

CHAUTAUQUE COUNTY DEPARTMENT OF HEALTH
 DIVISION OF ENVIRONMENTAL HEALTH SERVICES
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MARK W. THOMAS
 County Executive

ROBERT BERKE, M.D.
 Commissioner of Health

STEVEN M. JOHNSON, P.
 Director of Environmental
 Health Services

July 30, 2004

Re: Impacts of Gas Well Drilling to Drinking Water Wells

Dear [REDACTED]

In response to your request regarding potential impacts of oil and gas well drilling to nearby water wells, I offer the following comments.

As you know, the New York State Department of Environmental Conservation (NYS DEC) regulates oil and gas well drilling in the state. The regulations that govern the industry were prepared in 1972 and no major changes have been made since then. There have been some efforts to substantially revise these regulations, most recently in 1998, but they were never finalized. New York regulations do not contain any requirements for offset distances between an oil and gas well and private water wells. They do require that oil and gas wells be located at least 1000 feet away from a public water supply well. This would include the Jamestown Audubon's well. In addition the current regulations do not include any provisions that cover stimulating or hydraulically fracturing the gas reservoirs (i.e. hydro-fracturing).

A representative I spoke with at the NYS DEC Division of Minerals insists that the potential for drinking water well contamination by oil and gas well drilling is almost non-existent. However, this Department has investigated numerous complaints of potential contamination problems resulting from oil and gas well drilling activities. Most of these investigations took place in the 1970s and '80s during the oil and gas drilling boom. They can be categorized into two groups: surface water contamination caused by above ground drilling-related activities, and suspected ground water contamination of private drinking water wells associated with drilling and hydro-fracturing. One of the most widespread problems was in the Levant area in the Town of Poland in the early 1980s where methane gas was intruding into water wells. In response to this, the Health Department began to keep detailed records of complaints received of water well problems suspected of being caused by oil and gas well drilling. The Department responded to 120 of these complaints between 1986 and 1988. As drilling activity decreased, so did the complaints, we responded to only nine from 1989 to 1990 and, over the past 12 years since I've been with the Department, we have received about a dozen such complaints. Those complaints that were reported are probably just a fraction of actual problems that occurred.

The Pennsylvania Department of Environmental Protection (PA DEP) has much more stringent regulations with respect to oil and gas well drilling. They require that oil and gas wells be drilled at least 500 feet away from private drinking water wells and at least 1000 feet away from public water supply wells. If oil and gas wells are to be drilled within 1000 feet of a private well, then the water well must be

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tested by the drilling company before the gas well is drilled and again between three and four weeks after the well is completed for a number of baseline chemicals. If the oil and gas well is located within a known ground water recharge area of a public water supply well, that water well must also be tested as noted above.

A colleague with our Department contacted a senior engineer in PA DEP who indicated that they have confirmed numerous instances where water wells had been negatively impacted by oil and gas well drilling. These impacts were seen in parts of the state that have a similar geologic setting as our county, namely in the Allegheny Plateau. A detailed review of our files found correspondence from the United States Geological Survey (USGS) regarding the likelihood of oil and gas well drilling to contaminate nearby water wells with methane gas. This was in response to the previously mentioned problem in Levant. The USGS noted that methane gas could "migrate into water wells at considerable distances from the gas wells where the gas encountered the [rock] fracture system. The problem is not unique to Chautauqua County. Similar problems occur in northwest Pennsylvania and northern Ohio as far west as Cleveland and Sandusky." The close of the letter reads: "In conclusion, the most likely source of the [methane] gas is the open boreholes of the producing gas wells." I've attached a copy of this letter as it also makes recommendations about how to reduce the contamination potential.

If the Jamestown Audubon Society pursues a lease with an oil and gas drilling company, I recommend that you take the following precautions to minimize the possibility of ground water contamination. It is also important to consider that most oil and gas wells drilled in the county, there are about 5000 of them, have had no known impact to our water resources.

- Require a 1000 ft setback from the Jamestown Audubon water well and reasonable setbacks from private water wells, either 500 or 1000 ft at your discretion (if directional drilling is used then the setback should consider the location of both the wellhead and the well bottom).
- Conduct baseline water quality sampling in the Jamestown Audubon well and surrounding private water wells for: iron, manganese, chlorides, sodium, barium, total dissolved solids, pH, turbidity, bacteria and methane/ethane. Water samples should be collected and analyzed by a NYSDOH certified laboratory. This could be made a requirement of the drilling company in the lease.
- Hire a consultant who is knowledgeable about oil and gas well drilling who could provide comments on the land lease, site plans and drilling plans, and also provides drilling inspection.
- Place adequate restrictions and safeguards in the lease to protect ground- and surface-water quality including the preparation and implementation of a storm water management plan that includes on-site erosion control measures.

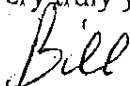
Please note that an area surrounding the Route 62 - Riverside Road intersection has been mapped by the USGS (Müller, 1988) as overlying a "principal aquifer." New York State DEC oil and gas well drilling regulations state, "The casing and cementing practices above are designed for typical surface casing cementing. The Department will require additional measures for wells drilled in environmentally or technically sensitive areas (i.e. primary or principal aquifers). NYS DEC oil and gas well regulations can be found at <http://www.dec.state.ny.us/website/dmn/welltrg.htm>.

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Should you or the Board of Directors of the Jamestown Audubon have any questions regarding this correspondence, or you would like to review any of the information cited herein, feel free to contact me at 753-4481.

Very truly yours,



William T. Boria
Water Resource Specialist

Encl.



United States Department of the Interior

GEOLOGICAL SURVEY

WATER RESOURCES DIVISION
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October 29, 1984

Hon. Stan Lundine
U.S. House of Representatives
Washington, D.C. 20515

Dear Congressman Lundine:

We have reviewed the several reports pertaining to the "methane-gas problem" in Chautauqua County in response to your request of July 30, 1984. At your suggestion, we contacted your District Representative, Pat Kinney, who graciously supplied us with consultant reports, oral statements, and some leads to more information. Most recently, we received the New York State Department of Environmental Conservation's (NYSDEC) initial report on the incident. We feel that field investigations by the State and consultants are sufficient to allow interpretation and evaluation of their conclusions.

Despite some discrepancies in the reports and a lack of certain data we offer the following comments, which include those of a member of our Geologic Division, Oil and Gas Resources. Our comments are:

- 1) Natural gas is present in abundance in the black upper Devonian gas shales. It has been provided commercially in Chautauqua County since 1821. This gas moves from the organic material in the black shales into fractures where it may accumulate under considerable pressure. It may also migrate vertically for hundreds or thousands of feet laterally or vertically if a system of interconnected fractured exists to permit this migration.

Waterwells and springs commonly release some natural gas in the northern part of Chautauqua County where the Devonian gas shales are near the surface. Natural gas bubbles up in Lake Erie and gas seeps are common in many localities in the streams draining into Lake Erie.

- 2) The most likely source of the gas is shale bedrock, from which gas is migrating upward into shallow permeable zones through the uncased sections of producing gas wells. Commonly, some 2,000 feet of Devonian shale bedrock is left uncased and uncemented between the cement cap above the gas-producing Medina formation and the cemented-in surface casing.

The Devonian shale gas comes from deep zones which gives the gas a higher ultimate formation pressure. If several thousand feet of unused well zone is exposed below the surface casing, shale gas under considerable pressure (depth in feet x 0.4 pounds per square inch/ft) could easily pressure the near surface joint system and migrate into water wells at considerable distances from the gas wells where the gas entered the fracture system. The problem is not unique to Chautauqua County. Similar problems occur in northwest Pennsylvania and northern Ohio as far west as Cleveland and Sandusky.

An intermediate casing string cemented below the oldest Devonian gas shale zone might keep the shale gas from migrating upwards into shallower fracture zones. But this is an expensive solution to the problem. It would not be effective unless cemented in place the full length to prevent the vertical migration of gas.

- 3) The buildup of the escaping shale gas in the annulus of surface casing and production pipe of a gas well is evidence of this migration, but the lack of buildup in some gas wells is not proof that the gas is not escaping through a permeable zone below the surface casing. Leak tests conducted on surface casings proved only that the casings were okay. The tests were not run on the borehole and would probably be ineffective there.
- 4) It is conceivable, but unlikely, that the earthquake of October 7, 1983, near Blue Mountain Lake in the Adirondacks, increased the natural release of shale gas in the area of concern by activating the fractures. The zone in which this earthquake was felt extended to west of Erie, Pa. Such an adjustment of fractures could cause an increase in gas release, but the release would likely dissipate with time--just as it commonly does in water wells that encounter gas zones.
- 5) The data are conflicting as to whether gas was present in the Short well, and thus coming from the aquifer below the casing of 120 feet. NYSDEC sampled the wellhead and found no gas. However, one of the consultants stated that gas was emitted from the household taps of the well. The owner's original statement implied that the well-pit cover was blown off, indicating that gas was collecting in the well pit from the surrounding soil.
- 6) The lack of data on other water-well depths, casing lengths, and type of aquifer (bedrock or unconsolidated material) makes it difficult to evaluate whether an unconsolidated aquifer has become contaminated with gas. The reports indicate, however, that well owners have complained. The data indicate gas only in the near-surface soils.

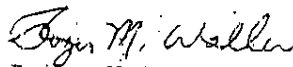
- 7) The natural presence of fractures (joints, bedding planes, faults) in all rock enables migration of fluids or gases, and the direction of flow depends on the pressure gradients. Thus, increased gradient changes induced by drilling activities, earthquakes, or injection pressures can cause a change in the movement of fluids or gases.
- 8) Marsh or swamp gas is found in wetland sediments. It seems unlikely that such gas would migrate laterally in unconsolidated material because it can readily diffuse upward to the atmosphere, especially in an area of permeable surficial material, where precipitation can readily recharge the formation in which the gas is being generated.
- 9) The chemical analyses of the gas emitted from the soil are too variable to be conclusive. It would have helped to analyze gas from the well waters involved to see if gas were entering at deeper zones.

In conclusion, the most likely source of the gas is the open boreholes of the producing gas wells. We understand it is standard practice that gas wells are completed without a cemented outer casing that extends to the producing horizon. It would seem prudent to reconsider this practice because of the risk of migration of any encountered gas (always under pressure) and associated brines in an uncased hole.

We will keep abreast of the situation through contact with NYSDEC headquarters and your District Representative.

For The District Chief,

Sincerely yours,



Roger Waller

District Ground Water Specialist

RW:cm

cc: Kinney