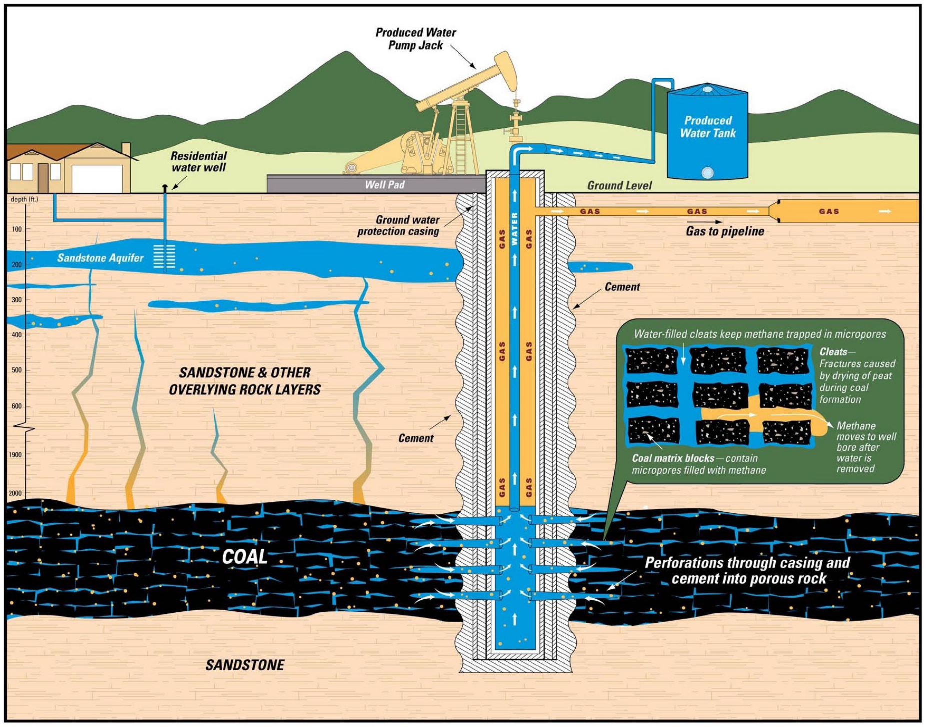
Fact Sheet July 2009

Hydraulic Fracturing



Source: Ecos Consulting, 'HD Mountains of Southwest Colorado: Impacts of Proposed Coal-Bed Methane Development and Promising Alternatives'

A cross section of a typical coalbed methane production well. In some regions the drinking water aquifer is located within the coal seam. Natural fissures located above the coalbed formation can provide possible conduits for contamination of underground sources of drinking water. During the hydraulic fracturing process the natural fissures can be expanded, facilitating further contamination.

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Hydraulic Fracturing

Hydraulic fracturing is a process used by drilling companies to increase the amount of oil and gas that is produced from each well. Fracturing is done after the well has been drilled into the formation. A fluid consisting of water, proppants (either sand or ceramic beads), and chemicals is injected into the well at extremely high pressures until eventually the rock, clay, compacted sand, or coal fractures. The fractures generally travel a few hundred feet[1], although fracturing fluids have been known to travel 3,000 feet away from the well.[2] These fractures are then held open by the sand or ceramic, enabling the oil & gas to flow more freely out of the well.

After the well has been fractured, the oil or gas is extracted from the formation. During the extraction process, the fracturing fluid, along with any water present in the rocks before fracturing are partially removed with the oil and gas.

Because hydraulic fracturing is highly variable and unpredictable, and because drinking water supplies are extremely precious resources, numerous concerns have been raised regarding the potential for hydraulic fracturing to contaminate drinking water supplies.

Concern: Toxic Chemicals

Large amounts of chemicals are also used in hydraulic fracturing. In natural gas fracturing, 435 chemical products are known to be used, many of which can be toxic to humans and wildlife, even in very small doses. Although the overall concentration of chemicals in fracturing fluid is around one percent, significant quantities are used – an average of 1,000 gallons of chemicals and 100,000 gallons of water for a standard coalbed methane (CBM) well. Around 20-70 percent of fracturing fluid remains underground[3], or an average of 20,000 to 70,000 gallons, raising concerns about the potential for contamination of drinking water supplies.

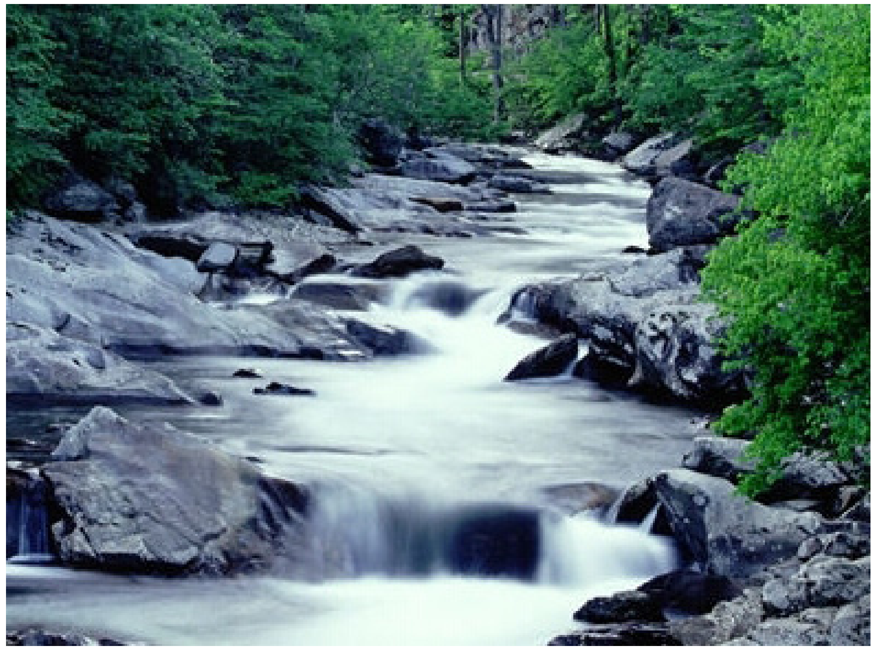

Photo Courtesy: Tim Seaver

A 2002 draft Environmental Protection Agency (EPA) study documents that fracturing fluids sometimes include concentrations of chemicals at concentrations higher than national drinking water standards.[4] For example, one known fracturing chemical, 1-methylnapthene, is considered hazardous by acute skin contact, inhalation or ingestion. Chronic exposure can cause genetic mutations.[5] According to testimony by John Bredehoeft, a hydrologist with the U.S. Geological Survey for 32 years, when the estimated amount of 1-methylnapthene, needed for an average fracturing job in a coal bed methane formation, is added to 100,000 gallons of fracturing fluid, it is still well over the legal safe drinking water standards. For the injected concentration of 1-methylnapthene to be considered safe it must further be uniformly dissolved in 300 million gallons of water.[6]

Methanol, an acid used in hydraulic fracturing to dissolve rock and open pores in a formation, causes adverse reproductive and fetal effects, central nervous system depression, digestive tract irritation, respiratory tract irritation, liver, kidney and heart damage, and may be fatal or cause blindness if swallowed.[7] The injected concentration of methanol, assuming, 100,000 gallons of water is needed to fracture a CBM well, must be uniformly dissolved in more than 1.2 billion gallons of water to reach drinking water standards.[8] Unfortunately the EPA has not conducted any study to investigate what precisely happens to acids such as methanol after they are injected into wells, and whether they continue to pose a threat to human health.[9]

Biocides are another type of chemical used in fracturing. The main purpose of biocides is to kill corrosive bacteria in oil and gas wells. Chemicals commonly used in biocides, such as formaldehyde, can cause skin disorders, respiratory problems and various types of cancer.[10] According to The Endocrine Disruption Exchange, or TEDX, a non-profit organization that tests chemicals for health and environmental effects, the high toxicity of biocides poses a significant danger to workers and those living near the pad or evaporation ponds. Biocides can also sterilize the soil and inhibit normal microbial and plant growth for many years.[11]

Concerns about the use of toxic chemicals in hydraulic fracturing are exacerbated by the fact that undisturbed aquifers move very slowly, at a pace of several feet to several ten feet a year. As a result fracturing chemicals can stay underground for a very long time at potentially high concentrations.[12]

Source: Powder River Basin Resource Council/ Clark Resource Council

A well site at Bennett Creek Prospect Well site, Line Creek, Clark, Wyoming. The amount of heavy machinery, large trucks and traffic connected with oil and gas development, results in a process that is intrusive to many neighbors.

Concern: Secrecy

Hydraulic fracturing companies have shielded substantial information about their products from disclosure, each claiming that their special proprietary mix is the most effective and vital to the success of their business, and that disclosure would be a taking of their private property. Out of the 435 chemical products known to be used in natural gas fracturing, all the ingredients have been disclosed for only 5 percent, and for 9 percent, no information about any of the chemicals in the products are available. This lack of information and secrecy prevents landowners and, in some case, government agencies from conducting proper water quality tests.[13]

While Material Safety Data Sheets (MSDS) are required to be kept on drill sites and made available to emergency responders, these sheets provide basic health information, for some, but not necessarily all of their chemicals used. The manufacturers of fracturing chemicals determine what information they include on MSDSs, with no Occupational Safety and Health Administration review.[13]

Misters are used to speed evaporation of a waste pits, south of Silt, CO, by spraying the contaminated water into the air. Once most of the water is gone the pit is typically buried with the remaining solid waste.

There are many shortcomings of MSDSs, by leaving some important health information as a mystery. For example, the MSDSs usually do not address the outcome of long-term, intermittent, or chronic exposures, or adverse health effect that may not be expressed until years after the exposure.[13] Health officials involved with a fracturing spill in Durango, CO reported that the MSDSs provided little help in treating an individual with chemical exposure.[14]

Concern: Produced Water Management

Depending on where the drilling is taking place, the produced water (including the fracturing fluid) recovered from the well is either placed into closed storage tanks or, more often, pumped into large, open holding pits and left to evaporate. One of the main problems with this practice of using open pits to store produced water is the fact that evaporation allows toxic, volatile chemicals to be released into the air, and it concentrates the non-volatiles in the pits.[15] Evaporation pits have been known to leak or overflow the concentrated toxic liquid, potentially contaminating the soil and local water sources.

Concern: Air Pollution

In February 2009, TEDX completed a study of chemicals used in hydraulic fracturing, stating that air is the primary pathway of concern for fracturing chemicals.[16] Out of the chemicals known to be used in hydraulic fracturing for which basic information is available, 96 percent provide a warning about eye and/or skin harm, 94 percent warn about respiratory system harm, and 49 percent warn about brain or neurological harm that can occur either when the chemicals are inhaled or when they come into contact with skin.[16]

Concern: Water Quantity

Hydraulic fracturing uses a very large amount of water, between 5,000 and 3 million gallons for one fracturing job, depending on the type of formation and type of well.[17,18] Colorado had 39,394 active oil and gas wells through June 6, 2009.[19] If each of these wells was fractured once, between 197 million and 118 billion gallons of water has been used in the state of Colorado alone. However, in the production lifetime of one well there are usually multiple fracturing jobs that are done. These billions of gallons of water are possibly coming from the same source that is used for household drinking wells, ranching and farming.

Despite the risks posed by hydraulic fracturing, it has been granted exemptions from different chemical reporting requirements as well as multiple environmental regulations.

- The Safe Drinking Water Act (SDWA) was enacted to protect public drinking water supplies as well as their sources. The exemption of hydraulic fracturing from the SDWA removes these standards and regulations.
- The Emergency Planning and Community Right-to-Know

Act was established to inform people of chemical hazards in their communities. Companies are required to report chemicals that are stored, released or transferred in an annual Toxic Release Inventory (TRI). While petroleum bulk stations, terminals, refining and related industries are required to report to the TRI, oil and gas exploration and production facilities, including hydraulic fracturing, are not.

- The Resource Conservation and Recovery Act (RCRA) is the primary federal law designed to ensure safe management of hazardous waste and prevent new toxic waste sites. Hydraulic fracturing is exempt from RCRA's cradle-to-grave regulation, which provides powerful incentives for companies to minimize waste, use nontoxic alternatives, recycle and reuse toxic substances where possible, and treat waste so that it is no longer toxic. In 1988, the EPA exempted oil and gas exploration and production wastes from RCRA's hazardous waste requirements.[20]

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