

United States Shale Gas Plays

Stacked Appalachian Plays



Marcellus Shale Gas Well Drilling Techniques

Drilling in the Marcellus Shale

In Northeastern Pennsylvania, the shale is 7,000 feet deep. Horizontal drilling reaches the layer of interest and then follows the layer of interest a couple thousand feet. It can give a greater return than vertical drilling.

Mud pond

Plastic-lined excavation used to contain debris from drilling.

Access road

Has to be cut through land so equipment and workers can get to drilling site.

Drilling rig

Set up and drilling take several weeks. Rig is removed and replaced with equipment to control gas extraction. Well can produce for decades.

Site prep

Area has to be cleared and prepped for drilling operations.

Gas pipelines

Needed to move gas off site once well is producing.

Concrete

Water table

The steel drill shaft is encased in concrete to prevent possible contamination of groundwater.

Water table

Steel casing

Shale

2,500 - 3,500 feet horizontally

6,500 - 7,500 feet deep (not to scale)

Extraction — The drill shaft is perforated with explosives. A slurry of water and sand is then pumped down into the shale. The pressurized mix fractures the shale, and forces the gas out and up the shaft.



Hydro-fracking Phase –
(a week or two)

Injection pumps, supplies,
and many frack tanks for
fresh and flowback waters



“Typical” Drillpad Design

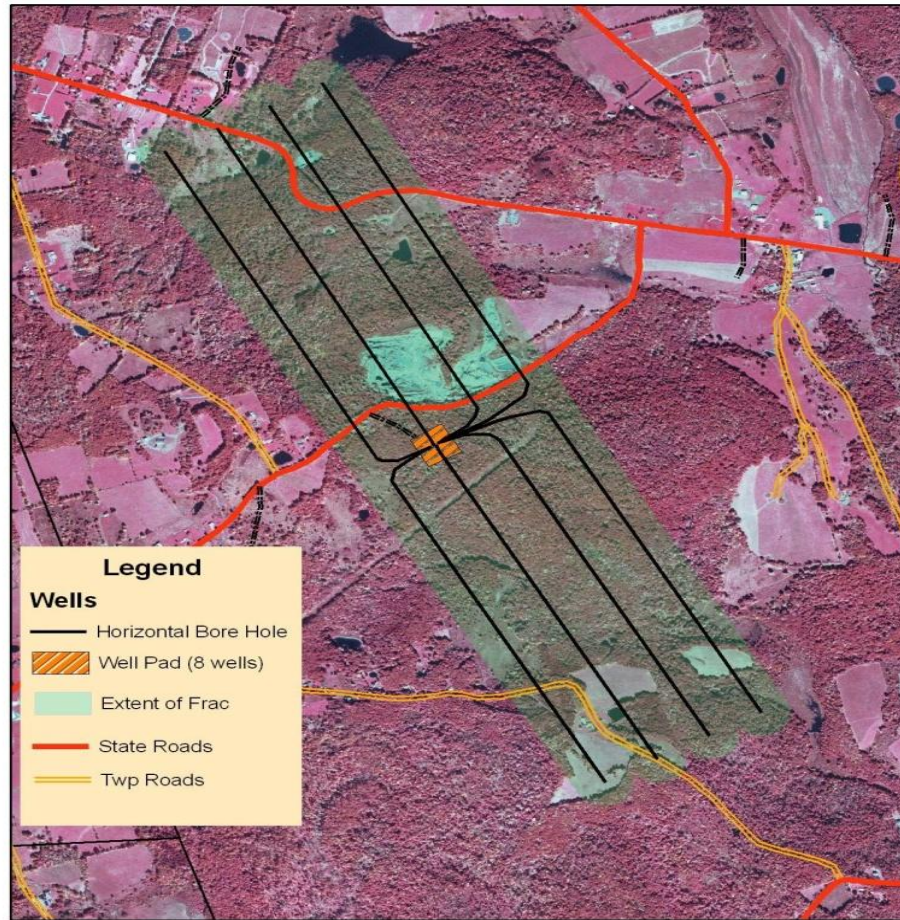


Water-source pond

Drill cuttings pond

Well Pad Drilling Site

Generic Single Pad Drilling Unit
8 Wells, 5,000 ft. horizontals, 640 acres



0 750 1,500 3,000 4,500 Feet

Concerns

1. Water Withdrawals, Use, and Tracking
2. Well Pads and Ancillary Infrastructure
3. Wastewater Tracking and Disposal

