling in the watershed. The final report is available at www.nyc.gov/html/dep/html/news/natural_gas_drilling.shtml.

TERRORISM ISN'T THE ONLY THREAT TO WATER SECURITY

Typically, when water supply security is mentioned, it calls to mind vulnerabilities to terrorism and other acts of intentional contamination. However, on the basis of the technical assessment performed by the joint venture, the city determined that hydrofracking poses an unacceptable threat to the unfiltered, freshwater supply for 9 million New Yorkers, and cannot safely be permitted within the New York City watershed. The most obvious threats are related to the chemicals that are used in the hydrofracking process, transported along country roads, and stored undiluted at staging facilities. The industry and New York officials frequently state that the hydrofracking mixtures are 99% water. Although

this is true, a 5-million-gallon frack job translates into 50,000 gallons of chemicals per well. Some of these chemicals may be common household additives, but many are toxic even at very low concentrations. For example, benzene, one of the common chemicals associated with contamination from natural gas drilling, has an ambient groundwater standard of 1 µg/L—or one part per billion.

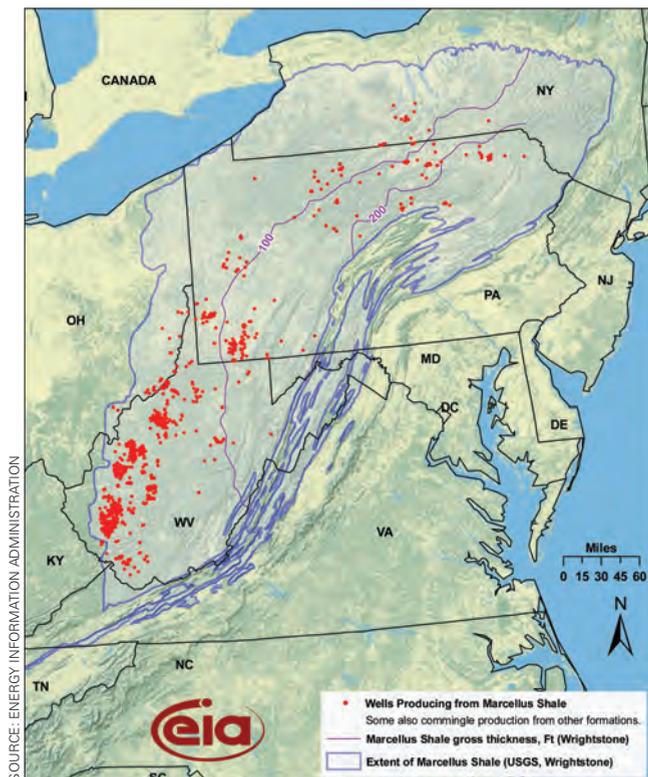
These chemicals would be transported to the drilling sites along narrow country roads, many of which wind along the reservoirs as scenic byways. Spills either along the roadways or at the drilling site are inevitable as this activity ramps up. If they occur near an intake or during a period of unusual operations (e.g., when not all parts of the system are online), the results could be serious and could result in violations of water quality standards. Regardless, all spills would require city operations staff to take remedial action, potentially including taking at-risk reservoirs offline. This could result in significant impacts on the reliability of the system, depending on

frequency, timing, and location of the incident(s) and would be expected to substantially affect public perception of the quality and reliability of the water supply.

There are also chronic risks from the use of all these chemicals in the watershed over time. Unreported or underremediated spills would result in a chronic low-level source of contamination. Gradual groundwater contamination from fluid migration from fractures or imperfectly sealed drill casings would also add to the background contamination. Given the nature of groundwater contamination, some of the repercussions may not be known for decades. The long list of possible chemicals also makes detection of contamination through routine surveillance monitoring extremely difficult and expensive. During the course of New York State's environmental review, stakeholders expressed concern about the state's ability to track spills and ensure that they are sufficiently remediated. An investigation in New York uncovered hundreds of spills listed in the New York State Department of Environmental Conservation (NYSDEC) Hazardous Substances Spills database related to oil and natural gas drilling. Reportedly, many sites were not fully remediated, and some spill cases were administratively closed without adequate remediation when they were transferred to a different division within NYSDEC.

INFRASTRUCTURE ALSO POTENTIALLY THREATENED

One surprising result of the natural gas risk assessment conducted by the city was the potential threat to the New York City water supply infrastructure. In the west-of-Hudson area alone, the city operates and maintains more than 167 miles of tunnels and aqueducts and 45 shafts both within and outside the watershed's boundaries. Initially it was assumed that because the city



According to the New York State Department of Environmental Conservation, geologists estimate that the entire Marcellus Shale formation contains between 168 trillion and 516 trillion cubic feet of natural gas. To put this in perspective, New York State uses about 1.1 trillion cubic feet of natural gas per year.

would not be leasing land around and over its infrastructure, and the horizontal drilling was far deeper than the aqueducts, the overall risk would be negligible. However, the technical assessment indicated that migration of methane or fluids through natural fractures in the bedrock, some extending for many miles, could compromise the city's aqueducts and shafts. If methane can migrate and accumulate in a private well house, it can also accumulate in a water supply shaft. Additionally, given the New York State regulatory structure and the rules governing compulsory integration, drillers could potentially receive a permit authorizing horizontal drilling directly below a water supply tunnel without city authorization. Even with a separation distance of hundreds or thousands of feet, this still represents a threat to the water supply.

LACK OF REGULATORY CONTROL CREATES ADDITIONAL VULNERABILITIES

One not-so-obvious threat to water supplies from natural gas drilling is the general lack of direct control and/or regulatory authority of water suppliers or local jurisdictions over the process. Jurisdiction over natural gas drilling activities primarily rests at the state level. Some permits or approvals may be necessary from the federal government (in New York State, underground injection wells for wastewater disposal are regulated by the US Environmental Protection Agency) or public service commission (in New York State, the Public Service Commission has jurisdiction over natural gas transmission lines and pipelines), but overall local jurisdictions are precluded from regulating or limiting natural gas

activities. In the New York City watershed, the city has promulgated watershed regulations to address certain activities that may constitute a source of contamination to or degradation of the water supply. These regulations give the city authority over a number of activities, focusing primarily on wastewater (including septic systems and wastewater treatment plants and their associated collection systems) and stormwater from construction activities. They also establish technical standards for these activities as well as procedures for city review and approval. However, when it comes to natural gas drilling and hydrofracking, the city does not have independent authority and must rely on the state agency's willingness and ability to share information and participate in joint decision-making. (The city does assert jurisdiction regarding the requirement for stormwater plans under the Watershed Regulations if the natural gas drilling activity exceeds any of the regulatory thresholds.) Even though natural gas drilling and hydrofracking pose a substantial risk to the water supply for 9 million people, the city does not have any statutory authority to review permit applications, inspect drilling sites, or receive disclosures of chemicals or incident reports.

SECONDARY IMPACTS ARE IDENTIFIED

In addition to the direct threat hydrofracking poses to the New York City water supply, there are secondary impacts that cannot be ignored. Natural gas-well development in the west-of-Hudson watershed at the rates and densities observed in comparable formations would be accompanied by a level of industrial activity and heightened risk of water quality contamination that is inconsistent with the expect-

tations for unfiltered water supply systems. Even without a single violation of water quality standards, this would negatively affect perceptions of the water supply purity. This change in perception and the lack of city control over this activity could also jeopardize the long-term sustainability of the city's unfiltered supply. The technical assessment by the joint venture showed that 3,000–6,000 wells could be drilled in the New York City watershed over the next two to four decades, with annual well completion rates on the order of 100–500 wells per year. Delivery of the equipment, chemicals, and water needed for well development would require many hundreds of truck trips per well, as will removal of equipment and hauling of flowback water. The proposed activity would generate millions of truck trips, thousands of acres of site clearing and grading, millions of tons of fracking chemicals, and millions of tons of wastewater.

The change in the watershed character would also affect watershed residents. For example, the city has strongly supported farming in the watershed as a compatible use of the land as long as basic safeguards are put in place. Recently, organic farmers in the watershed have indicated their concern of potentially being put out of business by natural gas drilling and the resulting contamination of the air, water, and land.

Balancing environmental and public health concerns with the need for adequate energy resources and economic development is a complex and challenging issue—not only in New York but throughout the United States. The refinement of the hydrofracking process has opened up large new areas of gas-bearing shale to this industrial activity all across the nation. The New York City water supply may be unique in many ways, but other public water supplies, large and small,

surface and subsurface, will be facing many of the same issues in the coming years. The need for alternative fuels and decreased reliance on foreign energy sources will keep the pressure on to develop this natural resource to its full capacity. We must ensure that the need for high-quality drinking water will not be forgotten in the process.

—Paul V. Rush is the deputy commissioner of the Bureau of Water Supply for the New York City Department of Environmental Protection. Rush oversees the operation, maintenance, and management of the upstate water supply infrastructure and protection of the nearly 2,000-square-mile watershed for New York City's water supply. He may be contacted at prush@dep.nyc.gov.