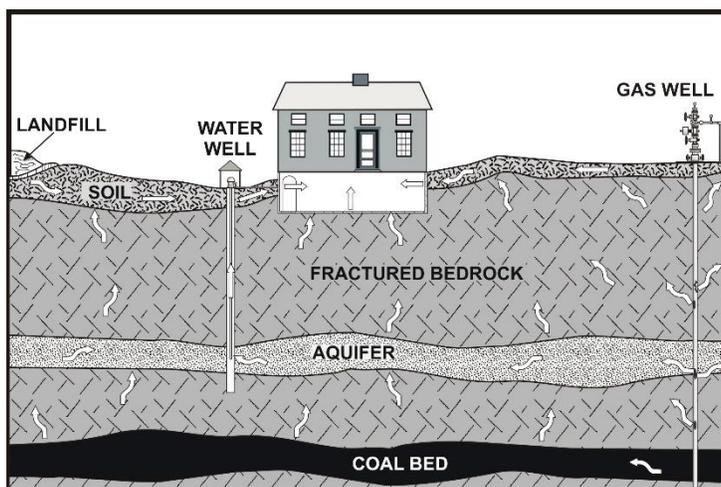


Methane Migration into Occupied Buildings

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

South-central Regional Office

909 Elmerton Avenue
Harrisburg, PA 17110-8200
Telephone No. 877-333-1904

Southeast Regional Office

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

Northwest Regional Office

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.