



Western States Petroleum Association

Hydraulic Fracturing in California FACT SHEET

Hydraulic fracturing has been in the news recently in connection with natural gas production in parts of the Northeast and Intermountain West regions of the United States. Hydraulic fracturing has been used for more than 60 years and is used throughout the oil and gas industry, including California. In California, however, hydraulic fracturing is typically used to produce liquid oil rather than natural gas.

Hydraulic fracturing has been used in California for decades to enhance the recovery of the state's prolific oil and natural gas resources. These resources contribute in significant ways to the state's economy, jobs and energy supply. Some 21,000 California jobs are linked to the production of oil and natural gas and half of those jobs are in the San Joaquin Valley.

During the decades it has been used, hydraulic fracturing has never been shown to adversely impact the state's environment, drinking water supply or pose any risk to nearby residents. In fact, to date there has not been a documented case of fluids used in fracturing operations entering a drinking water aquifer.

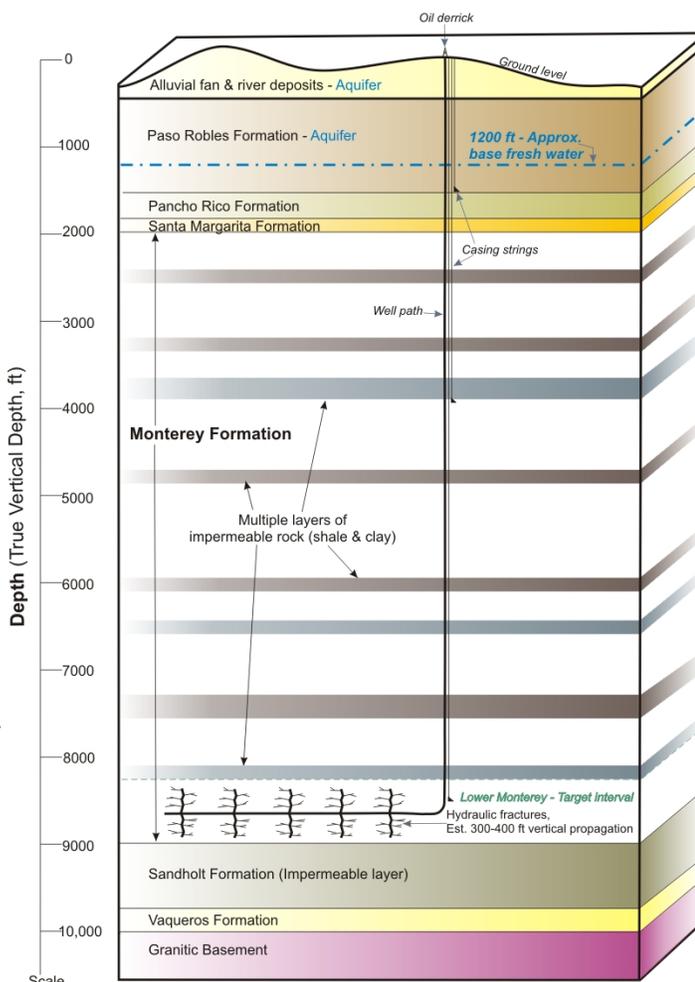
In 2011, WSPA member oil companies conducted some form of hydraulic fracturing operation on 628 wells.

What is Hydraulic Fracturing?

Hydraulic fracturing is one energy production technique used to obtain oil and natural gas in areas where those energy supplies are trapped in rock and sand formations. Once a well has been subjected to hydraulic fracturing, crude oil or natural gas production may occur for years without additional fracturing. Hydraulic fracturing operations occur over very short time periods, usually two to five days.

Once an oil or natural gas well is drilled and properly lined with steel casing, fluids are pumped down to an isolated portion of the well at pressures high enough to cause cracks in the rock formation thousands of feet below the earth's surface. These cracks or fractures allow oil and natural gas to flow more freely. A propping agent such as sand is pumped into the well to keep fractures open.

Conceptual Diagram to Illustrate Hydraulic Fracturing in California Lower Monterey Shale



Hydraulic Fracturing and Water Quality

Oil and gas deposits that undergo hydraulic fracturing generally are separated from drinking water aquifers by one or more impermeable rock barriers. Extensive state, federal and local regulations related to well design and construction require equipment and procedures to ensure hydraulic fracturing does not impact drinking water supplies. Even with these safeguards in place, the oil and gas industry uses multiple practices and techniques to understand each hydraulic fracture operation.

A landmark study in 2004 by the U.S. Environmental Protection Agency examined the risks of hydraulic fracturing in gas formations. That study concluded there was “little to no risk of fracturing fluid contaminating underground sources of drinking water during hydraulic fracturing.”

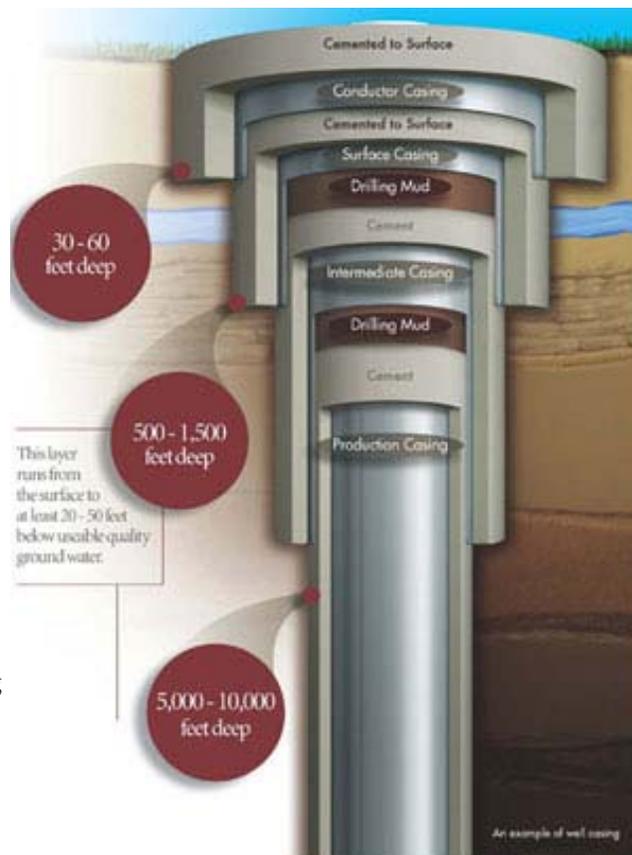


In October, 2012, an intensive year-long study of hydraulic fracturing in the Baldwin Hills area of Los Angeles concluded there were no recorded impacts to groundwater in the area. In fact, the study closely examined 14 specific environmental risk factors, including earthquake risks, and concluded there were no impacts to any of those areas as a result of hydraulic fracturing.

Proper construction and maintenance of well bores where they pass through aquifers is key to protecting groundwater -- regardless of whether or not an oil or gas well is hydraulically fractured.

In California, the Division of Oil, Gas and Geothermal Resources requires all wells to meet strict construction and design requirements to ensure the maximum protection of ground water supplies and nearby ecosystems.

- All wells must be lined with multiple layers of steel pipe casing and cement that extends below the depth of any groundwater aquifers and below an impervious layer of rock that would prevent any migration of fluids up into the drinking water supply;
- Each well must comply with groundwater protection standards and upon completion, a report must be submitted to the California Division of Oil, Gas & Geothermal Resources;
- Each well's casing is required to be secured by well cement and tested to ensure the casing meets industry integrity and operating standards;
- The disposal of fracturing fluids is regulated by state and federal water quality laws, including the Clean Water Act and the Safe Drinking Water Act.



Graphic Courtesy of Texas Oil and Gas Association

Source: FracFocus, Courtesy of Texas Oil and Gas Association

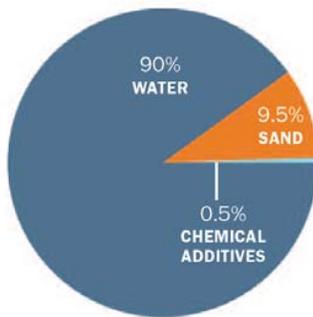
Surface activity during hydraulic fracturing

Once a well has been drilled, fracturing operations typically take place over a period of two to five days. Once completed, the production site is reduced to about the size of a two-car garage with the remainder of the site restored to its original condition.

What is in Hydraulic Fracturing Fluids?

While no two hydraulic fracturing operations are identical, the fluids used in those operations typically are 99.5 percent water and sand. The remaining 0.5 percent of fluids is chemicals and materials, many found in common household products, designed to reduce friction, inhibit scaling, control iron and corrosion and reduce the growth of bacteria. Many of these chemicals are used to maintain the mechanical integrity of the equipment used in hydraulic fracturing operations, thereby further protecting groundwater resources.

Typical Shale Fracturing Mixture Makeup



Typical Chemical Additives Used in Frac Water

Compound	Purpose	Common application
Acids	Helps dissolve minerals and initiate fissure in rock (pre-fracture)	Swimming pool cleaner
Sodium Chloride	Allows a delayed breakdown of the gel polymer chains	Table salt
Polyacrylamide	Minimizes the friction between fluid and pipe	Water treatment, soil conditioner
Ethylene Glycol	Prevents scale deposits in the pipe	Automotive anti-freeze, deicing agent, household cleaners
Borate Salts	Maintains fluid viscosity as temperature increases	Laundry detergent, hand soap, cosmetics
Sodium/Potassium Carbonate	Maintains effectiveness of other components, such as crosslinkers	Washing soda, detergent, soap, water softener, glass, ceramics
Glutaraldehyde	Eliminates bacteria in the water	Disinfectant, sterilization of medical and dental equipment
Guar Gum	Thickens the water to suspend the sand	Thickener in cosmetics, baked goods, ice cream, toothpaste, sauces
Citric Acid	Prevents precipitation of metal oxides	Food additive; food and beverages; lemon juice
Isopropanol	Used to increase the viscosity of the fracture fluid	Glass cleaner, antiperspirant, hair coloring

Source: DOE, GWPC: Modern Gas Shale Development in the United States: A Primer (2009).

Hydrocarbons and the California economy

California's economy runs on fossil fuels. Despite significant growth in the numbers and types of alternative and renewable fuels, 96 percent of the transportation fuels in California are derived from petroleum. Natural gas provides almost one-third of the state's total energy needs. Forty percent of the electricity used in California is generated using natural gas.

Hydraulic fracturing is one of several techniques developed to enhance and more efficiently use California's energy resources. In addition to enhanced oil recovery practices like steam injection and water flooding, hydraulic fracturing also is a proven and safe practice that helps to keep the state a major energy producer.