

Hydraulic Fracturing of Coalbed Methane Wells: A Threat to Drinking Water

We strongly urge the Senate, in considering energy legislation, to reject section 604 of S. 1766. This provision would effectively overturn two U.S. Court of Appeals decisions by amending the Safe Drinking Water Act (SDWA) to establish an unjustifiable 41-month moratorium on EPA regulation of hydraulic fracturing of coalbed methane wells—a risky activity that should be regulated to assure protection of public health and drinking water quality. This provision is unnecessary because a recent federal circuit court decision provides a flexible mechanism to regulate this activity’s impact on underground sources of drinking water.

The U.S. Court of Appeals for the Eleventh Circuit has twice ruled—most recently in December 2001—that hydraulic fracturing is in fact “underground injection” required to be regulated under the SDWA, and has directed the State of Alabama to regulate the procedure in accordance with Class II injection well requirements of the SDWA and with US EPA approval.^{1 2} In addition, the Eleventh Circuit found that regulation of hydraulic fracturing under the SDWA can be accomplished using the more flexible oil and gas injection regulatory provisions in SDWA section 1425, rather than the more stringent requirements of SDWA section 1422.³

Congress and the oil and gas industry should support the regulation of hydraulic fracturing of coalbed methane wells under section 1425 of the SDWA, since they have advocated that states should regulate all other oil and gas-related injection under the flexible terms of that provision for decades, while opposing regulation under section 1422.

In order to protect public health and the environment, the hydraulic fracturing of coalbed methane wells must be regulated under the SDWA. The potential for the toxic and carcinogenic chemicals used in hydraulic fracturing fluids to contaminate underground sources of drinking water (USDWs) is significant. Furthermore, it is important to prevent damage to soil and surface water caused by discharge of hydraulic fracturing fluids and produced water removed from coalbed methane wells.

Solution to Protect the Environment and Public Health

Congress should remove section 604 from S. 1766 in order to allow regulation of hydraulic fracturing of coalbed methane wells under section 1425 of the SDWA. This position would be consistent with the past support of Congress and the oil and gas industry for regulation of other oil and gas related injection under that flexible provision, and would leave in place two recent US Court of Appeals decisions finding that hydraulic fracturing is underground injection subject to the public health protection provisions of the SDWA. Congress should refuse to weaken the Safe Drinking Water Act’s requirement that hydraulic fracturing must be regulated in order to protect public health—without delay.

Background

The association of methane gas, (the primary component of natural gas), with coal formations has been recognized for centuries. Collection of methane gas from subsurface coal formations has historically been cost prohibitive due to the costs of drilling deep wells and removing large quantities of ground water. The increased market value for cleaner burning natural gas, improved technology, identification of large, thick, shallow coal formations, and Federal tax credits for coalbed methane development have resulted in dramatic growth of this industry during the past fifteen years. Exploration and identification of coal formations with good methane production potential in the Appalachian, Rocky Mountain, Plains, and Gulf

regions have oil and gas companies scrambling to secure mineral rights and finalize aggressive development plans.

Problems

“Desorption” or release of methane gas from coal in order to allow its collection occurs only when the pressure is sufficiently reduced by removing ground water from the porous, fractured coal formations. In an effort to increase the quantity of methane gas removed from coal formations, fluids are forced into the formation through a well at very high pressures to hydraulically fracture the coal seams. Sand particles in the hydraulic fluid prop up the widened and newly created fractures in the coal allowing more methane gas to escape after much of the hydraulic fluid and ground water have been pumped out the well(s).

The porosity and permeability that makes many coal formations effective receptacles for methane gas also allow them to hold large quantities of ground water that often serve as important sources of irrigation as well as drinking water, for humans and farm and ranch animals. For instance, the water contained by the coal formation of the southeastern Powder River Basin in Wyoming is high quality water that serves the domestic and agricultural needs of the region.⁴ Injecting hydraulic fracturing fluids into underground sources of drinking water risks permanent contamination of these valuable resources.

The greatest concern about the hydraulic fracturing of coalbed methane wells is that the fracturing fluids being pumped into ground water are likely to contain toxic and carcinogenic chemicals. Efforts by several environmental and ranching advocacy organizations to obtain chemical compositions of hydraulic fracturing fluids and other materials used in coalbed methane production have not been successful – oil and gas companies will not reveal what they say is proprietary information. A Bureau of Land Management (BLM) 1998 Environmental Impact Statement lists the hazardous substances potentially used as gelling agents in fracturing include toxic substances such as benzene, polycyclic aromatic hydrocarbons, ethylbenzene, toluene, xylenes, naphthalene, methanol, sodium hydroxide, and MTBE.⁵ The gelling agents are added to improve the ability of the hydraulic fracturing fluid to transport sand particles into widened and new fractures.⁶ The 950 gallons of hazardous gelling agents used in each well accounts for approximately 71% of the fracturing materials by volume (not including sand).⁷ Very small quantities of toxic chemicals such as benzene are capable of contaminating millions of gallons of water.

For example, only 28 tablespoons of MTBE could contaminate millions of liters of ground water at concentrations that would render it unusable.⁸

Although much of the injected fracturing fluids are pumped out of the ground, 20% to 30% of the fluids may remain in the ground.⁹

Another study by three Amoco scientists also discovered that a significant volume of fracturing fluids are not withdrawn.¹⁰ They found that the gelling agents remained in coal samples in spite of efforts to flush them with water and strong acids. The gelling agents in hydraulic fracturing fluids actually decreased the permeabilities of coal samples. They concluded that the reduced permeability caused by fracturing fluids could negate most of the benefits of hydraulic fracturing. More importantly, since these chemicals are not fully recovered, they could serve as continuous sources of ground water contamination.

One of the goals of S. 1766 is to remove MTBE from reformulated gasoline since it has contaminated drinking water sources across the country primarily via leaking underground storage tanks.¹¹

Ironically, hydraulic fracturing fluids that contain MTBE may be injected directly into underground sources of drinking water without appropriate Federal regulation under the SDWA.

The contamination of US sources of drinking water by MTBE has been instructive about the difficulty in remediation of contaminated ground water. Likewise, we should not allow the unregulated underground injection of toxic chemicals into drinking water sources via hydraulic fracturing of coalbed methane wells.

The discharge of hydraulic fracturing fluid and produced water to lands and surface water threaten the quality of soil and surface water. Citizens in Alabama, Virginia, Colorado, Wyoming, and Montana have complained about the adverse impacts that hydraulic fracturing of coalbed methane wells has had on the quality and supply of well water and the discharge of hydraulic fracturing fluids on land and in surface water. Coalbed methane developers are known to have violated Clean Water Act protections of discharge to surface water in Montana and Wyoming.^{12 13}

Citizen complaints of contamination of underground sources of drinking water contemporaneous with and near hydraulic fracturing of coalbed methane wells are known to have occurred in the states of Alabama, Colorado, Virginia, and Wyoming. Some examples of such complaints are listed below:

Alabama – Lake View – The Hocutt family’s water well became contaminated in June 1989 with brown, slimy, petroleum smelling fluid that was similar to the discharged hydraulic fracturing fluid that traveled downhill from the USX-Amoco methane well near their house (reportedly killing all plant and animal life in its path). Water from a landfill containing municipal and industrial wastes reportedly was used in the fracturing fluid. USX-Amoco closed the well and bulldozed the site in 1991. Ms. Hocutt and her husband have both experienced a variety of diseases including cancers of unknown etiology. At least 8 more neighbors also have some form of cancer of unknown etiology. EPA Region IV staff collected only two grab samples from the well 6/26/90. No *targeted* contaminants were detected in the samples.¹⁴

Alabama – Adger – Francis Herring complained of an oily smell in her drinking water in 1989 after hydraulic fracturing of a nearby coalbed methane well. AL Dept. of Env. Management implied receipt of similar complaints elsewhere when their first question was whether or not there was a methane gas well nearby. EPA Region IV staff collected only two grab samples from the well 6/26/90. No *targeted* contaminants were detected in the samples.¹⁵

Alabama – Adger – The McMillian family’s drinking water well became contaminated with an oily substance and methane gas after hydraulic fracturing of a coalbed methane well near their home. A private consultant’s testing results confirmed the presence of methane gas in the water well. Alabama Oil & Gas Board (OGB) only tested for naturally occurring contaminants. EPA did not sample and test the well water until nearly 10 months after the event. EPA samples did not contain contaminants, but ordered the core well sealed to prevent escape of methane gas. State agencies claimed not to have a complete list of chemicals contained in the hydraulic fracturing fluid. MSDS were finally obtained for the fracturing fluid through a FOIA request. The McMillians had to haul their own water for seven years until they installed a whole house filtration system. They have no assurances that the problem will not occur again.¹⁶

Virginia – Wise County – A car wash business located near a coalbed methane well hydraulic fracturing project was forced to close when its well water became too contaminated to operate.¹⁷

Virginia – Buchanan County – Sheila McClanahan – Buchanan Citizens Action Group claims that over 100 documented complaints of adverse effects of hydraulic fracturing of coalbed methane wells have been received by the state, but have allegedly been intentionally misclassified and filed as impacts of long-wall coal mining.¹⁸

Virginia – Dickenson County – Dickenson County Citizens Committee claim ground water quality has deteriorated throughout the county as a result of the large number of coalbed methane well hydraulic fracturing events. Only 40% of the county is served by public water.¹⁹

Oil and gas companies developing and fracturing coalbed methane wells in Alabama claim that evidence does not exist that links contamination of underground sources of drinking water to their activities. However, the investigations of complaints in Alabama were late and misguided. Water samples were collected from contaminated wells at least six months after the initial occurrence of water quality problems and analyses did not target all chemicals that present health concerns and are known to exist in hydraulic fracturing fluid.²⁰

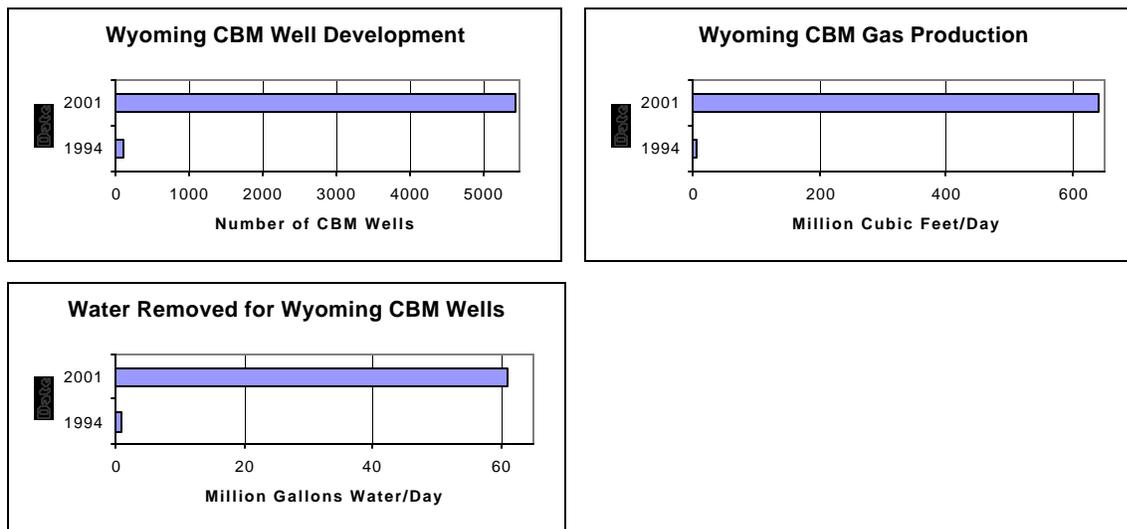
State agencies that have oversight responsibility for coalbed methane development have been largely unresponsive to concerns and complaints from the public. Examples of this include:

- Claims by Virginia organizations that Virginia Division of Mineral Resources have received over 100 complaints about the adverse effects of hydraulic fracturing of coalbed methane wells but have intentionally classified and filed them as complaints about long wall coal mining to conceal the existence of impacts by coalbed methane development in southwest Virginia.²¹
- A letter from Harold D. Kemp, Assistant Director, Wyoming Office of State Lands and Investments to Wyoming Coal Bed Methane Operators encourages operators to save money associated with higher permitting costs for federal wells and compliance with NEPA, and other laws, by drilling on largely unregulated state land.²²
- The director of the Alabama Oil & Gas Board has threatened residents who have complained about contamination of their water wells by hydraulic fracturing of coalbed methane wells with liability for waste if their water wells are generating methane gas.²³

Planned Development

Approximately 7.5 percent of the total natural gas production in the US is comprised of coalbed methane.²⁴ Estimates of technically recoverable coalbed methane in the conterminous US have increased in recent years with new and improved information about the geology of coal basins.²⁵

The magnitude of acceleration of US coalbed development is illustrated by the production activity in the Powder River Basin located in Wyoming and Montana. There were 110 coalbed methane wells in the basin in May 1994 producing 6.5 million cubic feet per day, and 949,637 gallons of water per day.²⁶ (Figures 1-3) In May 2001, only seven years later, there were 5,446 wells producing 642 million cf/day requiring the removal of 61.1 million gallons of water per day.²⁷ (Figures 1-3)



Figures 1 to 3 – Illustration of the exponential growth of coalbed methane development in the Powder River Basin, Wyoming from May 1994 to May 2001.

Approximately 51,000 coalbed methane wells are planned for the Powder River Basin in Wyoming alone.²⁸ Approximately 25,000 additional coalbed methane wells are planned for the Montana portion of the Powder River Basin.²⁹

Exponential increases in coalbed methane development in the Powder River Basin could be accompanied by massive environmental impacts, including threats to drinking water quality and supply—particularly without Federal regulation.

Recent Federal Court Decisions

In response to complaints of drinking water well contamination in areas of Alabama where hydraulic fracturing of coalbed methane wells was occurring, the Legal Environmental Assistance Foundation sued US EPA to require that this process be regulated under the SDWA in an effort to prevent future contamination. In 1997 the US Court of Appeals for the Eleventh Circuit ruled that hydraulic fracturing of coalbed methane wells is in fact “underground injection” and must be regulated under the Safe Drinking Water Act.³⁰ The Eleventh Circuit found that Congress intended all underground injection activities to be regulated under state and Federal Underground Injection Control programs.³¹

In January 2000 the Legal Environmental Assistance Foundation brought another suit against US EPA for approving Alabama’s revised underground injection control program when it contained several alleged deficiencies. The most recent ruling by the US Court of Appeals for the Eleventh Circuit again directed US EPA to require Alabama to regulate hydraulic fracturing of coalbed methane wells as Class II injection wells in accordance with the SDWA.³² In addition, the Eleventh Circuit found that regulation of hydraulic fracturing under the SDWA can be accomplished using the more flexible oil and gas injection regulatory provisions in SDWA section 1425, rather than the more stringent requirements of SDWA section 1422. Section 1422 strongly discourages, but in limited circumstances may allow injection into underground sources of drinking water by Class II wells, and requires EPA to establish strict and detailed regulations for such wells. Section 1425 allows states to establish their own oil and gas injection control programs (which need not track EPA rules, so long as they meet the flexible test of being “an effective program to prevent underground injection which endangers drinking water sources”).

These US Court of Appeals decisions have significant ramifications for coalbed methane producers operating in other states. Coalbed methane wells utilizing hydraulic fracturing in states where this practice is not regulated simply need to urge their state to adopt a section 1425 program to subject them to regulation under the SDWA. States not regulating hydraulic fracturing under the SDWA will need to adopt regulatory programs governing such injection to maintain primacy over their Underground Injection Control programs. However, this is far from an unreasonable burden. All states with significant oil and gas activity already have had their section 1425 programs approved by EPA for all other oil and gas-related injection, and there is no reason that these programs cannot be modestly amended (if any amendment is needed at all) to regulate hydraulic fracturing.

¹ LEAF v. EPA, 118 F. 3d 1467 (11th Cir. 1997)

² LEAF v. EPA, No. 00-10381, 2001 U.S. App. LEXIS 27066 (11th Cir., Dec., 21, 2001)

³ Id.

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- ⁴ Testimony of Dr. Gene Whitney, Supervisory Geologist, US Geological Survey, Oversight hearing on “The Orderly Development of Coalbed Methane Resources from Public Lands,” Subcommittee on Energy and Mineral Resources, Committee on Resources, US House of Representatives, September 6, 2001.
- ⁵ Bureau of Land Management, Colorado State Office, Glenwood Springs Resource Area - Oil & Gas Leasing & Development Draft Supplemental Environmental Impact Statement, June, 1998, Appendix L: Hazardous Materials Summary, pp. L-1, L-4-5.
- ⁶ Puri, R., G.E. King, and I.D. Palmer, 1991, “Damage to Coal Permeability During Hydraulic Fracturing,” Society of Petroleum Engineers Proceedings from Rocky Mountain Regional Meeting and Low-Permeability Reservoirs Symposium, Denver, CO, p. 109-115, (SPE # 21813).
- ⁷ Bureau of Land Management, Colorado State Office, Glenwood Springs Resource Area - Oil & Gas Leasing & Development Draft Supplemental Environmental Impact Statement, June, 1998, Appendix L: Hazardous Materials Summary, pp. L-1, L-4-5.
- ⁸ Johnson, R., et al., “MTBE: To What Extent Will Past Releases Contaminate Community Water Supply Wells?,” Environ. Sci. Technol. 2000, 34 (9), 210 A-217 A.
- ⁹ I.D. Palmer et al., Comparison between Gel-Fracture and Water-Fracture Stimulations in the Black Warrior Basin, Proceedings of the 1991 Coalbed Methane Symposium 233, 237.
- ¹⁰ Puri, R., G.E. King, and I.D. Palmer, 1991, “Damage to Coal Permeability During Hydraulic Fracturing,” Society of Petroleum Engineers Proceedings from Rocky Mountain Regional Meeting and Low-Permeability Reservoirs Symposium, Denver, CO, p. 109-115, (SPE # 21813).
- ¹¹ Johnson, R., et al., “MTBE: To What Extent Will Past Releases Contaminate Community Water Supply Wells?,” Environ. Sci. Technol. 2000, 34 (9), 210 A-217 A.
- ¹² Personal communications with staff of Northern Plains Resource Council and Powder River Basin Resource Council, December 2001 and January 2002.
- ¹³ Sink, M., “Wyoming: Groups File Pollution Suit,” New York Times, National Briefing, January 19, 2002, p. A10.
- ¹⁴ Comments submitted to EPA Water Docket W-01-09 in response to in Response to 7/30/01 Fed. Reg. Notice Requesting Information Of Ground Water Contamination Incidents Believed To Be Due To Hydraulic Fracturing Of Coalbed Methane Wells. EPA conducted extractable and purgeable organics analyses that did not assess all hydraulic fracturing fluid components.
- ¹⁵ Id. Also, November 13, 1990 The Tuscaloosa News article submitted to EPA water docket.
- ¹⁶ Comments submitted to EPA Water Docket W-01-09 in response to in Response to 7/30/01 Fed. Reg. Notice Requesting Information Of Ground Water Contamination Incidents Believed To Be Due To Hydraulic Fracturing Of Coalbed Methane Wells. Also, see LEAF v. EPA, 118 F. 3d 1467 (11th Cir. 1997)
- ¹⁷ Comments submitted to EPA Water Docket W-01-09 in response to in Response to 7/30/01 Fed. Reg. Notice Requesting Information Of Ground Water Contamination Incidents Believed To Be Due To Hydraulic Fracturing Of Coalbed Methane Wells.
- ¹⁸ Public comments submitted by Sheila McClanahan on behalf of the Buchanan Citizens Action Group to EPA for the August 24, 2000 public hearing about EPA’s proposed study of hydraulic fracturing of coalbed methane wells as well as telephone conversations with other concerned citizens from Buchanan and Dickenson Counties.
- ¹⁹ Comments submitted to EPA Water Docket W-01-09 in response to in Response to 7/30/01 Fed. Reg. Notice Requesting Information Of Ground Water Contamination Incidents Believed To Be Due To Hydraulic Fracturing Of Coalbed Methane Wells.
- ²⁰ Id. Also, January 2002 personal correspondence with David Ludder, General Counsel, Legal Environmental Assistance Foundation and lead attorney for LEAF v. EPA, No. 00-10381, 2001 U.S. App. LEXIS 27066 (11th Cir., Dec., 21, 2001).
- ²¹ Public comments submitted by Sheila McClanahan on behalf of the Buchanan Citizens Action Group to EPA for the August 24, 2000 public hearing about EPA’s proposed study of hydraulic fracturing of coalbed methane wells as well as telephone conversations with other concerned citizens from Buchanan and Dickenson Counties.
- ²² Darin, Thomas F. and Amy W. Beatie, 2001, “Debunking the Natural Gas “Clean Energy” Myth: Coalbed Methane in Wyoming’s Powder River Basin,” The Environmental Law Reporter, 31 ELR 10566.
- ²³ January 2002 personal correspondence with David Ludder, General Counsel, Legal Environmental Assistance Foundation and lead attorney for LEAF v. EPA, No. 00-10381, 2001 U.S. App. LEXIS 27066 (11th Cir., Dec., 21, 2001).
- ²⁴ Nuccio, Vito, 2000, “Coal-Bed Methane: Potential and Concerns,” US Geological Survey, Fact Sheet FS-123-00.
- ²⁵ Testimony of Dr. Gene Whitney, Supervisory Geologist, US Geological Survey, Oversight hearing on “The Orderly Development of Coalbed Methane Resources from Public Lands,” Subcommittee on Energy and Mineral Resources, Committee on Resources, US House of Representatives, September 6, 2001.
- ²⁶ Id.
- ²⁷ Id.

²⁸ Environmental Impact Statement for Coalbed Methane Development in the Powder River Basin, Wyoming, Bureau of Land Management, January 18, 2002.

²⁹ The Bureau of Land Management anticipates releasing the Environmental Impact Statement for coalbed methane development in Powder River Basin in Montana sometime in February 2002.

³⁰ LEAF v. EPA, 118 F. 3d 1467 (11th Cir. 1997)

³¹ Id.

³² LEAF v. EPA, No. 00-10381, 2001 U.S. App. LEXIS 27066 (11th Cir., Dec., 21, 2001)