



Comments to Draft Scope for Draft Supplemental  
Generic Environmental Impact Statement on the  
Oil, Gas and Solution Mining Program with respect  
to Well Permit Issuance for Horizontal Drilling and  
High-Volume Hydraulic Fracturing to Develop the  
Marcellus Shale and Other Low Permeability Gas  
Reservoirs

- I. The Draft Scope Does Not Appear to Intend to Require Peer-Reviewed Scientific Studies for the Supplemental Generic Impact Statement (the "Supplemental" or "Supplemental GEIS").
  - A. Peer-reviewed scientific studies must be considered, analyzed and afforded greater weight than industry-funded and/or demonstrably incomplete studies of horizontal drilling and high-volume hydraulic fracturing.
  - B. As an example of a demonstrably incomplete study, reference is made to the United States Environmental Protection Agency's own report on horizontal drilling and high-volume hydraulic fracturing, which omits the grave risk posed to drinking water supplies.
    1. See [Our Drinking Water at Risk: What the EPA and the Oil and Gas Industry Don't Want Us to Know About Hydraulic Fracturing](http://www.earthworksaction.org/pubs/DrinkingWaterAtRisk.pdf), Oil & Gas Accountability Project, <http://www.earthworksaction.org/pubs/DrinkingWaterAtRisk.pdf>, April, 2005.

2. Indeed, Weston Wilson, a Senior EPA Engineer in Denver, Colorado, has publicly stated that the EPA has not provided sufficient evidence that hydraulic fracturing is not harmful to drinking water.

[http://www.earthworksaction.org/PR\\_OGAP\\_FracReport.cfm](http://www.earthworksaction.org/PR_OGAP_FracReport.cfm); see also

<http://articles.latimes.com/2005/apr/14/nation/nahalliburton14> (“Weston Wilson, a 32-year veteran

of the EPA, said that a recent agency review of the safety of the drilling technique did not use established agency standards and relied on a peer review panel dominated by energy industry personnel”); EPA to Citizens: Frack You,

<http://www.salon.com/news/feature/2006/05/05/fracking/>

- C. The DEC should address the documented concerns raised in Drill for Natural Gas, Pollute Water, Scientific American, November 17, 2008, annexed hereto as Exhibit A.

1. The EPA Report is incomplete, was secretly biased by direct negotiations with private energy companies and cannot serve as a basis for

concluding that hydraulic fracturing is safe.

2. Documented instances of contamination in Sublette County, Wyoming and "more than 1,000 other cases of contamination ... in Colorado, New Mexico, Alabama, Ohio and Pennsylvania require:
  - a. Investigation with respect to the companies involved;
  - b. Determination whether these same companies will participate in the development of low-permeability shale gas extraction in New York State;
  - c. Review of the possibility of underground migration of chemicals and fluids beyond that foreseen by the gas companies and regulators;
  - d. Analysis of how the same or similar contamination can be avoided here;
  - e. Detailed specification of the dangers and costs attendant to similar instances of contamination in New York State;
  - f. Toxicology studies of the known components of fracturing fluid should be part of the Supplemental GEIS.

II. The Draft Scope Offers No Method of Considering, Let Alone

Implementing Best Practices for Gas Drilling and Extraction.

- A. "Often, there are alternatives available to the standard technologies and practices used by the oil and gas industry. Sometimes companies are hesitant to use alternatives because they perceive these options as being more expensive, or the companies are simply used to doing things a certain way."

<http://www.earthworksaction.org/pubs/LOguide2005book.pdf>

- B. Despite the widespread publication and availability of Best Practices for drilling, the Draft Scope does not propose to consider any.
- C. At a minimum, the Draft Scope should address the feasibility, advisability and safety of:
1. Closed Loop Drilling;
  2. Steel Tanks for Containment of Fracturing Fluid and Storage of Produced Water;
  3. Flareless Completion of Gas Wells in Place of "Burning Off";
  4. Waste Minimization During Drilling Operations; and
  5. Minimization of Noise and Air and Water Pollution.
- D. Additional resources concerning Best Practices can be found at

<http://www.earthworksaction.org/pubs/LOguide2005book.pdf>  
f, pp. V-3 - V-4, and  
[http://www.blm.gov/wo/st/en/prog/energy/oil\\_and\\_gas/best\\_management\\_practices/gold\\_book.html](http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/best_management_practices/gold_book.html)

III. While It Purports to Seek to Address the Cumulative Impact of Horizontal Drilling and High-Volume Hydraulic Fracturing, the Draft Scope Fails to, But Must Address the Full Impact Over the Anticipated Extraction Period of 20-30 Years, including:

- A. All Pipelines and Other Ancillary Equipment and Installations Associated with the Exploitation of New York Shale Drilling;
- B. Multiple Stimulation Over the Lifetime of the Thousands of Wells Contemplated;
- C. All Low Permeability Shale Deposits Which May be Subject to Horizontal Drilling and/or High-Volume Hydraulic Fracturing complete with:
  - 1. Specific Identification of All Low Permeability Shale Deposits-only the Marcellus Shale is currently named;
  - 2. Geographical and Geological Documentation, Mapping and Diagramming of All Shale Deposits, including

all existing operating, capped and uncapped wells located in these areas;

3. Full and Complete Mapping of all Primary and Principal Aquifers;
4. Collection of baseline data with respect to water quality in all affected and potentially affected areas.

D. Review of the capacity, condition and adequacy of wastewater treatment facilities available for produced water. The DEC itself reports that "one-quarter of the 610 facilities in New York are operating beyond their useful life expectancy and many others are using outmoded, inadequate technology, increasing their likelihood of tainting our waters."

1. Disposal of the vast quantities of produced water should be addressed globally in the Draft Scope, rather than left to the permitting process on a case-by-case basis.
2. Although the Draft Scope suggests that water quality and preservation issues must be addressed, as well as the disposal of produced water or "slick water," the Draft Scope does not address

the adequacy or capacity of wastewater treatment plants which may be used for produced/slick water.

IV. The Draft Scope Ought Also to Consider a Phased-In Approach to Permitting Which Would Limit the Number of Permits Considered and Granted to a Number Proportional to the Full-Time DEC Inspectors Devoted to Gas Extraction through Horizontal Drilling and High-Volume Hydraulic Fracturing.

A. Currently, the DEC promises consideration of drilling applications on a strict timeline. However, given the high quantity of permits anticipated with respect to the Marcellus Shale gas extraction alone, the Draft Scope must address whether these timelines are appropriate in light of the DEC's current ability to analyze, investigate and consider all of the risks posed by every new well, stimulation, extraction and/or capping.

B. The potential benefits of limiting the number of permits to a steady number over time include:

1. The opportunity for the DEC and all other involved and affected government entities to conduct a thorough review of each application;
2. Affected communities and individuals would have

the chance to ramp up their own regulations and adjust to the vast changes even a single high-volume hydraulic fractured horizontal well would entail; and

3. Study and monitoring of permitted wells in a continuing effort to ensure safe drilling, operation and extraction.

V. The Draft Scope Evinces DEC's "Go-it-alone" Plan, Which is Unnecessary and Counter-Productive, Since Other Government Agencies Will Be Involved.

A. As noted in the Supplemental GEIS, various other government agencies are involved in the process of drilling, extraction and termination of gas extraction wells.

1. The Public Service Commission is involved with respect to the construction and maintenance of pipelines;
2. The Department of Health to the extent that any facet of the process affects the public health by pollution, contamination or otherwise;
3. The New York City Department of Environmental Protection is implicated insofar as this new and

substantial process affects the watershed and/or any source or potential contamination of water which supplies New York City;

4. The Delaware River Basin Commission and Susquehanna River Basin Commissions are involved to the extent that water is drawn from either basin and with respect to the disposal of produced water which may affect either basin; and
5. Local towns are involved as the primary regulators of roads and public nuisances within their vicinages.

B. Consideration, communication and cross-responsibilities of each such entity should be included as part of the scope of the Supplemental GEIS.

VI. The Draft Scope Fails to Incorporate the Substantial Experiences and Regulatory Successes and Failures of Horizontal Drilling and High-Volume Hydraulic Fracturing In Sister States.

A. The Supplemental GEIS must address the various systematic and accidental effects of high-volume hydraulic fracturing and horizontal drilling in other states to determine whether and how the same can be

avoided in New York:

1. The DEC should address known incidents of well-water, groundwater and surface water contamination, and VOC contamination in Pennsylvania and other states;
2. The DEC should review and/or conduct epidemiological studies of those living near high-volume hydraulic fractured horizontal wells to determine the risks to the general public;
3. The DEC should review and compare the geological profile of the low permeability shales in New York with those in other states to determine which differences are necessary to protect the general public;
4. The DEC should, as part of the permitting process, review the compliance and competence history of permit applicants based upon experience in other states. Such reviews should include all subcontractors to be engaged by the applicants to determine the potential risk that such applicants will intentionally and/or negligently disregard New York regulations.

- a. For example, certain drilling companies have completely ignored the permitting requirements of the Susquehanna River Basin Commission with virtual impunity. Companies such as these should not be allowed to drill in New York.
- B. The Supplemental GEIS must address the regulatory successes in other States to determine whether New York could benefit from a revised regulatory structure.
1. New Mexico has passed comprehensive legislation which seeks to more tightly regulate gas extraction without compromising environmental protection. Colorado has also revised its regulatory legislation with respect to gas drilling.
  2. States such as Utah, Wyoming and Texas provide less regulation.
    - a. Considerable anecdotal evidence suggests that air and water contamination in these states has caused public health problems.
    - b. Significant declines in wildlife in the areas surrounding high-volume hydraulic fracturing

and horizontal drilling indicates that the process has significant environmental costs.

c. The Pittsburgh water supply has apparently been contaminated as a result of low permeability shale gas drilling.

3. The Supplemental GEIS should consider whether DEC regulations are sufficient.

a. A review of the 1992 GEIS's recommended regulations against those actually promulgated suggests that promulgation lagged.

b. It may be more effective and promote a stronger DEC if legislation is enacted to strengthen the DEC's power and the permitting process is committed to force of law.

(1) The DEC may need greater authority over the process in order to close any regulatory holes and to put in better balance the positive and negative impacts;

(2) Legislation may also draw in additional support from other state agencies

involved in the process;

- (3) Prosecution of violations could be considered for the Attorney General's office; and
- (4) Local governments should be permitted a more active role than currently provided for in the Environmental Conservation Law.

VII. The Draft Scope Must Provide a Thorough Analysis of the Substantially Revised Regulatory Overlay in Light of the Energy Act of 2005.

- A. The GEIS noted the Federal involvement in regulating the drilling, extraction, disposal and capping process, which, at the time, included the Environmental Protection Agency, the Federal Energy Regulatory Commission and other bodies.
- B. However, the Energy Act of 2005 exempted domestic energy production from much of the protective overlay of federal regulation, including the Clean Air Act, the Clean Water Act, the Safe Drinking Water Act, CERCLA and the purview of the EPA.
- C. The draft Scope must address which areas are no longer

subject to federal regulation and assistance and provide for how the DEC and other agencies may comprehensively fill that regulatory and remedial void.

VIII. The Appropriateness of Injections Wells as a Disposal Option Must Be Determined and Addressed in the Supplemental GEIS.

IX. DEC Staffing Remains A Substantial Concern in Light of The Quantity of Wells Foreseen, But Is Not Addressed in the Draft Scope.

A. The Supplemental GEIS must address the number of full time DEC Staff devoted to the various stages of high-volume hydraulic fracturing and horizontal drilling, including permitting, drilling, extraction and maintenance and capping;

B. The Supplemental GEIS must address the volume of work per staff-person at each stage of the process;

C. The Supplemental GEIS must consider the education and training necessary for DEC staff members involved at each stage of the process.

X. The Economic Impact Analysis in the GEIS is incomplete and inaccurate for the following reasons:

A. The analysis and report are dated January 1988, and are

therefore terribly outdated. No decisions should be based on such outdated analysis. The economy has changed dramatically in the last 20 years; and the oil and gas market of the 1980s is very different from that of today. The analysis of 1988 seemed to focus predominantly on the oil industry. The economic impact analysis must be updated to reflect the current market and economy, and it should reflect accurately the actual industry and product being considered.

- B. The outdated report states that the multiplier effect is 1.4, meaning that for every \$1.00 of well/drilling output, \$1.40 is contributed to the State's economy through direct, indirect and induced effects. The report states *"the reported earnings multiplier of 1.4 for the oil and gas industry in New York is lower than many manufacturing and service industries, partly because the industry as a whole is not labor intensive, and also because most of the companies which provide services to the industry in New York are headquartered in nearby Pennsylvania."* If an updated economic impact analysis were to find a similar multiplier, then it would appear to make more sense to encourage an alternative industry that would provide a greater

economic impact in the Catskills and in New York State generally. If an updated and more accurate analysis were to conclude that the multiplier effect of gas drilling is as great or greater than that of other industries, then there may be an economic reason to encourage gas drilling. While multipliers cannot be reliably compared across studies due to widely varying approaches and assumptions, the Planning Department of Greene County in the Catskills has stated that the income multipliers for industries already important to the Catskills such as agriculture, deer hunting and services (including tourism) are 2.29, 1.78 and 1.48, respectively. The analysis done to date indicates that based on economic impact alone, gas drilling should not necessarily be encouraged.

- C. Input/output tables that are used for economic impact analyses generally are not calibrated to reflect environmental effects, and certainly in the 1980s, such impacts were not properly considered. More recently, there has been an attempt by economists to encourage the Bureau of Economic Research (BEA) of the Department of Commerce, the keeper of the National Income and Product Accounts, upon which the input/output tables

and multipliers are based, to become "green." The input/output tables and multipliers are updated on a fairly regular basis. The latest available from BEA are based on 2005 national and regional data, so clearly the economic impact analysis in the GEIS does not reflect the most recently available tables. It is likely that even the more recent 2005 tables do not completely capture the environmental and natural resource economic impacts.

- D. The use of the Department of Commerce RIMS II multipliers is not appropriate for analyzing the impact of gas drilling in the Catskills, for several reasons. First, it is a static approach that does not allow impacts to be analyzed over time. Also, the approach assumes linear production and consumption functions, implicitly assuming that household spending increases directly with income and there are no economies or diseconomies of scale. With increased income, there are, in fact, increased leakages away from local spending and into saving and investment and purchase of travel and luxury goods. In addition, such an approach tends to assume the existence of nearly perfect supply elasticity in all sectors and the absence of supply

constraints. It provides little allowance for the inability of any local sector to supply the required products. It also assumes that relative prices are constant. Finally, the multiplier that is used reflects a statewide effect. The impacts specific to the regions being affected must be an important focus. The statewide multiplier will clearly be greater than a localized multiplier.

- E. The report mentions environmental issues, but makes no attempt to value them. The report states,

Unfortunately, it is difficult to assign precise monetary values to aesthetic benefits such as the beauty of an unspoiled wilderness. The monetary value for improvements in such areas as clear air, clean water, and clean soil are easier to estimate and assign by using parameters such as increased property value, decreased health care costs, increased recreational and tourist use, and improved production from forestry, fishery and agriculture.

No justifiable reason is offered for why none of these parameters were estimated. A thorough analysis should evaluate each of these. The report even states "Most experts in this field agree that in most cases it is much cheaper to prevent pollution than to restore the environment after it has occurred."

XI. In order to realistically estimate the economic and socioeconomic impacts of gas drilling in the affected New York region, the unique underlying structure of the economy in the region must be accurately reflected and understood; and the analysis must go well beyond the strict application of input-output models.

- A. Several reports have emphasized the economic growth effects of gas drilling in the Barnett Shale of Texas and the Fayetteville Shale of Arkansas. It does not appear that any rigorous statistical work was done to try to isolate the causes of economic growth. It is possible that some of the growth may have occurred regardless of the drilling industry.
  
- B. The specifics of the economies of the rural counties of the Catskills may be very different than those of the affected counties in Texas and Arkansas. For example, the Catskill region is heavily dependent on tourism, hunting, fishing, organic and specialized agriculture, and second-home owners. The importance of such industries to the Catskills must be reflected in any economic impact analysis of the region. There has been little mention of studies done in some Western states that show that the hunting industry would be negatively

impacted by drilling activity as game animals tend to venture far away from both new roads and drilling activity. As the Catskills are in close proximity to New York City, it is a unique region in which natural beauty and outdoor pursuits encourage relatively higher income New York City residents to visit as tourists and also purchase second homes. This factor should be reflected in the economic impact analysis. If the pristine beauty, abundant wildlife and water and air quality are negatively impacted, high spending city folk will stop coming to the region. A recently released "Second Home Owner Study" of Sullivan County, prepared by the Sullivan County Division of Planning and Environmental Management, indicates that second home ownership grew by 65% in Sullivan County between 2001 and 2007. The same study found that "70% of respondents indicated that rural features and viewsheds appealed to them most when buying their home." Any economic impact analysis must weigh the potential short-term benefit from gas drilling against the long-term loss of spending by visitors and second home owners.

C. In some cases, the authors of the reports are employed

by organizations that are funded or sponsored by corporations or government entities that may have special interests. An independent consultant should do the analysis, and concerned citizens should have input equal to that of the interested corporations and government entities.

- D. While the success of gas drilling in the Fort Worth Texas area is frequently cited as an example of positive economic impacts, the fact is that Fort Worth was already a thriving urban area. It had an infrastructure in place to support a large and growing population. One study by the Joint Urban Studies Center of Wilkes-Barre, Pennsylvania, describes the impact as "icing on the cake" for an already flourishing urban area. The same study also points out that in both urban and rural areas, crime rates and poverty rates have increased at the same time that population and average household incomes have grown. Analysis of the potential impact on crime rates and poverty rates must be included.
- E. As many of the jobs associated with the proposed drilling efforts in the Catskills would be relatively short-term jobs and as the area is rural, it is

possible that such workers would elect to live there temporarily and leave their families in their original locations in other states. Spending by such temporary employees would have a relatively small impact on the local economy, as much of their income would be spent in their home states. The permanence of workers' relocations should be evaluated.

- F. Alternatively, if there is a large influx of workers and their families to the region, the drilling may go on for a relatively short time compared to the required financing and maintenance of improved infrastructure to support the increased population. In fact, on October 15, 2008, Orville Cole, President of Gastem USA, testified before the New York Assembly Standing Committee on Environmental Conservation and stated that after drilling, they will employ only one full time person for every 20 well sites. Mr. Cole also stated, "in all likelihood the drilling and service crews will not be drawn from the local labor pool due to the expertise required." An impact analysis must consider the costs to the region to maintain underused roads, schools, hospitals, etc, in the future if the expanded population is no longer there. If a large population

increase is expected, then a thorough economic impact analysis must evaluate the potential effects on housing values and affordability, public school systems, transportation infrastructure, land use, need for public services and safety, health care and social services, and crime rates, to name a few. The long-term impacts must be carefully analyzed due to the fact that once the drilling is completed, the region may be left with population declines, scars on the environment and no permanent economic growth.

- G. It is possible that due to the rural nature of the Catskill region, landowners who have significant monetary gains from land leases and royalties may relocate to other areas with greater cultural advantages, in which case their increased spending and investment would not benefit the local region.
- H. A recently released report prepared for the Marcellus Shale Committee by the Pennsylvania Economy League of Southwestern Pennsylvania, LLC titled "The Economic Impact of the Oil and Gas Industry in Pennsylvania" is an example of a biased study. The Marcellus Shale Committee is "comprised of oil and gas companies actively engaged in developing natural gas resources of

the Marcellus Shale in Pennsylvania as well as adjoining states." There is no indication in the report that they evaluated the percentage of local residents who would be employed, the percentage of imported employees who would relocate their families as opposed to staying on a temporary basis. There is no indication that landowners were interviewed with regard to their intentions if they have significant monetary gains. There is no discussion of whether population changes would be long-term or short-term and how such population changes may affect the factors mentioned above such as housing values and affordability, public school systems, roads and bridges, public services and safety, crime rates, etc. in both the long and short term. The only factors evaluated are employment, output, employee compensation, and other income; and the conclusions even for these factors are likely to be biased as "the Economy League used an input-output model for the state supplemented with analyses based on discussions with experts in the Oil and Gas industry." Such an approach, the strict use of input-output multipliers without full consideration of other obvious economic issues, cannot lead to an accurate evaluation

of socioeconomic impacts.

If, after an up-to-date, realistic, thorough and unbiased analysis of the economic, socioeconomic and environmental impacts of gas drilling in the affected New York region, it is concluded that the net benefits would be substantial, municipalities should insist on binding agreements with the drilling companies that specify reparations and mitigations for negative long-term impacts.

XII. Any Economic Analysis Must Address the Gas Companies' History of Non-Payment of Royalties.

- A. Chesapeake Energy, one of the leading purchasers of gas extraction rights with respect to New York State Marcellus Shale interests, was sued by 8,000 landowners in West Virginia for improperly withholding royalties on gas extraction. The plaintiffs were awarded \$404 million, but had to pursue litigation up to the U.S. Supreme Court in order to collect it.
- B. Before companies with non-payment histories like Chesapeake are permitted to drill in New York State, the economic effects must be carefully analyzed to include the costs of litigation, the risks of non-payment by such companies and the possibility that any

judgment ultimately awarded may not be collectible.

- C. Additionally, cases of recalcitrance such as Chesapeake's demonstrate that open and neutral monitoring of the volume of gas extracted is necessary to protect New York State landowners. The Supplemental GEIS should propose a system which would provide for open, neutral and easily monitored extraction meters.

XIII. The Supplemental Should Address All Regulatory Recommendations in the Original GEIS Which Were Not Promulgated and Which Relate to Gas Extraction in Low Permeability Shale Formations.

- A. Despite dozens of recommended regulations in the GEIS, none appear to have been promulgated by the DEC.
- B. An analysis of why proposed regulations were not promulgated and whether the procedures can be addressed must predate finalization of the Supplemental GEIS.

XIV. The Supplemental GEIS Should Include a Comprehensive Map of All Primary and Principal Aquifers, Water Bodies, Rivers and Streams in Any Area in Which Low Permeability Shale Gas Extraction May Take Place.

XV. The Draft Scope fails to address the danger to private water wells, which provide a majority of the drinking water

consumed in the Southern Tier Counties, as well as Sullivan and Delaware County.

- A. Well contamination has already been experienced in Pennsylvania as a result of high-volume hydraulic fracturing and horizontal drilling.
- B. Well contamination from hydraulic fracturing has already taken place in New York
  - 1. The Supplemental GEIS should address the incidents which have already occurred, providing explanation of the causes and prospective solutions which will avoid further incidents.
  - 2. Additionally, the Supplemental GEIS should explain how the DEC will maintain a comprehensive, publicly-available database which records and preserves for public access all incidents of contamination so that the offending companies, the particular wells and the chemicals employed can be identified.
  - 3. The Supplemental GEIS should provide authority for any distinctions made between protection of (i) private wells and (ii) primary and principal Aquifers.

XVI. The Supplemental GEIS Should Also Provide Comprehensive, State-wide Mapping of Any Land in Which Any Low-Permeability Shale May Be Subject to Drilling, Including:

- A. All Forest Preserves, Parkland and Any Other Designated Areas in Which Regulations May Differ from Privately-Owned Property;
- B. All Wildlife Preserves, Threatened and/or Endangered Species Habitats;
- C. All Wetlands and Floodplains;
- D. All Archaeological and/or Historical Sites.

XVII. Alternative Actions in Original GEIS Should Be Updated to Reflect New Economics.

XVIII. The Draft Scope Fails to Address Disposal of Drill Cuttings, Which Will Be Substantially Greater With Respect to Horizontal Drilling.

XIX. The Supplemental GEIS Should Address Additional Financial Protections for Municipalities, Property Owners and Others Negatively Affected by High-Volume Hydraulic Fracturing and Horizontal Drilling

- A. Posting of bonds for road wear and damage should be analyzed, and imposed for the substantially increased traffic anticipated to result from this new extraction

process.

B. Strict liability should be imposed on gas companies for damage to surface and groundwater.

1. Such strict liability has ample precedent in riparian rights and product liability law involving inherently dangerous substances and devices.

2. Only entities which are adequately capitalized or insured against such losses should be permitted to drill.

XX. The Draft Scope Should Be Expanded to Include and Impose Various Time Limitations on the Application and Drilling Process.

A. Current time limitations imposed on the DEC require action in what may be an inordinately short period of time, thus inhibiting the review process.

1. In light of the greater burden on the DEC from the withdrawal of Federal authority, these time lines should be extended so that they do not arbitrarily interfere with the thorough analysis and examination required for considering drilling applications.

B. Strict time limits should be imposed on permitted drilling which delineate the dates on which water will be withdrawn and require disposal in short order to avoid seepage, spills and other potential dangers associated with maintaining the fluid onsite.

1. In order to delimit and coordinate withdrawals of surface and/or groundwater from any domestic source, gas companies should commit to withdrawal within set timeframes, absent which further permitting required.

2. Similarly, the coordination and capacity of wastewater treatment of the contemplated significant volumes of produced water should be strictly regulated.

XXI. The Supplemental GEIS Should Set Standards for All Water Treatment Facilities Which Are Allowed to Treat Fracturing Fluid.

A. All water treatment facilities treating fracturing fluid should be required to record the amounts treated, the entity responsible for supplying such amounts and the wells from which the fluids were drawn.

B. The DEC should require wastewater treatment facilities

to be approved in advanced of treating fracturing fluid.

1. Such facilities should be determined to be capable of treating such materials, including the removal of naturally occurring radioactive materials and volatile organic compounds. Some substances in produced water, including arsenic and xylene, may not be removable by wastewater facilities, the treatment and removal of which must be addressed.
2. Public notice of such facilities' intent to treat fracturing fluid should be provided in advance of the granting of any permit.

XXII. The Supplemental GEIS Should Address Fiscal Issues Associated With the Anticipated New Activity

- A. Permitting fees should be addressed and analyzed to determine whether increase is necessary for the DEC to be able to afford to accomplish its mandate.
- B. The DEC's budget, staffing and organization should be evaluated to determine whether the DEC has adequate resources on a going forward basis to handle the permitting, inspection and monitoring processes and damage control and remediation contingencies.

XXIII. The Supplemental GEIS Should Address the Ability of Local and Municipal Officials to Handle Any Contingencies.

A. The Supplemental GEIS should address the nature and type of any accidents, including spills, fires, explosions, contamination and any other possible dangers.

B. The Analysis must include both the proper authorities for responding to such contingencies and the proper responses.

1. What types of accidents are possible?
2. What would be the consequences of such accidents?
3. How could such accidents be remediated?
  - a. Who would be liable for remediation?
    - (1) How would compensation be sought?
4. Who would effect remediation?
5. How would local authorities have to respond?
  - a. Are local authorities capable of responding?
    - (1) Is this uniform statewide?
    - (2) Where are they not capable?

XXIV. Line Edits/Comments to the Draft Scope of the

Supplemental GEIS:

**Additional Comments by Page and Line**

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<b>Page/Section</b>	<b>Comment</b>
p. 1, § 1.1	This should include Ulster and Greene along with "Delaware and Sullivan where natural gas production has not previously occurred". All shales should be named and included and added to the scopes wherever Marcellus is mentioned, and a specific geological area should be declared.
p. 3, § 1.2	Is the IOGCC relevant insofar as it is: (a) a seventy-three year-old compact, not a document with specific legislative impact; (b) predates the establishment of the EPA by thirty-five years; © may be rendered irrelevant by the Energy Act of 2005?
p. 3, § 1.3	<ul style="list-style-type: none"><li>- Although this speaks in terms of statewide mandates, the draft Scope does not contain any comprehensive mapping of all low-permeability shale gas reserves</li><li>- Area where drilling may not occur in the Catskill Forest Preserves should be mapped. Project location should be consistent throughout the document and should not differ here from 1.1.</li><li>- The 1992 GEIS states that drilling is unlikely in the Marcellus shale - this turns out not to be accurate so therefore Adirondacks, NYC and Long Island should be included.</li></ul>

### **Additional Comments by Page and Line**

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<b>Page/Section</b>	<b>Comment</b>
p. 4, § 1.4	<p>- The prior GEIS did not address either horizontal drilling or high-volume hydraulic fracturing and, as such should not delimit at all the scope of the Supplemental GEIS</p> <p>- "A separate finding was made that issuance of an oil and gas drilling permit for a surface location above an aquifer is also a non-significant action, based on special freshwater aquifer drilling conditions implemented by the Department." Testimony has already been heard about the short life span of the concrete casing protection for aquifers. The Supplement should include peer reviewed scientific studies on the exact concrete mixture to be used to protect aquifers and its life span. Wells in the Marcellus shale are estimated to have a life span of 20-30 years and the casings should be designed for this kind of time period. In the 1992 document people applying for some well permits (gas storage and salt) are required to get information on seismic activity - given the length of life of the horizontal wells, this should be included on all applications for high-volume hydraulic fracturing and horizontal drilling, given the substantial volume of fracturing fluid which will remain in the well.</p>

### **Additional Comments by Page and Line**

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#### **Page/Section    Comment**

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- p. 5, § 1.4    - In 1981 (according to the GEIS) 2 million people in upstate New York got their water from private water wells. Water in these wells comes from bedrock aquifers and should be protected with the same protection as municipal water supplies - 2000 feet. Since horizontal drilling, which is only mentioned once in the GEIS and is described as experimental (18-17 & 18) reaches at least 4000 feet horizontally, the scopes/supplement should review whether 2000 feet is adequate protection for any water system.  
- Horizontal drilling, considered experimental in the GEIS, was not analyzed at all. Therefore the primary factors mentioned should include an analysis of this very different type of drilling operation as well as the geographic locations and the water uses.
- p. 7,  
§ 1.4.1        - Definition by surface area affected is no longer valid, given the substantial horizontal distances contemplated for drilling and subject to the Supplemental GEIS  
- Horizontal drilling was considered experimental in the GEIS, and that review of both of the EAFs is required. Horizontal hydro fracturing required a 5 acre pad. Only 2 - 3 acre pads are discussed in the GEIS at all. The whole SEQRA determination should be reviewed to take this into account.

### **Additional Comments by Page and Line**

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<b>Page/Section</b>	<b>Comment</b>
p. 8, § 1.5	<p>- The Scope must include surface equipment used to compress and drive the gas into pipelines, such as compressors, which do not appear to be otherwise regulated.</p> <p>- Pipelines must be included in the supplemental. Land disturbance is analyzed in the GEIS and is considered a reason to include access roads in the environmental review. There is no gas infrastructure in the eastern part of the Marcellus play and significant numbers of pipelines will be required to move the gas. There are no gas storage reservoirs either. The soil and land disturbance required for these lines should be included.</p>

### **Additional Comments by Page and Line**

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<b>Page/Section</b>	<b>Comment</b>
p. 9, § 2.1	The 1992 document did not consider horizontal drilling nor the large volume of water required. The Supplemental should address the full build-out and the requisite number of staff. The 1992 GEIS does address staffing issues, and they should be reconsidered in light of the new methodologies.
p. 10, § 2.11	<ul style="list-style-type: none"><li>- The efficacy of sister states' regulation should be addressed and considered for adoption in New York.</li><li>- Supplemental should look at any differences in the chemicals mentioned in 1992 and the chemical in use today for hydro-fracturing.</li></ul>
p. 10, § 2.1.2	<ul style="list-style-type: none"><li>- Hydraulic fracturing heretofore practiced did not involve horizontal drilling or the newly-developed fluids for low permeability shale extraction.</li><li>- The Scope fails to address the ongoing use of stimulation by high-volume hydraulic fracturing throughout the decades-long lifetime of each well.</li><li>- The Scope should explain or address how aquifer location and depth is determined and mapping should be undertaken.</li><li>- Sister states' operations, incidents, accidents and contamination should be addressed.</li><li>- Instances of contamination from hydraulic fracturing have been presented to the DEC. The Scope must address why it lacks documentation of such incidents and how a more accurate database will be maintained.</li></ul>

### **Additional Comments by Page and Line**

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<b>Page/Section</b>	<b>Comment</b>
p. 11, § 2.1.2	<ul style="list-style-type: none"><li>- The regulations alluded to should be referenced and harmonized with the retreat of Federal protection and remediation in light of the Energy Act of 2005.</li><li>- The assertion that 99% of "slick water" is water is false and lacks any basis.</li><li>- Contamination can result from stored chemicals, not merely spillage of diluted "slick water."</li><li>- Maintenance and monitoring of pit liners should be addressed and specified.</li></ul>
p. 11, § 2.1.2.1	<ul style="list-style-type: none"><li>- How is this process determined, monitored and enforced?</li><li>- The safety of additives and diesel stored at well heads in flood areas - whether pre-mixed or not should be addressed.</li><li>- Supplemental should detail all the inspections that must be made to each drill site by DEC and explain how they will be able to keep on top of well casing issues and 'proper liner maintenance' at current staffing levels.</li></ul>
p. 12, § 2.1.2.1	<ul style="list-style-type: none"><li>- The Scope should include alternative methods, such as closed-loop drilling.</li><li>- Any deviation from steel containment tanks should only be allowed in non-flood prone areas which should be mapped statewide to prevent flooding of open pits.</li><li>- Open pits are known air pollutants through the evaporation of volatile organic compounds and the exposure of naturally occurring radioactive materials, like radon.</li></ul>
p. 12, § 2.1.2.2	Mixing, injection, removal, site-removal and treatment of water used in hydraulic fracturing should be monitored and metered.

### **Additional Comments by Page and Line**

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<b>Page/Section</b>	<b>Comment</b>
p. 13, § 2.1.2.2	<ul style="list-style-type: none"><li>- The Scope must address the potential effects of slick water remaining in the well.</li><li>- There is a public interest in public disclosure of the contents and composition of fracturing fluid.</li></ul>
p. 14, § 2.1.4	<ul style="list-style-type: none"><li>- Supplemental should discuss the herbicides used on the large drill pads and their impact on the natural flora of the site.</li><li>- Also the DEC should look at the importation of alien species on truck wheels or by other means.</li></ul>
p. 14, § 2.1.5	<ul style="list-style-type: none"><li>- How is the integrity of the walls determined in horizontally-drilled wells?</li><li>- The dSGEIS will discuss whether any additional production equipment or activities would be found at Marcellus Shale wells that would necessitate new or different mitigation measures" This should include diesel storage and fumes from compressors, dehydrators, evaporators, generators, trucks. Also the same again for the stimulations in the future of the well. And the noise from same.</li><li>- The capping process should be updated to address capping of horizontal wells and the determination of whether vertical fractures from stimulation in the horizontal extensions have occurred and must also be capped.</li></ul>
P. 15, § 2.1.6	<ul style="list-style-type: none"><li>- 16 wells per square mile is environmentally worse than one well per 40 acres. This can be skewed so as to crowd many wells tightly into one area, based on geology with only lip service paid to the environmental character and the needs of local inhabitants.</li><li>- Why is the foot distance between wellbores (660 feet) more environmentally important than the distance between wellbores and spacing unit boundaries (330 feet)?</li></ul>

### **Additional Comments by Page and Line**

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<b>Page/Section</b>	<b>Comment</b>
p. 17, § 4.1.1	Known additional equipment will include compressors required to run 24/7 to move the gas
p. 17, § 4.1.2	The reduction due to multiple wells from a single site may be substantially offset by open pit storage and evaporation of fracturing fluid.
p. 19, § 4.1.2	Because these wells will require ongoing, multiple stimulation over their productive lives, the visual effects may not be reduced after initial drilling.
p. 20, § 4.1.2	Photographs should also include similar wells drilled in other states.
p. 20, § 4.1.3	<ul style="list-style-type: none"><li>- The Scope should state the basis for why some effects are deemed "uncommon."</li><li>- The Scope fails to address air quality issues arising from open pit evaporation of produced water.</li><li>- The Scope fails to address air pollution from compressor equipment running 24/7 at every well-site to move the gas.</li><li>- Hydrogen sulfide is lethal and should not enter the atmosphere under any circumstances. This should be addressed.</li><li>- Effects of water-borne chemical additives upon locally grown food and upon the skin and organs of people using recreational water bodies should be studied.</li></ul>
p. 20, § 4.1.3.1	How will permitting be handled while the DEC searches for guidance?

### **Additional Comments by Page and Line**

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<b>Page/Section</b>	<b>Comment</b>
P. 21, § 4.2.1	<ul style="list-style-type: none"><li>- "Potential effects" of water withdrawals should include effects on public <i>and private</i> water supply.</li><li>- There should be penalties and strict liability for draining water wells and aquifers, and injured parties reimbursed for provable damages.</li><li>- "Potential impacts should include impacts on all water bodies, including recreational lakes and ponds, and on croplands and gardens.</li></ul>
p. 22, § 4.2.1	<ul style="list-style-type: none"><li>- All "existing authorities . . . , protocols and regulations" must be identified in advance of the finalization of the Scoping document so that the list can be evaluated for completeness.</li><li>- New regulations should be put into place to give DEC control over unregulated water sources.</li></ul>
p. 23, § 4.1.1.1	The Scope should note that gas companies effected improper withdrawals of water without advance permitting from the Susquehanna River Basin and should address how that type of grossly improper action will be prevented in New York State.
P. 26 § 4.2.2	<ul style="list-style-type: none"><li>- Private wells should have same protection as municipal supplies.</li><li>- Applications for permits should be required to show locations of all water wells and aquifers within at least 2,000 feet of drill site and horizontal extension(s).</li><li>- Casing and cementing have not eliminated contamination where the cementing job was faulty.</li><li>- Upward pressure of gas in wellbores can overwhelm the force of downward drilling, allowing gas to escape into water supplies.</li></ul>

### **Additional Comments by Page and Line**

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<b>Page/Section</b>	<b>Comment</b>
p. 27, § 4.2.2	<p>- The GEIS did not address the deep drilling, horizontal drilling or high-volume hydraulic fracturing anticipated for low permeability shale gas extraction and thus SEQRA has not been satisfied.</p> <p>- The reference to contamination in other states should be addressed fully and comprehensive plans to avoid this in New York must be presented.</p> <p>- Well drilling and production fluids may be taken to disposal wells. These wells operate under State Pollution Discharge Elimination System ("SPDES") permits and federal EPA-Underground Injection Control ("UIC") permits which govern composition of the injected fluids, rates and pressures at which the fluids are injected, the injection zone and area of review, and reporting requirements. In light of the withdrawal of Federal regulation, this practice must be reassessed and comprehensively regulated at the state level.</p>
p. 28, § 4.2.3	<p>The Department lacks any scientific basis for concluding that gas well drilling has no significant environmental effect on a water body 50 feet away. A downstream waterbody will be the first receptor of gelling agents, surfactants, chlorides, et al, escaping via overflows, mixing accidents, and underground leakages from the site.</p>
p. 29, § 4.2.3.3.	<p>Operators typically scrape off the topsoil in preparation for construction. This by itself produces erosion, as bare soil is washed downstream more readily than planted soil. Contaminants may migrate with it.</p>
p. 30, § 4.2.4	<p>"So that NYCDEP could determine if the proposed location is within a 1,000-foot wide protective corridor surrounding a water tunnel or aqueduct." With horizontal drilling going at least 4000 ft, is this enough protection?</p>

### **Additional Comments by Page and Line**

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<b>Page/Section</b>	<b>Comment</b>
p. 32, § 4.3	Habitats in 1992 document only show western part of the state. They should be re-done. Cumulative impact explored in new geographic area.
p. 32, § 4.5	Because of the expanded geographic area for the proposed drilling, DEC must map - wetlands both state and federal, also archaeological sites, historic places, flood plains.
p. 33, § 4.6	<p>- The Scope should address the substantial costs to counties and municipalities of the increase in traffic on local roads for movement of equipment and water.</p> <p>- Post-drilling truck traffic should be addressed in areas where pipelines will not be used to transport gas. Pipeline communication and truck-surface transportation should be addressed in the Supplemental GEIS.</p> <p>- The Supplemental GEIS should address all truck traffic - cement, water in, water out, chemicals, diesel carriers, people, and road damage, revenue shortfall, noise, air quality</p>
p. 34, § 4.7	<p>Given the substantial displacement of gas, volatile organic compounds and naturally occurring radioactive materials, it is grossly false to state that "The emission and discharge of pollutants into the atmosphere, or into ground and surface water from shale gas development will only occur as a result of violations or accidents" This should be corrected and the anticipated release of such materials as a documented effect of low permeability shale gas production analyzed, mitigated and subjected to remediation.</p> <p>- over nine hundred spills from gas extraction operations have been reported in Colorado in only four years. Twenty percent of these have affected ground and surface water.</p>

### **Additional Comments by Page and Line**

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<b>Page/Section</b>	<b>Comment</b>
p. 38, § 4.8	<p>- The Supplemental GEIS must address the common practice among operators of shipping in transient workers to do low-skill jobs. In Rifle, Colorado, which is surrounded now by some 5000 gas wells drilled in the past four years, the population has increased 7% per year by reason of this activity. Crime has surged. Social services have had to increase to cope with attendant issues like child and spousal abuse. The mayor says the town is managing to survive the economic impacts because of its size (pop 19,000) because of grants it applied for and because the state is required to return some of its gas revenues to the affected towns. When told that Sullivan and Delaware County communities were small and sparse, he said, "You'll be overrun."</p> <p>- The Department has entirely avoided reference to the economic impacts of gas drilling, which greatly affect communities. Such impacts are within its jurisdiction not only because it is the lead agency but because (1) the state has stripped regulatory powers from local government and (2) the Department's mandate under the ECL includes protecting the economic and social well-being of the citizens of the state. The obvious economic impacts on local communities include depressed property values in the vicinity of wellsites, and consequent shrinkage of the tax base; loss of tourism income, including income from sporting such as hunting and fishing; population impacts on local schools, hospitals and policing, and heightened wear and tear on roads. These compound impacts can be seen to overwhelm the prospects of local tax income on gas-leased property, local opportunities for jobs, and business income for those of the towns that have substantial commercial centers.</p>

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### Additional Comments by Page and Line

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Page/Section	Comment
p. 35, § 5.0	The Supplemental GEIS should consider whether the DEC has sufficient staff adequately to handle the responsibilities for which it is charged, since the Pataki Administration reduced DEC staff by at least 700 employees during the period 1995 through 2004.
p. 36, § 5.1	Public disclosure by immediate, online posting of all permit applications should be addressed and required. Adjacent property owners should receive written notice of drilling permit applications with sufficient time to offer comments and concerns.

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Exhibit A

# SCIENTIFIC AMERICAN

Features - November 17, 2008

## Drill for Natural Gas, Pollute Water

The natural gas industry refuses to reveal what is in the mixture of chemicals used to drill for the fossil fuel

By Abraham Lustgarten and ProPublica

In July a hydrologist dropped a plastic sampling pipe 300 feet down a water well in rural Sublette County, Wyo. and pulled up a load of brown oily water with a foul smell. Tests showed it contained benzene, a chemical believed to cause aplastic anemia and leukemia, in a concentration 1,500 times the level safe for people.

The results sent shockwaves through the energy industry and state and federal regulatory agencies.

Sublette County is the home of one of the nation's largest natural gas fields, and many of its 6,000 wells have undergone a process pioneered by Halliburton called hydraulic fracturing, which shoots vast amounts of water, sand and chemicals several miles underground to break apart rock and release the gas. The process has been considered safe since a 2004 study by the Environmental Protection Agency found that it posed no risk to drinking water. After that study, Congress even exempted hydraulic fracturing from the Safe Drinking Water Act. Today fracturing is used in 9 out of 10 natural gas wells in the United States.

Over the last few years, however, a series of contamination incidents have raised questions about that EPA study and ignited a debate over whether the chemicals used in hydraulic fracturing may threaten the nation's increasingly precious drinking water supply.

An investigation by ProPublica, which visited Sublette County and six other contamination sites, found that water contamination in drilling areas around the country is far more prevalent than the EPA asserts. Our investigation also found that the 2004 EPA study was not as conclusive as it claimed to be. A close review shows that the body of the study contains damaging information that wasn't mentioned in the conclusion. In fact, the study foreshadowed many of the problems now being reported across the country.

The contamination in Sublette County is significant because it is the first to be documented by a federal agency, the U.S. Bureau of Land Management. But more than 1,000 other cases of contamination have been documented by courts and state and local governments in Colorado, New Mexico, Alabama, Ohio and Pennsylvania. In one case a house exploded after hydraulic fracturing created underground passageways and methane seeped into the residential water supply. In other cases the contamination occurred not from actual drilling below ground, but on the surface, where accidental spills and leaky tanks, trucks and waste pits allowed benzene and other chemicals to leach into streams, springs and water wells.

It is difficult to pinpoint the exact cause of each contamination, or measure its spread across the environment accurately, because the precise nature and concentrations of the chemicals used by industry are considered trade secrets. Not even the EPA knows exactly what's in the drilling fluids. And that, EPA scientists say, makes it impossible to vouch for the safety of the drilling process or precisely track its effects.

"I am looking more and more at water quality issues... because of a growing concern," said Joyel Dhieux, a

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drilling field inspector who handles environmental review at the EPA's regional offices in Denver. "But if you don't know what's in it I don't think it's possible."

### **Toxic Brew?**

Of the 300-odd compounds that private researchers and the Bureau of Land Management suspect are being used, 65 are listed as hazardous by the federal government. Many of the rest are unstudied and unregulated, leaving a gaping hole in the nation's scientific understanding of how widespread drilling might affect water resources.

Industry representatives maintain that the drilling fluids are mostly made up of non-toxic, even edible substances, and that when chemicals are used, they are just a tiny fraction of the overall mix. They say that some information is already available, and that releasing specific details would only frighten and confuse the public, and would come at great expense to the industry's competitive business.

"Halliburton's proprietary fluids are the result of years of extensive research, development testing," said Diana Gabriel, a company spokeswoman, in an email response. "We have gone to great lengths to ensure that we are able to protect the fruits of the company's research.... We could lose our competitive advantage."

"It is like Coke protecting its syrup formula for many of these service companies," said Scott Rotruck, vice president of corporate development at Chesapeake Energy, the nation's largest gas driller, which has been asked by New York State regulators to disclose the chemicals it uses.

Thanks in large part to hydraulic fracturing, natural gas drilling has vastly expanded across the United States. In 2007 there were 449,000 gas wells in 32 states, thirty percent more than in 2000. By 2012 the nation could be drilling 32,000 new wells a year, including some in the watershed that provides drinking water to New York City and Philadelphia, some five percent of the nation's population.

The rush to drill comes in part because newly identified gas reserves offer the nation an opportunity to wean itself from oil.

Natural gas, as T. Boone Pickens said recently, is "cleaner, cheaper... abundant, and ours." Burning gas, used primarily to heat homes and make electricity, emits 23% less carbon dioxide than burning oil. Gas is the country's second-largest domestic energy resource, after coal.

The debate over water arises at a critical time. In his last days in office President George W. Bush has pushed through lease sales and permits for new drilling on thousands of acres of federal land. President-elect Barak Obama has identified the leasing rush as one of his first pressing matters and is already examining whether to try to reverse Bush's expansion of drilling in Utah.

State regulators and environmentalists have also begun pressing the gas industry to disclose the chemicals they use and urging Congress to revisit the environmental exemptions hydraulic fracturing currently enjoys.

But in the meantime, the drilling continues.

In September the Bureau of Land Management approved plans for 4,400 new wells in Sublette County, despite the unresolved water issues. Tests there showed contamination in 88 of the 220 wells examined, and the plume stretched over 28 miles. When researchers returned to take more samples they couldn't even open the water wells; monitors showed they contained so much flammable gas that they were likely to explode.

### **Dirty Water**

News that water in Sublette County was contaminated was especially shocking because the area is so rural that until a few years ago cattle were still run down Main Street in Pinedale, the nearest town to the gas field. The county is roughly the size of the state of Connecticut but has fewer people than many New York city blocks. With so little industry, there was little besides drilling that people could blame for the contamination.

"When you just look at the data... the aerial extent of the benzene contamination, you just say . . . . This is huge," says Oberley, who is charged with water study in the area. "You've got benzene in a useable aquifer and nobody is able to verbalize well, using factual information, how the benzene got there."

Other signs of contamination were also worrying residents. Independent tests in several private drinking wells

adjacent to the anticline drilling showed fluoride -- which is listed in Halliburton's hydraulic fracturing patent applications and can cause bone damage at high levels -- at almost three times the EPA's maximum limit.

"We need the gas now more than ever," says Fred Sanchez, whose water well is among those with high levels of fluoride. But gazing off his deck at the prized trout waters of the New Fork River, he wonders whether drilling has gone too far. "You just can't helter skelter go drilling just because you have the right to do it. It's not morally right to do it. There should be some checks and balances."

Further east, in the town of Clark, the Wyoming Department of Environmental Quality found benzene in a residential well after an underground well casing cracked. In Pavilion, another small town, a series of drinking water wells began running with dark, smelly water, a problem a state official speculated might be linked to drilling nearby.

"There is no direct evidence that the gas drilling has impacted it," says Mark Thiesse, a groundwater supervisor for the Wyoming DEQ. "But it sure makes you wonder. It just seems pretty circumstantial that it's happening."

On federal land, which is where most of the Sublette County wells are located, the BLM governs leasing and permitting for gas development, with secondary oversight from the state and only advisory input from the EPA. When the contaminated water results were first reported, both the BLM and the state downplayed their significance.

The EPA's regional office in Denver sharply disagreed. But because it has only an advisory role in the federal review process, and hydraulic fracturing is exempted from the Safe Drinking Water Act, there was little the EPA could do. It rebuked the BLM in a strongly worded letter and gave the development plans in Sublette County a rare "unsatisfactory" rating. It also recommended that the project be stopped until further scientific study could be done.

The BLM, backed by a powerful business lobby, ignored that recommendation. Why do a study if you can't prove something is wrong, industry argued.

Drilling operators said the benzene came from leaky equipment on the trucks that haul water and waste to and from the drill sites -- and in one or two cases, EPA scientists say that was likely. One theory put forth by the BLM blamed the benzene contamination on malicious environmentalists "hostile to gas production," an accusation the agency later said it had no evidence of.

Thiesse, the DEQ supervisor, recounted a meeting where the debate dwindled down to semantics: "I called it contamination, and somebody said is it really contamination? What if it's naturally occurring?"

The industry insisted, as it has for years, that hydraulic fracturing itself had never contaminated a well, pointing to an anecdotal survey done a decade ago by the Interstate Oil and Gas Compact Commission, a coalition of state regulatory bodies and, again, to the 2004 study by the EPA.

"You have intervening rock in between the area that you are fracturing and the areas that provide water supplies. The notion that fractures are going to migrate up to those shallow formations -- there is just no evidence of that happening," says Ken Wonstolen, an attorney representing the Colorado Oil and Gas Association who has worked with the petroleum industry for two decades. "I think fracturing has been given a clean bill of health."

A flurry of mail from industry representatives to the BLM said the sort of study the EPA wanted would needlessly slow production. "BLM's restrictions on drilling in the Intermountain west have seriously reduced the supply of natural gas reaching consumers," wrote the American Gas Association.

Washington leaned down on Pinedale too. The message, according to Chuck Otto, field manager for the BLM: Make this happen by November. The 4,400 new wells were approved in September without any deadline for cleaning up the contamination or further research. State regulators told ProPublica that hydraulic fracturing was not even considered as a possible cause.

"The BLM looks at it more as a business driven process," Otto said. "It's not like I have Vice President Cheney calling me up and saying you need to get this done. But there definitely is that unspoken pressure... mostly from the companies, to develop their resources as they'd like to see fit... to get things done and get them done pretty

fast.”

### **Flawed Report?**

The 2004 EPA study is routinely used to dismiss complaints that hydraulic fracturing fluids might be responsible for the water problems in places like Pinedale. The study concluded that hydraulic fracturing posed “no threat” to underground drinking water because fracturing fluids aren’t necessarily hazardous, can’t travel far underground, and that there is “no unequivocal evidence” of a health risk.

But documents obtained by ProPublica show that the EPA negotiated directly with the gas industry before finalizing those conclusions, and then ignored evidence that fracking might cause exactly the kinds of water problems now being recorded in drilling states.

Buried deep within the 424-page report are statements explaining that fluids migrated unpredictably -- through different rock layers, and to greater distances than previously thought -- in as many as half the cases studied in the United States. The EPA identified some of the chemicals as biocides and lubricants that “can cause kidney, liver, heart, blood, and brain damage through prolonged or repeated exposure.” It found that as much as a third of injected fluids, benzene in particular, remains in the ground after drilling and is “likely to be transported by groundwater.”

The EPA began preparing its report on hydraulic fracturing in 2000, after an Alabama court forced the agency to investigate fracturing-related water contamination there under the Safe Drinking Water Act. Political pressures were also mounting for the agency to clarify its position on fracturing. The 2001 Energy Policy, drafted in part by the office of Vice President Dick Cheney, a former Halliburton CEO, noted that “the gas flow rate may be increased as much as 20-fold by hydraulic fracturing.” While the EPA was still working on its report, legislation was being crafted to exempt hydraulic fracturing from the Safe Drinking Water Act.

Before that happened, however, the EPA sought an agreement with the three largest hydraulic fracturing companies, including Halliburton, to stop using diesel fuel in fracturing fluids. Diesel fuel contains benzene, and such a move would help justify the report’s conclusion that no further studies were needed.

“Our draft is pending release,” a senior EPA official wrote to Halliburton’s counsel in an August 2003 email. “It would certainly strengthen our preliminary position not to continue studying the issue... if the service companies were able to remove diesel all together, or even move in that direction.”

In a subsequent meeting, an EPA official’s handwritten notes show that a Halliburton attorney asked federal officials: “are we willing to entertain regulatory relief in other areas; eg: fewer inspections?”

“Willing...,” was the reply from Tracy Mehan, then the EPA’s assistant administrator for water.

A Halliburton spokesperson declined to comment on this exchange.

The diesel agreement was signed. But according to the EPA, it isn’t legally enforceable and the agency hasn’t checked to see if diesel is still being used. Furthermore, the agreement applies only to fluids used in a specific kind of gas drilling, not all drilling across the United States.

Mehan did not return calls for comment about his negotiations. Roy Simon, associate chief of the Drinking Water Protection Division’s Prevention Branch at EPA headquarters in Washington says the “EPA still stands by the findings outlined in the (2004) report.”

But one of the report’s three main authors, Jeffrey Jollie, an EPA hydrogeologist, now cautions that the research has been misconstrued by industry. The study focused solely on the effect hydraulic fracturing has on drinking water in coal bed methane deposits, typically shallow formations where gas is embedded in coal. It didn’t consider the impact of above-ground drilling or of drilling in geologic formations deep underground, where many of the large new gas reserves are being developed today.

“It was never intended to be a broad, sweeping study,” Jollie says. “I don’t think we ever characterized it that way.”

Nevertheless, a few months after the report’s release, the sweeping 2005 Energy Policy Act was passed. Almost no attention was paid to the three paragraphs that stripped the federal government of most of its

authority to monitor and regulate hydraulic fracturing's impact on the environment. By default, that responsibility would now fall to the states.

"That pretty much closed the door," said Greg Oberley, an EPA groundwater specialist working in the western drilling states. "So we absolutely do not look at fracking... under the Safe Drinking Water Act. It's not done."

### **Dangerous Ground**

On April 30, 2001 a small drilling company now owned by the Canadian gas company Encana fractured a well at the top of Dry Hollow, a burgeoning field in western Colorado that has seen one of the fastest rates of energy development in the nation.

The well sat at the end of a dirt drive among pinion pines and juniper at the crest of a small mesa overlooking the Colorado River. It was also less than 1,000 feet from the log farmhouse where Larry and Laura Amos lived. As usual that day, water trucks lined up like toy soldiers on the three acre dirt pad cleared for drilling just across the Amos' property line. They pumped 82,000 gallons of fluids at 3,600 pounds of pressure thousands of feet into the drill hole.

Suddenly the Amos' drinking water well exploded like a Yellowstone geyser, firing its lid into the air and spewing mud and gray fizzing water high into the sky. State inspectors tested the Amos well for methane and found lots of it. They did not find benzene or gasoline derivatives and they did not test fracking fluids, state records show, because they didn't know what to test for.

The Amoses were told that methane occurs naturally and is harmless. Inspectors warned them to keep the windows open and vent the basement, but they were never advised to protect themselves or their infant daughter from the water. It wasn't until three years later, when Laura Amos was diagnosed with a rare adrenal tumor, that she started challenging the state about the mysterious chemicals that might have been in her well.

Much of what is known about the makeup of drilling fluids comes from the personal investigations of Theo Colborn, an independent Colorado-based scientist who specializes in low-dose effects of chemicals on human health and has testified before Congress on drilling issues. Although she opposes drilling, her research is referenced by scientists at the EPA, at the United States Geological Survey, and at state-level regulatory agencies and is widely believed to be the most comprehensive information available.

Spurred by reports of water contamination in Colorado, Colborn painstakingly gathered the names of chemicals from shipping manifests that trucks must carry when they haul hazardous materials for oil and gas servicing companies. Whenever 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, adding the results to her list.

Industry officials say they use such tiny amounts of chemicals in the drilling -- of the million or so gallons of liquid pumped into a well, only a fraction of one percent are chemicals -- that they are diluted beyond harmful levels. But on some fracturing sites that tiny percentage translates to more than 10,000 gallons of chemicals, and Colborn believes even very low doses of some of the compounds can damage kidney and immune systems and affect reproductive development.

In Garfield County there were signs this was already happening. Animals that had produced offspring like clockwork each spring stopped delivering healthy calves, according to Liz Chandler, a veterinarian in Rifle, Co. A bull went sterile, and a herd of beef cows stopped going into heat, as did pigs. In the most striking case, sheep bred on an organic dairy farm had a rash of inexplicable still births -- all in close proximity to drilling waste pits, where wastewater that includes fracturing fluids is misted into the air for evaporation.

Among Colborn's list of nearly 300 chemicals -- some known to be cancer causing -- is a clear, odorless surfactant called 2-BE, used in foaming agents to lubricate the flow of fracking fluids down in the well. Colborn told Congress in 2007 that it can cause adrenal tumors.

Laura Amos, who suffered from such a tumor, pressed Encana on whether the compound had been used to fracture the well near her house. For months the company denied 2-BE had been used. But Amos persisted, arguing her case on TV and radio. In January 2005 her lawyers obtained documents from Encana showing that 2-BE had, fact, been used in at least one adjacent well.

"Our daughter was only six months old when fracturing blew up our water well," Amos wrote in a letter to the Oil

and Gas Accountability Project, an anti-drilling group. "I bathed her in that water every day. I also continued breast-feeding her for 18 more months... If there was a chemical in my body causing my tumor, she was exposed to it as well."

In 2006 Amos stopped talking to the media after she accepted a reported multi-million settlement from Encana. The company was fined \$266,000 for "failure to protect water-bearing formations and ... to contain a release of (gas production) waste." Yet investigators also concluded, without further explanation, that hydraulic fracturing was not to blame.

Asked about the Amos case and the rash of complaints in the area, an Encana spokesman said the company disagreed with the state's judgment on the Amos case and emphasized that there was no proof that fracturing had caused the explosion. Environmentalists had created a climate of fear in the community, he added.

"The concerns residents have expressed – and some of them are legitimate and heartfelt concerns – a lot of them are out of misinformation," said Doug Hock. "Just because chemicals are used at a site does not create risk. We have a proven process that helps us ensure that there are no pathways."

### **Deep Impact**

In the past 12 months a flurry of documented incidents has made such reports harder to dismiss.

"We've kind of reached the tipping point," says Dhieux, the EPA inspector in Denver. "The impacts are there."

In December 2007 a house in Bainbridge, Ohio exploded in a fiery ball. Investigators discovered that the neighborhood's tap water contained so much methane that the house ignited. A study released this month concluded that pressure caused by hydraulic fracturing pushed the gas, which is found naturally thousands of feet below, through a system of cracks into the groundwater aquifer.

In February a frozen 200-foot waterfall was discovered on the side of a massive cliff near Parachute, Co. According to the state, 1.6 million gallons of fracturing fluids had leaked from a waste pit and been transported by groundwater, where it seeped out of the cliff. In a separate incident nearby in June benzene was discovered in a place called Rock Spring. Three weeks later a rancher was hospitalized after he drank well water out of his own tap. Tests showed benzene in his water, and the Colorado Oil and Gas Conservation Commission cited four gas operators, not knowing which one was responsible for the spill. Colorado state records show more than 1,500 spills since 2003, in which time the rate of drilling increased 50 percent. In 2008 alone records show more than 206 spills, 48 relating to water contamination.

As more contamination cases are documented, state governments and Washington are being pressured to toughen oversight. One aim is to institutionalize the precautionary measures some companies are already experimenting with.

When ProPublica visited an Encana drilling operation in Pinedale, for example, the company was placing its drill rigs on raised platforms to protect the underlying landscape and using rubber pools to catch spilled fluids before they could seep into the soil. Drilling companies in New Mexico have begun storing waste in enclosed steel tanks rather than open pits.

Such efforts can add 10 percent to drilling costs, but they also dramatically lessen the environmental risks, an Encana employee said.

### **Government Oversight**

State regulators and Washington lawmakers though are increasingly impatient with voluntary measures and are seeking to toughen their oversight. In September U.S. Congresswoman Diana DeGette and Congressman John Salazar, from Colorado, and Congressman Maurice Hinchey, from New York, introduced a bill that would undo the exemptions in the 2005 Energy Policy Act. Wyoming, widely known for supporting energy development, has begun updating its regulations at a local level, as have parts of Texas.

New Mexico has placed a one year moratorium on drilling around Santa Fe, after a survey found hundreds of cases of water contamination from unlined pits where fracking fluids and other drilling wastes are stored. "Every rule that we have improved ... industry has taken us to court on," said Joanna Prukop, New Mexico's cabinet secretary for Energy Minerals and Natural Resources. "It's industry that is fighting us on every front as we try to improve our government enforcement, protection, and compliance... We wear Kevlar these days."

The most stringent reforms are being pursued in Colorado. Last year it began a top-to-bottom re-write of its regulations, including a proposal to require companies to disclose the exact makeup of their fracking fluids – the toughest such rule in the nation.

In mid August the Colorado debate intensified when news broke that Cathy Behr, an emergency room nurse in Durango, CO, had almost died after treating a wildcatter who had been splashed in a fracking fluid spill at a BP natural gas rig. Behr stripped the man and stuffed his clothes into plastic bags while the hospital sounded alarms and locked down the ER. The worker was released. But a few days later Behr lay in critical condition facing multiple organ failure.

Her doctors searched for details that could save their patient. The substance was a drill stimulation fluid called ZetaFlow, but the only information the rig workers provided was a vague Material Safety Data Sheet, a form required by OSHA. Doctors wanted to know precisely what chemicals make up ZetaFlow and in what concentration. But the MSDS listed that information as proprietary. Behr's doctor learned, weeks later, after Behr had begun to recuperate, what ZetaFlow was made of, but he was sworn to secrecy by the chemical's manufacturer and couldn't even share the information with his patient.

News of Behr's case spread to New York and Pennsylvania, amplifying the cry for disclosure of drilling fluids. The energy industry braced for a fight.

"A disclosure to members of the public of detailed information... would result in an unconstitutional taking of [Halliburton's] property," the company told Colorado's Oil and Gas Conservation Commission. "A number of studies have concluded there are no confirmed incidents of contamination of drinking water aquifers due to stimulation operations... EPA reached precisely this conclusion after undertaking an extensive study."

Then Halliburton fired a major salvo: If lawmakers forced the company to disclose its recipes, the letter stated, it "will have little choice but to pull its proprietary products out of Colorado." The company's attorneys warned that if the three big fracking companies left, they would take some \$29 billion in future gas-related tax and royalty revenue with them over the next decade.

In August the industry struck a compromise by agreeing to reveal the chemicals in fracturing fluids to health officials and regulators -- but the agreement applies only to chemicals stored in 50 gallon drums or larger. As a practical matter, drilling workers in Colorado and Wyoming said in interviews that the fluids are often kept in smaller quantities. That means at least some of the ingredients won't be disclosed.

"They'll never get it," says Bruce Baizel, a Colorado attorney with the Oil and Gas Accountability Project, about the states' quest for information. "Not unless they are willing to go through a lawsuit. When push comes to shove Halliburton is there with its attorneys."

Asked for comment, Halliburton would only say that its business depended on protecting such information. Schlumberger and BJ Services, the two other largest fracturing companies, did not return calls for comment.

Lee Fuller, vice-president for government relations at The Independent Petroleum Association of America, said the oil and gas industry's reluctance to release information about drilling chemicals is to be expected. "These operations are ones where companies have spent millions of dollars," he says. "They are not going to want to give up that competitive advantage. So I would fully expect that they will try to protect that right as long as they possibly can."

*Abraham Lustgarten is an investigative reporter for ProPublica, an independent, non-profit newsroom that produces journalism in the public interest.*

### **Further Reading**

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