SURVEY RESULTS
ON
INVENTORY AND EXTENT
OF HYDRAULIC FRACTURING IN
COALBED METHANE WELLS IN
THE PRODUCING STATES

DECEMBER 15, 1998

CONDUCTED BY:
GROUND WATER
PROTECTION COUNCIL

GROUND WATER PROTECTION COUNCIL
827 NW 63rd, Suite 103, Oklahoma City, OK 73116
INTRODUCTION

Over the past months, the Ground Water Protection Council (GWPC) has been engaged in discussions related to potential additional regulation of hydraulic fracturing in coalbed methane operations by the states. The GWPC became involved in this matter following a GWPC Board of Directors Resolution in support of the USEPA and its position in a lawsuit brought by the Legal Environmental Assistance Foundation (LEAF). In that suit, the U.S. Court of Appeals for the Eleventh Circuit determined that the definition of underground injection under the Safe Drinking Water Act's UIC provisions was broad enough to include hydraulic fracturing of coalbed methane wells. The court remanded the matter back to EPA for re-examination of the UIC provisions and the practice of hydraulic fracturing in coalbed methane operations. The GWPC filed an Amicus Curiae Brief supporting the EPA's argument in their request for a re-hearing that hydraulic fracturing did not meet the definition of "underground injection". The request for re-hearing was denied and the EPA is now gathering information to assist them in making a regulatory determination on hydraulic fracturing in coalbed methane operations.

The GWPC has not conceded on this issue and will continue to make its position known on a technical basis to the EPA and others as necessary. However, we concurrently took it upon ourselves to conduct a survey of the state oil and gas regulatory agencies that we believe will be useful to the EPA as it responds to the Court's decision.

The survey was developed by a team of state agency representatives and sent to twenty-five oil and gas producing states. Among the twenty-five respondents were all of the major coal producing states in which any coalbed methane gas was produced in 1997. The results of that survey follow. Individual state surveys appear in the Appendix.

A summary of this survey can be found at the GWPC website: gwpc.site.net. Additional hard copies can be obtained by contacting the Ground Water Protection Council at (405) 516-4972.
# SURVEY

HYDRAULIC FRACTURING IN COAL BED METHANE WELLS

<table>
<thead>
<tr>
<th>States Replying to Survey</th>
<th>Number of Wells</th>
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<tbody>
<tr>
<td>1. Alabama</td>
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<tr>
<td>2. Alaska</td>
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</tr>
<tr>
<td>3. Arkansas</td>
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<td>4. California</td>
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<td>5. Colorado</td>
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<td>9. Kansas</td>
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<td>24. Virginia</td>
<td>1,504</td>
</tr>
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<td>25. Wyoming</td>
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**Total Wells** 10,373
SURVEY

HYDRAULIC FRACTURING IN COALBED METHANE WELLS

I. Extent of Hydraulic Fracturing

1. Is hydraulic fracturing practiced in your state for coal bed methane wells?

2.a. How many coal bed methane wells are there in your state, regardless of whether they have ever been hydraulically fractured? Do not include wells that have already been plugged and abandoned.

b. Using your best professional judgement, what percentages of the wells in (2.a) have or will be hydraulically fractured? Are any of these wells likely to be fractured more than one time?

3. How many hydraulic fracturing jobs were performed on your state during 1997 on coal bed methane wells?

4. Is the number of coal bed methane hydraulic fracturing jobs in your state likely to increase, decrease, or remain at about the same level over the next several years? Please explain your answer.

II. Regulatory Issues

5. Do you currently regulate coal bed methane hydraulic fracturing activities? If so, please explain your regulatory structure for these activities.

III. Documented Cases of Contamination Attributable to Hydraulic Fracturing

6. Please indicate whether you have had any complaints attributable to coal bed methane hydraulic fracturing activities in your state.

a. Was your agency able to substantiate that any of these cases resulted in contamination of a USDW or to increased risk to human health? If so, was your agency able to determine that coal bed methane hydraulic fracturing activities were the cause of the resultant damage? Were any other factors directly responsible for or contributory to such damage? Please provide details.

7. What response did your agency make to the complaints?

Please mail or fax your responsible to the GWPC. 405-516-4973(fax)
SURVEY RESULTS
Hydraulic Fracturing of Coal Bed Methane Wells

Question 1: Is hydraulic fracturing practiced in your state for coal bed methane wells?

Responses: Twelve (12) states responded yes, eleven (11) states responded no and one (1) state was unsure.

Question 2a: How many coal bed methane wells are there in your state, regardless of whether they have ever been hydraulically fractured? (Not including wells that have already been plugged and abandoned.)

Responses: Twelve (12) states responded that there were no wells of such nature and (4) states reported that there were between one (1) and ten (10) wells. The remaining states answered as follows: IN-23, OK-250, UT-260, WY-525, KS-600, CO-1300, VA-1504, NM-2398, and AL-3500.

Question 2b: Using your best professional judgement, what percentage of the wells in 2a have or will be hydraulically fractured?

Responses: Sixteen (16) states responded that no wells would be hydraulically fractured, six (6) states reported that 50% or more have been hydraulically fractured and three (3) states responded that 100% of the wells were hydraulically fractured.
Question 2b2: Are any of these wells likely to be fractured more than once?

Responses: For sixteen (16) states this question was not applicable, five (5) states responded no, three (3) states responded yes, and one (1) state was unknown.

Question 3: How many hydraulic fracturing jobs were performed in your state during 1997 on coal bed methane wells?

Responses: Eighteen (18) states responded there were no jobs in '97. The remaining states responded as follows: NM-44, UT-60, CO-70, KS-100, OK-175, VA-238, and AL-450.

Question 4: Is the number of coal bed methane hydraulic fracturing jobs in your state likely to increase, decrease, or remain at about the same level over the next several years?

Responses: For eleven (11) states the question was not applicable. Five (5) states responded that the number would remain the same, eight (8) responded that it would possibly increase, and one (1) reported that the number would decrease.
Question 5: Do you currently regulate coal bed methane hydraulic fracturing activities?

Responses: Seven (7) states responded yes, eight (8) states responded no, and seven (7) states responded N/A. Three (3) states responded that there were other state agencies in charge of regulation.

![Question 5 Chart]

Question 6: Please indicate whether you have had any complaints attributable to coal bed methane hydraulic fracturing activities in your state.

Responses: Twenty-four (24) states responded no and one (1) state responded yes.

![Question 6 Chart]

Question 6a: Was your agency able to substantiate that any of these cases resulted in contamination of a USDW or to increased risk to human health?

Responses: The one state responding yes to Question 6, AL, found no substantiation to the claims.

Question 7: What response did your agency make to the complaints?

Responses:

AL: Discussions have been held with landowners followed by site investigation of water supply wells that were claimed to have been affected by coal bed methane hydraulic fracturing activities. Water samples were collected and analyzed at the agency’s expense.

One complaint involved three (3) regulatory agencies; the State Oil & Gas Board of Alabama; the Alabama Dept. of Environmental Management (the water pollution control agency for the State of Alabama); and the United States Environmental Protection Agency. All three (3) agencies conducted site investigations and collected and analyzed water samples. None of these agencies could confirm that the quality of water had been degraded as a result of coal bed methane hydraulic fracturing activities.
Conclusions

The purpose of this survey was to establish an accurate assessment (as of 1997) of the number of active coalbed methane wells in the individual states and the extent to which any associated hydraulic fracturing has and will continue to occur. The survey also sought information on state-substantiated contamination that has occurred to a USDW that could be directly related to the fracturing of a coal bed.

In order to minimize the time burden on the state agencies the survey was limited to answering the above. Although there were other questions that might have been added, the state workgroup that designed the survey felt the most important information to collect would be that which helped define the geographic scope of the coalbed methane industry and the level of activity within each state. From this information, any future program reviews would be able to determine the relative potential for contamination and the need, or lack there of, for additional regulation.

Of the twenty-five (25) states surveyed and responding, thirteen reported having any coalbed methane wells. Four of the thirteen had less than ten wells while the remaining nine showed inventories ranging from 23 to 3500 wells. Of the approximately 10,373 wells in the U.S., 10,260 of them are found in eight states: Oklahoma, Wyoming, Colorado, Utah, New Mexico, Kansas, Virginia, and Alabama. The majority of these wells have already been hydraulically fractured to enhance or stimulate gas production. There were approximately 1130 wells hydraulically fractured in 1997.

Of the eight major producing states, four have regulatory or oversight programs in place specifically for coalbed methane wells. In the remaining four, the process is regulated under the states' general oil and gas production rules. To date a total of only
one drinking water related complaint of contamination from the hydraulic fracturing of coalbed methane wells has been received and reviewed (Alabama). After hydrologic and reservoir investigation and tests, including collection and analysis of water samples by several agencies, none of the claims were substantiated.

Based upon this survey, as well as previous technical presentations and open meeting discussions among the various member states, the GWPC continues to believe that additional federal regulations regarding coalbed methane wells are unnecessary to protect underground sources of drinking water. There is no evidence to support the claims by some that public health is at risk as a result of the hydraulic fracturing of coalbeds used for the production of methane gas.

Existing state authorities and oversight of this process have been obviously sufficient to protect USDW's from contamination related to these wells. If additional federal regulations were to be imposed they would not be based on scientific observation of associated contamination and there would be little if any increase in protection of public health and the environment. However, new regulations could impose a significant additional financial burden on the states.

The other state programs regulated under the Safe Drinking Water Act have seen their annual federal budget double and triple over the last 10 years. During that same time, the UIC State Grants budget has remained constant at $10.5 million. This amount must be spread among all 50 states to regulate four different types of UIC programs (Classes I, II, III, V). Adding an additional regulatory burden on the states will only dilute their ability to be responsive in each of these programs. New regulations could
also impede oil and gas development within the states and contradict the original intent of the SDWA, Section 1425 legislation.
APPENDIX

Overview of Coalbed Methane Production

State Surveys
The story of methane: An overview

In a way, this is a story of primordial soup. It all started hundreds of millions of years ago when swampy vegetation began to rot and be covered over by layers of clay. Over the millennia, that organic matter continued to decay, separated from oxygen, forming first peat and eventually layers of coal. Within those layers, water pressure trapped one of the by-products of the transformation — methane gas.

The story from there is more familiar. Coal, being an important fossil fuel, gave rise to an expansive industry. The methane gas trapped in that coal proved to be a danger to the miner and the mining process. Many techniques were tried, including the familiar canary in a cage, to at first detect the methane and then remove it from the mine. For years large ventilators have been used to blow millions of cubic feet of methane gas out of the mines and into the atmosphere. Continued concern over mine safety and the realization that a valuable energy resource was being lost led to a closer examination of the problem.

The U.S. Bureau of Mines began a research program in cooperation with U.S. Steel to find ways to remove methane gas, which is a major component of natural gas, from coal before it is mined. Part of that program resulted in the first coaled methane wells in Alabama, drilled in 1971 near Oak Grove in Jefferson County.

Commercial production of coaled methane in the Warrior Coal Basin began in 1980 at Pleasant Grove. The methane industry grew from there, and today, Alabama leads the nation in its development.

In 1984, Alabama became the first state to adopt regulations governing coaled methane production. These regulations are a model for other states with coaled methane development potential.

"We're a new industry, and we've worked with regulatory agencies in an effort to go beyond what's necessary to make our work compatible with the area," said Jerry Sanders, president of Black Warrior Methane. "We owe a lot of credit to the efforts made by the University of Alabama and its early pilot projects through the School of Mines and Energy Development."

Methane's importance as a fuel is due in part to the fact that, at our current consumption rate, the United States could use its proven conventional gas reserves of 195 trillion cubic feet in about 10 years.

Coaled methane resources in the United States are estimated at 600 trillion cubic feet. If only 50 percent of this resource can be recovered, it will equal the existing proven conventional reserves.

"Coaled methane doesn't have the pollution threat that imports crude oils has," said Sanders. "It's the cleanest burning and most environmentally sound of the fossil fuels."

For the most part, Alabama's methane is pipeline quality gas. As much as one-half of the methane gas produced in the Warrior Basin could be used by Alabama consumers.

Locating drilling sites

"Pump jacks" like this one at a completed well in north Tuscaloosa County have become familiar sights in the area. The pump is used to remove water from the coal so that methane can flow to the surface.

"The first step in establishing a well, obviously, is to find a coal seam. In Alabama, that's made easier by previous coal mining operations. But in some parts of the state, there's not a clear history to guide developers," said Sanders.

"At each site, we try to interpret their electric logs for coal, based on what we know today," said Dr. Reed Holland, methane consultant and former head of the University of Alabama's School of Mines and Energy Development.

Geological evaluations also involve using high- and low-altitude infrared photography and side-looking radar imagery to pick out features that indicate favorable areas for gas production.

Obtaining approvals

Workers on a "frac" crew are preparing for the next high-pressure injection of water and other fluids into the well bore. The process will crack the underground coal so that it will produce methane.

"Now you're seeing more attention to slopes and grades. Instead of just putting a road anywhere, you are now seeing people selecting routes, not for what is the easiest way to initially put in a road, but for what's going to be most effective in terms of erosion and cost to maintain over a longer period of time."

Along with the road, methane companies install field pipelines to transport water and gas that will be produced from the wells once drilling operation is complete.

Drilling wells

Coal seams exist in layers at various levels below ground, from very shallow to quite deep, so all wells aren't the same. But drilling usually begins with a 300-foot segment, and steel pipe is placed into that hole and surrounded by cement. This special surface casing is put in to allow residential and commercial growth near the project area without disturbing the drilling site.
Overview

Continued from Page 21 called, is designed to protect shallow water sources. Drilling then continues through the layers of earth and coal, sometimes thousands of feet, and production pipe is installed into the hole.

Most coalbed methane wells in Alabama range between 1,000 and 4,000 feet deep and take from one to five days to drill, depending on many factors. By comparison, conventional oil and gas wells in Alabama can be as deep as 22,000 feet and take up to a year to drill.

Fracturing coal

Once the production pipe is securely in place, holes are punched through it into the seams of coal to be produced. The well is then ready for fracturing, a process which creates a system of cracks in the coal through which both the gas and the groundwater holding the gas in place can be removed.

"Fracturing coal is a straightforward hydraulic process in which you use fluid under pressure to force open cracks in the coal seams," said Alex Farris, president of DE-GAS Inc.

Coal is crystalline in structure, and within that structure, it has natural fractures called cleats, which are generally at right angles to each other. These cleats are where coal naturally cracks.

"It's the same principle diamond cutters use to cut stones," Farris explained. "That structure makes coal crack in a very predictable way, usually along a major cleat that runs in a northeast/southwest direction.

The fracturing process breaks what are in effect miniature underground pipes or conduits. Operators then pump water or other fluids, mixed with sand into the cracks.

"When you punch the water out, the sand keeps the fractures open," said Farris. "The sand that's used is spherical — the grains are round.

"Imagine a handful of marbles. If you hold those marbles in your hand and blow through one side of them, the air will come out the other side because of the voids or openings around the marbles."

Extracting water and gas

"Since, in this part of the country, gas and water exist together, you have to pump the water out for two reasons," Farris said. "One, it's a hydraulic stopper on the formation, but primarily it inhibits the flow of gas through the fractures in the coal."

The less water in the coal, the more easily the gas can flow to the well bore and on to the surface.

Production begins

The process is gradual and the time it takes varies. Some wells produce gas within 30 to 60 days, while others have to be pumped for six months.

"Usually for the life of the well, you'll pump a little water," Farris said. "After initial pumping, the volume of water drops at some point, and generally speaking, gas increases at that same point.

"Coalbed methane releases vary slowly at low pressure, which results in a much safer energy production process than conventional gas wells, where it's not unusual to see hundreds of pounds of pressure."

Gas piped from the wells goes to a system designed to remove any remaining water vapor and then flows through a meter to measure production. The State Oil and Gas Board requires operators to turn in monthly reports containing the volume of gas and water produced.

Once the methane gas has been separated from water and metered, it begins its journey to market, it travels through a network of pipes to a central compressor station, where it is pressurized and dried to standards of the purchasing company.

"Sometimes, depending on how far away the central compressor station is," Farris explained, "it may be necessary to have smaller booster compressors to make sure the gas continues to flow. Each project must be engineered for the amount of gas you make, the distance you have to move the gas and the water, and also the terrain all of this has to go over — hills and valleys, etc. It's a fine art to do it correctly."
STATE SURVEYS

The following states reported that there was no Hydraulic Fracturing of Coal Bed Methane Wells. Arkansas, California, Florida, Georgia, Louisiana, Mississippi, Nebraska, New York, North Dakota, Pennsylvania, South Dakota and Texas. The surveys of the remaining states are compiled herein.
1. Extent of Hydraulic Fracturing

Question:
1. Is hydraulic fracturing practiced in your state for coal bed methane wells?

Response:
Yes.

Question:
2.a. How many coal bed methane wells are there in your state, regardless of whether they have ever been hydraulically fractured? Do not include wells that have already been plugged and abandoned.

Response:
Approximately 3,500.

Question:
2.b. Using your best professional judgement, what percentage of the wells in 2.a. have or will be hydraulically fractured?

Response:
Approximately 94 per cent.

Question:
Are any of these wells likely to be fractured more than once time?

Response:
Yes.

3. How many hydraulic fracturing jobs were performed in your state during 1997 on coal bed methane wells?

Response:
Approximately 450-500.

Question:
1. Is the number of coal bed methane hydraulic fracturing jobs in your state likely to increase, decrease, or remain at about the same level over the next several years? Please explain your answer.

Response:
Hydraulic fracturing jobs should remain at about the same level because the number of wells to be permitted and drilled and the number of maintenance fracturing jobs on existing wells are expected to be comparable to 1997 statistics.
II. Regulatory Issues

Question:
5. Do you currently regulate coal bed methane hydraulic fracturing activities? If so, please explain your regulatory structure for these activities.

Response:
Yes, the Board has regulated fracturing operations since promulgating its first rules governing the exploration for and production of oil and gas resources in Alabama during 1946. The Board's current rules that regulate fracturing operations statewide are as follows:

Rule 409-1-3-.02, Notice of Activities. (1)... In addition, the (Oil and Gas) Supervisor shall be notified and approval obtained thereof prior to performing any of the following operations: ... (h) Chemical treatment or fracturing... (2) The Supervisor may send a duly authorized representative to the location to witness such operations.

Rule 400-1-3-.14, Notice of Intention to Chemically Treat, or Fracture a Well. Wells shall not be chemically treated, or fractured, until the permission of the (Oil and Gas) Supervisor is obtained. Each well shall be treated, or fractured, in such manner as will not cause injury to the formation, or result in water encroachment into the oil or gas formation, and necessary precautions shall be taken to prevent injury to the casing... If chemical treatment, or fracturing results in irreparable injury to the well or to the oil and gas formation, the well shall be properly plugged and abandoned.

Rule 409-1-3-.15, Report of Well Treatment. Within thirty (30) days after the chemical treating, or fracturing of a well, a report shall be filed with the Board in triplicate by the operator on Form OGB-6 setting forth in detail the method used in treating the well. (A copy of Form OGB-6 is attached for reference.)

III. Documented Cases of Contamination Attributable to Hydraulic Fracturing.

Question:
6. Please indicate whether you have had any complaints attributable to coal bed methane fracturing activities in your state.

Response:
Yes.

Question:
a. Was your agency able to substantiate that any of these cases resulted in contamination of a USDW or to increased risk to human health?

Response:
No.
Question:
If so, was your agency able to determine that coal bed methane hydraulic fracturing activities were the cause of the resultant damage?

Response:
We were unable to substantiate that contamination had occurred as a result of coal bed methane hydraulic fracturing activities.

Question:
Were any other factors directly responsible for or contributory to such damage?

Response:
We were unable to substantiate that contamination had occurred.

Question:
7. What response did your agency make to the complaints?

Response:
Discussions have been held with landowners followed by site investigations of water supply wells that were claimed to have been affected by coal bed methane hydraulic fracturing activities. Water samples were collected and analyzed at the agency's expense.

One complaint involved three (3) regulatory agencies: the State Oil & Gas Board of Alabama; the Alabama Department of Environmental Management (the water pollution control agency for the State of Alabama); and the United States Environmental Protection Agency. All three (3) agencies conducted site investigations and collected and analyzed water samples. None of these agencies could confirm that the quality of water had been degraded as a result of coal bed methane hydraulic fracturing activities.
ALASKA OIL AND GAS
CONSERVATION COMMISSION

Survey Response
HYDRAULIC FRACTURING IN COALBED METHANE WELLS

I. Extent of Hydraulic Fracturing

1. Is hydraulic fracturing practiced in your state for coalbed methane wells?  
No

2. a. How many coalbed methane wells are there in your state, regardless of whether they have ever been hydraulically fractured? Do not include wells that have already been plugged and abandoned.  3  
b. Using your best professional judgement, what percentage of the wells in 2a have or will be hydraulically fractured? Are any of these wells likely to be fractured more than one time?  0

3. How many hydraulic fracturing jobs were performed in your state during 1997 on coal bed methane wells?  0

4. Is the number of coal bed methane hydraulic fracturing jobs in your state likely to increase, decrease, or remain at about the same level over the next several years? Please explain your answer. Increase  
Alaska's coal bed methane industry is truly in its infancy. The first three coal bed methane wells were drilled earlier this year. One of these wells is currently being dewatered prior to initial production. The other two are awaiting agency approval of disposal operations before they may be dewatered.

II. Regulatory Issues

5. Do you currently regulate coal bed methane hydraulic fracturing activities? If so, please explain your regulatory structure for these activities. Yes. It will be regulated the same as conventional oil field fracturing activities. Initial fracturing must be reviewed and authorized by Sundry Approvals. Subsequent activities in proven fields need not submit Sundry's

III. Documented Cases of Contamination Attributable to Hydraulic Fracturing

6. Please indicate whether you have had any complaints attributable to coal bed methane hydraulic fracturing activities in your state. None  
a. Was your agency able to substantiate that any of these cases resulted in contamination of a USDW or in increased risk to human health? If so, was your agency able to determine that coal bed methane hydraulic fracturing activities were the cause of the resultant damage? Were any other factors directly responsible for or contributory to such damage? Please provide details. N/A

7. What response did your agency make to these complaints? N/A
COLORADO
SURVEY
HYDRAULIC FRACTURING IN COALBED METHANE WELLS

I. Extent of Hydraulic Fracturing

1. Is hydraulic Fracturing practiced in you state for coal bed methane wells?
   Yes.
2.a. How many coal bed methane wells are there in your state, regardless of whether they have ever been hydraulically fractured? Do not include wells that have already been plugged and abandoned.
   1,300
b. Using your best professional judgement, what percentages of the wells in (2.a) have or will be hydraulically fractured? Are any of these wells likely to be fractured more than one time?
   1000, Yes.
3. How many hydraulic fracturing jobs were performed on your state during 1997 on coal bed methane wells?
   70
4. Is the number of coal bed methane hydraulic fracturing jobs in your state likely to increase, decrease, or remain at about the same level over the next several years? Please explain your answer.
   Increase due to additional drilling of CBM wells.

II. Regulatory Issues

5. Do you currently regulate coal bed methane hydraulic fracturing activities? If so, please explain your regulatory structure for these activities.
   No.

III. Documented Cases of Contamination Attributable to Hydraulic Fracturing

6. Please indicate whether you have had any complaints attributable to coal bed methane hydraulic fracturing activities in you state.
   Yes - Noise.
   a. Was your agency able to substantiate that any of these cases resulted in contamination of a USDW or to increased risk to human health? If so, was your agency able to determine that coal bed methane hydraulic fracturing activities were the cause of the resultant damage? Were any other factors directly responsible for or contributory to such damage?
   Please provide details.
6. What response did your agency make to the complaints?
   Took gas analyst compared to CBM gas.
   Please mail or fax your responsible to the GWPC. 405-516-4973(fax)

EXHIBIT 1
HESI
IANA SURVEY

HYDRAULIC FRACTURING IN COALBED METHANE WELLS

I. Extent of Hydraulic Fracturing

1. Is hydraulic fracturing practiced in your state for coal bed methane wells? 
   Unknown.

2.a. How many coal bed methane wells are there in your state, regardless of whether they have ever been hydraulically fractured? Do not include wells that have already been plugged and abandoned.
   23

b. Using your best professional judgement, what percentages of the wells in (2.a) have or will be hydraulically fractured? Are any of these wells likely to be fractured more than one time?
   0%, Unknown.

3. How many hydraulic fracturing jobs were performed on your state during 1997 on coal bed methane wells?
   None reported.

4. Is the number of coal bed methane hydraulic fracturing jobs in your state likely to increase, decrease, or remain at about the same level over the next several years? Please explain your answer.
   Unknown.

II. Regulatory Issues

5. Do you currently regulate coal bed methane hydraulic fracturing activities? If so, please explain your regulatory structure for these activities.
   No.

III. Documented Cases of Contamination Attributable to Hydraulic Fracturing

6. Please indicate whether you have had any complaints attributable to coal bed methane hydraulic fracturing activities in your state.
   None.

a. Was your agency able to substantiate that any of these cases resulted in contamination of a USDW or to increased risk to human health? If so, was your agency able to determine that coal bed methane hydraulic fracturing activities were the cause of the resultant damage? Were any other factors directly responsible for or contributory to such damage? Please provide details.

7. What response did your agency make to the complaints?
   N/A

   Please mail or fax your responsible to the GWPC. 405-516-4973(fax)
Hydraulic Fracturing in Coal Bed Methane Wells
G.W.P.C Survey

Survey Response for the State of Kansas
Kansas Corporation Commission
Conservation Division
M.L. Korphage, Director

I Extent of Hydraulic Fracturing

1. Is hydraulic fracturing practiced in your state for coal bed methane wells?
   Ans. Yes.

2. a. How many coal bed methane wells are there in your state, regardless of whether they have every been hydraulically fractured? Do not include wells that have already been plugged and abandoned.
   Ans. Approximately 600 coal bed methane wells are located in the State of Kansas. All of these coal bed methane wells are located in the eastern 1/3 of the state. The total depth of these wells range between 600 ft. to 1300 ft. below ground surface. Approximately 50% of these wells were drilled for the express purpose of producing coal bed methane. The other 50% were oil wells which have been reworked and converted to coal bed methane wells.

   b. Using your best professional judgment, what percentage of the wells in 2.a. have or will be hydraulically fractured? Are any of those wells likely to be fractured more than one time?
   Ans. Nearly 100% of the wells in Kansas require fracture treatment before the wells produce coal bed methane. Production enhancements usually include light to moderate fracture treatments and/or in some cases acidization. The degree of fracture treatments vary with both zone and depth. Wellhead pressures are generally reduced to 0 p.s.i. within a few hours of hydraulic fracture treatment.

   No, most coal bed methane wells in Kansas are fractured only one time.

3. How many hydraulic fracturing jobs were performed in your state during 1997 on coal bed methane wells?
   Ans. Approximately 100 coal bed methane wells were hydraulically fractured in Kansas during 1997.
4. *Is the number of coal bed methane hydraulic fracturing jobs in your state likely to increase, decrease, or remain at about the same level over the next several years? Please explain your answer.*

**Ans.** The number of coal bed methane wells being hydraulically fractured will probably increase over the next few years. There are two reasons for this potential increase. 1) Continued low oil prices will encourage operators to convert shallow wells to coal bed methane gas producers in areas where markets and transport systems are available. 2) Potential for additional tax incentives for coal bed methane wells.

**II Regulatory Issues**

5. Do you currently regulate coal bed methane hydraulic fracturing activities? If so, please explain your regulation structure for these activities.

**Ans.** No.

**III Documented Cases of Contamination Attributable to Hydraulic Fracturing**

6. Please indicate whether you have had any complaints attributable to coal bed methane hydraulic fracturing activities in your state.

**Ans.** No. The Conservation Division has no record of complaints attributable to coal bed methane hydraulic fracturing activities.

6.a. *Was your agency able to substantiate that any of these cases resulted in contamination of a USDW or to increase risk to human health?*

**Ans.** No.

7. What response did your agency make to the complaints?

**Ans.** (not applicable).
Kentucky
SURVEY

HYDRAULIC FRACTURING IN COAL BED METHANE WELLS

I. Extent of Hydraulic Fracturing

1. Is hydraulic fracturing practiced in your state for coal bed methane wells? Yes. hydraulic fracturing is practiced in Kentucky for coal bed methane wells.

2. a. How many coal bed methane wells are there in your state, regardless of whether they have ever been hydraulically fractured. Do not include wells that have already been plugged and abandoned. There are currently three coal bed methane wells in Kentucky.
   b. Using your best professional judgement, what percentage of the wells in 2.a have or will be hydraulically fractured? Are any of these wells likely to be fractured more than one time. The completion reports for these three wells indicate that two of the three wells were fractured for a percentage of 66%. The Division is unaware that these wells will be fractured more than once.

3. How many hydraulic fracturing jobs were performed in your state during 1997 on coal bed methane wells? The completion reports for the three wells indicate that the wells were completed prior to 1997, therefore, the Division has no knowledge of any coal bed methane well being hydraulically fractured during 1997.

4. Is the number of coal bed methane hydraulic fracturing jobs in your state likely to increase, decrease or remain at about the same level over the next several years. Please explain your answer. Possibly increase or remain the same. Since there were no known fracture jobs in 1997, the Division can only assume that fracture jobs on coal bed methane wells will increase from zero or remain at zero.

II. Regulatory Issues

5. Do you currently regulate coal bed methane hydraulic fracturing activities? If so, please explain your regulatory structure for these activities. No, the Division does not regulate coal bed hydraulic fracturing activities. With the limited number of well sand lack of any indication of problems associated with hydraulic fracturing of coal bed methane wells, the Division sees no need to regulate this activity.
III. Documented Cases of Contamination Attributable to Hydraulic Fracturing.

6. Please indicate whether you have had any complaints attributable to coal bed methane hydraulic fracturing activities in your state.
   a. Was your agency able to substantiate that any of these cases resulted in contamination of a USDW or to increased risk to human health? The Division has received no complaints attributable to coal bed methane hydraulic fracturing activities. If so, was your agency able to determine that coal bed methane hydraulic fracturing activities were the cause of the resultant damage? Were any other factors directly responsible for or contributory to such damage. Please provide details.

7. What response did your agency make to the complaints? No complaints.
Missouri
SURVEY

HYDRAULIC FRACTURING IN COALBED METHANE WELLS

I. Extent of Hydraulic Fracturing

1. Is hydraulic fracturing practiced in your state for coal bed methane wells?
   Yes
2. How many coal bed methane wells are there in your state, regardless of whether they have ever been hydraulically fractured? Do not include wells that have already been plugged and abandoned.
   4 producing
3. Using your best professional judgement, what percentages of the wells in (2.a) have or will be hydraulically fractured? Are any of these wells likely to be fractured more than one time?
   All/
4. How many hydraulic fracturing jobs were performed on your state during 1997 on coal bed methane wells?
   0
5. Is the number of coal bed methane hydraulic fracturing jobs in your state likely to increase, decrease, or remain at about the same level over the next several years? Please explain your answer.
   Increase

II. Regulatory Issues

5. Do you currently regulate coal bed methane hydraulic fracturing activities? If so, please explain your regulatory structure for these activities.
   No.

III. Documented Cases of Contamination Attributable to Hydraulic Fracturing

6. Please indicate whether you have had any complaints attributable to coal bed methane hydraulic fracturing activities in your state.
   No complaints.
   a. Was your agency able to substantiate that any of these cases resulted in contamination of a USDW or to increased risk to human health? If so, was your agency able to determine that coal bed methane hydraulic fracturing activities were the cause of the resultant damage? Were any other factors directly responsible for or contributory to such damage?
      Please provide details.

7. What response did your agency make to the complaints?
   N/A
   Please mail or fax your responsible to the GWPC. 405-516-4973(fax)
NEW MEXICO RESPONSE
GWPC SURVEY-HYDRAULIC FRACTURING
IN COAL BED METHANE WELLS

I. Extent of Hydraulic Fracturing

1. Is hydraulic fracturing practiced in your state for coal bed methane wells?

Yes, hydraulic fracturing is a common method of stimulating coal bed methane gas wells in New Mexico.

2. a. How many coal bed methane wells are there in your state, regardless of whether they have ever been hydraulically fractured? Do not include wells that have already been plugged and abandoned.

Total number of coal bed methane wells—2,398

b. Using your best professional judgement, what percentage of the wells in 2.a have or will be hydraulically fractured? Are any of these wells likely to be fractured more than once?

Approximately sixty-three percent of these coal bed methane wells have been hydraulically fractured.

(Note: Hydraulic fracture stimulations are required to be reported to the NMOCID on Form C-105 (Well Completion or Recompletion Report and Log) and as a result, we believe that our estimate is very accurate.)

It is not likely that a coal bed methane well will be hydraulically fractured more than once.

3. How many hydraulic fracturing jobs were performed in your state during 1997 on coal bed methane wells?

In 1997, there were forty-four coal bed methane wells hydraulically fractured.

4. Is the number of coal bed methane hydraulic fracturing jobs in your state likely to increase, decrease, or remain at about the same level over the next several years. Please explain your answer.

A large percentage of existing coal gas wells in New Mexico were drilled
during the period from January 1, 1980 through January 1, 1992 in order to qualify for the Section 29 Non-conventional Fuel Tax Credit pursuant to the Crude Oil Windfall Profit Tax Act of 1980. Since 1992, drilling activity for coal bed methane gas wells in New Mexico has continued to decline, and should continue to decline for the next several years. The only factor which may affect this decline is a determination that one coal bed methane gas well per 320-acres is not sufficient to efficiently and effectively drain its proration unit. If such a determination is made, infill drilling on 160-acre effective spacing may ultimately be authorized which may lead to a significant increase in drilling and resultant hydraulic fracturing activity.

II. Regulatory Issues.

5. Do you currently regulate coal bed methane hydraulic fracturing activities? If so, please explain your regulatory structure for these activities.

As previously stated, hydraulic fracture jobs are required to be reported to the NMOCOD on Form C-105. Generally, the NMOCOD receives notification of the occurrence of a hydraulic fracture job after it has been conducted. If, after a hydraulic fracture job has occurred it becomes apparent that such activity has resulted in waste of hydrocarbons, violation of correlative rights, endangerment to human health, contamination of fresh water resources, or any other issue under the jurisdiction of NMOCOD, action may then be taken by the Division to address and remedy such situations.

III. Documented Cases of Contamination Attributable to Hydraulic Fracturing.

6. Please indicate whether you have had any complaints attributable to coal bed methane hydraulic fracturing activities in your state.

a. Was your agency able to substantiate that any of these cases resulted in contamination of a USDW or to increased risk to human health? If so, was your agency able to determine that coal bed methane hydraulic fracturing activities were the cause of the resultant damage? Were any other factors directly responsible for or contributory to such damage? Please provide details.

The NMOCOD recently heard a case which involved the alleged migration of hydrocarbon gas and water from a producing coal reservoir into an adjacent sandstone gas producing reservoir which purportedly occurred as a result of hydraulically fracturing either the coal or sandstone formation, or both. This case involved correlative rights issues only and did not affect any USDW's or human health risks.

There have been no other reported incidents of hydraulic fracturing of coal bed methane gas wells affecting USDW's or resulting in risks to human
7. What response did your agency make to the complaints?

In the case cited above, the NMOCX asserted jurisdiction over the hydraulic fracturing activities due to the fact that it may have resulted in the violation of correlative rights. The case came before the NMOCX where extensive evidence and testimony was given. A decision in this matter is pending.
OHIO
SURVEY
HYDRAULIC FRACTURING IN COALBED METHANE WELLS

I. Extent of Hydraulic Fracturing

1. Is hydraulic fracturing practiced in your state for coal bed methane wells?
   Not to date.

2.a. How many coal bed methane wells are there in your state, regardless of whether they have ever been hydraulically fractured? Do not include wells that have already been plugged and abandoned.

   3

b. Using your best professional judgement, what percentages of the wells in (2.a) have or will be hydraulically fractured? Are any of these wells likely to be fractured more than one time?
   2

3. How many hydraulic fracturing jobs were performed on your state during 1997 on coal bed methane wells?
   0

4. Is the number of coal bed methane hydraulic fracturing jobs in your state likely to increase, decrease, or remain at about the same level over the next several years? Please explain your answer.
   Same, unless coalbed methane becomes more significant in terms of number.

II. Regulatory Issues

5. Do you currently regulate coal bed methane hydraulic fracturing activities? If so, please explain your regulatory structure for these activities.
   No.

III. Documented Cases of Contamination Attributable to Hydraulic Fracturing

6. Please indicate whether you have had any complaints attributable to coal bed methane hydraulic fracturing activities in your state.
   No.

   a. Was your agency able to substantiate that any of these cases resulted in contamination of a USDW or to increased risk to human health? If so, was your agency able to determine that coal bed methane hydraulic fracturing activities were the cause of the resultant damage? Were any other factors directly responsible for or contributory to such damage?
   Please provide details.

7. What response did your agency make to the complaints?

   Please mail or fax your responsible to the GWPC. 405-516-4973(fax)
OKLAHOMA
SURVEY

HYDRAULIC FRACTURING IN COALBED METHANE WELLS

I. Extent of Hydraulic Fracturing

1. Is hydraulic fracturing practiced in your state for coal bed methane wells?  
   Yes.

2.a. How many coal bed methane wells are there in your state, regardless of whether they have ever been hydraulically fractured? Do not include wells that have already been plugged and abandoned.
   250

   b. Using your best professional judgement, what percentages of the wells in (2.a) have or will be hydraulically fractured? Are any of these wells likely to be fractured more than one time?
   75%

3. How many hydraulic fracturing jobs were performed on your state during 1997 on coal bed methane wells?
   125 (Approximately)

4. Is the number of coal bed methane hydraulic fracturing jobs in your state likely to increase, decrease, or remain at about the same level over the next several years? Please explain your answer.
   Same.

II. Regulatory Issues

5. Do you currently regulate coal bed methane hydraulic fracturing activities? If so, please explain your regulatory structure for these activities.
   Yes - under the state's general oil and gas statutes.

III. Documented Cases of Contamination Attributable to Hydraulic Fracturing

6. Please indicate whether you have had any complaints attributable to coal bed methane hydraulic fracturing activities in your state.
   None.
   a. Was your agency able to substantiate that any of these cases resulted in contamination of a USDW or to increased risk to human health? If so, was your agency able to determine that coal bed methane hydraulic fracturing activities were the cause of the resultant damage? Were any other factors directly responsible for or contributory to such damage?
      Please provide details.

7. What response did your agency make to the complaints?

   Please mail or fax your response to the GWPC. 405-516-4973 (fax)
UTAH SURVEY

HYDRAULIC FRACTURING IN COALBED METHANE WELLS

I. Extent of Hydraulic Fracturing

1. Is hydraulic fracturing practiced in your state for coal bed methane wells?
   Yes.

2a. How many coal bed methane wells are there in your state, regardless of whether they have ever been hydraulically fractured? Do not include wells that have already been plugged and abandoned.
   260 wells.

b. Using your best professional judgement, what percentages of the wells in (2a) have or will be hydraulically fractured? Are any of these wells likely to be fractured more than one time?
   Most oil CB wells are hydraulically fractured. Some more than once.

3. How many hydraulic fracturing jobs were performed on your state during 1997 on coal bed methane wells?

4. Is the number of coal bed methane hydraulic fracturing jobs in your state likely to increase, decrease, or remain at about the same level over the next several years? Please explain your answer.
   The number of Frac jobs will increase as additional wells are completed.

II. Regulatory Issues

5. Do you currently regulate coal bed methane hydraulic fracturing activities? If so, please explain your regulatory structure for these activities.
   Regulated through the permit process and approval of Sundry notices.

III. Documented Cases of Contamination Attributable to Hydraulic Fracturing

6. Please indicate whether you have had any complaints attributable to coal bed methane hydraulic fracturing activities in your state.
   No.

   a. Was your agency able to substantiate that any of these cases resulted in contamination of a USDW or to increased risk to human health? If so, was your agency able to determine that coal bed methane hydraulic fracturing activities were the cause of the resultant damage? Were any other factors directly responsible for or contributory to such damage?
   Please provide details.

7. What response did your agency make to the complaints?

Please mail or fax your responsible to the GWPC. 405-516-4973(fax)
VIRGINIA
SURVEY
HYDRAULIC FRACTURING IN COALBED METHANE WELLS

I. Extent of Hydraulic Fracturing

1. Is hydraulic fracturing practiced in your state for coal bed methane wells? YES

2(a). How many coal bed methane wells are there in your state, regardless of whether they have ever been hydraulically fractured? 1504 Active Permits

2(b). Using your best professional judgement, what percentage of the wells in 2(a) have or will be hydraulically fractured? Estimated 1100

Are any of these wells likely to be fractured more than one time? NO

3. How many hydraulic fracturing jobs were performed in your state during 1997 on coal bed methane wells? 238

4. Is the number of coal bed methane hydraulic fracturing jobs in your state likely to increase, decrease, or remain at about the same level over the next several years? The amount of wells being fractured should remain the same or increase over the next several years. Projected new applications are predicted to be between 200 to 300 applications for coal bed methane wells.

II. Regulatory Issues

5. Do you currently regulate coal bed methane hydraulic fracturing activities? DMME does not directly regulate the procedures for fracturing which are contracted through the operator. However, the Department does regulate the effects of such fracturing in regards to the environmental effects of the process. This is regulated through the permit that is issued which contains the requirements for protection of groundwater.

III. Documented Cases of Contaminated Attribute to Hydraulic Fracturing

6. Please indicate whether you have had any complaints attributable to coal bed methane hydraulic fracturing activities in your state. Specific to hydraulic fracturing the answer would be NO. The Division of Gas and Oil has received several complaints in regards to vibration, water loss (temporary and permanent), water degradation, and erosion problems from the activities of developing a well.

(a) Was the agency able to substantiate that any of these cases resulted in contamination of a USDW or to increased risk to human health? All investigations that have been conducted thus far from complaints which have been filed has not revealed any contamination of a
I. Extent of Hydraulic Fracturing

1. Is hydraulic fracturing practiced in your state for coal bed methane wells? **YES**

2(a). How many coal bed methane wells are there in your state, regardless of whether they have ever been hydraulically fractured? **1504 Active Permits**

2(b). Using your best professional judgement, what percentage of the wells in 2.a have or will be hydraulically fractured? **Estimated 1100**
Are any of these wells likely to be fractured more than one time? **NO**

3. How many hydraulic fracturing jobs were performed in your state during 1997 on coal bed methane wells? **238**

4. Is the number of coal bed methane hydraulic fracturing jobs in your state likely to increase, decrease, or remain at about the same level over the next several years. The amount of wells being fractured should remain the same or increase over the next several years. Projected new applications are predicted to be between 200 to 300 applications for coal bed methane wells.

II. Regulatory Issues.

5. Do you currently regulate coal bed methane hydraulic fracturing activities? **DMME does not directly regulate the procedures for fracturing which are contracted through the operator. However, the Department does regulate the effects of such fracturing in regards to the environmental effects of the process. This is regulated through the permit that is issued which contains the requirements for protection of groundwater.**

III. Documented Cases of Contaminated Attribute to Hydraulic Fracturing

6. Please indicate whether you have had any complaints attributable to coal bed methane hydraulic fracturing activities in your state. Specific to hydraulic fracturing the answer would be **NO**. The Division of Gas and Oil has received several complaints in regards to vibration, water loss (temporary and permanent), water degradation, and erosion problems from the activities of developing a well.

   (a) Was the agency able to substantiate that any of these cases resulted in contamination of a USDW or to increased risk to human health? All investigations that have been conducted thus far from complaints which have been filed has not revealed any contamination of a
USDW or an increase risk to human health resulting from the
development of a coal bed methane well, which includes hydraulic
fracturing the target formations.

If so, was your agency able to determine that coal bed methane hydraulic
fracturing activities were the cause of the resultant damage? N/A

Were any other factors directly responsible for or contributory to such
damage. N/A

7. What response did your agency make to the complaints?
The Department has investigated each of the complaints. The
investigations found no connection between the coal bed methane
operations and the complaints filed. The results of the investigations
were transmitted to the complainants.

The Department is also investigating the land surface effects of
hydraulic fracturing. The initial investigation in the fall of 1998 will
examine whether or not surface vibrations can be felt by
hydraulically fracturing coal bed methane wells.
I. Extent of Hydraulic Fracturing

1. Is hydraulic fracturing practiced in your state for coal bed methane wells? NO

2. a. How many coal bed methane wells are there in your state, regardless of whether they have ever been hydraulically fractured? Do not include wells that have already been plugged and abandoned. 525
   
2. b. Using your best professional judgement, what percentage of the wells in 2.a have or will be hydraulically fractured? Are any of these wells likely to be fractured more than one time? NONE

3. How many hydraulic fracturing jobs were performed in your state during 1997 on coal bed methane wells? NONE

4. Is the number of coal bed methane hydraulic fracturing jobs in your state likely to increase, decrease, or remain at about the same level over the next several years. Please explain your answer. N/A

II. Regulatory Issues.

5. Do you currently regulate coal bed methane hydraulic fracturing activities? If so, please explain your regulatory structure for these activities. NO

III. Documented Cases of Contamination Attributable to Hydraulic Fracturing.

6. Please indicate whether you have had any complaints attributable to coal bed methane hydraulic fracturing activities in your state.
   
a. Was your agency able to substantiate that any of these cases resulted in contamination of a USDW or to increased risk to human health? If so, was your agency able to determine that coal bed methane hydraulic fracturing activities were the cause of the resultant damage? Were any other factors directly responsible for or contributory to such damage. Please provide details.

7. What response did your agency make to the complaints?

Please mail or fax your response to the GWPC. 405-516-4973(fax) By September 1st.