Hydraulic Fracturing

For Oil & Gas Production

Marty Link
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Nebraska Department of Environmental Quality
DISCLAIMER
We're going to start fracking under our biggest competitor's headquarters.

My plan is to pollute their water and generate earthquakes to destroy their campus.

The project code name is "fracking awesome."

Catchy
“What the frac?”
A Toxic Spew?
Officials worry about impact of 'fracking' of oil and gas.

By Jim Motzauj / Newsweek Web Exclusive
Aug 20, 2008 | Updated: 5:25 p.m. ET Aug 20, 2008

PROJECT GREEN

Top Ten
Technology / Business

Waste disposal and other hazards in drilling for natural gas.

Published: March 1, 2011

Chemicals and Toxic Materials That Come With Hydrofracking

Millions of gallons of water can be used to activate a typical gas well. It is stored in an artificial pond, part of a drilling complex that can require a forest clearing of between 3 to 10 acres.

Sand and chemical agents, often toxic, are blended into the water.

WATER SUPPLY

CHEMICALS AND SAND
Study to Evaluate the Impacts to USDWs by Hydraulic Fracturing of Coalbed Methane Reservoirs

The study of coalbed methane (CBM) wells involved interviews with approximately 50 state and local government agency staff members, communications with about 40 citizens who were concerned that CBM production had adversely affected their drinking water wells, and searches for confirmed incidents of drinking water well contamination. EPA published a draft report in August 2002, requested public comment, and incorporated changes as appropriate in the final report.

Below are links to the major documents prepared as part of EPA's effort to gather and analyze information related to the potential impacts on underground sources of drinking water from the injection of hydraulic fracturing fluids into CBM wells.

- Visit the [hydraulic fracturing](http://www.epa.gov/ogwdw/uic/wells_coalbedmethanestudy.html) page for more information about hydraulic fracturing and for background on why EPA conducted the study.

Final Study

- [Study Fact sheet (EPA 816-F-04-017) June 2004](http://www.epa.gov/ogwdw/uic/wells_coalbedmethanestudy.html) (2 pp, 91K)
- [Download Entire Study (ZIP File)](http://www.epa.gov/ogwdw/uic/wells_coalbedmethanestudy.html) (13MB zip file)
- [Executive Summary (PDF)](http://www.epa.gov/ogwdw/uic/wells_coalbedmethanestudy.html) (22 pp, 2MB)
- [Cover, Table of Contents, Glossary (PDF)](http://www.epa.gov/ogwdw/uic/wells_coalbedmethanestudy.html) (30 pp, 204K)
  - Chapter 1 - Introduction (PDF) (11 pp, 878K)
  - Chapter 2 - Study Methodology (PDF) (7 pp, 54K)
  - Chapter 3 - Characteristics (PDF) (32 pp, 1092K)
  - Chapter 4 - Hydraulic Fracturing Fluids (PDF) (26 pp, 1.21MB)
  - Chapter 5 - Summary of Coalbed Methane Basin Descriptions (PDF) (17 pp, 704K)
  - Chapter 6 - Water Quality Incidents (PDF) (16 pp, 34K)
- [Appendices](http://www.epa.gov/ogwdw/uic/wells_coalbedmethanestudy.html)
  - Appendix A - Department of Energy - Hydraulic Fracturing White Paper (PDF) (23 pp, 495K)
  - Appendix B - Quality Assurance Plan (PDF) (14 pp, 139K)
  - Master References (PDF) (15 pp, 79K)

Attachments

You will need Adobe Reader to view some of the files on this page. See [EPA's PDF page](http://www.epa.gov/ogwdw/uic/wells_coalbedmethanestudy.html) to learn more.
WHY IS HYDRAULIC FRACTURING NOW A PROBLEM?

- Exploration in new geographic areas
- Severed Minerals Estates
- Highly Technical Process
- Misinformation from Press
- Incomplete water well testing
- Lack of Information from Oil and Gas Companies
- Trade Secrets from Service Companies.
Texas Regulators Cite

EPA Errors in Tests of Water Wells

BY RUSSELL GOLD

AUSTIN, Texas—In an ongoing bout between Texas and the Environmental Protection Agency over the safety of gas drilling, the Lone Star State claimed a victory Tuesday and took the opportunity to criticize the federal agency.

Texas regulators said that extensive testing showed that flammable water wells west of Fort Worth were not contaminated by nearby gas drilling, as the EPA maintained.

Instead, they said, evidence shows that the gas in a shallow water aquifer was migrating up from a rock formation directly underneath it.

The gas had a different “geochemical fingerprint” from gas found and extracted a mile lower in the Barnett shale rock formation, Texas officials said.

“This is an example of overreaching at its worst,” said Michael Williams, one of three elected commissioners who oversee oil and gas drilling. The EPA “has a built-in bias against the fossil fuel energy industry.”

Tuesday’s finding by Texas officials comes about three months after an EPA order to shut down the gas wells to prevent two houses from exploding.

At the time, the EPA criticized the state agency that regulates drilling, the Texas Railroad Commission, for failing to address the situation.

In a written statement, the EPA responded that it is standing by its belief that gas drilling contributed to the contamination and said it would not comply with Texas’ request to rescind its earlier order.

The state finding “is not supported by EPA’s independent, scientific investigation,” the agency wrote.

That didn’t stop Texas officials from alleging that the federal government peddled shoddy science. “Do your job based on facts,” Jim Keffler, chairman of the Texas Railroad Commission, Range, which has continued to operate the wells, is fighting the EPA in federal court to overturn the order that declared that its operations were endangered.
Hydraulic Fracturing - what is it?

- **Creation of artificial fracture systems** in reservoirs containing oil, gas, using water, steam

- Artificial fractures are **mechanically propped open** with sand, sintered bauxite, glass beads

- **Fluid is generally a water** or foam-based fluid and is viscosified with gelling agents, primarily guars

- **Additives** for control of clays, fluid loss to zone, friction reduction, gel breakers can be added.
AQUIFER

Pierre Shale

Induced FRACTURE ZONE

OIL RESERVOIR

Idealized Cross Section

Land surface

CEMENT
Oil producing formation

Fracture, propped open with water, sand, chemicals
View from the surface
(looking down)
So what is happening in Nebraska?

- 1000s of oil and gas wells have been fractured
- part of the permit to drill an oil/gas well
  - proper protective construction
  - layers of protection
- located in Panhandle and SW Nebr.
Oil and Gas Fields, SW & W Nebraska
Niobrara Gas Wells

- Chase, Dundy, Perkins (some in Cheyenne) Co.
- ~ 400 +/- gas wells, last 10 years
- ~ 95% of these wells were Hydraulically Fractured
Niobrara Shale in Wyoming
Water Use in H.F.

- Nationally: 2-5 Million Gallons per well
- **Nebraska**: 10,000s to 100,000 gallons typical
  - Purchased locally
    - City, Landowner
  - Stored in pits/tanks and mixed on-site

10,000 gallons = 0.03 acre ft or 0.36 acre inch
100,000 gallons = 0.3 acre ft or 3.6 acre inch
Surface Operation

Source: www.halliburton.com
Oil & Gas Challenge

- **Ultimately...**
  - Data Transparency
  - Data Availability
  - Ease of data entry and data review

- **Is needed.**
Making Data Available

a Chemical Registry Tool

- Simple tool that will allow Operators to voluntarily submit information regarding HF
  - Present this chemical data to application users to aid with understanding and transparency
  - **Educate** users on what is being shown and allow for user comments
  - Provide means to upload activities @ well level for viewing
  - Provide means to search for wells.
Welcome to FracFocus, the hydraulic fracturing chemical registry website. This website is a joint project of the Ground Water Protection Council and the Interstate Oil and Gas Compact Commission.

On this site you can search for information about the chemicals used in the hydraulic fracturing of oil and gas wells. You will also find educational materials designed to help you put this information in perspective.

Looking for information about a well site near you?

Search for nearby well sites that have been hydraulically fractured to see what chemicals were used in the process.
Main Menu Choices

- Hydraulic Fracturing, how it works
- Groundwater protection
- Chemical use
- Regulations by State
- Find a Well, by state
- Frequent Questions.
Groundwater Protection and Water Usage
Chemical Use

Chemical Use in Hydraulic Fracturing

Introduction to Chemical Use

Why Chemicals Are Used

What Chemicals Are Used

Chemicals & Public Disclosure

Looking for information about a well site near you?

Search for nearby well sites that have been hydraulically fractured to see what chemicals were used in the process.

www.FracFocus.org

WHY CHEMICALS ARE USED

Often today’s technology, chemicals must be used in hydraulic fracturing to ensure the producing formation is effectively treated. The charts shown below depict generic hydraulic fracturing chemical usage including the types of chemicals, their uses in the process, the consequences of not using them and the additive types and amounts which are typically used in the hydraulic fracturing of shales.

Read more

WHAT CHEMICALS ARE USED

As previously noted, chemicals perform many functions in a hydraulic fracturing job. Although there are dozens to hundreds of chemicals which could be used as additives, there are a limited number which are routinely used in hydraulic fracturing. The following is a list of the chemicals used most often. This chart is sorted alphabetically by the Product Function to make easier for you to compare to the fracturing records.

Read more
Chemical Use (by volume)

- Water and Sand: 99.51%
- Other: 0.49%
- Surfactant: 0.085%
- Friction Reducer: 0.088%
- Acid: 0.123%
- Gelling Agent: 0.056%
- Scale Inhibitor: 0.043%
- pH Adjusting Agent: 0.011%
- Breaker: 0.01%
- Crosslinker: 0.007%
- Iron Control: 0.004%
- Corrosion Inhibitor: 0.002%
- Biocide: 0.001%

www.FracFocus.org
For Example, on the Groundwater Protection Page...

State* Regulation of Well Construction (Oil/Gas Well)

- Cement Set-up Period or Test: 78%
- Production Casing Cement Height: 67%
- Production Casing: 89%
- Surface Casing Cementing Bottom to Top: 96%
- Surface casing below deepest Groundwater: 93%

*27 States, 2009

www.FracFocus.org
Oil and Gas Producing States....

31 states with some/any Oil & Gas Production
4 states have very minimal production
27 states regulations reviewed

12 states REQUIRE disclosure of H.F. chemicals:
Arkansas  Colorado  Louisiana  Michigan  Montana  New Mexico  North Dakota  Oklahoma  Pennsylvania  Texas  West Virginia  Wyoming
(+ 7 thinking about it)
Regulations by State

Colorado Contact Information

Oil and Natural Gas Representatives:
Colorado Oil & Gas Conservation Commission
Phone: 303.894.2100
Email: dnr.oogcr@state.co.us

Regulations:
- Learn More About Regulations
- View Colorado Regulations

- When you click links marked with the # symbol, you will leave the FracFocus website and go to websites that are not controlled by or affiliated with this site.

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4/25/11 to 4/19/13

Participating companies = 545
Reporting companies = 427
Disclosures reported = 42,709
Website visits = 488,122
Unique visitors = 331,580

Wells Reported by State....
Wyoming – 1577
Texas – 19709
Colorado – 5228
Nebraska – 1

-------- 42,709 total
LB635 ...

Provide powers and duties regarding hydraulic fracturing to the Nebraska Oil and Gas Conservation Commission

Enhancements to our site

We have added new features and applications to this site to make managing your operation simpler.

Introducing eForms. This application allows you to file our required regulatory forms quickly and without the need for postage and/or fax expense. Initially you are able to submit your well completion (Nebraska Form 5) reports. In the future all of our regulatory forms will be available through eForms. The tried and true PDF forms will remain available for those of you who prefer that approach. Please request your eForms username and password by calling our office at 308/254-6919.

Our GIS Data Mining has a new tooltip feature that makes it easier to identify wells and allows you to access and print scout tickets with fewer clicks. Just hover over a well for 1 or more seconds to see the tooltip. You will also notice that we have added a utility to view and print wellbore diagrams to the toolkit. This utility is also available through a new wellbore tab in the Details Pane. In the near future you will be able to export data from GIS Data Mining to use in your local management application(s). Just look for a printer icon next to tables and lists throughout the site. Additional plans for the future include the addition of orthographic photos map layer, Field - Unit - Lease map layer, Quarter/Quarter map layer and much more. The GIS Data Mining site has been tested and certified with Internet Explorer versions 7 and higher, Mozilla Firefox, Google Chrome and Apple Safari. Please see data mining requirements if you are having troubles.

www.nogcc.ne.gov
308/254-6919
Questions?