

**Testimony of
John Hines, Deputy Secretary for the Office of Water Management
Department of Environmental Protection
before the
Senate Environmental Resources and Energy Committee
Wednesday, January 27, 2010**

Chairman White, Senator Musto and members of the committee, thank you for the opportunity to appear before you to discuss the issues concerning the treatment of wastewater created through the extraction of natural gas from the Marcellus Shale formation.

The Marcellus Shale gas reserve is enormous. It potentially holds enough gas to fully supply the nation for 10 or more years. Producing the gas will create hundreds of billions of new wealth and tens of thousands of jobs, profoundly changing Pennsylvania and its economy, but not at the sacrifice of our water resources.

Extracting natural gas from the Marcellus Shale formation requires horizontal drilling and a process known as 'hydraulic fracturing' and uses greater amounts of water than traditional natural gas exploration. Drilling for natural gas from shale requires pumping large amounts of water, sometimes in the magnitude of a few million gallons, along with sand and other chemical additives into the formation under tremendous pressure to fracture the shale around the well, allowing the natural gas to flow freely. When the pressure is released, some water will flow back to the surface. In addition, once the hydraulic fracturing process is complete, the used water must be treated to remove chemicals and minerals. This fluid and production wastewater is classified as residual waste pursuant to the Pennsylvania's Solid Waste Management Act and the department's regulations.

In working to manage the wastewater, the department utilizes several statutes that provide the department with regulatory authority including: the Oil and Gas Act; the Pennsylvania Clean Streams Law; the Dam Safety and Encroachments Act; the Solid Waste Management Act; as well as requirements of federal Clean Water Act. And by statute, since the wastewater generated by these wells is considered residual waste, it must be contained in impermeable tanks or impoundments, treated and disposed of at a permitted treatment facility approved to receive the wastewater.

The solid waste that is stored, processed or disposed at the well site is regulated under the Oil and Gas Act and Oil and Gas Regulations under 25 Pennsylvania Code, Chapter 78. Once these wastes are removed from the well site, they are then governed by the Pennsylvania Solid Waste Management Act and the residual waste regulations. As such, they are required to be transported, stored, transferred, processed, treated and disposed in accordance with 25 Pennsylvania Code, Chapters 287-299. Our challenge stems from determining the cost effective means to treat and dispose of the wastewater safely and effectively.

And despite our best efforts to educate the public and the media, rumors persist that the chemicals used in the fracing process are a secret, and that DEP has no knowledge of what chemicals are used. To the contrary, the department obtained the Material Safety Data Sheets

from the industry that disclose all the chemicals used by the various fracking companies. These MSDS sheets are also made available to local emergency responders and are public records. DEP has posted a list of the basic chemicals used in the fracturing process on its Web site and many of the companies operating in the Marcellus Shale have also posted similar company specific information on their Web sites. I should note however, that while DEP does know what chemical are in the frac fluids, we do not know the exact proportions of the chemicals used as the industry considers this information to be a trade secret.

The treatment and disposal of wastewater poses a challenge for the department and the oil and gas industry. From a water quality perspective, the pollutants that are expected to affect the use of and quality of surface waters are classified as Total Dissolved Solids (TDS). TDS is a measure of all elements dissolved in water and can include carbonates, chlorides, sulfates, nitrates, sodium, potassium, calcium and magnesium.

Sources of TDS can include sewage treatment plants, stormwater runoff, metal mining, mining, meat packing plants, vegetable processing plants, grain milling plants, bakeries, beverage processing facilities, agricultural chemical manufacturing, oil and gas drilling, petroleum refining, leather processing, primary metal industries, fabricated metal products, electric services, refuse systems, scrap and waste material industries and Abandoned Mine Drainage (AMD)

In fact, many of the areas where the drilling for natural gas is proposed have a history of mining activity and are affected by AMD. That history has left the commonwealth with a difficult pollution legacy. Brine and fracturing wastewater have high concentrations of dissolved solids. Considering the already elevated levels of dissolved solids in the AMD-affected surface waters, stringent control of dissolved solids likely will be necessary to protect the quality of these receiving streams and assure they meet their designated uses.

The problem of TDS is a very real threat to Pennsylvania's waterways. In 2008 and 2009, TDS levels exceeded drinking water standards along the Monongahela River. This serves as a reminder and a warning that rivers and waterways can only dilute so much pollution before water quality reaches unacceptable levels. In addition, Pennsylvania's water treatment plants are not equipped to remove TDS from drinking water and these pollutants are delivered through our pipes and out of the taps to our residents.

Recognizing the importance of addressing the TDS issue, the department took action and issued the Permitting Strategy for High TDS Wastewater Discharges on April 11, 2009. This strategy presents an approach that allows the department, until the proposed regulation is finalized and approved, to effectively deal with the increasing demand for assimilative capacity in the surface waters to accept increasing new loads of TDS from current and new facilities. As a major part of this strategy, the department proposed revisions to its 25 Pa Code Chapter 95 Wastewater Treatment Requirements to eventually codify key treatment discharge limitations.

To date, the department has held four public meetings regarding the proposed regulation revisions and has received a significant amount of comments encouraging the department to continue with the adoption of the current regulation revision proposal or to revise the regulation

proposal to adopt more stringent criteria. In addition, the department has heard presentations from a variety of environmental and stakeholder groups that could be impacted by the change of the regulation, including the oil and gas industry.

Prior to these draft changes to the Chapter 95 regulations, the Water Resources Advisory Committee (WRAC) noted concerns over the technologies available for treatment of high TDS wastewater as well as the costs associated with that treatment. As such, WRAC requested that DEP work with a subcommittee to specifically discuss these concerns and the department has been meeting regularly with the subcommittee since August 2009.

This subcommittee has further examined the technologies available and the cost associated with the treatment of TDS and has determined that technologies exist to remove the pollutants so that the resulting effluent can be discharged to streams; however, the capacity to treat the expected levels of wastewater is not yet available. Numerous permit applications for these types of facilities have been submitted to the department and are currently being reviewed.

Other disposal methods for wastewater are available, such as underground injection or passive evaporation basins. Underground injection is not currently available in Pennsylvania at the capacity necessary to handle the amount of wastewater that is generated; so much of this type of disposal is taking place in other states. In addition, the cost associated with the transportation of the wastewater also limits the use of underground injection. Pennsylvania's climate does not lend itself readily to the use of large evaporation basins which are frequently used in more arid sections of the country. The most likely treatment technology, evaporation or distillation, is an energy intensive activity and is has been viewed by the industry as cost prohibitive. The initial estimate provided by the department for treatment costs was approximately \$0.25 per gallon. Industry estimates suggest that those cost estimates could be between \$0.12 and \$0.25 per gallon. Technology purveyors report cost estimates for treatment between \$0.10 and \$0.20 per gallon.

The department is encouraging the reuse and recycling of wastewater, which will cut down on water withdrawals and dramatically reduce the amount of water being taken to treatment facilities. The department has heard reports that up to 50 percent of operators are reusing at least a portion of the wastewater, with some operators reporting nearly 100 percent reuse. The reuse of wastewater will reduce the overall disposal needs for high TDS wastewater throughout the state, however it is still unknown to what extent the needs will be reduced.

Preliminary reports from Marcellus Shale wells suggest that less than 40 percent of the water used for fracturing the well is flowing back to the surface as flow-back water, which greatly reduces the water treatment obligations for these wells. Regardless, even with reuse and recycling, we must still find a solution for the flow-back and production fluids that cannot be reused. As the drilling activities continue to increase in Pennsylvania, the department fully anticipates the need for increased treatment capacity, even at the reduced flow-back estimates.

This department realizes and acknowledges that while no energy source is perfect, each has its strengths and weaknesses, and natural gas is one of the best clean fuel options we have available to us today. Some communities have experienced small fish kills from minor spills, complications from erosion and sediment control violations and during drilling operations like

those in Dimock, Susquehanna County and along Headhodge Lane in Bradford Township where methane was detected in the drinking wells of residents as a result of gas migration. When these problems do occur, the department quickly responds by requiring clean up, as well as imposing fines, revoking permits or ordering drilling operations to cease. In addition, the department closely monitors operations at the well site through routine inspections.

In addition to protecting our surface waters, the department is working quickly to improve our well construction standards to protect the public from gas migration events. Both DEP and the oil and gas industry recognize that gas migration is not acceptable. The department has developed draft regulations in conjunction with our Oil and Gas Technical Advisory Board that will strengthen well-casing and cementing requirements.

The regulations and protections I've described above are important to the protection of our natural resources. However, they mean very little if the department does not have the staff necessary to inspect well sites and oversee the environmentally protective development of this resource. Through the increased well permit fees, the department was able to add an additional 37 people to its regional permitting, compliance and enforcement staff in 2009.

In closing, DEP is working each day to ensure that natural gas is produced responsibly and our water is protected. We will continue to work with the legislature, other agencies, environmental organizations and the oil and gas industry to develop these resources responsibly.

Chairman White, Chairman Musto and members of the committee, I thank you for your attention, and look forward to your thoughts and questions.

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