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New Jersey Oil and Gas Update

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NEW JERSEY OIL AND GAS UPDATE

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I. THE DELAWARE RIVER BASIN COMMISSION'S PROPOSED REGULATION OF NATURAL GAS DEVELOPMENT ACTIVITIES

The Delaware River Basin Commission ("DRBC") has proposed regulations of natural gas development activities for the natural gas development industry within the Delaware River basin. This water-

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intensive industry has brought widespread public hope, worry, and controversy about its effects to the millions of people who rely on the waters of the Delaware River. The DRBC has broad regulatory jurisdiction to protect the water resources of the Delaware River Basin. The proposed rules, if adopted by the DRBC, would regulate all use and disposal of water by the natural gas industry within the Basin. For other natural gas development activities, such as the construction and operation of gas wells and their infrastructure, the DRBC will continue its role as a supplementary regulator. The proposed DRBC rules would preserve any individual state regulation of those industrial activities, but they would supplement them by regulating specific construction and operation activities for natural gas well projects above a certain threshold size. The matter is of significant import, as natural resources essential to millions of people depend upon coordinated and effective regulation of the industry.

Currently, a burst of natural gas development activity is focused on a geological formation, the Marcellus Shale, located underneath parts of Pennsylvania ("PA") and New York ("NY") in the Delaware River Basin. A deeper formation, the Utica Shale, extends beneath New Jersey ("NJ") and is believed to contain natural gas.[1] Due to the depth of the Utica, however, there are no plans to drill for natural gas in NJ at this time. Nevertheless, the proposed DRBC regulation of the natural gas industry is very important to NJ for significant environmental and economic reasons. NJ is the most densely populated state in the United States. The Delaware River is fairly clean in its non-tidal reach, much of which remains relatively undeveloped, rural, and beautiful. It is a source of potable water for over 2 million people in NJ. Its banks are lined with property whose value and utility depend upon the quality of the river valley. Many NJ residents seek recreational escape in the outdoors of the Delaware valley, which contains large national and state parks and wildlife habitat. It is that rare place in NJ where one may hike miles on the Appalachian Trail, watch bald eagles scoop fish from a clear river, and wait for a bear family to cross the road—all within two hours' drive of the entire state. NJ already has its share of dirty water and industrial zones. Degrading the relatively unspoiled Delaware valley would impose unwelcome and unacceptable environmental and economic costs on the people of NJ. Therefore, NJ is watching the DRBC rulemaking process closely to ensure the rules continue the DRBC's commendable track record of protecting the water resources of the Delaware River Basin. NJ needs effective regulations that ensure that development of the natural gas resource does not compromise the immensely valuable natural resources of the Basin.

1. Hobart M. King, *Utica Shale - The Natural Gas Giant Below the Marcellus*, GEOLOGY.COM, http://geology.com/articles/utica-shale/ (last visited Nov. 17, 2012).

This Article discusses the proposed rules, focusing on provisions that may be the most important to NJ. It describes the geographic and cultural significance of the Delaware River Basin; relevant aspects of the natural gas development industry, including the practice of hydraulic fracturing ("hydrofracturing" or "fracking"); economic and environmental issues related to this industry; the DRBC and its regulatory scheme; the environmental concerns that the draft DRBC regulations are intended to address; and potential issues that the DRBC rules will not address at this time.

A. *The Delaware River Basin*

The Delaware River is the longest un-dammed river in the United States east of the Mississippi River, extending 330 miles from the confluence of its East and West Branches at Hancock, NY, to the mouth of the Delaware Bay, where the river meets the Atlantic Ocean.[2] The river is fed by 216 tributaries, the largest being the Schuylkill and Lehigh Rivers in PA. The basin contains 13,539 square miles, draining into parts of PA, NJ, NY, and Delaware ("DE").[3] The non-tidal segment of the Delaware River, above the fall line at Trenton, NJ, is 197 miles long.[4]

Three reaches of the Delaware River, a total of 151.9 miles, have been included in the National Wild and Scenic Rivers System.[5] One of these reaches extends seventy-three miles, from the confluence of the river's East and West Branches at Hancock, NY, downstream to Millrift, PA.[6] The second is a forty-mile stretch from just south of Port Jervis, NY, downstream to the Delaware Water Gap near Stroudsburg, PA.[7] The third, the Lower Delaware Wild and Scenic River, is a 38.9-mile section linking the Delaware Water Gap with Washington Crossing, PA, just upstream of Trenton, NJ.[8] Three-quarters of the non-tidal Delaware River is now included in the National Wild and Scenic Rivers System.[9]

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2. This includes 48.2 river miles through Delaware Bay. *See* DEL. RIVER BASIN COMM'N, WATER QUALITY REGULATIONS, at ii (Dec. 8, 2010), http://www.nj.gov/drbc/library/documents/WQregs.pdf.

3. This total area includes the 782 square-mile Delaware Bay, which lays roughly half in NJ and half in DE. *Basin Information*, DEL. RIVER BASIN COMM'N, http://www.nj.gov/drbc/basin (last visited Nov. 17, 2012) [hereinafter DRBC *Basin Information*].

4. DEL. RIVER BASIN COMM'N, NATURAL GAS DEVELOPMENT REGULATIONS § 7.3(a)(2)(iv) (2011), *available at* http://www.state.nj.us/drbc/library/documents/naturalgas-REVISEDdraftregs110811.pdf [hereinafter NATURAL GAS DEVELOPMENT REGULATIONS].

5. *See* DRBC *Basin Information*, *supra* note 3.

6. *Id.*

7. *Id.*

8. *Id.*

9. *Id.*

As explained by Congress, the purpose of the National Wild and Scenic Rivers System is to preserve the extraordinary rivers of the United States:

> It is hereby declared to be the policy of the United States that certain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations.[10]

According to the National Park Service, the United States has 3.5 million miles of rivers, but only 11,434 river miles (just over one-quarter of one percent) are included in the National Wild and Scenic Rivers System.[11] Most of the non-tidal Delaware River flows through forested and agricultural land, with a few small towns, suburbs, vacation homes, and public recreation areas along its banks.

The natural resources of the Delaware Basin are extensive. The river valley holds enormous economic and social value for the adjoining states, providing both a critical water supply for industrial and commercial activity, and attractive and accessible outdoor locations. According to the DRBC, "over 15 million people . . . rely on the waters of the Delaware River Basin for drinking, agricultural, and industrial use," including both New York City ("NYC") and Philadelphia.[12] The Delaware River provides about 90% of the water supply for NYC's population (which totals over 8 million people) and for 50% of NY State's population (which totals over 19 million people). More than one billion gallons of potable water from the upper Delaware River in the Catskill Mountains are delivered to NYC every day, having been treated by chlorination but not by expensive filtration facilities. The river provides potable water for about 25% of NJ's population (which totals over 8.5 million people).

Current uses of the Delaware River are varied. They include agricultural and commercial withdrawals, and supplying industrial activities with process water and non-contact cooling water, especially along its tidal segment. The Delaware Valley is also home to a number of older industrial cities and towns whose economies have been fading for some time, such as Port Jervis, NY; Easton, PA; and Phillipsburg, NJ. The agricultural and industrial activities that provided a livelihood to the region for over 200 years included lumbering, farming, milling, quarrying, mining, smelting and other heavy industries, along with the canals and railroads that served them. PA in particular still shows the scars from 200 years of natural resource extraction,

10. Wild and Scenic Rivers Act, 16 U.S.C. § 1271 (2006).

11. *See* DRBC *Basin Information*, *supra* note 3.

12. NATURAL GAS DEVELOPMENT REGULATIONS, *supra* note 4, § 7.3(a)(1).

with abandoned coal mines draining acidic water and old lumbering clear cuts and abandoned quarries showing on rocky, eroded slopes.

Today, the main activities along the river are residential and recreational, relying on the steady, clean flow of the river. The river valley is home to tidy rural towns that are popular with weekend visitors, replete with affluent suburbs and vacation homes. Large national, state, and local outdoor recreational areas are located along the banks and its upland forests and hills (e.g., Delaware Water Gap, Appalachian Trail). These areas are popular destinations for hiking, camping, canoeing, rafting, swimming, fishing, hunting, and other outdoor activities. Families and friends float down the river during warm weather, and anglers line its banks during prime fishing seasons. NJ has even reintroduced a hunting season to thin its burgeoning black bear population.

The discovery of valuable and recoverable quantities of natural gas in PA and NY has renewed industrial development in the Delaware River Basin. From drilling and pipeline construction through leasing and power generation, the natural gas industry has surged in PA. Owners of property overlying hydrocarbon-rich rocks have begun to lease their land profitably, and suppliers of industrial equipment and vehicles have seen a dramatic increase in demand. Struggling farmers hope the potential income will keep them viable. Owners of recreational properties and businesses, as well as users of the river's clean and plentiful waters, are anxious about the potential risk of depleting or polluting those waters.

Residents of adjoining states are familiar with industrialized waterways, such as those surrounding the harbors of NYC and Philadelphia. They have become accustomed over the past fifty years to seeing the non-tidal Delaware Valley as an uncrowded retreat with forests and clean water and air. Government regulators throughout the region are being called upon to intercede to avoid potentially catastrophic impacts on any of the natural resources of the Basin.

B. *The Natural Gas Development Industry*

Natural gas is a naturally-occurring, energy-rich gas, composed primarily of methane,[13] which is widely used as a source of energy and industrial chemicals. Natural gas can be extracted from many hydrocarbon-rich rock formations, which also may contain coal or petroleum oil.[14] These formations are found at many depths, from the surface to deep underground, and, at times, below the sea floor. Geologists have long known about oil and gas deposits in hydrocarbon-

13. *Methane Emissions*, U.S. ENVTL. PROT. AGENCY, http://epa.gov/methane/scientific.html (last visited Nov. 20, 2012).

14. *See, e.g.*, *Background*, NATURALGAS.ORG, http://www.naturalgas.org/overview/background.asp (last visited Nov. 20, 2012).

rich rock deep underground. In practical and economic terms, however, extracting such deep oil and gas was deemed impractical. However, recent advances in engineering techniques allow gas extraction at a feasible cost from deep formations, some a mile or more underground.[15]

These new methods now permit cost-effective extraction of this deep natural gas. Analysis of data from drill samples and seismic imagery creates a three-dimensional image of the gas-bearing formation. Optimum extraction points are chosen to drill a well vertically down into, and then horizontally through, the gas-bearing formation. Drilling uses a mix of water and chemicals to lubricate and cool drill bits as they cut through and pulverize the rock, producing a liquid waste (a/k/a "mud") that flows out of the borehole.

The vertical borehole is lined with a steel casing along its depth, and the space between the casing and the edge of the hole is sealed with a cement-like grout. If done properly, this leaves space only for the natural gas to move to the surface. A well often penetrates through porous rock formations (e.g., shale) that may contain fresh or brackish water or gas. Under natural conditions, the water or gas may seep up to the surface or may instead remain trapped underground. Without proper casing and sealing, a well may allow fluids or gases to migrate between different underground formations or even to the surface. Such migration may contaminate water underground or on the surface or release gas into the air. These uncontrolled releases can be sudden (a "blowout") or a gradual and long-term leak.

Where hydrofracturing is necessary to extract the gas, large volumes of water, chemicals, and particulate material (e.g., sand) are injected at high pressure down into the gas-bearing formation. This process breaks open and extends cracks in the rock. When the drilling pressure is released, some of the drilling fluid flows back out of the well. The injected particulates prop open the fissures in the shale, thus releasing natural gas and allowing it to collect in the fissures. From there, the accumulated gas will either flow or be pumped to the surface, depending on pressure and depth.[16] It is then collected, treated, and distributed.

Each step of the natural gas development process represents an engineering challenge that has the potential to cause adverse environmental effects. Among other concerns, these include the following: drilling through rock formations that may be fractured or porous, or may contain water or gases; ensuring or obtaining an adequate water supply to perform the hydrofracturing; wastewater management; air emissions; truck traffic on rural roads (over 500 truckloads of water

15. *Unconventional Natural Gas Resources*, NATURALGAS.ORG, http://www.naturalgas.org/overview/unconvent_ng_resource.asp (last visited Nov. 20, 2012).

16. *See BENEFITS: Big Shoes, Small Benefit*, NATURALGAS.ORG, http://www.naturalgas.org/shale/shalewells.asp (last visited Nov. 20, 2012).

may be needed to prepare a single well); and the forest clearance and excavation needed to build wells, well pads, access roads, and pipelines.[17]

The Marcellus Shale is a hydrocarbon-rich formation that can yield commercially valuable quantities of natural gas.[18] It extends southwest along the western slope of the Appalachian Mountains, from NY through PA, Maryland ("MD"), Virginia ("VA"), West Virginia ("WV"), Ohio ("OH"), and Kentucky ("KY") at depths of up to 5,000 feet underground.[19] Since the Marcellus Shale does not extend beneath NJ or DE, there are no plans to conduct natural gas development activities in NJ or DE at this time. However, the deeper Utica formation, which underlies the Marcellus Shale and extends beneath NJ, is rich in hydrocarbons and may yield recoverable quantities of natural gas. The Marcellus Shale lies underneath much of the Delaware River Basin headwater areas.

Due to its geology and depth, extracting natural gas from the Marcellus Shale will require the use of hydrofracturing, and thus, it will require the use of large volumes of water. Natural gas development activities in PA can drain into several rivers, including the Ohio, the Susquehanna, and the Delaware, and drainage within NY would flow mostly into the Delaware. Natural gas development activities in MD, VA, WV, OH, and KY can drain into rivers other than the Delaware.

Within the Delaware Basin, natural gas extraction from the Marcellus Shale using hydrofracturing has begun in PA. In 2010, NY Governor Andrew Cuomo imposed a moratorium while the state develops regulations for the industry, in the face of significant economic and political pressure to begin natural gas development.[20] The Marcellus Shale lies under the entire NYC watershed in the Catskills Mountains and under some of the aqueducts and tunnels that carry its potable waters to the city. Portions of the NYC watershed lie outside the Delaware River Basin, and hence the DRBC lacks jurisdiction to address all potential adverse effects of natural gas development activities on the NYC water supply.

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17. *See generally* DRBC *Basin Information*, *supra* note 3.

18. Other hydrocarbon-rich shale formations that have significantly increased the proved reserves of natural gas in the United States include the Bakken Shale in North Dakota and the Barnett Shale in Texas. *See* U.S. ENERGY INFO. ADMIN., U.S. CRUDE OIL, NATURAL GAS, AND NATURAL GAS LIQUIDS PROVED RESERVES, 2010, at 5, 10 (2012), *available at* http://www.eia.gov/naturalgas/crudeoilreserves/pdf/uscrudeoil.pdf [hereinafter EIA PROVED RESERVES].

19. *You've Got Shale: The "Where" and "What" of Shale Gas Formations*, NATURALGAS.ORG, http://www.naturalgas.org/shale/gotshale.asp (last visited Nov. 20, 2012).

20. Freeman Klopott & Jim Efstathiou, Jr, *Cuomo Said to Want to Limit Fracking to 5 New York Counties*, BLOOMBERG (June 13, 2012, 1:58 PM), http://www.bloomberg.com/news/2012-06-13/cuomo-said-to-want-to-limit-fracking-to-five-new-york-counties.html.

C. *The Natural Gas Market*

Development of natural gas from the Marcellus and other shale formations has produced a huge increase in natural gas reserves in the United States. The United States Department of Energy ("DOE") Energy Information Administration ("EIA") estimates that in 2010, proved natural gas reserves[21] in the United States were 317.6 trillion cubic feet; this represented an increase of 11.9% over the prior year and constituted the twelfth consecutive annual increase. EIA reported that advances in drilling technology, such as horizontal drilling and hydraulic fracturing, were critical to this continued increase.[22]

With increasing domestic proved reserves, natural gas prices in the United States have fallen. The falling prices, as well as reduced air emissions,[23] have led electric companies to construct or convert generation facilities to burn natural gas. The EIA reports that, for the first time since it began to collect data, natural gas generated as much electricity in the United States as coal during April 2012, with each fuel generating about 32% of the total.[24]

Falling prices have led to a reduction of imported natural gas and an increase in exports. Net imports of natural gas to the United States (imports minus exports) were just over 5 billion cubic feet per day in 2011, representing half the daily average in 2007, and the lowest level since 1992. The EIA explained that "net import declines are due to both lower imports and higher exports," and it attributed this sharp fall in net imports to "significant increases in United States natural gas production."[25]

The price of domestic natural gas in the United States has fallen so low that some producers are applying for regulatory approval to liquefy and export it since they can obtain a higher price on international markets.[26] The DOE has received applications (nine through April

21. "Proved" reserves are one of several measures used by the industry to estimate natural gas volume. "Proved reserves are those volumes of oil and natural gas that geologic and engineering data demonstrate with reasonable certainty to be recoverable in future years from known reservoirs under existing economic and operating conditions." EIA PROVED RESERVES, *supra* note 18, at 3.

22. *U.S. Proved Reserves Increased Sharply in 2010*, U.S. ENERGY INFO. ADMIN. (Aug. 2, 2012), http://www.eia.gov/todayinenergy/detail.cfm?id=7370.

23. Burning natural gas to generate electricity produces much less air pollution than burning coal. *Archive*, U.S. ENVTL. PROT. AGENCY, http://www.epa.gov/cleanenergy/energy-and-you/affect/natural-gas.html (last visited Dec. 17, 2012).

24. *Monthly Coal- and Natural Gas-Fired Generation Equal for First Time in April 2012*, U.S. ENERGY INFO. ADMIN. (July 6, 2012), http://www.eia.gov/todayinenergy/detail.cfm?id=6990.

25. *U.S. Natural Gas Net Imports at Lowest Levels Since 1992*, U.S. ENERGY INFO. ADMIN. (Mar. 15, 2012), http://www.eia.gov/todayinenergy/detail.cfm?id=5410.

26. During the summer of 2012, natural gas prices per million BTUs averaged less than $3 at the "Henry Hub" distribution point in the United States; $9 in the United Kingdom; and $13 to $18 in East Asia. Ron Nissimov, *LNG Exports Not Viable for Decades Due to Low Spot LNG Prices, New Study Says*, INSIDE FERC, Aug. 20, 2012, at 20, *available at* 2012 WLNR 18757773.

2012) for authorization to export liquefied natural gas ("LNG") produced from domestic natural gas. The Federal Energy Regulatory Commission has also received applications (five through April 2012) for approval to build gas liquefaction facilities to export domestically produced LNG to both free trade agreement and non-free trade agreement countries (such as China and Japan).[27] Some producers also have reduced their output at times when the market price has fallen particularly low.[28]

While natural gas prices have fallen, prices for petroleum oil and other hydrocarbon-rich liquids have risen. The ratio between the spot prices of crude oil and natural gas has been generally increasing since January 2009. For example, from October 3, 2011, to March 30, 2012, the spot price for Brent crude oil increased 19%, while the spot price for natural gas at the "Henry Hub" point in the United States decreased 45%.[29] Accordingly, some gas producers have switched their production to wells that produce oil or other natural gas liquids, since these related liquids have many uses and a higher market value than the usual "dry" natural gas.[30] In PA, while the number of new "dry" gas wells drilled during the first four months of 2012 fell compared with the same time period in 2011, the number of new wells drilled to produce a combination of oil and natural gas rose 60% between the same time periods.[31]

D. *The Delaware River Basin Commission*

The DRBC is a federal interstate compact agency created in 1961. Its creation represented one of the measures taken by the states who share the Delaware River to resolve disputes over the allocation and use of its water. Those disputes involved interstate litigation before the United States Supreme Court over proposed reservoir construction and water withdrawals for NYC. They were resolved with a De-

27. *Project Sponsors are Seeking Federal Approval to Export Domestic Natural Gas*, U.S. ENERGY INFO. ADMIN. (Apr. 24, 2012), http://www.eia.gov/todayinenergy/detail.cfm?id=5970.

28. *U.S. Dry Natural Gas Production Growth Levels Off Following Decline in Natural Gas Prices*, U.S. ENERGY INFO. ADMIN. (June 11, 2012), http://www.eia.gov/todayinenergy/detail.cfm?id=6630.

29. *Price Ratio of Crude Oil to Natural Gas Continues to Increase*, U.S. ENERGY INFO. ADMIN. (Apr. 13, 2012), http://www.eia.gov/todayinenergy/detail.cfm?id=5830.

30. *What are Natural Gas Liquids and How are They Used?*, U.S. ENERGY INFO. ADMIN. (Apr. 20, 2012), http://www.eia.gov/todayinenergy/detail.cfm?id=5930.

31. *Horizontal Drilling Boosts Pennsylvania's Natural Gas Production*, U.S. ENERGY INFO. ADMIN. (May 23, 2012), http://www.eia.gov/todayinenergy/detail.cfm?id=6390.

cree written by Justice Oliver Wendell Holmes in 1931[32] and an Amended Decree in 1954.[33]

The four states who share the Basin (PA, NY, NJ, and DE) entered into the Delaware River Basin Compact (the "Compact"). As an interstate compact, it was approved in legislation by Congress[34] and the member states.[35] The Compact and its regulations are intended to supplement existing state laws,[36] and each state member of the Compact has enacted legislation to repeal any individual state law that is inconsistent with them.[37]

The Compact also preserves applicable federal laws. The Federal Water Pollution Control Act (commonly referred to as the Clean Water Act) requires a permit to discharge pollutants from a point source.[38] These regulated pollutants include drilling fluids. The United States Environmental Protection Agency ("USEPA") administers this National Pollution Discharge Elimination System permit system,[39] which is usually implemented through individual states' environmental regulations (often called State Pollution Discharge Elimination System permits).[40]

The Underground Injection Well program, authorized under the Safe Drinking Water Act and administered by the USEPA,[41] establishes standards for state programs to protect drinking water sources from underground injection of fluids.[42] The Energy Policy Act of 2005,[43] however, exempted certain activities from regulation under the Underground Injection Well program by redefining "underground injection." Now, under the Safe Drinking Water Act, the term "underground injection" expressly excludes "the underground injection of fluids or propping agents (other than diesel fuels) pursuant to hydrau-

32. New Jersey v. New York, 283 U.S. 805 (1931), *superseded by* 347 U.S. 995 (1954).

33. *New Jersey*, 347 U.S. 995 (establishing the Chief Hydraulic Engineer of the United States Geological Survey, or that official's designee, as the Delaware River Master). *See also* Office of the Del. River Master, *History of the Reservoir Release Program in the Upper Delaware River Basin*, U.S. GEOLOGICAL SURVEY, http://water.usgs.gov/osw/odrm/releases.html (last visited Dec. 17, 2012).

34. Delaware River Basin Compact, Pub. L. No. 87-328, 75 Stat. 688 (1961).

35. 53 DEL. LAWS 185 (1961); 1961 N.J. LAWS 41; 1961 N.Y. LAWS 794; 1961 PA. LAWS 518.

36. Some New York municipalities also have asserted the right to regulate and even prohibit natural gas drilling within their boundaries, and the scope of their authority has been the subject of litigation. *See, e.g.*, Anschutz Exploration Corp. v. Town of Dryden, 940 N.Y.S.2d 458 (Sup. Ct. 2012); Cooperstown Holstein Corp. v. Town of Middlefield, 943 N.Y.S.2d 722 (Sup. Ct. 2012).

37. *See supra* note 35.

38. 33 U.S.C. §§ 1251–1274 (2006).

39. 33 U.S.C. § 1342 (2006 & Supp. 2011).

40. *Id.*; *see Clean Water Act*, U.S. ENVTL. PROT. AGENCY, http://cfpub.epa.gov/npdes/cwa.cfm?program_id=45 (last updated Dec. 17, 2012).

41. 42 U.S.C. §§ 300f to 300j–26 (2006).

42. *See* 40 C.F.R. pts. 144–148 (2011).

43. Energy Policy Act of 2005, Pub. L. No. 109-58, 119 Stat. 294 (2005).

lic fracturing operations related to oil, gas, or geothermal production activities."[44]

The Resource Conservation and Recovery Act[45] governs the storage, use, and disposal of hazardous materials, including wastewater from natural gas development activities.[46] In addition, the USEPA is studying the environmental effects of hydraulic fracturing, and it anticipates releasing a final draft report, for public comment and scientific peer review, in 2014.[47]

Through the Compact, member states established the DRBC,[48] and authorized and directed it to promulgate regulations to protect the water and other resources of the Basin. DRBC has authority to regulate allocations, diversions, and releases of water within and from the Basin;[49] to review and approve any "project having a substantial effect on the water resources of the basin";[50] "to develop, implement and effectuate plans and projects for the use of the water of the basin for domestic, municipal, agricultural and industrial water supply";[51] "to control future pollution and abate existing pollution in the waters of the basin," including "sewage or industrial or other waste originating within a signatory state," to ensure that such pollution does not "injuriously affect waters of the basin as contemplated by the [DRBC] comprehensive plan";[52] and to "promote sound practices of watershed management in the basin, including projects and facilities to retard runoff and waterflow and prevent soil erosion."[53]

To implement its mission, DRBC has authority to make and enforce regulations, which are effective only after public hearing and filing in accord with the administrative procedures of each of the signatory states.[54] Consistent with the Compact, the DRBC has promulgated several sets of regulations. Those regulations have been incorporated by reference into title 18 of the Code of Federal Regulations.[55]

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44. § 300h(d)(1)(B)(ii).

45. 42 U.S.C. §§ 6901–7000 (2006).

46. 42 U.S.C. § 6921 (identifying and listing hazardous waste).

47. *Questions and Answers About EPA's Hydraulic Fracturing Study*, U.S. ENVTL. PROT. AGENCY, http://www.epa.gov/hfstudy/questions.html (last updated Nov. 9, 2012).

48. DEL. RIVER BASIN COMM'N, COMPACT § 2.1 (1961), *available at* http://www.state.nj.us/drbc/library/documents/compact.pdf [hereinafter COMPACT]. The members of the DRBC are the Governors of the four signatory states, *ex officio*, and one federal commissioner. *Id.* The federal commissioner is a regular army officer of the United States Army Corps of Engineers. *Id.* at 48.

49. *Id.* § 3.3.

50. *Id.* § 3.8.

51. *Id.* § 4.1.

52. *Id.* § 5.2.

53. *Id.* § 7.1.

54. *Id.* § 14.2(a).

55. The DRBC Administrative Manual has been incorporated by reference into Rules of Practice and Procedure, 18 C.F.R. pt. 401 (2012); Water Quality Regulations, 18 C.F.R. pt. 410 (2011); Flood Plain Regulations, 18 C.F.R. pt. 415 (2012); Water

As natural gas development in the Marcellus Shale within the Delaware River Basin has the potential to affect the quantity and quality of the Basin's water resources, both concerns fall squarely within the jurisdiction of the DRBC. The magnitude of effects is potentially quite large. The DRBC anticipates that developing and hydrofracturing each well will require withdrawing and injecting underground some 3 to 5 million gallons of water, to be hauled in to the well site in over 500 tanker truck loads.[56] In PA alone, from January through April 2012, drilling began on 618 new natural gas wells and 263 new wells producing a combination of oil and natural gas, many within the Delaware Basin.[57] The New York City Department of Environmental Protection ("NYC DEP") commissioned an assessment of the impact of natural gas production in the NYC Water Supply Watershed,[58] which estimated that between 3,000 and 6,000 wells could be potentially drilled within the NYC watershed area of the Delaware Basin, and that such wells would require from 3.6 to 7.2 million truck trips.[59]

The DRBC prepared a Comprehensive Plan (the "DRBC Plan")[60] for development and use of the water resources of the Basin.[61] The DRBC Plan includes all public and private projects and facilities that the DRBC considers necessary for the immediate and long-term planning, development, conservation, utilization, management, and control of the Basin's water resources.[62] The DRBC also established a Water Resources Program,[63] based on the DRBC Plan, listing projects anticipated over the following six years.[64]

The DRBC Plan includes "Water Quality Standards for the Delaware River Basin,"[65] to govern DRBC's review of proposed new

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Supply Charges, 18 C.F.R. pt. 420 (2012); and the DRBC Special Regulations have been incorporated by reference into Ground Water Protection Area: Pennsylvania, 18 C.F.R. pt. 430 (2012).

56. NATURAL GAS DEVELOPMENT REGULATIONS, *supra* note 4, § 7.3(a)(2)(i) (2011), *available at* http://www.state.nj.us/drbc/library/documents/naturalgas-REVISEDdraftregs110811.pdf.

57. *Horizontal Drilling Boosts Pennsylvania's Natural Gas Production*, U.S. ENERGY INFO. ADMIN. (May 23, 2012), http://www.eia.gov/todayinenergy/detail.cfm?id=6390.

58. N.Y.C. DEP'T OF ENVTL. PROT., IMPACT ASSESSMENT OF NATURAL GAS PRODUCTION IN THE N.Y.C. WATER SUPPLY WATERSHED, at ES-1 (2009), *available at* http://www.nyc.gov/html/dep/pdf/natural_gas_drilling/12_23_2009_final_assessment_report.pdf.

59. *Id.*

60. COMPACT, *supra* note 48, §§ 2.1, 13.1.

61. DEL. RIVER BASIN COMM'N, COMPREHENSIVE PLAN (2001), *available at* http://www.nj.gov/drbc/library/documents/comprehensive_plan.pdf [hereinafter COMPREHENSIVE PLAN].

62. *Id.* § I.A.b.

63. COMPACT, *supra* note 48, §§ 3.2, 13.2.

64. COMPREHENSIVE PLAN, *supra* note 61, § I.A.c.; DEL. RIVER BASIN COMM'N, WATER RESOURCES PROGRAM (2010), *available at* http://www.state.nj.us/drbc/library/documents/WRP2010-2015.pdf.

65. COMPREHENSIVE PLAN, *supra* note 61, § I.C.3.

projects and contemplated corrective actions designed to control and abate pollution from existing facilities. As authorized by the Compact,[66] the DRBC adopted Water Quality Regulations ("WQ Rules"),[67] to implement its Water Quality Standards for the Delaware River Basin.[68] The DRBC sets an anti-degradation objective for all waters of the Basin.[69] For all interstate waters, the policy of the DRBC is to maintain their quality, "unless it can be affirmatively demonstrated to the [DRBC] that such change is justifiable as a result of necessary economic or social development or to improve significantly another body of water."[70] For Special Protection Waters,[71] which the DRBC considers to have "exceptionally high scenic, recreational, ecological, and/or water supply values," the policy of the DRBC is to prevent any "measurable change in existing water quality except towards natural conditions."[72]

The DRBC also established Rules of Practice and Procedure[73] that set forth its administrative procedures for adopting and revising the DRBC Plan and the Water Resources Program; for reviewing, approving, and overseeing any project that may have "a substantial effect on the water resources of the basin";[74] and for exercising any of its other powers and duties under the Compact.[75]

The Compact states the authority of the DRBC to review an application for approval of a project, directing it to determine whether the proposed project will cause harm. The DRBC

> shall approve a project whenever it finds and determines that such project would not substantially impair or conflict with the comprehensive plan and may modify and approve as modified, or may disapprove any such project whenever it finds and determines that the project would substantially impair or conflict with [the DRBC Comprehensive P]lan.[76]

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66. COMPACT, *supra* note 48, §§ 5.1, 14.2.

67. Water Quality Regulations, 18 C.F.R. pt. 410 (2010), *available at* http://www.nj.gov/drbc/library/documents/WQregs.pdf.

68. The DRBC Water Quality Standards are incorporated into article 3 of the Water Quality Regulations. 18 C.F.R. pt. 410, § 3.

69. *Id.* § 3.10.3A.

70. *Id.* § 3.10.3A.1.

71. Special Protection Waters are "waters of the mainstem Delaware River located between Hancock, NY and Trenton, NJ and select tributary reaches classified by the [DRBC] as Outstanding Basin Waters or Significant Resource Waters." NATURAL GAS DEVELOPMENT REGULATIONS, *supra* note 4, § 7.2. This is the segment of the Delaware, approximately 151.9 river miles long, that has been included in the National Wild and Scenic Rivers System. *Id.*

72. 18 C.F.R. pt. 410, § 3.10.3A.2; NATURAL GAS DEVELOPMENT REGULATIONS, *supra* note 4, § 7.3(a)(2)(iv).

73. DEL. RIVER BASIN COMM'N, RULES OF PRACTICE AND PROCEDURE (2012), *available at* http://www.state.nj.us/drbc/library/documents/admin_manual.pdf.

74. COMPACT, *supra* note 48, § 3.8.

75. *Id.* § 14.2.

76. *Id.* § 3.8.

E. *The DRBC Draft Natural Gas Development Regulations*

At its May 5, 2010, meeting, the DRBC directed its staff to begin drafting regulations of well pad construction in shale formations in the Delaware Basin, and it enacted a moratorium on natural gas drilling in the Basin, stating that the moratorium would remain in effect until it adopts regulations for the industry.[77] The DRBC published its draft Natural Gas Development Regulations on December 9, 2010, and, after an extensive public comment period during which it received over 69,000 comments, published a revised draft on November 8, 2011.[78]

The DRBC has proposed these Natural Gas Development Regulations ("Gas Rules" or "DRdr"), for a new "Article 7: Natural Gas Development Regulations" of its Administrative Manual, Part III - Water Quality Regulations,[79] to supplement the DRBC Plan with respect to natural gas extraction projects within the Basin.[80] These Gas Rules state that their purpose is

> to protect the water resources of the Delaware River Basin during the construction and operation of natural gas development projects. To effectuate this purpose, this Section establishes standards, requirements, conditions and restrictions to prevent, reduce or mitigate depletion and degradation of surface and groundwater resources and to promote sound practices of watershed management including control of runoff and erosion.[81]

Like other DRBC regulations, the Gas Rules would preserve and utilize existing agencies, allowing the individual member states who already regulate the construction and operation of natural gas wells and well pads, i.e., NY and PA, to continue doing so.[82] The DRBC will consider compliance with governing NY or PA law to satisfy DRBC requirements for natural gas well construction and operation,[83] with the exception of certain activities to be regulated by the DRBC.

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77. DEL. RIVER BASIN COMM'N, MEETING OF MAY 5, 2010 (2010), http://www.state.nj.us/drbc/library/documents/5-05-10_minutes.pdf; *see* Mike Soraghan, *Obama Admin Rejects Timeout for Natural Gas Drilling in N.Y., Pa.*, N.Y. TIMES, Sept. 22, 2010, *available at* http://www.nytimes.com/gwire/2010/09/22/22greenwire-obama-admin-rejects-timeout-for-natural-gas-dr-60467.html.

78. DEL. RIVER BASIN COMM'N, DRAFT NATURAL GAS DEVELOPMENT REGULATIONS (2010), *available at* http://www.state.nj.us/drbc/library/documents/naturalgas-draftregs.pdf; NATURAL GAS DEVELOPMENT REGULATIONS, *supra* note 4.

79. Water Quality Regulations, 18 C.F.R. pt. 410 (2011); *Delaware River Basin Commission*, NAT'L PARK SERV., http://parkplanning.nps.gov/projectHome.cfm?projectId=33467 (last visited Sept. 19, 2012).

80. NATURAL GAS DEVELOPMENT REGULATIONS, *supra* note 4, § 7.1(b).

81. *Id.* § 7.1(a).

82. *Id.* § 7.1(c), (i); *see* COMPACT, *supra* note 48, § 1.5.

83. NATURAL GAS DEVELOPMENT REGULATIONS, *supra* note 4, § 7.1(i). The Pennsylvania requirements are set forth in its Oil and Gas Act of December 19, 1984, Pub. L. No. 1140, No. 223 (1984) (codified at 58 PA. STAT. ANN. §§ 601.101–.605 (1984) (current version at 58 PA. CONS. STAT. 3201–3274 (2012))), the Oil and Gas

In DRBC-designated High Value Water Resource Landscapes and along Special Protection Waters, the DRBC would regulate the siting of natural gas wells and well pads relative to surface water and groundwater sources.[84] DRBC approval is required for water sources and bulk water uses and management related to natural gas development activities.[85] Natural gas well construction and operation must protect high value water resource landscapes and special protection waters.[86] The DRBC also will regulate wastewater generated by natural gas development.[87] Moreover, the DRBC retains its authority "to take actions or impose requirements that [it] may determine to be necessary to prevent adverse impacts to water resources."[88]

F. *Regulating a New Industry in the Delaware Basin*

Natural gas development activities differ fundamentally from the types of activities that the DRBC has regulated over the past fifty years. Through this rulemaking process, the DRBC proposes adjusting its traditional regulatory role in response to those differences. The DRBC Plan, WQ Rules, and Rules of Practice and Procedure have long contemplated "continuous or regular [water] withdrawals to serve stationary domestic, commercial and industrial projects."[89] Natural gas development, though, involves intermittent but relatively large-volume water withdrawals that will affect the "flows and assimilative capacities in aquifers and surface waters in the vicinity of the sources," and that will vary with "the quantity, location, timing and manner of such withdrawals."[90]

In its determinations for the Gas Rules, the DRBC recognizes that, due to geologic and geographic conditions, most natural gas development activity will take place in headwater areas of the Basin. The DRBC also recognizes that natural gas development is an intensively industrial activity that will involve multiple land disturbances across an extensive headwaters area that is now largely undeveloped. Potential land changes include

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Conservation Law, 58 PA. CONS. STAT. §§ 401–419 (2012), and 25 PA. CONS. STAT. § 78 (2012). New York requires compliance with article 23 of its Environmental Conservation Law, N.Y. ENVTL. CONSERV. §§ 23-0101 to 2723 (2012), and its regulations. New York also has proposed regulations for the industry. Due to a variety of factors, including New York City's extreme reliance on the Delaware River Basin for its water supply, the process has generated many comments and has been quite controversial. Mary Esch, *New York Fracking Decision: Cuomo Under Pressure To Rule On Hydraulic Fracturing*, HUFFINGTON POST (Sept. 6, 2012, 2:59 PM), http://www.huffingtonpost.com/2012/09/06/new-york-fracking-decision_n_1862112.html.

84. NATURAL GAS DEVELOPMENT REGULATIONS, *supra* note 4, § 7.5(d).
85. *Id.* § 7.4.
86. *Id.* § 7.5.
87. *Id.* § 7.6.
88. *Id.* § 7.1(i).
89. *Id.* § 7.3(a)(2)(i).
90. *Id.*

> loss of forest cover, building on erodible slopes, and encroachment on water bodies and riparian lands. These multiple aspects of natural gas development activities may have a substantial effect, either individually or cumulatively, on the surface water and groundwater resources of the basin.[91]

The DRBC recognizes that water use and management related to natural gas development activities has the potential to adversely affect the water supply of the Basin. The Gas Rules note that much of the water used for each well (3 to 5 million gallons) will be consumed and lost to the water supply of the Basin, meaning that large volumes of withdrawn water will not be returned to its source near its point of withdrawal.[92] Some will be recovered and reused to develop other wells within the Basin; some will remain underground where it is injected into a well; and some will be transported outside the Basin for treatment or disposal.[93]

The Gas Rules also recognize that wastewater from natural gas hydrofracturing may differ significantly from wastewaters that the DRBC has long regulated. Wastewater from natural gas development will be discharged intermittently and "may differ in quantity or composition from the chemicals normally present in municipal and industrial wastewater."[94] For example, it may contain pollutants that are not common in typical municipal and industrial wastewater, and it may harm or pass through standard wastewater treatment facilities without proper treatment.[95] Those pollutants, such as radionuclides and salts, also may contaminate wastewater treatment sludge and render it unusable for certain management methods such as beneficial reuse.[96]

G. *DRBC Proposes a Broad Scope of Regulation*

The Gas Rules would broadly regulate the use, storage, and disposal of all water, including clean and wastewater, surface and groundwater, used in natural gas development activities within the Basin. The DRBC proposes that the Gas Rules regulate natural gas industry activities that could affect water quantity and quality within the Basin more comprehensively than the activities it has traditionally regulated.[97] Applying the Gas Rules, the DRBC would review[98] direct water use activities (e.g., sources and uses of water transfer, treatment,

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91. *Id.* § 7.3(a)(1).
92. *Id.* § 7.3(a)(2)(i).
93. *See id.* § 7.3(a)(2)(i)–(ii).
94. *Id.* § 7.3(a)(2)(ii).
95. *Id.*
96. N.Y.C. DEP'T OF ENVTL. PROT., *supra* note 58, at ES-1 (noting high levels of total dissolved solids, hydrocarbons, heavy metals, and radionuclides); *id.* at 46–47 (noting large volumes of concentrated brine or crystalline salt cake).
97. NATURAL GAS DEVELOPMENT REGULATIONS, *supra* note 4, § 7.3(a)(3).
98. COMPACT, *supra* note 48, § 3.8.

or discharge of wastewater) by a natural gas development project of any size, DRBC finding inapplicable the usual minimum review thresholds in its Rules of Practice and Procedure.[99] The Gas Rules would not routinely review nineteen types of listed activities (e.g., siting of natural gas wells, well pads, and infrastructure), unless they involve a project above a certain quantitative threshold or the DRBC Executive Director specially directs. Natural gas development activities exempt from review under the Gas Rules would include, for example, "the construction of new impoundments or the enlargement or removal of existing impoundments,[100] for whatever purpose, when the storage capacity is less than 100 million gallons."[101] In other words, the DRBC will continue to exempt from review, even when used for a natural gas development activity, any impoundment unless its volume exceeds the equivalent of over 150 Olympic-sized swimming pools.[102]

In the Gas Rules, the DRBC asserts broad authority to regulate natural gas development activities, including the sources and uses of water; the transfer, treatment, or discharge of wastewater by any facility within the Basin generated by those activities; and to site natural gas wells, well pads, and associated infrastructure.[103] The Gas Rules establish an administrative process to review natural gas development activities, in essence reviewing sources and uses of water supply and wastewater for all natural gas development projects of any size, and reviewing larger projects for a broader range of activities that could affect water resources in the Basin.[104]

The Gas Rules define a natural gas development project broadly, as constituting "[o]ne natural gas development activity, or several interrelated natural gas development activities, for which an applicant is required to seek an approval from the [DRBC]."[105] The Gas Rules define "natural gas development activities," in turn, as

> all activities undertaken for the development, exploration, production and transportation of natural gas, including but not limited to (1) the construction and operation of wells and well pads, including air rotary and mud rotary natural gas exploratory or production well drilling and other aspects of natural gas exploratory and production well construction and testing, hydraulic fracturing well stim-

99. NATURAL GAS DEVELOPMENT REGULATIONS, *supra* note 4, § 7.3(a)(3).

100. The Gas Rules define an "impoundment" as "a liquid containment facility that is installed in a natural topographical depression, an excavation, or a bermed area formed primarily of earthen materials." *Id.* § 7.2.

101. DEL. RIVER BASIN COMM'N, RULES OF PRACTICE AND PROCEDURE § 2.3.4.A.1 (2012), *available at* http://www.state.nj.us/drbc/library/documents/admin_manual.pdf.

102. An Olympic-sized swimming pool contains 660,000 gallons of water. *Water Trivia Facts*, U.S. ENVTL. PROT. AGENCY, http://water.epa.gov/learn/kids/drinkingwater/water_trivia_facts.cfm (last updated Mar. 6, 2012).

103. NATURAL GAS DEVELOPMENT REGULATIONS, *supra* note 4, § 7.3(a)(3).

104. *Id.* § 7.3.

105. *Id.* § 7.2.

> ulation and hydraulic fracturing chemical storage; (2) the installation, operation and maintenance of gas collection and transmission infrastructure (e.g., gathering and transmission pipelines and compressor stations); (3) associated access road construction, staging, support vehicle tire cleaning, and withdrawal and storage of fresh water; (4) the final plugging and abandonment of natural gas wells and restoration of the well pad site; (5) any mitigation or remediation required by the Commission or the host state or federal government; and (6) the storage, reuse, transfer, transport and discharge of all domestic and non-domestic wastewaters, including flowback and production water.[106]

The DRBC must issue a Bulk Water Use and Management Approval ("Bulk Water Use Approval") for the withdrawal or use for water for "natural gas development projects."[107] Such approval is issued by the DRBC Executive Director as an Approval by Delegated Authority ("ADA").[108] The Gas Rules establish the ADA, defining it as the approval by the DRBC Executive Director necessary for "natural gas development activities."[109] A Bulk Water Use Approval is necessary, for example, for each well pad that will be constructed or operated.[110] An ADA is independent of and in addition to any other approval required by the DRBC or any government entity, such as obtaining a "docket" approval[111] for a Natural Gas Development Plan. Any DRBC approval for a natural gas development activity will be deemed expired if neither construction nor operation has commenced within three years of its issuance.[112]

The Gas Rules require approvals for, and conditions on, water sources and bulk water uses and management for natural gas development activities.[113] The Gas Rules' stated goal is to protect high-value water resource landscapes and DRBC-designated Special Protection Waters by requiring preparation of Natural Gas Development Plans (discussed in detail below) for lease holdings of 3,200 acres or more, and for development of more than five well pads.[114] The Gas Rules also regulate the transfer, treatment, and discharge of wastewater generated by natural gas development activities.[115]

The DRBC must approve any use of water sources located within the Basin to serve natural gas development projects, whether inside or

106. *Id.*
107. *Id.* § 7.3(b)(1)–(2).
108. *Id.*
109. *Id.* § 7.3(b)(2).
110. *Id.* § 7.3(b)(2)(i).
111. The DRBC defines a "docket" as "a legal document granting approval by the [DRBC] for a project that may have a substantial effect on the water resources of the Basin." *Id.* § 7.2.
112. *Id.* § 7.3(e).
113. *Id.* § 7.4.
114. *Id.* § 7.5.
115. *Id.* § 7.6.

outside the Basin.[116] DRBC approval, in the form of a docket or a protected area permit,[117] with limited exceptions, is required to use water sources within the Basin for natural gas development activities.[118] Any diversion outside the Basin of water withdrawn within the Basin requires a DRBC docket or protected area permit.[119]

Withdrawals of surface water or groundwater that DRBC already has approved may continue to be used if "they have a valid and current DRBC approval and any necessary state permit; do not increase the proposed amount of water use; continue to comply with all applicable approval and permit conditions; and do not trigger any condition requiring DRBC review."[120]

The DRBC must approve any diversion or "importation" of water into the Basin from sources located outside the Basin for use in any natural gas development purpose, except for certain categories of water.[121] Those exempt categories include fresh water; domestic wastewater treated to secondary standards; industrial wastewater treated with "Best Practicable Treatment" or "Best Available Treatment" as defined by the USEPA; natural gas flowback and production water, treated or untreated, if used within the same source state; non-contact cooling water; and mine drainage water.[122] Importation into the Basin of such non-exempt categories of waters requires a Bulk Water Use Approval from the DRBC.[123]

Importation into the Basin of wastewater of other types or for other uses requires a Bulk Water Use Approval as well as a DRBC-issued docket.[124] A DRBC docket or protected area permit for a water withdrawal or diversion may include detailed conditions for its use, as the DRBC "deems necessary to protect the water resources of the basin," including, but not limited to

> volumetric withdrawal limits; a "pass-by" flow requirement that a minimum amount of water must remain in the source water body for the withdrawal, or that no water may be withdrawn when the flow falls below a minimum level; an invasive species control plan; a non-point source pollution control plan; a natural diversity inventory assessment; metering and recording of withdrawals; a withdrawal site plan and access restrictions; a withdrawal site operations

116. *Id.* §§ 7.3(b)(1)(i), 7.4(a).

117. A protected area permit is a specific type of DRBC approval, defined as "a permit approved by the Executive Director in accordance with the [DRBC]'s Southeast Pennsylvania [i.e., Philadelphia area] Ground Water Protected Area Regulations." *Id.* § 7.2.

118. *Id.* § 7.4(a).

119. *Id.* § 7.4(a)(1)(iii).

120. *Id.* § 7.4(a)(1)(i).

121. *Id.* §§ 7.3(b)(1)(ii), 7.4(b).

122. *Id.* § 7.4(b)(1).

123. *Id.*

124. *Id.* § 7.4(b)(1)–(2).

> plan; a drought emergency plan; and requirements relating to complaints by other water users alleging interference.[125]

A DRBC docket or protected area permit for a water withdrawal or diversion has a term of ten years.[126]

H. *Standards for a Bulk Water Use and Management Approval, an Approved List of Water Sources, and a Withdrawal Approval*

A Bulk Water Use Approval includes terms and conditions to ensure compliance with the Compact, the DRBC Comprehensive Plan, DRBC Flood Plain Regulations, and all other DRBC rules.[127] A Bulk Water Use Approval is valid for a term of up to five years, with additional five-year renewals until all natural gas wells in the approval are in production, after which it may be extended for ten-year terms. The approval establishes the maximum volume that may be diverted, in millions of gallons per day or for the project. The approval also requires reuse and recycling of flowback and production waters, payment to the DRBC of a fee for all the water used, and payment for or performance of physical, chemical, and biological monitoring of surface water upstream and downstream of the well pad before and after each hydrofracturing event.[128]

A Bulk Water Use Approval application must provide extensive information and plans, including

> an invasive species control plan;[129] a plan to meter and report all water delivered to the natural gas well pad from each water source;[130] to meter and report the volume of water used for each hydrofracturing event, as well as the amount of recycled and recovered flowback and production water used;[131] a full report after each hydrofracturing event of the total amount of fracturing fluid used, including the amount and identity of each chemical additive;[132] a plan to meter and report quarterly all wastewater (flowback and production water) transported from each well pad;[133] a plan for offsite transportation of drill cuttings and fluids for proper disposal within forty-five days after completion of well drilling;[134] plans to

125. *Id.* §§ 7.3(b)(1)(iii), 7.4(d).
126. *Id.* § 7.3(b)(1)(iii).
127. *Id.* § 7.4(e).
128. *Id.* § 7.4(e)(3).
129. *Id.* § 7.4(e)(3)(x).
130. *Id.* § 7.4(e)(3)(xi).
131. *Id.* § 7.4(e)(3)(xii).
132. *Id.* This provision of the Gas Rules would require reporting to the DRBC of the chemicals mixed with water used to hydrofracture each well. *Id.* The Energy Policy Act of 2005 has exempted such reporting to the USEPA under the Safe Drinking Water Act's Underground Injection Well program.
133. *Id.* § 7.4(e)(3)(xiii).
134. *Id.* § 7.4(e)(3)(xiv).

store, reuse, treat and discharge wastewaters;[135] a plan to sample flowback and production water, for specific parameters using specific methods;[136] the volumetric allocation requested, in millions of gallons per day or for the entire project;[137] the proposed water sources;[138] each bulk water sale agreement between the applicant and each proposed water source;[139] a non-point source pollution control plan, that complies with DRBC and host state requirements, for Special Protection Waters;[140] financial assurance sufficient to close all wells and restore all gas well pad sites, complete all mitigation and restoration requirements, and mitigate or remediate (or both) any release or threatened release of hazardous substances;[141] a plan for groundwater monitoring and post-construction monitoring and reporting;[142] and planned wastewater treatment facilities.[143]

The applicant for a Bulk Water Use Approval must provide advance notice to the public of its intent to construct a natural gas well, to the DRBC of receipt of approval from the host state or states, and to the DRBC of its intent to commence natural gas well construction, completion of construction, and of initiation of well stimulation.[144] The Bulk Water Use Approval holder must immediately notify and supply all material information to the DRBC if its monitoring indicates that its withdrawal significantly affects or interferes with any designated uses of surface water or groundwater, or if the holder receives any complaint about its withdrawal.[145]

Well pads must comply with specific siting and setback requirements.[146] The stated goals of these requirements include "protect[ing] landscape features essential to maintaining existing high water quality in the non-tidal river" (i.e., the segment north of Trenton, NJ),[147] preventing any degradation of water quality in that area, minimizing flood plain and headwater stream encroachment, and minimizing net loss of forest cover in headwater watersheds and flood plains and fragmentation of forest cores (i.e., sheltered forest environment at least 300 feet from forest edges).[148]

135. *Id.* § 7.4(e)(3)(xv).
136. *Id.* § 7.4(e)(3)(xvi).
137. *Id.* § 7.4(e)(4)(v).
138. *Id.* § 7.4(e)(4)(vi).
139. *Id.* § 7.4(e)(4)(vii).
140. *Id.* § 7.4(e)(4)(viii).
141. *Id.* §§ 7.3(j), 7.4(e)(4)(ix). The Gas Rules limit the amount of a financial assurance to a maximum of $250,000 to plug and abandon all wells in an entire Basin leasehold; to $8,000 per acre and a maximum of $5,000,000 per well pad; and $25,000,000 for an entire Basin leasehold, to mitigate or remediate any release or threatened release of hazardous substances. *Id.* § 7.3(j)(7).
142. *Id.* § 7.4(e)(4)(x).
143. *Id.* § 7.4(e)(4)(xi).
144. *Id.* § 7.4(e)(3)(vii).
145. *Id.* § 7.4(e)(3)(xvii).
146. *Id.* §§ 7.4(e)(3)(ix), 7.5.
147. *Id.* § 7.5(a).
148. *Id.* § 7.5(b)(2).

The recipient of a Bulk Water Use Approval may withdraw surface water or groundwater for its natural gas projects within the Basin only from an Approved List of Water Sources ("ALWS").[149] The DRBC is to maintain the ALWS for each natural gas development project sponsor, and the sponsor may withdraw from any source on the ALWS, provided the use will not exceed or violate any other condition in its approval.[150] The ALWS may include a centralized wastewater storage facility that is "constructed to store and distribute water," if its use will comply with all its regulatory approvals, and subject to quarterly reporting to the DRBC of the quantity, source, and destination of all wastewater transferred to and from the facility.[151]

The Gas Rules set forth criteria for DRBC review of any water source proposed for an ALWS to protect the water resources of the Basin.[152] Compliance is required with all government agencies' regulatory requirements and all other DRBC rules, including those for flood plains.[153] The proposed withdrawal must not have a significant adverse effect on or interfere with other users, such as reducing the assimilative capacity of the water body to receive upstream discharges.[154] The withdrawal also must not significantly harm aquatic resources such as wetlands, aquatic life, or groundwater levels.[155] The Gas Rules would ensure that a withdrawal will not unduly interfere with continued pass-by flows by setting a minimum pass-by flow requirement of "Q7-10,"[156] or the most stringent limit proposed by a state where the withdrawal would occur or that shares the waterway.[157] The permittee must specify the equipment it will use to ensure compliance with its flow requirement and minimize any short-term swings in surface flow volumes. The water source approval standards reiterate that no water from the Basin may be diverted outside the Basin without express approval in a DRBC docket.[158]

DRBC approval to withdraw water from an ALWS will be subject to extensive conditions intended to protect water resources. These include

> an invasive species control plan;[159] a non-point source pollution control plan, that complies with DRBC and host state requirements, for Special Protection Waters;[160] a natural diversity inventory as-

149. *Id.* §§ 7.3(b)(3), 7.4(c).
150. *Id.*
151. *Id.* § 7.4(c)(4).
152. *Id.* § 7.4(d).
153. *Id.* § 7.4(d)(1).
154. *Id.* § 7.4(d)(1)(iv).
155. *Id.*
156. Q7-10 is "a statistical estimate of the lowest average flow during a consecutive [seven] day period with an average recurrence interval of ten years." *Id.* § 7.2.
157. *Id.* § 7.4(d)(1)(v).
158. *Id.* § 7.4(d)(1)(vi).
159. *Id.* § 7.4(d)(1)(vii).
160. *Id.* § 7.4(d)(1)(viii).

> sessment of the water withdrawal site;[161] a plan for metering and recording withdrawals and transfers, measured to within 5% of actual flow;[162] a withdrawal site plan, including a map showing facilities to be installed and final construction plans and specifications;[163] a plan to restrict access to the withdrawal site, by fencing, signage or other means access;[164] compliance with DRBC Flood Plain Regulations;[165] and a withdrawal site operations plan, including procedures to meter, record, and report withdrawals and pass-by flow compliance.[166]

Use of sound excavation, backfill, and reseeding practices must be exercised at all withdrawal sites.[167]

DRBC approval to withdraw groundwater from an ALWS also requires an evaluation of the anticipated effects on groundwater. This evaluation must include a final hydrogeologic report detailing extended pumping test procedures conducted, results and analyses, and detail the impact on the aquifer, surface waters, and wetlands.[168]

The applicant for an ALWS is responsible to obtain access to the withdrawal site.[169] The applicant must agree to notify the DRBC of the start and completion of construction.[170] The ALWS approval holder must immediately notify and supply all material information to the DRBC if its monitoring indicates that its withdrawal significantly affects or interferes with any designated uses of surface water or groundwater, or if the holder receives any complaint about its withdrawal.[171]

Before construction begins, the applicant must receive approval of its water intake design from the DRBC Executive Director, the host state, and, where applicable, the United States Army Corps of Engineers and the United States Fish and Wildlife Service.[172] Approval to withdraw water from an ALWS is limited to three years unless project operation has begun,[173] and it requires an application for renewal at least one year before the expiration date.[174] ALWS approval for withdrawal from a water body does not constitute approval to conduct any other physical development activity.[175] All ALWS withdrawal ap-

161. *Id.* § 7.4(d)(1)(ix).
162. *Id.* § 7.4(d)(1)(x).
163. *Id.* § 7.4(d)(1)(xi).
164. *Id.* § 7.4(d)(1)(xii).
165. *Id.* § 7.4(d)(1)(xiii).
166. *Id.* § 7.4(d)(1)(xiv).
167. *Id.* § 7.4(d)(1)(xxiii).
168. *Id.* § 7.4(d)(1)(xx).
169. *Id.* § 7.4(d)(1)(xxii).
170. *Id.* § 7.4(d)(1)(xv).
171. *Id.* § 7.4(d)(1)(xxi).
172. *Id.* § 7.4(d)(1)(xxiv).
173. *Id.* § 7.4(d)(1)(xvi).
174. *Id.* § 7.4(d)(1)(xvii).
175. *Id.* § 7.4(d)(1)(xviii).

provals are subject to any drought emergency declaration by a government authority.[176]

I. *Standards for a Natural Gas Development Plan*

Larger natural gas development projects, involving either natural gas leaseholds totaling over 3,200 acres or construction of more than five natural gas well pads, require a Natural Gas Development Plan ("NGDP").[177] The NGDP is in addition to all other required approvals, including but not limited to a Bulk Water Use Approval, ALWS approval, and ALWS withdrawal approval. An NGDP involves a more comprehensive review than those approvals, primarily because the DRBC reviews the proposed natural gas development activities beyond those directly related to protecting the water resources of the Basin. The NGDP provisions of the Gas Rules establish planning and design standards for natural gas development projects above the threshold sizes "to protect landscape features essential to maintaining existing high water quality in the non-tidal river."[178]

An NGDP approval requires a DRBC docket, with detailed review of the proposed natural gas development activities. This is essentially a review of the proposed land use. It includes compliance with siting and setback requirements,[179] and detailed mapping and review of the area proposed for development.[180] The siting requirements prohibit most natural gas infrastructure in flood hazard areas, but a pipeline may be sited there with a variance from the DRBC.[181] Infrastructure in the Upper Delaware River Corridor, essentially the main river segment north of NJ and between NY and PA, must comply "from ridge to ridge" with the River Management Plan developed by NY and PA.[182] All well pads and other non-linear infrastructure must comply with the more stringent of any state-imposed requirement or the DRBC default setbacks.[183] The minimum DRBC setbacks range from the greater of 300 feet from the well bore or 100 feet between the nearest disturbance and any stream, water body, or wetland; 500 feet between the nearest disturbance and a private water supply well; and 1,000 feet between the nearest disturbance and a surface water supply intake, water supply reservoir, or public water system.[184] Variances are available if application of a minimum required setback would place "an undue burden" on the project or if the proposed alternative

176. *Id.* § 7.4(d)(1)(xix).
177. *Id.* §§ 7.3(b)(4), 7.5.
178. *Id.* § 7.5(a).
179. *Id.* § 7.5(c)(1), (d).
180. *Id.* § 7.5(e).
181. *Id.* § 7.5(d)(1)(i).
182. *Id.* § 7.5(d)(1)(ii).
183. *Id.* § 7.5(d)(1)(iii).
184. *Id.*

siting would be "equally or more protective" of the water resources of the Basin.[185]

The landscape mapping of the proposed natural gas development area must provide three sets of data: (1) areas prohibited from development by government regulation, such as flood hazard areas; (2) areas prohibited from development absent a regulatory variance; and (3) areas available for natural gas development, each showing their levels of environmental sensitivity.[186] The project sponsor also must demonstrate that the project design will meet the goals and objectives of the NGDP review process.[187] An exemption from the NGDP review process may be requested where it can be shown that the well pad sites are "geographically disparate," meaning that the natural gas produced from the wells will not be transported through a common gathering pipeline.[188]

One of the shortest but most significant sections of the Gas Rules requires DRBC approval by docket of any transfer, treatment, or discharge of any non-domestic natural gas wastewater at a new or existing facility within the Basin.[189] Recovered flowback and production water reused to stimulate a natural gas well is exempt from this requirement.[190] The primary consideration of this section of the Gas Rules is a demonstration that the proposed wastewater management facility is able to treat the anticipated waste stream and discharge it without exceeding any applicable safe drinking water regulations, effluent limitations, or stream quality objectives.[191] Disposal of non-domestic natural gas wastewater in an underground injection well within the Basin is subject only to approval by the USEPA and the host state, which the DRBC will deem sufficient to demonstrate consistency with the DRBC Plan.[192]

J. *The Gas Rules Require Review of Wastewater Plans and Encourage Beneficial Reuse of Wastewater*

The Gas Rules include numerous provisions encouraging beneficial reuse and recycling of treated and untreated domestic and non-domestic wastewater streams. The Gas Rules define "non-domestic wastewater" broadly, as "including treated or untreated wastewater, from sources other than domestic sanitary and gray water, including brines, production water, [well] flowback, drilling muds, hydraulic fracturing fluids, well servicing fluids, oil, drilling fluids, and cement mixer or

185. *Id.* § 7.5(d)(2).
186. *Id.* § 7.5(e)(1).
187. *Id.* § 7.5(b), (e)(2).
188. *Id.* § 7.5(c)(2)(ii)(B).
189. *Id.* § 7.6(a).
190. *Id.*
191. *Id.* § 7.6(b).
192. *Id.* § 7.6(b)(9).

cement truck washout water."[193] The Gas Rules also recognize that "some of the water used to hydraulically fracture a natural gas well will be recovered and reused to hydraulically fracture other natural gas wells . . . ."[194] With DRBC approval, a natural gas development activity may withdraw and use a variety of wastewaters, including treated wastewater or non-contact cooling water; mine drainage water; recovered flowback and production water; water from "incidental" sources such as top-hole water (uncontaminated groundwater or surface water brought to the surface by drilling); and collected precipitation.[195] With DRBC approval, certain wastewaters withdrawn outside the Basin may be imported into the Basin for use in natural gas development activities, including domestic wastewater treated to secondary standards; industrial wastewater treated with "Best Practicable Treatment" or "Best Available Treatment" as defined by the USEPA; natural gas flowback and production water, treated or untreated, if used within the same source state; non-contact cooling water; and mine drainage water.[196] In its Bulk Water Use Approval criteria, the DRBC requires maximum reuse and recycling of flowback and production waters,[197] and it incorporates conditions that encourage reuse of wastewaters, including flowback and production water and domestic and non-domestic wastewater.[198] Wastewater from a centralized storage facility may be used for a natural gas development project, subject to compliance with all regulatory approvals and quarterly reporting of wastewater transfers to and from the facility.[199]

K. *Status of the Rulemaking Process*

The DRBC has stated that its staff will provide the Commissioners with an "administrative and operational review" of the program established by the Gas Rules eighteen months after their effective date, and, after reviewing the report, the Commissioners will recommend any adjustments they deem appropriate.[200] The DRBC also has stated that it will authorize total Bulk Water Use Approvals for not more than 300 natural gas wells, until the Commissioners should approve more such approvals.[201] The NJ Department of Environmental Pro-

193. *Id.* § 7.2.
194. *Id.* § 7.3(a)(2)(i).
195. *Id.* § 7.4(a)(3)–(5), (7).
196. *Id.* § 7.4(b)(1).
197. *Id.* § 7.4(e)(3)(iv).
198. *Id.* § 7.4(e)(3)(xv)(C).
199. *Id.* § 7.4(c)(4).
200. DEL. RIVER BASIN COMM'N, REVISED DRAFT NATURAL GAS DEVELOPMENT REGULATIONS "AT-A-GLANCE" FACT SHEET (2011), *available at* http://www.nj.gov/drbc/library/documents/naturalgas-REVISEDdraftregs-factsheet110811corrected.pdf.
201. *Id.*

tection had requested similar limits, in its comments to the DRBC on the draft Gas Rules.[202]

The DRBC received extensive comments on its draft Gas Rules.[203] The DRBC had scheduled consideration of the Gas Rules at its November 21, 2011, meeting but postponed that action indefinitely. As of mid-September 2012, the DRBC had not announced any further action on the Gas Rules or explained the reason for their lengthy postponement.[204] Failure to adopt these rules leaves the Delaware Basin without rules for comprehensive and holistic oversight of the cumulative effects of natural gas development on its water resources.

L. *Economic and Environmental Issues*

Natural gas development, especially in the Delaware Basin, has raised public concern about a host of contradictory economic and environmental issues. The emotional debate and partisan claims have at times obscured objective analysis. Development of the natural "shale" gas industry offers significant benefits to some sectors of the economy. The Natural Gas Supply Association asserts that "[s]hale production provides new revenue to state and local governments.[205] Currently, the United States natural gas industry is responsible for between 3 and 4 million direct and indirect jobs, which represented approximately 2% of total employment in 2008.[206]

The Natural Gas Supply Association described a study of the potential economic benefits to the state of PA alone:

> [T]he proliferation of shale development presents the opportunity to create thousands of new jobs, providing a new revenue and tax base for many states currently struggling in the current economic downturn. In Pennsylvania in 2008, development of the Marcellus Shale generated $2.3 billion in economic impact, created more than 29,000 jobs and resulted in $240 million in state and local taxes. This economic growth associated with the Marcellus development could have an even larger impact over the next few years. A Pennsylvania State University report estimated that natural gas produc-

202. Letter from Bob Martin, Comm'r, NJ Dep't of Envtl. Prot., to Carol R. Collier, Exec. Dir., Del. River Basin Comm'n (Apr. 14, 2011), *available at* http://www.nj.gov/dep/docs/collier-drbc20110414.pdf.

203. *See* DEL. RIVER BASIN COMM'N, DRAFT NATURAL GAS DEVELOPMENT REGULATIONS (2010), *available at* http://www.state.nj.us/drbc/library/documents/natural gas-draftregs.pdf ("The [DRBC] held eighteen hours of public hearings at three locations during February 2011 to receive testimony and received approximately 69,000 submissions commenting on the Dec. 2010 draft during the public comment period that closed on April 15, 2011.").

204. *See* Sandy Bauers, *Commission Looking at Gas Drilling Mum on Discussions*, PHILA. INQUIRER, Sept. 14, 2012, http://www.philly.com/philly/news/local/20120913_Commission_looking_at_gas_drilling_mum_on_discussions.html#ixzz26NgEt0uy.

205. *Fueling Jobs and Economic Growth*, NATURALGAS.ORG, http://www.naturalgas.org/shale/fuelinggrowth.asp (last visited Dec. 28, 2012).

206. *Id.*

> tion in the state in 2012 will be responsible for a $14 billion economic impact, $1.4 billion in state and local tax revenue and 180,000 jobs.[207]

Horizontal drilling with hydraulic fracturing enabled natural gas production within PA to more than quadruple between 2009 and 2011, rising from almost 500 million cubic feet per day to nearly 3.5 billion cubic feet per day.[208] This unprecedented increase in production demonstrates the influence of hydraulic fracturing.[209] The effectiveness of this method has enabled production to rise dramatically while the total number of wells drilled has fallen. Drilling has consisted mainly of vertical wells, which typically are less productive and do not employ hydrofracturing.[210]

Others dispute the extent of economic benefits that may actually materialize and argue that the costs and risks of natural gas production, especially using hydrofracturing, are not worth the potential, and unevenly distributed, benefits. Most of the jobs directly created by natural gas development are short-term, focusing on drilling and constructing and developing the well pads, wells, and pipelines. Once the wells are developed and begin to produce gas, staffing levels necessary for operation and maintenance are much lower. Related industrial activities, such as pipe manufacturing, also are primarily short-term; once the wells, well pads, pipelines, and related facilities (such as compressor stations) are constructed, they are typically kept in service for decades.

Severance and other taxes and fees levied on the natural gas industry, and the methods of calculating them, vary substantially according to state and local laws.[211] Owners of property where wells are located are paid a negotiated leasehold fee, but owners of property that either does not contain gas or who choose not to allow drilling fear potential losses. These include diminished property values, adverse health and environmental effects, and esthetics incompatible with their intended property use (e.g., residential and vacation homes, river-oriented recreation, tourism).

Some see increased natural gas production as key to United States energy independence or to fostering a manufacturing revival, but those outcomes are not assured. Producers already have begun ex-

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207. *Id.*

208. *Horizontal Drilling Boosts Pennsylvania's Natural Gas Production*, U.S. ENERGY INFO. ADMIN. (May 23, 2012), http://www.eia.gov/todayinenergy/detail.cfm?id=6390.

209. *Id.* "Historically, natural gas exploration and development activity in Pennsylvania was relatively steady, with operators drilling a few thousand conventional (vertical) wells annually." *Id.*

210. *Id.*

211. PA, for example, does not levy a severance tax on natural gas extraction. CALVIN KENT ET AL., TAXATION OF NATURAL GAS: A COMPARATIVE ANALYSIS 2–3 (2011).

porting gas to countries where prices are higher. Some drillers have reduced production and switched their rigs to oil drilling when gas prices have fallen and oil prices have risen. Reducing the United States gas supply will raise prices towards global levels, thereby also diminishing the advantage from reduced energy prices to manufacturers and other consumers in the United States. There is no significant initiative in the United States to convert motor vehicles to use natural gas rather than gasoline. The energy source that natural gas has begun to displace is not imported petroleum oil for use in motor vehicles, but domestically mined coal for generating electricity. In the absence of a significant initiative in the United States to convert motor vehicles to use natural gas or electricity instead of gasoline, increased United States natural gas production will not significantly displace gasoline from petroleum oil as a source of motor vehicle fuel. While more remote in causation, some have expressed concern that increased natural gas production and continued falling prices may deter the development of non-hydrocarbon renewable energy sources.

Natural gas is a cleaner fuel than coal for generating electricity, and drilling for natural gas can cause less damage to land, water, and air than mining for coal. Fueling motor vehicles with natural gas rather than gasoline would produce less air pollution than refining the gasoline from petroleum and combusting it in engines. According to the USEPA, "[c]ompared to the average air emissions from coal-fired generation, natural gas produces half as much carbon dioxide, less than a third as much nitrogen oxides, and one percent as much sulfur oxides at the power plant."[212] While burning natural gas rather than coal to generate electricity produces only half as much carbon dioxide, its primary component—methane—is about twenty-one times more powerful than carbon dioxide at warming the atmosphere.[213] Additionally, natural gas development activities have reportedly caused significant leaks of natural gas into the atmosphere. Moreover, some sparsely populated areas with intensive gas drilling, such as Wyoming, have reported air pollution levels rivaling those of densely populated areas. The net result could be increased emission of air pollutants, such as methane, that trap heat in the atmosphere.

Natural gas development activities allegedly present numerous potential environmental risks to humans and the environment. They range from the direct effects of the drilling itself to the indirect effects of pipelines and truck traffic. The direct risks asserted include improperly sealed wells, allowing drilling fluids or well gases to contaminate ground or surface water or the air; using billions of gallons of water to hydrofracture thousands of wells; managing natural gas was-

212. *Clean Energy*, U.S. ENVTL. PROT. AGENCY, http://www.epa.gov/cleanenergy/energy-and-you/affect/natural-gas.html (last updated Oct. 17, 2012).

213. *Methane*, U.S. ENVTL. PROT. AGENCY, http://epa.gov/climatechange/ghgemissions/gases/ch4.html (last updated June 22, 2010).

tewater; well blowouts; seismic activity induced by hydrofracturing; air emissions from the wells and related equipment; and the increased costs to treat and manage wastewater, potable water, and water treatment sludge. While the DRBC Gas Rules would regulate and presumably reduce the impact of many of these direct effects, the scope of variances granted could undermine a particular rule. For example, a variance is available if a minimum setback requirement would place "an undue burden" on a natural gas development project,[214] allowing placement of a well closer to a water body. As another example, a variance to allow construction of a pipeline in a flood hazard area[215] could allow a greater level of risk as climate change results in more frequent and destructive flooding. Introducing a cost-benefit analysis can provide the DRBC with flexibility to respond to an inverse condemnation claim;[216] however, such analyses may value the allegedly reasonable expectations for the project investment more than the potential risks and costs to the environment and the community.

The natural gas development industry also could impose additional costs on the community. Only a limited number of technologies and facilities are available to treat the type of wastewater generated by natural gas hydrofracturing.[217] The cost of expanding or upgrading existing wastewater facilities within the Basin could be imposed on water and sewer utility ratepayers. Discharging improperly treated wastewater could increase the cost to treat potable water supplies, or impose health risks from drinking it.

The many potential indirect risks allegedly attributable to the natural gas development industry are similar to those that accompany any major development project. Most natural gas development in the Delaware Basin will occur in rural areas, where roads were not built or maintained to withstand intensive traffic. As mentioned above, over 500 tanker truck trips are needed to develop each new well using hydrofracturing, in addition to carrying heavy equipment for drilling and construction. The traffic impacts will include truck damage to roads, road congestion, noise, air pollution, and traffic safety issues. These potential effects may be exacerbated when development activities continue around the clock, every day until each well has begun to produce. The DRBC Gas Rules would not review most of these potential indirect effects.

Pipelines present both direct and indirect issues. Natural gas development in the Delaware Basin will require an extensive network of new pipelines. Local pipelines must be constructed through rural areas to collect the gas from possibly thousands of individual wells, and

214. NATURAL GAS DEVELOPMENT REGULATIONS, *supra* note 4, § 7.5(d)(2)(ii).
215. *See id.* § 7.5(d)(1)(i).
216. *See* Penn Cent. Transp. Co. v. City of New York, 438 U.S. 104, 124 (1978) (discussing factors of a regulatory taking claim).
217. N.Y.C. DEP'T OF ENVTL. PROT., *supra* note 58, at 46–47.

to transport it to treatment facilities and large interstate pipelines for conveyance. These collector pipelines often must be cut through forested and hilly watershed areas. The existing interstate pipeline network must be expanded to accommodate this new and large supply of gas from the Delaware Basin. These pipelines were originally built to transport gas from sources in states in the Southwest (e.g., Texas, Louisiana) to markets in the Northeast (e.g., NJ, NY). Building new collector pipelines and expanding the interstate pipeline network may generate environmental effects from the wellhead to cities hundreds of miles away. These potential effects may include forest clearing; stream and river crossings; hydrology disruption; habitat fragmentation; erosion; and damage to properties along pipeline routes. Expanding interstate pipelines also will require excavating and building pipelines through crowded urban areas (e.g., NYC, northeast NJ) to reach ports and markets.

Natural gas development activities, if conducted extensively within the Delaware Basin, have the potential to cause cumulative effects that the DRBC and state agencies may consider beyond the scope of their review of individual projects. In its comments on the draft regulations of horizontal drilling and high-volume hydrofracturing proposed by the NY State Department of Environmental Conservation ("NYSDEC"), for example, NYC pointed out that NYSDEC has not studied the cumulative effects of water withdrawals for the industry.[218] Extensive natural gas development activities, including forest clearing and construction, may cause erosion and non-point sources of pollution that may cumulatively deteriorate surface water quality. NYC has stated that such increased water pollution could compromise its watershed protection program, costing it $10 billion to construct a new water filtration plant and another $100 million per year to operate it.[219] A potentially alarming concern is the risk that seismicity induced by hydrofracturing may damage the tunnels and aqueducts that carry over 90% of the potable water supply to NYC.[220] Such concerns arise within the contexts of both state review of natural gas well drilling and

218. N.Y.C. DEP'T OF ENVTL. CONSERVATION, COMMENT TO DRAFT SUPPLEMENTAL GENERIC ENVIRONMENTAL IMPACT STATEMENT (DSGEIS) 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 12–17 (2009), *available at* http://www.nyc.gov/html/dep/pdf/natural_gas_drilling/nycdep_comments_final_12-22-09.pdf.

219. Letter from Steven W. Lawitts, Acting Comm'r of N.Y.C. Dep't of Envtl. Prot., to Div. of Mineral Res., Bureau of Oil & Gas Regulation (Dec. 22, 2009), *available at* http://www.nyc.gov/html/dep/pdf/natural_gas_drilling/12_22_2009_impact_statement_letter.pdf.

220. Letter from Carter H. Strickland, Jr., Comm'r of N.Y.C. Envtl. Prot., to Joseph Martens, Comm'r of N.Y. State Dep't of Envtl. Conservation (Jan. 11, 2012), *available at* http://www.nyc.gov/html/dep/pdf/natural_gas_drilling/nycdep_comments_on_rdsgeis_for_hvhf_20120111.pdf.

DRBC review of natural gas industry effects on Basin water resources.

The cost of remediating or mitigating the potentially devastating economic consequences of a mishap by the industry, and the possibility of its occurrence, must be carefully weighed. It is unclear, for example, if the amount of financial assurance required by the Gas Rules would be adequate to remediate or mitigate potential damage. The amount of financial assurance is limited to a maximum of $250,000 to plug and abandon all wells in an entire Basin leasehold, and to $8,000 per acre and a maximum of $5 million per well pad and $25 million for an entire Basin leasehold to mitigate or remediate any release or threatened release of hazardous substances.[221]

II. CONCLUSION

Through the Gas Rules, the DRBC would protect the water resources of the Delaware River Basin by supplementing regulation of natural gas development activities by other levels of government. The DRBC would thereby regulate practically all uses of water for natural gas development activities, as well as certain construction and operation activities for larger natural gas development projects, within the Basin. The Gas Rules represent broader and more holistic, though not comprehensive, oversight of the effects of natural gas development on the natural resources of the Basin.

While the Gas Rules would significantly expand the scope of regulated activities, they would regulate only the effects of certain natural gas development activities. The Rules include variances, exemptions, and limited financial assurances that could undermine their effectiveness. For example, the DRBC likely will be asked to determine the quantum of economic development that is sufficient to justify a natural gas development activity that could degrade the quality of the Basin's interstate waters.[222] Moreover, the Gas Rules do not consider the cumulative or indirect effects of natural gas development activities throughout the Delaware River Basin. The Gas Rules would regulate a long list of activities only for larger projects, not all natural gas development activities, and would expressly recognize individual member states' authority to regulate the construction and operation of natural gas wells. Despite those individual state regulations, however, the natural gas development industry presents numerous potential risks to the water resources of the Basin. These risks may arise from cumulative development throughout the Basin, or from circumstances

221. NATURAL GAS DEVELOPMENT REGULATIONS, *supra* note 4, § 7.3(j)(7).

222. *See* Water Quality Regulations, 18 C.F.R. pt. 410 § 3.10.3.A.1 (2011) (showing the DRBC policy to maintain interstate water quality, "unless it can be affirmatively demonstrated . . . that such change is justifiable as a result of necessary economic or social development . . . ." DRBC will likely maintain a similar policy regarding natural gas and require a similar explanation as required with water quality).

well beyond the scope of review for any individual project. The DRBC retains the authority, however, to further regulate a natural gas development activity now regulated by a state if it should cause significant adverse effects on the water resources of the Basin.

The primary mission of the DRBC is to preserve the water resources of the Basin, which have recovered well from the damage caused by 200 years of natural resource extraction and industry. The DRBC has crafted the Gas Rules to carry out its mission while addressing the challenges of this new industry. Only time will tell if this effort proves successful in its goal of creating a workable compromise between environmental protection and economic development.