The Illusion of the Blue Flame

Water Law and Unconventional Gas Drilling in New York State

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Abstract

This article explores the question of whether natural gas can still be considered a clean fuel by probing the relationship of water law and hydraulic fracturing in New York State. The paper begins by explaining the geology of tight shales, the engineering techniques needed to extract gas from solid rock, and the density and location of drilling that would be allowed under New York State law. Relying on information provided by the New York State Department of Environmental Conservation, scientific studies, and press accounts of the unprecedented citizen advocacy on this matter, it goes on to show the sharp distinction between the icon of natural gas as a clean blue flame and the actual and projected impacts of unconventional gas drilling. It concludes that the common sense of citizens is far ahead of established public policy in this fast moving area, and suggests that elected officials be attentive to these well-informed advocates as they determine the energy sources of the future.

I. Introduction

For years natural gas has been touted as a clean burning fuel that could serve as the transition from coal to renewables. The association of gas with clean heat became iconic, as can be seen in the ubiquitous blue flame that appears in ads, logos, trademarks, and other promotional materials. [2] However, the public policy of using natural gas as a transitional fuel developed at a time when this fossil fuel was found in reservoirs, and could be easily pumped out of the porous rock formations where it had accumulated. [3] Since then, conventional gas supplies

have peaked, and there are no new major reservoirs of methane to be found in the United States. [4] Instead, the industry is now extracting gas from tiny cracks in otherwise solid rock located as much as a mile - or more - beneath the earth's surface. [5] This unconventional form of gas drilling is referred to as high-volume hydraulic fracturing (HVHF), but is more commonly known as "fracking." As the name implies, the process requires large quantities of water to release particles of methane trapped in tiny spaces of rock. The technique has inextricably entwined water use with energy creation, and lead to a litany of unintended consequences.

The transition from conventional to unconventional gas drilling mostly took place in either industry friendly or rural portions of the United States, where the impacts could be dismissed as either nonexistent or necessary to keep the fuel flowing to the rest of the Nation. [6] This out-of-sight / out-of-mind scenario came to an abrupt end when the oil and gas industry targeted the Marcellus shale in New York State. There the companies stepped on the proverbial hornet's nest, and were quickly surrounded by a swarm of citizens who started stinging the invaders with a determination meant to drive them away. [7]

In July of 2008 the people of New York State were given an opportunity to learn more about fracking – and affect its outcome – when then Governor David Paterson decided to supplement a sixteen year old Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program (1992 GEIS) to counterbalance an industry-friendly statute on spacing units for gas drilling that he was signing into law. [8] The New York State Department of Environmental Conservation (DEC) issued a draft scope of work for a supplemental impact statement later that year. [9] Public comments on both the scope of work and the first Draft Supplemental Generic Environmental Impact Statement (2009 DSGEIS) called for studies on almost all of the social and natural resources in the state, including water supplies, air, food,

public health, socio-economic development, wildlife, and forests. [10] This paper will focus on a subset of those issues, namely the relationship between unconventional natural gas drilling and water law in New York State. [11]

While nothing has been firmly decided over the past four years, much has changed. Most significantly, the oil and gas industry can no longer rely upon the iconic image of natural gas as a clean blue flame. [12] The informed public is now more likely to associate natural gas drilling with either faucets that catch on fire or brown water that flows out of the tap. [13] These citizens have come to understand that unconventional gas drilling is just an extreme – maybe even desperate – form of fossil fuel extraction, and no amount of regulation will make it safe. They show a decided unwillingness to exchange their clean air, water, and health for energy. [14] And their common sense is supported by science. [15] While citizens ask their leaders to pursue other solutions, such action is not forthcoming; public policy and the law have simply failed to keep pace with the rapidly evolving realities of this resource war. [16] Therefore no matter what is decided in New York State, the power struggle between clean water and fossil fuels is likely to play out in a more violent fashion elsewhere as the need for energy intensifies around the world, potentially threatening large portions of the global water supply. [17]

II. Peak Gas and High-Volume Hydraulic Fracturing (HVHF)

A. Conventional Gas Drilling

Understanding the relationship between water and gas drilling requires a basic knowledge of geology, hydrology, and fossil fuel extraction. Many of the fundamental facts about New York State's geology can be found in the DEC's 1988 draft GEIS, and high-volume hydraulic fracturing **(**HVHF) is described in the DEC's 2011 revised DSGEIS. [18] However, a cumulative impact analysis of a full build out of gas wells is missing from the current study. It

takes an active imagination to convert the 1537 pages of words, graphics and charts contained in the current draft SGEIS into a mental model that expresses the impact gas drilling may have, and what New York State may look like in the future. The basic structure of that model can be found in the ancient past.

Over 400 million years ago, a shallow ocean spread across the area now defined as Appalachia. [19] Dead organisms and other debris fell to the bottom forming sedimentary deposits that are now miles thick. [20] Bacteria decomposed some of the organic matter, which was also compressed, heated, and subjected to lifting, faulting, folding, and tectonic collisions. Some of the petroleum products that we now covet as a source of energy rose up through these deposits to collect in porous sandstones, trapped by a cap of low permeable shales. [21] Oil and gas also seeped to the surface of the earth and were used by Native Americans and early settlers. [22] Fredonia, New York was the site of the first gas producing well in the Nation and since then, reservoirs of trapped gas have been drilled in western New York State. [23]

These conventional gas wells are comparatively benign. Basically the industry drills a hole down to the reservoir of gas, lines the hole, and either pumps up the hydrocarbons or lets them flow naturally from internal pressure. [24] However, by 1970 the oil and gas industry was having difficulty finding new reservoirs of gas that could be easily and cheaply extracted. [25] Gas production flattened out for the next two decades as the government worked with industry to develop new techniques to extract gas from tight shales, thereby giving birth to unconventional gas drilling. [26]

B. Invention is the mother of necessity

Modern society has let itself become almost completely dependent on fossil fuels for its survival, even though there are many other potential sources of energy. In the United States,

these alternatives include geothermal, biomass, photovoltaic, wind, fuel cells, hydrogen, biodiesel, ethanol, and oxygen fuel. [27] In addition, conservation and efficiency could greatly reduce our needs. [28] However, much of our infrastructure for transportation, heat, and electricity is tied to fossil fuels – and the industry that extracts and sells it may be the most powerful in the world – making a switch politically difficult. [29] Therefore, when the government saw that there were no new reservoirs of natural gas to be drilled in the United States, it lead the effort to find a solution by trying to extract gas directly from the cracks and pores of black shales. These formations are the source of the methane that has been accumulating in the sandstones for tens of millions of years – to be summarily depleted by modern man in a couple of centuries. [30] To tap the shale, the government first tried detonating nuclear bombs to fracture it, but those attempts made the gas radioactive. [31] Undeterred, the Atomic Energy Commission tried to conduct more nuclear experiments in the mid 1970s, but then stopped. [32]

Next the government partnered with private industry to develop what is now being promoted as a technological breakthrough, but an understanding of exactly what is involved calls that description into question. [33] Releasing gas from tight shales using HVHF with horizontal well bores requires a number of steps. Basically the industry drills a vertical hole, removes the drill bit, lines the hole with steel tubing, and then forces cement between the steel and the earth, hoping to create a seal tight enough to stop methane and other chemicals from migrating into water supplies, or up to the earth's surface. [34] The vertical drilling continues down, and then the drill is angled until it moves horizontally through the middle of the targeted shale. [35] Finally, in stages starting at the furthest point from the well pad, millions of gallons of water – mixed with sand and chemicals – are blasted through the holes at a pressure high enough to fracture rock a mile beneath the earth's surface. [36] Although there are no bombs involved, fracking requires an

explosive force that is powered by a dense chain of equipment on the surface. [37] Depending upon the depth of the borehole and the length of the horizontal pipe, anywhere from two to eight million gallons of water can be used to frack a well. [38] Added to this water is sand, which is used to hold open the pores, and a concoction of toxic chemicals. [39]

Drilling and fracking generate vast amounts of waste, which comes back to the surface as drilling fluids, cuttings, flowback water, and produced water. Since Marcellus shale is radioactive, so are the cuttings, water and gas that emerge. [40] It is anticipated, based on the data from Pennsylvania, that nine to thirty-five percent of the fracking water will flow back to the surface, along with the chemicals that were added to it. [41] In addition, the produced water, which returns with the gas, must be separated and disposed of, either through an industrial treatment plant or an injection well. [42] This produced water, or brine, is extremely salty, and includes an assortment of heavy metals and hydrocarbons. [43] All of the waste needs to be trucked out of the site, and probably out of the state, so there is a risk of accidents and spills anywhere along those routes. Finally, there is the possibility of migration of methane, vapors, fracking fluids, and brine through natural and manmade conduits into aquifers and up to the earth's surface. [44]

Government and industry failed to study the negative consequences of HVHF as they developed techniques to release the gas that is trapped in the pores of tight shales. Instead the technology was promoted as an advancement and innovation. [45] The shale "plays" were touted as a "discovery" of vast new reserves of domestic natural gas, and experts who dared question this rosy picture had their articles pulled. [46] True to its wild west heritage of "shoot first, ask questions later," the United States embraced HVHF simply because it had been invented – and promised to release a vast trove of natural gas. [47] The icon of clean energy – the blue flame of

natural gas – was transferred from conventional to unconventional gas drilling without a second thought.

However, someone seemed to be aware of the negative impacts of this new technology as the federal government systematically excluded and exempted hydrofracking from seven environmental statutes. [48] These include the Clean Water Act (CWA), Safe Drinking Water Act (SDWA), Resource Conservation and Recovery Act (RCRA), Clean Air Act (CAA), Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or the Superfund Act), Emergency Planning and Community Right to Know Act (EPCRA), and National Environmental Policy Act (NEPA). [49] Some of these exemptions were included in the 2005 Energy Policy Act, which was passed under then President George W. Bush and Vice President Richard B. Cheney. [50] For example, environmental reviews are to be expedited when gas drilling or transmission lines are sited on federal land. [51] In a similar fashion of fostering laxness over precaution, the 2005 Energy Policy Act exempted the oil and gas industry from having to comply with the underground injection provisions in the Clean Water Act and Safe Drinking Water Act. [52]

C. Cumulative Impacts of Unconventional Gas Drilling

To understand why 70% of residents in affected counties in New York State oppose fracking, one must imagine exactly what is entailed to put a shale well into production, and then extend and compound that volume of activity over space and time to generate a mental model of the impact of the tens of thousands of gas wells needed to achieve the projected production. [53] There is no easy comparison to assist in generating this mental map; the size and scope of industrial activity this generic environmental review will enable is unprecedented in New York State. However, a statement in a report to the United States Energy Information Administration

on the 750 trillion cubic feet of shale oil and gas estimated to exist in the United States might help: “In order to realize this production, substantial drilling is required. As the effective lifespan of the shale gas wells is relatively short, new wells are required to maintain current production levels as well as increase them.” [54]

New York State applies different standards for the various drilling techniques and formations. [55] Therefore each combination must be individually assessed and layered on top of another in order to comprehend the potential density of a complete build out of gas wells. According to the state’s spacing law, a multi-acre well pad will be permitted every square mile for horizontal drilling in a specific shale formation. [56] Depending on the size, shape, and topography of the unit, it is possible that one to sixteen horizontal gas wells will be drilled and fracked per square mile. [57] In addition, vertical infill wells, based on a forty-acre spacing unit, may be permitted within this same square mile in order to extract gas from areas the horizontal drilling could not reach. [58] A standard DEC permit will require all wells within a spacing unit to be drilled within three years. [59] However, because gas production tends to drop off precipitously in tight shales, each of these wells may have to be refracked to keep the gas flowing, potentially making each well pad a continuous site of industrial activity. [60]

More significantly, New York State has multiple formations of low permeable shales that can be productively tapped, with the Marcellus and Utica being the most extensive. [61] This means that two companies could each have a well pad on all, or a portion, of the same 640-acre spacing unit, with one company targeting the Marcellus and the other targeting the Utica. In addition to the tight shales, there are conventional formations, such as the Trenton Black River and Herkimer, with distinct spacing units, that can also be drilled within the same surface area. [62] Therefore, in many areas of the state, this generic state-wide environmental review of HVHF,

which will co-exist with the 1992 GEIS, will theoretically enable many distinct well pads to be permitted per square mile. [63]

When calculating the cumulative impact, in addition to the number of wells, one must also factor in the amount of land disturbed, and the impact of the activity associated with bringing each well into production. [64] Industry estimates that the average size of a typical HVHF well pad will be 3.5 acres. [65] Some well sites will have ponds for the storage of fresh water or the flow back of drill cutting fluids. [66] Each pad will also require an access road and pipelines for gathering the gas for distribution. [67] The DEC has estimated that it will take 3,959 heavy truck trips, and 2,840 light truck trips to frack one horizontal gas well using HVHF. [68] These trucks will be needed to prepare the access roads, well pads, and ponds; deliver the rig, pipes, water and chemicals needed to frack a well; and remove all of the waste products. The drilling and fracking process will take place twenty-four hours a day, seven days a week, accompanied by high intensity lights and sound that will shatter what had been a dark and quiet country scene. [69]

New York has about 28,500 square miles of Utica shale and 18,700 square miles of Marcellus shale beneath its surface, and the two formations overlap each other in the southern half of the state. [70] In addition, there are layers of sandstones, and other formations, that may contain gas that will be drilled in the future. It is only when gas wells for all of these overlapping formations get added together, with the total maximum number of trucks, water, chemicals, lights, sounds, spills, and vapors, that the true picture of what could happen as a result of this generic environmental review begins to emerge. [71]

III. Resource wars: the collision of water and energy, and the politics of who gets gas versus who gets "fracked."

There have always been people who have paid the price for the extraction of fossil fuels so that others could purchase it and live the easy life. [72] In many ways the situation that is proposed for New York State, in regards to gas drilling, is similar to what has been taking place around the globe, but in New York, the drilling, selling, and consumption of the fossil fuels would be happening in close proximity. Suddenly, we, or our neighbors, are the ones who are being threatened by the ill health and environmental degradation of fossil fuel extraction, making it harder for us to hide from the consequences of our energy consumption. [73]

Every gas well using high-volume hydraulic fracturing (HVHF) with horizontal drilling turns millions of gallons of pure water into toxic waste. This puts direct pressure on the quantity and quality of fresh water available for all other uses. In addition, there is the problem of how to separate and dispose of the waste. New York State does not have facilities that are capable of removing the radioactivity, chemical compounds, heavy metals, and brine that emerge from the earth with the gas. [74] Even if treatment facilities are constructed, fracking still has the potential to contaminate surface and ground water through spills, leaks, and effluent discharge because of the need to transport the material from the well pads to the facility, and the impossibility of removing all of the toxins in a cost-effective manner. [75] The state could require the industry to distill the wastewater – a process that would be able to remove the salts. [76] However, in that scenario, the amount of energy needed to extract the gas, and remove the contaminates, may be greater than what is produced from burning the natural gas, resulting in a net loss of energy. [77] Irrespective of the approach that will be taken, the industry will still have to dispose of the residuals – the concentrated toxins that are left after the water is cleaned. [78] In the ultimate form of "sweeping the dirt under the rug," some states force the fracking waste back into the earth.

However, this has been causing earthquakes in some areas, and the geology in New York State is not conducive to these injection wells. [79]

New York State has abundant water supplies that could be contaminated by fracking. This water normally provides a habitat for countless species, and potable water for tens of millions of people. There are seventeen watersheds in the state, 7600 freshwater lakes, ponds, and reservoirs, two great lakes, and 70,000 miles of rivers and streams. [80] The Susquehanna, Chemung, and Delaware Rivers have their headwaters in the area that lies above the Marcellus and Utica shales. [81] In addition, the state has an extensive network of primary and principal aquifers. [82] Both types are considered "highly productive," but primary aquifers are those that are currently being used by a major municipal water supply system. [83] Finally, there are many dispersed springs and aquifers, which are relied on by homeowners across the state. Many of them are perched aquifers, which are usually smaller in size. [84] Perched aquifers are abundant in New York State, but have not been mapped. In many instances they are located close to the surface of the earth, and are particularly vulnerable to surface disturbances and spills. [85]

In the current draft SGEIS, the DEC is proposing different standards for different water supplies, with the amount of protection directly correlated to the number of people dependent upon that water supply. For example, no drilling can take place within 4,000 feet of the border of watersheds of New York City and Syracuse, which have been granted filtration avoidance. [86] However, fracking can take place **within the watersheds** that supply water to smaller cities, with a setback of 2,000 feet from the wells, reservoirs, or streams that supplies the reservoir. [87] For the first two years, no well pads can be located within 500 feet of a primary aquifer. [88] Placing a well pad within 500 feet of a principal aquifer or private well, or within 150 feet of a stream, lake, or pond is not forbidden; it just requires a site-specific environmental review. [89]

These proposed bans, moratoria, and setbacks are proportional to the quantity of water served, with the water supplies of the most densely populated areas getting the greatest protection, and individual homeowners, and currently underutilized watersheds, getting the least amount of protection. [90] These standards defy logic, and many people are convinced that the DEC's plan is based on political expediency, not scientific fact.

A. Water law in New York State

In addition to the DEC's proposed regulations, the gas industry's use of water in the extraction of methane from low permeable shale will be subject to both common and statutory laws. [91] These laws include torts, nuisance, riparian rights, state permits for water withdrawals over 100,000 gallons, interstate compacts for the Susquehanna and Delaware River Basins, an international compact for the Great Lakes and Saint Lawrence Seaway, and the federal Clean Water Act. Finally, under the DEC's proposal, the Safe Drinking Water Act will determine if a watershed is exempt from all HVHF based on its filtration avoidance status.

Since there are overlapping local, state, interstate, and federal laws, preemption is likely to be a recurring issue. The problem has already emerged in terms of whether local municipalities can exert their land use powers to determine where gas drilling can take place within their borders. [92] Industry and landowners claim that the DEC has the sole right to regulate gas drilling, while towns argue that local land use laws are not regulating how the industry operates, but whether and where they can drill. [93]

Riparian rights

Riparian rights are derived from English common law and have been adopted in about thirty-two states in the eastern part of the Nation, including New York. A riparian parcel is land

that adjoins a natural body of water, such as a river or stream, and is thereby granted a property right to use the water – along with all of the other riparian parcels. [94] Traditionally the doctrine guaranteed absolute quantity and quality of water, meaning that no riparian owner could diminish the flow of water, or pollute it. [95] However, over time, this was reduced to a reasonableness standard, which means that a plaintiff must now prove that the defendant unreasonably took too much water, or unreasonably polluted it. [96] Riparian use of water is limited to the watershed from which it is taken. [97] If a court decides that the use, or abuse, by the defendant is unreasonable, then the judge can provide equitable relief by balancing, adjusting, or apportioning the uses of the other riparian owners so that all of them get enough water, or clean enough water, based upon the circumstances of that particular case. [98]

Statutory permits

In 2011 New York State enacted a law requiring a permit for the use of water by industry, commerce, and agriculture. [99] Water withdrawals over 100,000 gallons per day now require the approval of the DEC. [100] While the bill was promoted by large environmental organizations, and enjoyed strong support amongst legislators, it was widely opposed by grassroots organizations that oppose fracking. [101] The citizen advocates believe the gas industry should have to pay for all of the water it uses, that the law includes unnecessary loopholes, and that it will result in unintended consequences. [102] For example, gas drillers could simply hire multiple truckers to take 95,000 gallons of water per day as a way to avoid the need for a permit, and thereby get the water for free. [103] Alternatively, the law may establish a less stringent cost and permitting standard for the Great Lakes than the Susquehanna and Delaware River Basins, thereby causing an unequal drawdown of water from those international waters. [104]

Other eastern states have been operating under a combination of common law riparian rights and a statutory permit system for some years, and this hybrid system is now referred to as regulated riparianism. [105] While the judicial system in each state has interpreted regulated riparianism differently, most of them now allow water to be used on non-riparian land, or even outside of the watershed from which it was drawn. [106] Neither of these uses would be allowed under a pure riparian system. However, these regulations were promulgated for a reason. The vast increase in population, complexity of water use, and global warming have lead to the need for a unified system of regulations to protect a consistent flow of water. [107]

Interstate and international compacts

New York State is home to the headwaters of the Delaware and Susquehanna Rivers, both of which are governed by an interstate compact. [108] The Delaware River Basin Commission (DRBC) was created in 1961, and is comprised of the governors of New York, Pennsylvania, New Jersey, and Delaware. In addition, the North Atlantic Division Engineer of the U.S. Army Corps of Engineers serves as the federal representative. The Susquehanna River Basin Commission (SRBC) was created in 1970, and shares a similar structure as the DRBC's, except the affected states are New York, Pennsylvania, and Maryland. Both compacts call for the protection of both the quantity and quality of the water. [109] In addition, New York State is a member of the Great Lakes-St. Lawrence River Basin Water Resources Compact, which also restricts water use and withdrawal out of the basin. [110]

To date the Delaware River Basin Commission has not allowed any water withdrawals from within the watershed. On a number of occasions it was poised to finalize regulations and begin issuing permits, but each time there was a flood of opposition, and the DRBC postponed making the decision. [111] The latest example took place in November, when a meeting was

cancelled after the Governor of Delaware stated he would be voting against the regulations. [112] In addition to public comments and political pressure, there has also been legal action to protect the watershed from potential harm. Last spring New York State Attorney General Eric Schneiderman sued the Army Corps of Engineers for their failure to initiate a full environmental review before allowing hydrofracking in the basin. [113] Since then, the federal government has moved to dismiss the complaint, and the Attorney General has continued to oppose the proposed regulations. [114]

In contrast, the Susquehanna River Basin Commission has given a green light to gas drilling, and authorizes water withdrawal permits for hydrofracking at almost every meeting. [115] Since their compacts are similar, this highlights the stark difference in the politics and administration of the SRBC and the DRBC. For example, this past summer the SRBC proposed rules that would relax water withdrawal standards. [116] This resulted in public comments calling for strict protection of the water, and a cumulative analysis of the health and water impacts. [117] However, the SRBC has not been responsive, and the New York State Attorney General has not sued the SRBC as he did the DRBC.

Clean Water Act (CWA)

In 1972 Congress passed the Clean Water Act so "that the discharge of pollutants into the navigable waters be eliminated by 1985." [118] To achieve this lofty goal, it was mandated that "the discharge of any pollutant by any person shall be unlawful." [119] However, not every spill or hillside runoff qualifies as a discharge because, by definition, it has to originate from a "point source." [120] Injection wells associated with the oil and gas industry are specifically excluded from the definition of pollutants. [121] In addition, the oil and gas industry is exempt from the CWA's storm water runoff program. [122]

Concurrent with the goal of eliminating pollution, the CWA allows a person to discharge pollution – as long as they have a permit to do so. [123] In most states, including New York, the state's environmental agency issues permits and enforces the CWA. [124] Therefore the gas industry will need permits for discharging pollutants from a point source into water, and for dredging and filling wetlands. [125] For example, if the industry were to build an industrial waste water treatment facility, then it would need a permit in order to discharge the effluent. [126] This permit would specify the location of the outfall and the exact amount of toxins that could be discharged on a daily or monthly basis. [127] However, the EPA has not issued effluent limitation guidelines for hydraulic fracturing fluids, and high-level radioactive waste cannot be discharged into navigable waters. [128] In a different scenario, if a drilling pad were to be located in a wetland, then the company would have to get a dredge and fill permit before they could proceed. [129]

Safe Drinking Water Act

The Safe Drinking Water Act (SDWA) was enacted to establish minimum standards for public water supplies. [130] As amended, it mandates that surface water supplies that have at least fifteen service connections, or regularly serve at least twenty-five people for sixty days of the year, be filtered. [131] The required treatment is directly based on the quality of the source water. Systems with fewer connections, or users, do not have to filter. In addition, there is a filtration avoidance exception that allows a municipality to use a combination of social and biological controls, instead of technology, to ensure that the water is free of pathogens. The regulations that enable filtration avoidance mandate a watershed control program over "human activities which may have an adverse impact on the microbiological quality of the source water." [132]

The Catskill and Delaware watersheds, which are located west of the Hudson River, normally supply New York City with 90% of its water. [133] In 1993, the US Environmental

Protection Agency (EPA) issued its first filtration avoidance determination (FAD) for these two watersheds. [134] However, in order for it to be renewed, the City had to revise its watershed agreement, buy land, and upgrade its wastewater treatment facilities. [135] After extensive negotiations, the EPA, New York State Department of Health, New York City, upstate communities, and some environmental nonprofits signed a Memorandum of Agreement whereby the City would pay for upgrades to septic systems, wastewater treatment plants, and barnyards, and implement other programs that would limit the possibility of microbial contamination in the water. [136] In exchange, the residents and municipalities in the two watersheds were subject to more stringent requirements than found in the rest of the state. In 1997 and 2002, the EPA granted the City its second and third five-year FADs, and in 2007 it granted a ten-year FAD. [137]

However, the EPA, which administers the SDWA, does not simply divide watersheds into filtered and unfiltered systems. Instead, the agency requires a multi-barrier approach to protect the quality of all surface waters, even if the water is going to be filtered before it is consumed. [138] This multi-barrier approach was incorporated into the SDWA as part of the 1996 amendments, and memorialized in the 1997 New York City filtration avoidance Memorandum of Agreement. [139]

> [T]he effectiveness of the filtration process and complexity of plant operation is dependent upon the quality of the water entering the filtration plant. In addition, many contaminants are not removed by conventional filtration. Therefore it is clear that enhancement of the City's existing watershed rules and regulations would be necessary even if the City were to build filtration plants to filter its entire water supply. [140]

Unlike the EPA, the DEC draws a sharp distinction between filtered and unfiltered water supplies in its draft SGEIS. The DEC concludes that gas drilling poses a remote but unacceptable risk to unfiltered drinking water, and proposes a complete ban in those watersheds. [141] The DEC reaches this conclusion by assuming that gas drilling will create more turbidity than other development, and that fact, along with the risk of toxic spills, may result in the loss of filtration avoidance. [142] Therefore the agency has proposed a complete ban on gas drilling within 4000 feet of the border of the Catskill and Delaware watersheds, which supply New York City, and Skaneateles Lake, which supplies Syracuse, as those watersheds currently have filtration avoidance. [143] Gas drilling in watersheds that are filtered can proceed, as can drilling in the unfiltered watersheds and recharge areas of individual homeowners.

In addition to surface water requirements, the SDWA also includes an underground injection control (UIC) program. [144] However, the oil and gas industry's use of hydrofracking was granted an exemption to this program in the 2005 Energy Act. [145] This exemption is commonly referred to as the Halliburton loophole because of Dick Cheney's role as both Vice President of the United States and former CEO of Halliburton, the company that controls the patent on the technology that underlies hydraulic fracturing. [146]

Hydraulic fracturing and injection wells are also becoming associated with other unintended consequences – namely volcanic activity and earthquakes. [147] It appears that injecting fluids deep into the earth adds pressure to faults and provides lubrication for slippage, and there is at least a location-based correlation between fracking and earthquakes. [148]

B. Is unconventional gas drilling worth the risks?

Every step of the process of HVHF carries significant risks to water, and the people, plants, and animals that rely on it. For example: (1) well pads, access roads, and pipeline

construction cause forest fragmentation, stormwater runoff, and degradation of water quality; [149] (2) water withdrawals threaten aquatic life, water quality, and the rights of riparian users; [150] (3) toxic fracking chemicals are spilled during transport to the site, on-site, or at some stage of processing flowback waste; [151] (4) methane can seep through the cement casings outside the well piping and cause explosions, water contamination, and powerful greenhouse gas emissions; [152] (5) water supplies can be contaminated with methane and fracking fluids; [153] (6) waste water can pollute rivers either through spills or the discharge of effluent that has not been adequately treated; [154] and (7) people and animals can be sickened by heavy metals, volatile organic compounds, endocrine disruptors, and radioactivity. [155] While New York State's common law and statutes may provide remedies after an injury has occurred, they are incapable of stopping the impacts and accidents that are associated with fracking.

The most infamous example of gas drilling fouling private water supplies took place in Dimock, Pennsylvania, where, three years ago, methane leaked from nearby gas wells into water aquifers, flinging an eight-foot wide concrete slab off the top of a well, and contaminating the water of sixteen households. [156] The gas companies were fined and ordered to provide water to the residents, but were recently allowed to stop delivering water by the Pennsylvania Department of Environmental Protection. [157] However, the U.S. EPA recently reopened its investigation, stating that the well water test results "merit further consideration." [158]

In an attempt to control the impacts of unconventional gas drilling so that such events do not happen in New York State, the DEC has developed a regulatory regime that offers guidelines on how to build well pads and access roads, store fracking chemicals, and case well bores. [159] However, many citizen advocates do not believe these regulations will stop the fragmentation, the spills, the contamination, or the sickness. [160] Nor do the proposed regulations reassure the

people who live where the drilling will take place. [161] Many have come to understand that the entire enterprise surrounding unconventional gas drilling is a form of madness that ensures our continued addiction to fossil fuel. [162] In response, some of these citizen advocates have drawn the line in the sand and hope to stop the development of this decentralized and invasive form of energy extraction before the infrastructure makes it a fait accompli. [163]

On the other side are government officials, industry, and others who have an interest in maintaining the world's dependence on fossil fuel. [164] They promote unconventional gas drilling, saying that it can be done safely if regulated properly. [165] Many of them believe that natural gas is cleaner than coal, and could reduce our greenhouse emissions. However, recent studies question that assumption because methane is twenty to twenty-five times more potent as a greenhouse gas than carbon dioxide, and its impact could be particularly damaging in the short term as climate change approaches a tipping point. [166] Others point out that fracturing shale may create long term pathways for the migration of methane from the depths of the earth to atmosphere. [167] In New York State, the governor, the DEC, and many of the people who live on the receiving end of the gas pipelines favor the development of shale gas. But they hide behind a secret that is obvious to the rest of the state – they do not want any gas drilling in the watersheds that supply them with water. [168]

Contrary to many people's understanding, New York City and Westchester County are as vulnerable to the gas drillers as the rest of the state. The proposed ban in the Catskill and Delaware watersheds is dependent on maintaining filtration avoidance, and there is no guarantee that status will last, particularly if gas drilling proceeds in the rest of the state. [169] The demographics of New York State have changed dramatically over the last thirty years, with many people moving upstate from urban and suburban areas. [170] These "transplants" – as the

locals call them – will simply emigrate from watersheds where fracking is allowed into the Catskill and Delaware watersheds in order to avoid gas drilling. Their immigration will increase the number of single-family homes and subdivisions in the Catskill and Delaware watersheds. Clearing land for new homes will increase turbidity and probably trigger an order to filter. [171] In fact, the DEC refers to a study that indicates that even under current trends, New York City is likely to lose its filtration avoidance status. [172] According to the draft SGEIS, once the EPA orders filtration, then fracking would be permitted in the Catskill and Delaware watersheds.

The proposed schedule for buffers and bans in the draft SGEIS implies that the DEC is intending to phase in gas drilling across the state. The water supplies of the rural areas are being given the least amount of protection when hydrofracking starts, and after two or three years, the buffers for primary and principal aquifers may be reduced. [173] Once the industry becomes well established in the state, then even the watersheds that currently enjoy a complete ban, because of filtration avoidance, may lose that protection and also get fracked.

C. Some municipalities just say no

In 2011, citizens and elected officials outside of the Catskill, Delaware, and Skaneateles Lake watersheds realized that the state was not going to protect them from the gas drilling industry. Towns across the state started using their land use and zoning powers to ban heavy industry, including gas drilling. [174] It did not take long for landowners and the industry to react. In mid-September, the Town of Dryden was sued by the Denver-based Anschutz Exploration Corporation and the Town of Middlefield was sued by Cooperstown Holstein Corporation. [175] The plaintiffs in both cases claim that the local laws are preempted by a state statute that gives the DEC the sole right to regulate gas drilling. [176] Defendants rely on a parallel situation, in regard to mining, that went to the New York Court of Appeals. The state's highest court held

that a statute giving the DEC the right to regulate how an industry operates does not preempt a municipality from regulating whether and where that industry operates within its borders. [177] Oral arguments in the Dryden case were heard on November 4th, and in the Middlefield case on December 13th. [178] During oral arguments in the Middlefield case, an attorney for the plaintiffs argued that a ban cannot be harmonized with the DEC's regulations. [179] However, the attorney for the amici succinctly countered that the New York Court of Appeals supported a complete ban in *Gernatt.* [180]

The lawsuits have not stopped municipalities from moving forward to protect the health, safety, and welfare of their residents. Dozens of cities, towns, and counties have passed ordinances to either temporarily or permanently ban gas drilling within their borders. [181] The latest was the city of Binghamton, which lies in the heart of the most sought after Marcellus shale. [182] To assist this home rule movement, legislation was introduced last year to clarify that state law does not preempt municipalities from enacting local laws and ordinances of general applicability. [183] While it did not pass in 2011, the legislation will be reintroduced during the 2012 session. [184]

IV. Conclusion

Industry has attempted to associate shale gas drilling with the clean blue flame of conventional gas drilling. While their branding succeeded for a number of years, fracking is now associated with dirty water that bursts into flames. Many citizen advocates from New York State do not believe that the intense, decentralized process of extracting methane from almost solid shale can be done safely, and simply want it banned. Their representatives in state and national governments need to catch up with them, and promote truly clean alternatives to power our Nation. The fate of the Empire State is in their hands.

[1] Anne Marie Garti, J.D. Candidate, Pace University School of Law, B.A. Antioch College 1975. This paper was written for a class on Water Resources, taught by adjunct professor Philip Weinberg.

[2] *See, e.g.*, Moira F. Harris, *Advertising Characters in the Land of Sky Blue Waters*, Minnesota History, 24, available at http://collections.mnhs.org/MNHistoryMagazine/articles/57/v57i01p023-035.pdf (last visited January 13, 2012) (Reddy Flame was the "sibling" of Reddy Kilowatt. They were mascots for natural gas and electricity.); Bill Virgin, *Why Reddy Kilowatt is no longer current*, SEATTLE POST-INTELLIGENCER, July 12, 2006, http://www.seattlepi.com/news/article/Why-Reddy-Kilowatt-is-no-longer-current-1208750.php (last visited January 13, 2012); Susan E. Peterson, *Reddy Flame joins Reddy Kilowatt*, STAR TRIBUNE, September 21, 1998, http://www.highbeam.com/doc/1G1-62566503.html (last visited January 13, 2012); U.S. DOE, Natural Gas, fueling the blue flame, http://www.fossil.energy.gov/education/energylessons/gas/ (last visited January 13, 2012); American Oil & Gas Historical Society, *The Blue Flame*, Vol. 6, No. 1, March 2009, PETROLEUM AGE, http://sites.google.com/site/petroleumage/home/march-2009/the-blue-flame (last visited January 13, 2012) (A natural gas powered vehicle, called the Blue Flame, broke the sound barrier in 1970, setting the record as the world's fastest car. It took thirteen years for it to be beaten.); James Reyes, *The El Paso Natural Gas Company's blue flame*, JAMES REYES' POCHO BLOG, July 25, 2011, http://www.pochoblog.com/2011/07/25/el-paso-natural-gas-company-blue-flame/ (last visited January 13, 2012); Midland Park Toronto, Midland Park – History, http://midlandparktoronto.com/history.html (last visited January 13, 2012) (The 1960 ad for this suburb, with its award-winning homes, featured "Famous 'blue flame' natural gas."); Natural Gas Depot, *Logo*, www.naturalgasdepot.com (last visited January 13, 2012).

[3] U.S. Energy Information Administration, *Schematic Geology of Natural Gas Resources*, http://www.eia.gov/oil_gas/natural_gas/special/ngresources/ngresources.html (last visited December 22, 2011).

[4] John Laherrere, *Oil and gas: what future?*, 23, Groningen Annual Energy Convention, (November 21, 2006).

[5] U.S. Energy Information Administration, *What is Shale Gas and Why is it Important?*, http://www.eia.gov/energy_in_brief/about_shale_gas.cfm (last visited December 22, 2011).

[6] U.S. Energy Information Administration, *Review of Emerging Resources: U.S. Shale Gas and Shale Oil Plays*, July 2011, http://www.eia.gov/analysis/studies/usshalegas/ (last visited December 22, 2011).

[7] *See, e.g.*, http://www.gasmain.org/ (This site includes links to some grassroots organizations that oppose gas drilling.)

[8] Abrahm Lustgarten, *Governor Signs Drilling Bill But Orders Environmental Update*, PROPUBLICA, July 23, 2008, http://www.propublica.org/article/governor-signs-drilling-bill-but-orders-environmental-update-723/ (last visited December 22, 2011).

[9] New York State Department of Environmental Conservation, *Review Process Timeline*, http://www.dec.ny.gov/energy/47554.html (last visited December 22, 2011). (This falls under New York State's Environmental Quality Review Act (SEQRA). As of January 2012, the DEC has issued two draft supplemental generic environmental impact statements, one in September of 2009 and the other in September of 2011. It is unknown when, or if, the final impact statement will be certified.)

[10] New York State Department of Environmental Conservation, *Scoping Meeting Transcripts*, http://www.dec.ny.gov/energy/51422.html (last visited December 22, 2011); New York State Department of Environmental Conservation, *Draft Supplemental Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program*, (September 2009), http://www.dec.ny.gov/energy/58440.html (last visited December 22, 2011).

[11] The third leg in this stool is climate change, but a full exploration of the triangulation between energy, water, and climate change is beyond the scope of this paper. *See, e.g.*, Exloco, *Peak Water, Peak Energy, Climate Crisis: The Collision Ahead*, (February 2010); Robert W. Howarth, *Greenhouse Gas Footprint of Shale Gas Obtained by High-Volume, Slick-Water Hydraulic Fracturing*, Cornell University, September 15, 2011, http://www.eeb.cornell.edu/howarth/Marcellus.html (last visited December 30, 2011).

[12] The blue flame symbolizes the "cleaner burning fossil fuel." Chesapeake Energy uses it as its logo, http://www.chk.com/Pages/default.aspx (last visited December 22, 2011).

[13] Abrahm Lustgarten, *Scientific Study Links Flammable Drinking Water to Fracking*, PROPUBLICA, July 23, 2008, http://www.propublica.org/article/scientific-study-links-flammable-drinking-water-to-fracking/single (last visited December 22, 2011); Water Under Attack, *Can You Do This With Your Tap Water?*, YOUTUBE, http://www.youtube.com/watch?v=U01EK76Sy4A (last visited December 22, 2011); Susan Phillips, *New York anti-fracking activists put Dimock, Pa. on national map*, NEWSWORKS, December 20, 2011, http://www.newsworks.org/index.php/local/item/31613 (last visited December 22, 2011).

[14] Pulse Opinion Polls in Delaware and Sullivan Counties, October 2011, http://catskillcitizens.org/, http://catskillcitizens.org/pulse2011/ (last visited December 22, 2011); *New Yorker support casinos, split on hydro-fracking, college poll finds*, MID-HUDSON NEWS, December 21, 2011, http://www.midhudsonnews.com/News/2011/December/21/Casinos_fracking_Qpoll-21Dec11.htm (last visited December 22, 2011). (The difference in the results between the Pulse and Quinnipaic College polls appears to be based on where people live. When polling is restricted to areas that would be directly impacted by gas drilling, the results show about 70% of the people opposed to it. In contrast, 53% of suburban residents support gas drilling. Most suburban residents in New York State would reap the benefits of drilling as gas consumers, but would not directly suffer the burdens of extraction.)

[15] Abrahm Lustgarten, *Fracking Cracks the Public Consciousness in 2011*, PROPUBLICA, December 29, 2011, http://www.propublica.org/article/fracking-cracks-the-public-consciousness-in-2011 (last visited December 30, 2011).

[16] Germany is setting an aggressive policy to switch to renewable energy. *See, e.g.*, Melissa Eddy, *All eyes on German renewable energy efforts*, ASSOCIATED PRESS, December 29, 2011, http://hosted.ap.org/dynamic/stories/E/EU_GERMANY_MAKING_RENEWABLES_WORK?SITE=AP&SECTION=HOME&TEMPLATE=DEFAULT&CTIME=2011-12-29-04-56-50 (last visited December 29, 2011).

[17] The U.S. is leading the world in shale gas drilling, and is just beginning to export the technology elsewhere. France responded by becoming the first country to ban unconventional gas drilling, and South Africa passed a moratorium, but that may not save its desert from fracking. *See, e.g.*, Ian Urbana, *Hunt for Gas Hits Fragile Soil, and South Africans Fear Risks*, NEW YORK TIMES, December 30, 2011, http://www.nytimes.com/2011/12/31/world/south-african-farmers-see-threat-from-fracking.html?_r=1&hp=&pagewanted=print (last visited December 30, 2011); Tara Patel, *France Vote Outlaws Fracking Shale for Natural Gas, Oil Extraction*, BLOOMBERG, July 1, 2011, http://www.bloomberg.com/news/2011-07-01/france-vote-outlaws-fracking-shale-for-natural-gas-oil-extraction.html (last visited December 30, 2011); Associated Press, *Bulgaria bans Chevron from using fracking techniques in search for shale gas*, WASHINGTON POST, January 17, 2012, http://www.washingtonpost.com/business/bulgaria-says-chevron-cannot-use-fracking-technique-in-search-for-shale-gas/2012/01/17/gIQApg3R5P_story.html (last visited January 17, 2012).

[18] New York State Department of Environmental Conservation, *Draft Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program*, § 5, (1988), http://www.dec.ny.gov/energy/45912.html (last visited December 22, 2011); New York State Department of Environmental Conservation, *Revised Draft Supplemental Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program*, (September 2011), http://www.dec.ny.gov/energy/75370.html (last visited December 22, 2011). (The 1988 draft GEIS is cross-referenced in the 1992 final *Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program*, which is available at http://www.dec.ny.gov/energy/45912.html.)

[19] DEC, *2011 Revised Draft SGEIS*, Figure 4.1.

[20] DEC, *1988 Draft GEIS*, § 5.B, B1.

[21] EIA, *Schematic Geology of Natural Gas Resources*.

[22] DEC, *1988 Draft GEIS*, §§ 4.A, 4.B.1.

[23] DEC, *2011 Revised Draft SGEIS*, §§ 4, 4.1; DEC, *1988 Draft GEIS*, § 5.C

[24] *Id*. photos 5.8, 5.9, 5.10, 5.11; EIA, *Schematic Geology of Natural Gas Resources*.

[25] Laherrere, *Oil and gas: what future?*, 23.

[26] DEC, *2011 Revised Draft SGEIS*, § 4.1; Michael Shellenberger and Ted Nordhaus, *Opinion, The boom in shale gas? Credit the feds*, WASHINGTON POST, December 17, 2011, http://www.washingtonpost.com/opinions/a-boom-in-shale-gas-credit-the-feds/2011/12/07/gIQAecFIzO_story.html (last visited December 22, 2011).

[27] Energy Policy Act of 2005, 42 U.S.C. § 15801(1)(b) (2006). The Table of Contents of the Energy Policy Act lists many, but not all, of the potential sources of energy.

[28] *Id*. Measures for increasing conservation and efficiency can be found in the following titles of § 15801: Title I; Title II (hydro-power); Title IV; Title V; Title VII, Subtitles D & E; Title IX; and Title XIII, Subtitle C. *See also*, U.S. EPA, *Energy Conservation Action Plan*, http://www.epa.gov/greenkit/q5_energ.htm (last visited January 13, 2012).

[29] John H. Walsh, *The Future for the Fossil Fuels*, Canadian Association for the Club of Rome, June 16, 1999, http://pages.ca.inter.net/~jhwalsh/corfos.html (last visited January 13, 2012).

[30] DEC, *2011 Revised Draft SGEIS*, § 4.2.

[31] David O. Williams, *Legal fallout from nuclear bomb frack job reaches Colorado Supreme Court*, COLORADO INDEPENDENT, December 7, 2011, http://coloradoindependent.com/107333/legal-fallout-from-nuclear-bomb-frack-job-reaches-colorado-supreme-court (last visited December 24, 2011).

[32] James P. Sterba, *A.E.C. is planning new shale blasts*, NEW YORK TIMES, March 6, 1974, http://select.nytimes.com/gst/abstract.html?res=F30A15F83B551A7493C4A91788D85F408785F9&scp=1&sq=A.E.C.%20IS%20PLANNING%20NEW%20SHALE%20BLASTS&st=cse (last visited December 24, 2011). (Environmentalists were said to favor hydraulic fracturing.)

[33] EIA, *Review of Emerging Resources*; U.S. Department of Energy, *DOE's Early Investment in Shale Gas Technology Producing Results Today*, February 2, 2011, http://www.netl.doe.gov/publications/press/2011/11008-DOE_Shale_Gas_Research_Producing_R.html (last visited December 24, 2011).

[34] DEC, *Revised Draft SGEIS*, § 5.9.

[35] *Id*. at § 5.2.

[36] *Id*. at 5.9; photos 5.24, 5.6, 5.7, pp. 5-93, 5-12, 5-13; EIA, *What is shale gas and why is it important?* graphic, http://www.eia.gov/energy_in_brief/images/charts/hydraulic_fracturing_large.jpg

[37] DEC, *Revised Draft SGEIS*, photos 5.6, 5.7, pp. 5-12, 5-13.

[38] *Id*. at photo 5.24, p. 5-93.

[39] Id. at § 5.4.

[40] *Id*. at §§ 5.11.3.2, 5.16.7, 6.1.9, 6.7.

[41] *Id*. at §§ 5.11, 6.1.8, 7.1.7.

[42] *Id*. at §§ 5.16.5, 5.16.6, 5.16.7, 6.1.3.3, 6.1.8, 7.1.7.

[43] *Id*.

[44] Marc Durand, *Shale Gas 101*, YOU TUBE, May 7, 2011, http://www.youtube.com/watch?v=AW2qGewjb7k (last visited January 1, 2012); Marc Durand, *Conventional Gas vs Hydrofracturing Gas Shale*, SHALE GAS INFO, March 12, 2011; Marc Durand, *The Longevity of Structures*, FRACDALLAS, June 30, 2011, http://fracdallas.org/docs/reclamation.html (last visited January 1, 2012). (*Shale Gas 101* includes a 3D model that shows fracturing and methane migration over geologic time.) Ronald E. Bishop, *History of Oil and Gas Well Abandonment in New York*, SUSTAINABLE OTSEGO 2000, January 8, 2012, http://catskillcitizens.org/ (last visited January 20, 2012).

[45] *See, e.g.*, DEC, *Revised Draft SGEIS*, § 5.8.3; U.S. Department of Energy, *DOE's Early Investment in Shale Gas Technology Producing Results Today*, February 2, 2011, http://www.netl.doe.gov/publications/press/2011/11008-DOE_Shale_Gas_Research_Producing_R.html; http://www.swarthmore.edu/MarcellusShale.xml; http://www.youngsommer.com/2011/attorney-articles/hydrofracking-in-new-york-a-brief-overview (last visited December 24, 2011); Jorn Madslien, *All change as gas reserves soar*, BBC NEWS, November 8, 2009, http://news.bbc.co.uk/2/hi/business/8303581.stm (last visited December 24, 2011). (The opening paragraph of the Swarthmore site characterizes HVHF as an "innovation." ICF, DOE and Young Sommer describe the technology as an "advancement." A caption in the BBC article reads, "New technologies make it cheaper and easier to extract gas from shale rock.")

[46] Steve Andrews, *Umbrage in the Gas Patch*, ASPO, November 9, 2009, http://www.aspousa.org/index.php/2009/11/umbrage-in-the-gas-patch/, (last visited December 24, 2011); Arthur Berman, *Lessons from the Barnett Shale suggest caution in other shale plays*, ASPO, August 10, 2009, http://www.aspousa.org/index.php/2009/08/lessons-from-the-barnett-shale-suggest-caution-in-other-shale-plays/ (last visited December 24, 2011).
The number of people who do not believe these highly speculative figures has been increasing. *See, e.g.*, Chris Nelder, *Is there really 100 years worth of natural gas beneath the United States?*, SLATE, December 29, 2011, http://www.slate.com/articles/health_and_science/future_tense/2011/12/is_there_really_100_years_worth_of_natural_gas_beneath_the_united_states_.single.html (last visited December 29, 2011); Ian Urbina, *Insiders Sound an Alarm Amid a Natural Gas Rush*, NEW YORK TIMES, June 25, 2011, http://www.nytimes.com/2011/06/26/us/26gas.html (last visited December 22, 2011); Arthur Berman, *Shale Plays: A Time for Critical Thinking*, (October 2009).

[47] U.S. Energy Information Administration, *U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Proved Reserves, 2009*, http://www.eia.gov/oil_gas/natural_gas/data_publications/crude_oil_natural_gas_reserves/cr.html (last visited December 24, 2011).

[48] *Lax Rules for the Natural Gas Industry*, NEW YORK TIMES, March 3, 2011, http://www.nytimes.com/interactive/2011/03/03/us/20110303-natural-gas-

timeline.html?scp=1&sq=Lax%25252520Rules%25252520for%25252520the%25252520Natural%25252520Gas%25252520Industry&st=cse (last visited December 24, 2011); Susan Phillips, *Burning Question: What Would Life Be Like Without the Halliburton Loophole?*, STATE IMPACT, December 5, 2011, http://stateimpact.npr.org/pennsylvania/2011/12/05/burning-question-what-would-life-be-like-without-the-halliburton-loophole/ (last visited December 30, 2011).

[49] Clean Water Act, 33 U.S.C. § 1251 *et seq*. (2006); Safe Drinking Water Act of 1974, Pub. L. No. 93–523, 88 Stat. 1660 (December 16, 1974); Resource Conservation and Recovery Act, 42 U.S.C. § 6901 *et seq*. (2006); Clean Air Act, 42 U.S.C. § 7401 *et seq*. (2006); The Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. § 9601 *et seq*. (2006); Emergency Planning and Community Right to Know Act, 42 U.S.C. § 11001 *et seq*. (2006); National Environmental Policy Act, 42 U.S.C. § 4321 *et seq*. (2006).

[50] Energy Policy Act of 2005, 42 U.S.C. § 15801 *et seq*. (2006).

[51] *Id*. at §§ 15921, 15926, 15927.

[52] 33 U.S.C. 1362(6); 42 U.S.C. § 300h(d).

[53] *See supra* note 14.

[54] U.S. Energy Information Administration, by INTEK, Inc., *Review of Emerging Resources: U.S. Shale Gas and Shale Oil Plays*, pp 5, 22, July 2011, available at http://www.eia.gov/analysis/studies/usshalegas/.

[55] New York State Department of Environmental Conservation, *Statewide Spacing Unit Sizes and Setbacks*, http://www.dec.ny.gov/energy/1583.html (last visited December 22, 2011).

[56] *Id.* (One square mile equals 640 acres.)

[57] DEC, *Revised Draft SGEIS*, §§ 5.1.4.2; 5.2.2. (This document "anticipates" the number and types of wells and well pads based on projections made by the industry. These positive statements should not be confused with the vastly greater number of wells that the law actually allows.).

[58] *Id*. at § 5.1.4.2. (The DEC specifically retains discretion to permit wells at a greater density.)

[59] *Id*. at § 5.2.2.

[60] Arthur Berman, *Shale Plays: A Time for Critical Thinking*, (October 2009); Ian Urbina, *Insiders Sound an Alarm Amid a Natural Gas Rush*, NEW YORK TIMES, June 25, 2011, http://www.nytimes.com/2011/06/26/us/26gas.html (last visited December 22, 2011).

[61] DEC, *Revised Draft SGEIS*, §§ 4.3, 4.4.

[62] DEC, *Statewide Spacing Unit Sizes and Setbacks*.

[63] DEC, *Revised Draft SGEIS*, §§ 3.2.1, 5.2.2. (Skytruth has documented the impact of gas drilling pads in the Jonah Fields of Wyoming, where drilling has been permitted for over a decade. An image showing the well density is available at http://www.flickr.com/photos/skytruth/5453897342/ .)

[64] Mireya Navarro, *Imagining a Blur of Fracking Activity*, NEW YORK TIMES, September 8, 2011, http://green.blogs.nytimes.com/2011/09/08/imagining-a-blur-of-fracking-activity/?scp=1&sq=Imagining%20a%20Blur%20of%20Fracking%20Activity&st=cse (last visited December 24, 2011).

[65] DEC, *Revised Draft SGEIS*, § 5.1.2.

[66] *Id*. at §§ 5.2.5.1, 5.7.2.

[67] *Id*. at §§ 5.1.1, 8.1.2.1. (Industry has estimated that the typical access road for a well pad will require .27 acre of land. The DEC has not included any information on the potential impacts of gathering lines, which are needed to bring the gas from each well to the distribution lines. The Public Service Commission regulates distribution lines.)

[68] *Id*. at § 6.11; table 6.62, p 6-303; figure 6.21, p 6-304.

[69] *Fracking Hollenbeck Gas Site*, December 15, 2011, http://www.youtube.com/watch?v=zPE2RU5099U (last visited December 26, 2011).

[70] DEC, *Revised Draft SGEIS*, §§ 4.3, 4.4; figures 4.4; 4.8. (The Utica shale underlies more than half of New York State.)

[71] It must be emphasized that there are profound social impacts associated with gas drilling, which this paper is not even mentioning. These include: (1) disruption or destruction of traditional land based economies, such as tourism, farming, hunting, and fishing; (2) rising prices, especially in the housing market, which may lead to rural homelessness; (3) rendering properties ineligible for mortgages; (4) increased need for social services; and (5) emigration to areas where fracking is prohibited in order to avoid the impacts;

[72] Joe Berlinger, *Crude, The Real Price of Oil*, http://www.crudethemovie.com/about-2/ (last visited January 13, 2012).

[73] Associated Press, *CDC scientist: Tests are needed to determine impact of hydrofracking*, SYRACUSE POST-STANDARD, January 4, 2012, http://www.syracuse.com/news/index.ssf/2012/01/cdc_scientist_tests_are_needed.html (last visited January 13, 2012); Michelle Bamberger and Robert E. Oswald, *Impacts of Gas Drilling on Human and Animal Health*, NEW SOLUTIONS, Vol. 22(1) 51-77 (2012), http://psehealthyenergy.net/Impacts_of_Gas_Drilling_on_Human_and_Animal_Health (last visited January 13, 2012). (For other papers on potential health impacts see Physicians, Scientists and Engineers for Healthy Energy, http://psehealthyenergy.org/resources/show_list/id/21/root/17/start/.)

[74] DEC, *Revised Draft SGEIS*, §§ 5.13, 7.1.8.1.

[75] Associated Press, Pennsylvania seeks more tests to determine if hydrofracking contaminates drinking water, SYRACUSE.COM, April 7, 2011, http://www.syracuse.com/news/index.ssf/2011/04/pennsylvania_seeks_more_tests.html (last visited January 13, 2012).

[76] DEC, *Revised Draft SGEIS*, § 5.12.3.2; Aqua Technology, *Water Systems for the 21st Century*, http://www.aquatechnology.net/oilandgaswastewater.html (last visited January 13, 2012). (This solution is limited to less than 100,000 gallons per day.)

[77] DEC, *Revised Draft SGEIS*, § 5.12.4. (The author has been unable to locate a study on the total energy required to frack and distribute natural gas, and encourages scientists to do a study on the energy input and output of hydraulic fracturing.)

[78] DEC, *Revised Draft SGEIS*, § 5.13.4.

[79] *Id*. at §§ 5.13.4, 7.1.8.2; Associated Press, *Officials: 4.0 magnitude quake in northeast Ohio related to wastewater injection well*, WASHINGTON POST, December 31, 2011, http://www.washingtonpost.com/business/40-magnitude-quake-strikes-in-northeast-ohio-the-latest-near-a-gas-drilling-injection-well/2011/12/31/gIQAhiRoSP_story.html (last visited January 1, 2012).

[80] DEC, *NYS Watersheds*, http://www.dec.ny.gov/lands/60135.html (last visited December 26, 2011);

[81] DEC, *Susquehanna River Watershed*, http://www.dec.ny.gov/lands/48020.html (last visited December 26, 2011); DEC, *Chemung River Watershed*, http://www.dec.ny.gov/lands/48373.html (last visited December 26, 2011); DEC, *Delaware River Watershed*, http://www.dec.ny.gov/lands/48372.html (last visited December 26, 2011).

[82] DEC, *Primary and Principal Aquifers*, http://www.dec.ny.gov/lands/36119.html (last visited December 26, 2011).

[83] *Id*.

[84] DEC, *Groundwater Definitions*, http://www.dec.ny.gov/lands/76322.html (last visited December 26, 2011).

[85] It is the landowners' responsibility to keep the water in these aquifers pure.

[86] DEC, *Revised Draft SGEIS*, §§ 3.2.4, 6.1.5, 7.1.5. (Filtration avoidance is described in the next section. The Catskill and Delaware watersheds have filtration avoidance, and normally supply 90% of the water to New York City, and most of the water to Westchester County.)

[87] *Id*. at § 3.2.4. (This is subject to reconsideration three years after issuance of the first permit for high-volume hydraulic fracturing.)

[88] *Id*. (This is subject to reconsideration two years after issuance of the first permit for high-volume hydraulic fracturing.)

[89] *Id*. at § 3.2.5.

[90] Stanley R. Scobie, *Setbacks: How Far is Far Enough?*, Physicians, Scientists and Engineers for Healthy Energy, January 11, 2012, http://psehealthyenergy.org/resources/view/198843 (last visited January 1, 2012). (This paper analyzes the relationship of setbacks and percentage of surface and subsurface area available for drilling.)

[91] For the nonlawyers: common law is made by judges, and their decision sets a precedent for the next decision within that particular jurisdiction. Lower court decisions are subject to appeal within the state or federal system.

[92] Mark Izeman, *Keeping the 'Pig Out of the Parlor': Can NY Towns Restrict Fracking?*, NRDC, http://switchboard.nrdc.org/blogs/mizeman/keeping_the_pig_out_of_the_par.html (last visited December 28, 2011); Aaron Munzer, *Dryden defends gas ban in State Supreme Court*, BINGHAMTON PRESS AND SUN, November 4, 2011, http://www.pressconnects.com/article/20111104/NEWS01/111040380/Dryden-defends-gas-ban-State-Supreme-Court (last visited December 28, 2011); Sarah Crean, *Will Community Bans on Hydrofracking Hold Up?*, GOTHAM GAZETTE, December 2011, http://www.gothamgazette.com/article/environment/20111218/7/3659/ (last visited December 28, 2011).

[93] *See* ECL 23-0303(2). (This issue is discussed in more detail in the last section of this paper.)

[94] *Town of Oyster Bay v. Commander Oil Corp.*, 96 N.Y.2d 566, 571-572 (2001).
[95] *Harris v. Brooks*, 283 S.W.2d 129, 132-133 (Ark. 1955).
[96] *Id*.; *Barkley v. Wilcox*, 86 N.Y. 140, 146-147 (1881).
[97] *Harris*, 283 S.W.2d at 133.
[98] *Colorado v. New Mexico*, 459 U.S. 176, 187 (1982).
[99] The water withdrawal bill (A. 5318-A / S.3798) was signed into law by Governor Andrew Cuomo on August 15, 2011. The DEC is currently accepting comments on its proposed rules. Information is available at http://www.dec.ny.gov/enb/20111116_not0.html.
[100] Mireya Navarro, *N.Y. Legislature Tightens Rules on Water Withdrawals*, NEW YORK TIMES, June 20, 2011, (last visited December 30, 2011).
[101] Jon Campbell, *Water withdrawal bill pulled, still appears headed for Senate vote*, POLITICS ON THE HUDSON, June 13, 2011, http://polhudson.lohudblogs.com/2011/06/13/water-withdrawal-bill-pulled-still-appears-headed-for-senate-vote/ (last visited December 30, 2011).
[102] For a list of organizations that opposed the bill, and a June 13, 2011 statement as to why, go to http://un-naturalgas.org/weblog/2011/06/nys-proposed-water-withdrawal-bill-a-bad-bad-idea/.
[103] This could only occur in areas outside of the jurisdiction of the DRBC and the SRBC.
[104] Rachel Treichler, *New York's Proposed Water Withdrawal Regulations: Unequal Treatment for the Great Lakes Basin*, NEW YORK WATER LAW, http://nywaterlaw.com/blog/1201/1201nywaterregs.html (last visited January 16, 2012).
[105] Jeremy Nathan Jungreis, *"Permit" Me Another Drink: A Proposal for Safeguarding the Water of Federal Lands in the Regulated Riparian East*, 29 HARV. ENVTL. L. REV. 369, 380-382 (2005).
[106] *Id*. at 381.
[107] Robert E. Beck, *The Regulated Riparian Model Water Code: Blueprint for Twenty First Century Water Management*, 25 WM. & MARY ENVTL. L. & POL'Y REV. 113, 113-115 (2000).
[108] Interstate compacts require the approval of the legislatures of the affected states and Congress. U.S. CONST. art. I, § 10, cl. 3.
[109] The Delaware River Basin Compact is available at http://www.state.nj.us/drbc/over.htm (last visited December 28, 2011); the Susquehanna River Basin Compact is available at http://www.srbc.net/about/geninfo.htm (last visited December 28, 2011).
[110] *See, e.g.*, Great Lakes-St. Lawrence River Basin Water Resources Compact, http://www.glslcompactcouncil.org/ (last visited December 28, 2011).
[111] Mike Soraghan, *Obama gets another energy headache as agency delays drilling vote*, GREENWIRE, November 21, 2011, http://www.eenews.net/public/Greenwire/2011/11/21/1 (last visited December 28, 2011).
[112] Governor Jack Markell, *"Fracking" Proposal Currently Lacks Sufficient Health and Safety Protections / Delaware will vote No at Monday meeting of the Delaware River Basin Commission*, November 17, 2011, http://news.delaware.gov/2011/11/17/drbc_fracking/ (last visited December 28, 2011). (On December 8, 2011 the Delaware River Basin Commission passed a resolution "to postpone the Commissions consideration of applications for water withdrawals within the State of New York to serve natural gas development activities, pending completion of New York's environmental quality review process." This delays the potential conflict between state and interstate regulations. A copy of the resolution is available at http://www.state.nj.us/drbc/ResForMinutes12-8-2011.pdf.)
[113] Mireya Navarro, *New York Sues Over a Drilling Rules Plan*, NEW YORK TIMES, May 31, 2011, http://www.nytimes.com/2011/06/01/nyregion/new-york-sues-to-slow-rules-for-new-gas-drilling.html?_r=1&hpw=&pagewanted=print (last visited December 28, 2011). (The complaint is available at http://blogs.democratandchronicle.com/voteup/2011/05/31/view-a-copy-of-schneidermans-fracking-lawsuit/.)
[114] Tiffany Kary, *Judge Lets U.S. Weigh in Against New York Fracking Lawsuit*, BLOOMBERG, August 11, 2011, http://www.bloomberg.com/news/2011-08-10/u-s-can-try-to-dismiss-new-york-lawsuit-on-fracking-process-judge-rules.html (last visited December 28, 2011); David King, *Schneiderman Weighs in on Federal Fracking Regs*, GOTHAM GAZETTE, November 8, 2011, http://www.gothamgazette.com/blogs/wonkster/2011/11/08/schneiderman-weighs-in-on-federal-fracking-regs/ (last visited December 28, 2011).
[115] Susquehanna River Basin Commission, *Natural Gas Shales and Natural Gas Well Development*, http://www.srbc.net/programs/projreviewnaturalgas.htm (last visited December 28, 2011).
[116] Susquehanna River Basin Commission, *SRBC to Conduct Hearings on August 2 and 4 on Proposed Changes Regarding Natural Gas Development*, July 27, 2011, http://www.srbc.net/newsroom/NewsRelease.aspx?NewsReleaseID=64 (last visited December 28, 2011).

[117] Jim Austin, *Local biological director to receive award*, DAILY STAR, September 16, 2011, http://thedailystar.com/localnews/x1492496002/Local-biological-director-to-receive-award (last visited December 28, 2011).

[118] Clean Water Act, 33 U.S.C. § 1251(a)(1) (2006).

[119] *Id*. at § 1311(a).

[120] *Id*. at § 1362(12). (A point source is defined as: "any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged. This term does not include agricultural storm water discharges and return flows from irrigated agriculture." § 1362(14).)

[121] *Id*. at § 1362(6). (It reads: "The term 'pollutant' means dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water. This term does not mean (A) 'sewage from vessels or a discharge incidental to the normal operation of a vessel of the Armed Forces' within the meaning of section 312 of this Act [*33 USCS § 1322*]; or (B) water, gas, or other material which is injected into a well to facilitate production of oil or gas, or water derived in association with oil or gas production and disposed of in a well, if the well used either to facilitate production or for disposal purposes is approved by authority of the State in which the well is located, and if such State determines that such injection or disposal will not result in the degradation of ground or surface water resources.")

[122] *Id*. at § 1342(l)(2).

[123] *Id*. at § 1311(a). (Generally this is done in accordance with effluent limitation guidelines established by the U.S. Environmental Protection Agency.)

[124] *Id*. at § 1342(b).

[125] *Id*. at §§ 1342, 1344.

[126] *Id*. at § 1342(a)(1).

[127] 40 C.F.R. §§ 124.6-8, 122.43, 122.41(j)(3)(i); 33 U.S.C. § 1342(a)(1).

[128] 33 U.S.C. § 1311(b), 1311(f).

[129] *Id*. at § 1344(a).

[130] Safe Drinking Water Act of 1974, Pub. L. No. 93–523, 88 Stat. 1660 (December 16, 1974).

[131] 42 U.S.C. § 300(f)(4)(A) (2006).

[132] 40 C.F.R. §141.71(b)(2) (2011). It reads:

"The public water system must maintain a watershed control program which minimizes the potential for contamination by Giardia lamblia cysts and viruses in the source water. The State must determine whether the watershed control program is adequate to meet this goal. The adequacy of a program to limit potential contamination by Giardia lamblia cysts and viruses must be based on: the comprehensiveness of the watershed review; the effectiveness of the system's program to monitor and control detrimental activities occurring in the watershed; and the extent to which the water system has maximized land ownership and/or controlled land use within the watershed. At a minimum, the watershed control program must:

(i) Characterize the watershed hydrology and land ownership;

(ii) Identify watershed characteristics and activities which may have an adverse effect on source water quality; and

(iii) Monitor the occurrence of activities which may have an adverse effect on source water quality.

The public water system must demonstrate through ownership and/or written agreements with landowners within the watershed that it can control all human activities which may have an adverse impact on the microbiological quality of the source water. The public water system must submit an annual report to the State that identifies any special concerns about the watershed and how they are being handled; describes activities in the watershed that affect water quality; and projects what adverse activities are expected to occur in the future and describes how the public water system expects to address them. For systems using a ground water source under the direct influence of surface water, an approved wellhead protection program developed under section 1428 of the Safe Drinking Water Act may be used, if the State deems it appropriate, to meet these requirements."

[133] NYC Department of Environmental Protection, *History of New York City's Water Supply System*, http://www.nyc.gov/html/dep/html/drinking_water/history.shtml (last visited January 14, 2012).

[134] U.S. EPA, *Filtration Avoidance*, http://www.epa.gov/region2/water/nycshed/filtad.htm (last visited January 14, 2012).

[135] *Id*.
[136] U.S. EPA, *Watershed Progress: New York City Watershed Agreement*, http://water.epa.gov/type/watersheds/nycityfi.cfm (last visited January 14, 2012).
[137] U.S. EPA, *Filtration Avoidance*.
[138] *See e.g*. Environmental Protection Agency, *Consider the Source: A Pocket Guide to Protecting Your Drinking Water*, 2-4 (June 2002), http://www.epa.gov/safewater/sourcewater/pubs/guide_swppocket_2002.pdf (last visited December 30, 2011).
[139] *Id*. at 5-16.
[140] *Rules and Regulations for the Protection from Contamination, Degradation and Pollution of the New York City Water Supply and its Sources*, § 18-12(c), May 1, 1997, amended April 4, 2010, available at http://www.nyc.gov/html/dep/html/watershed_protection/watershed_regulations.shtml (last visited December 30, 2011).
[141] DEC, *2011 Revised Draft SGEIS*, §§ 6.1.5 - 6.1.5.4.
[142] *Id*.
[143] *Id*. at § 6.1.5.
[144] U.S. EPA, *Underground Injection Control Program*, http://water.epa.gov/type/groundwater/uic/index.cfm (last visited December 30, 2011).
[145] 42 U.S.C. § 300h(d).
[146] Earthworks, *Halliburton loophole*, http://www.earthworksaction.org/halliburton.cfm (last visited December 31, 2011).
[147] *See, e.g.*, Seth Mydans, *A Corner of Indonesia, Sinking in a Sea of Mud*, NEW YORK TIMES, December 19, 2008, http://www.nytimes.com/2008/12/19/world/asia/19mud.html?sq=mud&st=cse&scp=1&pagewanted=print (last visited December 31, 2011); *Report Says Drilling, Not Earthquake, Caused The Lusi Mud Volcano*, Science 2.0, June 9, 2008 http://www.scientificblogging.com/news_releases/report_says_drilling_not_earthquake_caused_the_lusi_mud_volcano (last visited December 31, 2011); Jeff Carlton, *Drilling might be culprit behind Texas earthquakes*, USA TODAY, June 15, 2009, http://www.usatoday.com/tech/science/2009-06-15-drilling-earthquake_N.htm (last visited December 31, 2011); James Glanz, *Deep in Bedrock, Clean Energy and Quake Fears*, NEW YORK TIMES, June 23, 2009, http://www.nytimes.com/2009/06/24/business/energy-environment/24geotherm.html?_r=1&em (last visited December 31, 2011); *Ben Casselman, Wastewater Disposal Well May Have Caused Texas Earthquakes*, WALL STREET JOURNAL, August 13, 2009, http://online.wsj.com/article/SB125020088034530363.html (last visited December 31, 2011); Oilprice.com, *U.S. Government Confirms Link Between Earthquakes and Shale Gas Extraction*, Minyanville.com, November 9, 2011, http://www.minyanville.com/businessmarkets/articles/earthquake-natural-gas-Rocky-Mountain-Arsenal/11/9/2011/id/37856?camp=syndication&medium=portals&from=yahoo (last visited December 31, 2011); *Ohio quakes probably triggered by waste disposal well, say seismologists*, PHSORG.COM, January 9, 2011, http://www.physorg.com/news/2012-01-ohio-quakes-triggered-disposal-seismologists.html (last visited January 20, 2012); Henry Fountain, *Add Quakes to Rumblings Over Gas Rush*, NEW YORK TIMES, December 12, 2011, http://www.nytimes.com/2011/12/13/science/some-blame-hydraulic-fracturing-for-earthquake-epidemic.html?_r=1&hpw=&pagewanted=print (last visited December 31, 2011); Associated Press, *Officials: 4.0 magnitude quake in northeast Ohio related to wastewater injection well*, WASHINGTON POST, December 31, 2011, http://www.washingtonpost.com/business/40-magnitude-quake-strikes-in-northeast-ohio-the-latest-near-a-gas-drilling-injection-well/2011/12/31/gIQAhiRoSP_story.html (last visited January 1, 2012).
[148] *Id*.
[149] *See, e.g.*, Karl Blankenship, *Marcellus Shale drilling may take huge chunks out of PA forests; Loss could heavily impact wildlife habitat, state's ability to meet TMDL goal*, CHESAPEAKE BAY JOURNAL, December 2011, http://www.bayjournal.com/article.cfm?article=4246 (last visited December 31, 2011).
[150] *See, e.g.*, Susan Phillips, *Pa. Lawmaker Proposal Would Strip Feds of Water Regulation Authority in Allegheny National Forest*, STATE IMPACT, December 13, 2011, http://stateimpact.npr.org/pennsylvania/2011/12/13/pa-lawmaker-proposal-would-strip-feds-of-water-regulation-authority-in-allegheny-national-forest/ (last visited December 31, 2011).
[151] *See, e.g.*, Laura Legere, *Cabot report finds chemicals but no health threats in whistleblower investigation*, THE TIMES TRIBUNE, December 15, 2011, http://thetimes-tribune.com/cabot-report-finds-chemicals-but-no-health-threats-in-whistleblower-investigation-1.1245292 (last visited December 31, 2011); *EOG fined for stream spill*, THE COURIER EXPRESS, December 16, 2011,

http://www.thecourierexpress.com/courierexpresscourierexpresslocal/943509-349/eog-fined-for-stream-spill.html (last visited December 31, 2011); Associated Press, *Police: Fracking fluid leaks onto central Pa. roadway, into creek, after truck crash*, WNEP, December 27, 2011, http://www.therepublic.com/view/story/bddc7a0287d34128abbcf9d684af7142/PA--Fracking-Fluid-Spill/ (last visited December 31, 2011).

[152] *See, e.g.*, Tom Wilber, *Houses near gas drilling in Dimock hooked to temporary water supply*, PRESS CONNECTS, January 21, 2009, http://www.pressconnects.com/article/20090121/NEWS01/901210374 (last visited January 22, 2009); Andrew Nikiforuk, *Fracking Contamination 'Will Get Worse': Alberta Expert*, THE TYEE, December 19, 2011, http://thetyee.ca/News/2011/12/19/Fracking-Contamination/ (last visited December 31, 2011); Marc Durand, *Conventional Gas vs Hydrofracturing Gas Shale*, SHALE GAS INFO, March 12, 2011 (last visited January 1, 2012).

[153] *See, e.g.*, Abrahm Lustgarten and Nicholas Kusnetz, *Feds Link Water Contamination to Fracking for the First Time*, PROPUBLICA, December 8, 2011, http://www.propublica.org/article/feds-link-water-contamination-to-fracking-for-first-time (last visited December 31, 2011).

[154] *See, e.g.*, Don Hopey, *State concerned about waste water from new gas wells*, PITTSBURGH POST-GAZETTE, December 21, 2008, http://www.post-gazette.com/pg/08322/928571-113.stm (last visited December 31, 2011); Adam Federman, What Killed Dunkard Creek?, EARTH ISLAND, Winter 2012 http://www.earthisland.org/journal/index.php/eij/article/what_killed_dunkard_creek/ (last visited December 31, 2011); James Hufnagel, *Fracking issue heating up here*, Niagara Falls Reporter, October 17, 2011, http://www.niagarafallsreporter.com/hufnagel10.18.11.html (last visited December 31, 2011).

[155] Michelle Bamberger and Robert E. Oswald, *Impacts of Gas Drilling on Human and Animal Health*, NEW SOLUTIONS, Vol. 22(1) 51-77 (2012), http://psehealthyenergy.net/Impacts_of_Gas_Drilling_on_Human_and_Animal_Health (last visited January 13, 2012); *Chemicals in Natural Gas Operations; Health Effects Spreadsheet and Summary*, TEDX, http://www.endocrinedisruption.com/chemicals.multistate.php (last visited December 31, 2011); *Investigation into animal deaths re-opened*, KSLA, May 19, 2009, *http://www.ksla.com/story/10392028/investigation-into-animal-deaths-re-opened?clienttype=printable&redirected=true* (last visited December 31, 2011); Peggy Heinkel-Wolfe, *Radioactive waste surfaces at Texas gas sites*, DALLAS NEWS, November 11, 2007, originally available at http://www.dallasnews.com/sharedcontent/dws/news/localnews/stories/DN-norms_11wes.ART.East.Edition1.420fc23.html, now available at http://www.flower-mound.com/env_resources/seismic/DMNArticle.pdf (last visited January 1, 2012).

[156] Tom Wilber, *Houses near gas drilling in Dimock hooked to temporary water supply*, PRESS CONNECTS, January 21, 2009, http://www.pressconnects.com/article/20090121/NEWS01/901210374 (last visited January 22, 2009).

[157] *Actor delivers water to Dimock Township*, YNN, December 6, 2011, http://centralny.ynn.com/content/top_stories/566143/actor-delivers-water-to-dimock-township/ (last visited January 1, 2012); Melissa Troutman, *Drinking Dimock: A Glass Full of Gas Water*, PUBLIC HERALD, December 6, 2011, http://www.publicherald.org/archives/14561/investigative-reports/energy-investigations/ (last visited January 1, 2012). (This article includes an interactive map that shows the gas drilling pads in Dimock.)

[158] Laura Legere, *EPA: Dimock water supplies 'merit further consideration'*, SCRANTON TIMES-TRIBUNE, December 30, 2011, http://thetimes-tribune.com/news/epa-dimock-water-supplies-merit-further-investigation-1.1251334 (last visited January 1, 2012).

[159] DEC, *2011 Revised Draft SGEIS*, Chapter 5.

[160] Mireya Navarro, *Chants, Boos and Celebrities at a Standoff on Fracking*, NEW YORK TIMES, November 30, 2011, http://green.blogs.nytimes.com/2011/11/30/chants-boos-and-celebrities-at-a-standoff-on-fracking/?hp (last visited January 1, 2012); Public testimony at hearing in New York City, SHALESHOCK, November 30, 2011, http://shaleshockmedia.org/2012/01/04/nyc-public-hearing-of-the-revised-draft-sgeis-113011/ (last visited January 13, 2012); Pre-hearing press conference, November 30, 2011, http://www.youtube.com/watch?v=SY5G3GKDb5o&NR=1&feature=endscreen (last visited January 1, 2012).

[161] Some of the public comments on the revised draft SGEIS were videotaped and posted. *See, e.g.*, Unofficial hearing in Ithaca, December 1, 2011, http://shaleshockmedia.org/2011/12/02/1-tccog-public-hearing-on-the-revised-sgeis/ (last visited January 1, 2012); Binghamton Public Hearing on the SGEIS 1-4 PM and 6-9 PM sessions, SHALESHOCK, November 17, 2011, http://shaleshockmedia.org/2011/11/20/binghamton-public-hearing-on-the-sgeis-1-4-pm-session-2/ and http://shaleshockmedia.org/2011/11/27/dec-sgeis-hearing-binghamton-6-9pm-session/

(last visited January 1, 2012). (It is estimated that the DEC received over 40,000 public comments to the revised draft SGEIS.)

[162] People have been consistently using the word madness to describe unconventional fossil fuel extraction. *See, e.g.*, STOP THE MADNESS, *Fracking Protest at the Ohio Statehouse*, January 10, 2012, http://www.nofrackohio.com/ (last visited January 14, 2012); Laura Legere, *Community rallies after judge denies request to continue water deliveries in Dimock*, SCRANTON TIMES-TRIBUNE, December 1, 2011, http://thetimes-tribune.com/news/gas-drilling/community-rallies-after-judge-denies-request-to-continue-water-deliveries-in-dimock-1.1239352 (last visited January 14, 2012); Sabrina Artel, *Mark Ruffalo: We Can Go Gracefully Into a Green Future, Or We Can Go Kicking and Screaming, But There Is No Choice*, AlterNet, September 16, 2011, http://www.alternet.org/story/152448/mark_ruffalo%3A_we_can_go_gracefully_into_a_green_future%2C_or_we_can_go_kicking_and_screaming%2C_but_there_is_no_choice (last visited January 14, 2012); Michael McCarthy, *Oil rush begins as Arctic ice melts*, photo caption, NEW ZEALAND HERALD, September 10, 2011, http://www.nzherald.co.nz/economy/news/article.cfm?c_id=34&objectid=10750795 (last visited January 14, 2012); Tammy Reiss, *Reward candidates who are willing to speak out*, DAILY STAR, November 3, 2011, http://thedailystar.com/opinion/x867533750/Letters-to-the-Editor-Nov-3-2011/print (last visited January 14, 2012).

[163] Creativity has played a role in expressing the public's opposition. *See, e.g.*, *My Water's on Fire Tonight*, e360, http://e360.yale.edu/digest/time_ranks_fracking_rap_among_most_creative_videos_of_2011/3257/ (last visited January 1, 2012); *mama don't allow no hydrofrackin round here*, YOU TUBE, December 31, 2011, http://www.youtube.com/watch?v=rJhcIueldxc (last visited January 1, 2012).

[164] Wenonah Hauter, *Cuomo's Cheney-Style "Transparency" on Fracking*, HUFFINGTON POST, October 31, 2011, http://www.huffingtonpost.com/wenonah-hauter/cuomo-fracking_b_1067293.html (last visited January 1, 2012).

[165] Danny Hakim and Nicholas Confessore, *Cuomo Will Seek to Lift Ban on Hydraulic Fracturing*, NEW YORK TIMES, June 30, 2011, http://www.nytimes.com/2011/07/01/nyregion/cuomo-will-seek-to-lift-drilling-ban.html?_r=1&hp=&pagewanted=print (last visited June 30, 2011).

[166] Robert W. Howarth, *Greenhouse Gas Footprint of Shale Gas Obtained by High-Volume, Slick-Water Hydraulic Fracturing*, Cornell University, September 15, 2011, http://www.eeb.cornell.edu/howarth/Marcellus.html (last visited December 30, 2011); Robert W. Howarth, *The Greenhouse Gas Footprint of Shale Gas*, Duke University, Environmental and Social Implications of Hydraulic Fracturing and Gas Drilling in the United States: An Integrative Workshop for the Evaluation of the State of Science and Policy, January 9, 2012, http://www.nicholas.duke.edu/hydrofrackingworkshop2012/speakers, http://www.nicholas.duke.edu/hydrofrackingworkshop2012/video (last visited January 15, 2012); Bill McKibben, *350 Science*, 350.org, http://www.350.org/en/about/science (last visited January 15, 2012).

[167] *See supra* note 44.

[168] Edith Honan, *NYC Council calls for ban on drilling in watersheds*, REUTERS, November 16, 2009, http://www.reuters.com/article/governmentFilingsNews/idUSN1651728820091116?sp=true (last visited January 1, 2012); Ilya Marritz, *Political Showdown Over NYC Tap Water*, NEW YORK TIMES, December 24, 2009, http://www.wnyc.org/articles/wnyc-news/2009/dec/24/political-showdown-over-nyc-tap-water/ (last visited January 1, 2012); Edith Honan, *NYC's Bloomberg opposes gas drilling in watershed*, REUTERS, January 25, 2010, http://www.reuters.com/article/2010/01/25/newyorkcity-gas-idUSN2519291120100125 (last visited January 1, 2012).

[169] DEC, *2011 Revised Draft SGEIS*, § 6.1.5.

[170] M. Hall, R. Germain, M. Tyrell, and N. Sampson, *Predicting Future Water Quality from Land Use Change Projections in the Catskill-Delaware Watersheds*, http://www.esf.edu/es/faculty/hall.asp (last visited January 1, 2012).

[171] *Id*. at 217-268.

[172] *Id*.; DEC, *2011 Revised Draft SGEIS*, § 6.1.5.3.

[173] *Id*. at §§ 3.2.4, 3.2.5.

[174] *See, e.g.*, Tom Grace, *Local town looks to decide gas drilling fate*, DAILY STAR, March 12, 2011, http://thedailystar.com/localnews/x2002721207/Local-town-looks-to-decide-gas-drilling-fate (last visited January 1, 2012); Tom Grace, *Town of Otsego bolsters frack ban*, DAILY STAR, May 13, 2011, http://thedailystar.com/localnews/x74961084/Town-of-Otsego-bolsters-frack-ban/print (last visited January 1, 2012); Tara MacIsaac, *DEC Leaves Hydrofracking Loophole; Municipal zoning law could keep oil companies out*, EPOCH TIMES, July 3, 2011, http://www.theepochtimes.com/n2/united-states/dec-leaves-hydrofracking-loophole-58625.html (last visited January 1, 2012); Tom Grace, *Springfield, Middlefield ban gas drilling*, DAILY STAR, June

16, 2011, http://thedailystar.com/localnews/x1678756068/Springfield-Middlefield-ban-gas-drilling/print (last visited January 1, 2012); Tom Grace, *More Otsego towns considering gas drilling bans*, DAILY STAR, July 13, 2011, http://thedailystar.com/localnews/x999480314/More-Otsego-towns-considering-gas-drilling-bans/print (last visited January 1, 2012); Tom Grace, *Cherry Valley town bans drilling, fracking*, DAILY STAR, July 16, 2011, http://thedailystar.com/localnews/x1100992273/Cherry-Valley-town-bans-drilling-fracking (last visited January 1, 2012); Aaron Munzer, *Dryden confirms ban on hydraulic fracturing*, ITHACA JOURNAL, August 3, 2011, http://www.theithacajournal.com/article/20110803/NEWS01/108030348/Dryden-confirms-ban-hydraulic-fracturing (last visited January 1, 2012); Joe Mahoney, *New Lisbon passes ban on gas drilling*, DAILY STAR, December 15, 2011, http://thedailystar.com/localnews/x1181957547/New-Lisbon-passes-ban-on-gas-drilling (last visited January 1, 2012).

[175] Jon Campbell, *Gas company to sue Dryden over town's drilling ban*, ITHACA JOURNAL, September 14, 2011, http://www.theithacajournal.com/article/20110914/NEWS10/109140363/Gas-company-sue-Dryden-over-town-s-drilling-ban?odyssey=tab|topnews|text|FRONTPAGE (last visited January 1, 2012); Anonymous Staff Report, *Residents sue town of Middlefield for drilling ban*, DAILY STAR, September 16, 2011, http://thedailystar.com/localnews/x1492495998/Residents-sue-town-of-Middlefield-for-drilling-ban (last visited January 1, 2012).

[176] ECL23-0303(2).

[177] *Frew Run Gravel Products, Inc. v. Carroll*, 71 N.Y.2d 126 (1987); *Gernatt Asphalt Prods. v. Town of Sardinia*, 87 N.Y.2d 668 (1996).

[178] Aaron Munzer, *Lawsuit on Dryden's gas drilling ban heads to court Nov. 4*, ITHACA JOURNAL, October 21, 2011, http://www.theithacajournal.com/article/20111021/NEWS01/110210362/Lawsuit-D (last visited January 1, 2012); Peter Mantius, *Dryden and Middlefield Fracking Bans Tested*, DC BUREAU, November 11, 2011, http://www.dcbureau.org/201111116473/natural-resources-news-service/dryden-and-middlefield-fracking-bans-tested.html (last visited January 1, 2012).

[179] The author attended this hearing.

[180] *Gernatt*, 87 N.Y.2d at 683.

[181] Sarah Crean, *Will Community Bans on Hydrofracking Hold Up?*, GOTHAM GAZETTE, December 2011, http://www.gothamgazette.com/article/environment/20111218/7/3659/ (last visited January 1, 2012). (This article includes a December 10, 2011 map showing the municipalities that have enacted ordinances in New York State.)

[182] Stephen Reilly, *Binghamton approves 2-year drilling moratorium*, PRESS CONNECTS, December 21, 2011, http://www.pressconnects.com/article/20111221/NEWS10/112210403/Binghamton-approves-2-year-drilling-moratorium?odyssey=tab| (last visited January 1, 2012).

[183] N.Y. Senator James Seward, *Home rule laws aren't a radical idea*, DAILY STAR, January 14, 2012, http://thedailystar.com/columns/x1467874958/Home-rule-laws-arent-a-radical-idea (last visited January 14, 2012).

[184] Mary Esch, *Home rule issues build over gas drilling*, PRESS CONNECTS, January 2, 2012, http://www.pressconnects.com/article/20120102/NEWS01/201020320/Home-rule-issues-build-over-gas-drilling (last visited January 16, 2012).