

Regional Commission
To Study and Address Oil and Gas Well Drilling and Exploration
REPORT and RECOMMENDATIONS
December 2015

INTRODUCTION

The Regional Commission to Study and Address Oil and Gas Well Drilling and Exploration (“Regional Commission” or “Commission”) was formed in January 2015 and is represented by many viewpoints, both pro and con, regarding oil and gas drilling. Members of the Commission and their respective communities are found in Exhibit XVII attached. The Commission recognizes the national importance of energy independence and is not intending to either encourage or discourage drilling. Rather, the Commission was formed to serve as a forum for education and discussion in order to formulate a regional response to safeguard the health, safety, and welfare of the region’s residents in connection with the extraction of hydrocarbons in the Commission’s planning area.

The Regional Commission was organized into three “fact-finding” committees - - (1) Science, Technology & Environment, (2) Safety and (3) Legal & Legislative. These committees were supported by a Communications and Political Outreach Committee. Over an 11-month period, the committees met frequently to research and address the following key questions:

- Are there substantive risks to local air, soil and water quality from horizontal drilling and what actions if any can a local community take to address any such risks?
- What is the impact of horizontal drilling on traffic, noise, lighting, overall aesthetics and general well being in a local community?
- Are there safety risks associated with horizontal drilling and what actions if any can a local community take to address any such risks?
- What is the likelihood of horizontal drilling coming to Northeast Ohio communities and what legal steps are available if a community wants to prevent or better control where horizontal drilling takes place?

While the primary focus of the Regional Commission was on horizontal drilling, it also looked at some aspects of vertical drilling, particularly by the Safety Committee. Importantly, it was the finding of the Commission that the recommendations and many of the findings in this report apply not only to vertical or horizontal drilling, but to any land use that could have a detrimental impact on a community. The key findings to the above questions and recommendations are contained in reports from each committee along with back up material. The reports and back up material can be found on the Commission website [www.rcogw.com]. Note that new studies and scientific reports regarding the lifecycle of horizontal drilling are surfacing frequently and such new information could augment the findings and recommendations of this report.

Horizontal drilling (also known as Unconventional Wells) involves hydraulic fracturing (referred to as “fracking”). As it relates to Northeast Ohio, current horizontal drilling pertains to drilling for gas, or oil and gas, in the Utica/Pt. Pleasant shale geologic formation (see Exhibit II attached). Hydraulic fracturing technology has been utilized since about 1947 and horizontal drilling into rock formation began in about 1986. The technology to horizontally fracture has only become commercially viable since 1998. A horizontal well is typically drilled vertically to a depth of 5,000-10,000 feet and then horizontally for up to 2 miles. The shale is then fractured, releasing natural gas and possibly natural gas liquids and oil trapped in the shale. This type of well is much different from the vertical or conventional gas wells that have been drilled throughout Northeast Ohio (see Exhibit III attached). Vertical gas wells in this region typically involve drilling to less than 4,000 feet to tap into pockets of natural gas. While 1,678 horizontal wells have been drilled in

Ohio (of which 1,118 are producing as of December 1, 2015; see Exhibit IV. & V.), there are currently no horizontal wells drilled in Cuyahoga, Lake, Geauga or Summit Counties. One permit has been issued for a horizontal well in Geauga County.

THE HORIZONTAL DRILLING PROCESS (See Exhibits VII. through XVI. attached)

The process of setting up, drilling, fracturing and then placing into production a horizontal well takes 25-30 days per well once a permit has been issued. Most horizontal drilling sites have up to 8 lateral wells per pad, so the total length of time to complete a horizontal drilling site is 4-7 months to drill all wells, if all the wells are drilled at one time. This length of time is considerably shorter than only a few years ago due to improved processes and could become even shorter in the future. The process consists of many steps summarized below:

Key Phases & Steps Developing a Horizontal Well Site

| <u>Key Step</u> | <u>Exhibit #</u> | <u>Comments</u> |
|--|---------------------|---|
| ● Leasing / Acquisition & Permitting | n/a | 640 acres leased; ODNR issues permit, avg. lease 5 yrs. plus usually 3 yr. extension |
| ● Site preparation and drill pad construction | VII. | Fairly quick; Up to 20 acres cleared; site leveled. |
| ● Equipment & materials mobilization and set up | VIII. & IX. | 800-1,200 heavy trucks per well; up to 7,200 per well pad |
| ● Drilling process, including drilling, cementing process and horizontal positioning | X. | } 25-30 days per well, 4-7 months per site, 24-7 operation, lighted, noisy (particular fracturing process), air releases, involves up to 30-40 heavy trucks per day; uses 5-7 mil. gal. of water per well; once well completed, drill pad eventually "re-landscaped" to 2 acres or so in size |
| ● Hydraulic fracturing process, including pressure pumps, water, sand and chemicals used | XI. & XII. | |
| ● Well completion | XIII. | |
| ● Oil and Gas Production, including separation of oil, wet gas and other liquids | XIV. | Significant decline in 1st 1-3 years, then gradual decline thereafter; avg. life up to 15 yrs. |
| ● Gas and Oil transportation, pipelines, compressor operations, separation plants | | Gathering & transmission pipelines installed for gas, requiring clearing of add'l. acreage; then, large compressor stations every 40 miles; oil typically trucked to trains. |
| ● "Re-fracking" | XI. & XII. | Re-stimulates well; up to 40% improvement; requires another 5-7 mil. gal. of water/well; can be w/i 1st 2-3 yrs. |
| ● Disposal of Residual Waste to landfills and injection wells | XV., XVI., & XVIII. | Drill cuttings, drill mud, sludge and flowback waste to local landfills; production waste (brine) to injection wells; 5 trucks/day/well |
| ● Plugging & Abandonment / Reclamation | n/a | After depletion; bonded driller should cover cost |
| ● Potential for new drilling on same site to new levels of geologic strata | | As technology advances, profitable extraction of oil and/or gas from new levels of geologic strata is possible |

Until recently, the economics of horizontal drilling were attractive for both the energy company (driller) and the mineral rights owners across the 640 or so acres. For the landowner who leased the mineral rights, the energy company has paid a signing bonus of as little as \$50 per acre and as much as \$8,000 per acre. The owner of the property holding the drill pad has received a signing bonus of up to \$10,000 per acre. In addition, the landowner receives a monthly royalty payment per acre based on 12-20% of the gas, or gas and oil, produced, which could be considerably larger than the signing bonus. The gas and/or oil production of a well can drop off significantly over the first 2-3 years, so the monthly royalty payments can also decline significantly. While the investment by the energy company to develop one wellhead is up to \$30 million (assuming 6 wells per wellhead), at historic gas prices, a reasonably producing horizontal well was very

profitable. With the recent collapse in gas and oil prices, fewer new horizontal wells are being drilled and some initial wells are being drilled on sites where mineral rights leases are nearing expiration. Further, energy companies are rapidly improving drilling processes and reducing costs, so it is possible that new wells could be drilled even at these much lower energy prices.

KEY FINDINGS AND CONCERNS

An overall summary of the key findings and concerns from the Regional Commission follows:

- 1) **Horizontal drilling is an intensive “industrial process” that is inconsistent with residential zoning.** Much more than for a vertical well, horizontal drilling is a very intense industrial process during the initial drilling and fracturing phases and then continues as an industrial activity for the life of the wells. There can then be another intensive “re-fracking” period several years after the initial drilling period. Horizontal wells result in a large area involving industrial activity that:
 - uses large amounts of land (up to 20 acres) for well pad construction and gathering/transmission pipelines;
 - results in destruction of local ground and tree cover;
 - requires that new roads be constructed and potentially maintained;
 - necessitates a high volume of heavy truck traffic during drilling activity;
 - produces high noise levels;
 - generates light pollution due to the requirement of 24/7 lighting and possibly to temporary flaring of gas under certain conditions for safe completion purposes;
 - requires the installation of collection pipes through the neighborhoods which in turn require large compressor stations every 40 or so miles;
 - requires very large oil and gas processing facilities within the region; and
 - can dramatically clash with reasonable expectations of land use and ambiance in communities zoned for residential to provide residents with a safe and aesthetically pleasing place to live.

- 2) **There are risks to water quality and in some communities, potentially to water supply.** The fracturing process uses 5-7 million gallons of water per each lateral well, which comes back out contaminated. This initial flow-back can be re-cycled for use in additional wells. For some communities, the volume for this water could impact the local water tables. For communities dependent on water aquifers for drinking water, the contamination risk is of two types: well failure and surface spillage. Surface accidents will inevitably occur, even with best practices, and any spills associated with such accidents could seep into the local water table or flow into nearby waterways. For this reason, the siting of wells should take into account mitigation of the problem after an accident. Well failures can occur during the initial drilling and fracturing phases due to poor practices, and well failure can also occur over the longer term due primarily to the potential deterioration of the cement encompassing the well casings. The likelihood and extent of well failures and the impact on the aquifer is still being highly debated and more studies are required to more accurately assess the extent and potential impact of well failure. In all cases, the risk of ground water contamination should be lowered if best practices for well construction are maintained.

- 3) **Horizontal drilling generates air pollution in the area of the wells, but the ability to accurately measure and determine the degree of risk and extent of pollution is still unclear.** During both the drilling process and throughout the production years, wells release methane, “NGL vapors” and Volatile Organic Compounds (VOCs) such as “BTEX’s” (Benzene, Toluene, Ethylbenzene and Xylenes) into the air. Many scientific studies conclude that there are long-term negative health consequences for residents living in proximity to wells. As of 2015, new horizontal wells are now required to follow the USEPA rules on “green completion,” which captures and separates gas and liquid hydrocarbons during the flow-back period. Additionally, the Ohio EPA requires a general air permit for horizontal wells in

production, with the intent to reduce the VOCs and other harmful emissions from the well. OEPA is tasked with enforcement, but currently has not demonstrated effectiveness for this task. Vertical wells are exempt from air permits by the USEPA rules and OEPA permit, are not monitored for air releases, and setback distances for vertical wells are proscribed with little or no consideration for air releases. Local authorities should consider air monitoring at the fence line to create a database to determine if regulations need to be strengthened.

4) **Waste disposal throughout the drilling and production process is an issue, and injection wells present local challenges.**

- Millions of gallons of contaminated liquid waste is returned to the surface of a well. The flow-back is generated right after the hydraulic fracturing process and the produced water is generated over the life of the well;
- Flow-back and produced water, with high concentration of chloride and sodium bicarbonate, is injected into injection wells which in many cases are depleted vertical wells; such wells may not be deep and could be much closer to the water tables;
- Injection wells are associated with heavy truck traffic (up to 3,000 heavy trucks per year per injection well);
- Residual waste is typically taken to local landfills and includes residual fracturing chemicals and sludge from the drilling process, some of which is radioactive; such waste is not considered hazardous under Federal rules;
- There is growing evidence that some injection wells cause tremors and earthquakes; and
- The USEPA is expected to issue new regulations for disposal of fracking waste materials from wells, which may help address at least some of these disposal issues.

5) **There are safety risks to the community during both the drilling and production phases; in addition, inspection and monitoring processes, notification procedures and proper response to safety incidents can be lacking.** Due to the industrial nature and heavy traffic over months associated with the drilling process of horizontal wells, there are numerous incidents of traffic accidents and of industrial accidents, including a few explosions. Because “best practices” have not always been followed during various phases of either horizontal or vertical drilling, there have also been incidents of gas and/or oil leakage during drilling and during production. And, a well can fail, initially during the drilling process and/or over the longer term, potentially resulting in contamination to waterways or water tables and/or potential air pollution.

6) **Ensuring that depleted wells are properly “plugged” and/or reclaimed can be a significant community challenge.** Ohio has a very large number of abandoned gas wells (“orphan wells”) that have not been properly plugged, although the exact number is unknown. An “orphan well” can break down over time and leak methane, sulfur, other odorous fugitive gases and/or oil into the surrounding environment. An orphan well can also serve as a conduit for leakage from other wells to contaminate aquifers. The typical cost of plugging a well is \$20,000-25,000; in the case of abandoned wells, this is intended to be paid out of state severance tax funds that gas and oil producers pay. Over the past 150 years, approximately 275,000 wells have been drilled in Ohio (mostly conventional wells), and currently 65,000 are in production. The state began a program to plug orphan wells in 1977 and so far have plugged approximately 1,000 such wells, but a large number of orphan wells remain (the backlog is estimated to be over 20 years). ODNR has recently put in place requirements that energy companies must plug all of their existing non-producing wells prior to obtaining a permit for a new well. While this issue is a state-level responsibility, local communities should be aware of the issue.

- 7) **There are various local, state and federal agencies with various responsibilities throughout the drilling, production and waste disposal process, but the Commission found that the knowledge of which agency is responsible for what and the coordination between agencies can be lacking.** Agencies include ODNR, OEPA, USEPA, Ohio Department of Health, State Emergency Response Commission, Local Emergency Planning Committees, local fire departments and county and local health agencies.
- 8) **As horizontal drilling comes to a community, the process of establishing sound, balanced leases with individual landowners is mixed.** The agreements for leasing the mineral rights of a landowner for the purpose of oil and gas drilling are complex, involving significant property, financial and environmental issues. A typical landowner is at a significant disadvantage when negotiating such agreements as they typically have no experience while the drilling company (the lessee) is very sophisticated and experienced at negotiating all facets of the lease to their advantage. As a result, many leases do not properly reflect the interests of the landowner or the community.
- 9) **The ability for a local community to prevent or control horizontal drilling is very limited, but strengthening local zoning laws and ordinances related to health, safety and the environment may help.** While the Ohio constitution includes a Home Rule provision giving local municipalities control over certain activities within their boundaries, the Ohio legislature, through O.R.C. Chapter 1509 has allegedly created a “general law” regarding oil and gas development such that local jurisdictions may not legislate in conflict and vests all regulatory authority over oil and gas development with the Ohio Department of Natural Resources (ODNR). Specifically, the law provides that ODNR has “sole and exclusive authority to regulate the permitting, location, and spacing of oil and gas wells and production operations . . .” in Ohio. This provision raises the question about what authority a local municipality still has in regard to zoning and other local ordinances as applied to horizontal drilling. This is a question that has not yet been adjudicated in Ohio. The Commission believes that if an appropriate case arises, the Ohio Supreme Court could rule such that ODNR would need to take into account local zoning laws and ordinances related to health, safety and environmental issues when regulating oil and gas wells.
- 10) **Landowners may take action to protect themselves regarding drilling and should not simply rely on the governmental process.** It is clear to the Commission that the current political environment in Columbus favors drilling so landowners cannot rely on the General Assembly to provide absolute protection to Ohio landowners against hydraulic fracturing. Local governments are limited in the actions they can take to prevent or regulate drilling, notwithstanding Home Rule. However, the Commission has concluded that individual landowners might be able to protect their neighborhoods and local jurisdictions from unwanted land use through restrictive covenants or other joint agreements under Ohio property law. In particular, landowners may be able to enter into restrictive covenants via conservation easements or possibly simple private contracts among a group of landowners by which all parties to the contract agree not to voluntarily enter into horizontal drilling leases. These private agreements may be effective at preventing or at least controlling horizontal drilling in a community, even if the General Assembly does not provide for legislation to protect property owners. In considering private agreements, it must be noted that Ohio has a statute, Section 1509.28 of the Ohio Revised Code, that authorizes compelled aggregation (“unitization”) of land to form a drilling unit if the owners of at least 65% of the land included in the proposed drilling unit agree to the drilling. The landowners who do not agree may be compelled to allow drilling below the surface of their land. This compelled invasion and extraction procedure under their land raises several significant due process issues that are unresolved.

- 11) **While the above findings may be of concern, the industry states the likelihood of horizontal drilling taking place in Northeast Ohio is relatively low.** Horizontal drilling in Northeast Ohio currently only involves the Utica Shale. As shown in Exhibit II, the portion of the Utica shale geologic formation that exists in Ohio is all in the eastern half of the state and has largely “thinned out” in the Cuyahoga, Lake, Geauga and Summit counties. Samples taken from the Utica shale formation in this 4-county area have indicated relatively little natural gas and virtually no oil. At current or even historic energy prices, the industry believes that it is unlikely that the gas recovery from horizontal drilling in this area is likely to be cost justified. Further, the difficulty of securing 640 acres in the densely populated communities and the lack of pipeline infrastructure makes it more unlikely that horizontal drilling would ever take place in this area. However, if energy prices someday go above historic highs, the potential for horizontal drilling could develop. It is also possible that new drilling technology could evolve that could make it feasible to drill to deeper strata or possibly to the shallower Clinton sandstone formation, which would increase the likelihood of horizontal drilling in this area. Thus, the Commission strongly believes that any community that is concerned about the impact of horizontal drilling in their neighborhoods should consider the recommendations in this report now.

RECOMMENDATIONS FOR COMMUNITIES AND LANDOWNERS

Based on the above key findings and concerns, the Regional Commission makes the following recommendations for a community that is interested either in better managing and controlling horizontal drilling in its community or possibly preventing or reducing the likelihood of horizontal drilling taking place in its community. And again, these recommendations can apply not only to drilling but to any land use that could have a detrimental impact on a community.

- 1) ***For communities that do not want horizontal drilling and/or at least want to control the location, explore the potential of a “mosaic” of conservation easements and/or private party agreements restricting land use.*** Conservation easements and deed restrictions restricting land use from drilling would protect land in perpetuity. The 2016 Commission plans to provide templates for such easements and deed restrictions. A less permanent alternative would be a contract among a group of landowners by which all parties to the contract agree not to voluntarily enter into horizontal drilling leases. While such agreements would not be binding on subsequent landowners, they would be enforceable by, among and against all signatories to those contracts. For either approach, the concept is to secure enough land in the community such that the ability to establish a “drilling unit” of at least 65% of 640 acres in that community would be very limited. Further, it would prevent the use of Section 1509.28 of the Ohio Revised Code to compel unitization, or forced aggregation, of land for the drilling unit. To enhance this recommendation, consider forming a Consortium of Conservation Organizations in 2016 to explore easement restrictions that prevents mineral extraction on protected properties.
- 2) ***Update and strengthen zoning where appropriate and update or adopt local ordinances addressing health, safety and the local environment that would apply to activities within the community, with particular attention to ordinances related to:***
- Noise
 - Traffic
 - Lighting
 - Local environmental laws, including but not limited to tree protection, riparian issues, hillside and land stabilization, aesthetics, etc.;

- Safety rules applicable to all hazardous operations, not just horizontal drilling, including notices by landowners and lessees of potentially hazardous operations, safety issues and pollution releases, reporting of local hazardous issues, etc.
 - Pollution of air or water
- 3) **Implement monitoring of water quality around vertical wells, non-producing wells and in areas affected by horizontal drilling, before drilling if possible to establish a baseline, and then thereafter.** See the Ohio EPA and ODNR publication entitled “Best Management Practices for Pre-Drilling Water Sampling” dated September 12, 2012 as at least one guideline.
 - 4) **To help address the risk of long-term health consequences, gather sufficient long-term air quality measurement data around vertical and old horizontal wells [which are exempt from permitting and thus not monitored by regulators], all new horizontal wells and all other associated facilities to determine the need to upgrade the current standards for air releases.**
 - 5) **To reduce the risk of accidents and their potential impact, including oil/gas leaks and spills, and to better track if accidents or leaks are occurring:**
 - Ensure that inspectors are present during the critical phases of drilling, casing, flow-back and fracturing operations;
 - Encourage the energy company to install remotely accessible air monitoring equipment at each wellhead, tank battery and associated facilities;
 - Use local safety authorities to help detect incidents at vertical wells that are not monitored regularly by operators;
 - Ensure the installation of remote shut-off devices on all wellheads and “hold-open” latches on the gates of the wellhead and tank battery enclosures; and
 - Create and/or enhance the procedures in place with the local fire department for responding to and tracking all accidents and incidents associated with a well.
 - 6) **Educate landowners on the importance of retaining a qualified lawyer and potentially a title examiner when negotiating a lease for a landowner’s mineral rights.** Because of the complexity of oil and gas leases, a landowner involved in leasing their mineral rights should retain a lawyer experienced in oil and gas leasing to advise the landowner and to negotiate the terms of the lease. Further, if a landowner has an issue regarding the ownership of oil and gas beneath their land, they should retain a title examiner to perform a title search. As part of the lease, include language that would prevent a well from ever being converted to an injection well.
 - 7) **Demand that the federal Emergency Planning and Community Right-to-Know Act (EPCRA) be followed.** Per the USEPA Region 5 letter, dated September 17, 2013, “ORC Chapter 3750 does not supersede federal EPCRA and oil and gas facilities are still required to comply with the federal EPCRA reporting requirements.” EPCRA requires (1) submission of a chemical inventory form and MSDS sheets to the State Emergency Response Commission, the Local Emergency Planning Committee and the local fire department, (2) submission of trade secret claims to the EPA for determination; and (3) requires industry to provide the “specific chemical identity... to any health professional who requests such information in writing”, including trade secrets. This includes medical researchers. In emergencies, requests need not be in writing and responses must be immediate.
 - 8) **Educate local residents on the benefits and drawbacks of drilling as described in this report and encourage advocacy among residents regarding this topic.**
 - 9) **Consider joining with other communities to create a regional voice to work with and persuade the state legislature to address the issues and recommendations contained in this report.**

RECOMMENDATIONS FOR THE OHIO LEGISLATURE AND ODNR

- 1) Amend O.R.C. 1509 to require that ODNR consider local zoning as part of the permitting process.
- 2) Enact improved health and safety requirements for both vertical and horizontal wells, including:
 - Create a standardized site inspection 'check sheet' to be utilized during site visits by inspectors and energy companies to be submitted to ODNR monthly;
 - Enable "right of entry" to oil/gas well facilities for local fire departments to conduct emergency response planning;
 - Require energy companies to report all investigations regarding the cause of incidents or emergencies to the local fire department;
 - Ensure that the state database listing all inspection reports including violations is easily web-accessible;
 - Require remote shut-off devices on all well heads;
 - Extend set back distances for occupied structures, educational facilities and places of assembly;
 - Require the installation of "hold-open" latches on the gates of the wellhead and tank battery enclosures;
 - Establish a mandatory 30-minute maximum response time to well incidents by the energy companies;
 - Require the energy companies to provide respiratory and thermal protective equipment for their workers;
 - Establish maximum 'duty hours' for gas well personnel, similar to DOT requirements for truck drivers and pilots.
- 3) Enact better bonding requirements to ensure that bonding stays in place to plug all currently producing and all new wells once the well becomes non-producing, and that sufficient funds remain to resolve all cleanup and closing issues, regardless of the financial viability of the energy company or operator.
- 4) Improve state oversight and coordination of agencies responsible for the enforcement of best practices for all drilling and related waste disposal activities in Ohio.

Other suggestions or more specific recommendations can be found in the reports of the Commission's Committees. Interested parties are encouraged to access and read those Committee reports on the Commission's website [www.rcogw.com]

NEXT STEPS FOR THE REGIONAL COMMISSION

The Regional Commission as formed for 2015 has completed it's work with the publication of this report and the individual committee reports and back-up material found on the website. This commission recommends that a reconstituted commission be formed for 2016 to accomplish the following:

- Publicize the findings and recommendations of the 2015 Commission;
- Develop language for model ordinances in the areas of noise, lighting, traffic and environment;
- Develop language for model conservation easement, deed restrictions and neighborhood contracts;
- Develop and implement a plan involving as many Northeast Ohio communities as possible to influence the Ohio legislature regarding issues and recommendations listed in this report; and
- Collaborate regionally to obtain funding for the purchase and sharing of water and air monitoring equipment and to develop the technical procedures to ensure effective monitoring.

Exhibits

[If the Exhibits in this section are not attached to this report, they are available to view on the Regional Commission website at www.rcogw.com.]

- I. Key Steps and Phases
- II. Ohio Oil and Gas Fields
- III. Horizontal (Unconventional) vs. Vertical (Conventional) Wells
- IV. Horizontal Utica / Pt. Pleasant Well Activity in Ohio
- V. Producing Horizontal Wells in Ohio
- VI. Depth of Utica Shale vs. Clinton Sandstone and Potable Groundwater Reservoirs
- VII. Drill Pad Construction
- VIII. Truck Traffic Throughout Drilling and Fracturing Process
- IX. Set Up for Drilling
- X. Drilling Process
- XI. Set Up for Fracturing Process & Mix of Fracture Fluid
- XII. Fracturing Process
- XIII. Well Completion
- XIV. Well Restrictions
- XV. Residual Waste Disposal
- XVI. Injection Well Structure
- XVII. Brine Injection Wells in Ohio
- XVIII. Regional Commission Members