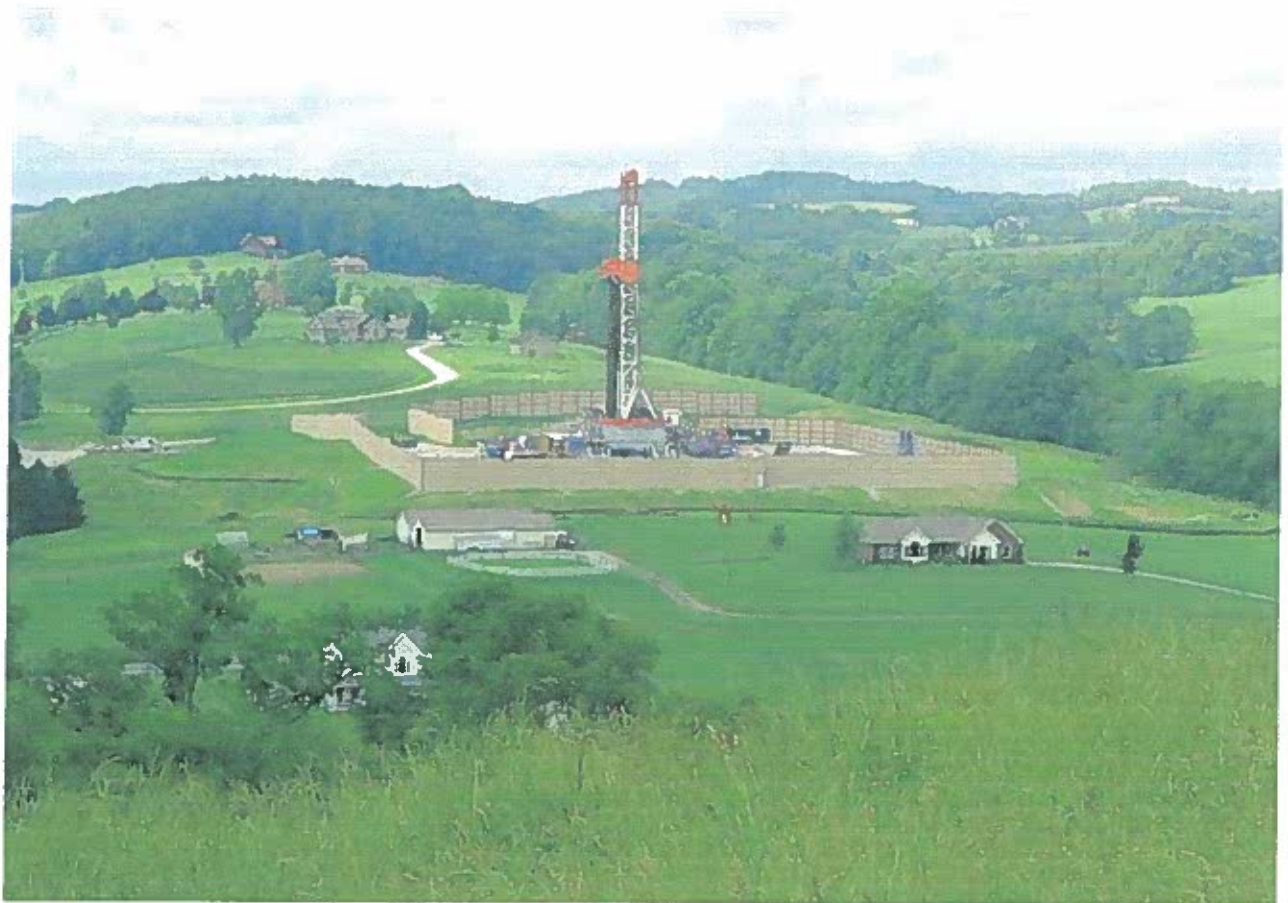


Citizens for the Preservation of Rural Murrysville (CPRM) Testimony for the House Majority Policy Committee Murrysville Hearing on Clean Water

Murrysville, PA

Draft Date: April 12, 2011



EXECUTIVE SUMMARY

CPRM is a citizens' group dedicated to maintaining the rural character of Murrysville, PA, as it experiences an anticipated stage of steady growth. Gas drilling in the Marcellus Shale can affect Murrysville in several ways, some of them positive but many of them negative. Initial drilling has resulted in many violations, and the scope of drilling operations far outweighs the state's current ability to regulate it. It is easy to foresee accidents occurring that are catastrophic in nature.

We feel that there is clear threat to clean water, property values, and local control of events in Murrysville. Access to clean water is not only a basic, common sense expectation—it is also guaranteed by the PA constitution.

Rather than waiting for a catastrophic event to drive tightened regulations, we propose putting conservative regulations in place in advance. We can always change them based on experience. However, you can never go back and undo a catastrophe.

BACKGROUND AND CONTEXT

Murrysville is located at the edge of the Pittsburgh population center. We are experiencing steady growth, mostly from professionals interested in good schools, lower taxes, and leafy community.

A major highway—PA route 22—bisects our community and is the site for our commercial area. Land on either side of Rt. 22 is rolling hills, bedroom communities, farm lots, and woodlands.

CPRM was started in the summer of 2006, after a developer bought a large lot of farmland and tried to re-zone it for commercial use. Against citizens' wishes, a development-oriented municipal council voted to make the changes. We then changed our focus to include electoral advocacy, and ran a slate of candidates with views consistent with most citizens' and ours. Our slate of four candidates (three of whom were novices) convincingly beat the slate of two incumbents, garnering over 80% of the votes. In other words, our positions and policies represented those of 80% of the voting population.

Today CPRM-PAC is an organized, incorporated Political Action Committee, serving as a watchdog to Murrysville's local government. Half of the leaders of CPRM are owners of businesses in Murrysville. Others are professionals, retirees, volunteers and moms & dads just like most people in the community. As a group, we are nonpartisan and affiliated with no political party. By happenstance, half of our governing body are registered Democrats and half are Republicans. We come together with one mission: to preserve the open and

natural, rural character of Murrysville, as related to its appearance, topography, ecology, traffic, and sense of community.

For more information about CPRM, see Attachment A.

MARCELLUS SHALE DRILLING: AN ASSESSMENT OF THE POSITIVES AND NEGATIVES

Once again, Murrysville has become a center of interest from the Natural Gas Industry. Over a century ago, Murrysville was home for the first well ever drilled for commercial use of natural gas. This was a “shallow well”, of course. Now this community—along with hundreds of others—is bracing for “deep well” drilling.

Five to seven thousand feet beneath our community lays a thick stratum of shale known as the Marcellus. Estimates have been made that this shale contains many trillions of cubic feet of natural gas under very high pressure, but trapped in the dense shale. Although the price of energy bounces around a lot, the general trend has been steadily upward. The price is now high enough to justify drilling into the shale layer to retrieve this source of energy. At the Murrysville Council meeting held April 7, 2010 in the Franklin Regional High School auditorium, Range Resources, Inc. gave a presentation to the public on the benefits of drilling in Murrysville. The following will give you our take on both sides of this controversial process.

POSITIVES:

The Marcellus Shale extends from southern New York State through the northeastern part of Pennsylvania, the western part of Pennsylvania, eastern Ohio and under almost all of West Virginia. It may contain as much energy reserves as the entire Middle East. By authoritative estimates, and *assuming that we convert our society from oil and coal based energy*, there is enough natural gas in the Marcellus to power our autos, generate electricity and heat our home for many years, Using this resource would:

1. Reduce the purchase of oil from one of the most unstable areas in the world: the Middle East.
2. Reduce the United States trade deficit,
3. Reduce the amount of greenhouse gas emissions (the gas produces a little less than half the amount of CO₂ as coal for an equal amount of energy.),
4. Create jobs and revenues for Pennsylvania and the United States,
5. Reduce pollution (gas is nearly clean burning and smokeless).

While these outcomes are desirable, they are predicated on the conversion of coal fired electricity generation to gas, conversion of oil based transportation to natural gas and do not address the environmental effects of the extraction and recovery process when compared to other energy sources. If achievable at all, these changes will not occur in the near future. In addition, there are obvious negatives associated with natural gas recovery:

NEGATIVES:

Drilling operations have some negatives that could significantly impact our environment and quality of life:

1. Very large amounts of water are required for the drilling and hydro-fracturing operations (“fracking”). Estimates are that as much as 3-5 million gallons of water are required per well, and most sites have multiple wells. This water needs to come from somewhere, which could have a significant impact on local water supplies,
2. Some nasty chemicals are put into the water to lubricate the drills, prevent corrosion and prevent bacterial growth. While the actual content is considered a trade secret, it is common to see industrial solvent and other toxic substances in the mix. In addition, since much of this contaminated water comes back out of the wells along with the gas, we can also expect a significant concentration of heavy metals. Unfortunately, there is no easy way to treat this water. The drilling companies will either haul away the water or just pump into large holding ponds for future use or treatment. The problem is that there are not enough treatment facilities capable of treating this volume of chemically contaminated water. Also, the holding ponds have a history of leaking, which has caused significant environmental impact.
3. Drilling is very noisy, uses bright lighting and goes on around the clock: 24/7. Estimates show the drilling process could take as long as a month per wellhead, so 24/7 light and noise could go on for months if multiple wells are planned.
4. A large number of heavy truck trips are necessary to bring in and take out drilling rigs, equipment and material. Drilling rigs can take up to 60 trucks to deliver and remove the rig. In addition, the fracking process requires a lot of material (water, sand, etc.), which requires several hundred-truck deliveries per day. This number of truck deliveries would clearly have a negative impact on local traffic and road wear.
5. Contamination of ground water (well water) is possible. There are reports across PA regarding ground water contamination that many believe are caused by this type of drilling. Drinking water contamination is not only obviously wrong—it is a violation of the PA constitution.
6. The Pennsylvania Gas Legislation Act denies Murrysville from regulating or taxing the Gas Industry to either protect local residents and our

- environment, or to recover adequate costs to the community resulting from the drilling operation.
7. Pipeline right-of-ways remain as well as tanks and compressors after drilling is completed. Compressors, which might be necessary for the life of the well, are very noisy. So, restoration of the properties involved is not back to original.
 8. A pad of from 5 to 8 acres is necessary to support the drilling equipment.
 9. Property values can be negatively impacted, as banks deny mortgages for properties that have existing or spent wells.
 10. This is a heavy industrial operation not compatible with Murrysville's rural character. Some have likened locating natural gas operations in urban and residential communities to the equivalent of moving the USS Edgar Thompson Works to our community—it's legal, but who would want to live near this industrial activity?

Most people heat their homes and water with natural gas. Generally, people are not against natural gas itself but they are against pollution to the environment from the drilling procedures. There will always be unforeseen accidents, but many are preventable. For example, the deaths of twenty-nine miners in West Virginia, the large leak in British Petroleum's Alaskan pipeline, the explosions at refineries in Texas and, most of all, the disastrous oil spill in the Gulf of Mexico last year were all preventable. The shortsighted pursuit of profit led to shortcuts in maintenance and safe operating procedures that caused the accidents.

A good example that this shortsightedness is not limited to just one industry is the leasing of ground surrounding Beaver Run drinking water reservoir to drilling companies. In one instance, a Marcellus drilling site has a "frack" wastewater pond located about 550 feet from the water we drink. If ever there was a preventable accident, this is it. This type of drilling so close to our reservoir belies common sense.

The State of Pennsylvania has enacted legislation that severely restricts local governments ability to provide safety for their community's citizens. By denying a community's right to legislate, the State, by default, has assumed the role of being the citizen's protector, particularly since the Pennsylvania State Constitution provides its citizens the right to clean air and water.

Therefore, it is incumbent upon the State to regulate and legislate the drilling industry to assure that preventable accidents never occur, and that stiff monetary penalties are enacted that make it more profitable for the drilling industry to drill safely than irresponsibly. It is incumbent also that local communities are fully reimbursed by the State for damages brought about by drilling accidents. If the State of Pennsylvania cannot, or is unwilling to protect its citizens, the power to protect should be returned to the local governments to do so.

WHAT IS NEEDED

It is our opinion that the residents of Pennsylvania are not opposed to the production of natural gas if it is done safely, without risk of harm to health and the environment. In that regard we request the following actions be implemented. Some of these requests you may have seen. Some are requests of the PA Campaign for Clean Water and some are the result of our research. The PA Campaign for Clean Water requests to the DEP is submitted as Attachment B.

Our primary request is that you, as our elected representatives, place the health, safety and well being of the citizens of Pennsylvania above the commercial interests of corporate entities whose only goal is extracting natural gas from the State. The risks of natural gas extraction include loss of life and irremediable damage to the environment. In their own words, natural gas extraction entities characterize these risks as:

“Oil and natural gas operations are subject to many risks, including well blowouts, craterings, explosions, uncontrollable flows of oil, natural gas or well fluids, fires, formations with abnormal pressures, pipeline ruptures or spills, pollution, releases of toxic natural gas and other environmental hazards and risks. If any of these hazards occur, we could sustain substantial losses as a result of:

Injury or loss of life;

Severe damage to or destruction of property, natural resources and equipment;

Pollution or other environmental damage;

Clean up responsibilities;

Regulatory investigations and penalties;

Suspension of operations.

As we begin drilling to deeper horizons and in more geologically complex areas, we could experience a greater increase in operating and financial risks due to inherent higher reservoir pressures and unknown downhole risk exposure.” (Excerpt from Range Resources Prospectus.)

Some of these risks are unknown and include only those that might affect the economic outcome of natural gas extraction. Long-term risks to the health and safety of the residents of Pennsylvania such as air and water pollution are ignored by gas recovery operators when there is no immediate impact.

Evidence that these risks are real is provided by the public record: Over the past two years, within a three hour drive of Pittsburgh PA, there has been one catastrophic blowout, one explosion and fire due to ignition of methane from an underground coal mine, and two fires (one at a multi-well site in production near Avella PA and one at a site being brought into production in Hopewell Township, PA).

Regarding current legislation on the federal level: at the very least, it is imperative that the Halliburton Loophole should be revoked, making the gas and oil industry conform to the clean air and water standards *as every other industry* must. On the state level, we favor support of Rep. Camille “Bud” George’s PA HB 971 (formerly HB 2213), Land and Water Protection Act, currently in the Consumer Affairs Committee.

Obviously, the wastewater from the fracking process is of great concern to the industry as well as the environmentalists and residents. As one of our members, a chemist at Alcoa, developing industrial processes has so succinctly put it, “dilution is not the solution to pollution,” a statement also found in the Clean Water Act. A second Alcoa requirement was to track hazardous waste “from cradle to grave.” And then there is the question of a plan for recycling. Even though recycling is preferable to not recycling due to the vast amounts of water required in the fracking process, an obvious problem is the buildup of contaminants, particularly the radioactivity in the recycled waste. We need the industry to have a solution other than dilution to polluted wastewater, a tracking procedure for wastewater from its initial stages to the end and a plan for recycling wastewater. Most importantly, the industry must take responsibility for the waste generated by the gas extraction process at each stage of its processing. It is not acceptable for drilling companies to blame illegal dumping of toxic waste on subcontractors or to drop off waste at a “treatment” facility, claiming that they have met all environmental requirements when they have knowledge that the treatment is ineffective or illegal.

Historically, the number of “serious environmental incidents” at well sites exceeds the number of wells (see Risk Assessment Report, by J.M. Evans, Ph.D., Attachment C). Accordingly, we ask for a state moratorium until extraction of the Marcellus (and Utica) Shale can be done without the risk of serious environmental incident. This moratorium would also prevent drilling at reservoirs or other sources of household water until it can be done safely.

We believe that it is only fair to expect drilling to fall within the safety range we expect from everyday activities. Gas extraction should be no more risky than, for example, pumping fuel at a gas station. Clearly, we have some way to go.

When considering the types of actions that could reduce the risks of water pollution and safety incidents, we commend the following safeguards to your attention. They might not *all* be implemented ultimately, but surely some combination is necessary to achieve basic safeguards.

- Disallow the treatment of toxic industrial waste produced by fracking in sewage treatment plants.

- Mandate the closed loop recycling system that Range Resources and Consol Energy claim they use
- Determine the extent of air pollution caused by natural gas extraction. Air quality should be monitored continuously by placing sensors around the wellhead that transmit to a municipality computer which displays on the municipality website. The cost of this would be a requirement placed on the drilling company.
- Monitor continuously the soil and subsurface pollution. This can be done by drilling monitoring wells around the well site and monitoring the well for methane. Landfills are required to use a similar system.
- The industry must use “best practices,” i.e., the best available technology to minimize pollution. In fact, the Marcellus Gas Coalition states this as a goal. Technology is improving continuously and the most up-to-date technology should be mandated and not just given lip service.
- Discontinue the use of water in the fracking process by replacing water as a fracking fluid with other incompressible liquids, such as liquefied natural gas, “where there would be no environmental issues since nearly all the gas would end up in the pipeline.” (Gerson Lehrman Group, December 18, 2009, “LNG and LIN can be Alternative Fracturing Methods for Shale Gas.”)
- Increase first responder training and provide any necessary special equipment. Currently the closest well-control specialists are in Canton Township, Bradford County, put in place following waits of 16 hours and 11 hours in 2010 for specialists to arrive from out of state when the well blew out in Clearfield County and the well fire occurred in Allegheny County.
- Impose a severance tax or user fee to cover remediation of any accidents caused by drilling. The argument that this is a “nascent” industry and should not be discouraged from activity by a severance tax is belied by industry claims to have been drilling in Pennsylvania since 2005 and in other locations for 60 years. Besides, all other extractive industries are required to restore conditions to what they were before site activities began. Given the probability of a serious environmental incident (see Risk Assessment Report by J. M. Evans, Ph.D., Attachment C), it would seem obvious to assess the industry prior to any damage being done and, because we are the only state not to have a severance tax, this is long overdue.

In summary, there are actions which can be implemented by both the industry and the PA Department of Environmental Protection to lessen the concerns of

the residents of communities who are not against natural gas extraction, only against the current unsafe processes and procedures used by the industry. We can work together on this issue, but the ability to resolve issues lies primarily in the pens of the legislator and the technology of the industry.

BEAVER RUN DRINKING-WATER RESERVOIR: THE POSTER CHILD FOR IRRESPONSIBLE DRILLING

The Beaver Run Reservoir, about ten miles from Murrysville, is the source of drinking water for some 150,000 PA citizens. The pristine, 1,300 acre lake, administered by the Municipal Authority of Westmoreland County, has many restrictions, essentially banning all public access. For example, fishing is prohibited. Swimming is not allowed. Boating—even by motorless craft such as canoes and kayaks—is forbidden. No doubt, these restrictions are considered necessary to ensure the purity of the drinking water.



However, hydrofracking is allowed. Open frack-water storage pits sit within about 550 feet of the community drinking water so carefully protected against the toxic effects of fishing.

By 2012, Consol energy will have some 60 deep and shallow wells drilled on this pristine water source (Valley News Dispatch, Saturday, October 16, 2010).

This irrational situation clearly demonstrates the unsuitability of the regulatory structure governing Marcellus Shale Drilling. What could be worse than drilling in public water supplies? Drilling in church lots? Drilling on elementary school property? Drilling through highway traffic lanes?



Hydrofracking in public water reservoirs clearly illustrates the absurdity of the current regulatory structure.

LEARNING FROM THE PAST

There has always been a tension between nursing new industry and protecting the public. Unfortunately, it has mostly followed a tragic pattern. First, people will express concern about a situation. Next, business owners will downplay the concern argue that any restrictions could “hurt business”. Then a tragedy occurs.

Suddenly, the press is alive with stories of death and tragedy. Politicians express outrage, and responsible parties increase the strictness of the controlling regulations.

A balance is eventually reached, but only after a tragic incident.

Here are some examples of this unfortunate pattern:

- In 1914 at the Triangle Shirtwaist factory in New York City, a fire killed 146 people, many of whom were locked inside the building. Fire laws were improved after years of resistance by business owners.
- In 1984 in Bhopal India, 3,787 people died when toxic gasses were released. This disaster raised expectations for safe working conditions at factories owned by US companies in foreign locations.
- In 1979, a serious accident at Pennsylvania's Three Mile Island nuclear plant caused the evacuation of 144,000 people. Only heroic efforts prevented a major release of radioactive materials, after approximately half of the fuel experienced melting. As a result, nuclear power plants were significantly upgraded to higher safety standards.
- Last year, lax regulations, coziness between politicians and industry officials, and human error led to the BP Oil spill. Only after the tragedy did deep water drilling receive the controls that such new technologies warranted.

It seems to be human nature to avoid facing known risks until a disruptive accident occurs. Knowing this pattern, we ask you to take the opposite approach. We ask you to mandate very conservative safeguards and then, over time and if appropriate, remove safeguards based on a history of safe operations. This would benefit the citizens and the environment. This would benefit the industry as well, by avoiding shutdowns and overreactions after the inevitable large-scale accidents.

CONCLUSION

Pennsylvania is simply not ready for drilling for Marcellus Shale gas. Our drinking water is not protected from the dangers of contamination, as shown by repeated violations. State government restricts our local communities from applying local controls to a community issue. Regulatory agencies are woefully understaffed, using past history as a judge. Newly appointed policymakers appear to be slanted towards industry interests rather than protecting the health and welfare of the citizens.

Our backs are against the wall. Citizens in local communities like Murrysville face clear and present danger to their drinking water, their community's character, and their way of life. You—our elected representatives—comprise our only hope.

Please listen to your constituents. Please restore balance by legislating the reasonable requirements we have asked for. This will not only restore balance between nature and extraction, but it will bring gas drilling in line with the other extractive industries.

Thank you for the opportunity to present this testimony.

CONTRIBUTORS

This document was a collaborative effort by Joseph Evans, PhD., Judy Evans, Joseph Guthrie, Brien Palmer, and Jerome Wolfe, representing the Citizens for the Preservation of Rural Murrysville, LLC.

Attachment A

A Brief Chronology of Initiatives And Accomplishments of CPRM

The Citizens for the Preservation of Rural Murrysville (CPRM) is a non-partisan citizen's action group comprised of diverse individuals who are dedicated to the preservation of the open and natural rural character of Murrysville, Pennsylvania. We are incorporated as a 501c4 organization.

The information below summarizes some of CPRM's past, current and future accomplishments/initiatives in the pursuit of maintaining the rural character of Murrysville.

2006 - Community Action to stop proposed development of the Buncher Property.

A landowner bought rural-zoned farm property (the Buncher property) and asked council to change zoning to allow development of a retail and residential effort.

A small group of concerned citizens, Ray Meehan, Jerome Wolfe, Robert Stemler and Shirley Turnage, begin to survey citizen opinion, which was almost unanimously against this proposal. Then they organized to work against this proposal, (known as MP22 Market Place, by Manor Development Group II (MDGII)). This small group was the founding members of CPRM. In December 2007, through their efforts and an outpouring of citizen input against the development, the MP22 Market Place development was defeated by a one-vote margin in a final Council vote. Little did this small group, or the community, know that this was not the end of the story.

2008 - MDGII appeals the Murrysville Council decision against the MP22 development initiative.

In response, a special mediation team appointed by Council is convened to address the issues with MDGII. The outcome of the mediation is a larger tract of land being made available to the developers as well as a new General Business Ordinance Overlay Ordinance (GBOO), which allows the MP22 Market Place development to now take place.

2008 - CPRM continues to work toward the defeat of the MP22 Development and GBOO

CPRM hires an attorney in May of 2008 to determine if there is any conflict of interest involved with the outcome of the mediation as there are council members who have ties to real estate development. Also wanted guidance on the development of a strategy to legally challenge this conflict.

May 2008 - CPRM designs, develops and circulates two petitions, one against the MP22 development and the other against the GBOO

800+ signatures are recorded on the petitions.

June 2008 – CPRM presents petitions with 800+ signatures to Murrysville Council against the MP22 and GBOO.

The council delays their scheduled vote on the GBOO Ordinance No 771-08 for further study based on the signed petitions and more public input against the MP 22 Development and GBOO

August 2008 - Council Votes to pass GBOO Ordinance 771-08

August 2008 - 2009 CPRM changes its focus to vote pro-development council members out of office in the 2009 Primary election.

"Since we could not get the council to listen to the people, we started supporting different people for council" per Jerome Wolfe, former chairman of CPRM. We recruited candidates, conducted interviews of all members running for council, produced campaign literature, brochures, signs and advertising, went door to door, held mock debates, wrote letters to the editors, etc.

As a result of existing community sentiment and CPRM efforts, CPRM-supported candidates beat the pro-development incumbents by a 2.5 to 1 margin.

After 2009

CPRM realized that in order to have an impact, we would have to focus on getting good people into elected positions. Consequently, we have tried to nurture people with views consistent with ours to run for office, and we have supported like-minded elected officials.

We are also actively engaged in community activities such as the business development corridor task force, the update to the comprehensive plan, monitoring Murrysville council activities, public communications (newsletter and emails), staffing a Community day booth, information and advocacy regarding Marcellus Shale drilling, and so forth.

For more information, please refer to MurrysvilleCPRM.org.

Attachment B

PA CAMPAIGN FOR CLEAN WATER

Marcellus Shale Asks to DEP

DEP Process:

- CCW requests regular meetings with DEP – need to know how frequently we can meet and with who.
- The Partnership with drilling companies should be broadened to include other stakeholders including environmental.

Water Withdrawals:

- The Ohio River basin should have water withdrawal and permitting rules to ensure that regulations are the same across the state.
- Water withdrawals should not be permitted in Critical Watershed Planning Areas.
- Streams being proposed for water withdrawals should be assessed prior to permitting.
- Upstream and downstream flow monitoring should be required for any water withdrawal to protect conservation flows.

Drilling Wastewater Treatment:

- There needs to be monitoring and analysis of the water at three points: 1) at point of water withdrawal, 2) when being introduced into the well (after mixing with frac chemicals), and 3) when produced as wastewater.
- Any treatment plant for drilling wastewater or sewage plant accepting it must monitor and sufficiently treat the full range of contaminants: TDS, metals, chlorides, frac chemicals, etc.
- Simple dilution of drilling wastewater by sewage plants should not be allowed.
- Any sewage plant seeking to modify their NPDES permit in order to accept drilling wastewater must regularly sample the wastewater to determine the pollutants present.
- DEP should keep discharges away from both primary and secondary drinking water intakes.
- We would like to see more analysis of whether deep well injection can be done in PA without groundwater and/or aquifer contamination.

Chemical Right to Know:

- Chemicals being discharged into surface water must be disclosed publicly. Amounts, concentrations, and specific compounds should be identified as is standard in all NPDES permits.

- Chemicals being used at each well site should be disclosed publicly. Again, amounts, concentrations in frac water, and specific compounds should be identified just as a chemical or other manufacturing plant would.

Restrictions on Drilling Site Location:

- CCW supports prohibiting any drilling in EV and HQ watersheds.
- CCW requests copies of anti-deg analyses that DEP has done for drilling sites in HQ/EV watersheds to date.
- Floodplain and riparian areas should not be disturbed by drilling sites, and there should be a 300 foot stream buffer as DCNR currently requires for drilling on state lands.
- The state should not add to the current amount of state controlled land leased to drilling companies.

Drinking Water Safety:

- Drilling within 1000 feet of a private drinking water well should be prohibited.
- All private well owners within ½ mile of a drilling site should be notified prior to the submittal of a drilling permit application. Every private well owner should be given the opportunity to have their well tested prior to application. These rules mirror those used in the mining program.
- Drilling within ½ mile of a public drinking water well should be prohibited.

Stormwater:

- DEP should require all drilling sites that disturb 1 acre or more to get a NPDES stormwater permit.
- Project sites should include all aspects of the drilling operation (roads, etc.), not just well pads, and should include the full project, not just initial construction.
- DEP must engage in meaningful technical review of all Ch. 102 and 105 permits and not utilize a permit by rule approach.
- All permits should have the opportunity for meaningful public participation.
- DEP should utilize the County Conservation Districts to review E&S plans and conduct inspections as is being done for other development.
- DEP should utilize Water Management staff for NPDES, 102 and 105 permits, not Oil and Gas staff.

Inspection and Enforcement:

- All drilling sites should be inspected regularly and especially at critical times (i.e. when wells are being sealed) as specified in Chapter 78.
- An inspection of E&S controls and plans should occur prior to drilling commencing.
- Enforcement actions need to go beyond the NOV level in order to ensure there is an incentive to comply. Fines calculations should include

recovering the economic benefit to the company of violating the regulations.

- We would like to see DEP's plan for drilling site inspection including number of inspectors and inspection frequency.
- We would like to see a complete list of DEP enforcement actions at Marcellus Shale drilling sites since Jan. 2008.

Air Quality:

- DEP should conduct air permitting of drilling sites that have sources that require plan approvals. Potential sources of air pollution include: drilling equipment, frac water pits, wastewater holding tanks, natural gas holding tanks, fuel tanks, etc.
- In developing State Implementation Plans (SIPs) DEP should consider the air quality impacts of the large number of Marcellus Shale producing wells currently in operation and expected to operate. Both point source and diesel emissions from truck traffic (moving water in and out) should be considered in emission inventories and control strategies.
- State diesel anti-idling laws should be enforced at drilling sites.

Site Restoration:

- Restoration plans at drilling sites need to include reforestation to replace trees that have been cut down. The landscape and vegetation should be returned as it was before drilling occurred.

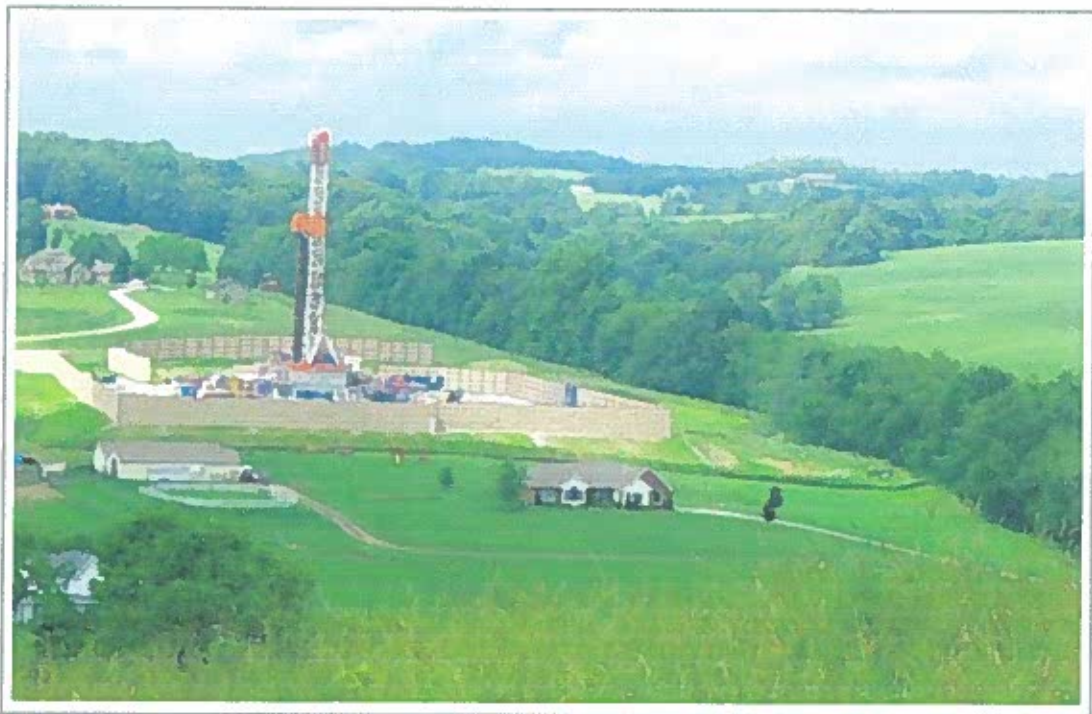
Cumulative Impact:

- DEP needs to conduct a study of the potential cumulative impact from the large numbers of wells being drilled in Pennsylvania, especially in certain watersheds. Overall environmental impacts should be analyzed including changes in water quality, air quality, habitat, and human health.

ATTACHMENT C

Safety of Deep Well Marcellus Shale Drilling

Preliminary Analysis of Probability of the
Occurrence of a "Serious Environmental
Incident"



J M Evans PhD
September 2010

The author may be contacted at: info@pulstar.us

Safety of Deep Well Drilling

A probability based approach to risk

Introduction

Recovery of natural gas from Marcellus Shale deposits that underlie the states of New York, Pennsylvania and West Virginia is accomplished through a process of deep well drilling (both vertical and horizontal), combined with fracturing the shale deposit using high pressure water, chemicals and explosives. A range of environmental and safety issues have been raised concerning the safety and potential impact of current industry practice in the development of these sources of natural gas. These concerns include:

- **Blowout** of the well casing resulting in potential injury or death to employees as well as first responders and contamination of air, water and land resources including underground aquifers.
- **Leaks** around the well casing resulting in contamination of aquifers.
- **Uncontrolled evaporation** of volatile hydrocarbons into the atmosphere resulting in potential death and/or disease due to endocrine system disruption.
- **Spills of contaminated water** used in the process resulting in contamination of land and water resources with known cancer causing chemicals.
- **Migration of contaminated water** from deep wells up to overlying aquifers resulting in permanent contamination of aquifers with known cancer causing chemicals.

Industry practice has supplied evidence that all of these concerns are valid as there is current documentation of the occurrence of all but the migration of deep well water to overlying aquifers. The recent EPA testing of shallow wells in Colorado has provided preliminary evidence of contamination of shallow wells that is not easily explained as

having occurred through other means(1). Recent testing of well water in Pennsylvania has found fracking chemicals in those tests(2).

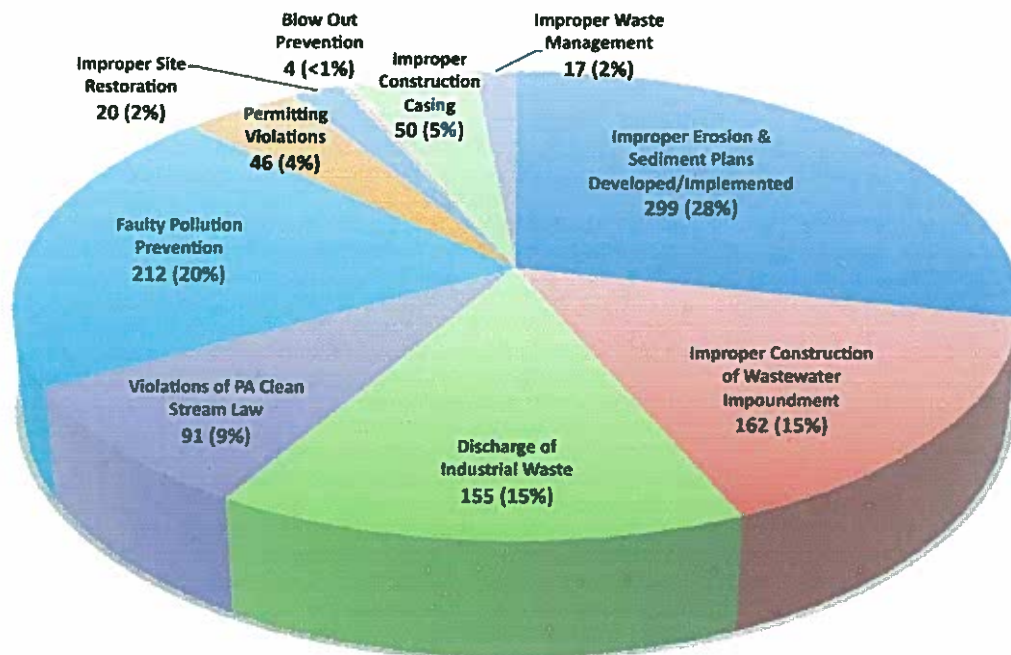
When confronted with the occurrence of incidents (blowouts, leaks, uncontrolled evaporation, spills, potential for upward migration of fracking fluid, explosions, burning of fresh water holding ponds etc.), the industry response has been that the migration of contaminated water from deep wells to overlying aquifers is simply impossible and that otherwise the process of deep well recovery of natural gas is "safe" when it is "done right." This response implies that the process can be safely carried out by those who are properly trained and employ the necessary tools and methods to effect the extraction of natural gas without the occurrence of serious incidents and that if such incidents do occur, they are the result of unskilled operators who are not employing proper methods or tools or who lack the experience, knowledge or training to safely pursue deep well drilling.

In the state of Pennsylvania, like the states of New York and West Virginia, the process of deep well drilling is overseen by state regulatory bodies; in Pennsylvania the Department of Environmental Protection (DEP). The Director of the Pennsylvania DEP recently recognized the inevitability of the occurrence of incidents involving the extraction of natural gas from Marcellus Shale deposits when he stated that "There's no such thing as zero-impact drilling" (3). In fact, the PA DEP regularly cites individual drilling companies for infractions where the driller pollutes the surface or groundwater at a drill site. In the past several years, these citations have been numerous and the Pennsylvania Land Trust has analyzed recent citations by drilling company, seriousness and frequency(4).

The PLT study is based on publicly available data maintained by the DEP. The Times-Tribune noted in an article published on line that the DEP database contains outdated and inconsistent records which may lead to an underestimation of the environmental impact of a reported incident(5). Therefore, in the time frame utilized, the PLT study may underestimate both the number of incidents that have occurred and the potential severity of their impact on the environment. Even though the actual situation may be much worse than their report indicates, the results of the PLT study are of great concern and should not be ignored.

The PLT study covers the period from January 1, 2008 to August 20, 2010, a period of slightly more than thirty months. During this period, the DEP recorded 1614 violations of PA environmental regulations or "incidents" by the 45 drilling companies currently pursuing the extraction of natural gas from the Marcellus Shale. The PLT study excluded 558 of these incidents because these incidents were judged to be unlikely to

"directly endanger the environment and/or the safety of communities." Whether this judgement was sound, given the finding of others that the recording of incidents by the DEP often downplayed the serious nature of specific incidents, is not possible to affirm without a detailed study of each incident incorporating on-site knowledge provided by persons familiar with the specific circumstances of each incident. However, if we accept this judgement, there were *only* 1056 incidents during this time period that were judged as having "the most potential for direct impact on the environment." The report illustrated the type and percentage of these incidents with a pie chart which is reproduced here with permission. None of these violations included traffic citations or warnings issued to trucks hauling Marcellus Shale drilling wastewater.



The PLT report provides a breakdown of violations for the 26 drilling companies with the **most violations** which is reproduced here. The frequency of violations per well drilled (number of violations divided by the number of wells drilled) is also calculated for each drilling company as well as for the total violations and wells drilled by these companies.

Drilling Company	Violations	Wells	Violations /Well
Chesapeake Appalachia LLC	149	190	0.78
Chief Oil & Gas LLC	110	63	1.75
East Resources MGT LLC	106	26	4.08
Talisman Energy USA INC	104	181	0.57
Cabot Oil & Gas Corp	93	75	1.24
PA Gen Energy Co LLC	46	34	1.35
Seneca Resources Corp	42	45	0.93
Atlas Resources LLC	40	153	0.26
Ultra Resources INC	39	37	1.05
Range Resources Appalachia	32	240	0.13
Williams Production Appalachia	32	7	4.57
J W Operating CO	29	1	29.00
EOG Resources INC	28	69	0.41
Anadarko E&P CO LP	25	75	0.33
XTO Energy INC	25	19	1.32
Citrus Energy Corp	18	2	9.00
Energy Corp of Amer	16	11	1.45
Southwestern Energy Prod CO	15	16	0.94
Phillips Exploration INC	10	9	1.11
EQT Production CO	9	45	0.20
Stone Energy CORP	9	5	1.80
Guardian Exploration LLC	7	1	7.00
Exco Resources PA INC	6	12	0.50
MDS Energy LTD	6	3	2.00
Novus Operations LLC	6	6	1.00
Penn Virginia Oil & Gas CORP	6	1	6.00
Totals & Average per Well	1008	1326	0.76

Estimation of Risk

The data in the PLT report provide a means of estimating the probability of the occurrence of a "serious" environmental incident at a well drilled by a member of this group without knowledge of which drilling company does the drilling as well as the probability of the occurrence of a serious environmental incident when we know which company is going to do the drilling. Assuming that the new well will be drilled using the current methods, equipment and technology, the estimation of the probability of the occurrence of such events is simply the frequency of these events that has been observed in the recent past. The probability of a serious incident occurring when a well is drilled by any member of this group is estimated to be .76. It appears that the Director of the PA Department of Environmental Protection is correct in that there may be no way to perfectly protect the environment from the industrial processes involved in Marcellus Shale drilling as the estimates of the probability of the occurrence of a significant incident is so high that, at least for this group of drilling companies, such an event appears to have a very high probability of occurrence.

On the other hand, those who imply that their company "does it right" appear to have a point. Range Resources, a drilling company with the most wells in the group has the best record with an estimated probability of having a serious incident of .13. Although the lowest in the group of drilling companies, this is still *more than one incident in every ten wells drilled*.

Minimization of Risk

Given that there is a quantifiable risk of Marcellus Shale drilling, can that risk be minimized and, if so, what is an acceptable level of risk? An analysis of the types of violations detailed in the PLT report reveal that most are related to escape or discharge of fracking fluid at the well site. Approximately 90% of the violations appear to fall into this category. Presumably, the use of technology that eliminates the possibility of spills or runoff of fluids from the well site could eliminate this type of violation. Such technology exists and is used by some drilling companies when forced to, even though its use is estimated to save some \$10,000 per well(6). A change from open storage of fracking fluid to enclosed storage could reduce the probability of a serious environmental incident by a factor of ten from .76 to .08 and also protect the environment from the additional pollution resulting from the evaporation of volatile hydrocarbons from "fresh water"

storage ponds (those ponds that catch fire and burn for several hours)(7). Other possible fracking technologies that eliminate the use of water entirely are the use of the CO₂-SAND, LIN (liquid nitrogen), liquid propane or liquid natural gas as the fracking fluid (8-10).

Incentives to adopt technology and methods that will result in reduction of risks of environmental impact (such as progressive fees for new wells that increase based on number of past violations) can and should be built-in to the process of permitting well sites. Why should companies with records of environmental violation as flagrant as East Resources, Williams Production, J W Operating, Citrus Energy and Guardian Exploration be given the opportunity to permit additional wells when a company such as Range Resources is doing such an obviously better job?

Some of the risks of Marcellus Shale drilling are impossible to minimize as they are completely unknown. One such risk is the possibility that deep well water will migrate upward and contaminate the overlying aquifers used to supply drinking water to many Pennsylvania residents. Given the paucity of knowledge regarding the fissuring of the geologic structure overlying the Marcellus Shale deposit, it seems to fly in the face of common sense when a geologist employed by a drilling company baldly states that such migration is impossible. At least one geologist identified such migration as a possibility more than 20 years ago(11). Indeed, the results of EPA testing of wells in Colorado indicates such migration may have already occurred(1). Recent tests of well water in Pennsylvania are also suggestive of fracking fluid contamination of groundwater(2). Unfortunately it may be too late to prevent this type of contamination.

Maximum Tolerable Risk

Assuming that the current risk of drilling incidents might be reduced from a probability of occurrence of .76 to .13 by following the lead of companies such as Range Resources and the use of closed loop fracking technology, is the target of a probably of occurrence of a serious environmental incident of .13 an acceptable level of risk to the environment? Given that the industry plans to develop thousands and thousands of Marcellus Shale wells in the near future and the fact that a frequency of environmental incidents of .13 will result in an incident at more than one of every ten wells drilled, the answer is NO! The environmental damage will be cumulative and even this frequency, low as it may appear when compared to current rates of environmental damage being incurred by the 26 companies in the PLT study, a frequency of .13 incidents per well is far too high.

If the frequency of .13 serious environmental incidents per well drilled is unacceptably high, are lower frequencies realistically possible and/or practical given the current rates of such incidents observed in the PLT study? We have only to remember that the PLT study focused on the 26 **worst performing drilling companies** and that the frequency of .13 serious incidents per well drilled reflects the performance of the **best performer in the group**. Nineteen drilling companies were not included in the PLT study because they all performed better (had lower numbers of DEP violations) than the companies in the group of poor performers. Inclusion of the violations for these companies might reveal that they are performing at a higher standard than that set by Range Resources.

The data on the best performing companies that is missing from the PLT report is presented in the following table. These companies were responsible for a total of 64 violations in the time period of the PLT report including 46 “serious” violations. Following the lead of the PLT report, 18 less serious violations were excluded from the data. The excluded violations were of four types:

- Failure to install a permit number at the site
- Failure to notify DEP etc. 24 hours before starting drilling
- E&S plan not adequate or not on site
- O&G Act 223-General

Drilling Company	Violations	Wells	Violations /Well
Anschutz Exploration Corp	2	1	2.00
Antero Resources Appalachia Corp	5	4	1.25
Baker Gas Inc	1	1	1.00
BLX Inc	3	3	1.00
Burnett Oil CO INC	3	4	0.75
Carrizo Oil and Gas Inc	2	1	2.00
CNX Gas Co LLC	4	4	1.00
Consol Gas CO	2	2	1.00
DL Resources INC	1	1	1.00
East Resources Inc	2	1	2.00

Interstate Gas Mkt Inc	1	1	1.00
Longfellow Energy LP	1	1	1.00
REX Energy Operating Co	1	1	1.00
Rice Drilling B LLC	4	3	1.33
Samson Res CO	5	6	0.83
SM Energy CO	2	2	1.00
Tanglewood Expl LLC	4	2	2.00
Vista Opr Inc	0	1	0.00
William S Burkland	3	3	1.00
Totals & Average per Well	46	42	1.10

It is evident that the assumption that this second group of drilling companies is performing better than the group with the larger number of violations in terms of frequency of violation per well drilled is unwarranted; in fact, based on the average frequency of violations per well in this group, the probability that one of these companies will be cited by the PA DEP for a “serious environmental incident” in their next operation is higher than for the group with the greater number of violations.

Summary and Conclusions

This analysis has revealed that it is highly likely that any deep well drilling for the extraction of natural gas from the Marcellus Shale will be accompanied by continued serious pollution of the water resources of the State of Pennsylvania and any other territory in which these activities are conducted. In addition, the pollution of air at each well site through evaporation of volatile hydrocarbons from open storage pits and vented process tanks will occur during and after the well drilling process. Such air pollution appears to simply be accepted by the regulatory bodies without any attempt at regulation or mitigation. The possibility that migration of fracking chemicals can pollute ground water aquifers overlying the Marcellus deposit is simply denied by both regulatory agencies and drilling companies alike. The oft heard refrain is that “the pollution of ground water by deep drilling natural gas extraction has never been documented.” This strident

response to the concern that such pollution might occur is not evidence that such pollution cannot occur or in fact has occurred.

It appears that a reduction in the risk of environmental pollution (both air and water) may be accomplished through implementation of fracking methods and techniques that use closed fluid systems or eliminate the use of water as the fracking fluid. Such techniques exist and are well known to the industry and may even save money when utilized for the fracking process. The potential for pollution of ground water supplies as a result of upward migration of fracking fluid through naturally existing fractures in the geologic structure overlying the Marcellus formation may be eliminated only through the elimination of toxic fracking chemicals currently used in the process.

It is often said that federal and state laws prevent the banning of deep drilling for the extraction of natural gas. While this may be true, these laws do not prevent the citizens of the state from exercising their constitutional rights to clean water and clean air. The exercise of these rights could result in the banning of specific technologies and methods currently in use by drilling companies that are judged to be of too great a risk to the environment when compared to less risky alternative methods. More study of the risks of current procedures and methods as well as expertise in alternatives is necessary before informed counsel can be offered to our legislature but time is running out and awareness of the concerns and options at all legislative levels appears woefully inadequate.

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