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NATURAL GAS WELL DRILLING AND PRODUCTION In the Upper Delaware River Watershed Fact Sheet

Where: Pennsylvania and New York communities in the Upper Delaware River Watershed.

The Marcellus shale formation defines the region that is involved in the exploration for natural gas in the region. The Upper Delaware River is a Scenic and Recreational River as designated by Congress under the Wild and Scenic Rivers Act based on its outstanding natural values and resources. Its watershed, habitats and tributaries share and contribute to those qualities. The Delaware River also supplies water to more than 15 million people, including New York City, Philadelphia, and one third of New Jersey's population. The impacts of natural gas production must be considered in this context.

What: Drilling of natural gas wells in the shale basin known as Marcellus Shale. Presently leases for gas rights are being signed in Wayne and Pike Counties, PA and in Sullivan and Delaware Counties, NY within the Delaware River Watershed and throughout the southern tier of New York and throughout Pennsylvania's portion of the Marcellus fairway outside of the Delaware River Watershed. Within the Delaware River watershed, one well has been drilled but not completed as a shale gas well in Wayne County (illegally); one well has been drilled into the Oriskany sandstone formation in Wayne County as well. For reference in terms of scale, the Susquehanna River Basin Commission (SRBC) has received many applications for water withdrawals, which will result in thousands of new gas wells. Throughout Pennsylvania in 2008, 4,320 new natural gas wells were permitted¹ and as of September 2009, 4,456 permits have been issued; PADEP reports that 1,592 were Marcellus shale permits.² No applications have been processed by the Delaware River Basin Commission and no permits have been issued yet by New York or Pennsylvania in the Delaware River Watershed.

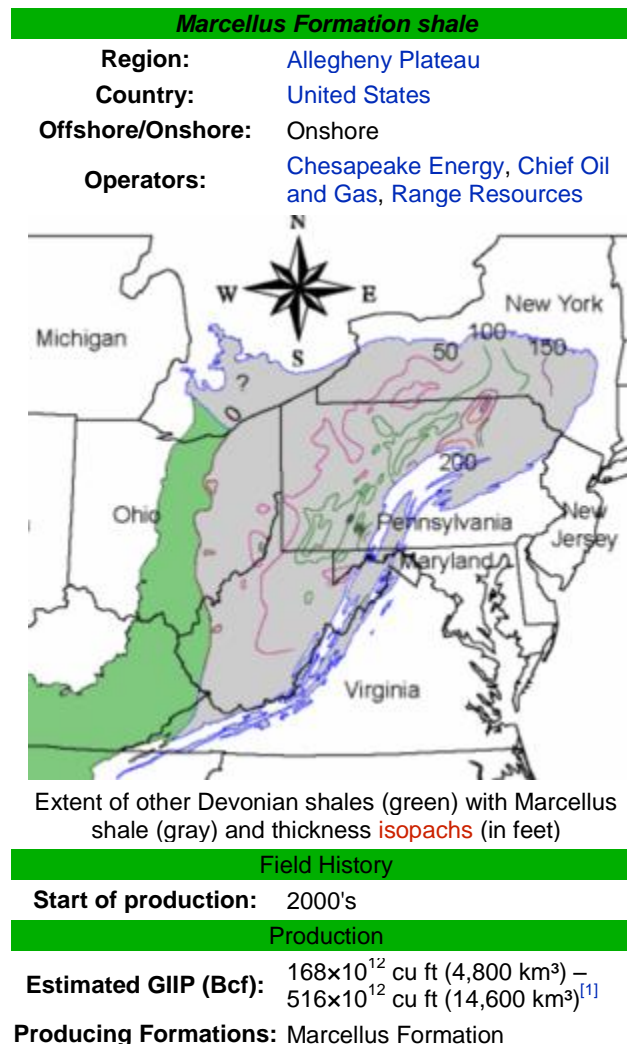
Why Now: Primary reasons:

1. Economy: Price of crude oil has made other fuels more competitive; value of natural gas is steadily climbing and its market is expanding; attractive for investment by big energy firms looking to diversify from oil (such as Hess, Exxon, and French Total's recent buys into the market).
2. Markets: The volume of natural gas that geologists expect to tap in the Marcellus Shale formation is larger than any other shale gas formation being developed today and there is an increasing push for new fuels that can supplement current energy sources, particularly domestic sources of energy.

¹ <http://www.dep.state.pa.us/dep/deputate/minres/OILGAS/Permits%20by%20County%202008%20Total.htm>

² Ford Turner, "Twelve Marcellus shale gas drilling wastewater plants proposed in northern Pennsylvania", the Patriot News, 11.18.09.

3. Advancements in technology that have made the gas more accessible: The two main development practices used are Hydraulic fracturing and Horizontal drilling
 - a. Hydraulic fracturing: “Fracking” (or “fracing”) is the practice of injecting fluid and proppants into the rock formation to open fractures to release gas. Fracking markedly boosts production.
 - b. Horizontal drilling: The well bore is directed down and then extended horizontally to access the shale bed. This markedly lengthens the well bore and expands the amount of gas that can be recovered from each well.



Marcellus Shale

http://en.wikipedia.org/wiki/Marcellus_Formation

Regulation: Drilling Permits are required for all gas wells in both Pennsylvania (PA) and New York (NY). Both states have an Oil and Gas/Minerals Division within their environmental departments which issue these permits. The degree of scrutiny that is given to these permits varies between the two states but generally the regulatory controls are thin, particularly because of several federal exemptions, including exemptions granted by the federal Energy Policy Act (2005), which exempts the industry from certain environmental protection laws, including some provisions of the Clean Water Act, Safe Drinking Water Act, Clean Air Act, National Environmental Policy Act (NEPA), Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). For more information go to <http://www.nrdc.org/land/use/down/contents.asp> and to http://www.earthworksaction.org/oil_and_gas.cfm

Both the House of Representatives (H.R. 2766) and the Senate (S. 1215) have introduced legislation - the FRAC Act - to overturn the exemption of hydraulic fracturing from the Safe Drinking Water Act and to require the public disclosure of what is in the fracking fluids being injected. These bills are sponsored by Senators Casey (PA) and Schumer (NY) and Representatives Hinchey (NY), DeGette (CO) and Polis (CO) -- 3 of the sponsors represent the Delaware River Watershed. Co-sponsors in the Delaware River Watershed include Congressmen Patrick Murphy (PA) Joe Sestak (PA), Rush Holt (NJ), Frank Palone (NJ), Michael Acuri (NY), John Hall (NY), and Paul Tonko (NY). The bills are gaining strength with more co-sponsors from across the nation; there is strong opposition to the Bills from the gas and oil industry and strong support from the public.

Note: Two recent court decisions may change the Clean Water Act exemption: a legal challenge by the Natural Resources Defense Council resulted in a federal court ruling that struck down the Environmental Protection Agency (EPA) exemption of the gas and oil industry in California; and the Pennsylvania Supreme Court recently ruled in part supporting some rights of municipalities in their attempts to restrict gas drilling.³ and⁴ (See Amici Curiae brief filed by DRN and Nockamixon Twp with PA Supreme Court, 7.8.08).⁵ Additionally, Nockamixon Township, who was sued by Arbor Resources of Michigan to overturn the township's efforts to protect resources within their borders, received a favorable ruling from Judge Clyde W. Waite, Bucks County Court of Common Pleas. September 29 the Judge issued an Order supporting the Township's ability to use the PA Municipalities Planning Code and the Floodplain Management Act to regulated gas drilling.⁶ Arbor Resources appealed to overturn the ruling and the case is being litigated.

³ Docket No. 30 WAP 2008 and 31 WAP 2008, Appeal from the Order of the Commonwealth Court of Pennsylvania entered July 27, 2007, No. 2406, reversing the December 8, 2006 Order of the Court of Common Pleas of Allegheny County, Pennsylvania, Docket No. S.A. 06-484 and Appeal from the Order of the Commonwealth Court of Pennsylvania entered August 9, 2007, affirming the Decision of the Court of Common Pleas of Westmoreland County of September 8, 2006.

⁴ Supreme Court of Pennsylvania, No. 29 WAP 2008, decided 2.19.09, Pa. Lexis 264; No. 30 and 31 WAP 2008, decided 2.19.09, Pa. Lexis 265.

⁵ Brief of Amici Curiae, Nockamixon Township, the Delaware Riverkeeper, Delaware Riverkeeper Network, American Littoral Society, and Damascus Citizens for Sustainability in Support of Appellants, In the Supreme Court of Pennsylvania, Western District, July 8, 2008.

⁶ Memorandum Opinion and Order, In the Court of Common Pleas, Pennsylvania, Civil Division, Arbor Resources, Pasadena Oil and Gas and Hook 'Em Energy Partners v. Nockamixon Twp., No. 2008-4801-31-1.

New York: New York State Department of Environmental Conservation (NYSDEC) is updating its Environmental Impact Statement (EIS) for gas drilling permits in Marcellus Shale.⁷ The Draft Supplemental Generic EIS (SGEIS) draft scoping document was released in October 2008; 6 public hearings and a comment period ran through December 15, 2008.⁸ The Final Scope was issued by NYSDEC in February 2009. The final Draft SGEIS was issued September 30 2009⁹ with 4 public hearings and an extended public comment period that concluded December 31, 2009.

More than 12,000 comments were submitted to NYSDEC on the Draft; a coordinated call for the withdrawal of the Draft and an extension of the existing permitting ban was lodged by environmental/conservation groups, elected officials, towns, and general public due to the inadequacy of the Draft to address the far reaching adverse impacts of shale gas drilling, the lack of a cumulative analysis, and the lack of any proposed regulations. New York City (NYC) filed extensive comments on the Draft, calling for the ban of all gas drilling within the NYC reservoir watershed due to water quality concerns.¹⁰ EPA also filed comments expressing concern about human health impacts and the possible pollution of NYC's water supply reservoirs.¹¹ 14 New Jersey organizations filed a letter calling for the withdrawal of the Draft due to lack of consideration of the adverse impacts on downstream water supplies, such as New Jersey's 2.8 million people who rely on the Delaware River. Some commenters supported the Draft and urged DEC to finalize it and remove the moratorium. The New York Times published an editorial position in support of a NYC Watershed ban.¹² See DRN comment to NYSDEC at www.delawariverkeeper.org

A moratorium on the processing of Marcellus Shale gas well permits for wells using the existing Generic Environmental Impact Statement (GEIS) that other types of gas wells use in New York State is in place. NYSDEC states that they may process individual supplemental EIS's for Marcellus shale well drilling permits in the meantime but none have been yet processed. At least eight applications have been received by NYSDEC for gas well permits in the Marcellus Shale near Hancock, NY.

New York State presently lacks meaningful water use regulation, leaving unanswered the question of how much water can be safely withdrawn without depleting water resources, streams and wetlands and allowing the massive water needs of the gas industry to run ahead of needed protection.¹³ State officials themselves have called current water resources regulation fragmented and incomplete, recommending a comprehensive water resource program that addresses both quantity and quality including legislation, for starters, to require permits for all water withdrawals of 100,000 gpd or more.¹⁴

⁷"Governor Paterson signs bill updating oil and gas drilling law; pledges environmental and public health safeguards", New York State Press Announcement, July 28, 2008. <http://www.dec.ny.gov/press/45423.html>

⁸ NYSDEC Division of Mineral Resources, Bureau of Oil and Gas Regulation, Draft Scope for Draft Supplemental Generic Environmental 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, 10.06.08.

⁹ www.dec.ny.gov/energy/58440.html

¹⁰ http://www.nyc.gov/html/dep/pdf/natural_gas_drilling/nycdep_comments_final_12-22-09.pdf

¹¹ <http://www.epa.gov/region2/spmm/r2nepa.htm#r2letters>

¹² NYT Editorial, "Where Water Trumps Energy", 10.15.08,

http://www.nytimes.com/2008/10/15/opinion/15wed3.html?_r=2&oref=slogin&oref=slogin

¹³ Trout Unlimited, "Tapped Out, New York's Water Woes", 2008.

¹⁴ Jim Dezolt, Director Division of Water, NYSDEC, Testimony before the New York Legislature, Assembly Standing Committee on Environmental Conservation, 8.6.08.

Pennsylvania: Pennsylvania Department of Environmental Protection (PADEP) Bureau of Oil and Gas Management and Bureau of Watershed Management adopted changes to the application for Marcellus Shale gas wells in 2008¹⁵. Information required by the “Marcellus Addendums” included water use and safe yield analysis, wastewater disposal, wetland and thermal impacts, disclosure of fracking fluid chemicals, and a natural resource inventory based on state records (PA Natural Diversity Inventory “PNDI”). But requirements have changed, with recent changes reducing oversight and environmental protections; the gas well drilling permitting process is considered to be “streamlined” for quicker results.¹⁶ Industry representatives are participating on committees with PADEP to develop policies and regulations.¹⁷ PADEP has begun a rulemaking process to develop Total Dissolved Solids (TDS), sulfate, and chloride effluent standards for high-TDS wastewaters, driven by gas drilling wastewater. PADEP has noticed proposed standards¹⁸, held 3 hearings in the State, and is accepting written comment up to February 12, 2010. TDS and wastewater issues are discussed later in this fact sheet.

There are no spacing requirements between wells and no limits on how many wells can be placed in a “field”. Water use regulation is notably lacking in Pennsylvania except where the Susquehanna and Delaware River Basin Commissions operate. Overall, regulation is weak and lays the Commonwealth’s water resources and waterways open to depletion and degradation resulting from gas development practices to meet their huge water supply and disposal needs.

¹⁵ 5500-pm-og0083 rev. 8/2008 Commonwealth of Pennsylvania Instructions Department of Environmental Protection Bureau of Oil and Gas Management Bureau of Watershed Management - 1 - application addendum and instructions for Marcellus shale gas well development.

¹⁶ http://www.dep.state.pa.us/dep/deputate/minres/oilgas/new_forms/ESCGP-1/E-S_Permit.htm

¹⁷ http://www.dep.state.pa.us/dep/deputate/minres/oilgas/new_forms/marcellus/marcellus.htm

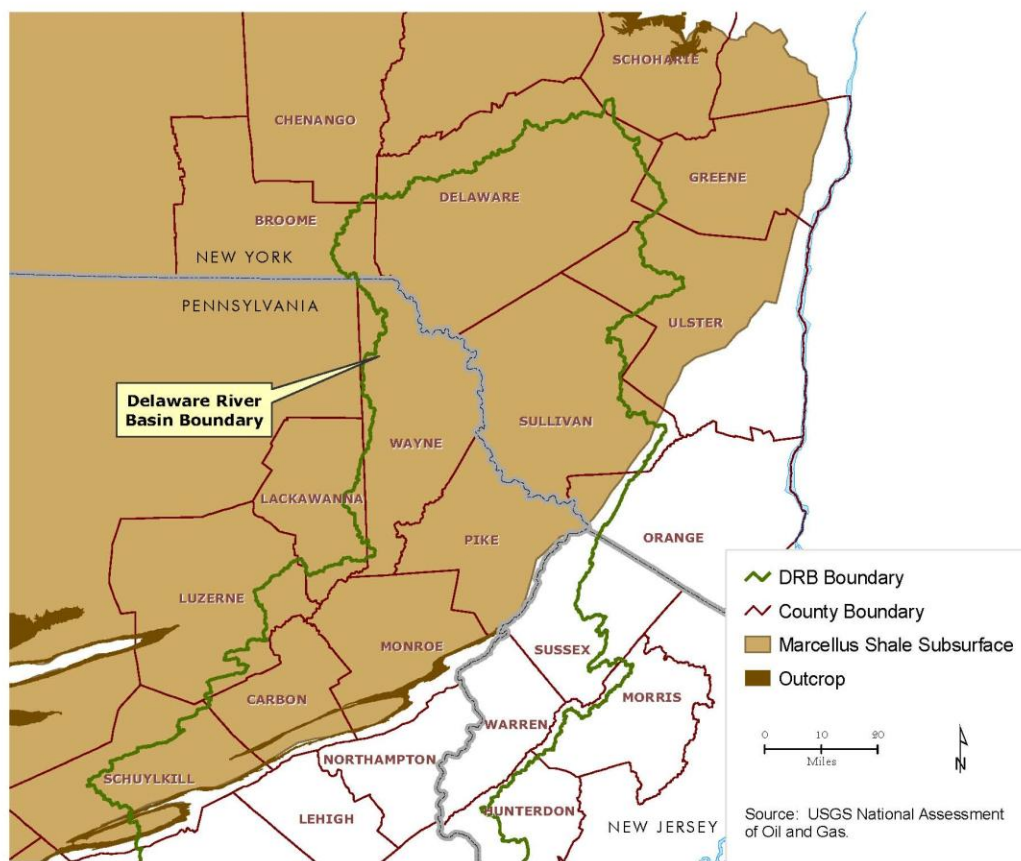
¹⁸ <http://www.depweb.state.pa.us/watersupply/cwp/view.asp?a=1260&Q=545730&watersupplyNav=|30160|>

¹⁸ <http://www.pabulletin.com/secure/data/vol39/39-45/2065.html>

Delaware River Basin



The Delaware River Watershed by State



Marcellus Shale in the Delaware River Watershed

<http://www.state.nj.us/drbc/naturalgas.htm>

Delaware River Basin Commission (DRBC): DRBC is an agency comprised of the four states in the Delaware River Basin (NY, PA, NJ, DE) and the federal government (Army Corps of Engineers).¹⁹ DRBC is responsible for the River's water resources and regulates water withdrawals and discharges within the Watershed, including all gas well permits. No applications have been approved yet by the DRBC for gas wells or gas drilling water supply. Chesapeake Appalachia Energy Co. filed the first application for water supply withdrawal for 1 million gallons of water per day from the West Branch of the Delaware River, near Hancock, NY.

A Hearing held on the Chesapeake application on July 15, 2009 drew hundreds of objectors to the water withdrawal (and a few supporters) and 1,200 letters were filed with the DRBC regarding this application. NYCDEP filed a letter 7.13.09 raising concerns with DRBC in regards to Chesapeake Gas Co.'s application to withdraw water from the West Branch of the Delaware, located above the gauge that measures how much water the City must release from its reservoirs into the River for conservation.²⁰ PA Fish and Boat Commission (with concurrence from PADEP), the National Park Service and other agencies objected to the inadequate minimum stream flow protection in the proposed permit.²¹ DRBC tabled action at the July meeting and announced they would be making changes to the draft permit based on comments received. A new draft permit was issued and

¹⁹ <http://www.state.nj.us/drbc/>

²⁰ Letter from NYCDEP to DRBC, July 13, 2009.

²¹ NPS_Comments_West_Branch-Withdrawal 7-14-09NER

another Hearing set for September 2009, which was postponed at the applicant's request. On October 20, 2009, Chesapeake withdrew its application, stating ". . . we have decided to withdraw the application and reassess our approach to the situation. We believe this is preferable to continuing with hearings and further public debate about the project at this time."²² No new applications have yet been submitted for any shale gas projects by Chesapeake to the DRBC.

Chesapeake Appalachia also drilled a new gas well into the Oriskany formation, a sandstone that is not being reviewed by the DRBC because the "target formation" is not shale.

Presumably, DRBC considers the amount of water that will be used to develop a well in the Oriskany to be much less (they claim up to 100,000 gallons as opposed to millions for shale wells) but DRN and others have objected to the DRBC's lack of oversight and PADEP's minimal permitting requirements for this well, called the Robson well, located in Wayne County. See March 6, 2009 DRN Comment to DRBC at www.delawariverkeeper.org

Applications for 6 natural gas wells were filed by Chesapeake with New York State in the Hancock region and with PADEP for one well in Wayne County, PA. Stone Energy, who drilled a vertical well in the Marcellus Shale in Wayne County, PA without DRBC approval and was notified that they were in violation of DRBC requirements, has submitted applications for a shale gas well and a water supply withdrawal of .70 mgd from the West Branch of the Lackawaxen River, a tributary to the Delaware River. The Stone Energy applications (one well and one water withdrawal) may be noticed for a Hearing in January 2010 with possible action by the DRBC in March 2010.

After being notified by DRBC of their requirements, Arbor Resources submitted applications for wells in a different shale formation in Nockamixon Township, Bucks County, PA where the company has signed leases and is expected to begin exploration.²³ They also have applied for a one-time withdrawal of groundwater to develop its exploratory well in the Rapp Creek Watershed in the Township. Other well applications by other companies are in the works in Wayne County. It is approximated that at least 200,000 acres of land have been leased out for gas wells in the Upper Delaware River Watershed to many different companies, including Hess in Northern Wayne County and large holdings to Chesapeake in New York State.

In an Executive Director Determination issued in May 2009, Executive Director Carol Collier stated that they will regulate all aspects of gas extraction including water supply, wastewater processing and discharge, wells and well pads, pit management and nonpoint source pollution for each well project. The DRBC has eliminated their usual review thresholds and is requiring all shale well projects, regardless of size or amounts of water to be used or discharged, to obtain approval from the DRBC due to the potential for substantial impact to the water quality of the Delaware's Special Protection Waters, individually or cumulatively.²⁴ They also say they will require the disclosure of all chemicals to be used in well development.²⁵

DRBC has announced that they will be developing shale gas-specific regulations for all shale gas projects that will be permitted by the DRBC. DRN and many other organizations have taken the position that no gas projects should be permitted by the DRBC until these regulations are implemented. See DRN comment to DRBC at www.delawariverkeeper.org

²² Letter d. 10.20.09 from James Grey, Chesapeake Appalachia LLC to Mark Klotz, DRBC Chairman.

²³ Letter dated Sept. 5, 2008 from Carol Collier, Executive Director, DRBC to Arbor Resources, re. Natural Gas Mining, PA, Well permit number 37-017-20002-00 and 37-017-20003-00.

²⁴ http://www.state.nj.us/drbc/newsrel_naturalgas.htm

²⁵ <http://www.state.nj.us/drbc/naturalgas.htm>

New York City Department of Environmental Protection (NYDEP) Watershed Rules: The Rules and Regulations for the Protection from Contamination, Degradation and Pollution of the New York City Water Supply and Its Sources (Chapter 13, New York City) govern the watershed lands that drain to New York City's three water supply reservoirs located in the Delaware River's headwaters (Pepacton, Cannonsville and Neversink Reservoirs). These rules provide the City with broad power to regulate land use activities and discharges within the reservoirs' watersheds. The City has the power to restrict and ban certain activities and has done so through limiting new sewage treatment plants, activities that lead to nonpoint source pollution, and has established programs to reduce or eliminate certain priority pollutants.

New York City Council, Committee on Environmental Protection, held hearings to consider establishing a ban on all gas well drilling and development in the NYC drinking water watershed.²⁶ Many of the Borough Committees in New York City passed resolutions calling for a total ban on gas drilling in the NYC Watershed drainage area. The public has become more aware about the threat of pollution that shale gas drilling poses to the up to 9 million people in New York City who drink water from the Delaware River through the City's reservoir system.

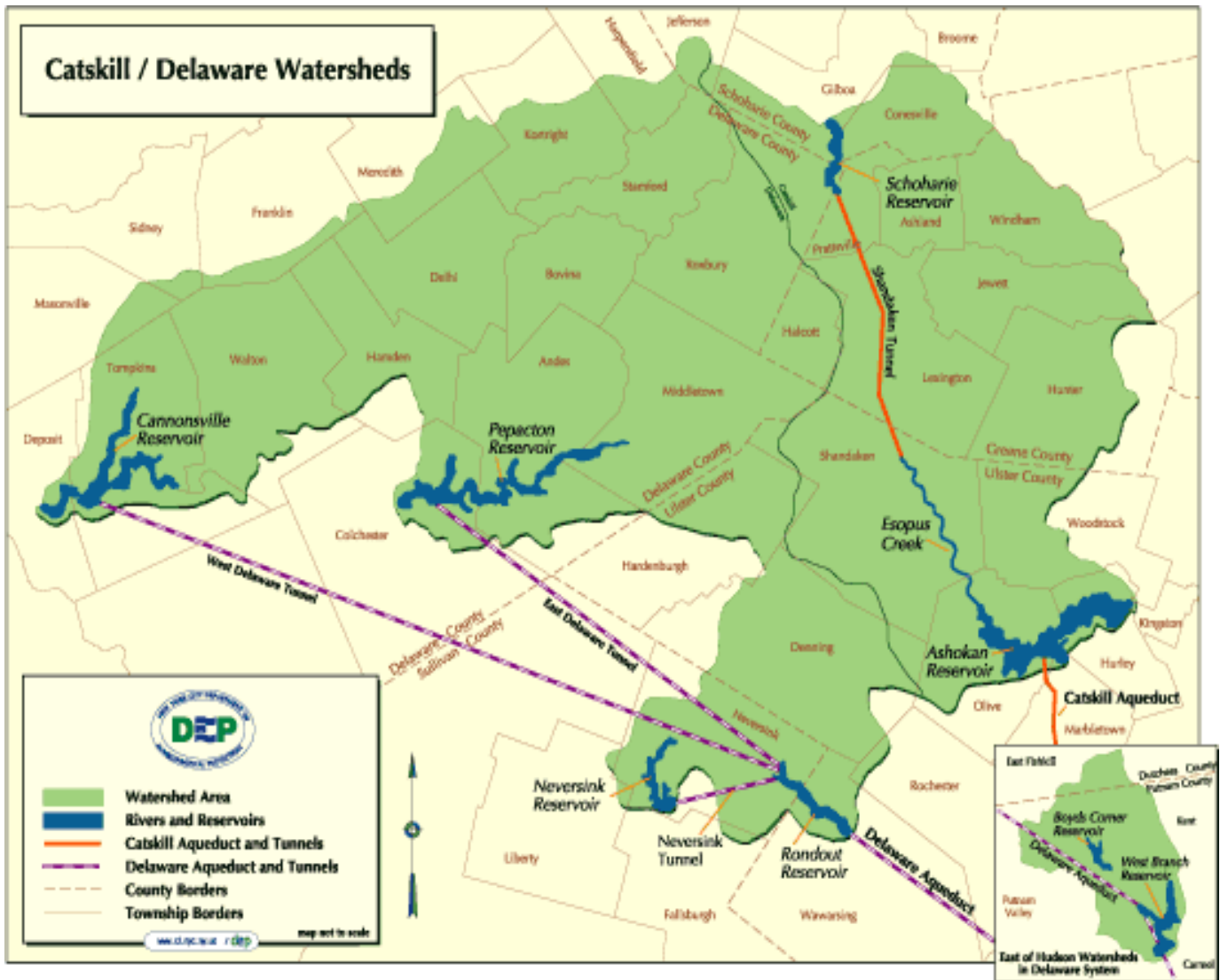
NYCDEP issued a draft report in September 2009 on the potential impacts of gas drilling in the NYC drainage area for the City's reservoirs underlain by Marcellus shale, pointing out how groundwater and the reservoirs could become polluted by hydraulic fracturing and horizontal drilling and watershed land changes.²⁷ NYCDEP's Final Report, issued when they filed their DSGEIS comments, examines the technical details of water quality and water resource risks inherent in shale gas drilling.²⁸

How the regulatory structure of these government entities will work together and whether these attempts will be successful in preventing environmental harm is a raging question throughout the Marcellus shale fairway. The wave of gas well development has not yet broken upon the Delaware River Watershed.

²⁶ See Delaware Riverkeeper Network statement to NYC Council, September 10, 2008

²⁷ New York City Department of Environmental Protection, "Rapid Impact Assessment Report, Impacts Assessment of Natural gas Production in the New York City Watershed", September 2009

²⁸ [Final Impact Assessment Report \(PDF\)](#)



NY City Reservoir System- Delaware/Catskill

http://nyc.gov/html/dep/html/dep_projects/catdel_wide.shtml

What's the Risk?

Issues: Numerous environmental and health issues arise from natural gas well drilling, development, production and infrastructure.

- ✓ **Water Quantity:** It takes between 2 and 9 million gallons of water to frack a well in the Marcellus Shale.²⁹ Amounts vary, depending on equipment, site specific conditions and the depth of the well (Marcellus shale wells are expected to be 5,000 to 8,000+ feet deep).³⁰ The water is either drawn from a water well or from surface water (e.g. a nearby stream). The use is classified as consumptive and depletive because the water is not returned. Considering the number of gas wells that can be installed, in the tens of thousands in the Upper Delaware River watershed, the volume of water that will be needed to hydrofrack and develop these wells will reach into the billions, a significant depletive loss. Potential impacts include aquifer depletion, stream flow depletion and disruption of natural flow regime, interference with hydroperiod flow to wetlands and other water dependent ecosystems. In turn, aquatic life, fish, wildlife and plant life can be affected. Drinking water supply can be depleted.

In addition to the volume of water used in fracking, in some instances water is “produced” by the gas well when fluids and gas rise to the surface, carrying water from deep geologic layers. This produced water is considered an additional depletive loss; the black Devonian shale that holds the Marcellus formation is known to produce higher quantities of water than some other natural gas geologies.³¹

- ✓ **Water Quality:** The use of chemicals and the contaminants that are produced by well development processes expose water resources and features, including drinking water supplies, to significant risk of pollution.³² The pathways for this pollution are multiple.

The drilling and fracking processes introduce chemicals into the well and also disturb, distribute, and bring to the surface flowback or “produced water” that contains chemicals/minerals from various rock formations such as salts, sulfate, heavy metals, arsenic, aromatic hydrocarbons such as benzene, and “normally occurring radioactive materials” or NORMS, which occur in the region³³. NORMS have required decontamination elsewhere such as at 140 sites since January 2005 in Texas in Barnett Shale.³⁴ New York State Department of Environmental Conservation identified NORMs as a substantial issue in flowback from Marcellus shale drilling since several radiological parameters were identified in samples of produced water or flowback from shale gas wells in PA and WVA, including Gross Alpha, Gross Beta, Total Alpha Radium, radium 226, and radium 228 and is expected to be found in New York Marcellus shale. Radium 226, the radionuclide of greatest concern in terms of human health, was found in the PA and WVA samples well beyond safe drinking water levels.³⁵

²⁹ “Gas Well Drilling and Development, Marcellus Shale, June 12, 2008 Commission Meeting”, www.srbcc.net

³⁰ “Gas Well Drilling and Development, Marcellus Shale, June 12, 2008 Commission Meeting”, www.srbcc.net

³¹ U.S. Dept. of Energy, Argonne National Laboratory, “A White Paper Describing Produced Water from Production of Crude Oil, Natural Gas, and Coal Bed Methane”, January 2004, page 17.

³² <http://www.earthworksaction.org/pubs/DrinkingWaterAtRisk.pdf>

³³ NYSDEC Draft Supplemental Generic Environmental Impact Statement on the Oil, Gas, and Solution Mining Regulatory Program (DSGEIS), 2009, Chapters 4, 5, and 6.

³⁴ “Radioactive Waste Surfaces at Texas Gas Sites”, Peggy Heinkel-Wolfe, Denton Record-Chronicle, 11.11.07.

³⁵ NYSDEC Draft Supplemental Generic Environmental Impact Statement on the Oil, Gas, and Solution Mining Regulatory Program (DSGEIS), 2009, Table 5-10

Chemicals are also used in the fracking fluids and drilling muds. It is estimated that 10%-75% of the fracking fluids and the chemicals they contain can remain underground and can spread into deep aquifers (how much stays in the well bore varies considerably site by site). The storage of the fracking fluids in open pits and the action of the well development process can expose the chemical mix to the land surface, which provides another pathway to groundwater through infiltration and to surface water through overland flow and deposition on water from the air volatilization of chemicals. Compromised pit liners and the residue left in/on cuttings that settle out in the open pit over time and are sometimes buried after a pit is removed, also can provide a pathway for contaminants to leach into groundwater aquifers.

Wastewater

How and where used fracking water (also called “brine water” due to the saltiness) will be disposed is far from settled. So much wastewater is being produced in Pennsylvania due to the frenzy of shale gas drilling, for instance, that the volume is overwhelming. According to PADEP, “Estimates from the industry indicate that demand for brine water treatment in Pennsylvania will reach approximately nine Million Gallons per Day (MGD) in 2009, 16 MGD in 2010, and 19 MGD in 2011. Estimates from the Susquehanna River Basin Commission are 20 MGD for that same timeframe”.³⁶

Due to the large amount of water used for fracking, the resulting volume of wastewater to be treated and discharged is beyond the capacity of existing treatment plants in the region.³⁷ Also, existing sewage treatment plants are not equipped to process or safely manage the contaminants in the wastewater – particularly since the wastewater is high in total dissolved solids (TDS) and salts -- but some municipal facilities in the Delaware River Watershed and New York State are considering importing it nonetheless, including the Central Wayne Regional Authority in Honesdale, PA³⁸ and the Delaware County Regional Water Quality Control Authority (DELCORA) in Chester, PA, which has applied to the DRBC for approval to accept gas drilling wastewater and will be re-applying to PADEP if the DRBC application is approved.³⁹

Several draft permits have been issued by PADEP to allow existing sewage plants to take gas drilling wastewater; one of the final permits is being challenged by objectors based on adverse environmental impacts.⁴⁰ NYDEC’s general discussion in their Draft SGEIS of treatment options available in the State to process the expected wastewater and their positive statement that wastewater can be exported to Pennsylvania⁴¹, also questions whether New York has the capacity to process the wastewater produced from shale gas development in the State.⁴² A NYSDEC official testified in July 2008 that sewage treatment

³⁶ PADEP “Permitting Strategy for High Total Dissolved Solids (TDS) Wastewater Discharges”, April 11, 2009, [http://www.depweb.state.pa.us/watersupply/cwp/view.asp?a=1260&Q=545730&watersupplyNav=\[30160\]](http://www.depweb.state.pa.us/watersupply/cwp/view.asp?a=1260&Q=545730&watersupplyNav=[30160])

³⁷ “Gas Well Drilling and Development, Marcellus Shale, June 12, 2008 Commission Meeting”, www.srb.net

³⁸ Weekly Almanac, “Sewer Plant Could Treat Drilling Waste”, Mary Baldwin, August 27, 2008, (<http://weeklyalmanac.com/articles/2008/08/27/news/doc48b594eab5658405325327.prt>):

³⁹ DRBC DELCORA Docket D-1992-18 CP-2

⁴⁰ Clean Water Action appeal WW Shallen Amended Notice FINAL, EHB Docket No. 2009-134-R, 11.02.09.

⁴¹ NYSDEC Draft Supplemental Generic Environmental Impact Statement on the Oil, Gas, and Solution Mining Regulatory Program (DSGEIS), 2009, p. 5-121.

⁴² NYSDEC Draft Supplemental Generic Environmental Impact Statement on the Oil, Gas, and Solution Mining Regulatory Program (DSGEIS), 2009, Chapters 6 and 7.

infrastructure in the state was inadequate for municipal needs⁴³ much less the needs of the natural gas industry for wastewater disposal.

It's not even clear exactly what is in the wastewater because no sampling is required of the waste that leaves the well site, says Dr. Conrad Dan Volz of the University of Pittsburgh and Tom Rathbun, a PADEP spokesperson.⁴⁴ Additionally, companies that subcontract hydrofracking guard their formulas and do not disclose all the ingredients of proprietary mixtures. Both states have stated that they intend to regulate disposal of all wastewater fluids as required under the Clean Water Act.

Wastewater treatment facilities further west in Pennsylvania and West Virginia are already accepting the waste – and are experiencing serious consequences. The discharge of wastewater from gas development in the Marcellus shale in Pennsylvania contributed to a serious contamination emergency for the Monongahela River, according to a PADEP news release October 22, 2008. PADEP discussed the 2008 total dissolved solids (TDS) overload in the Monongahela River in its Chapter 95 revision public rulemaking (discussed further below), using it as an example as to why a TDS effluent standard is needed.⁴⁵

PADEP investigated the unusually high levels of TDS in the Monongahela River that affected at least 11 public water supplies that serve 325,000 customers and industrial facilities such as an electric generating station and a steel mill. TDS represents the dissolved elements in water and can include carbonates, chlorides, sulfates, nitrates, sodium, potassium, calcium and magnesium and causes water to be discolored and of poor taste.⁴⁶ PADEP issued a water quality advisory for consumers to use bottled water until the problem was addressed and has limited the acceptance of wastewater from gas well hydrofracking by local sewage treatment plants there (requiring reduction of gas drilling wastewater to 1% of the daily sewage flow—some plants were taking in as much as 20%).⁴⁷ Water treatment facilities are not equipped to remove the TDS that has fouled the Monongahela River. The overload of TDS was repeated twice since 2008 in varying degrees. Apparently the 1% limit and other measures imposed by PADEP have not been adequate. In August 2009, PADEP issued a consent order and agreement with Shallenberger allowing a wastewater plant on the Monongahela to accept gas drilling wastewater but the discharge that would result is considered by challengers to the permit to be polluting and in violation of existing regulations and clean water laws in an appeal filed by Pennsylvania Clean Water Action in November 2009.⁴⁸

Recently PADEP stated that applications for at least 12 new industrial treatment plants have been received for northern Pennsylvania⁴⁹, which, in itself, is a significant environmental issue, considering the limited assimilative capacity of the region's surface waters. Pennsylvania has 6 industrial discharge plants (2 of them are "brine" plants

⁴³ Testimony of Jim Dezolt, Director, Division of Water, NYSDEC, before NYS Legislature, Assembly Standing Committee on Environmental Conservation, August 6, 2008.

⁴⁴ Don Hopey, "State concerned about waste water from new gas wells", Pittsburgh Post Gazette, 12.21.08

⁴⁵ PADEP "Permitting Strategy for High Total Dissolved Solids (TDS) Wastewater Discharges", April 11, 2009, <http://www.depweb.state.pa.us/watersupply/cwp/view.asp?a=1260&Q=545730&watersupplyNav=|30160|>

⁴⁶ PADEP News Release 10.22.08, "DEP investigates source of elevated total dissolved solids in Monongahela River", <http://www.ahs.dep.state.pa.us/newsreleases/default.asp?ID=5337&varQueryType=Detail>

⁴⁷ PADEP News Release 10.22.08, "DEP investigates source of elevated total dissolved solids in Monongahela River", <http://www.ahs.dep.state.pa.us/newsreleases/default.asp?ID=5337&varQueryType=Detail>

⁴⁸ CWA appeal WW ShallenAmended Notice FINAL

⁴⁹ Ford Turner, "Twelve Marcellus shale gas drilling wastewater plants proposed in northern Pennsylvania", the Patriot News, 11.18.09.

specifically for high-chloride wastes) but these are at their limit; tank trucks wait in line for hours at a time to deposit natural gas wastewater. The issue of how to safely treat and dispose of gas drilling wastewater is unresolved in both NY and PA.

November 7, 2009 PADEP released for public comment proposed changes to Chapter 95 wastewater regulations that will govern discharges of high TDS, chloride and sulfate.⁵⁰ The rulemaking will establish effluent limits for these gas drilling wastewater constituents by 2011 but will permit continued discharge of this wastewater in the interim. The proposed standard of 500 mg/L TDS and 250 mg/L for chloride and sulfate are open for public comment until February 12; DRN and others want stricter limits adopted by PADEP and the regulations expanded to cover other contaminants in gas drilling wastewater. (See DRN Action Alert at www.delawariverkeeper.org)

Contamination Incidents

Incidences of water contamination and environmental pollution have been reported around the country near natural gas wells either from spills, accidents or through customary practice⁵¹. In Dimock Township, Susquehanna County, PA a residential drinking water well exploded without warning near a new gas well in January, 2009. PADEP shows that natural gas (methane) mixed with several private water wells, fouling water and forcing homes on water tanks. PADEP issued a violation notice to Cabot for the pollution in March, 2009.⁵² PADEP settled with Cabot in November with a fine of \$150,000 for polluting 13 water wells and several square miles of aquifer with methane. Also, in November 2009 a group of Dimock residents announced that they filed a class action law suit against Cabot for pollution of their water and the environment.

Also in Susquehanna County, in Springville and Dimock Townships, diesel spills related to gas drilling by Cabot have dumped 100 gallons, 800 gallons and 100 gallons of fuel on the ground in three recent separate incidents.⁵³ In September 2009, there were also three spills of fracturing fluid by subcontractor Halliburton at Cabot wells in Dimock that were undergoing hydraulic fracturing stimulation. Two spills entered Stevens Creek and wetlands, causing a fish kill. After these three fracturing fluid spills in one week, PADEP then ordered that Cabot stop fracking operations at all their wells, although they were allowed to continue drilling. The ban was lifted in November once Cabot filed spill prevention plans, which had been missing or inadequate while these pollution incidents occurred.

⁵⁰ <http://www.pabulletin.com/secure/data/vol39/39-45/2065.html>

⁵¹ <http://www.earthworksaction.org/pubs/Spills.pdf>, <http://www.earthworksaction.org/oilgaspollution.cfm>

⁵² Steve McConnell, "Gas driller found in violation for 'polluting' groundwater", Wayne Independent, 3.10.09

⁵³ <http://www.riverreporter.com/issues/09-03-12/news-gasglance.html>



Dimock Township hydraulic fracturing fluid spill, September 2009

In Bradford Township, McKean County, PADEP found Schreiner Oil and Gas responsible for contaminating at least 7 water supplies with methane and/or high levels of iron and manganese, ruining local wells. They also found Schreiner committing pit and other gas well violations, endangering the community and environment; bottled water is being supplied on an emergency basis to the homes while more are tested.⁵⁴

In McNett Township, Lycoming County, Pennsylvania, an East Resources natural gas well leaked methane in late July 2009. The leak was noticed first in a creek. Emergency crews evacuated one home; the company provided water to four homes and is monitoring 18 wells. 20 firefighters worked for a few days while the well leak was being plugged.⁵⁵ In Greene, Fayette, and Washington Counties, PA, PADEP found Atlas Resources guilty of discharging “residual and industrial waste, including diesel fuel and production fluids, onto the ground at 7 of 13 natural gas well sites” and in violation of erosion and sediment control measures and site restoration requirements at 8 well sites for incidences that occurred between Dec. 8 2008 and July 31, 2009, resulting in a fine of \$85,000 in January 2010.⁵⁶

In Hickory, PA, farmer Ron Gulla’s fish pond has been polluted and polluted runoff continues to ruin his farm⁵⁷; PADEP says the lack of pre-drilling condition data lets Range Resources off the hook. PA’s shale region is experiencing pollution from natural gas storage facilities, pipelines and gas wells.⁵⁸ In a report January 2010 in Tioga County, PA, Fortuna Energy Co. is being blamed for polluting a water well and a stream with methane by a resident near their gas wells.⁵⁹ In October, 2009, Mt. Pleasant, PA raw natural gas escaped from a pipeline near a MarkWest Co. Station with such force that nearby houses shook, causing residents to report toxic clouds of gas

⁵⁴ <http://www.ahs2.dep.state.pa.us/newsreleases/default.asp?ID=5494&varQueryType=Detail>

⁵⁵ The Daily Review, Towanda, Pa, “Natural Gas Well Down After Leak”, 7.30.09, <http://www.thedailyreview.com>.

⁵⁶ http://www.portal.state.pa.us/portal/server.pt/community/news_releases/14288

⁵⁷ <http://uk.reuters.com/article/environmentNews/idUKTRE5422TG20090503?sp=true>

⁵⁸ <http://uk.reuters.com/article/environmentNews/idUKTRE5422TG20090503?sp=true>

⁵⁹ http://www.syracuse.com/news/index.ssf/2010/01/tioga_county_man_blames_natura.html

that caused nausea and coughing; PADEP is investigating with air tests.⁶⁰ Also reported was the emission of large amounts of natural gas and an oily substance at a Spectra compressor station in Clearville, PA in August 2009.⁶¹

In Arkansas, two major wastewater companies were shut down in 2009 after high salt levels were found in a reservoir and fish kills occurred in a local creek.⁶² In another example, an incident reported in Newsweek recounted a fracturing fluid spill that sent a worker to the hospital and is being investigated as the cause of his nurse's near death illness⁶³. An incident of methane from a gas well leaking into 43 water wells has been reported in Ohio, ruining private wells and requiring water to be imported for the neighborhood.⁶⁴

Other incidents of pollution near natural gas wells include water wells in the Pinedale Anticline, a natural gas rich area in Wyoming where six wells are emitting potentially flammable gas in such high levels that they can't be safely tested⁶⁵ and also in Wyoming where hydrocarbons have been found in a water well for livestock⁶⁶. In Spring Ridge, Louisiana, 20 cattle dropped dead after drinking fluid next to a Chesapeake Oil and Gas Co. natural gas well.⁶⁷ An increased risk of stillbirths linked to the flaring of natural gas with high levels of hydrogen sulfide has been reported in cattle in Canada.⁶⁸ In Colorado benzene and other pollutants from natural gas drilling is exposed as the cause of many human health and environmental problems in a documentary "Split Estate".⁶⁹ Incidents in Texas are increasingly reported, especially in the Fort Worth region.⁷⁰

There is a need for thorough study of the environmental and health impacts of well drilling and development; there is very little on record. For instance, in Colorado a Health Impact Assessment has been called for as part of an Environmental Impact Statement due to documented pollution problems from natural gas development in Garfield County that require scientific analysis.⁷¹ To date, research has been impeded because fracking fluid formulas are protected from disclosure by federal exemptions granted to the oil and gas industry despite health and environmental impacts.

⁶⁰ <http://pittsburgh.indymedia.org/news/2009/10/31424.php>

⁶¹ Ibid.

⁶² Lauren Trager, "Department of Environmental Quality Tells Two Wastewater Companies to Shut Down", KARK News, 12.15.08

⁶³ Jim Moscou, "A Toxic Spew?" Newsweek, 8.20.08.

⁶⁴ Joan Demirjian, "Home near gas well on brink of explosion" Chagrin Valley Times, 10.22.08.
<http://www.chagrinvalleytimes.com/NC/0/274.html>

⁶⁵ Joy Ufford, "Untested Water Wells Trigger 'Explosive' Alarm" Sublette Examiner, 9.17.08.

⁶⁶ Gazette News Service, "Impurities Seen in Well Near Drilling" Billings Gazette, 9.10.08.

⁶⁷ <http://content.usatoday.net/dist/custom/gci/InsidePage.aspx?cld=thetowntalk&sParam=30643841.story>

⁶⁸ Waldner, C. L. et al., "Associations between oil- and gas-well sites, processing facilities, flaring, and beef cattle reproduction and calf mortality in western Canada," Preventive Veterinary Medicine 50 (2001) 1-17.

⁶⁹ <http://www.documentary.org/content/meet-filmmakers-debra-anderson-split-estate>

⁷⁰ Fwweekly.com

⁷¹ Witter, et al, "Potential Exposure-Related Human Health Effects of Oil and Gas Development: A White Paper", Colorado State University, University of Colorado, page1 and 21.



Image retrieved from: Independent Oil and Gas Association of Pennsylvania's, Drilling & Developing the Marcellus Shale⁷²

Several issues compound the water quality impacts of natural gas development:

- Because of the industry's Energy Policy Act exemptions and protections from Right to Know laws based on "trade secrets", they have not had to reveal specific fracking chemicals that are being used. EPA's list of common fracking fluids and additives include liquid carbon dioxide, liquid nitrogen, crude oil, kerosene, and various lubricants, friction reducers, gels, surfactants, defoamers, biocides, polymers and proppants.⁷³
- NYSDEC lists up to 260 "unique chemicals" and another 40 compounds (with ingredients that are not disclosed by the industry) that are being used for hydrofracking in Marcellus shale in PA and WVA and that are expected to be used in New York.⁷⁴
- A report submitted to Congress by an EPA whistleblower employee in 2004 revealed that acids, BTEX, formaldehyde, polyacrylamides, chromates, and other toxic substances may be introduced underground and to deep aquifers during fracking.⁷⁵ The concerns reported were ignored by EPA in their decision that fracking fluids do not pose significant environmental threats to drinking water.
- Water contamination incidents across the nation are increasingly reported; most recently hydrogeologists discovered benzene 1,500 times the level safe for people in a

⁷² <http://www.srb.net/whatsnew/docs/Marcellusshale61208ppt.PDF>

⁷³ U.S. Environmental Protection Agency, Office of Solid Waste, "Associated Waste Report: Completion and Workover Wastes", January 2000.

⁷⁴ New York State Department of Environmental Conservation, Division of Mineral Resources, "Draft Supplemental Generic Environmental Impact Statement on the Oil, Gas, and Solution Mining Regulatory Program", September 2009, 5-35 and 5-45.

⁷⁵ Weston Wilson, "EPA Allows Hazardous Fluids to be Injected into Groundwater", October 8, 2004.

water well near hydrofracked natural gas well fields in Wyoming. Over 100 other reports have been documented in Colorado, Alabama, Ohio, and Pennsylvania.⁷⁶

- During well development, hydrofrack water and produced water or “flowback” is stored on site in an open pit, usually mixed with fresh water that is imported and stored for use in fracking. Testing of pit water contents in New Mexico had a 30% detection rate for the chemicals tested including polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), semi volatile organics (SVOs), including arsenic, lead, mercury, 2,4-Dinitrotoluene, 2-Methylnaphthalene, phenol, benzene, m,p-Xylene, sulfate, barium, cadmium, chromium. Most of the 154 constituents found in the pits can be classified as hazardous.⁷⁷ Impacts to water quality from the pits occur when liners fail or the pit is breached and pollutants escape into the environment, contaminating soil and surface water.
- Formaldehyde, a human carcinogen, acids, pesticides that are toxic to fish and aquatic life, and at least 85 other hazardous materials are added to the frack water being used in Pennsylvania, according to public records.⁷⁸
- The fracking chemicals and drilling muds have health impacts for humans and animals that range from mild to severe skin and eye irritation to brain and nervous system effects. Some cause acute problems, others lead to slowly developed disorders.⁷⁹ Some chemicals are known carcinogens. The environmental and health impacts are not tracked or closely studied since well and stream monitoring, pit testing and disclosure of constituents used in well development and that are contained in the wastewater have not been routinely required for natural gas well drilling and none of this analysis is required in Pennsylvania or New York.
- “Produced water” or “flowback” is fluid that is brought to the surface when gas is released from a well bore during natural gas development procedures. The constituents of produced water vary depending on the geologic conditions, the composition of the gas, and the chemical properties of any injected fluids, such as fracking fluids; produced water requires treatment before discharge under Clean Water Act requirements.⁸⁰ During natural gas production, produced water is separated from the gas. The Department of Energy has found that this wastewater product has “higher contents of low molecular-weight aromatic hydrocarbons such as benzene, toluene, ethylbenzene and xylene (BTEX) than those from oil operations; hence they are relatively more toxic than produced waters from oil production.”⁸¹ The fluid also may contain salts (chlorides can be so high that the liquid, called “brine”, is 5-10 times saltier than sea water), high iron and barium levels, and may be acidic (typical range is 3.5-5.5).⁸² It is estimated

⁷⁶ Abrahm Lustgarten and ProPublica, “Drill for Natural Gas, Pollute Water”, Scientific American, 11.17.08.

⁷⁷ www.emnrd.state.nm.us/OCd

⁷⁸ Don Hopey, “State concerned about waste water from new gas wells”, Pittsburgh Post Gazette, 12.21.08 and <http://www.riverreporter.com/issues/08-12-18/frac.pdf>

⁷⁹ Theo Coburn, PhD, “An Analysis of Possible Increases in Exposure to Toxic Chemicals in Delta County, Colorado Water Resources as the Result of Gunnison Energy’s Proposed Coal Bed Methane Extraction Activity”, October 22, 2002.

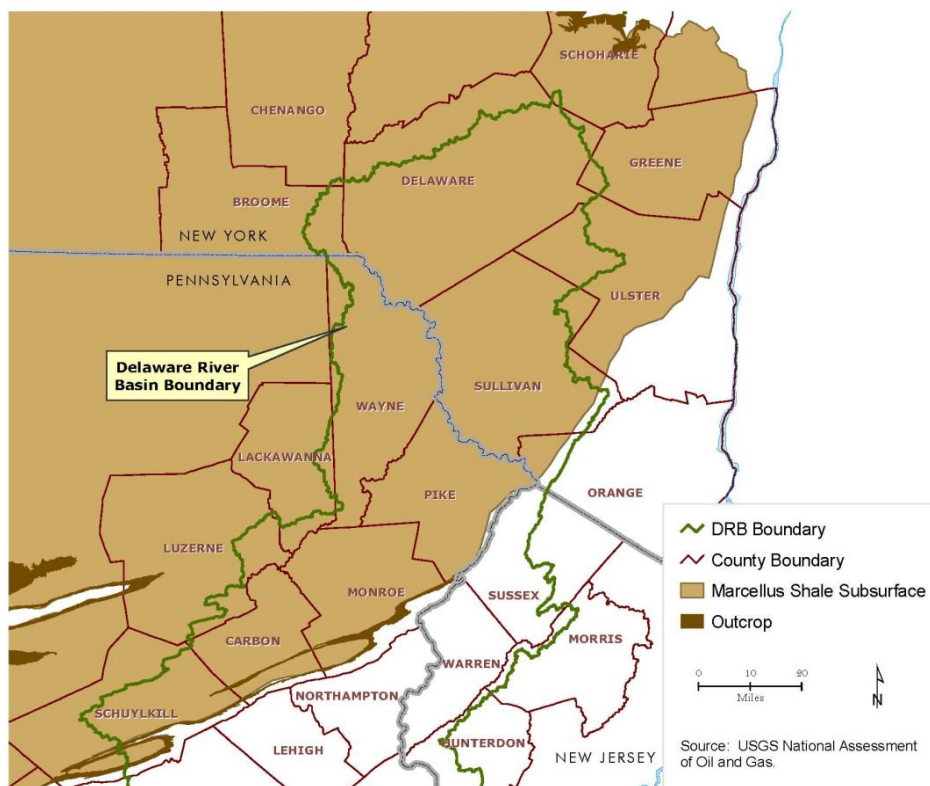
⁸⁰ U.S. Dept. of Energy, Argonne National Laboratory, “A White Paper Describing Produced Water from Production of Crude Oil, Natural Gas, and Coal Bed Methane”, January 2004, page 25.

⁸¹ U.S. Dept. of Energy, Argonne National Laboratory, “A White Paper Describing Produced Water from Production of Crude Oil, Natural Gas, and Coal Bed Methane”, January 2004, page 4.

⁸² U.S. Dept. of Energy, Argonne National Laboratory, “A White Paper Describing Produced Water from Production of Crude Oil, Natural Gas, and Coal Bed Methane”, January 2004, page 5.

that the produced waters discharged by natural gas operations are about 10 times more toxic than those from offshore oil wells.⁸³ USGS also reports that natural gas condensates may also contain the chemicals known as “BTEX”.⁸⁴

- NYSDEC discovered significant amounts of benzene in samples of flowback from PA and WVA, reported in its Draft SGEIS, in addition to many other dangerous contaminants.⁸⁵ Benzene is regulated by EPA because it is carcinogenic and has other well-documented adverse human health impacts and exposure to benzene is considered a global human health hazard; the maximum contaminant level set by EPA for drinking water for benzene is 0.005 mg/L, which makes even tiny amounts harmful.⁸⁶



Marcellus Shale in the Delaware River Watershed

<http://www.state.nj.us/drbc/naturalgas.htm>

- ✓ Stormwater runoff: Erosion and sediment control permits are needed according to federal regulations for land disturbances of 5 acres or more. Drilling pads can be between 3 and 5 acres but it is expected that most disturbances will attempt not to break the 5 acre threshold to avoid the possibility of strict stormwater regulation. If there is a point discharge

⁸³ U.S. Dept. of Energy, Argonne National Laboratory, “A White Paper Describing Produced Water from Production of Crude Oil, Natural Gas, and Coal Bed Methane”, January 2004, page 4.

⁸⁴ Williams, Ladd and Farmer, “Fate and transport of Petroleum Hydrocarbons in Soil and Ground Water at Big South Fork National River and Recreation Area, Tennessee and Kentucky, 2002-2003”, U.S. Geologic Survey, 2006 p. 10, <http://pubs.usgs.gov/sir/2005/5104/PDF/SIR20055104.pdf>

⁸⁵ NYSDEC Draft Supplemental Generic Environmental Impact Statement on the Oil, Gas, and Solution Mining Regulatory Program (DSGEIS), 2009, Tables 5-8 and 5-9, p. 5-109.

⁸⁶ Department of Health and Human Services, Agency for Toxic Substances and Disease registry, “ToxFAQs for Benzene, August 2007, updated 10/05/07, www.atsdr.cdc.gov/tfacts3.html

on site, a General NPDES permit is usually required with one acre or more of land disturbance. However, because gas drilling is exempted from the NPDES provisions of the federal Clean Water Act, most states do not require NPDES for these wells.

- Under NY and PA rules, both states require stormwater management and erosion and sediment control plans in order to protect stream quality but the level of management differs in each state.

Pennsylvania Department of Environmental Protection (PADEP) adopted a stormwater rule (General Permit)⁸⁷ for oil and gas well construction in May 2008 that applies when 5 acres or more are disturbed. Recent changes by PADEP have weakened this General Permit and allowed an “expedited” process that eliminates technical review of stormwater plans by any agency prior to construction, relying simply on the applicant’s engineer for certification.

The stormwater “permit by rule” adopted by PADEP was protested by DRN and members of the PA Clean Water Campaign when it was adopted in 2009 and when the local Conservation Districts were stripped of their review of soil and erosion plans for natural gas and oil drilling sites.⁸⁸ According to PADEP, erosion and sediment control plans are required under PA Chapter 102 for a drilling permit but now the DEP has assigned this to the Oil and Gas division of PADEP, even though their budgeting has been cut by the legislature by almost 30%. Chesapeake Bay Foundation filed appeals of 2 natural gas projects that were permitted under the new “permit by rule” standards; PADEP subsequently rescinded those permits as being issued in error. PA Fish and Boat Commission announced in late 2009 that they were starting a stream monitoring program to attempt to track stream quality in gas drilling areas.

NYSDEC says that they expect to review erosion and sediment control plans when the environmental assessment form (environmental impact statement or EIS) is submitted by the applicant under SEQRA (New York State Environmental Quality Review Act). NYSDEC admits in their Draft SGEIS that the land conversion required by gas well development from natural vegetation to impervious surfaces may cause pollution and increased flooding but they express confidence in their stormwater regulations by overstating the controls that these regulations have over stormwater runoff.⁸⁹ Due to understaffing and budget cuts, the employee’s union that represents NYSDEC workers filed a comment with NYSDEC during the public review of the Draft SGEIS that they do not feel they have the work force needed to properly oversee the development of natural gas wells in the State.

- DRBC is planning to require nonpoint source pollution control plans for the Upper Delaware River that is governed by Special Protection Waters. This designation does not apply to the Schuylkill River, the Delaware River’s main tributary, which is also underlain by Marcellus Shale. SPW also does not apply above New York City reservoir dams; NYCDEP, however, has broad watershed rules governing nonpoint source pollution and stormwater runoff management but how these would be applied is unclear.

⁸⁷ PADEP ESCGP-1

⁸⁸ Letter to PADEP Secretary John Hanger from PA Campaign for Clean Water dated March 31, 2009.

⁸⁹ New York State Department of Environmental Conservation, Division of Mineral Resources, “Draft Supplemental Generic Environmental Impact Statement on the Oil, Gas, and Solution Mining Regulatory Program” (NY SGEIS), September 2009, Section 6.1.2.

Since stormwater management is not consistently or comprehensively managed throughout the Watershed, wells have not historically had and may continue to lack a high and consistent level of stormwater management. Further, municipalities are responsible under the NPDES 2 Stormwater Rule to control runoff and nonpoint source pollution under municipal General Permits⁹⁰ yet those efforts are being challenged by gas companies in court. Impacts of poor stormwater controls include nonpoint source pollution from drilling operations, land disturbance, machinery and pits; increased stormwater volume and erosion due to removal of natural vegetation and compaction and leveling of land surface; increased flood flows to and disruption of natural flow regime of streams; reduction of stream base flow due to less groundwater recharge on land; destabilization of stream banks and channels; sedimentation of streams and stream bottoms; and degraded stream quality and ecology. In turn, fish and aquatic life are harmed, as is drinking water quality.

Further, if stormwater is not prevented from inundating the open pit(s) on a well site, heavy rain can cause an overflow, spilling polluted pit water onto the land surface and into the nearest stream. Some of the constituents in the water stored in pits on site are toxic, some are carcinogenic and some can cause fish kills, harm wildlife and pollute water supplies (such as pesticides and biocides used to retard algae growth in the ponds).⁹¹

- ✓ Floodplain Impacts: In both PA and NY, natural gas wells can be placed in floodplains. Flooding is a major issue in the Delaware River Watershed. Catastrophic flooding in 2004, 2005 and 2006 in the Watershed has spurred new flood studies by the DRBC, the Army Corps of Engineers, and other agencies, all of which are ongoing. The Federal Emergency Management Agency and the Hazard Mitigation Program have spent millions upon millions of dollars addressing flood damages in recent years here.

New York confirms that flooding and stream pollution may be worsened by natural gas development due to:

1. Hydraulic fracturing fluid chemicals that may enter a waterway from fracturing procedures, open pits, spills or accidents;⁹²
2. Out of date flood maps;⁹³
3. Land use changes (land clearing, larger well pads, etc.) that increase stormwater runoff volume from natural gas well sites;⁹⁴
4. Other pollutants and debris at well sites.⁹⁵

Yet, they do not protect the floodplain from drilling and infrastructure; even New York State's designated Special Flood Hazard Area is not kept off limits to new natural gas wells.

It is irresponsible and contrary to sound public policy and safety goals to allow gas wells and their related infrastructure, including open pits containing polluted water and equipment, in the floodplain. There is a requirement in each state for a minimal setback from a waterway but in both states the setback does not extend far enough, allowing the floodplain to be drilled in and used for gas projects.

⁹⁰ <http://www.epa.gov/npdes/pubs/fact1-0.pdf>

⁹¹ Don Hopey, "State concerned about waste water from new gas wells", Pittsburgh Post Gazette, 12.21.08

⁹² NY GEIS, 8-44

⁹³ NY DSGEIS, 2-34-35

⁹⁴ NY DSGEIS, 6-15-16

⁹⁵ NY GEIS, 8-44

- ✓ Habitat loss and Agricultural loss: Individual wells require pads of 3 to 5 acres each for the rigs, equipment, pits, storage tanks, and other machinery. The sites also require roads for access and transport and transmission lines for delivering the gas off site. Usually wells are developed as fields of many wells, sometimes laid in a grid pattern on the land surface, covering large areas. There are no current regulations to limit the size of the fields; estimates range from a square mile to many square miles. The typical life of a well is about 20 years. Habitat impacts include removal of natural vegetation and loss of habitat; fragmentation of forest and vegetative communities; open water degradation; destruction of wildlife and of rare, threatened and endangered species and communities of plants and animals and their habitats.

Agricultural lands that are leased for natural gas development lose some present use and, as recounted under Water Quality Impacts, some farms have suffered total loss of ponds and other surface waters, effecting fish and farm animal grazing areas. Contamination of some individual wells have also led to farm animal illnesses and other health impacts, as reported by farm owners in Dimock Township, PA. A report from Alberta, Canada, indicates that farmland that has natural gas wells developed on it loses its productivity afterwards, as compared to land where no gas or oil exploration has taken place.⁹⁶

Some well pads include gas processing and gathering stations, compressors, and frack fluid processors. These facilities have their own environmental impacts related to nonpoint and point source pollution, erosion and runoff, air quality and related environmental disturbances.

- ✓ Air pollution: Air quality impacts are emerging as a major impact in areas of large scale well development. In Wyoming, for instance, the State Dept. of Environmental Quality commented to the Bureau of Land Management during the NEPA review for the Pinedale Anticline Project Area that significant mitigation measures, controls and monitoring were necessary to reduce NOx emissions, visibility impacts, and ozone elevation, including ambient air monitoring stations and regular inspections and reporting.⁹⁷ These problems are surfacing in urban drilling areas as well, such as Ft. Worth, Texas, where natural gas and oil emissions have been found to be a major contributor to the severe smog conditions there.⁹⁸ But in any region – not only urban -- where gas well development is underway, air quality impacts occur due to volatilization into the air of chemicals in fracking fluid and produced water pits and emissions from well development processes, storage tanks that contain condensates from the “wet methane” in gas, machinery, generators, compressors, drilling operations, causing pollution and health impacts.

A Houston study calculated the Volatile Organic Compounds (VOCs) in vapors released from permanent natural gas condensate storage tanks located at finished well sites. The storage tanks hold liquids that are bled off natural gas which contains moisture as it comes out of the ground; the moisture is made up of water and gas products, termed “condensates”. These condensates easily evaporate and escape through pressure valves on the tanks. The study shows that these condensate tanks are emitting significant VOCs that are poorly tracked and regulated. The North Texas region is classified by EPA as a severe nonattainment area for ozone and emissions from the natural gas industry is a measurable contributor to the polluted conditions.⁹⁹ Compressors used to pump gas through pipelines were also tracked and found to be a significant contributor to pollution that contributes to the classification of regions in Texas and Wyoming as severe non-attainment areas for ozone.¹⁰⁰ New ozone reduction plans

⁹⁶ Anthony Kovats, “Farmland scarred by wells”, Sun Media, Fort Saskatchewan Record, 3.17.09.

⁹⁷ Wyoming Dept. of Environmental Quality, letter to BLM from John Corra, Director, d. 4.2.07.

⁹⁸ http://www.edf.org/documents/9235_Barnett_Shale_Report.pdf

⁹⁹ Mike Lee, “Gas Well Emissions Drawing Scrutiny”, Star-Telegram, 10.14.08.

¹⁰⁰ <http://www.harc.edu/Search/Results.aspx?q=Storage+Tank+VOCs>

there are attempting to address these pollution sources but the air quality problems result from routine natural gas extraction and production practices, making solutions difficult and pollution incidious.

Nationally EPA reports that many states are increasing the number of counties where ozone air quality standards are being violated, many of them in gas drilling areas.¹⁰¹ The practices that are causing air pollution problems in gas drilling areas that have been under development for a period of time are in use throughout the natural gas industry and can be expected to be the *modus operandi* here.

A recent health study in Dish Texas calculates that sixty-one percent of the health problems reported by residents in a survey are associated with the toxic air emissions detected there.¹⁰² NYSDEC's DSGEIS projects that gas development may violate existing air standards.¹⁰³

- ✓ Noise: The drilling process is very loud and equipment used for well development is noisy. Compressors are especially noisy, estimated to produce about 95 decibels of noise in a consistent, low frequency pattern.¹⁰⁴ For comparison, a jackhammer is 100 decibels, truck traffic or a train whistle at 500 feet is 90 decibels.¹⁰⁵ Prolonged exposure to sounds over 90 to 95 decibels can cause hearing loss.¹⁰⁶ While the use of compressors may be limited to the period of well development – which takes several weeks to several months – the permanent infrastructure that is required for gas pipelines require permanent compressor stations. Noise has documented human health impacts and has negative impacts on wildlife.
- ✓ Light and Scenic Impacts: Lights are required for safety on the rig and at the operation during construction and, to some extent, at the finished well, disturbing natural light and causing glare into the night sky (“sky glow”). Light pollution can confuse wildlife, including migrating birds, and has human health impacts by disturbing sleep.¹⁰⁷ There are scenic vista impacts from elements such as machinery, cleared and disturbed areas, and installation of overhead electric wires which is especially important where scenic and cultural resources are located, such as in the Upper Delaware Wild and Scenic River, parks, and historic locations. The completed well site requires some permanent vegetation removal and control, power source, impervious surface, equipment, storage containers, and access.
- ✓ Health and Safety: Apart from environmental pollution and human health impacts related to pollution, safety issues include risk of explosion, blowouts, fire, and accidents, hazardous material releases, explosive methane leaks, and other emergencies. For example, in Greene County, PA a worker was killed and another badly injured when a coalbed methane gas well exploded.¹⁰⁸ In Ohio, one home exploded, another home narrowly averted an explosion, and 46 wells in the area are contaminated by methane gas that leaked from a Ohio Valley Gas Company well into the aquifer. The problem is still unresolved and homes are on bottled water and some are vacated

¹⁰¹ <http://www.epa.gov/groundlevelozone/pdfs/CountyPrimaryOzoneLevels0608.pdf>

¹⁰² http://earthworksaction.org/pubs/DishTXHealthSurvey_FINAL_hi.pdf

¹⁰³ New York State Department of Environmental Conservation, Division of Mineral Resources, “Draft Supplemental Generic Environmental Impact Statement on the Oil, Gas, and Solution Mining Regulatory Program” (NY SGEIS), September 2009.

¹⁰⁴ Tom Wilbur, “Noise Levels Can Pose Problems”, Press and Sun Bulletin, 8.24.08.

¹⁰⁵ <http://www.gcaudio.com/resources/howtos/loudness.html>

¹⁰⁶ <http://www.gcaudio.com/resources/howtos/loudness.html>

¹⁰⁷ NJ Light Pollution Study Commission, reported in “Outdoor Light Pollution Disrupts Sleep and Wastes Energy”, Todd B. Bates, Asbury Park Press, 10.06.08

¹⁰⁸ Don Hopey, “Gas Well Incident Claims 1 in Greene County”, Pittsburgh Post-Gazette, 12.3.07.

while water lines are built to the neighborhood.¹⁰⁹ Trained crews are needed to help control and clean up pollution accidents as well, such as the cleanup of an 800 gallon diesel oil spill and another 100 gallon diesel oil spill in January 2009 in Dimock Township, Susquehanna County, PA, at Cabot Oil's natural gas well sites.¹¹⁰ Another 100 gallon diesel spill there in February required emergency clean up when a fuel tank contracted by Cabot crashed after sliding on ice.¹¹¹

Also in Dimock Township, a homeowner's water well exploded without warning near an area where Cabot is developing new gas well fields in Susquehanna County, PA¹¹² and in Lycoming County, methane escaped from an East Resources well into a stream and possibly into water wells¹¹³ (see page 11 of fact sheet). In Leidy Township, Clinton County, PA, a gas well exploded into flames Sept. 14, 2008; special firefighters from Texas were brought in to contain the fire, which was expected to burn for weeks.¹¹⁴ In Appomattox County, also on September 14, a Williams Gas Co. pipeline that runs from the Gulf Coast to New York exploded without warning, destroying 2 homes and damaging 6 others, hurting 5 people, causing the evacuation of a neighborhood of hundreds, and leaving a 50 foot crater behind.¹¹⁵ Emergencies like these require emergency personnel and the expense attached to providing adequate response, rescue and interim care. Additional human impacts include trauma¹¹⁶, worker health and safety risks, reduction of quality of life, loss of recreational use and scenic vistas and the economic impact of harm to established ecotourism and nature-based economies, such as fishing and hunting.



Natural gas well fire, Leidy Twp. PA

<http://www.lockhaven.com/page/content.detail/id/505600.html?showlayout=0>

¹⁰⁹ Joan Demirjian, "Home near gas well on brink of explosion" Chagrin Valley Times, 10.22.08.
<http://www.chagrinvalleytimes.com/NC/0/274.html>

¹¹⁰ Josh Mrozinski, "Gas well lessors weigh environmental cost", Scranton Times-Tribune, 2.16.09.

¹¹¹ <http://www.riverreporter.com/issues/09-03-12/news-gasglance.html>

¹¹² Laura Legere, "DEP Probes Blast in Gas-drilling Region", Scranton Times-Tribune, 1.3.09.

¹¹³ The Daily Review, Towanda, Pa, "Natural Gas Well Down After Leak", 7.30.09, <http://www.thedailyreview.com>.

¹¹⁴ Jim Runkle, "Gas Well Fire Could Burn for Weeks", Loch Haven Express, 9.16.08

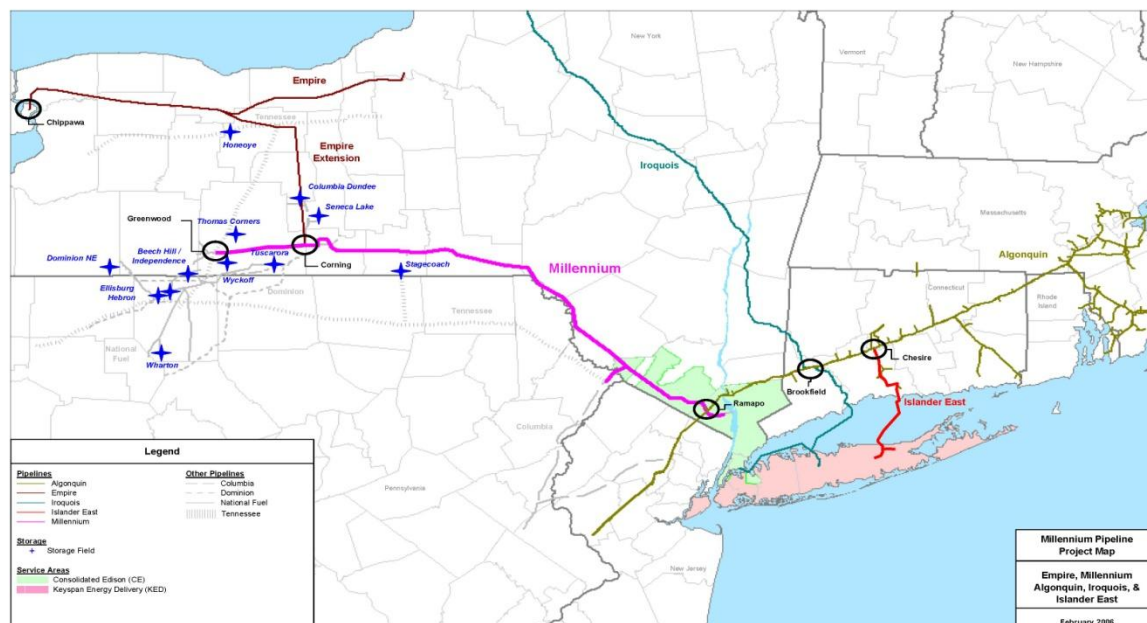
¹¹⁵ Candice Nelson, Carrie Sidener, "Gas Company Talks to Families about Explosion", WSLs and Lynchburg News and Advance Reporter, 9.16.08, and Candice Nelson, "Community Moves Forward after Appomattox Explosion", 9.16.08.

¹¹⁶ For example, one mother evacuated due to the pipeline rupture and fire said her children are afraid to return home and her 6 year old daughter can't sleep, "Mommy, I don't want to be here" said her daughter; Carrie Sidener, "Nearby Pipelines Still Working after Appomattox Explosion", The News and Advance, 9.16.08.

- ✓ Permanent Natural Gas Infrastructure: In addition to the well itself, pipelines, processing stations, compressor stations which are required along a pipeline (typically the size of a city block¹¹⁷), ventilation, power sources, and other permanent infrastructure and the land management they require (such as vegetation control) impose a set of separate and additional environmental impacts. In Pike and Wayne Counties, PA, Tennessee Gas Pipeline Co. is planning to expand an existing pipeline and add compressor stations to carry out newly produced Marcellus Shale gas¹¹⁸; other pipelines are in the works across the region.

Eminent domain is a tool being employed by the industry for the siting of pipelines and compressor stations and other natural gas utility infrastructure. In both Pennsylvania and Texas eminent domain is being used by gas companies to condemn properties for the right of way passage of new pipelines and/or gas storage facilities.¹¹⁹

Specific to the region, the Millennium Pipeline, 182 miles of 30 inch diameter steel pipeline, was completed in December 2008 across New York from the lower Hudson Valley and Southern Tier, traversing the Upper Delaware River Watershed near Hancock, NY.¹²⁰ This pipeline will collect gas from wells and will also deliver gas as an energy source, which is presently being marketed to towns and industries in the New York region. Pennsylvania can hook into the line through a trunk line. The Millennium Pipeline is one of several new pipelines being constructed and is considered to be the centerpiece of a \$1 Billion investment by the industry in permanent natural gas infrastructure in the region.¹²¹



Millennium Pipeline

<http://www.millenniumpipeline.com/maps.htm>

¹¹⁷ Tom Wilbur, "Noise Levels Can Pose Problems", Press and Sun Bulletin, 8.24.08.

¹¹⁸ Sandy Long, "Powerlines and Pipelines: Here We Grow Again", The River Reporter, 8.28-9.23.08

¹¹⁹ Bedford County, PA: Tribune-Democrat, "Gas Storage Facility Allowed to Continue", 9.23.08

http://www.tribune-democrat.com/archivesearch/local_story_267214931.html; Ft. Worth, Texas: Press and Sun-Bulletin, "Gas Lines Pit People vs. Profit in Texas", 8.24.08.

¹²⁰ <http://www.millenniumpipeline.com/overview.htm>

¹²¹ http://www.millenniumpipeline.com/news_12_22_08.htm

- ✓ Land Conservation and Preservation: Natural gas, like other minerals, is a controversial matter when it comes to mineral rights under preserved land. First, land conservation efforts are being undermined by gas leasing activities; some conservation organizations are being rebuffed by landowners who are choosing to lease natural gas rights rather than encumber their property with conservation easements. Some conservancies are reporting a loss of new easement and fee simple acquisitions in the Upper Delaware River Watershed since the beginning of the lease-signing craze.

Second, public lands and privately conserved lands often do not hold mineral rights. Both New York and Pennsylvania are leasing public lands for natural gas development, threatening the public purposes that these lands were to serve, having been purchased with taxpayer money (or user fees). At risk are the use of the land for public recreation, agriculture, natural resource preservation, hunting, fishing, historic and community resource conservation and scenic value protection. Further, private non-profit land conservation organizations are struggling themselves with the question of whether they should lease out natural gas rights on their land to provide funding for more land conservation. The large amounts of money involved and the long term prospect of income has created a tension between natural lands protection and collecting substantial revenue from existing land holdings.

- ✓ Global Climate Change: When weighing the environmental costs and benefits of new energy sources, such as natural gas, it is essential that the analysis assess the impacts of the whole process of energy development. So, when broad statements are made that natural gas is clean and will reduce greenhouse gas emissions, the critical question must be asked and answered: how was this conclusion arrived at? Was the contribution of emissions from “cradle to grave” considered?

To answer this question, one must examine the environmental impacts, particularly air quality impacts, of natural gas from exploration to development to extraction to production to marketing to delivery to utilization. The evaluation of the cleanliness of natural gas is not simply, “what does a flame release when burned?” but “what is the contribution of natural gas throughout its life cycle to greenhouse gases and global climate change?”

The EPA lists methane emissions from natural gas extraction, production and delivery as the primary source of methane emissions.¹²² Methane is a greenhouse gas that is a major contributor to global warming.

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¹²² http://epa.gov/climatechange/emissions/downloads/08_Energy.pdf