

## **MARCELLUS SHALE**

### **MARCELLUS SHALE FORMATION**

The Marcellus Shale is a rock formation that underlies approximately two-thirds of Pennsylvania and portions of the states of New York and West Virginia at a depth of 5,000 to 8,000 feet. The Marcellus Shale is believed to hold trillions of cubic feet of natural gas and has long been considered prohibitively expensive to access. Recent advances in drilling technology and rising natural gas prices have attracted new interest in this previously untapped formation. The geology of the Marcellus formation suggests that areas in the southwest, northcentral and northeastern regions of Pennsylvania that have not traditionally seen much gas well drilling may be especially productive.

### **NATURAL GAS EXTRACTION FROM THE MARCELLUS SHALE**

Efficiently extracting natural gas from the Marcellus Shale formation requires both vertical and horizontal drilling, combined with a process known as 'hydraulic fracturing.' After the well is drilled, cased and cemented to protect groundwater and the escape of natural gas and other fluids, drillers pump large amounts of water mixed with sand and other fluids into the shale formation under high pressure to fracture the shale around the well, which allows the natural gas to flow freely to the wellbore. The amount of water typically required for hydraulic fracturing ranges from about one million gallons for a vertical well to approximately five million gallons for a vertical well with a horizontal lateral segment. There can be several horizontal laterals from a vertical wellbore.

Once the hydraulic fracturing process is completed, the used water, often referred to as "flowback" must be reused in the next well or sent to an approved treatment facility.

### **LANDOWNERS AND MARCELLUS SHALE LEASING**

In order to access Marcellus Shale natural gas, drilling companies must enter into a lease with landowners. A mineral lease is a private contractual agreement between the owner of a mineral tract (the lessor) who grants the right to develop deposits of the mineral to a producer (the lessee). Oil and gas mineral rights can be sold or leased separately to different parties. Usually a lessee will insist on the right to sell or reassign a mineral lease to another party. Because a mineral lease gives the lessee a property interest in the mineral, leases should be recorded at the Recorder of Deeds office in the county where the leased tract is located. A lease is usually secured by annual rental payments or a royalty on production paid to the lessor. Lease payments, royalty amounts; well, road and pipeline locations; protections for crops, livestock, buildings, personal property, and the expiration date of the lease can be negotiated.

The commonwealth is not involved in regulating/negating lease agreements between mineral property owners and producers, and does not audit payments, read or calibrate meters or tanks, or otherwise get involved in lease matters.

If approached by a drilling company about leasing mineral rights on your property, it is recommended that you consult an attorney who is familiar with oil and gas law before signing any documents. Consider contacting the local bar association for assistance in finding an attorney in your area, if necessary.

The Penn State University Cooperative Extension conducts gas leasing workshops for landowners. A schedule of upcoming workshops and other leasing information can be found at <http://extension.psu.edu/naturalgas> or by contacting your local extension office.

### **REGULATION OF MARCELLUS SHALE DRILLING**

More than 350,000 oil and gas wells have been drilled in Pennsylvania since the first commercial oil well was developed in 1859 by Colonel Drake in Titusville. Oil and gas exploration is regulated under the state's oil and gas laws (Oil and Gas Act, Coal and Gas Resource Coordination Act, and Oil and Gas Conservation Law), and the environmental protection laws that include the Clean Streams Law, the Dam Safety and Encroachments Act, the Solid Waste Management Act, and the Water Resources Planning Act.

## **WELL DRILLING ACTIVITIES**

The Department of Environmental Protection (DEP), Office of Oil and Gas Management regulates the safe exploration, development and recovery of Marcellus Shale natural gas reservoirs in a manner that will protect the commonwealth's natural resources and the environment.

To drill a new Marcellus Shale natural gas well in Pennsylvania, the operator must obtain a well permit from the DEP and post a bond. The bond is a financial incentive to ensure that the operator will adequately perform the drilling operations, address any water supply problems the drilling activity may cause, reclaim the well site, and properly plug the well upon abandonment. The bond amount for a single well is \$2,500; a blanket bond to cover any number of wells is \$25,000.

In the Marcellus Shale natural gas well permit application, the applicant must show the location of the well, proximity to coal seams, and distances from surface waters and water supplies. Technical staff in DEP's regional offices review the permit application to determine whether the proposed well would cause environmental impacts, conflict with coal mine operations, or exceed well spacing requirements. Operators must submit reports on well completion, waste management, semi-annual production and well plugging.

Pennsylvania law requires drillers to case and cement Marcellus Shale natural gas wells through all fresh water aquifers before drilling through deeper zones known to contain oil, gas, or brackish water. The casing and cement protects groundwater from the fluids and natural gas that will be contained inside the well, and keeps water from the surface and other geologic strata from mixing with and contaminating groundwater.

Disruption of water quality or flow in water wells from drilling activities is often rare and generally temporary. However, if problems persist, state law requires drilling operators to replace or restore water supplies affected by drilling. If you are not satisfied with the drilling company's response, a complaint can be filed with the nearest DEP regional office. DEP will investigate complaints within 10 days and issue orders as necessary to replace or restore the water supply.

Operators of wells permitted to produce from the Marcellus shale formation are required to submit a production, waste, and well status report to DEP semi-annually on or before Feb. 15 and Aug. 15 of each year. The report due on Feb. 15 shall include all information for the first time period from July 1 through Dec. 31 of the preceding year. The report due on Aug. 15 shall include all information for the time period from Jan. 1 through June 30 of that year. The reports must be submitted electronically through DEP's online reporting application which can be accessed at the following website at [www.paoilandgasreporting.state.pa.us](http://www.paoilandgasreporting.state.pa.us).

Once a well is no longer producing, the operator must plug the well and restore the site within nine months of plugging the well.

Many landowners and municipalities are interested in receiving notice of well permit applications. DEP has a no-cost subscription service called eNotice that notifies landowners and municipalities with an email when a well permit application is received. This system enables landowners and municipalities to receive notice of a permit application at the same time that DEP receives the application. eNotice can be accessed through DEP's website at [www.depweb.state.pa.us](http://www.depweb.state.pa.us).

## **EARTH DISTURBANCE ACTIVITIES**

Marcellus Shale natural gas well construction involves extensive earth disturbance including roads, drilling pads and pipelines that can speed erosion. Drilling pads may be in excess of five acres for the deeper Marcellus Shale natural gas wells, a larger portion of disturbed earth than more conventional shallow natural gas well pads.

Various regulations, implemented through DEP, are in place to protect surface water and groundwater from erosion and sedimentation due to earth disturbances.

Erosion and Sediment Control Plan requirements under state law apply to any earth disturbance activities, including Marcellus Shale natural gas drilling (Pa. Code Chapter 102). Erosion and sediment plans require gas companies to use preventative measures (referred to as Best Management Practices or BMPs) to prevent accelerated erosion and sedimentation. Operators are required to restore and permanently stabilize the site within nine months of completion of well drilling.

For all Marcellus Shale natural gas drilling, the operator must use the proper BMPs to control erosion, sedimentation, and stormwater, and develop an Erosion and Sediment Control Plan. The BMPs must minimize

point source discharges to surface waters, preserve the integrity of stream channels, and protect the quality of the receiving waterway.

For Marcellus Shale natural gas drilling activities that disturb more than five acres at one time, a Notice of Intent for authorization for the Erosion and Sediment Control General Permit must be completed. The Notice of Intent and the Erosion and Sediment Control Plan must be submitted to DEP for review and approval.

### **WATER USE AND WASTEWATER DISPOSAL ACTIVITIES**

Large volumes of water are required to complete a Marcellus Shale natural gas well, and large volumes of waste water are generated as part of the drilling process. This wastewater is considered industrial wastewater and is a residual waste in the commonwealth. DEP, in cooperation with the Susquehanna and Delaware River Basin Commissions, has created additional permit guidelines for drilling in the Marcellus Shale formation to create consistent rules for water withdrawal, usage, treatment and disposal in all areas of the state, and to ensure that the water quality and uses of waters of the commonwealth are not threatened by drilling operations.

As part of the permit application process, drilling companies must identify where they plan to obtain and store the water used in their drilling operations. When applying for a permit, drillers must specify the sources and location of fresh water and the anticipated impacts of water withdrawals on water resources, and obtain approval from the appropriate River Basin Commission. Pits or impoundments with an embankment used to temporarily store water for drilling activities must meet DEP standards for construction and may also require a DEP dam permit.

Drilling companies must also identify where the produced wastewater will be stored, treated and disposed. Pits or impoundments with an embankment for temporarily storing drilling wastes must meet DEP standards for construction (e.g., synthetic liners) and may also require a DEP dam permit.

Wastewater (fluids) must be reused and recycled, or collected and treated at an authorized wastewater treatment facility. DEP approval is required before the receiving treatment facility can accept the wastewater for processing and/or disposal.

### **MONITORING**

DEP inspects well sites from construction to reclamation to ensure that the site has proper erosion controls in place, and that any waste generated in drilling and completing the well was properly handled and disposed. Also, well operators are required to submit a variety of reports regarding well drilling, completion, production, waste disposal, and well plugging. When called for, DEP employs progressive enforcement against well operators to ensure that facilities are brought into compliance.

DEP field operations staff inspects well sites to ensure that the operator sites and drills the well according to the permit and applicable laws. DEP staff also investigate complaints where an oil or gas well or drilling activity may be causing environmental or public safety concerns, especially when contamination of a drinking water supply is suspected.

### **COMPLIANCE ASSISTANCE**

In addition to permitting and enforcement, DEP works to instruct and advise well drillers and operators on BMPs and procedures for environmental control and waste management. Compliance assistance helps to prevent incidents of environmental degradation. DEP holds workshops for industry and will meet with applicants as needed to address environmental matters in advance of well site construction.

For more information about oil and gas drilling and production in Pennsylvania, visit [www.depweb.state.pa.us](http://www.depweb.state.pa.us), keyword: oil and gas, or contact one of the following offices.

PA Department of Environmental Protection  
Bureau of Oil and Gas Management  
P.O. Box 8765  
Harrisburg, PA 17105-8765  
Phone: 717-772-2199 Fax: 717-772-2291

PA Department of Environmental Protection  
Oil and Gas Management Program  
Eastern Regional Office  
208 West Third Street  
Williamsport, PA 17701-6448  
Phone: 570-321-6550 Fax: 570-327-3420

PA Department of Environmental Protection  
Southwest Regional Office  
Oil and Gas Management Program  
400 Waterfront Drive  
Pittsburgh, PA 15222-4745  
Phone: 412-442-4024 Fax: 412-442-4328

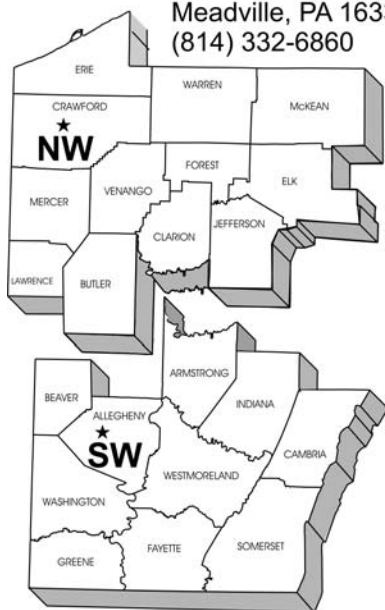
PA Department of Environmental Protection  
Oil and Gas Management Program  
Northwest Regional Office  
230 Chestnut Street  
Meadville, PA 16335-3481  
Phone: 814-332-6860 Fax: 814-332-6121

**COMMONWEALTH OF PENNSYLVANIA - OIL & GAS OFFICES**  
**DEPARTMENT OF ENVIRONMENTAL PROTECTION**

## Oil and Gas Regions

★ **Northwest Region**

230 Chestnut Street  
Meadville, PA 16335-3481  
(814) 332-6860



★ **Eastern Region**

208 West Third Street  
Williamsport, PA 17701-6448  
(570) 321-6550



★ **Southwest Region**

400 Waterfront Drive  
Pittsburgh, PA 15222-4745  
(412) 442-4024



● **Central Office**

Bureau of Oil and Gas Management  
PO Box 8765  
Harrisburg, PA 17105-8765  
(717) 772-2199

