COMMENTS ON THE NY DEC DRAFT OF SUPPLEMENTAL GENERIC ENVIRONMENTAL IMPACT STATEMENT (DSGEIS) FOR GAS DRILLING

By the Otsego Lake Watershed Supervisory Committee
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The Otsego Lake Watershed Supervisory Committee (WSC) has the authority under Public Health Law Section 1100, Watershed Rules and Regulations, to protect the watershed and lake as a public drinking water supply for the Village of Cooperstown. The potential for gas drilling in the Otsego Lake watershed using horizontal drilling and high volume hydraulic fracturing is cause for concern. These comments are in response to the DEC's September 30, 2009 publication of a draft Supplemental Generic Impact Statement (dSGEIS) on the Oil, Gas and Solution Mining Regulatory Program.

Given that the Otsego Lake watershed is a public drinking water supply and overlays the same shale-gas bearing geologic formation as the New York City west-of-Hudson (WOH) watershed, the WSC's comments are based in part on the report by the NYC DEP's engineers, Hazen and Sawyer, entitled "Impact Assessment of Natural Gas Production in the New York City Water Supply Watershed - Final Impact Assessment Report". The areas of comment are as follows:

- Impact assessment - NYC watershed
- New York City watershed versus others.
- Filtered versus unfiltered water supplies.
- Potential mitigations.
- Recommendations

Impact Assessment - NYC Watershed

The impact assessment conducted by the NYC DEP's engineering consulting firm is an in-depth analysis of the long-term impacts of gas drilling in the NYC watershed. The study of the geology in the area, which is similar the geology throughout the shale-gas region in NYS, highlights a concern about faults and fractures and how they can become conduits for contaminants to migrate to fresh ground water and eventually surface waters. Also looked at was the "industrialization" of the watershed due to long-term development of gas drilling and the quantification of factors such as the number of gas wells, water usage, chemical usage, wastewater generation, and truck traffic. The threats to water quality included surface spills, subsurface migration and wastewater handling.

The bottom-line conclusion of DEP is that gas drilling, as currently defined in the dSGEIS, is incompatible with the operation of the NYC watershed and should be prohibited. In addition, the DEP is recommending to DEC that the dSGEIS be rescinded because it fails to adequately address the risks to the watershed. The DEP has also requested the NYSDOH to conduct a study of the public health threat posed by long-term exposure to low levels of toxic chemicals.

New York City Watershed versus Others

There are many small drinking water watersheds, similar in purpose to the NYC watershed, located in the shale-gas region of NYS. The geologic setting underlying all of these watersheds includes the Marcellus, Utica, and Trenton Black River formations that also underlie the NYC WOH watershed. **Thus, these small drinking water watersheds have the same potential for gas well development and density as the NYC watershed.** Also, geologic faults and fractures issues exist throughout the region, and not just in the NYC watershed. (See Figure 2-4, Map of Geologic Faults and Linear Features in New York State, in the DEP/Hazen and Sawyer report.) **This means that the concerns about subsurface migration of hydro-fracturing chemicals vertically through faults and fractures and ultimately contaminating fresh water resources, both ground and surface are the same throughout the shale-gas region.**

The protective measures (mitigations) proposed for the NYC watershed in the dSGEIS are greater than those proposed for other drinking water watersheds in the shale-gas region in NYS (e.g. Otsego Lake). In terms of setbacks, the protection of surface waters in the NYC watershed is twice that of other surface waters, including drinking water lakes (300 feet versus 150 feet).

The reason given by the DEC for the special treatment given to the NYC watershed versus others is that NYC's drinking water is unfiltered. The EPA, in conjunction with the NYS Department of Health, issued a Filtration Avoidance Determination (FAD) in 2007 which found that NYC's watershed protection program meets the requirements for unfiltered water systems. The focus of FAD watershed control requirements is on protecting the microbiological quality of the source water.

Filtered versus Unfiltered

DEC's logic that an unfiltered water supply needs greater protection than a filtered supply, given the potential contamination by gas drilling wastewaters, is scientifically flawed. Wastewater from gas drilling using high volume hydraulic fracturing contains "flowback" water, which is a portion of the hydraulic fracturing fluid, and "produced" water, which comes from the shale formation. The volume of the wastewater ranges 2.6 to 3.5 million gallons per well, and contains heavy metals, hydro-fracturing chemicals (many of which are toxic), dissolved salts, and radioactive contamination.. These contaminants can enter a surface drinking water supply by both chronic small-scale surface spills and acute spills such as a wastewater storage facility failing or chemical tanker truck rupturing. Contamination of surface waters can also occur via subsurface migration through faults and vertical fractures.

The point is that the contaminants in gas drilling wastewater are in solution, and, if in the water supply, cannot be removed by conventional filtration processes used by municipal water treatment facilities. Thus, it's irrelevant whether the water supply is filtered or unfiltered, the impact on public health of low levels of toxic chemicals will be the same.

The following is a quantitative analysis of the contaminants found in gas drilling wastewater that are also listed in the federal drinking water standards.

(Note: The list of contaminants in the federal drinking water standards, which contains around 70 chemical entities, was last updated in the 1980's. The potential total number of chemical entities used in hydraulic fracturing fluids is estimated to be over 300. Thus, for the majority of chemical contaminants in gas drilling wastewater, there's no "Maximum Contaminant Level" (MCL) established.

Contaminant	Max Allowed (mg/L) (MCL)	Flowback Avg. Conc. (mg/L)	Factor X Greater
Arsenic	0.01	0.107	10.7
Barium	2.0	661.5	330.8
Cadmium	0.005	0.032	6.4
Chromium	0.1	5.0	50.0
Copper	1.3	0.04	0.03
Cyanide	0.2	0.013	0.06
Fluoride	4.0	392.6	98.0
Lead	0.015	0.24	16.0
Selenium	0.05	0.06	1.2
Thallium	0.002	0.1	50.0
Benzene	0.005	0.48	96.0
Ethylbenzene	0.7	0.05	0.07
Tetrachloroethylene	0.005	0.005	1.0
Toluene	1.0	0.83	0.83
Xylenes	10.0	0.49	0.05
Radium 226/228	5 pCi/L	Range 2.6-33	0.5-6.6

The data for the average concentrations of contaminants found in flowback wastewater come from the dSGEIS, Chapter 5, page 5-104, Table 5-9. The data also showed maximum concentrations found, which, for example, were five times the average for benzene, two times the average for lead, and 37 times the average for cadmium.

The heavy metals are a big concern in that the flowback concentrations are many times higher than drinking water standards. Of the organics, benzene, a known carcinogen, is almost 100 times higher than the allowable limit in drinking water. The data on radioactivity in vertical wells in NYS have been found to be as much as six times the drinking water limit.

Chlorides are also a problem. The dSGEIS refers to data from the original GEIS, which show, based on the analyses of 73 pits in Pennsylvania containing mixed waste fluids (drilling fluid, formation water, and flowback water), that the average chloride concentration is close to 3,600 mg/L. The maximum concentration found was 37,500 mg/L. The secondary drinking water standards show a maximum chloride concentration of 250 mg/L. Thus, gas drilling wastewaters can contain chloride concentrations that are orders of magnitude higher than the drinking water standards.

Not only are these wastewater contaminants many times the concentrations allowed in drinking water, but they are also dissolved in the wastewater, and thus are more difficult to remove than un-dissolved particulate matter. This raises a key question that is not addressed in the dSGEIS. Assuming that surface spills, both chronic and acute, cannot be avoided over a long time period, and the potential for subsurface migration of toxic hydro-fracturing chemicals to ground and surface drinking waters, what is the long-term effect on public health of low-level exposure to toxic chemicals?

Filtration

Municipalities supplying drinking water sourced from surface waters are required to filter the water. However, there are a few exceptions, like New York City, which has a Filtration Avoidance Determination from the EPA. Those that do filter the water use filter beds containing mixed granular media with a range of particle sizes. A common type of mixed media filtration is called "Rapid Sand Filtration". Quoting from a paper put out by the Civil Engineering Department at Virginia Tech University, "Rapid sand filtration is the flow of water through a bed of granular media, normally following settling basins in conventional water treatment trains. The purpose of this filtration is to remove any particulate matter left over after flocculation and settling. (Note: flocculation is a process of aggregating fine suspended particles.) The filter process operates based on two principles, mechanical straining and physical adsorption. Sand filtration is a "physical-chemical process for separating suspended and colloidal impurities from water passage through a bed of granular material. Water fills the pores of the filter medium, and the impurities are adsorbed on the surface of the grains or trapped in the openings." (Culp) The key to this process is the relative grain size of the filter medium." **The point is that the typical filtration process for surface drinking waters removes only insoluble particulate matter, and not contaminants in solution.**

The point was reinforced in the DEP/Hazen and Sawyer report, which states, "In the event that filtration is ultimately required, NYC expects that the current $10 billion filtration plant design would not be adequate to remove the chemicals that could be introduced into the watershed. Advanced oxidation, granulated activated carbon adsorption, and/or membrane filtration processes could be required." These advanced treatment processes do not exist at the Otsego Lake/Village of Cooperstown filtration plant, nor at other such municipal water treatment facilities.

Therefore, since filtration of surface drinking water will not remove the dissolved contaminants from gas drilling flowback wastewaters, the impact of contamination will be the same regardless of whether the water is filtered or unfiltered. Thus, the same level of protection from gas drilling should be provided for ALL surface public drinking water supplies. More specifically, whatever protection is deemed appropriate for the NYC watershed should also be applied to all other surface public drinking water supplies in the shale-gas region of NYS.

Mitigations

If gas drilling, using horizontal drilling and high-volume hydraulic fracturing were to be permitted in the Otsego Lake watershed, enhanced mitigation measures would be needed to better protect the water supply. First, some background:

Setback distances are one way to protect water bodies from surface spills. In the dSGEIS, DEC proposes setbacks for various water bodies - reservoirs, lakes, and streams, but allows for site-specific SEQR for any proposed well pad within the proposed setbacks. For lakes and streams, including natural drinking water lakes, the proposed "setback" is 150 feet. This proposed setback is very surprising given that the DEC recommended the same 150 foot setback back in 1992 for the GEIS when gas drilling operations were much different from the high volume hydraulic fracturing proposed today. The whole point of the SGEIS was to respond to the new drilling technique of horizontal drilling and high volume hydraulic fracturing, which results in wastewater volumes much greater than with vertical drilling and hydraulic fracturing done 15-20 years ago.

An element of DEC's rationale for the proposed 150 foot setback from surface waters is based on a review of local Watershed Rules and Regulations, similar to those for Otsego Lake. DEC attempted to equate certain activities allowed today, with setbacks, as "analogous to aspects of high volume hydraulic fracturing". This is a huge stretch. In the WRR's around the state, there's nothing allowed that even comes close to having to deal with the hundreds of tons of toxic chemicals and the millions of gallons of wastewater generated by high volume hydraulic fracturing of a single gas well. The only mitigating factor is the proposal that for each well, only steel tanks be used for the storage of flowback water rather than open pits. This helps, but the proposed 150 foot setback remains inadequate.

Another aspect of the proposed setbacks from surface waters has to do with "reservoirs", which are man-made structures, versus drinking water lakes. It appears from the dSGEIS that the setback for reservoirs is 300 feet from well pads versus 150 feet for all natural lakes, including those used for drinking water. This is illogical. The setback should be the same for both reservoirs and drinking water lakes.

To mitigate surface spills, the WSC proposes setbacks in the Otsego Lake watershed similar to those proposed for the NYC watershed, which would exclude gas drilling within 2000 feet of the lake and 1,000 feet of lake's tributary streams. Other areas of mitigation concerning the WSC are chemical usage and the management of wastewater. The WSC mitigation recommendations for these concerns are the same as are in the DEP/Hazen and Sawyer report, Appendix D, pages 2 and 3.

Centralized Flowback Water Surface Impoundments

The dSGEIS discusses the potential use of centralized facilities to store flowback water as part of a dilution and reuse system. Surface impoundments (ponds) would be constructed for this purpose , and would range in size from one to five acres and hold one to 16 million gallons of

flowback wastewater. These impoundments would be lined and fenced, and would be in use for an extended period of time.

The damage to the environment if one of these impoundments were to fail would be very significant, particularly to nearby surface waters. DEC recognizes this to an extent, and proposes the following limits:

- Not allowed within the boundaries of primary and principal aquifers, unfiltered water supplies, or mapped 100 year floodplains.

- Site specific SEQRA required if planned to be within 1000 feet of a reservoir, 500 feet of streams, wetlands, storm drains, lakes or ponds, or 300 feet of a private or public water supply well.

Given these proposed protective measures, a 16 million gallon impoundment of flowback wastewater could be located 500 feet from a drinking water lake or its tributary streams. Failure of the impoundment would contaminate the drinking water supply with heavy metals and organic chemicals. Using data from the dSGEIS on typical concentrations of flowback constituents, 16 million gallons of flowback water could contain up to 16 pounds of arsenic, 61 pounds of lead, 2.5 pounds of cyanide, 260 pounds of benzene, and 425 pounds of toluene. Only trace amounts of these contaminants are allowed in drinking water.

The measures proposed to protect surface waters from these large impoundments of flowback wastewater include the same flawed logic that was used for the setbacks from well pads. There's the continued distinction between unfiltered and filtered drinking water supplies, and between reservoirs and drinking water lakes. All surface drinking water supplies should be treated the same regardless of whether they are filtered or unfiltered or stored in a man-made reservoir or a natural lake.

<u>WSC Recommendations</u>

1. **Prohibit gas drilling and the location of centralized flowback water surface impoundments in the Otsego Lake watershed and all other drinking water watersheds in the shale-gas region of NYS**

2. **If gas drilling were to proceed in the above referenced watersheds, adopt the mitigation measures outlined in the NYC DEP/Hazen and Sawyer Final Impact Assessment Report, Appendix D. These include increased setbacks, better control of chemicals, and better management of wastewaters.**

3. **Rescind the dSGEIS on the basis that it fails to take a 'hard look" at all of the environmental risks and public health risks posed by gas drilling in NYS.**