

PROPOSED GAS DRILLING IN THE UPPER DELAWARE RIVER BASIN WATERSHED

Introduction and Overview of Important Issues.

- The Delaware River Basin Watershed extends into four states.
- Over 15 million people (approximately five percent of the nation's population) rely on the waters of the Upper Delaware River Basin Watershed for drinking water.
- The impact of unregulated, unlimited, gas drilling activities using "hydraulic-fracturing," upon the integrity of the Upper Delaware River Basin Watershed has not been assessed. There will be significant impacts to the environment and human health.
- It has been learned in the last several weeks - that there are over 1400 leases in just the northern part of Wayne County, Pennsylvania alone. This news confirms the calculations of experts that the gas industry plans over 25,000 wells in the Delaware River Watershed.
- An indication of the long-term impacts upon the public health – is that on August 6, 2008 New York City officials have demanded a BAN on gas drilling near its Catskills reservoirs because they fear the drilling would contaminate the city's drinking water.
- The Gas & Oil Industry in 2005 gained exemptions to important provisions of the Clean Water Act, Safe Drinking Water Act, Clean Air Act, Right-to-Know Act, and Super-Fund Act; and the EPA has been ordered not to become involved. This constitutes total federal "deregulation." It is now up to Pennsylvania and other states to regulate the environmental impacts from the proposed activity.
- The PA-DEP (and the NY- DEC) does not have the staff to deal with the "deployment" that the energy industry intends in the Upper Delaware Watershed. State budgetary shortfalls are making it almost impossible to increase state regulatory staff to properly inspect all drilling sites.
- We urgently request the several state governors within the Watershed- use their seats on the "Delaware River Basin Commission" (DRBC) to propose that no drilling permits be issued until such time as an Environmental Impact Study (EIS) is undertaken that identifies and focuses on the possible degradation to the Delaware River Basin aquifer and the impacts upon human health.

On August 6, 2008, New York City officials demanded a BAN on gas drilling near its Catskills reservoirs because they fear the drilling would contaminate the city's drinking water. Governor David Paterson has ordered an EIS be prepared to assess the environmental impacts from hydraulic fracturing. Likewise, Governor Bill Richardson of New Mexico recently extended a moratorium on new oil and gas drilling in the Galisteo Basin. Similar concerns have been raised in Colorado and Texas where hydraulic fracturing is also not regulated.

1. What is Hydraulic-Fracturing?

Hydraulic fracturing is a method used to create fractures that extend out from a wellbore. (This is the actual hole drilled into the ground that becomes the gas well) These wellbores can be considered either vertical or horizontal; both start out vertical then the horizontal (or "directional") well is shifted to drill horizontally into a particular layer of interest. Horizontal lateral lengths can exceed 2,000 feet. A proppant (fine sand/silica dust) is suspended in water by chemicals, and is injected into the ground by using high volumes of water containing these chemicals, including lubricants, biocides, foamers, and other materials (1) that help the process and machinery. The mixture is under large amounts of hydraulic pressure to create mini-earthquakes that open new fractures in the strata and inject the proppant to keep the fractures propped open. The technique is used to maximize the rate of flow during gas extraction from a shale layer ("stimulation"). By creating fractures, the surface area of the formation exposed to the wellbore is increased and the fracture and lubricants provide conductive paths connecting to the well, which effectively increases the rate that gas can be produced from the formations 4000-8500 feet below the surface. Hydraulic fracturing incorporates the disciplines of fracture mechanics, fluid mechanics, solid mechanics, and porous medium flow. "Completions" may involve multistage fracturing with more than three stages per well and repeated fracturing events for up to 50 years.

The Marcellus Shale is currently the hottest "play" in the 54,000-square mile Appalachian Basin. Prior to 2000, this low-density, shale formation was exploited with a number of successful vertical gas wells, many of which have produced – slowly but surely – for decades. However, not until the 2005 introduction of techniques pioneered by Halliburton in the Barnett shale, did Marcellus wells begin to promise significantly improved returns on investment.



An indication of scale is this photograph (from <http://www.SkyTruth.org>) of the Jonah gas field, Wyoming, May, 2006. Taken from a small plane this image shows 3 to 5 acre well pads in a 40 acre spacing. In the Upper Delaware Watershed the “scale” will be more dense. Most of these wells were installed in about five years time. See item #8 for calculations of intended scale in the Upper Delaware Watershed. And in reference # 4 see similar pictures taken in Pennsylvania in the Allegheny National Forest.

The Marcellus shale, covers a large portion of the northeast United States, it is a continuation of a shale layer remaining from an ancient seabed that sweeps from Texas through the South and up into Pennsylvania and western New York State. To date, the heavy leasing activity has occurred primarily in geographic areas where the shale is thick and can be drilled at minimum depths. The current trends are toward inevitably deeper wells, longer laterals and more stages. The industry has targeted the extreme eastern part of Pennsylvania for aggressive investment activity. The gas industry itself calls this a “land grab” and a deployment; and in their own language intend a major “scale of operations.”

2. How is this drilling technique undertaken?

The drilling of the well is accomplished by the use of a drill rig (usually diesel powered, using 800 to 1,600 gallons of diesel in a day) and long drill shafts, specialized drill bits and synthetic drilling muds that mediate the drill environment for most efficient drilling and the removal of drill cuttings. The wellbore is drilled into the earth through drinking water formations (in direct contact with these formations) using chemical mixtures (the drilling muds) that are designed to facilitate the drilling [see: http://en.wikipedia.org/wiki/Drilling_mud] The drilling muds and the material returned to the surface with the cuttings are toxic as they can contain biocides, acids, volatile organic compounds, diesel fuel, metals, salts, radioactive materials and undisclosed proprietary chemicals. There are many steps in the drilling process and at each step the materials and processes currently are formulated toward efficiency of drilling with little thought of the contamination resulting.(2) And what can happen to these materials is shown in this incident from the Roan Plateau in Colorado where millions of gallons of drilling muds were spilled in four incidents into a tributary of Parachute Creek in March of this year. (3)

As the drilling proceeds there are usually a series of casings installed. A slurry of cement is pumped through one pipe into a space (“annulus”) to strengthen the well structure and isolate it from the surrounding formations which can contain or lead to drinking water aquifers. These casings are subject to operator error in the mixtures, the timing allowed for

strengthening and in their placement (5,6,7) When they fail there can be contamination of clean water aquifers (CWA) with pollutants from the drilling itself, and from other layers now in contact with CWA.

Once the drilling has reached the desired depth where the assumed gas bearing material is located and the drilling is completed, the well is hydraulically fractured using large volumes of water, the proppant and fracturing fluid. The chemicals used in currently marketed fracturing fluids include methanol, benzene, naphthalene, acids, metals, corrosion inhibitors, glycol ethers, ethylene glycol, and biocides, to name just a few (withdrawn EPA study, 2002 (1)). At most 70% of the injected materials are returned to the surface, sometimes 0% is recovered. "Blowouts" of the fracturing fluids are the main source of actual analyses (see Dr. Theo Colborn's Analysis of the Crosby Well Blowout (8) and others at:

<http://www.EndocrineDisruption.org> and the spreadsheet of 5 states) The reason for this is that the companies do not have to reveal what they are injecting into safe drinking water aquifers, etc. due to exemptions to the Safe Drinking Water Act, etc. at the federal level and the states, like PA, not requiring any further regulation of the companies or their practices. In PA the DEP and the Penn State Ag Extension has provided cruelly erroneous and misleading information to the public; for example, "...the fracturing fluid is only white sand and water" quote from Ron Gilius, Feb.20, 2008 at Bryn Mawr Conference Center near Honesdale, PA. (9)

3. What are its impacts on the environment?

The Gas & Oil Industry in 2005 gained exemptions to the Clean Water Act, Safe Drinking Water Act, Clean Air Act, Right-to-Know Act, and Super-Fund Act; and the EPA has been ordered not to become involved. This constitutes total federal "deregulation" – and makes possible the above-mentioned proprietary Halliburton solution. Each deep gas well uses millions of gallons of water, sand, 171 products, and 245 chemicals (some unknown & toxic). The clean water is taken from streams, lakes, rivers, and aquifers. Some of the returned (produced) water leaches into the drinking water aquifers and surface waters. As stated above AT MOST 70% of the fracturing fluid mixture is recovered (source:industry statements) which leaves the remainder below ground. In much of this area our drinking water moves through bedrock with natural vertical fractures that connect the geologic layers and allow the water to move - and will also allow the contaminants pumped under ground to move. (10). Aquifer contamination can happen from the mere connection of the gas bearing layer and the water bearing layer (6). Surface water contamination happens from flooding of pits, pads (see Matoushek well photo), human error (not putting the plug in a tank in Hickory, PA), spills, and other accidents (2, 3, 11).

The U.S. Department of Energy lists "produced water" (drilling waste fluids) from gas drilling as among the most toxic of any industry byproduct, and when the water returns to the surface, it must be dealt with as toxic industrial waste. According to a 2004 report from Argonne National Laboratory prepared for the energy department, "Studies indicate that produced waters discharged from gas... platforms are about 10x more toxic than the produced waters discharged from oil platforms."(12). Overwhelming evidence now exists - that this type of drilling has caused significant environmental harm in other states – and will degrade and damage the watershed that supplies drinking water to fifteen million people in Pennsylvania, New York, New Jersey; and in the greater Philadelphia region (13, 14).

In New Mexico, oil and gas drilling that uses waste pits comparable to those planned for the Upper Delaware Watershed has already caused toxic chemicals to leach into the water table at over 700 sites. Colorado has reported more than 300 spills affecting its ground water (15). "Between the mid 1980s and 2003, ... the New Mexico Environmental Bureau recorded more than 6,700 cases of pits causing soil and water contamination"(16)

The damage done to the environment includes; extensive air pollution from the volatile components of the released natural gas (it is an ore, a mixture) and the resulting ground level ozone produced, and from the chemicals like 2-BE, used for the productive life of the well for separation and dehydration of the gas; water pollution, both surface and underground from the drilling, spills, from the fracturing processes and from the mere connection of the gas bearing layer with the water bearing layers; soil contamination from all factors just listed; land fragmentation with impacts on wildlife - water and air pollution also impact all living things, plant and animal; erosion and runoff greatly increased by the large areas cleared and made impermeable (3 to 5 acre pads plus roads and pipelines); noise of the drilling, trucks, compressor stations, etc. is very disturbing for several miles. Effects on wildlife, for example, in the area of the Jonah gas field have been to reduce the populations by half in the time referenced by the above photo. Many stories of whole towns and individual people impacted severely by gas drilling are available, one Pennsylvania testimony is included with this summary; a person so severely impacted by gas drilling almost a mile from her house she will have to abandon her home (17).

4. What are its health impacts on human health?

In 2004 Dr. Theo Colborn, a respected scientist who specializes in the health effects of low-dose chemical exposure and opposes gas drilling, began investigating the makeup of drilling fluids. She was spurred by the story of a Colorado resident who suspected her cancer was tied to water contamination from a nearby gas well. To figure out what was in the water, Colborn collected shipping manifests that trucks must carry when they haul hazardous materials for oil and gas servicing companies. When an accident occurred – a well spill in Colorado, or an explosion at a drilling site in Wyoming – she took water and soil samples and tested them for contaminants. Colborn's list has now grown to over 200 chemicals, from suspected cancer-causing compounds like Benzene to a compound called 2-BE, which she told congress causes adrenal tumors and other human health problems. (18)

Of those products that had negative health effects, 19% had one to three effects and 81% had 4 to 14 effects. Her research disclosed that 93% of the chemicals used had negative health effects. "The other 7% represents the products for which we had no information at all because it was proprietary and there was one product for which we could find no information about its health effects." And what surprised her was to find that 42% of products on Dr. Colborn's list are endocrine disruptors....chemicals that can interfere with the total function of the body and can interfere with the development of individuals before they are born and cause irreversible life time changes in how they function. Wildlife, including fish and birds have proven to be sensitive to chemicals of this nature at ambient concentrations.(18, 19)

Air quality is also at risk. Air quality got little attention until some concerned officials in Garfield County began challenging industry's spokespersons regarding increased levels of ozone in western Colorado. One molecule of ozone can burn a hole in the deep alveolar tissue in the lungs where your body releases CO₂ in exchange for oxygen. And continued daily exposure to ozone leads to early aging of the lungs...they become brittle and dry out ...the lungs cannot repair the damage like the liver and leads to asthma, COPD (emphysema), and other pulmonary disorders. Children are especially vulnerable because their lungs continue to grow and enlarge until about age 18. As they mature in the presence of ozone alveoli production is reduced, and they end up with brittle lungs like those of an 80 year old.(19).

Dr. Colborn's findings are supported by studies in New Mexico, Wyoming and Texas. Tests done by the New Mexico Office of Oil Conservation on mud and water from two gas drilling pits found Benzene, Toluene, Naphthalene and other substances. In the Barnett Shale in Texas – the formation geologists consider most similar to the Marcellus Shale – the state has overseen the cleanup of radioactive material (NORM -Normally Occurring Radioactive Material) dredged up at hundreds of gas sites - concentrated by the flow of fluids in and out of the well.((19, 20) Hydrogen Sulfide gas, poisonous and deadly in low concentrations also is released in many areas from gas drilling.(19, LM) There are the pipelines and compressor stations that also produce extensive air pollution; the compressor stations also produce noise including very harmful Low Frequency Noise that causes organ and brain scarring and ruptured eardrums(21).

5. Current operating history, track record in communities that have approved it.

The gas industry has sued several PA towns. The townships, including Nockamixon Township, Bucks County, want to regulate aspects of natural gas extraction in order to protect their residents and natural and public resources. Gas industry firms, Range Resources and Huntley and Huntley natural gas developers challenged the right of the townships to apply municipal ordinances, given the State law. The PA Supreme Court has agreed to hear this case. It is to commence in September, 2008.

In Fort Worth, Texas these wells are being placed between (and around) homes. There are over 800 operating gas wells, and permits have been issued for over 1300 wells. Gas drilling in North Texas' Barnett Shale range has been a problem for years, especially for homeowners, ranchers, and farmers who depend on well water. When the drilling started, residents in many cases found their water wells going dry, some temporarily, some permanently. The Trinity-Woodbine aquifer that waters most of north Texas, and provides commercial, industrial, and livestock water has become contaminated. The presence of toluene in the water was a red flag that something was terribly wrong underground:

<http://www.fweeklly.com/content.asp?article=6885>

New Mexico's Gov. Bill Richardson has extended a state moratorium on new oil and gas drilling in the Galisteo Basin and Santa Fe County for another six months. Richardson's order bans new hydrocarbon extraction in the basin through January. It also directs state agencies to develop baseline air and water quality data for the "fragile and ecologically sensitive" basin and write new rules specifically tailored to protecting the area.

Residents of Hickory, PA were excited about the prospect of making money from gas drilling. Now, after more than two years of the presence of drilling companies with their heavy trucks and huge drill rigs, they wish they had never signed leases. People are getting gasses and other materials in their drinking water wells. Smelly, oily liquids have started welling up in the middle of farm fields. Human error (neglecting to put a drain plug in a collection tank, in one instance) recently has resulted in surface water, domestic well water, stream and land contamination:

<http://www.youtube.com/GasDrillingTruth>

The extent to which secrecy of the fracturing fluid ingredients is valued over life and health is shown in this example: Recently, in Denver, Colorado, a nurse at Mercy Regional Medical Center fell gravely ill from chemical exposure after treating a sick gas-field worker in April who had been doused with gas drilling fracturing fluids. The nurse who initially treated the drilling rig worker - was exposed to the chemicals on his cloths, shoes, and body in the emergency room. She then became very ill with a life threatening collapse of vital body functions. She began to suffer liver, heart and lung failure and had extensive treatment in Mercy's intensive care unit. The company refused to provide the hospital with the much needed information on the exact chemical nature of the fluids she had been exposed to. Dale Davis with Halliburton argued against the disclosure. Halliburton protects its frac-fluid formula because it is their highest profit product. Mr. Davis says "it leads to a 20 percent to 30 percent increase in well production, ... if Halliburton had to disclose its formula, even only to state regulators, the company would quit using its secret formula in Colorado, and well production would drop." <http://www.newsweek.com/id/154394>

6. New York's decision to require environmental impact report.

On July 23, 2008 Gov. David Paterson has ordered an environmental impact statement to assess how drilling will affect his state - of particular interest is the hydraulic fracturing process and materials. Currently there is an involvement of the public in a "scoping" procedure to set up parameters for the Generic (not site specific) Environmental Impact Study that has been promised. Gov. Paterson also called for an assessment of staffing and enforcement capabilities at the state Department of Environmental Conservation, a reexamination of jurisdiction over water withdrawals and an evaluation of the overall existing environmental regulatory structure as it relates to drilling. But at the present time, New York State has instituted a hiring freeze of regulatory personnel.

7. Current status of approvals before the PA-DEP (NY-DEC) and DRBC.

The advent of natural gas well drilling and development in the Marcellus shale formation of the Upper Delaware River Watershed has caught Pennsylvania and New York regulators unprepared. There was a recent announcement of the signing of over 1400 leases in just the northern part of Wayne County, PA, alone. This is a clear indication of the intended scale. The legal filings of several PA towns document that they are attempting to control where natural gas wells are drilled and storage ponds are placed in order to prevent the damages to their communities from associated contamination, storm-water runoff, and impacts to private and public property and to natural values.

Gov. David Paterson's executive order for an updated environmental review for gas drilling in New York could take 12 months to complete, but that doesn't mean drilling can't begin in the meantime. "The announcement of the preparation of a supplemental environmental impact statement does not necessarily freeze drilling," said Judith Enck, the deputy secretary of the environment in the governor's office, "however site specific environmental reviews may be required in the interim for new drilling permits."

In the Upper Delaware region of Pennsylvania, Stone Energy Corporation, the company that has been drilling for gas in Clinton Township, Wayne County, is being pressed by the Delaware River Basin Commission (DRBC) to comply with their regulations. Carol Collier, Executive Director of the DRBC, has said that it has informed Stone Energy that it will need to apply for and receive approval from the commission before it can extract natural gas in Wayne County.

The company began drilling this spring on the lands of Louis Matoushek on Creamton Road. As of the end of August, this is the only natural gas drilling that has begun in Wayne County despite many applications to the Pa. Department of Environmental Protection (DEP). According to the DEP. Ms. Collier said that a letter was sent by the DRBC to the company over a month ago and so far there has been no reply. A compliance letter was sent. "There are fines running," said Collier. The only well in the Watershed - is currently in total noncompliance. Please see photograph on next page.



Shown here is the drilling activity at the Matoushek site. It is the only well in the Upper Delaware Watershed. It is currently capped and it is in non-compliance. Stone Energy has not yet responded to a letter from the DRBC. It can be clearly viewed that the “production water pits” are not lined. Overflow can be seen around the pit on the left and along the drain rut running next to the pit and along to the back of the pad and then off the pad. Notice the grey in the mower tracks further out in the field. The Upper Delaware River has recently been subject to three major flood events (all “100-year floods”), and if another flood occurred, pits such as this would likely to contaminate the Watershed.

8. Long term projection and impact on environment, watershed, and human health.

An indication of the long-term impacts upon the public health – is that on August 6, 2008 New York City officials have recently demanded a BAN on gas drilling near its Catskills reservoirs because they fear the drilling could contaminate the city’s drinking water. They’ve asked the state Department of Environmental Conservation to establish a one-mile wide protective perimeter around each of the city’s six major Catskills reservoirs and connecting infrastructure – a buffer that would put at least 500,000 acres off limits to drilling.

The impact of unregulated, unlimited gas drilling activities using hydraulic-fracturing upon the integrity of the Upper Delaware River Basin Watershed – would be catastrophic. The watershed covers approximately 4,500 sq. miles. All of the Upper Basin’s acreage (2,880,000) is situated above the targeted Marcellus Shale. If developed to the extent anticipated by the gas industry (as limited by the States) there would be at least 1 well per 80 acres in NY and at least 1 well per every 40 acres in PA. This frequency of wells would equal 18,000 in NY and 36,000 in PA or a total of 54,000 wells in the Upper Basin. A very conservative estimate would be 25,000 wells.

This provides the following statistics;

1. 125 to 250 Billion gallons of water would be used and contaminated.
2. 125,000 acres of land will be cleared for development, service roads, and drilling pads.
3. A \$100 Billion construction project using confirmed toxic industrial practices would be introduced into a “protected watershed basin.”

The geology of the Delaware River Basin includes sedimentary rock with natural fractures that ground water moves through in unpredictable directions. The bedrock formations that supply drinking water to these rural areas are the sole source of water available to most residents. If contaminated there are no public water-supply lines available as replacement sources of water (14). In addition to the rural population living in the Upper Delaware, over 15 million people (approximately five percent of the nation’s population) rely on the waters of the Upper Delaware River Basin Watershed for drinking water. Uncertain weather patterns complicate any predictions of water flows, indeed, there has been three “100”

Delaware River Basin

WATERSHED

New York

Pennsylvania

New Jersey



year floods in the Basin in the past 4 years. If drilling takes place here, the runoff during flood events would cause a great harm to public health. A New York City geologist, Councilman James Gennaro recently stated that gas drilling by hydraulic-fracturing is an activity that is “completely and utterly inconsistent with a drinking water supply.”

<http://www.nytimes.com/2008/08/10/nyregion/10towns.html>

What we don't know:

- Chemicals used, their quantity - concentrations - the combinations(23)
- How much fluid is recovered
- What is in the drill spoils, evaporation and condensate pits
- The amount and source of the water used and where and how it is disposed of
- The frequency and absolute (not on a weighted scale) decibel level of the noise of the drilling and compressor stations the amount and contents of the air emissions produced by the drilling, pipelines, compressors, evaporation pits.
- NORM - Normally Occurring Radioactive Materials - accumulates on equipment - where it occurs.
- H2S - Hydrogen Sulfide - “sour” gas - poisonous, where it occurs is a major air pollutant and can also get into water. Both of these can be anywhere - predictions aside it is NOT known where either NORM or H2S will actually occur.
- Baseline levels of water, air and soil to gauge potential changes in quality (22)
- Structure and connectivity of aquifers in the several major Watersheds.

We urgently request the several state governors within the Watershed- use their seats on the “Delaware River Basin Commission” (DRBC) to propose that no drilling permits be issued until such time as an Environmental Impact Study (EIS) is undertaken that identifies and focuses on the possible degradation to the Delaware River Basin aquifer and the impacts upon human health.

Please see links below to petition for Watershed Moratorium - please read some of the 80-pages of public comments:
<http://www.DamascusCitizens.org/petitionUD>


Prepared By: Damascus Citizens for Sustainability, Inc.
<http://www.DamascusCitizens.org>


All of the above can be additionally referenced if desired - please see following notes . . .


1. This chart found here and made readable, printable in references:
<http://www.earthworksaction.org/fracfluidslarge.cfm>
2. see <http://www.earthworksaction.org/publications.cfm?pubID=143>
3. see PDF of GJSentinel article in references
4. see attached pictures of Allegheny National Forest for comparable in PA - Allegheny National Forest:
<http://picasaweb.google.com/AlleghenyDefenseProject> -A few pictures from this website in references
5. see <http://www.EndocrineDisruption.org> and Crosby well analysis in references
6. <http://www.fweekly.com/content.asp?article=6885>
7. LM - Lionel Milberger, Professional Engineer, full CV available, with 35 years in the oil/gas field and 59 patents to his name in the field.
8. Crosby Well Analysis in references
9. Four witnesses including the writer will swear to this.
10. USGS study of contamination in fractured rock aquifers - in references
11. <http://www.newsweek.com/id/154394>
12. http://www.ead.anl.gov/pub/dsp_detail.cfm?PubID=1715
13. Delaware Riverkeeper letter to DRBC - in references
14. Hydrogeologist Kastrinos' letter to DRBC - in references
15. ProPublica report: <http://www.propublica.org/feature/new-yorks-gas-rush-poses-environmental-threat-722>
16. Pit pollution report, from OGAP.org ... pages 19,20,21
<http://www.earthworksaction.org/pubs/PitReport.pdf> - in references
17. Siri Lawson letter in references - Please read it.
18. Dr Colborn's testimony before Congressman Waxman's Oversight Committee
<http://oversight.house.gov/story.asp?ID=1576>
19. Dr. Colborn live remote talk (private recording - available on request) May 31,2008, Callicoon,NY
20. USGS Fact Sheet FS-142-99, September 1999 - in references [see "USGS-NORM.pdf"]
21. Communication from Charles Morgan, P.E. - in references [see "N-GAS-Compressor Stationpdf"]
22. recommendations for minimum EIS - in references [see "PApetition_8-8-08.pdf"]
23. see <http://www.earthworksaction.org/Chemicalsandhealth.cfm>


Please see links to PDF documents on next page . . .


Links to PDF Documents for Reference (Ref. number)


 2008-John Kastrinos_Geologist 07_14_DRBC.pdf ... # (14)


 Allegheny_Drilling_Photos.pdf ... # (4)

 CROSBYanalysis_of_products_used_well_in_wyoming_2-25-08.pdf ... # (8)


 Delaware Riverkeeper_letter.pdf ... # (13)


 EPAFracfluids.pdf ... # (1) Printable


 EPAfracturingIngred.pdf ... # (1)

 N-Gas-Compressor-Station-Noise-Tortures-Local=Residents.pdf... # (21)

 Oil_gas_spills_show_risk_to_Roan_Plateau.pdf ... # (3)

 PApetition_8-8-08 .pdf ... # (22)

 USGS-Contamination_in_fractured_rock_aquifers.pdf ... # (10)

 USGS-NORM.pdf ... # (20)

 Siri-Lawson_Letter.pdf ... # (17)