Major Modern Advances

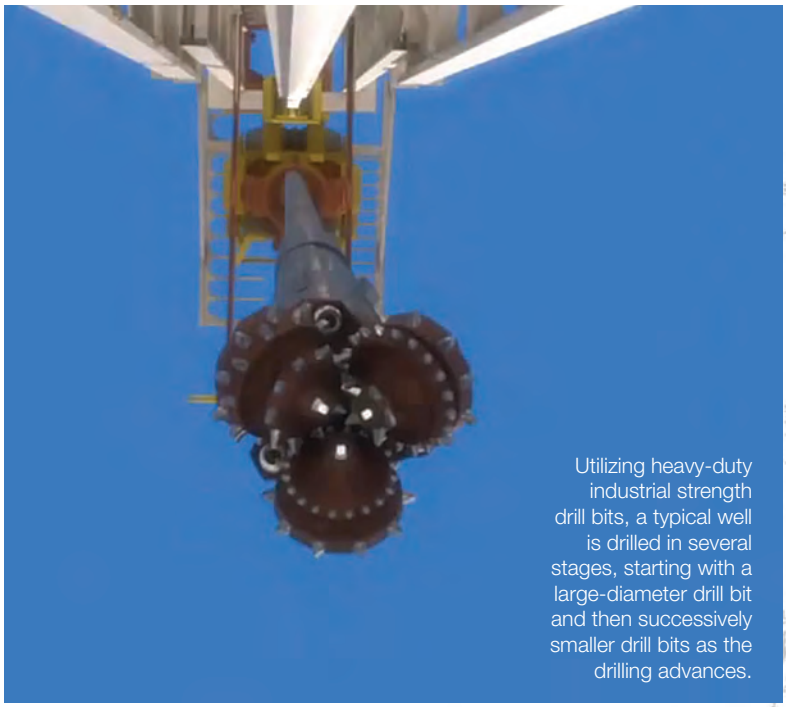
Horizontal Drilling

BY KENSIE HAMILTON

NATURAL GAS FRACING has been around since the 1940s and has a long history in the Mountain State. Through the major advances made in the past decade, this process has been combined with horizontal drilling techniques to increase productivity and decrease impact on the landscape.

It is said a picture is worth a thousand words, and this story features 11. In response to the many questions and misinformation circulating not only about how a natural gas well is drilled but also about the steps taken to ensure it is drilled safely, Chesapeake Energy has designed a step-by-step video to help people better understand the methods and technologies used to capture natural gas. This video helps lay to rest the fears produced by that misinformation and features an explanation as to how modern horizontal drilling is used to capture the same amount of gas as 32 traditional vertical wells with much less impact on the surface.

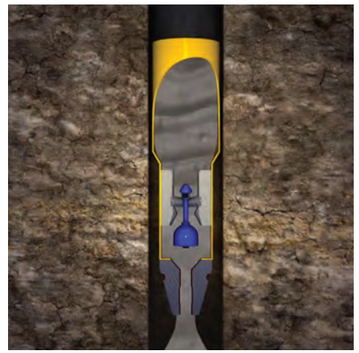
The images featured in this story are still images taken from the drilling video. You can find the full video at Chesapeake's Web site in the animations section at www.chk.com/Media/Educational-Library.



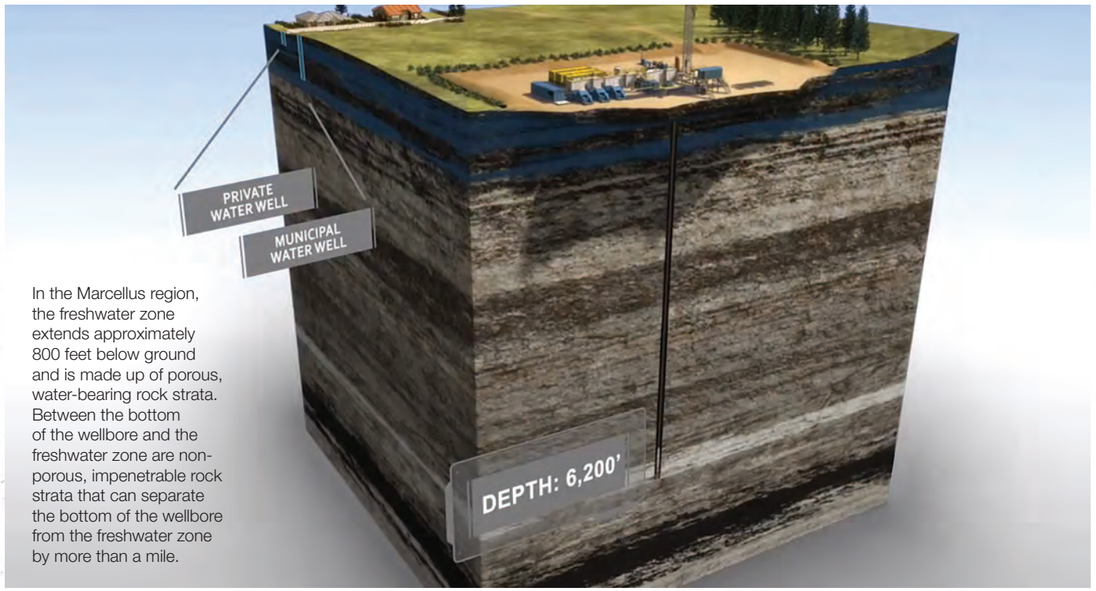
Utilizing heavy-duty industrial strength drill bits, a typical well is drilled in several stages, starting with a large-diameter drill bit and then successively smaller drill bits as the drilling advances.

During drilling, specially prepared drilling mud is used to cool and lubricate the drill bit while bringing cuttings to the surface. Air drilling techniques are typically used in the initial portion of the wellbore to protect freshwater zones.

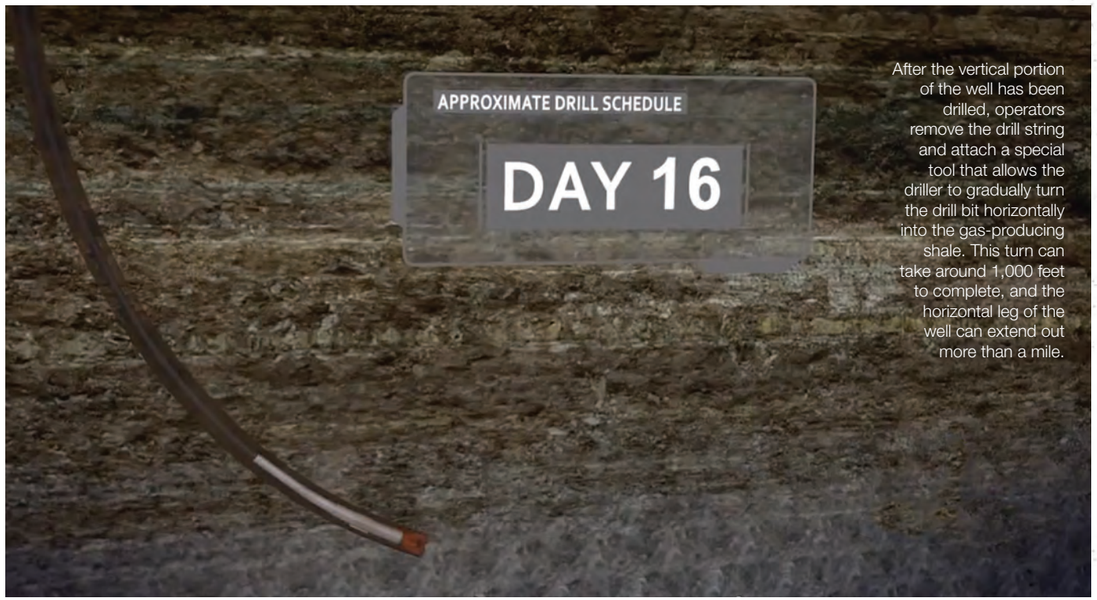
After each stage of drilling is complete, the casing is cemented firmly inside of the wellbore. To do this, a specialized tool is lowered into the wellbore that centers the casing inside the well and allows cement to be pumped into the wellbore.



Cement is pumped down through the surface casing and up along the sides of the well to provide a proper seal. This completely isolates the well from the deepest of private or municipal water wells.

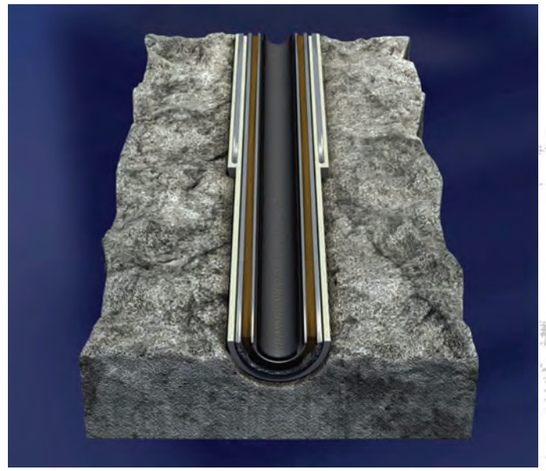


In the Marcellus region, the freshwater zone extends approximately 800 feet below ground and is made up of porous, water-bearing rock strata. Between the bottom of the wellbore and the freshwater zone are non-porous, impenetrable rock strata that can separate the bottom of the wellbore from the freshwater zone by more than a mile.



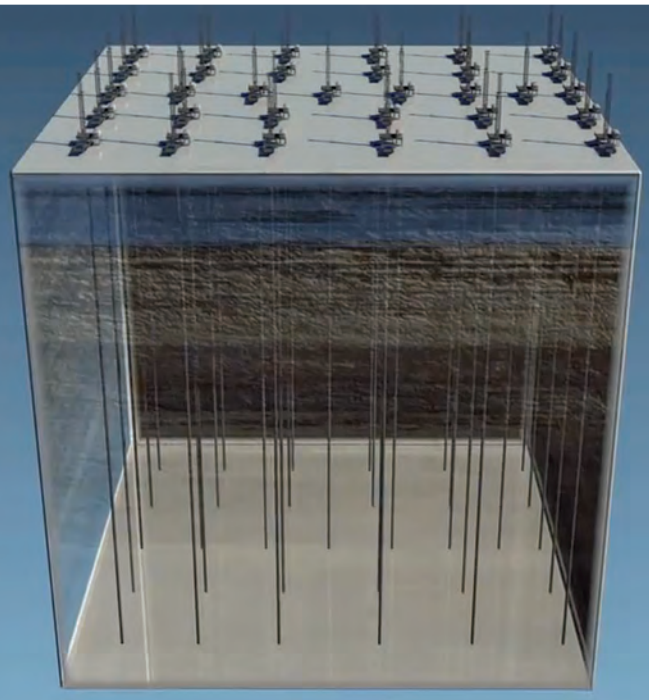
After the vertical portion of the well has been drilled, operators remove the drill string and attach a special tool that allows the driller to gradually turn the drill bit horizontally into the gas-producing shale. This turn can take around 1,000 feet to complete, and the horizontal leg of the well can extend out more than a mile.

Throughout the drilling process, multiple layers of protective casing are installed and cemented into the wellbore to isolate the flow of natural gas and protect groundwater sources. From largest to smallest: conductor casing, surface casing, production casing and production tubing.



This cross-section shows the seven layers of protection used in a standard Marcellus well. From the outside in: cement, conductor casing, cement, surface casing, drilling mud, production casing and the production tubing through which natural gas will flow to the surface.

Development of a 1,280-acre tract of land using conventional vertical drilling techniques could require as many as 32 vertical wells with each having its own multi-acre pad site.



Since horizontal wells contact more of the gas-producing shale, fewer wells are needed to optimally develop a gas field. Multiple wells can be drilled from a single pad site. One multi-well pad site with horizontal wells can effectively recover the same natural gas reserves from the 1,280-acre tract of land while reducing the overall surface disturbance by 90 percent.