

Ten Problems with New York's Shale Gas Drilling Plan

By: Environmental Working Group and Physicians, Scientists and Engineers for Healthy Energy, June 13, 2012

The New York state government's proposed plan for regulating and monitoring horizontal drilling and high-volume hydraulic fracturing would put the state's water supplies and the health of its residents at great risk by allowing drilling for shale gas to proceed without an adequate scientific foundation.

The New York Times reports today that the Cuomo administration intends to limit drilling to areas in the Marcellus Shale near the Pennsylvania border where the shale is at least 2,000 feet deep and there is at least 1,000 feet of separation between the top of the shale and water supplies, among other recent modifications. While the Cuomo administration deserves some credit for adopting what appears to be a more conservative approach to drilling, state officials have still not resolved the significant scientific gaps.

While Cuomo has not made public details of his new approach, those reported by the Times appear to perpetuate the seemingly arbitrary, unscientific thinking behind the published draft plan. State officials seem to believe they can prevent pollution by confining drilling to certain underground deposits. But the state will have to explain how these depths were chosen when:

- A 1987 EPA report to Congress found that a shale gas well hydraulically fractured at a depth of more than 4,200 feet contaminated a water supply only 400 feet from the surface.¹
- A 2004 investigation by the state of Colorado found that an improperly cemented natural gas well drilled more than 6,500 feet deep and hydraulically fractured released natural gas and associated contaminants from more than 4,000 feet underground, polluting surface water with unsafe levels of benzene, a known human carcinogen.²
- Industry studies have found that oil and gas wells routinely develop leaks that allow gas and potentially associated contaminants to migrate from deep underground to the surface.³
- The U.S. Geological Survey has found that the Marcellus Shale is highly fractured, providing pathways for contaminants to migrate vertically into water supplies.⁴
- The U.S. Geological Survey has found that New York officials do not know the locations of many underground water supplies.⁵

¹ U.S. Env'tl. Prot. Agency, Report to Congress: Management of Wastes from the Exploration, Development, and Production of Crude Oil, Natural Gas, and Geothermal Energy 4-22, 4-23 (1987), <http://www.epa.gov/osw/nonhaz/industrial/special/oil/rtc1987.pdf>. Env'tl. Working Group, Cracks in the Façade, Aug. 3, 2011. Accessed online June 13, 2012 at <http://www.ewg.org/reports/cracks-in-the-façade>.

² Colo. Oil & Gas Conservation Comm'n, Order No. 1V-276 (Sept. 16, 2004), <http://cogcc.state.co.us/> (follow link for "Orders"). Colo. Oil & Gas Conservation Comm'n, COGIS Well Information, API # 05-045-09306.

³ Claudio Brufatto et al. From Mud to Cement – Building Gas Wells, Oilfield Review, Autumn 2003 (on file with EWG). Theresa L. Watson and Stefan Bachu, Evaluation of the Potential for Gas and CO₂ Leakage Along Wellbores, Society of Petroleum Engineers, 2009 (on file with EWG).

⁴ U.S. Geological Survey, New York Water Science Center, Comments on the Revised Draft Supplemental Generic Environmental Impact Statement 7 (2012) [hereinafter USGS].

⁵ Id. at 1.

Moreover, limiting drilling to several counties near the Pennsylvania border still does not solve the problem of how to safely dispose of millions of gallons of toxic wastewater.

From what we know about the changes Cuomo contemplates to the state's published draft plan, there are still too many shortcomings and unanswered questions to gamble on high volume hydraulic fracturing and horizontal drilling for shale gas. It is encouraging that the administration told the Times that its plan is not final; more research is needed to determine whether this type of gas production can be conducted safely, and if so, what safeguards are necessary.

The ten most significant deficiencies in the draft plan drawn up by the state Department of Environmental Conservation are:

- No empirical scientific data on drilling and fracking risks
- Drilling allowed too close to sensitive water supplies
- No plan for disposing of millions of gallons of toxic wastewater
- Radioactive pollution from drilling underestimated
- Outdated studies to estimate greenhouse gas emissions from shale gas operations
- No assessment of the impact of shale gas development on New Yorkers' health
- Little basic data on the location of underground water supplies, faults and flood plains
- No review of siting plans and risks of potentially explosive natural gas pipelines
- No provisions to protect sensitive areas from vertical drilling and lower-volume hydraulic fracturing
- Too few inspectors to enforce scientifically rigorous regulations

Ten problems with New York's draft shale gas plan

1. Failure to use empirical scientific data to assess risks

Instead of relying on the relatively few empirical studies that suggest that drilling risks are significant, waiting for the results of ongoing studies or establishing its own scientific record, the New York Department of Environmental Conservation appears ready to drill first and do the science later.

A case in point is the department's claim that there is virtually no risk of failure in the steel casings and cement used to prevent natural gas and associated contaminants from escaping from gas wells into nearby water supplies.

"The effectiveness of the Department's well construction approach with respect to gas migration is demonstrated by the rarity of gas migration incidents in New York," department officials wrote. "The most recent incident occurred 15 years prior to the date of this document, in 1996, and resulted not from well construction but from the operator reacting improperly to a problem encountered while drilling. More than 3,000 wells have been drilled under [state] permits since 1996 without another occurrence." The department said it has added additional requirements to reduce the risk of gas migration even further.⁶

However, William Boria, a water resource specialist for the Chautauqua County Department of Health, disputes that contention. The county has a long history of vertical natural gas drilling. Boria said the department had identified a 2008 incident in which gas migrating from a well contaminated three water wells in Poland, N.Y.,

⁶ N.Y. State Dep't. Env'tl. Conservation, Supplemental Generic Env'tl Impact Statement on the Oil, Gas and Solution Mining Regulatory Program, Well Permit Issuance for Horizontal Drilling and High-Volume Hydraulic fracturing to Develop the Marcellus Shale and other Low-Permeability Gas Reservoirs (2011), [hereinafter NYDEC SGEIS] at 10-1, 10-2.

another case in 1983 in which gas migration contaminated 12 water wells and six other instances of gas drilling polluting water wells in various ways between 1982 and 2011. Boria acknowledged that there have been relatively few known incidents overall, but not all cases of gas migration or other gas drilling pollution may have been reported.⁷ Moreover, the state's drilling plan predicts that 50,000 wells drilled in the Marcellus shale alone. Even if a small percentage of those wells fail, the results could be disastrous for numerous landowners and communities.⁸

In official comments submitted to the state regarding the draft drilling plan, the Chautauqua County Water Quality Task Force noted that it knew of no analysis showing that New York's drilling regulations, last updated in 1992, have been effective in preventing pollution. "We reiterate our concern... that the Department [of Environmental Conservation] has thus far not disclosed any objective monitoring of mitigation measures," the task force wrote. "Gas drilling to date has largely occurred in our part of the state. Though the department claims there has [sic] been no problems related to gas drilling, we assert there has been little to no resource monitoring specifically designed to assess impacts associated with all phases of gas drilling operations on the state's resources or citizens."⁹ The task force added that the county Department of Health had identified 142 complaints in which homeowners had alleged that their water had been impacted by natural gas drilling operations between 1982 and 2011. Of these, the department found that 21 water wells were likely contaminated by some type of oil or natural gas drilling activity. Eleven wells showed methane or brine contamination that might have been caused by drilling or natural sources. The department concluded that eight wells were not impacted by drilling and that 102 wells lacked enough testing data to draw any conclusions. "The [New York Department of Environmental Conservation] should acknowledge that impacts to private [water] wells have likely occurred in Chautauqua County and elsewhere," the task force concluded.¹⁰

The state's claim that gas migration incidents have not occurred since 1996 is inconsistent not only with evidence from Chautauqua County, but also with industry studies that describe gas migration through leaks in casing and cement as a common problem. In 2003, Schlumberger, one of the world's largest companies specializing in hydraulic fracturing and other oilfield services, published an article about gas leaks in natural gas wells in its magazine, *Oilfield Review*. "Techniques for locating, exploiting and transporting natural gas to our homes and industries have had huge advances since the early days," the authors wrote. "Despite these advances, many of today's wells are at risk."

The authors reported that in the Gulf of Mexico, 6,692 of approximately 15,500 producing, shut-in and temporarily abandoned wells in the outer continental shelf area (43 percent) had gas leaks in which natural gas migrated through the wells from underground to the surface. The gas leaked through the spaces between layers of steel casing that drilling companies had injected with cement precisely to prevent such gas leaks. These spaces between casing layers are called "annuli." Sustained leaking of gas through the annuli to the surface is known as "sustained casing pressure" or "SCP." The authors noted that "by the time a well is 15 years old, there is a 50% probability that it will have measurable SCP in one or more of its casing annuli." The authors also wrote that in deviated or horizontal wells like those proposed to be drilled for shale gas in New York, there is a higher concern that a channel can develop through the cement on the top side of the well's horizontal leg through which gas can migrate. The authors posed several likely causes for gas migration including leaks in the steel casing and pressure and temperature changes that can cause paths to develop between the cement and casing.¹¹

⁷ Telephone interview with William Boria, Water Resource Specialist for the Chautauqua County Dept. of Health (May 25, 2012).

⁸ NYDEC SGEIS, *supra* note 6, at 2-1.

⁹ Chautauqua County Water Quality Task Force, Comments on Supplemental Generic Evtl Impact Statement on the Oil, Gas and Solution Mining Regulatory Program, Well Permit Issuance for Horizontal Drilling and High-Volume Hydraulic fracturing to Develop the Marcellus Shale and other Low-Permeability Gas Reservoirs, submitted to N.Y. State Dep't Evtl. Conservation, Dec. 30, 2011.

¹⁰ *Id.*

¹¹ Claudio Brufatto et al., *supra* note 3.

A more recent study published in 2009 by the Society of Petroleum Engineers also casts doubt on the New York Department of Environmental Conservation's claims that no cases of gas migration have occurred in New York since 1996. The study of more than 315,000 oil, gas and injection wells in Alberta, Canada, found that 4.6 percent of the wells had gas flow to the surface through casing annuli or gas migration outside the casing. However, in a special area in which Alberta authorities required testing for gas migration outside the casing in addition to routine testing for gas leaks in the annuli, 15.5 percent of wells (3,205 of 20,725) had some type of gas leak. Much like the authors of the Schlumberger article, the authors here noted that inside the special testing area, the incidence of gas leaks was much higher – 66 percent – in horizontal or deviated wells than in vertical wells. (It appears similar data were not available for wells outside the testing area.)¹²

Last year, the drilling industry experienced 121 well failures resulting in methane migration in Pennsylvania's portion of the Marcellus shale, out of a total of 1,937 wells drilled that year. This failure rate, six percent, is the same as the previous year, 90 well failures out of 1,454 wells drilled.¹³ However, the New York Department of Environmental Conservation does not mention these statistics, the Schlumberger study or the Society of Petroleum Engineers study. Nor does it indicate that it has conducted its own testing for gas leakage as the state of Alberta does.

The Department of Environmental Conservation implied that the risk of hydraulic fracturing fluid migrating through leaks in the casing into underground water supplies from shale gas wells was low, based on a consultant's analysis of a hypothetical study conducted for the American Petroleum Institute in the 1980s, but this study was not about wells that were hydraulically fractured but rather of *drilling wastewater injection wells*. According to the consultant's analysis, the American Petroleum Institute study suggested that the probability of hydraulic fracturing fluids migrating into drinking water as a result of failures in production well casings or cement would be fewer than 1 in 50 million wells.¹⁴ However, the American Petroleum Institute study found that the risk of contamination from injection wells could be much more significant. It appears that the consultant relied on a distorted interpretation of the American Petroleum Institute study.¹⁵ In addition, the Department of Environmental Conservation did not mention another study in the 1980s by Congress' investigative arm, the Government Accountability Office, which surveyed 88,000 of 160,000 oil and gas wastewater injection wells and found a much higher rate of contamination: six wells had caused groundwater contamination due to leaks in the casing and 17 other injection wells had polluted groundwater through other pathways. The pollution in most of these cases was severe, requiring a \$300-million-dollar cleanup in one case and judged too expensive to address in many others. The GAO added that "the full extent to which [oil and gas injection disposal wells] have caused drinking water contamination is unknown, largely because the method for detecting contamination – installing underground monitors – can itself create a conduit for contamination and is therefore not widely used."¹⁶

The Department of Environmental Conservation has failed to conduct its own research on hydraulic fracturing. In response to a Freedom of Information Law inquiry filed in December 2008 asking whether in the past 50 years the state had conducted any tests on hydraulic fracturing chemicals or had received such studies from other researchers, the department responded that it had no such studies in its possession.¹⁷ There is no evidence

¹² Theresa L. Watson and Stefan Bachu, *supra* note 3.

¹³ Pennsylvania Dep't of Env'tl. Conservation, Oil and Gas Compliance Report. Accessed online June 12, 2012 at http://www.portal.state.pa.us/portal/server.pt/community/oil_and_gas_compliance_report/20299.

¹⁴ NYDEC SGEIS, *supra* note 6, at 6-41.

¹⁵ William C. Fischer, Comparing the Michie Report and the GAO Report to Research Conducted by NTC, and ICF International In Support of the Revised Draft of the SGEIS, Feb. 28, 2012.

¹⁶ U.S. General Accounting Office, Drinking Water Safeguards are not Preventing Contamination from Injected Oil and Gas Wastes, July 1989.

¹⁷ Environmental Working Group (EWG), Freedom of Information Law (FOIL) Request #08-2685, Dec. 12, 2008. N.Y. Dept. of Env'tl. Conserv., Response to FOIL #08-2658, Jan. 14, 2009 (on file with EWG).

it has conducted such studies since that time.

To make matters worse, the department has proceeded with its drilling plan without waiting for the results of the federal Environmental Protection Agency's national study of hydraulic fracturing's impact on drinking water due to be released beginning in 2012. This study aims to feature some of the only on-the-ground scientific testing ever conducted to determine how and whether hydraulic fracturing contaminates water supplies.¹⁸ Nor is the department waiting for the outcome of an ongoing study of groundwater pollution that the EPA is conducting in Pavillion, Wyoming. In a draft report published last December, EPA researchers found that groundwater in Pavillion had likely been contaminated by oil and natural gas waste pits and by hydraulic fracturing. Drilling industry representatives and Wyoming state officials criticized the study. The EPA has agreed to conduct a new round of tests.¹⁹

Before moving forward with shale gas drilling, the state should either wait for the results of ongoing research or conduct its own rigorous scientific analysis of drilling risks. It should also include full analyses of the best available research on drilling risks including the Schlumberger article, the Society of Petroleum Engineers analysis and Pennsylvania's data on well failures.

2. Setbacks too close to sensitive water supplies

The New York Department of Environmental Conservation plan would prohibit drilling within 500 feet of private drinking water wells and municipal underground water supplies, but the U.S. Geological Survey says these distances are too close for comfort. The state's buffer for private water wells and springs "affords limited protection" and "does not take local geohydrologic conditions and topographic setting into account," the USGS found in its analysis of the state plan. The federal agency added that "changes brought about by drilling, including water quality changes, can be felt rapidly at significant distance from a disturbance – especially if a domestic well is [downhill] of a well pad."²⁰ The USGS said the setback for major municipal water systems "is one-size-fits-all and may provide only partial protection to these aquifers."²¹ In some cases, the USGS found, it might be necessary to prohibit drilling in a five square mile area surrounding aquifers to avoid polluting them.²²

The USGS position is bolstered by documented cases in Colorado, Ohio and Pennsylvania where natural gas and related contaminants have polluted underground water supplies at distances much greater than 500 feet:

- In 2004, natural gas and associated contaminants traveled underground more than 4,000 feet laterally from a well that had been improperly fractured and cemented by Canada-based Encana Corp. in Garfield County, Colo., according to state officials. As a result, a creek was contaminated with dangerous levels of carcinogenic benzene. The state of Colorado fined Encana a then-record \$371,200. Despite more than seven years of cleanup efforts, three groundwater-monitoring wells near the creek still found unsafe levels of benzene as of last September.²³

¹⁸ U.S. Env'tl. Protection Agency, EPA's Study of Hydraulic Fracturing and Its Potential Impact on Drinking Water Resources. Accessed online June 12, 2012 at <http://www.epa.gov/hfstudy/index.html>.

¹⁹ U.S. Env'tl. Protection Agency, Investigation of Ground Water Contamination Near Pavillion, Wyoming, Draft, Dec. 8, 2011, at xi, xiii. Mead Gruver, EPA, Wyo., Tribes Agree to More Groundwater Tests, Associated Press, Mar. 8, 2012.

²⁰ USGS, *supra* note 4.

²¹ *Id.* at 6.

²² *Id.* at 6-7.

²³ URS Corp., Phase I Hydrogeologic Characterization of the Mamm Creek field Area in Garfield County (2006), <http://cogcc.state.co.us/> (follow links for "Library" and then "Piceance Basin") (prepared for Bd. of County Comm'rs, Garfield

- In 2007, a gas well fractured by Ohio Valley Energy Systems Corp. in Bainbridge, Ohio, caused natural gas to contaminate 23 nearby water wells, two of which were more than 2,300 feet from the drilling site.²⁴
- In 2009, several improperly cemented natural gas wells drilled in Dimock, Penn., by Houston-based Cabot Oil and Gas Corp. polluted water wells used by at least 19 families, according to the Pennsylvania state Department of Environmental Protection. Cabot has disputed the finding. At least three of the water wells were farther than 1,000 feet from the drilling sites. Pennsylvania regulators ordered the company to deliver water to the families for about two years, but last December Cabot stopped the deliveries after the Department of Environmental Protection ruled that the company had met its obligations. The affected families were forced to scramble for new sources of water. Later, however, the EPA's Region III office found dangerous contaminants in well water in Dimock and ordered the resumption of water deliveries for four families.²⁵ EPA officials said recently they found no reason to take further action after testing for contaminants in water wells at 61 homes. However, 23 of the tests at 17 homes revealed levels of methane in the water at or above levels at which the U.S. Department of the Interior urges action to prevent explosions. Ronald Bishop, a chemistry lecturer at the State University of New York College at Oneonta, criticized the EPA's conclusion, saying that the presence of methane, oil, grease and 2-methoxyethanol, in addition to elevated levels of sodium, arsenic, barium, lithium and manganese, "suggest that many of these homeowners' water wells are significantly contaminated with a variety of pollutants in concentrations which are of concern to public health professionals."²⁶

The New York Department of Environmental Conservation draft drilling plan would allow drilling within 1,000 feet of underground aqueducts that transport drinking water to New York City from upstate reservoirs as long as the drilling companies obtain site-specific permits. The U.S. Geological Survey warned that such drilling could damage the West Delaware Aqueduct. "The possibility of damage to the aqueduct from hydraulic-fracturing operations is an issue of concern" and deserves more study, the agency wrote. Naturally occurring fractures "may potentially provide pathways for the migration of pressurized fluids over significant distances," the USGS found.²⁷

An earlier analysis commissioned by New York City's Department of Environmental Protection also concluded that drilling might endanger the West Delaware Aqueduct and others. The city found that there are naturally occurring underground pathways near the aqueducts that could create a conduit for contamination and "can extend up to seven miles laterally and up to 6,000 feet in depth." It added:

County, Colo.); Colo. Oil & Gas Conservation Comm'n, Order No. 1V-276 (Sept. 16, 2004), <http://cogcc.state.co.us/> (follow link for "Orders").

²⁴ Ohio Dep't of Natural Res., Report on the Investigation of the Natural Gas Invasion of Aquifers in Bainbridge Township of Geauga County, Ohio 6, 46-7 (2008); Bair, E. Scott, et al., Expert Panel Technical Report, Subsurface Gas Invasion Bainbridge Township, Geauga County, Ohio 3-113 (2010), <http://www.ohiodnr.com/mineral/bainbridge/tabid/20484/default.aspx> (submitted to Ohio Dep't of Natural Res., Div. of Mineral Res. Mgmt.); Ohio Dep't of Natural Res., Order Number 2009-17 (Apr. 14, 2009) (see attachments A, B).

²⁵ Consent Order & Settlement Agreement in re Cabot Oil & Gas Corp. (Dep't Env'tl. Prot. Dec. 15, 2010); Consent Order & Settlement Agreement in re Cabot Oil & Gas Corp. (Dep't Env'tl. Prot. Nov. 4, 2009); Laura Legere, DEP Drops Dimock Waterline Plans; Cabot Agrees to Pay \$4.1M to Residents, Scranton Times-Tribune, Dec. 16, 2010, <http://thetimes-tribune.com/news/gas-drilling/dep-drops-dimock-waterline-plans-cabot-agrees-to-pay-4-1m-to-residents-1.1077910>. Laura Legere, Outside Groups Deliver Water as Sides Spar over Drilling, Scranton Times-Tribune, December 7, 2011.

²⁶ U.S. Env'tl. Protection Agency, EPA in Pennsylvania, Dimock, PA Activities, Validated Data Summary Report for 61 Dimock Households that Were Sampled. Accessed online May 27, 2012 at <http://www.epa.gov/aboutepa/states/pa.html>. U.S. Department of the Interior, Office of Surface Mining, Technical Measures for the Investigation and Mitigation of Fugitive Methane Hazards in Areas of Coal Mining, Sept. 2001, at 40. Accessed online May 27, 2012 at <http://arblast.osmre.gov/>. Laura Legere, EPA Releases Last Dimock Tests; No Cause for More Action, Scranton Times-Tribune, May 12, 2012.

²⁷ USGS, supra note 4, at 19-20.

“The vertical and lateral persistence of these features in conjunction with the potential for failed casings or other unforeseen occurrences could result in significant surface and subsurface contamination of fresh water aquifers, as illustrated by incidents in other well fields, most notably documented in Garfield County, Colorado (migration of toxic formation material through subsurface fractures) and Dimock, Pennsylvania (migration of natural gas to the surface via improperly cemented wells). Similar mechanisms could permit migration of material into the fresh water aquifers that comprise the NYC West-of-Hudson watersheds and present potential risks to water quality and tunnel lining integrity.”²⁸ Based on this assessment, the city agency recommended several precautionary measures, including barring drilling within seven miles of several aqueducts and a drilling ban within two miles of others.²⁹

3. No plan for disposing of wastewater

The state plan would require that drillers certify that they can dispose of their toxic wastewater,³⁰ but it is unclear how drilling companies would do this. It acknowledges that New York’s sewage treatment plants may not be equipped to remove toxic chemicals from the millions of gallons of wastewater generated by hydraulic fracturing. In 2008, the state Division of Water advised sewage treatment plants of requirements to accept high-volume hydraulic fracturing wastewater, but none had agreed to do so as of last September, according to the draft drilling plan.

According to 59 scientists and engineers with experience in water treatment, chemistry and the disposal of radioactive materials, it is, at best, uncertain that any available system can treat drilling wastewater. “Potential contaminants of concern known to be in some flow-back fluids include benzene and other volatile aromatic hydrocarbons, surfactants and organic biocides, barium and other toxic metals, and soluble radioactive compounds containing thorium, radium, and uranium,” the scientists wrote to Gov. Andrew M. Cuomo on Sept. 15, 2011. “Municipal filtration systems were not designed with such hazards in mind, and the ability of the filtration systems to remove such hazardous substances has received little, if any, study. We believe, however, the best available science suggests that some of these substances would pass through the typical municipal filtration system.”³¹

One common alternative is to inject wastewater into underground disposal wells, but this practice carries significant risks, such as the earthquakes that recently shook Youngstown, Ohio. In response to these quakes, the Ohio Department of Natural Resources halted injection of drilling wastewater into a disposal well that the state later concluded appeared to be the source of the quakes. The state also halted injections within a five-mile radius of the well. The well associated with the earthquakes had received millions of gallons of wastewater from natural gas drilling operations, mostly in Pennsylvania.³² In a recently released abstract of a forthcoming paper, the USGS identified an unusual rash of earthquakes over the past decade that appear to be associated with oil and natural gas drilling activity. The agency said it did not know exactly how oil and natural gas drilling might have caused the increase.³³ One possibility is that over the past decade, companies have significantly increased

²⁸ N.Y. City Dep’t of Env’tl. Prot., Final Impact Assessment Report, Impact Assessment of Natural Gas Production in the New York City Water Supply Watershed 39-40 (2009).

²⁹ N.Y. City Dep’t of Env’tl. Prot., Comments on the Revised Draft Supplemental Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program 2 (2012).

³⁰ See NYSDEC SGEIS, supra note 6, at ES-25.

³¹ Letter from Robert Howarth and 58 other scientists to N.Y. Governor Andrew M. Cuomo (Sept. 15, 2011).

³² Henry Fountain, Disposal Halted at Well After 11th Quake in Ohio, N.Y. Times, Jan. 2, 2012, at A11. Ohio Dep’t of Natural Resources, Preliminary Report on the Northstar 1 Class II Injection Well and the Seismic Events in the Youngstown, Ohio, Area, Mar. 2012, at 4.

³³ Ellsworth, W.L. et al., U.S. Geological Survey. Are Seismicity Changes in the Midcontinent Natural or Manmade? Abstract. Accessed online May 2, 2012 at http://www2.seismosoc.org/FMPro?-db=Abstract_Submission_12&-sortfield=PresDay&-sortorder=ascending&-sortfield=Special+Session+Name+Calc&-sortorder=ascending&-sortfield=PresTimeSort&-

the number of wells drilled and the amount of fluid injected into each for hydraulic fracturing, creating more wastewater that is injected into underground disposal wells.³⁴ Scientists have linked these wastewater injection wells to earthquakes since the 1960s.³⁵

In addition to creating a risk of seismic activity, underground injection wells can leak, and injected fluids can intersect with abandoned oil and natural gas wells, migrating up these wells and breaking out near the surface where they can contaminate groundwater.³⁶

The New York Department of Environmental Conservation has indicated that drilling companies could reuse their wastewater,³⁷ but recent industry practices in Pennsylvania show that only some wastewater is being reused. The *New York Times* reported last year that according to state and industry records, during the year and a half that ended in December 2010, drilling companies recycled at least 320 million gallons of wastewater. But at least 260 million of more than 680 million gallons generated were delivered to treatment plants. The fate of some of the wastewater cannot be traced because the industry opposed a rigorous tracking system proposed by the state, the *Times* reported, making it unclear whether wastewater is being recycled, disposed of properly or dumped. Last year, drilling companies in Pennsylvania's Marcellus Shale recycled or reused just 38 percent of their flowback water, according to data compiled by the state.³⁸ Even recycling has its limits. "No one wants to admit it, but at some point, even with reuse of this water, you have to confront the disposal question," a wastewater recycling executive told the *Times*.³⁹

Before New York approves high volume hydraulic fracturing and horizontal drilling, the state should know whether wastewater can be safely disposed of.

4. Underestimate of radioactive pollution; lack of a disposal plan

The DEC fails to take seriously the radioactive pollution generated by wastewater from shale gas drilling. After companies inject fluid into a well for hydraulic fracturing, they reverse the fluid's flow and a portion of the injected fluid comes back out of the well. This return fluid is known as "flowback water." The DEC estimates that a single shale gas well will generate between 216,000 and 2.7 million gallons of flowback water following the injection of between 2.4 million and 7.8 million gallons of fracking fluid.⁴⁰ The flowback water must be properly treated and disposed. A related waste fluid, naturally-occurring groundwater known as "produced water" or "production brine" also flows out of wells during gas production. Both flowback water and produced water can contain radioactive contaminants.

sortorder=ascending&-op=gt&PresStatus=0&-lop=and&-token.1=ShowSession&-token.2=ShowHeading&-recid=224&-format=%2Fmeetings%2F2012%2Fabstracts%2Fsessionabstractdetail.html&-lay=MtgList&-find.

³⁴ U.S. Dept. of Energy, Energy Information Administration, U.S. Crude Oil, Natural Gas and Dry Exploratory and Development Wells Drilled, Annual. Accessed online Mar. 30, 2010 at

http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=E_ERTW0_XWC0_NUS_C&f=A. See, e.g., New York State Department of Environmental Conservation, Draft Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program, Volume 1, Jan. 1988, at 9-26 (assuming that oil and natural gas wells would be hydraulically fractured with 20,000-80,000 gallons of fluid). NYSDEC SGEIS, supra note 1, at ES-8 (assuming that shale gas wells would be hydraulically fractured with 2.4 million to 7.8 million gallons of fluid).

³⁵ U.S. Evtl. Protection Agency, Underground Injection and Seismic Activity, Dec. 2010. Accessed online May 2, 2012 at www.epa.gov.

³⁶ U.S. Gov't Accountability Office, Safeguards Are Not Preventing Contamination from Oil and Gas Wastes (1989), <http://www.gao.gov/products/RCED-89-97>.

³⁷ NYSDEC SGEIS, supra note 6, at 6-64.

³⁸ Pennsylvania Dep't Evtl. Protection, Oil & Gas Reporting Website - Statewide Data Downloads By Reporting Period. Accessed online May 31, 2012 at <https://www.paoilandgasreporting.state.pa.us/publicreports/Modules/DataExports/DataExports.aspx>

³⁹ Ian Urbina. Gas Wells Recycle Water, but Toxic Risks Persist, *New York Times*, Mar. 2, 2011, at A1.

⁴⁰ NYSDEC SGEIS, supra note 6 at ES-8.

The state Department of Environmental Conservation claims that “based upon currently available information it is anticipated that flowback water would not contain levels of [naturally-occurring radioactive materials] (NORM) of significance whereas production brine could contain elevated NORM levels.”⁴¹ However, the EPA’s Region II office, in its comments on the state’s draft drilling plan, said that “available data of flowback water obtained by EPA Region 3 from six natural gas companies in Pennsylvania through information request letters shows elevated levels of naturally occurring radioactive materials (see http://www.epa.gov/region3/marcellus_shale/#wastewater). Thus the NYSDEC should consider revising this statement.”⁴²

The data to which EPA’s Region II office refers was requested last year by EPA Region III following a *New York Times* investigation that found that drilling companies in Pennsylvania were sending drilling wastewater with high levels of radioactive contaminants to sewage treatment plants unequipped to decontaminate it. The treatment plants then discharged the wastewater into rivers, sometimes just upstream from drinking water intakes.⁴³ EPA Region III asked the drilling companies to submit information about all types of waste fluids including flowback water and produced water, generated by the natural gas drilling operations in shale formations in the region, which includes Pennsylvania.⁴⁴ Some of the radioactive contamination in the wastewater was hundreds or thousands of times the safe maximum for drinking water.⁴⁵ The records show that at least some elevated levels of radioactive contaminants were found in flowback water, which the Department of Environmental Conservation claims would not contain significant levels of radioactive pollution. For example, one of the lab tests for Atlas Resources’ wastewater entitled “Westmoreland Flow Back” showed levels of gross alpha, a radioactive contaminant, more than 30 times the safe level in drinking water,⁴⁶ while a test of “Washington County Flow Back” showed levels more than 20 times the safe level.⁴⁷ A lab test disclosed by Range Resources that appeared to refer to “day 14” of flowback from a particular well (flowback water can flow out of a shale gas well for two to eight weeks),⁴⁸ showed levels of radium-226 and 228 that were 300 times the safe level in drinking water.⁴⁹

If such radioactivity were to contaminate public water supplies, it is unlikely that drinking water providers would discover the problem before consumers drank the pollutants; testing for radioactive contaminants in public drinking water systems occurs as infrequently as once every six or nine years under federal law.⁵⁰ Such lax testing in Pennsylvania was documented last year by The New York Times’ investigation of drilling wastewater. The newspaper did not distinguish between flowback water and naturally occurring produced water, but documents accompanying the series on The Times’ website show that at least some of the elevated levels of radioactivity were found in flowback water.⁵¹

⁴¹ NYSDEC SGEIS, *supra* note 6 at ES-19.

⁴² U.S. Env’tl. Protection Agency, Region II, Comments on Revised Draft NYSDEC Revised dSGEIS for Horizontal Drilling and High-Volume Hydraulic Fracturing to Develop the Marcellus Shale and Other Low-Permeability Gas Reservoirs, Jan. 11, 2012.

⁴³ Ian Urbina, Regulation Lax as Gas Wells’ Tainted Water Hits Rivers, *N. Y. Times*, Feb. 27, 2011 at A1.

⁴⁴ See, e.g., U.S. Env’tl. Prot. Agency, Region III letter to Atlas Resources and Enclosures, May 12, 2011.

⁴⁵ See, e.g., Chesapeake Energy Corp. letters to EPA Region III, May 26, June 9 and June 17, 2011 at 136 of 147 (showing a gross alpha level more than 1,700 times the safe drinking water standard, and a radium level more than 1,500 times the safe drinking water standard). SWEPI (Shell Exploration and Production Company) letter to EPA Region III, May 25 and June 9, 2011 at 42-43 of 249 (showing levels of gross alpha more than 2,700 times the safe drinking water standard and a radium level more than 3,600 times the safe drinking water standard). Accessed online Apr. 30, 2012 at http://www.epa.gov/region3/marcellus_shale/#wastewater.

⁴⁶ Atlas Resources, LLC letter to EPA Region III, May 25, 2011 at 168 of 209.

⁴⁷ See *id.*, at 170 of 209.

⁴⁸ NYSDEC SGEIS, *supra* note 6, at 5-99.

⁴⁹ Range Resources – Appalachia, letter to EPA Region III, May 25, 2011 at 83 of 102.

⁵⁰ Urbina, Ian, *supra* note 38. 40 CFR 141.26 (3) (2012).

⁵¹ Urbina, Ian, *supra* note 38. Drilling Down, Documents: Natural Gas’s Toxic Waste, Feb. 26, 2011 at 410. Accessed online Apr. 9, 2012 at <http://www.nytimes.com/interactive/2011/02/27/us/natural-gas-documents-1.html#document/p410/a9941>.

Given these findings, it is not surprising that the state Department of Environmental Conservation would ban spreading flowback water from any formation, including the Marcellus Shale, for deicing roads, dust suppression or road stabilization. But the department strangely takes a different approach with production brine, which it says is *more* radioactive, noting that it has suspended permits for road spraying with production brine from Marcellus Shale wells while it studies radiation levels in this type of wastewater. This decision implies that the DEC might allow road treatment with Marcellus production brine if tests show that the fluid is safe. But the department itself reports in an appendix to its draft drilling plan that samples of production brine from 13 vertical natural gas wells drilled in New York's Marcellus Shale in 2008 and 2009 contained gross alpha at levels four to 8,200 times the safe maximum in drinking water. Eleven of the 13 wells produced brine with radium levels 400 to almost 3,400 times the safe maximum.⁵² In its comments, EPA's Region II office criticized the department's distinction between flowback water and produced water and noted that it would be extremely difficult to guarantee that produced water could be safely sprayed on roads "unless each truckload is tested, which would be a monumental task given the amount of produced water that is expected to be generated from Marcellus and Utica shale gas extraction and available for road spreading."⁵³

EPA's Region II office criticized the department's handling of potentially radioactive cuttings – fragments of rock produced when a drill bores through the earth. The department noted that "in New York State, the [naturally-occurring radioactive material] in cuttings is not precluded by regulation from disposal in a solid waste landfill..."⁵⁴ The EPA commented that the department appeared to be understating the radioactivity of drill cuttings and that it is unclear who would have responsibility for cleanup or engineering controls at landfills that accept high concentrations of these materials.⁵⁵

The department's draft drilling plan fails to address the presence of radon in natural gas. According to the EPA, radon is the leading cause of lung cancer among non-smokers and the second leading cause of lung cancer for all Americans. According to the U.S. Centers for Disease Control and Prevention, radon is found in natural gas because the gas had previously been in contact with underground formations of uranium and thorium-laden rock and soil that continually emit radon. The radon and its radioactive decay products stay in the natural gas as it travels through pipelines from wells to homes. There, the radon and decay products are emitted into air where they can be inhaled when natural gas is burned in fireplaces, furnaces, heaters, stoves and water heaters.⁵⁶

The EPA's Region II office had several criticisms of the state plan's failure to address risks from radon, including failure to assess risks to workers at drilling sites and failure to analyze potential harm from inhalation of radon generally.

5. Use of outdated studies to assess greenhouse gas impacts

The Department of Environmental Conservation understates the likely greenhouse gas emissions from natural gas drilling and natural gas' contribution to climate change by using few scientific studies and outdated information. First, it uses an outdated estimate of how powerful natural gas is as a greenhouse gas. Typically, the term greenhouse gas is synonymous with carbon dioxide. But methane, which is the major component of natural gas, is also an important contributor to climate change. Natural gas emits both methane that is released to the atmosphere during natural gas production and distribution, and carbon dioxide that is released when natural gas is burned. According to the latest scientific research, methane is a significant contributor to climate

⁵² NYDEC SGEIS, *supra* note 6, at 5-133, 5-141, 7-60, Appendix 12, Appendix 13.

⁵³ U.S. Env'tl. Prot. Agency, Region II, Comments on Revised Draft NYSDEC Revised dSGEIS for Horizontal Drilling and High-Volume Hydraulic Fracturing to Develop the Marcellus Shale and Other Low-Permeability Gas Reservoirs, Jan. 11, 2012.

⁵⁴ See NYDEC SGEIS, *supra* note 6, at 5-129, 51-130.

⁵⁵ See U.S. Env'tl. Prot. Agency, Region II, *supra* note 53.

⁵⁶ U.S. Centers for Disease Control, Agency for Toxic Substances & Disease Registry, Case Studies in Environmental Medicine, Radon Toxicity, June 1, 2012.

change over the lifecycle of natural gas production and use especially over the first 20 years following emission. Methane is 105 times more potent as a greenhouse gas than carbon dioxide over a 20-year timeline and 33 times more potent over a 100-year timeline.⁵⁷ Yet the state plan uses outdated figures, estimating that methane is only 72 times more potent over 20 years and 25 times more potent over 100 years.⁵⁸

It fails to mention several recent studies that have shown a significantly greater greenhouse impact from natural gas than previously known. For example, in November of 2010, the EPA issued an analysis significantly boosting its estimate of greenhouse emissions from natural gas. The agency also concluded (as it did in several follow-up reports) that shale gas has far greater greenhouse emissions than conventional natural gas. Conventional gas is located in concentrated deposits underground and can typically be produced with less hydraulic fracturing than shale gas and other unconventional deposits of gas that are more widely dispersed. This new information led EPA to conclude that natural gas production and distribution is now the single largest source of methane pollution in the U.S., accounting for 39 percent of all methane released. However the state plan does not cite this research. Three studies published last year (two of them peer-reviewed), well before publication of the state environmental impact plan, show that the greenhouse impact of shale gas can be worse than that for coal and oil. In one peer-reviewed study, Robert Howarth, Cornell professor of ecology and environmental biology, and two coauthors concluded that such pollution is worse than that from coal and oil over time lines of at least 40 years following emission and perhaps over a century or longer.⁵⁹ This globally important question is receiving continuous, intense scientific investigation, and the state's treatment is wholly inadequate.⁶⁰

The state plan fails to convey the urgency of reducing methane emissions. Noted NASA climate scientist James Hansen and coauthors warned in 2007 that if the average global temperature rises above 1.8 degrees Celsius, our climate may pass a tipping point that would have extremely negative effects including significant floods due to sea level increases and dramatic shifts in food production as some agricultural areas become unable to support crops. Hansen and his coauthors write that methane emissions must be reduced to avert this tipping point. According to a United Nations report released in July 2011, the Earth is in danger of passing an irreversible climate-tipping point if the average temperature increases approximately 1.5 degrees Celsius. At the world's current rate of methane emission, we will reach this temperature rise within only 15 to 35 years. Only immediate reductions in methane emissions can prevent such a temperature increase, the U.N. wrote.⁶¹ But using more shale gas will increase methane emissions from the U.S. New York's drilling plan makes no mention of these reports and papers and proposes regulations that would not require drilling companies to capture large amounts of methane that are routinely vented at the time of well completion and flowback. The state should prohibit venting of methane during flowback operations and require state-of-the-art methane emission controls on compressor and processing stations. It should revise its section on greenhouse gas

⁵⁷ Howarth et al., Methane and the Greenhouse-gas Footprint of Natural Gas from Shale Formations, *Climatic Change*, Mar. 2011.

⁵⁸ NYDEC SGEIS, *supra* note 6, at 6-201.

⁵⁹ Robert Howarth et al., *supra* note X. D. Hughes, Lifecycle Greenhouse Gas Emissions from Shale Gas Compared to Coal: An Analysis of Two Conflicting Studies, Post Carbon Institute. Accessed online May 27, 2012 at <http://www.postcarbon.org/report/390308-life-cycle-greenhouse-gas-emissions-from>. TML Wigley, Coal to Gas: The Influence of Methane Leakage, *Climatic Change Letters*, 2011, DOI 10.1007/s10584-011-0217-3.

⁶⁰ Three other recent peer-reviewed papers on this topic include: G. Petron et al. Hydrocarbon Emissions Characterization in the Colorado Front Range – A Pilot Study. *Journal of Geophysical Research*, in press, doi:10.1029/2011JD016360. D. Shindell et al. Simultaneously mitigating near-term climate change and improving human health and food security. *Science* 335: 183-189 (2012). RW. Howarth et al. Venting and leakage of methane from shale gas development: Reply to Cathles et al. *Climatic Change*, doi:10.1007/s10584-012-0401-0 (2012).

⁶¹ United Nations Environment Program/World Meteorological Organization, Integrated Assessment of Black Carbon and Tropospheric Ozone: Summary for Decision Makers. United Nations Environment Programme and the World Meteorological Organization (2011). Accessed online June 12, 2012 at http://www.unep.org/publications/contents/pub_details_search.asp?ID=6201.

emissions to reflect the current science.⁶²

6. Lack of a health assessment

Natural gas production poses many risks to human health. The drilling and fracking process requires the use of dangerous chemicals including the known human carcinogen benzene and the neurotoxins ethylbenzene, toluene and xylene.⁶³ Some of these same chemicals occur naturally with natural gas deposits and, when disturbed, can migrate to the surface and can contaminate water supplies.⁶⁴ In addition, the drilling process produces wastewater that can contain high levels of carcinogenic radioactive contaminants such as radium. In Pennsylvania, sewage treatment plants that received this wastewater discharged their outflow into waterways that supply public drinking water.⁶⁵ Air pollution from drilling operations can include benzene and other contaminants and create ozone, which can harm human health.⁶⁶ Despite repeated requests from public officials and health professionals, the state's draft drilling plan contains no assessment of the effects that horizontal drilling and high volume hydraulic fracturing might have on New Yorkers' health.

Commenting on New York State's first draft drilling plan in 2009, EPA's Region II office called for "a greater emphasis... on the potential health impacts that may be associated with gas drilling and hydrofracturing." The regional office suggested that the New York Department of Health join the Department of Environmental Conservation in developing the draft drilling plan.⁶⁷ In February 2011, dozens of New York health professionals and New York-based organizations, including the American Academy of Pediatrics New York District, the Broome County Medical Society and the Cortland County Board of Health, sent a letter to Department of Health Commissioner Dr. Nirav R. Shah citing the health risks of the natural gas drilling process and urging the department to help develop the state's drilling policy.⁶⁸ In September of last year, a larger number of New York health professionals and organizations wrote to Gov. Andrew Cuomo asking for "systematic identification and analysis of direct and indirect health effects" of gas drilling.⁶⁹ Health organizations that have recently asked for a health impact assessment include the Medical Society of the State of New York, the New York Nurses Association, New York State Academy of Family Physicians, the University of Rochester Medical Center and the Healthy Schools Network.⁷⁰ Thus far, the state has failed to act on any of these requests.

⁶² Robert Howarth comments on the SGEIS submitted to NYDEC, Nov. 30, 2011. Accessed online June 12, 2012 at <http://www.psehealthyenergy.org/resources/view/198833>.

⁶³ NYDEC SGEIS, supra note 6, at 5-40 through 5-79.

⁶⁴ Marathon, Material Safety Data Sheets, Marathon Oil Company Products, Natural Gas-Condensate C2-C8, 0197MAR001, supra note 35. Marathon. Material Safety Data Sheets, Marathon Oil Company Products, Natural Gas-Condensate Sour, 0245MAR001. Accessed online Oct. 20, 2010 at <http://www.marathonpetroleum.com/Products/MSDS/> (on file with Environmental Working Group). URS Corp., Phase I Hydrogeologic Characterization of the Mamm Creek field Area in Garfield County (2006), <http://cogcc.state.co.us/> (follow links for "Library" and then "Piceance Basin") (prepared for Bd. of County Comm'rs, Garfield County, Colo.); Colo. Oil & Gas Conservation Comm'n, Order No. 1V-276 (Sept. 16, 2004), <http://cogcc.state.co.us/> (follow link for "Orders").

⁶⁵ Urbina, supra note 38.

⁶⁶ Al Armendariz, Emissions from Natural Gas Production in the Barnett Shale Area and Opportunities for Cost-Effective Improvements, a report for Ramon Alvarez, Env'tl. Def. Fund, Jan. 26, 2009.

⁶⁷ Letter from John Filippelli, Strategic Planning and Multi-Media Programs Branch, U.S. Environmental Protection Agency Region II, to Bureau of Oil & Gas Regulation, New York State Department of Environmental Conservation Division of Mineral Resources, Dec. 30, 2009.

⁶⁸ Letter from Dr. Larysa Dyrszka et al. to Nirav R. Shah, Commissioner, New York State Department of Health, Feb. 28, 2012.

⁶⁹ Letter from Dr. Allan Abramson et al. to New York Governor Andrew M. Cuomo, Sep. 15, 2011.

⁷⁰ Medical Society of the State of New York statement on health impact assessment (on file with EWG). New York State Nurses Association, Memo of Support, Hydraulic Fracturing Health Impacts Assessment (on file with EWG). New York State Academy of Family Physicians, memorandum on health impact assessment (on file with EWG). Letter from University of Rochester Medical Center to Sheldon Silver, Speaker, New York Assembly regarding health impact assessment, Mar. 20, 2012. Letter from Healthy Schools Network to Gov. Andrew Cuomo et al. regarding health impact assessment, Mar. 20, 2012 (on file with EWG).

7. Lack of basic data on underground water supplies, faults and floodplains

The draft drilling plan has troubling data gaps. In its comments, the USGS warned that the state does not know the location of many faults that could allow contamination to spread. The USGS also found that the state does not know the location of critical drinking water supplies that must be protected.

“Only scattered and incomplete information is available” on underground fresh water sources, the USGS wrote. The federal agency recommended that the state require drilling companies to maintain detailed logs to identify and protect these aquifers.⁷¹

The state plan said that drilling should not be allowed in 100-year floodplains but then acknowledges that regulators do not know where they are. Furthermore, this proposed ban on drilling in these floodplains is not protective enough, given recent history. During periods of intense rain, flooding could wash contaminants from drilling waste pits or rupture tanks holding toxic fluids used by drillers. In five of the last 10 years (2004, 2005, 2006, 2009 and 2011), flooding in New York exceeded 100-year levels in at least some counties where high-volume hydraulic fracturing and horizontal drilling is likely to occur. In addition, the DEC admits that maps showing the location of floodplains have been inaccurate in recent floods.⁷²

One recent flood in Owego, N.Y., covered a Superior Well Services facility in water eight feet deep. Among other things, the facility holds fluids that are used for hydraulic fracturing. A consultant hired by Superior said that it investigated and found no evidence of serious contamination or of a 150-gallon diesel spill reported by Owego Deputy Mayor Kevin Millar. The consultant did report seeing puddles of water with “visible sheen,” and the state agency also “noted petroleum on puddles of water.”

The consultant also said that the flood did not affect full containers of fracking fluid in a storage building, but Millar said he still had concerns, particularly about bags of dry chemicals that he saw submerged under water. “The [diesel] spill issue was minor compared to the possible chemical contamination,” he said. Superior’s consultant said the bags of unidentified chemicals had been disposed of after the flood.

Millar noted that the facility should never have been built in a floodplain. “It was really a shame it ever went there,” he said.⁷³

The USGS raised serious questions about the state’s count of natural faults in the gas-rich Marcellus Shale formation. A key map in the draft drilling plan “grossly under-represents the number and extent of [natural] faults in the Appalachian Basin of New York,” the federal agency wrote, adding that drilling and hydraulic fracturing directly underneath a fault could allow contaminants to escape upward into underground aquifers. The USGS noted that there are generally far more natural faults in the bedrock above the Marcellus Shale than elsewhere.⁷⁴

Last year, researchers from Duke University echoed the USGS’ concerns in a study published by the National Academy of Sciences. The Duke scientists reported finding an average of 17 times more natural gas in water

⁷¹ USGS, *supra* note 4, at 1.

⁷² NYDEC SGEIS, *supra* note 6, at 7-76; U.S. Geological Survey, Flood of April 2-3, 2005, Neversink River Basin, New York (2006), <http://pubs.usgs.gov/of/2006/1319/>; U.S. Geological Survey, Remnants of Tropical Storm Lee Cause Record Flooding in the Susquehanna River Basin (2011), <http://ny.water.usgs.gov/leeindex.html> (see table of provisional flood peaks and flood frequency estimates); NYDEC SGEIS, *supra* note 6, at 2-32-33.

⁷³ Letter from Sean K. Grady, Conestoga-Rovers & Assoc., on behalf of Superior Well Serv., to John Okesson, N.Y. State Dep’t of Env’tl. Conservation, Region 7 (Nov. 8, 2011); N.Y. State Dep’t of Env’tl. Conservation, Spill Nos. 1107403 & 1107477; telephone interview with Kevin Millar, Owego Deputy Mayor (Jan. 3, 2012).

⁷⁴ See USGS, *supra* note 4, at 9.

wells close to active gas wells than in other water wells. The most likely cause, they said, was leaky well casings, but they raised the possibility that some gas had migrated through “extensive fracture systems” in rock above the shale formations. Another factor, they said, might be gas migration through many older, un-cased wells abandoned over 150 years of drilling in Pennsylvania and New York.⁷⁵

8. No review of siting or impacts of pipelines

As the Region II EPA wrote in its comments, the state has failed to include an environmental analysis of the impacts of pipelines and gathering lines that would convey the natural gas from wells to customers.⁷⁶ Such pipelines can have significant impacts including massive explosions, property damage and deaths, as documented last year in a series in the *Philadelphia Inquirer*.⁷⁷ The *Inquirer* found that many pipelines are generally exempt from regulation either because they are located in rural areas or because they are defined as “gathering lines” that route natural gas or oil from drilling fields to supposedly larger – and regulated – “transmission lines” that carry the fuel cross country. However, as the *Inquirer* detailed, gathering lines and rural pipelines in at least some cases can be just as large as transmission lines and subject to even higher pressures, especially in the Marcellus shale region.

Congress’ investigative arm, the Government Accountability Office, issued similar findings this year, reporting that there are approximately 200,000 miles of pipelines unregulated by the federal government. The GAO found that in response to a survey of state pipeline regulators, “state pipeline safety agencies cited construction quality, maintenance practices, unknown or uncertain locations, and limited or no information on pipeline integrity as among the highest risks for federally unregulated pipelines. Without data on these risk factors, pipeline safety officials are unable to assess and manage safety risks associated with these pipelines.”

The GAO added that “while incidents involving gathering pipelines regulated by [the federal government] have resulted in millions of dollars in property damage in recent years, comparable statistics for federally unregulated gathering pipelines are unknown.” It added that “the increased extraction of oil and natural gas from shale deposits is resulting in the development of new gathering pipelines, some of which are larger in diameter and operate at higher pressure than older pipelines.” It recommended better data collection about federally-unregulated pipelines among other measures.⁷⁸ In the face of this mounting evidence of growing risks combined with regulatory exemptions, the state says that an analysis of pipelines and associated compressor stations is outside the scope of its authority because the New York Public Service Commission has jurisdiction over pipelines and generally has authority over associated compressor stations.⁷⁹ However, as the EPA Region II recommends, the Department of Environmental Conservation could work with the Public Service Commission, whose recommendations could be incorporated into any drilling plan.⁸⁰

⁷⁵ Stephen G. Osborn, et al., Methane Contamination of Drinking Water Accompanying Gas-Well Drilling and Hydraulic Fracturing, 108 PNAS 8172-76, 8175 (2011), <http://www.pnas.org/content/108/20/8172>.

⁷⁶ U.S. Env'tl. Prot. Agency, Region II, supra note 53, at 2.

⁷⁷ Craig R. McCoy and Joseph Tanfani, Ambitious U.S. Gas Pipeline Illustrates Hazards, the Philadelphia Inquirer, Dec. 10, 2011. Craig R. McCoy and Joseph Tanfani, Similar Pipes, Different Rules, Philadelphia Inquirer, Dec. 12, 2011. Craig R. McCoy and Joseph Tanfani, Top U.S. Lawmaker on Pipeline Rules, Philadelphia Inquirer, Dec. 12, 2011. Craig R. McCoy and Joseph Tanfani, ‘Us vs. Them’ in Pa. Gaslands, Philadelphia Inquirer, Dec. 13, 2011. Craig R. McCoy and Joseph Tanfani, Aging Pipes, Deadly Hazards, Philadelphia Inquirer, Dec. 18, 2011.

⁷⁸ U.S. Government Accountability Office, Collecting Data and Sharing Information on Federally Unregulated Gathering Pipelines Could Help Enhance Safety, Mar. 2012.

⁷⁹ NYDEC SGEIS, supra note 6, at 3-7.

⁸⁰ U.S. Env'tl. Prot. Agency, Region II, supra note 53, at 2.

9. Water supplies exposed to vertical, low-volume fracking

The Department of Environmental Conservation proposes to place several sensitive areas off-limits to high-volume hydraulic fracturing and horizontal drilling. Among other things, it would bar drilling and fracturing within 500 feet of a private water well or within the watersheds for New York City and Syracuse. However, the state would allow low-volume hydraulic fracturing and vertical drilling in the same areas. Though there is some evidence to suggest that high-volume hydraulic fracturing and horizontal drilling present greater risks including the studies of gas leaks by Schlumberger and the Society of Petroleum Engineers, there is little evidence that lower-volume fracturing and vertical drilling would be fundamentally safer, especially in sensitive areas. The department itself, reports that the produced water coming out of vertical Marcellus Shale wells in New York contains radioactive waste at extremely high levels. Even if the volume of wastewater were lower in lower-volume fracturing operations, there is still the potential that toxic produced water or flowback water could spill or leak into water supplies. Many drilling companies discuss the “inherent” risks in their drilling operations when they are required by federal law to disclose to investors the most significant risks facing their businesses. These risks typically include leaks, spills, explosions, blowouts, environmental damage, inadequate insurance, bodily injury and death. The companies generally do not say that these risks are lower for vertical or lower-volume fracking operations.⁸¹

Is an activity this risky really appropriate so close to water supplies whether drilling is vertical or horizontal and whether fracking is high-volume or low volume? At a minimum, the department should conduct more research before allowing any drilling near sensitive areas.

10. Who would enforce drilling regulations?

The Department of Environmental Conservation lacks the personnel to adequately regulate heavily industrialized and highly complex shale gas drilling. According to a report published last year by *Reuters*, the state has just 14 inspectors to oversee 13,000 existing natural gas and oil wells – a level of staffing that is already inadequate.⁸² Department of Environmental Conservation Commissioner Joe Martens acknowledged this shortcoming in a December 9 television appearance, admitting that “we have about 16 people in our oil and gas bureau. That’s clearly not enough to handle the activity should we go forward with high volume hydrofracking...we won’t permit wells if we don’t have the staff to properly oversee the activity.”⁸³ Commissioner Martens estimated in an online chat last October that the state will need to hire 225 more inspectors at a cost of \$25 million by the fifth year of drilling and suggested later that the revenue would come from drilling fees and possibly taxes on the drilling industry.⁸⁴ It is unclear whether even this level of staffing would be adequate. The Chautauqua County Water Quality Task Force criticized the department for failing to conduct an analysis of its staff needs. “Because monitoring and enforcement are critical to public health and environmental mitigation effectiveness, Department staffing relative to [high volume hydraulic fracturing] operations is, in fact, an environmental issue and should have been included,” the task force wrote.⁸⁵

⁸¹ See, e.g., XTO Energy Corp., Annual Report (form 10-K) (Mar. 31, 2003).

⁸² Edward McAllister, *Insight: NY Water at Risk from Lack of Natgas Inspectors?*, *Reuters*, July 29, 2011, <http://www.reuters.com/article/2011/07/29/us-newyork-shale-drilling-idUSTRE76S5FA20110729>.

⁸³ Joseph Martens, *Television Appearance on WMHT* (Dec. 9, 2011).

⁸⁴ Joseph Martens, *Online Chat* (Oct. 8, 2011), <http://governor.ny.gov/citizenconnects/?q=content/nys-deccommissioner-joe-martens>.

⁸⁵ Chautauqua County Water Quality Task Force, *Comments on Supplemental Generic Env'tl Impact Statement on the Oil, Gas and Solution Mining Regulatory Program, Well Permit Issuance for Horizontal Drilling and High-Volume Hydraulic fracturing to Develop the Marcellus Shale and other Low-Permeability Gas Reservoirs*, submitted to N.Y. State Dep't Env'tl. Conservation, Dec. 30, 2011.

Conclusion: New York is Not Prepared for Shale Gas

The New York Department of Environmental Conservation's inadequate protections for critical water supplies, its lack of data on underground water sources, faults, floodplains, drilling and fracturing risks, its failure to conduct analyses on health impacts, pipeline hazards and staffing needs, its use of outdated data on greenhouse gas emissions, its underestimate of radiation hazards and failure to identify safe disposal options for toxic wastewater show conclusively that New York is not ready for shale gas drilling. The state must address this issue with the seriousness it deserves. While state officials will no doubt argue that they have spent more than three years researching shale gas drilling and have written thousands of pages of analysis, time and effort are no substitute for the type of high-quality research that is sorely needed. New Yorkers deserve a rigorously scientific approach that strikes the right balance between energy production and other values including clean water, homes, economic security, and health.