The Implications of Advanced Oil and Gas Operations to Landowners

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Introduction

While, to some Americans, the terms "hydraulic fracturing," "hydrofracking" or "fracking," evoke images of a highly hazardous and dangerous method to extract oil and gas from the earth and suggest a short sighted energy policy, industry advocates now believe that the technique will help usher in a pathway to U.S. energy independence.[2] Generally, Americans know that the use of horizontal drilling in combination with hydraulic fracturing has greatly expanded the ability of producers to profitably recover natural gas and oil from low-permeability geologic plays, particularly shale plays, from significantly larger production sites.[3] However, many Americans misunderstand the implications of shale gas operations for the U.S. economy and are concerned about potential impacts of such operations to the environment. Since the advent of the combined use of hydraulic fracturing and horizontal drilling in drilling operations, the size and sophistication of operations have changed dramatically and the potential impact on communities has grown geometrically, serving only to heighten the public's concerns. In order to address potential concerns raised by these large-scale operations, states have accelerated efforts to change current laws and regulations to meet public concerns, but so far have not been able to keep up with the advancements in oil and gas operations. This paper will provide a background on gas and oil drilling operations, a description of the risks associated with large scale oil and gas operations, the changing status of federal and state laws and regulations, and some recommendations for landowners.

Background

Horizontal Drilling

Horizontal drilling can be traced as far back as 1891, although the technique was not practically applied in oil and gas drilling until the early 1980s.[4] The technique allows an operator to intersect a shale oil and gas reservoir at more locations than by a vertically drilled well, thus providing a significantly greater number of opportunities to recover the oil and gas located in a

[1]The author gratefully acknowledges the assistance of David T. Dohnal, a Senior Associate of The Chilcote Law Firm LLP.

[2] New York Times (December 21, 2010 and October 31, 2011).

[3] Review of Emerging Resources: U.S. Gas and Shale Oil Plays, U.S. Energy Administration (2011).

[4] Lynn Helms, Division of Minerals Research (National Science Foundation) Newsletter, Volume 35, Issue No. 1 "*Horizontal Drilling,*" (2010).

reservoir. Wells can be drilled horizontally to extend as far as two miles from the well pad.[5] Although horizontal wells can cost considerably more to complete than vertical wells, the surface area needed for an oil and gas operation can be significantly reduced by reducing the number of wells in an area. At the same time, given the reach of horizontal drilling, the productivity of such a well can be greatly increased. In fact, horizontal wells may be two to three times more productive than vertical wells, and even more so when coupled with hydraulic fracturing.[6]

Hydraulic Fracturing

While fractures form naturally in rock and are one means by which gas and petroleum migrate, the term "hydraulic fracturing" refers to the process by which a pressurized, proppant-containing[7] fluid is injected into a rock layer in order to expand and sustain the fractures located in the layer. Hydraulic fracturing is widely used by energy companies to accelerate the fracturing process in order to release greater volumes of petroleum, natural gas, coal seam gas, or other substances for extraction than would otherwise occur naturally,[8] and is undertaken from a well bore drilled from the surface into rock formations containing reservoirs of oil and gas, known as reservoir rock.[9] Essentially, the result of this practice is that the energy from the injection of highly-pressurized fluids creates new channels in the reservoir rock, which often increases the extraction rates and ultimate recovery of fossil fuels. The most recovered fossil fuels recovered are oil and gas. Distinction should be made between low-volume hydraulic fracturing used to stimulate high-permeability reservoirs, which may consume typically 20,000 to 80,000 gallons of fluid per well, and high-volume hydraulic fracturing, used in the completion of shale gas wells, which can use as much as two to three million gallons of fluid per well.[10] This latter practice is what has been questioned by the public and regulatory authorities in many states and caused a debate across the country.[11]

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[5] Domestic Oil and Natural Gas Producers Alliance, "*The Oil and Natural Gas Industry Impacting Oklahoma Video"* (2011).

[6] Robert B. Jackson, B. Rainey Person, S. Osborn, N. Warner, A. Vengosh, "*Research and Policy Recommendations for Hydraulic Fracturing and Shale-Gas Extraction*" Center on Global Change, Duke University, Durham, North Carolina (2011).

[7] The term "proppant" refers to natural quartz sand, glass balls and metal balls. The typical chemical elements of proppant sands are aluminum tri-oxide (30-70%), silicon dioxide (40-60%), and a few other dioxides. Proppant sand is formed in pellets with 0.45-0.90mm diameter. A newer form of proppant sand is now gaining ascendancy in the industry. Proppant sand is made with high-quality bauxite, coal and other raw materials. Proppant sand is composed of eco-friendly materials and is designed to replace other proppant materials, which are less eco-friendly. Schlumberger, *Oilfield Glossary,* www.glossary.oilfield.slb.com (2012).

[8] Philippe A. Charlez, *"Rock Mechanics: Petroleum Applications*, Editions Technip (1997).

[9] Schlumberger, *"The Making of Oil: Birth of Reservoir"* (2005).

[10] Anthony Andrews, et. al., *"Unconventional Gas Shales: Development, Technology, and Policy Issues"* (2009).

[11] Huffington Post, *"New York's Fracking Moratorium"* (February 11, 2012); Rutland Herald, *"Vermont Lawmakers Weigh Fracking Moratorium"* (January 10, 2012).

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Fluids and Wastes

The pressurized fluid used for hydraulic fracturing is generally composed of water and sand. A number of chemicals are added to the sand-water mixture, but usually represent less than one percent of the liquid used for hydraulic fracturing. These chemicals are used for a variety of purposes, including for the purpose of initiating cracks in the shale rock, preventing corrosion of the pipe, thickening the water to suspend the sand in the reservoir rock, preventing scale deposits in the pipe, and eliminating bacteria that produces corrosive by-products.[12]

The use of the hydraulic fracturing liquid results in the production of large amounts of wastewater often referred to as flowback water, and well production produces a wastewater commonly referred to as brine. These wastewaters are contaminated with industrial chemicals and have extremely high salt content. For example, Ohio brines can be six times or more saline than seawater.[13] These wastewaters are toxic to humans and corrosive to machinery. In many drilling operations, the wastewater will often sit at pits at the drilling site before being disposed. Disposal usually occurs by injecting the wastewater into injection wells or saltwater disposal wells located in geologic formations deep beneath the earth's surface. Advanced techniques are being developed and implemented that allows for pitless drilling systems and recycling of wastewater. One such technique is known as closed-loop drilling, which negates the need for reserve pits. Closed-loop drilling has been voluntarily utilized by companies in several states and has been recognized as a best management practice in New Mexico, Illinois and Texas.[14]

Industry Growth

Recent publicity and many articles would suggest to the reader that hydraulic fracturing has been in use by the oil and gas industry only a short while. However, experimentation of fracturing techniques to stimulate oil and gas production dates back to the 19th century and began to grow rapidly in the 1950s.[15] Starting in the mid-1970s, a partnership of private operators, agencies of the federal government, and an industry research group endeavored to develop technologies for the commercial production of natural gas from the relatively shallow Devonian (Huron) shale in the eastern United States.[16] This partnership helped nurture technologies that eventually became crucial to the production of natural gas from shale rock, including horizontal

[12] FracFocus Chemical Disclosure Registry, www.fracfocus.org.

[13] Underground Injection Control (UIC), Ohio DNR Division of Mineral Resources Management, www.ohiodnr.com/mineral/injection/tabid/10374/Default.aspx.

[14] Earthworks, Alternatives to Pits, www.earthworksaction.org.

[15] U.S. Energy Information Administration, *"Review of Emerging Resources: U.S. Shale Gas and Shale Oil Plays"* (July 2011).

[16] *Id*. at page 4.

wells, and techniques known as multi-stage fracturing and slick-water fracturing.[17] Practical application of horizontal drilling to oil production began in the early 1980s, by which time the development of improved downhole drilling motors and the invention of other necessary supporting equipment, materials, and technologies (particularly, downhole telemetry equipment) had made some applications commercially viable.[18]

The beginning of large-scale shale gas production did not occur until Mitchell Energy and Development Corporation experimented during the 1980s and 1990s to make deep shale gas production a commercial reality in the Barnett Shale in North-Central Texas.[19] As the success of Mitchell Energy and Development became apparent, other companies aggressively entered the play, so that by 2005, the Barnett Shale formations in Texas alone were producing nearly 0.5 trillion cubic feet of natural gas per year.[20] As producers gained confidence in the ability to produce natural gas profitably in the Barnett Shale, with confirmation provided by results from the Fayetteville Shale in Arkansas, they began pursuing other shale plays, including Haynesville (Texas and Louisiana), Marcellus (New York, Pennsylvania, Ohio and West Virginia), Woodford (Oklahoma), Eagle Ford (Texas), and others.[21] Today, oil and gas companies are focusing on developing those formations that contain oil and "wet gas," as opposed to those that just contain "dry gas" because of the low price of and demand for natural gas and the huge demand for wet gas and oil.[22]

Landowner Risks

When considering allowing oil and gas drilling operations (including injection of wastewater) on their properties, landowners should envision such projects as industrial sites on their properties. These are large-scale projects that have serious implications for a landowner's property. Risks associated with drilling and operating include natural gas explosions, environmental contamination, and increased chances for earthquakes. Below are a few real-life examples of when these risks became reality.

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[17] G.E. King, Apache Corporation, *"Thirty Years of Gas Shale Fracturing: What Have We Learned?"* (2010).

[18] U.S. Energy Information Administration, *"Drilling Sideways, A Review of Horizontal Well Technology and its Domestic Application"* (April 1993).

[19] *"Review of Emerging Resources: U.S. Shale Gas and Shale Oil Plays," supra* note 15 (July 2011).

[20] *Id*.

[21] *Id*.

[22] Penn State College of Agricultural Sciences Extension. extension.psu.edu/naturalgas. *"Wet Gas vs. Dry Gas – Do you know what these are? If not, you need to!"* "Dry gas" refers to natural gas with a high methane concentration, whereas "wet gas" includes evaporated liquids such as ethane, butane and pentane.

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On December 15, 2007, an explosion occurred at a home in Bainbridge Township, an exurban area located in Geauga County in Northeast Ohio.[23] Natural gas had invaded the home by migrating through a water well. The Ohio Division of Natural Resources determined that the accumulation and confinement of deep, high pressure gas in the surface-production casing annulus on the well resulted in over-pressurization of the annulus, which in turn, resulted in the invasion, or migration of natural gas from the annulus of the well into the natural fractures in the bedrock below the cemented surface casing.[24] Hydraulic fracturing had been used to enhance the natural fractures and improve the flow of gas and/or crude oil into the production casing. Ohio officials ultimately determined that inadequate primary cementing of the production casing was the primary case of the incident.

In 2008, residents of Pavillion, Wyoming contacted the United States Environmental Protection Agency ("EPA") with complaints about adverse changes to the water quality of private drinking water wells. Under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 ("CERCLA"), the EPA investigated the inquiry. After some review in 2010, the EPA warned residents not to drink or cook with water from the wells and to keep their homes ventilated when showering. It was determined that hydraulically fractured gas wells were as shallow as 372 meters below the earth's surface, with surface casing as shallow as 110 meters below the earth's surface, while water wells in the area are as deep as 244 meters below the earth's surface. Samples taken by the EPA detected high concentrations of chemicals, organics and hydrocarbons in both shallow and deep ground water samples. The EPA, in a draft report released in December 2011, identified three potential contaminant migration pathways existed: (i) insufficient or inadequate cement outside production casing, (ii) fracture fluid excursion from a tight sandstone formation to a more permeable formation, and (iii) the process of hydraulic fracturing generated new fractures or enlarged those fractures already existing, which increased the fracture system.[25]

On September 21, 2009, more than 8,000 gallons of hydraulic fracturing fluid were discharged into a nearby creek from a well site located in Dimock, Pennsylvania by Cabot Oil and Gas. In April 2010, the Pennsylvania Department of Environmental Protection fined Cabot $240,000, and ordered it to permanently shut three wells and install water-treatment systems in 14 homes within 30 days or face a $30,000 a month fine. Its more than two-dozen pending

[23] Ohio Department of Natural Resources *"Report on the Investigation of the Natural Gas Invasion of Aquifers in Bainbridge Township of Geauga County, Ohio"* (September 1, 2008).

[24] *Id.* at page 4. The primary already developed oil and gas bearing zone in eastern Ohio is the Silurian "Clinton" sandstone, generally 3600 to 3900 feet below the surface. Over 80,000 wells have been drilled in this zone since 1897. Vertical hydrofracturing has been used in this zone since the 1950s and was more widely used the 1980s.

[25] United States Environmental Protection Agency, *"Investigation of Ground Water Contamination near Pavillion, Wyoming"* (December 2011), at page 32. A public comment period closed on March 2, 2012, as to whether it is possible to differentiate sources of contamination from pits, septic systems, agricultural and domestic practices from gas production wells.

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drilling applications were also put on hold. Fifteen Dimock residents whose wells were contaminated undertook litigation.[26]

On April 21, 2011, a Pennsylvania gas well operated by Chesapeake Energy in Leroy Township, northwest of Philadelphia erupted, causing thousands of gallons of drilling fluids to flow from the drill site over containment berms toward a tributary of a nearby fishing stream and forcing nearby families to temporarily evacuate their homes. This incident was possibly the most serious incident related to hydraulic fracturing in the multiple year effort by drillers to develop natural gas from the Marcellus Shale, which underlies large parts of Pennsylvania. The Pennsylvania Department of Environmental Protection ("DEP") determined that the cause of the accident was due to a mechanical failure. [27]

On New Year's Eve 2011, a 4.0 magnitude earthquake shook homes in Youngstown, Ohio, the last of 11 earthquakes that occurred in the area that year.[28] Four injection wells in the area had been drilled to depths well in excess of 8,000 feet, the depth of the confining shale zone in the area in prior years. Ohio officials immediately ordered four injection wells in the area to be shut and issued a moratorium on deep injection wells in the area.[29]

These incidents are among tens of incidents that have occurred in those states that have permitted large scale combined hydraulic fracturing and horizontal drilling operations. While incidents have occurred in the oil and gas industry since the industry came into existence in the 1860s and while extensive and increasingly protective laws and regulations governing oil and gas have been put in place over the last 60 years, the lack of regulatory oversight is patently evident. These incidents illustrate that landowners need to be more proactive in protecting their interests in connection with the fast growing developments in oil and gas production.

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[26] Pro Publica (September 21, 2009). According to a Material Safety Data Sheet provided to the state by Halliburton, the parent of Cabot Oil and Gas, the spilled drilling fluid contained a liquid gel concentrate consisting of a paraffinic solvent and polysaccharide, chemicals listed as possible carcinogens. The MSDS form for Halliburton's proprietary product called LGC-35 CBM warned that the substances have led to skin cancer in animals and may cause headache, dizziness and other central nervous system effects to anyone who breathes or swallows the fluids.

[27] Popular Mechanics (April 2011). According to state and company officials, the failure occurred while Chesapeake was in the middle of a hydraulic fracturing process. Officials investigating the incident concluded that the cause of the accident was related to a steel coupling located beneath the well's blowout protector, but above ground, which allowed thousands of gallons of contaminated water to gush out of the well.

[28] Aaron Marshall, Cleveland Plain Dealer (January 16, 2012). According to the article, an injection well, known as North Star No. 1 was drilled into or near a fault area more than 9,000 feet and had received more than 175,000 barrels of waste drilling fluids from out of state sources. A pair of Colombia University scientists suggested that the injection of liquid waste at high pressures, coupled with the proximity to a fault line, may have allowed the waste to infiltrate into the fault and thereby reduce the natural friction between the tectonic plates at the location.

[29] The Ohio Department of Natural Resources determined that the four injection wells were unnecessarily drilled through the confining zone and have imposed an 8,000 maximum depth for injections wells in the area.

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Federal Oversight

As many writers have noted, the oil and gas industry has always been largely exempted from the reach of the major federal environmental law and regulations.[30] Under the CERCLA, hazardous chemicals that would otherwise fall under the ambit of CERCLA are immune from the statute when encompassed in petroleum or crude oil.[31] Similarly, under the Resource Conservation and Recovery Act ("RCRA"), oil field wastes have been exempted due to the "adequate" state and federal regulations already in place and the costs.[32] Further, the Safe Drinking Water Act ("SDWA") was amended in 2005 in three ways: (i) hydraulic fracturing operations were exempted from regulation under the SDWA, (ii) only voluntary discontinuance of diesel fuel use was required in hydraulic fracturing operations in lieu of banning diesel fuel use, and (iii) underground injection in oil and gas operations was defined so as to alleviate the USEPA from regulating threats to drinking water from fluids unless diesel fuels are used. [33] Under a complex set of amendments to the Clean Water Act ("CWA") adopted in 2005, essentially, sediment from petroleum sites and stormwater from oil and gas fields do not qualify as pollutants and all covered oil and gas-related construction activities are eligible for the stormwater permitting exemption for uncontaminated stormwater discharges without regard to the amount of acreage disturbed.[34] Finally, the Clean Air Act ("CAA"), provides that oil and gas wells, and in some instances pipeline compressors and pump stations, shall not be aggregated together to determine if they are subject to the provisions.[35]

By virtue of the 2005 amendments to the SWDA and other federal laws and regulations before and after 2005, regulation of hydraulic fracturing has been largely left to the states. However, on February 10, 2011, in an effort to circumvent the prohibition against the regulation of hydraulic fracturing under the SWDA, the USEPA proposed federal regulations under the CAA to reduce air-borne pollutants released by large-scale oil and gas operations.[36] The regulations would become final, at the earliest, in early April 2012. If approved as currently written, the regulations would establish national standards for emissions from hydraulic fracturing. The proposal would limit emissions released during many stages of natural gas production and development and would apply a sector-based approach to the mix of volatile organic compounds that are emitted in hydraulic fracturing operations. Drillers would need to develop and implement optimum control strategies, considering feasibility, cost impacts and

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[30] See Renee Lewis Kosnik, The Oil and Gas Industry's Exclusion and Exemptions to Major Environmental Statutes (October 2007), Earthworks www.earthworksaction.org ; see also The Earthworks Oil and Gas Accountability Project, www.ogap.org.

[31] 42 U.S.C. Section 9601 (14).

[32] 53 Fed. Reg. 25, 477

[33] http://energycommerce.house.gov/legalviews/108lvhr0006-oilgas.shtml.

[34] 71 Fed. Reg. 33631-33632-33636.

[35] 42 U.S.C. Section 7412 (n).

[36] 40 CFR Parts 60 and 63.

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benefits across the pollutant types, to reduce emissions using equipment that captures these compounds. The USEPA projects that these control strategies could reduce emissions by as much as 95 percent. The USEPA proposal also calls for reducing emissions of toxic chemicals, such as cancer-causing benzene, produced by processing, transmitting and storing natural gas.

Given the breadth of the exemptions provided under CERCLA, RCRA, SWDA, CWA and the CAA, and the uncertainty as to whether additional regulations will be effective, a landowner should not simply rely on a "compliance with laws" type provision, but should rather carefully craft special covenants and indemnities to cover the areas not covered by federal law and to ensure that its land is not harmed. Detailed reference to the specifications for construction and operating standards for production facilities (e.g., closed loop drilling, retention pits with 36" of clay base and appropriate inserted lining during construction) needs to be included in any agreement between a land owner and an oil and gas producer.

State Regulations

While oil and gas laws and regulations have been in place in all states for more than 100 years, the advent of large scale oil and gas operations and the attendant environmental risks arising out of the combined use of horizontal drilling and hydraulic fracturing have caused states to scramble in order to adopt new laws and regulations. Some states, such as New York, were not prepared for the sudden growth of large scale oil and gas operations and imposed moratoriums on hydraulic fracturing. A discussion of selected state laws and regulations will illustrate the status of existing law and regulations as well as efforts being made by states to address the increase in the scale of operations and the new technologies associated with those operations.

Pennsylvania

Edwin L. Drake drilled the first oil well in Pennsylvania in 1859. Pennsylvania's oil industry thereafter centered near the original well in Venango County, but has grown across the state in recent years. Hydraulic fracturing of wells has been occurring in Pennsylvania since the 1950s. Since the 1980s, nearly all wells in Pennsylvania have been hydraulically fractured. In total, more than 350,000 oil and gas wells have been drilled in Pennsylvania.[37]

The Pennsylvania DEP Office of Oil and Gas Management regulates the state's oil and gas programs. This agency develops and enforces regulations for bonding, permitting and identification of wells, environmental requirements for drilling, disposal, well cementing and casing, and plugging of wells. Since 2008, Pennsylvania has been increasing the DEP's oversight of gas drilling in the state. For example, in 2010, a new regulation requiring drilling water to be treated to the same levels as drinking water for total dissolved solids was imposed. The state also increased its setback requirements for wells in 2010.[38]

[37] Pennsylvania Department of Environmental Protection (2012), www.portal.state.pa.us/portal/server.pt/community/marcellusshale/20296.

[38] Pennsylvania Department of Environmental Protection (2012), www.depweb.state.pa.us.

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In February 2012, the governor of Pennsylvania signed the Marcellus Shale bill into law, with most provisions becoming effective within a few months. The newly enacted law enhances protection of natural resources through stronger environmental standards. It is the first comprehensive revision to the 1984 Oil and Gas Act. The new law increases setback distances from water bodies, building, and water wells, enhances hydraulic fracturing chemical disclosure, authorizes counties to adopt an impact fee, and increases the enforcement ability of the Department of Environmental Protection.[39]

New York

Commercial oil and gas development and production in New York dates back to well before the beginning of the 20th century. New York's first oil well was drilled in Allegany County in 1863, just four years after the famous Drake well in Pennsylvania. New York's oil production reached its peak of 7.3 million barrels of oil in 1882. Natural gas production reached its peak of 55 billion cubic feet in 2005. By 2007, an estimated 75,000 oil and gas wells had been drilled in New York.[40] It is estimated that approximately 14,000 of these wells are still active.[41]

New York's State Constitution provides strong home rule authority to local governments in enacting laws relating to property, government, and protection, order, conduct, safety, health and well-being of persons or property within the locality. The Environmental Conservation Law of New York, and the regulations promulgated thereunder, includes a provision that provides that the oil and gas laws of the state supersede local laws or ordinances attempting to regulate the oil and gas industries. However, this provision permits local governments to retain jurisdiction over local roads and rights under the state's real property tax law.[42] As a result, local governments in New York have investigated ways to regulate the oil and gas industry at the local government level.[43]

Historically, New York's regulations were very limited in scope, but evolved over time. Issues addressed in the historical regulations were the spacing of well units, surface restrictions, and transportation, but over time adopted rules and regulations as to well drilling concerns.[44] New York had effectively placed a moratorium on hydraulic fracturing in the state, but proposed

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[39] www.whptv.com/news/local/story/Governor-Corbett-signs-Marcellus-Shale-bill-into/JDp_6lYqoU6L200CeYRKBg.cspx. *"Governor Corbett signs Marcellus Shale bill into law."*

[40] See www.tiogaslease.org/images/NYSERDAReport.pdf.

[41] New York State Department of Environmental Conservation, www.dec.ny.gov/energy/205.html.

[42] The Supreme Court of New York recently ruled that local governments do have the power to regulate hydraulic fracturing under their delegated zoning powers in *Anschutz Exploration Corp. v. Town of Dryden*, 2012 NY Slip Op 22037 (N.Y. Sup. Ct., 2012).

[43] Michael E. Kenneally and Todd M. Mathes, *"Natural Gas Production and Municipal Home Rule in New York"*, New York Zoning Law and Practice Report, Volume 10, No. 4, (January/February 2010).

[44] Kimberlea Shaw Rea, *A Legal and Practical Guide to Protecting Your Citizens and Environment in the Face of Marcellus Shale Natural Gas Drilling*, (March 30, 2009).

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modifications have been suggested to the regulatory scheme that would allow the practice in parts of the state. Included in these modifications are new subparts that specifically regulate high volume hydraulic fracturing (in both the regulation of mineral resources and in the state pollutant discharge elimination system regulations) and revisions to the well spacing requirements that increase the distances from buildings and water sources. The proposed modifications would apply to all vertical and directionally drilled wells where high volume hydraulic fracturing is planned. Required disclosures for drilling permits, including mapping and hydraulic fracturing fluid disclosure are strengthened with these proposed regulations. Specific well construction and operation regulations have also been proposed. The proposed regulations also include a requirement to use a closed-loop tank system instead of a reserve pit for drilling fluids in most horizontal drilling sites in the Marcellus Shale. Wastewater will also be tested for naturally occurring radioactive material prior to removal from the site for disposal.[45]

New York is preparing to open its lands to large-scale operations utilizing horizontally drilled wells stimulated by hydraulic fracturing. In so doing, New York is also strengthening and enhancing its regulations of the industry based, in part, on the problems that occurred elsewhere in the country. These regulations have been thoughtfully considered in light of the environmental risks posed by the industry and the advances in technology.

Ohio

Ohio has a long history in the oil and gas industry, dating back to the mid-1800s. The first commercial production of oil in Ohio occurred in 1860 and the first commercial production of gas occurred in 1884. As of end of 2010, the number of oil and gas wells drilled in Ohio reached 275,774 wells yielding 1.136 billion barrels of crude oil and more than 8.52 trillion cubic feet of natural gas.[46] Hydraulic fracturing has been used in more than 15,000 Ohio wells since 1990 and in over 85,000 Ohio wells since 1953. Ohio has significant remaining producible oil and gas reserves in Clinton sandstone, large untapped reserves in Utica shale and lesser untapped reserves in Marcellus shale.[47] Ohio has extensive experience with oil and gas wells drilled in Clinton sandstone dating back to the 1970s and Rose Run sandstone dating back to the

[45] Proposed 6 NYCRR Parts 550 -556, 560, 750.1 and 750.3.

[46] Jack Kleinhenz, Kleinhenz & Associates in association with Jim Robey, Mohr Partners, Inc., *"Ohio's Natural Gas and Crude Oil Exploration and Production Industry and the Emerging Utica Gas Formation",* (September 2011) prepared for the Ohio Oil and Gas Energy Education Program.

[47] Kleinhenz projects that more than over 4,000 wells would be drilled in Utica shale in Ohio by 2015, and that 3,922 of those will be ultimately completed. *Id* at 14. Investment is estimated at $10 million per well with more than $34 billion in the aggregate by 2015. *Id.* at 16. Jobs are estimated at more than 200,000 across all industries by 2015. *Id*. at 18. A report commissioned by the Ohio Chamber of Commerce on behalf of the Ohio Shale Commission and released in late February 2012, states that, by 2014, the oil and gas drilling activities in Ohio will result in more than 1,000 wells per year at a cost of $6 billion to the energy companies, and the creation of more than 66,000 jobs. John Funk, "*Shale Drilling Likely to Give the State a $5 Billion Yearly Boost, Study Says – Projection Estimates That by 2014 it will Add Nearly 66,000 Jobs,*" Cleveland Plain Dealer, February 29, 2012, at C1.

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1980s. Ohio currently ranks fourth nationally behind Texas, Oklahoma and Pennsylvania in oil and gas production.[48]

Existing law and regulations provide for relatively stringent requirements for construction of wells, including bonding (surety bond, financial statement or cash deposit), insurance (liability and property damage), permits (application content and conditions), and drilling operations (pits, casing, spacing, drilling and deepening). Producing operations must meet stringent requirements as well, including operational requirements (signage, fencing, locks, tanks, landscaping and hours of operation), reporting (well completion, logs, stimulation, production, monitoring procedures), producing conditions (waste minimization and disposal, spill control, safety, pipelines), plugging (oversight, methods, restoration, orphan and idle wells, waste disposal), and underground injection control (permits, construction, operation, monitoring and reporting, fees, recovery, disposal, and surface application of brine).

In light of the rapid increase in the combined use of horizontal drilling and hydraulic fracturing in drilling operations, Ohio has promulgated detailed construction rules and is proposing rules requiring advanced technologies in larger scale operations such as closed loop drilling as well as mandatory payments to local governments and significant fines and penalties for energy companies that do not meet the enhanced requirements.

Advice to Landowners

Although complying with the regulations should be the oil and gas industry's responsibility, landowners should be aware of the risks of allowing large scale horizontal drilling operations on their land. Landowners should also be aware of the qualifications and past practices of the drilling and operating companies. Before finalizing any lease, the landowner needs to understand exactly what potential liability it will be subject to and the standards to which the oil and gas company is and should be held.

Landowners should understand that, in most states, government regulations alone will not adequately protect their interests. If a landowner decides to negotiate a lease, the landowner should consider subjects well beyond the economics of the transaction. Landowners should include provisions about drilling techniques and wastewater storage, especially if the regulations in the state where the land is situated do not adequately regulate the technology available to gas and oil companies. Other considerations landowners should consider are the source of water for hydraulic fracturing and the level of air emissions from the drilling operations. The landowner should also consider practical topics, such as times in which trucks may enter or leave the site, because of the large-scale size of the operation. While many oil and gas companies will present a "one size fits all" lease agreement to a landowner, each situation is unique and should be documented accordingly.

Conclusion

Because a number of risks are associated with large scale oil and gas drilling operations, and existing federal and state laws and regulations do not adequately shield the landowner from

[48] *Id*. at 18.

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these risks, it is essential to aggressively pursue needed protections. Fortunately, with the aid of knowledgeable counsel, a landowner can negotiate all of the necessary protections in documentation with the energy company desiring to conduct such operations. With the boom of oil and gas extraction facing the United States today, landowners need to be in as protected a position as possible.

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