Landfill Loophole Legislation Hearing September 30, 2021

I first would like to thank Senator Muth for holding this hearing and senators in attendance. My name is John Stolz, I am a professor and director of the Center for Environmental Research and Education at Duquesne University. I live in Glenshaw, Pennsylvania north of Pittsburgh.

In my forty plus years in environmental microbiology, I have studied fresh water, marine, and extreme environments. The focus of the research has been on microbes that metabolize toxic metals like arsenic, selenium, and chromium. More recently, I have concentrated on water quality issues and the environmental impacts of unconventional oil and gas development. The research has been funded over the years by grants from the National Science Foundation, US Environmental Protection Agency, Department of Agriculture, Department of Energy, NASA, and the National Institutes of Health. I have published 90 peer reviewed papers, 40 book chapters, and co-authored/edited three books.

Relevant to this hearing, in researching water quality in Pennsylvania, over the past eight years, I and my students have interviewed hundreds of people who have been negatively impacted by unconventional oil and gas development. We have analyzed over 1,800 samples for their chemistry and have published the results in peer reviewed journals. I also have a edited volume on the environmental impacts of the development of unconventional oil and gas reserves in press.

Land Fills and Public Drinking water

Today I want to tell you about my findings regarding the improper disposal of oil and gas wastes, both solid and liquid, and the threat to public drinking water sources it poses. When the shale boom began in Pennsylvania in the mid-2000's, the state allowed the companies to take their liquid wastes, including the produced water, to publicly owned sewage treatment plants, also known as POTWs for disposal. However, it was soon discovered that because the fluids were so concentrated, it could not be diluted enough, and was impacting the discharge from these plants into public water. Many of the plants were exceeding their discharge permit limits. More importantly, the increase in total dissolved solids, and bromide in particular, was causing problems downstream for public drinking water authorities. Carcinogenic trihalomethanes, such as chloroform and bromoform, were being generated at the drinking water plants during the chlorination process. Also known as disinfection by-products, these carcinogens are regulated by the US EPA, with quarterly testing and reporting required of the POTWs. However, the utility doesn't have to notify their customers unless they are out of compliance for four straight quarters. With more and more utilities falling out of compliance it was realize this waste disposal policy was not working. Further, the POTWs were incurring the costs to deal with the issue, many switching to chloramination. Chloramination can lead to issues with lead leaching from pipes and fittings. Initially, a voluntary prohibition of using POTWs for shale gas liquid waste was put in place, and as a result there was a decrease in bromide levels in the three rivers. However, this problem has reemerged over the past few years. Apparently, the oil and gas industry found a loophole and their waste was again getting into the source water for drinking. But how? My suspicions were confirmed in April of 2019 when I met with the manager

of the POTW in Belle Vernon, PA. The waste treatment plant had been receiving leachate, 100,000 to 300,000 gallons a day, from the local sanitary landfill in Rostraver PA. The leachate was so toxic, it killed the microbes that were supposed to be treating the sewage. My analysis of the land fill leachate showed it contained the same toxic constituents found in produced water from fracking, having high amounts of chloride and bromide, as well as the radioactive element radium. The discharge from the POTW, which I collected at the time, also had similar constituents, including bromide and radium, although less concentrated. The dried sludge from the plant was also radioactive (containing thousands of picoCuries of radium 226 and radium 228 per kilogram), so it was clear to me that the landfill leachate had contaminated the waste treatment facility. Furthermore, the discharge from the waste treatment plant was exceeding the permitted amount of total dissolved solids by almost 3 times and was going directly into the Monongahela River. The Charleroi drinking water facility is just down stream. So it wasn't too surprising to discover that they too had been having issues with trihalomethanes since at least 2015. Thanks to a court injunction, the POTW is no longer receiving leachate from the landfill and is now back in compliance for their discharge. I confirmed this when I visited the plant.

The PA DEP allows drilling wastes, both solid and liquid to be taken to sanitary landfills, up to 80% volume per day. The solids, such as drill cuttings are buried along with municipal waste and are often used to cover the landfill at night. The liquids, which may contain drilling fluids, flowback, and produced water, are "immobilized" with wood chips or other absorbents, and buried along with the municipal waste. Although the solid waste containers are screened for radioactivity when they arrive at the landfill, the sheer volume accumulated over time has led to elevated levels of radium and radon gas. Remember, the half life of radium 226 is 1,600 years so it's going to take a long time for this to go away naturally. As for the liquids, there currently are no requirements to test for radioactivity or toxic chemical constituents as it is defined as "residual waste" or "brine". However, based on my own research as well as PA DEP and USGS data, these fluids may contain thousands of picoCuries of radium 226 and radium 228. The Westmoreland landfill is now under a consent agreement with the PA Department of Environmental Protection to dispose of the leachate. But because it is so toxic, they can't use normal means of disposal. One idea was to install an evaporation system commonly used at other landfills to reduce leachate volumes. But if the Westmoreland landfill installed such a system, it would also concentrate the radioactivity. According the proposed permit, the daily activities would produce hundreds of gallons of concentrated leachate with tens of millions of picoCuries of radium. Radium 226 decays to Radon 222 (3.8 days), a radioactive gas, and then Lead 210 (22 years) and Polonium 210 (138 days), both also radioactive. Polonium 210, by the way, was how Russian ex-patriots Alexander Litvinenko was assassinated. So it's not just the radium, but the decay products it produces. In fact, if you were to seal up a container of produced water from a Marcellus Shale well, for example, in two weeks time it would be five times as radioactive due to the build up of decay products. And that is what is going into the landfills.

There are at least 16 sanitary landfills in Pennsylvania that are reported to be taking oil and gas wastes. Over the past year we have tried to find out just how much, but the PA DEP records don't match with company records. Nevertheless, this practice is affecting the quality of the

leachate, rendering it more toxic and radioactive. Sanitary Landfills are not allowed to take certain items like batteries, smoke detectors, and e-waste. Further, allowing this leachate to be disposed of at POTWs threatens their operation and is facilitating the discharge of oil and gas wastes into the waters of Pennsylvania. Regardless of the future of oil and gas development in the state, the more than 11,000 unconventional wells already drilled will continue to generate the toxic and radioactive brine. We need laws that will address the proper disposal of this waste to make sure it doesn't wind up in our drinking water. I encourage you to support the legislation proposed by Senator Muth.

Thank you.

John F Stolz, PhD