

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 can be explosive as well as pose asphyxiation hazards under certain conditions.

What is Methane?

Methane (CH₄) is a naturally occurring hydrocarbon gas found underground. It is present in shallow and deep coal beds, rock units, glacial deposits 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 and pathways 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 have developed leaks. 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 concentrate at high levels 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 or, more rarely, pose an asphyxiation hazard.

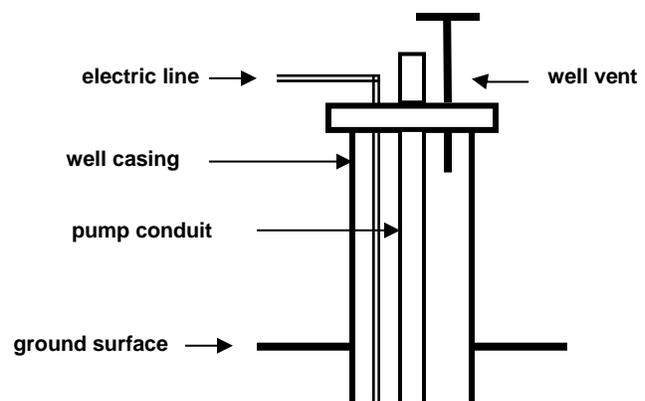
What to Do?

Methane gas is lighter than air with a specific gravity of 0.555, so it is less likely to 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



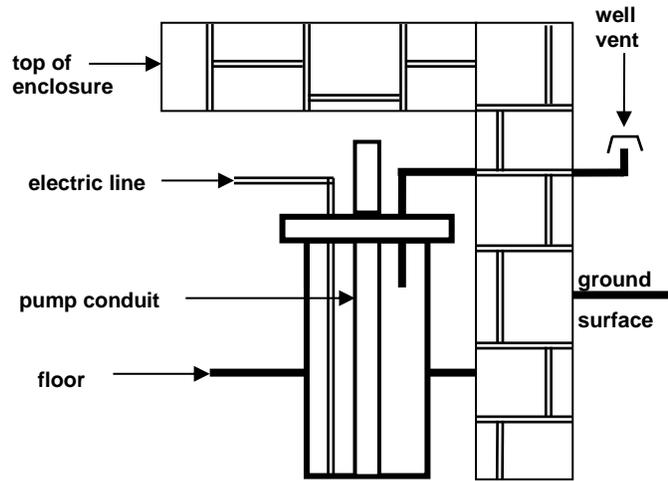
by volume), installation of a spark-arresting cap at the end of the pipe should be considered. In addition, conduits from the water well that carry electrical lines or waterlines into the building should be sealed so that the air in the conduit does not vent into the building. Venting of wells will not 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, Beaver, Cambria, Fayette, Greene, Somerset, Washington, and Westmoreland

South-central Regional Office

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

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Norristown, PA 19401-4915
Telephone: 484-250-5900

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Counties Served: Armstrong, Butler, Clarion, Crawford, Elk, Erie, Forest, Indiana, 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

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