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## Underground resources: natural gas

Energy interests, environmentalists debate effects

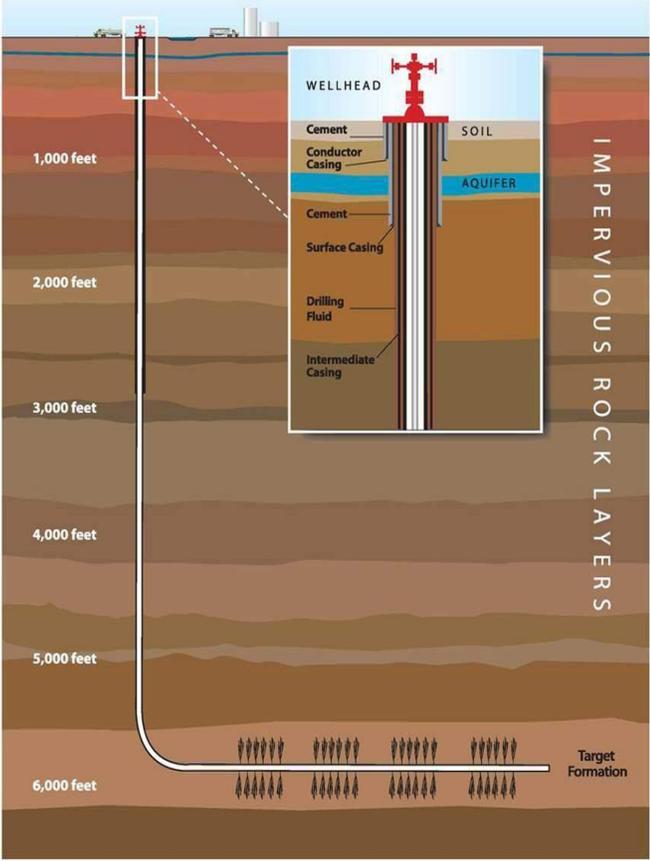
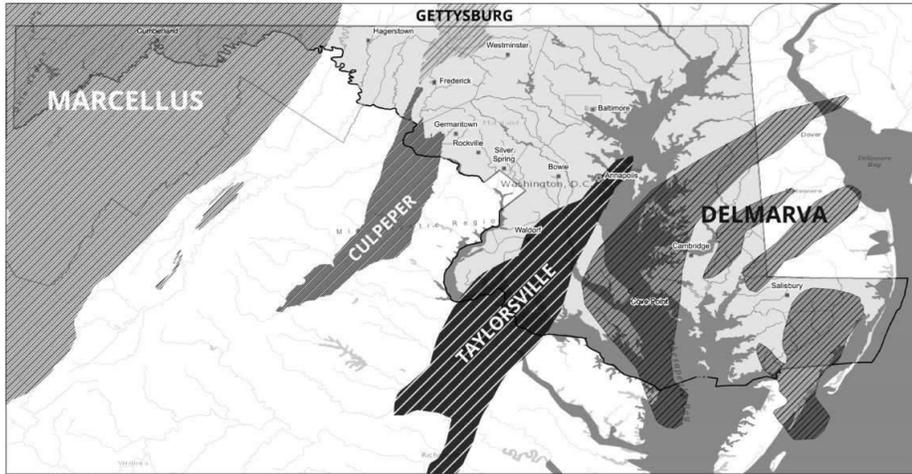
by [Sarah Fleischman](#) Staff writer



Staff photo by DARWIN WEIGEL

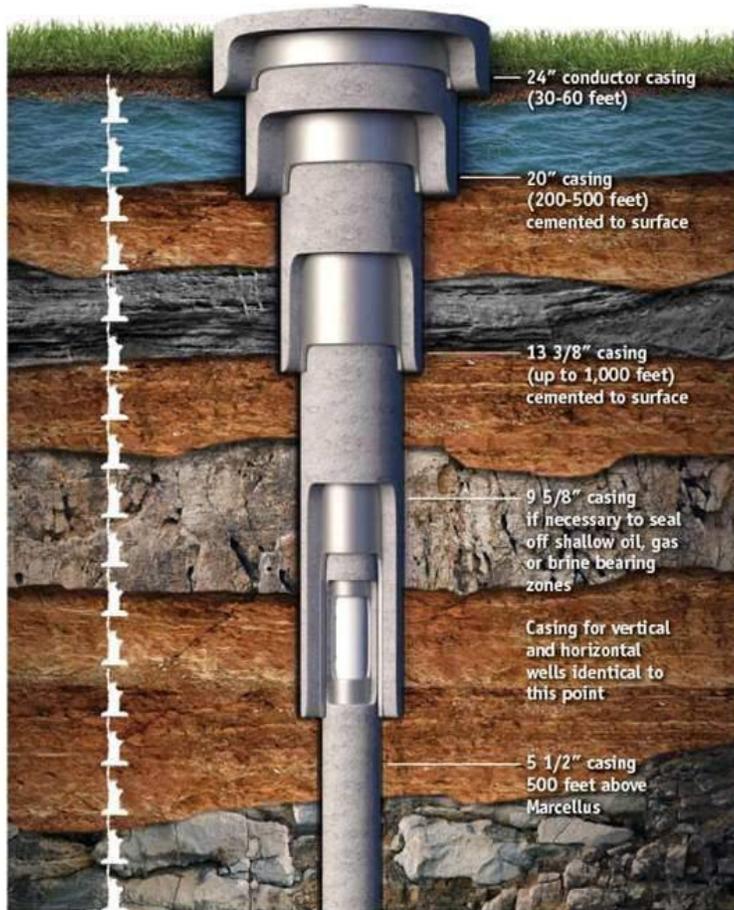
Patuxent Riverkeeper Fred Tutman, here at the fishing pier at Kings Landing Park in Huntingtown, has been on the job for 10 years.





### General Casing Design for a Marcellus Shale Well

The Marcellus Shale is more than a mile below the Earth's surface.  
It would take 17 Statues of Liberty on top of one another to reach the formation.



Miles beneath Southern Maryland's water table, another valuable and ancient resource lies hidden in the rock: 240-million-year-old natural gas basins.

Although not as substantial as the enormous Marcellus Shale formation underneath Pennsylvania and Western Maryland, the Taylorsville Basin has 1.064 trillion cubic feet of gas, the U.S. Geological Survey has estimated. The Marcellus has 84 trillion.

The Taylorsville basin goes through Virginia, much of central and south Charles County, northern St. Mary's and northern Calvert. Additionally, there is a supply of gas in the Delmarva basins. The Delmarva basins are several long, skinny basins, one of which is under southern St. Mary's County and Calvert County and reaches across the Eastern Shore into Delaware.

The Marcellus Shale formation was created about 390 million years ago and took 20 million years to form, said Jim Coleman, research geologist for the USGS. Marcellus was formed at the same time as the Appalachian mountains as continents came together. The Taylorsville basin and the Delmarva basins were created by the expansion of the earth's crust, Coleman said.

Marcellus Shale and the gas deposits under Southern Maryland are equally accessible, depending on the various state regulations, roadwork and waterways, Coleman said.

The potential for hydraulic fracturing — called fracking, a process in which water mixed with chemicals and sand is injected deep into the formation to force natural gas to the surface — in Western Maryland prompted Gov. Martin O'Malley (D) to issue an executive order, the Marcellus Shale Safe Drilling Initiative, in 2011, which mandated the formation of the Governor's Shale Advisory Commission and multiple state reports on the impacts of fracking and recommended best practices. Although there is a moratorium on fracking in Maryland, the potential and possibility for the resources available in the state have some concerned about how the process could affect the lives of Marylanders, by the state's analysis of fracking in Western Maryland and in Southern Maryland as well.

“Water and chemicals into the earth is a permanent change in the nature of the land,” said Bonnie Bick, conservation chairwoman of the Southern Maryland Sierra Club.

How they do it

Although fracking has been done for decades, relatively new technology was developed for the oil and gas industry to dig deeper than ever before in the early 2000s — and horizontally — said Jorge Aguilar, Southern region director for Food and Water Watch.

Horizontal fracking means only one well has to be drilled to frack in multiple directions, said Drew Cobbs, executive director for the Maryland Petroleum Council. Horizontal fracking has less effect on the surface, as strictly vertical fracking causes a “Swiss cheese” effect.

Before, drilling could only go 2 to 5 miles underground, but the new technology allowed depths of about 25 miles, Aguilar said.

Each frack is done a section at a time, forcing chemicals, sand and water miles under the ground. The chemicals include benzene and hydrochloric acid, Aguilar said, but Cobbs said the solution injected into the ground is mostly water, and the well casings are designed to protect the harmful chemicals from infiltrating into the groundwater supply.

The objective of fracking is to inject the sand and water under very high pressure to break the rock, Coleman said.

The fracking itself happens in a relatively short period of time, and then the well can produce for years. As the process is so new, it's not yet known what the average production length is, Cobbs said.

## An executive order and its effect

The Marcellus Shale Safe Drilling Initiative required the Maryland Department of the Environment, the Department of Natural Resources and the governor's Marcellus Shale Advisory Commission to study the drilling out of the Marcellus Shale in Western Maryland. One percent of the entire Marcellus Shale basin is in Maryland, Cobbs said.

“The only anticipated areas of gas production in the Marcellus are western Allegany and Garrett counties,” according to MDE.

The regulations developed from the executive order would apply throughout the rest of the state, said Nick Weber, a member of the governor's advisory commission and chairman of the Mid-Atlantic Council of Trout Unlimited.

Any decision or lifting of the fracking moratorium in Maryland won't come within the year. The final report was due Aug. 1 but was delayed, Weber said. The study of best practices for fracking was released in August of this year — two years late, Weber said. “The decision to go forward will clearly be on the next governor,” Weber said.

Included in the Recommended Best Management Practices for Marcellus Shale Gas Development in Maryland are state-developed regulations to support the design and implementation of comprehensive drilling plans; two years of predrilling monitoring of groundwater, surface water and endangered and threatened species; and not permitting fracking where the formation is within 2,000 feet of the surface.

“We believe that it is inevitable that there will be negative impacts from MSGD [Marcellus Shale gas development] in Western Maryland (and perhaps beyond the state's borders) and that a significant portion of these ‘costs’ will be borne by local communities,” states the document.

A state report in July on the potential public health effects of fracking in Maryland lists four areas as ones with a high likelihood of negative public health effects: air quality, health care infrastructure, occupational health and social determinants of health. The report lists three areas as ones with a moderately high likelihood of negative public health effects: cumulative exposures/risks, flowback and noise. Earthquakes were categorized as a topic with a low likelihood of negative public health effects, according to the report.

Peter Vogt, a Port Republic resident who studies geology as a hobby, said the longer and more thoroughly the state studies fracking, the safer it will be. Like buying a new car, Vogt said, the longer you wait, the more problems and issues can be discovered to inform in making the choice.

“My guess is that humanity is going to exploit all the expendable fossil fuel that is there,” Vogt said.

## Industry interest

But even if the state allows fracking, the industry has to be interested in drilling in Maryland.

“There’s a lot less interest in the industry in Maryland than there was four or five years ago,” Cobbs said.

Prices of natural gas came down significantly because of the available supply coming from Marcellus Shale, which makes drilling for the gas in Maryland less appealing. Additionally, state regulations do not currently allow fracking. The long timetable of the studies in the state makes Maryland unattractive for the industry, Cobbs said.

“The reality is no one has leased any land in Maryland in parts other than Western Maryland,” Cobbs said.

Although there is potential to frack for gas in Southern Maryland in the Taylorsville and Delmarva basins, those basins are largely unexplored and therefore are risky investments, Cobbs said. Marcellus Shale is a proven abundant supply and a more secure investment, although only 1 percent of all of Marcellus Shale is in Maryland, he said.

“The industry isn’t exactly chomping at the bit to frack here in Maryland,” Cobbs said.

But Aguilar said there is incentive to frack in Maryland because the supply is there. “The next likeliest basin would be the Taylorsville because the others are unassessed,” Aguilar said.

The infrastructure is being built now to transport natural gas to wherever it can attract the highest cost and make the highest profit. The incentives are in place to send the gas overseas where the largest profit exists, Aguilar said.

“An investment in natural gas now is laying the groundwork to relying on fossil fuels for the next 20 or 30 years,” Aguilar said. “There’s a highly speculative market of natural gas. ... That incentivizes more drilling.”

#### Environmental concerns

Some are concerned that fracking and its residual effects will permanently change the landscape and way of life in Southern Maryland, regardless of if fracking ever takes place here.

Fred Tutman, the Patuxent Riverkeeper, said the effects of fracking will be felt with the pending \$3.8 billion expansion of the liquefied natural gas terminal at Dominion Cove Point in Lusby.

“It makes Southern Maryland a stakeholder in fracking, not because fracking is happening on our backyard, but the byproducts are,” Tutman said. “We’re casualties of the fracking industry.”

Although Dominion has asserted it is not part of the fracking industry and only the transport industry — it doesn’t own the fracked fuel going through the facility — Tutman said the expansion still means fracking comes close to home.

Tutman compared Dominion's connection to the fracking industry to a gas station. A gas station is on the distribution side of gasoline, not the production, Tutman said, but it's still the gasoline industry.

"The public has been misdirected to believe one has nothing to do with the other," Tutman said. "They're connected and are the same industry."

Tutman said he is concerned about the increased industrial activity that would take place in Southern Maryland as a result of the expansion, not only in Calvert but also in the Chesapeake Bay and the Patuxent River because of ship traffic.

"Fracking would turn us into a Third-World-type country," Bick said. "There should be a fracking ban. The issue with Cove Point is we would be facilitating fracking."

"The Cove Point export project is not dependent upon any particular source of natural gas, and the development of the Marcellus and Utica shale formations is not dependent upon the Cove Point export project," said Karl Neddenien, spokesman for Dominion Cove Point. "They're obviously related, but one does not depend on the other. People have been saying it will drive hydraulic fracturing, and that is not the case."

Eyes have turned to the stories coming out of Pennsylvania, where fracking from the Marcellus Shale is already commonplace. Aguilar said Pennsylvania rushed to set up fracking infrastructure and is reaping the harmful effects from the poor guidelines. Maryland is headed in the same direction, he said.

"Maryland is doing a pretty sloppy job in moving forward with these guidelines in the sense that they've only looked at Western Maryland," Aguilar said.

One of the concerns is that fracking has the potential to affect water supply, as it uses millions of gallons for each frack, Coleman said. Additionally, the water used contains harmful chemicals, and the pipes go through the aquifers themselves.

States restrict how deep wells can go and how to protect the groundwater above them, Coleman said.

The casings around the well pipes are thicker closer to the surface and closer to the water table, Coleman said. Aquifers are in the thousands of feet under the ground, while the natural gas deposits are miles below the aquifers, Cobbs said. The casing structure resembles an upside-down wedding cake, Cobbs said.

But Aguilar said 6 percent of well casings fail within the first year.

"What ends up happening is the thousands of chemicals and methane bubbling back to the surface is prone to contaminating these water tables," Aguilar said.

Concern also has been expressed about earthquakes resulting from fracking. As fracking involves breaking rock, the process itself causes small earthquakes.

“By definition, when you break the rock you get an earthquake,” Coleman said.

The earthquakes caused by fracking typically register a 1 or 2 on the Richter scale, Coleman said.

“There may be times when the injection process has to end up going at a higher pressure or faster rate that may produce responses on the 2s and 3s on the Richter scale,” Coleman said.

The earthquake that hit the Washington, D.C., area in 2011 was not attributed to fracking, Coleman said.

Water disposal wells have been the primary cause of earthquakes attributed to fracking that have been felt outside of the normal 1s and 2s on the Richter scale, Coleman said. In these disposal wells, the fracking companies put the used chemical-laden water back underground. Many companies do not want to store it, so they pass the used water through a chemical process at the surface to filter out the solid chemicals. The solids are contained in a lined pit or sealed container or dehydrated and sent to a landfill.

Much of the fracking water is recycled, as water is costly to transport, and through the filtration process can be reused for multiple fracks. Each frack uses 3 million to 9 million gallons of water, Coleman said.

“Most companies would rather recycle or rehabilitate the water they use,” Coleman said.

Fracking water is not put back into the water cycle, so unless it is rehabilitated, those millions of gallons are only used once.

“Other industrial uses of water for the most part are multiple use,” Coleman said. “You can use it again because it goes back into the hydrological cycle. ... If hydrofracking goes on for the next decade and we have a couple of drought years, it can cause problems with who has claim over the water.”

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