Comments on draft sGEIS on the Oil, Gas and Solution Mining Regulatory Program

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These comments are limited to addressing mitigating the impacts of drilling for gas in the Marcellus Shale on the water resources of New York State. The comments are organized under three major topics of concern:

1) Mitigating cumulative impacts

2) Minimizing environmental risk

3) Monitoring activities and impacts

Mitigating Cumulative Impacts

Water withdrawals

Exploiting gas in the Marcellus Shale using horizontal hydrofracking will require the withdrawal of water from nearby surface waters and possibly groundwater. The Susquehanna River Basin

Commission (SRBC) estimates that the cumulative consumptive use of water in the Susquehanna River Basin for shale gas well hydrofracking could be 28 mgd, or ~5% of current total daily consumptive use in the basin. The SRBC has since indicated that this value may be too high, as they assumed no reuse of flowback water for hydrofracking, which is now occurring in Pennsylvania. This evaluation suggests that the annually available basin wide surface water resources are sufficient to support likely rates of gas drilling in the Marcellus. However, regulations are needed to mitigate environmental and possibly drinking water supply impacts of cumulative water withdrawals during specific times and within specific stream systems. The SRBC has implemented changes in its permitting process to address water withdrawals for hydrofracking while requiring that minimum levels of passby flow to maintain adequate stream ecosystem services. The Delaware River Basin Commission (DRBC) has the authority to implement comparable regulations in the Delaware Basin.

We recommend that a similar regulatory structure that exists for the Susquehanna River Basin in New York be implemented in the currently unregulated Great Lakes and Hudson-Mohawk River Basins before permits are issued in these basins for gas wells requiring horizontal hydrofracking. NYS Bill A8806 (relating to the implementation of water withdrawal permits) or an analogous bill needs to be enacted, staff hired and permitting process developed for the DEC to effectively mitigate the cumulative impacts of water withdrawals in the currently unregulated basins. The DEC should undertake a comprehensive, comparative analysis of passby flow regimes to serve as a basis for establishing criteria for maintaining designated uses for streams in these basins. The methods proposed in the sGEIS are old (1970s), from different hydrologic regions (New England Flow Policy), and combined in ways that have not been assessed for outcomes. As presented now, the "natural flow regime method" and the aquatic base flow method for ungauged streams (i.e. maintain 0.5 cfs of flow mi^{-2} drainage area) suggest different acceptable levels of passby flow on the same stream. An analysis of 10 USGS gauged streams in the Susquehanna and Chemung basins indicated none had mean August flow exceeding the minimum 0.5 cfs of flow mi^{-2} drainage area, implying that no water could be withdrawn from any of these water bodies during August. However, the natural flow regime method would permit removals in August since this method allows use of all water exceeding 30% of the mean flow. Because Marcellus Shale gas exploitation will be water use intensive, the narrative New York streamflow protection standard (6 NYCRR Part §701.2-3) needs to be advanced to a numeric and justified instream flow. The New York State Water Resources Institute will be assessing candidate numeric standards in 2010 and may be able to help resolve this issue. In addition, a regulatory structure should address in detail the monitoring systems that will be required to ensure passby flows requirements are being met. Criteria to mitigate cumulative impacts of withdrawals of groundwater in these basins should also be developed. In conclusion, we find that the approach for mitigating the cumulative impacts of water withdrawals proposed in the draft sGEIS (7.1.1 and pg. 7.23) needs to be more thoroughly developed.

Limiting stream water withdrawals is only one component of minimizing the negative consequences of water withdrawals for hydrofracking. Minimally, hundreds of truck trips between the source of the water and the well site will be required to have sufficient water available on site for hydrofracking. Places where water will be removed need to be carefully considered, not only in terms of sufficiency for water withdrawals, but also in terms of adequacy of roads, capability to store on site thousands of gallons of water and appropriate protection of the water body through adequate setbacks for truck loading pads. We recommend that these issues be addressed in the final sGEIS.

Waste Disposal

Although requirements for disposal of flowback water via wastewater treatment plants are specified (7.1.8), there is no analysis of potential cumulative impacts of flowback water disposal through release to surface waters, particularly with respect to total dissolved solids (TDS). Such an analysis should be conducted to determine if there is sufficient volume of receiving waters to dilute the mass of added salts below a specified concentration. There is already a precedent, via application of salt to roads, for indirect additions of large amounts of TDS to surface waters. In central NY, about 25 tons of road salt is applied annually per mile of road. A million gallons of flowback water would contain 388 tons of TDS at concentrations of 93,200 mg/L reported in sGEIS Table 5-9. As an example, the Fall Creek watershed (an approximately 130 mi^2 watershed that drains into Cayuga Lake), with 370 miles of roads has about 9,000 tons of road salt applied annually, the TDS in approximately 20 million gallons of flowback water. There is also concern about whether ordinary landfills can handle the cumulative solid waste generated from treatment of flowback water (see below).

Drilling Pads, Roads, Transport of Chemicals

We recommend that the sGEIS include an analysis of cumulative impacts of drilling pads and roads on erosion and on the likelihood of chemical spills based on different assumptions about the density of drilling pads and the time frame over which construction of roads and pads, as well as drilling when multiple wells are drilled on a single construction pad, is likely to take place. Similar assessments of impacts are conducted for many other types of development and included in an EIS.

Minimizing Environmental Risk

Reducing Chances of Exposure of Surface and Groundwater to Pollutants

We recommend requiring secondary containment of hydraulic fracturing chemical additives at all sites, not just on a site-specific basis (7.1.3.3).

We recommend complete containment of all drilling wastes, e.g. closed loop systems, be required at all sites. The draft sGEIS requires a close loop tank system only in 100 year floodplains (7.1.3.2).

We endorse the requirement that flowback water handled at the well pad be directed to and contained in steel tanks (7.1.3.4). Likewise, centralized surface impoundment systems for flowback water should not be open to the atmosphere; we strongly recommend these impoundment systems should either be completely enclosed or flowback water should be stored in tanks (7.1.7 and 7.7). The advantages of storage tanks over open surface impoundments are referred to in both these sections.

Cuttings contaminated with oil-based drilling muds are not allowed to be buried on site (7.1.9). However, given the nature of Marcellus Shale cuttings (reduced sulfur that will oxidize to form sulfuric acid, the presence of heavy metals and NORMs) and the high proportion of Marcellus shale cuttings generated through horizontal drilling, we strongly recommend that all cuttings be disposed of in landfills.

Flowback water will not be allowed to be spread on roads but produced brine could be used for road spreading with a permit (7.1.6.2). However, it is unclear how Marcellus Shale flowback water and produced brine will be distinguished. Data presented in Appendix 19 indicates that NORM levels in produced water could be very high. Serious consideration should be given to restricting the application of produced water to roads.

Ensuring proper well bore casing is critical to reducing exposure of fresh groundwater resources to chemicals used in drilling and fracking, as well as migration of contaminants from deeper formations to formations containing potable groundwater. Therefore, we recommend that state regulators be required (not just given the opportunity) to witness casing and cementing operations (7.1.4). Also, we recommend going beyond just requiring a pre-frac form as a guarantee of sufficiency of wellbore construction (7.1.4.2) and require testing to show evidence of sufficiency.

Though section 7.1.8 discusses regulating the discharge of flowback water to surface waters there is no discussion of disposal of solid waste resulting from flowback water treatment either from POTW's or private treatment facilities. This is particularly important in the case of POTW's because radium in solution may be reduced during treatment to acceptable levels to discharge into surface waters through being retained in the solid waste. As over half of POTW's solid waste is land applied (i.e. sludge application to farm fields) in NYS, it may be prudent to require removal of radium as part of the pretreatment process. However, there is still the issue of where to dispose of the solid waste from pre-treatment of flowback water or flowback water treated in dedicated facilities. Both Louisiana and Texas regulate disposal of NORMS in solid waste from exploration and production of natural gas. It appears that NYS has this authority under NYCRR Part 360 (or 380 p7-102). However, reference is only made to standards for discharges in effluent; it is not clear whether standards exist for discharge in solid waste.

A 1999 report prepared for the Department of Energy (Smith et al. 1999. An Assessment of the Disposal of Petroleum Industry NORM in nonhazardous Landfills, DOE/BC/W-31-109-ENG-38-8), considered the risks of disposing of NORMs in nonhazardous landfills. The study used a scenario of 2,000 m^3 of 50 pCi/g disposed in a landfill and found negligible harm to landfill workers, nearby residents, and future recreational users of the landfill property. It did note that higher levels could lead to increased risks. As shown in Appendix 13, production brine from previously sampled wells drilled into the Marcellus Shale could have radium concentrations of upwards of 5000 pCi/L. Assuming a pretreatment process removes solids that comprise 1% of the effluent volume including all the radium, this generates a solid with approximately 500 pCi/g, 10 times the concentration use in the prior study. Although just a rough estimate, it highlights the potential for NORM levels above those even typically considered in other states when dealing with land disposal options. We recommend that the sGEIS address the potential NORM levels in pretreatment or dedicated treatment facilities solid waste, and the risks associated with disposing of these wastes in landfills that are not permitted to accept hazardous waste.

Wetland protection (7.3) is contingent on the current NYSDEC inventory of regulated wetlands, however the inventory is known to contain serious deficiencies in coverage, does not identify many wetlands present in the National Wetland Inventory maps for NY, and is specifically deficient with respect to "isolated wetlands" since NYS has not yet enacted an isolated wetland protection act to offset the SWANK Supreme Court verdict. We recommend that for the purposes of the Marcellus gas drilling the NWI maps be used as the standard reference.

Existing regulations require buffers of 50 ft of any public stream and the 1992 GEIS recommends, but does not require that this distance be increased to 150 feet (sect. 7.1.12.2, p. 7-69). As comparison, the USDA recommends minimum buffer widths of 100 ft to minimize impacts from agricultural activities. We recommend that the DEC require the wider buffer width of 150 ft for streams and that this width be increased to 350 ft for drinking water supplies, and along the upslope boundaries of environmental areas of unique and irreplaceable value.

Transport of the fracking fluids in tanker trucks and the drilling rig fuel tanks are exempt from NYSDEC petroleum bulk storage regulations and registration requirements. Given the potentially large number of truck-miles and the volumes of liquids anticipated in these specific activities, the likelihood of spills occurring is not insignificant. The draft sGEIS recommends paper-based monitoring (sect. 7.1.6.1) However, given the potential impacts on surface and groundwater, it is strongly recommended that transport and storage of chemicals and fuels be subject to the Petroleum Bulk Storage regulations.

Reducing Impact of Exposure of Surface and Groundwater to Pollutants

Included on the long list if chemicals that may be used in hydrofracking are at least two known carcinogens: benzene and formaldehyde. For other compounds, such as xylene and to a lesser extent monoethanolamine, some information suggests carcinogenic activity, but the literature is not in agreement. Table 6-13 of the draft sGEIS also lists heavy naptha as a material likely to be used. Heavy naptha is not a unique compound, but rather a mixture of many hydrocarbons, including several that are carcinogenic. Benzene is a high-risk carcinogen and was found in nearly half of all flowback waters (Table 5.9) from Pennsylvania and West Virginia (14/29 samples) at concentrations ranging from 15.7 to 1950 µg/L, with an average of 479.5 µg/L. This average number is nearly 100 times the maximum contaminant level (5 µg/L) established by the EPA. The maximum concentration was nearly 400 times higher. Even if one considers a dilution or attenuation factor, as is done at superfund sites, of as much as 100, it is possible that mishandling of flowback water could contaminate nearby aquifers or groundwater at levels that could exceed an MCL established by the EPA. We also note that benzene, formaldehyde, and several of the other potentially carcinogenic substances used in hydrofracking operations are highly volatile.

Furthermore, the known and extremely potent mutagen 4-nitroquinoline-N-oxide is included in chemicals found in flowback water (Table 5.9), though it was not included in the list of chemicals that may be used in hydrofracking. Although it has no established MCL, this compound is routinely used in animal studies to induce cancer formation. The extremely high concentrations (ranging from 1422 to 48336 mg/L, with an average of 13906 mg/L) of 4-nitroquinoline-N-oxide exceed the 0.5% total by weight for all chemical additives cited on page 5.42. This suggests that the values for this compound reported in Table 5.9 may be incorrect. This is perhaps not surprising, as there were no substantial comments on Table 5.9 in the draft sGEIS, which clearly would have been warranted if this data was accurate.

Other compounds of concern in fracking fluids are nonylphenol and octylphenol ethoxylate surfactants which can be degraded by microbes to become endocrine disruptors that mimic estrogen and may adversely affect the health of terrestrial and aquatic wildlife. The ethoxylate portion of these compounds are easily removed by microbes and result in the formation of nonylphenol and octylphenol which are both weakly estrogenic. Normal monitoring of the parent compounds used in fracking fluids would not pick up the presence of these degradation products. Based on the similarity to other environmental exposure scenarios, it is reasonable to expect them to be present any time the parent surfactants are used in the environment. Exposure to these compounds, even at extremely low concentrations (μg/L) can cause feminization of fish.

Requiring the use of less hazardous alternative compounds (aka substitution) is a well accepted method of risk mitigation. Many drilling companies phased out the use of benzene in the 1990s so it should be possible for those working in the Marcellus Shale to do the same. In order to reduce the risk of contamination associated with spills or storage failure, the use of benzene and other petroleum distillates in drilling fluids should be disallowed since functional alternatives exist. With respect to 4-nitroquinoline-N-oxide, it was presumably being used as a biocide; alternative biocides exist that are far less hazardous. Alternative surfactants to nonylphenol and octylphenol ethoxylate exist so banning these compounds should not pose an undue burden on drilling companies. We strongly recommend that the DEC adopt a system, clearly articulated in the sGEIS that will ban, discourage and encourage specific chemical additives and promote the development and adoption of green and non-chemical fracturing technologies and additives (9.3).

We strongly recommend that the DEC adopt a clearly articulated system that will explicitly 1) ban, 2) discourage, or 3) encourage specific chemical additives. The current language in the sGEIS suggests that chemicals will mainly be regulated under SPDES permitting, but this does little to reduce risks resulting from unintended releases (e.g. spills). Despite the fact that there are still limited human health and ecological risk assessments on many chemicals in the frac fluid, it should be possible to generally group and screen chemicals based on at least basic characteristics (e.g. toxicity, solubility, and persistence) as well as whether substitute chemicals that perform similar functions are readily available.

Monitoring Activities and Impacts

We recommend that all required monitoring and reporting of gas well drilling activities, spills and well contamination in New York State (for example 7.1.2.2) be made publicly available via a website.

We recommend requiring full public disclosure of the chemicals used in drilling and hydrofracking.

We also recommend requiring that gas companies engaged in drilling in New York State be required to disclose surface and groundwater contamination associated with their drilling operations that occur in other states, and that this information be made publicly available.

We recommend that private water well testing (7.1.4.1) as proposed in the draft sGEIS be clarified, including whether an order of testing is to be established, and a more complete description be given of methods for testing. It is not clear why it is necessary to test private well water for all 12 of the parameters listed in Table 7.3, as most of these are not related to contamination due to gas well drilling and therefore would not establish an appropriate baseline. The draft sGEIS identifies barium, TDS and pH as initial indicators of drilling contamination but also presents an additional list (page 7-41) of 14 other testing parameters, including the generic category "surfactants". It is not clear whether the DEC is proposing that all private wells be tested for all 28 parameters in Table 7.3 and on page 7-41 to establish contamination due to drilling. Or is the DEC proposing initial testing of barium, TDS and pH followed by more thorough testing if these parameters indicate potential contamination? In this case, we strongly recommend testing for benzene in all wells.

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