

Frac Fluid – What's in it?

Three Things You Need to Know

- SWN hydraulic fracturing or “frac” fluid is comprised of approximately 99.9% fresh water and sand. The remaining 0.1% is a combination of chemical compounds, many similar to everyday cleaning products and food additives.
- Our well integrity prevents frac fluids from contacting freshwater zones in the earth where drinking water originates. Our installation of well casing and cement eliminates potential contamination of groundwater. These precautions are directed and enforced by state regulations.
- SWN voluntarily reports frac fluid composition at state and federal levels. We are an industry leader in advocating this practice.

Facts about Fracing Fluid

Purpose and Use

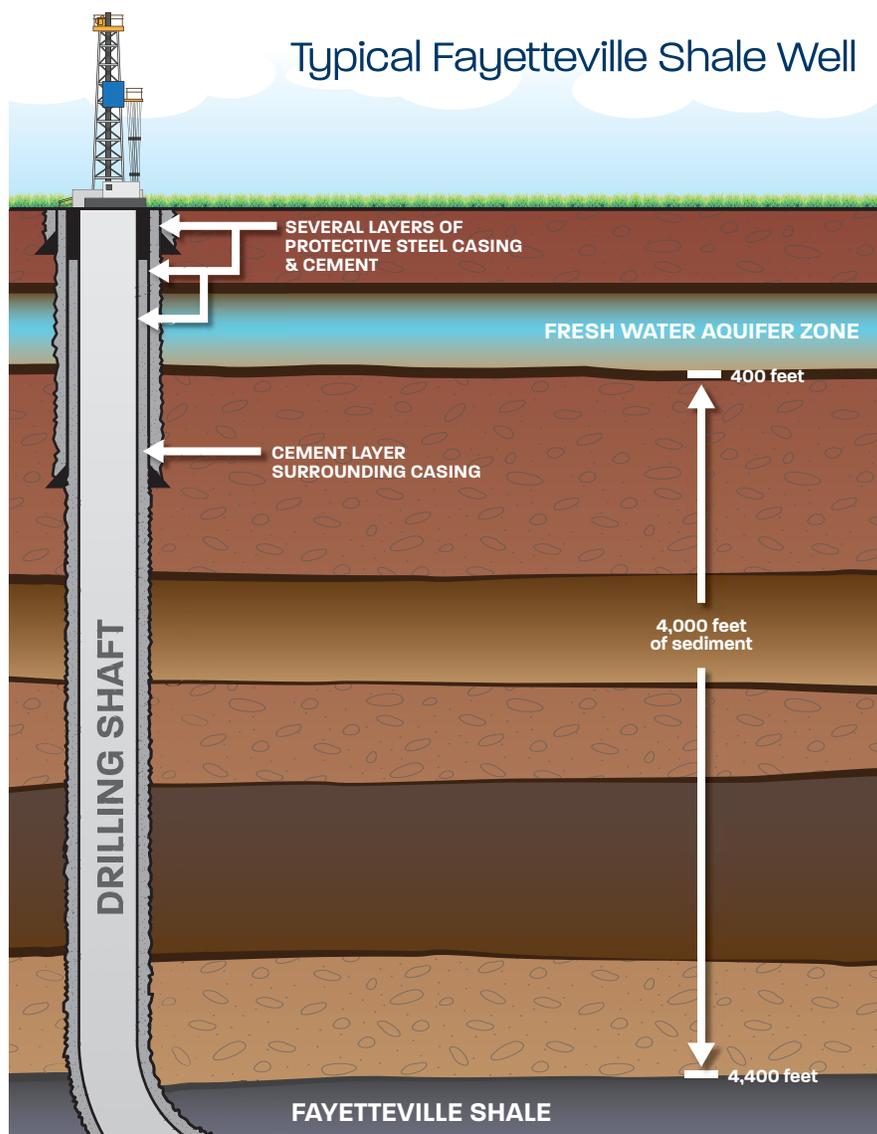
Frac fluid is a mixture of water, sand and other additives used during the hydraulic fracturing or “fracing” process to induce gas to flow from underground geological formations called shales. This fluid is pumped into the shale through wells drilled several thousand feet below the earth's surface. Fracing creates small fractures and pathways for the natural gas to flow from within the shale, releasing it for production and ultimately to supply consumers with clean burning natural gas.

Composition

SWN frac fluid is comprised of 99.9% fresh water and sand. The water comes from permitted sources, while the sand is similar to what would be found at a playground.

The remaining 0.1% is a combination of compounds, some with identical chemical composition of many common household products. This mixture is designed to protect the integrity of the geological formation and improve the production of natural gas – allowing fracing to be performed in a safe and effective way.

Typical Fayetteville Shale Well

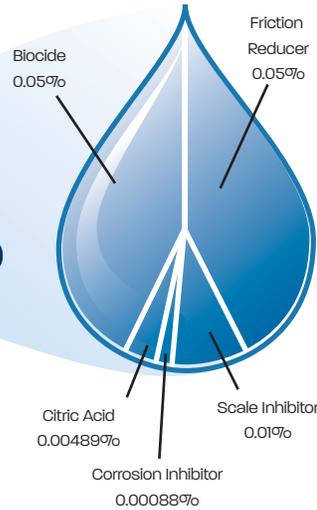


Frac Fluid – What's in it? (continued)

Water and Sand
99.9%



Additives
0.1%



Source: Southwestern Energy, Ground Water Protection Council

Additives protect the wellbore from corrosion and improve the effectiveness of the fracture stimulation.

Recycling and Disposal

During and after the fracturing process, water and frac fluids flow back out of the well to be recycled or properly disposed at permitted injection facilities. SWN currently recycles the majority of the water recovered after fracturing, allowing for the water to be reused for fracturing another well. Our goal is to recycle as much water as possible.

Some fluid does not immediately return, rather it remains isolated in the well or trapped in the rock thousands of feet below the surface, permanently isolated from freshwater zones. We have practices in place to ensure the construction, maintenance and long-term integrity of our wells meet or exceed all regulations. We hold ourselves to high standards in order to protect the health, safety and environment of our employees and our neighbors.

Regulation and Voluntary Reporting

We report all hydraulic fracturing activities through local, state and federal regulatory agencies that require permitting and reporting, such as local townships, the Arkansas Oil and Gas Commission and the Pennsylvania Department of Environmental Protection.

On a voluntary basis, we report frac fluid composition to the "Frac Focus Chemical Disclosure Registry," which is a voluntary registry maintained by the Groundwater Protection Council – a national association of groundwater regulatory agencies.

More Information Available Online

www.energyindepth.org

www.fracfocus.org

www.aogc.state.ar.us

Additive	Purpose	Common Application
Biocide (glutaraldehyde)	Eliminates bacteria in the water that can produce corrosive by-products	Disinfectant; Sterilizer for medical and dental equipment
Corrosion inhibitor (N, n-dimethyl formamide)	Prevents the corrosion of the pipe	Used in pharmaceuticals, acrylic fibers and plastics
Friction reducer (polyacrylamide)	Minimizes friction between fluid and pipe as required	Water treatment, soil conditioner
Citric acid	Prevents precipitation of metal oxides	Food additive; Food and beverages; Lemon juice
Scale Inhibitor (ethylene glycol)	Prevents scale deposits in the pipe... not always required	Automotive antifreeze, household cleansers, deicing, and caulk
Sand	Allows the fissures to remain open so the gas can escape	Drinking water filtration, play sand