

August 6, 2024

CERTIFIED MAIL NO. [REDACTED]

[REDACTED]

Re: Request for Investigation 352432
Stray Gas Migrating into Water Supplies and Soil
Positive Determination – 58 Pa. C.S § 3218
Kiskiminetas Township, Armstrong County

[REDACTED]

The Pennsylvania Department of Environmental Protection (Department) has completed its investigation into the stray gas migrating into your water supplies (Abandoned Water Supply) and (Active Water Supply) and the soil in your front yard. Based on information gathered during the investigation, the Department has determined that the CS Bollinger 2 gas well (Bollinger gas well), permit number 005-22644, owned and operated by Diversified Gas and Oil (Diversified) was likely the source of the stray gas.

CASE INFORMATION:

Date of Complaint	Nature of Complaint (odor, taste, quantity, use, color)	Sample Results Above Statewide Standards or Recommended Levels
September 10, 2020 (Peoples Natural Gas)	Stray gas present at the roadside nearest address is 3064 Woodlake Road, Apollo	None

CASE BACKGROUND:

On September 10, 2020, Peoples Natural Gas (Peoples) notified the Department of a complaint of gas odors and a dead spot in the front yard at [REDACTED]. A Peoples pipeline is located at the eastern edge of the front yard of the property and the Bollinger gas well is located in the yard between the dead spot area and the residence and is approximately 50 feet from the Peoples pipeline. The residence is supplied gas from the Peoples pipeline by way of a separate supply line that runs near the Bollinger gas well. The Bollinger gas well fed into the Peoples pipeline. Based on the Department’s initial conversations with you and Peoples, it appears that the gas odors and dead spot in the front yard date back to 2018.

Beginning in 2018, Peoples investigated your complaint and made multiple attempts to locate the source of gas. Peoples collected gas samples from the dead spot area and from their pipeline. Compositional and isotopic analysis were completed on the samples by Isotech Laboratories Inc

(Isotech). The sample results were evaluated by Echelon Applied Geochemistry (Echelon) and it was determined by Echelon that the Peoples pipeline could not be ruled out as a potential source of gas. Peoples communicated that based on their investigation, it appeared that their pipeline was not the source.

On September 11, 2020, the Department met with you and conducted a gas sweep of the dead spot area, your Abandoned Water Supply, your Active Water Supply, the basement of your home, and the area surrounding the Bollinger gas well. 58% methane by volume was detected in the Abandoned Water Supply, 100% methane by volume was detected in the shallow soil of the dead spot area, and 9% lel (lower explosive limit) of combustible gas was detected in the Active Water Supply. Gas monitoring points were established at the Abandoned Water Supply, Active Water Supply, and in the dead spot area of the front yard and monitored throughout the investigation.

Also, during the initial investigation, the annulus of the Bollinger gas well was vented. After venting the annulus, significant levels of gas continued to be detected in the dead spot area; however, the gas level detected in the headspace of the Abandoned Water Supply, which was initially as high as 58% methane by volume, dropped and remained significantly lower after venting the annulus. The drop in the level of gas detected in the Abandoned Water Supply after venting the annulus of the Bollinger gas well indicates that the Bollinger gas well may be related to the stray gas migrating into the Abandoned Water Supply.

The Department collected gas samples from the Abandoned Water Supply, from the soil in the dead spot area, the Bollinger gas well, and the nearby J Miller 3 gas well (Miller gas well). Diversified collected gas samples from the Bollinger gas well and from the soil of the dead spot area. All samples were sent to Isotech for compositional and isotopic analysis. The gas sample results were submitted to Echelon for evaluation and interpretation of the gas geochemistry. Based on the sample results, Echelon concluded that the stray gas found at 3064 Woodlake Road and the gas from the Bollinger gas well and the Miller gas well are of the same genetic origin. Echelon further concluded that the production gas and annular gas in the Bollinger gas well are from the same genetic origin, and may indicate that the production gas is leaking into the annulus of the gas well.

After the initial investigation and receiving the Echelon report, Diversified elected to plug the Bollinger gas well. The plugging of the Bollinger gas well was completed on July 23, 2021. The plugging contractor stated that they discovered a hole in the 3 ½-inch production tubing at 2,120 feet, which was likely allowing the production gas to enter the 6 ½ x 3 ½-inch annulus. In addition, a hole was discovered in the surface casing approximately 15 feet below ground, likely allowing the gas to flow from the gas well into the surrounding soil.

The Department continues to monitor the water supplies and the side yard at 3064 Woodlake Road. Gas levels have dropped significantly since the start of the investigation. As of June 25, 2024, the gas levels in the Abandoned Water Supply and Active Water Supply were non-detect, and the gas level detected in the dead spot area and the plugged well area was 0.01% gas and 2.05% gas respectively. It is believed that the remaining gas in the soil is residual gas and the gas levels should continue to decline.

Based on the review of geologic mapping, inspections and monitoring of nearby oil and gas wells, monitoring of the shallow soil in your front yard , the gas sample results, and the information gathered from the plugging of the Bollinger gas well, the Department determines that the Bollinger gas well was likely the source of stray gas detected in your water supplies and the shallow soil in the front yard located at [REDACTED]

This determination formally closes your complaint. If you have any questions about any of the above, please contact Aaron O'Hara at 814-308-3118.

Sincerely,

Scott M. Dudzic

Scott M. Dudzic
District Program Manager
Northwest District Oil and Gas Office
Northwest District Oil and Gas Operations

Enclosures:

PADEP: Methane Gas and Your Water Well
PADEP: Methane Migration into Occupied Buildings

C: Joe Lichtinger (email)
Steve Lencer (email)
Dave Adams (email)
Jennifer McDonough (email)
Paul Strobel (email)
Aaron O'Hara (email)

CONFIDENTIAL

Exhibit A



Methane Gas and Water Wells

Residents of the coal and natural gas-producing regions of Pennsylvania need to be aware of the potential dangers resulting from the accumulation of microbial gas, coal bed methane or natural gas in their water wells.

High concentrations of methane in water wells, water well enclosures and other confined spaces could cause an explosion.

What is Methane?

Methane (CH₄) is a naturally occurring hydrocarbon gas found underground. It is present in shallow and deep coal beds as well as in other rock units, and it is the main hydrocarbon found in natural gas and coal beds. Methane can occur as a gas or dissolved in the groundwater, or as a gas in the soil and rock zones below the surface.

Methane migrates from areas of high pressure to areas of low pressure. Mining and well drilling operations can affect the pressure in the subsurface and cause the migration of methane to areas of lower pressure, such as shallow aquifers and water wells used as water supplies. Gas migration in the subsurface can also be influenced by an increase or decrease in the water level of an aquifer, atmospheric pressure changes and other natural processes.

Active underground mining operations can lower groundwater levels, reducing pressure in aquifers occurring above and adjacent to the area of coal extraction. This reduction in pressure can allow gases within the overlying rock layers to migrate into nearby water wells. Methane can also be released from abandoned deep mines and from active and/or abandoned gas wells that are prone to leakage. Additionally, improperly constructed operating gas wells may mobilize methane in the subsurface. Releases from these and other sources can also migrate into nearby water wells.

Methane can migrate into water wells in a gaseous phase or dissolved in the groundwater. At atmospheric pressure, methane is soluble in water between 26-35 milligrams per liter. It is sometimes recognizable as effervescent gas bubbles in water drawn from a faucet. In some cases, the release of methane in a water well may be recognized by a sound similar to that of boiling water. However, methane is a colorless and odorless gas, and it may accumulate undetected in water wellbores and water well enclosures that are not properly vented. Methane may also move into basements of homes and other structures through plumbing and piping containing electrical connections. These conditions could lead to an explosion.

What to Do?

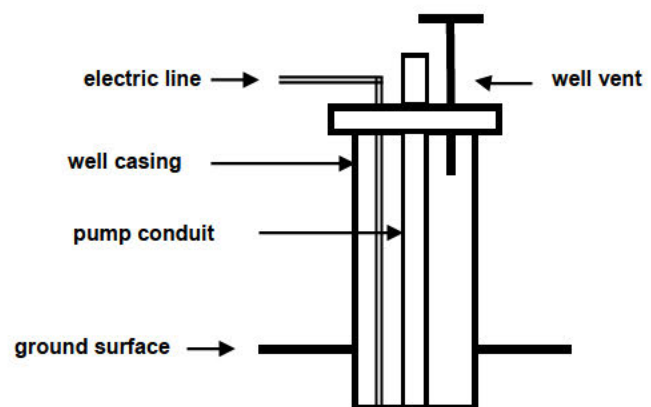
Methane gas is lighter than air with a specific gravity of 0.555, so it will not accumulate in the water wellbore if the water well is adequately vented to the atmosphere. Venting is an inexpensive and effective way to mitigate methane accumulation in water wells, water well enclosures and other confined spaces, such as basements. Proper venting reduces the potential for methane gas to seep into homes or structures from water wells.

Recommended Venting Procedures

Proper design is extremely important. Water well vents should be installed by a qualified water well driller or plumber.

The vent should extend above any possible flood level, potential ignition sources and areas of exposure (above the roof line for water wells adjacent to buildings), and it should have watertight connections to prevent surface water from entering. The well vent should be at least one (1) inch diameter or larger to facilitate gas flow. The end of the vent pipe should have a down-turned "gooseneck" or "T" and be capped with corrosion-resistant screening. If the vent is not screened, it can become a potential entry point for debris and small animals.

If concentrations in a vent pipe happen to exceed the lower explosive limit for methane (5 percent methane in air), installation of a spark-arresting cap at the end of the pipe should be considered. In addition, conduits from the water well that carry electrical lines or waterlines into the building should be sealed so that the air in the conduit



does not vent into the building. Venting of wells will not adequately remove methane dissolved in the groundwater, but properly designed water aeration systems are one effective way to lower the concentration of methane dissolved in the water.

Enclosed Wells

When the top of the water well is buried in a covered pit or enclosed in a basement, the vent pipe must vent gas to the outside air, as shown in the diagram at right.

The vent pipe should be screened and extend above any possible flood level, roof line, potential ignition sources and areas of exposure.

In cases where the water well is located in an enclosure, it should have a tight-fitting well cap, and all openings through the cap should be properly sealed to prevent methane from escaping into the water well enclosure.

Play It Safe

When a water well is no longer in service, the plumbing connections should be disconnected and sealed to prevent methane from entering the home or building.

NOTE: Water wells may differ considerably from the wells depicted in the diagrams. Also, well-venting requirements may vary from place to place because of differences in local plumbing codes. Therefore, water well owners are encouraged to contact a professional water well specialist or a local building code enforcement officer to determine the proper venting procedures required under the local plumbing code.

For more information on methane and water wells, please contact the local DEP office:

Southwest Regional Office

400 Waterfront Drive
Pittsburgh, PA 15222-4745
Telephone: 412-442-4000

Counties Served: Allegheny, Armstrong, Beaver, Cambria, Fayette, Greene, Indiana, Somerset, Washington and Westmoreland

South-central Regional Office

909 Elmerton Ave.
Harrisburg, PA 17110-8200
Telephone: 877-333-1904

Counties Served: Adams, Bedford, Berks, Blair, Cumberland, Dauphin, Franklin, Fulton, Huntingdon, Juniata, Lancaster, Lebanon, Mifflin, Perry and York

Southeast Regional Office

2 E. Main St.
Norristown, PA 19401-4915
Telephone: 484-250-5900

Counties Served: Bucks, Chester, Delaware, Montgomery and Philadelphia

Northwest Regional Office

230 Chestnut St.
Meadville, PA 16335-3481
Telephone: 814-332-6945

Counties Served: Butler, Clarion, Crawford, Elk, Erie, Forest, Jefferson, Lawrence, McKean, Mercer, Venango and Warren

North-central Regional Office

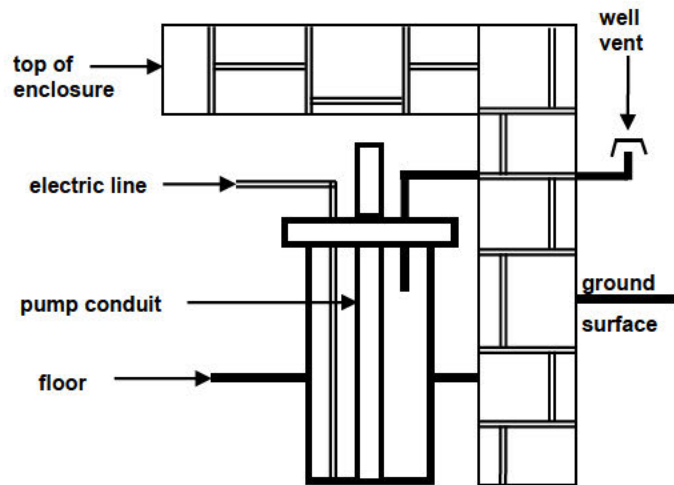
208 W. Third St., Suite 101
Williamsport, PA 17701-6448
Telephone: 570-327-3636

Counties Served: Bradford, Cameron, Centre, Clearfield, Clinton, Columbia, Lycoming, Montour, Northumberland, Potter, Snyder, Sullivan, Tioga and Union

Northeast Regional Office

2 Public Square
Wilkes-Barre, PA 18701-1915
Telephone: 570-826-2511

Counties Served: Carbon, Lackawanna, Lehigh, Luzerne, Monroe, Northampton, Pike, Schuylkill, Susquehanna, Wayne and Wyoming



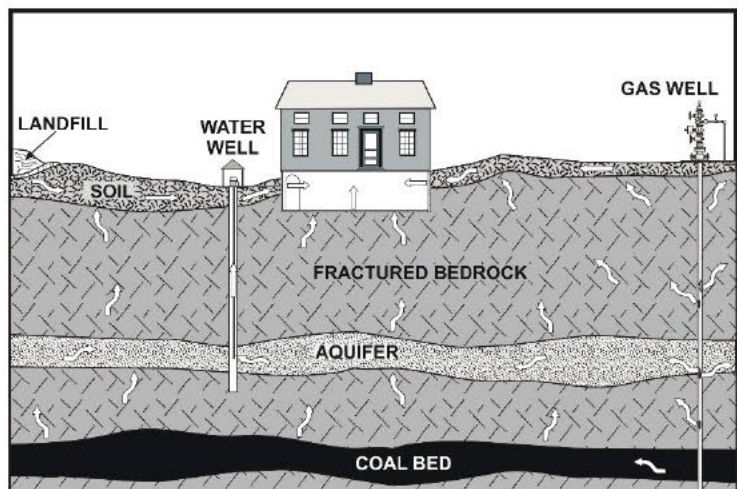
For more information, visit www.dep.state.pa.us, keyword: Wells.

Methane Migration into Occupied Buildings

Recovery and utilization of Pennsylvania's mineral resources by mining and drilling for oil and gas has a long history that continues today with the extraction of natural gas from the Marcellus Shale and other formations. These activities can directly or indirectly increase levels of methane gas in buildings from deeper sources such as coalbed methane or other geologic formations, or shallower sources in soil and groundwater. Although modern mining and well drilling practices have reduced the risk of environmental impacts; releases from wells, pipelines, and deep mines can and do occur. Methane migration can also occur naturally or in response to other human activities such as water well drilling or landfilling. The prevalence and amount of methane in the subsurface varies across the state depending on many factors. When gases migrating in the soil or water come into contact with man-made structures, the resulting accumulation of gas can cause unsafe conditions for building occupants.

What is Methane and How Is It Mobilized?

Methane (CH₄) is a naturally-occurring hydrocarbon gas found underground. It is lighter than air, colorless, odorless, and flammable. Methane is present in shallow organic-rich deposits and deep coal beds as well as other rock units, and is the primary hydrocarbon found in natural gas and coalbed gas. Gas migration may cause methane to accumulate undetected inside basements of homes and other structures. Mobilized gas can enter man-made structures through utility connections, porous surfaces, and basement walls. These conditions may present a life-threatening safety hazard and could lead to an explosion.



Methane migrates from high-pressure to low-pressure areas through available pathways. Migration through rock is typically slow. Fractures in the rock provide faster migration pathways. Mining and well drilling operations can affect the pressure as well as increase the pathways in the subsurface, allowing the migration of methane to areas of lower-pressure such as shallow aquifers and water wells. Gas migration in the subsurface can also be influenced by an increase or decrease in the water level of an aquifer. Active underground mining operations can lower groundwater levels, reducing pressure in aquifers occurring above and adjacent to the area of coal extraction. This reduction in pressure can allow gases within the overlying rock layers to migrate into nearby water wells or enclosed structures. Methane can also be released from abandoned deep mines and abandoned gas wells. The Department of Environmental Protection (DEP) has no evidence that the well completion process of hydraulic fracturing alone creates a pathway for methane to communicate with groundwater.

Gas Migration Investigations

DEP Oil and Gas Well regulations (25 Pa. Code, Chapters 78 and 78a) and DEP policy require a timely investigation into complaints alleging impacts to water supplies from oil and gas drilling. All complaint information reported to DEP is kept confidential. The purpose of the investigation is to determine the nature of the incident, assess the potential for hazards to public safety, and mitigate any hazard posed by concentrations of stray natural gas. When investigations are conducted by DEP and/or by an oil or gas operator, they typically include a site visit and interview; a field survey; and, if necessary, monitoring at potential sources, potentially impacted structures, and the subsurface. DEP uses multiple sources of evidence to determine if methane migration or other impacts to water supplies are attributable to drilling. This includes working to identify the origin of the gas through various methods which may include chemical

and isotopic gas analysis, evaluating nearby gas well integrity through pressure and well logging, tests and understanding the local geology and its relationship to the water supply in question.

Detailed investigations to confirm the source(s) of impacts to water supplies or the interior of a structure are time consuming and often require soil, water, and air sample collection for chemical analysis. DEP reviews the results of investigations conducted by oil and gas operators, consultants, and others; provides technical assistance and may conduct an independent investigation. When investigations indicate the need for engineering controls to mitigate impacts, DEP works with all involved parties to ensure that timely, effective solutions are implemented. DEP will also issue temporary water supply replacement orders as necessary during investigations.

Public Health and Safety

If methane gas infiltrates any enclosed structure, it can build up to dangerous levels. Concentrations of methane at five percent in air constitute an explosion hazard. A spark from a furnace or a faulty wire, a cigarette or a lit match can cause the gas to explode. Oil and gas industry professionals, local fire departments, and DEP staff are trained in the use of methane gas meters and explosimeters that measure airborne gas concentrations. As a safety precaution, DEP recommends that occupants vacate any building that has methane concentrations at 10 percent or greater of the lower explosive limit (0.5 percent methane in air). There are no known health impacts from drinking water that contains methane, nor is there an established federal safe drinking water level for methane.

Protections of Private Water Supplies

In cases where water supplies near oil and gas wells have been impacted by gas migration, there are significant enhanced protections for those water supply owners, including a presumption that the operator of the nearby oil or gas well is liable for the impact. This presumption applies if the water supply is within 2,500 feet of the vertical wellbore and the pollution occurs within one year from unconventional well drilling and completion of hydraulic fracturing. For conventional well drilling, the presumption of liability applies within 1,000 feet of the well and six months of the completion of drilling or alteration. Operators may rebut the presumption of liability by raising one of several defenses, including demonstrating the impact was pre-existing or not due to drilling-related activities.

Should DEP determine that an operator has impacted a water supply (regardless of the distance or time limitations of the presumption), the law requires those operators to restore or replace the water supply to its pre-existing condition or to federal safe drinking water standards, whichever is of higher quality.

DEP encourages you to report any cases of suspected water contamination that may be associated with the development of oil and gas resources or any other environmental complaint, please call toll-free 1-866-255-5158. For more information on methane gas migration, please contact the DEP office in your area.

Southwest Regional Office

400 Waterfront Dr.
Pittsburgh, PA 15222-4745
Telephone No. 412-442-4000

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909 Elmerton Avenue
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Southeast Regional Office

2 East Main Street
Norristown, PA 19401-4915
Telephone No. 484-250-5900

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230 Chestnut Street
Meadville, PA 16335-3481
Telephone No. 814-332-6945

North-central Regional Office

208 West Third Street, Suite 101
Williamsport, PA 17701-6448
Telephone No. 570-327-3636

Northeast Regional Office

2 Public Square
Wilkes-Barre, PA 18701-1915
Telephone No. 570-826-2511

For more information, visit www.dep.pa.gov.

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AUG 14 2024

Environmental Protection
Northwest Regional Office

DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL & GAS MANAGEMENT
230 CHESTNUT ST
MEADVILLE PA 16335-3407

Dudzic, [Signature]

SENDER: COMPLETE THIS SECTION

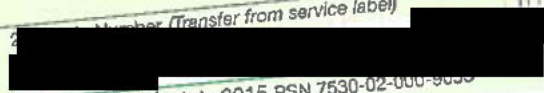
- Complete items 1, 2, and 3.
- Print your name and address on the reverse so that we can return the card to you.
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1. Article Addressed to:



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2. Insurance Number (transfer from service label)



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Agent
Addressee
of Delivery

Yes
No

If YES, enter...

3. Service Type

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- Adult Signature Restricted Delivery
- Certified Mail®
- Certified Mail Restricted Delivery
- Collect on Delivery
- Collect on Delivery Restricted Delivery
- Insured Mail
- Insured Mail Restricted Delivery (per \$500)
- Priority Mail Express®
- Registered Mail™
- Registered Mail Restricted Delivery
- Return Receipt for Merchandise
- Signature Confirmation™
- Signature Confirmation Restricted Delivery

Domestic Return Receipt