Talking Points – EPA Wastewater Report

Name of report to refer to: U.S. Environmental Protection Agency (EPA), Engineering and Analysis Division, Office of Water, published a report in May 2018 entitled "**Detailed Study of the** Centralized **Waste Treatment** Point **Source Category** for **Facilities Managing** Oil **and Gas Extraction Wastes"** EPA-821-R-18-004.

"Given changes in the industry since 2000, particularly with respect to management of oil and gas extraction wastes, EPA has undertaken a detailed study of the CWT industry. A primary goal of the study is to determine if the existing CWT regulations should be updated given changes in the industry, specifically related to facilities that accept oil and gas extraction wastes." (p. 1-1)

The EPA report reviews what was examined in their study and provides "observations" by EPA regarding what was found. In the Talking Points, I quote the section and provide (**in bold**) an interpretive talking point – the bolded text is only a suggestion of how to summarize the quoted text. We can each work up and/or expand in our verbal comment what we want to say about the chosen EPA-identified issue. Please choose a Talking Point and respond to the group by email the number of the point you want to take. That way we won't all be saying the same thing and we can bring different EPA-flagged issues before the Commissioners.

1. "Oil and gas extraction wastes can contain a variety of constituents, including biochemical oxygen demand (BOD), bromide, chloride, chemical oxygen demand (COD), specific conductivity, sulfate, total dissolved solids (TDS), total suspended solids (TSS), barium, potassium, sodium, strontium, benzene, ethylbenzene, toluene, xylenes, sulfide, gross alpha, gross beta, radium 226, and radium 228." (p.1-2)

   "EPA approved analytical methods do not exist for many constituents found in oil and gas extraction wastes. In addition, some constituents (such as total dissolved solids) found in oil and gas extraction wastes can interfere with EPA approved analytical methods and significantly affect the ability to detect and quantify the level of some analytes." (p. 1-3)

   EPA says in their report that the wastewater produced by fracking can contain many pollutants that are not included on EPA's list of Priority Pollutants – the list that DRBC is proposing to use to identify the pollutants requiring treatment for in-basin disposal. Furthermore, many constituents don't have EPA-approved analytical methods, leaving potentially dangerous pollutants untested and uncontrolled, opening a pathway of pollution. EPA also says that TDS, a known contaminant in frack wastewater, can interfere with accurate testing of other constituents in the waste stream.

2. The constituents in Oil and Gas wastewater can vary greatly, depending on the location of the well, the type of drilling, whether fracking was used, the types and amounts of additives used in drilling and fracking and the age of the well. (p. 1-2)

   EPA says in their report that the make-up of frack wastewater varies greatly based on location of the well, the type of drilling, whether fracking was used, the types and amounts of additives used in drilling and fracking and the age of the well. This presents a challenge that requires batch by batch sampling to identify the constituents in the waste to ensure pollutants are removed before discharge, a process that would be time consuming and most likely prohibitively expensive and overly cumbersome in practice. DRBC has not addressed how the day in and day out differences in the make-up of frack wastewater will be addressed.

3. "Oil and Gas wastewaters contain a variety of chemicals, from sources such as HF fluid additives, well stimulation and well maintenance activities. In addition, the source formation can contribute various constituents. The chemical concentrations in O&G wastewater (outlined in Section 9.1.5 and discussed in Section 5), particularly for HF fluids, have not been widely characterized in publicly available literature. Subsequently, researchers have not studied the impacts of these varied chemicals on CWT treatment abilities or the efficacy of CWT facilities treating those chemicals. Because the HF fluid chemicals in effluent are generally not documented, many constituents have not been tested, and therefore impacts from those chemicals to human health and aquatic life are unknown." (P. 9-36)

   EPA says in their report that the lack of information about many of the constituents of frack wastewater, including the lack of scientific research on the chemicals used and on those chemicals that are kept secret under the cloak of Trade Secrets, leaves a data gap that is insurmountable, making it impossible to identify and control the impacts on human health and aquatic life. DRBC does not explain how this lack of information about the chemicals in drilling and fracking, many of which are present in the produced wastewater, will be overcome. If EPA has not been able to get this needed information, why does DRBC think it will not be an insurmountable problem?

4. "Centralized waste treatment facilities accepting oil & gas extraction (O&G) wastewaters can release pollutants into the environment that impact aquatic ecosystems and human health. Potential pollutants can reach the environment (1) through effluent discharging to surface waters either directly from a CWT facility or indirectly from publicly owned treatment works (POTWs) accepting treated CWT effluent; (2) during managed use of wastewater, such as irrigation; and (3) by releases from storage impoundments and spills. Direct discharges of treated effluent from CWT facilities accepting O&G wastewater have caused

environmental impacts, particularly on water quality, drinking water, and aquatic health." (p. 9-1)

"Because the effect CWT facilities have on downstream water quality is variable, Warner et al. (2013) calculated an annual average enrichment factor for pollutants discharged from facilities accepting O&G wastewater to determine how much impact CWT facilities had on downstream waters (see Box 1). Even with variability in effluent concentrations and upstream conditions, there is a clear impact to downstream concentrations from CWT effluent. In the following sections, documented and potential impacts from elevated concentrations for pollutants from CWT effluent are discussed." (P. 9-18)

EPA acknowledges that frack wastewater discharges pollute and harm human health and aquatic life and they document the pathways of pollution. Even when the concentrations of pollutants vary, depending on the waste stream and conditions in the receiving waterway, studies show that the overall impact is one of degradation. DRBC has not provided any evidence that it will be able to avoid the inevitable degradation of water quality that accompanies the routine handling and discharge of frack wastewater where it is now occurring.

5. "Effluents from CWT facilities treating O&G wastewater have been associated with alterations in downstream surface water quality in individual receiving streams (e.g., Warner et al., 2013; Ferrar et al., 2013) as well as at the watershed level (e.g., Wilson and VanBriesen, 2012; Olmstead et al., 2013; Vidic et al., 2013). Extraction techniques, such as hydraulic fracturing (HF), became a major source of O&G wastewater in the early 2000s (Wilson and VanBriesen, 2012; U.S. EPA, 2016c). HF wastewater has been characterized as either flowback water or produced water in some references. Some pollutants of potential concern from an environmental or human health perspective in O&G wastewater include TDS; halides (e.g., bromide, chloride, and iodide); metals; technologically enhanced naturally occurring radioactive materials (TENORM); and a wide range of poorly characterized chemicals in injected fluids including surfactants, biocides, wetting agents, scale inhibitors, and organic compounds." (p. 9-1)

   "CWT facilities treating O&G wastewater and discharging to surface waters have direct and measurable impacts on downstream surface waters and sediment. As shown in Figure 9-2 through Figure 9-6, reported effluent and downstream concentrations are higher than upstream concentrations in the surface water for TDS, chloride, bromide, metals, and TENORM. In many instances, downstream concentrations exceed applicable aquatic and/or drinking water thresholds, indicating that the elevated downstream concentrations can negatively affect human health or aquatic life. Documented and potential impacts to human health and aquatic life are discussed in more detail in Sections 9.4 and 9.5." (p. 9-18)

EPA states in its report that wastewater produced by fracking is being treated and discharged at permitted centralized waste treatment facilities today. Scientific investigations in Pennsylvania of the downstream surface water quality and sediments show that the discharges have caused pollution plumes in these streams and that dangerous levels of contaminants such as radium 226 have accumulated in the stream's sediments. In its report, EPA says many of the constituents identified are pollutants of concern and have negative human health effects including "TDS; halides (e.g., bromide, chloride, and iodide); metals; technologically enhanced naturally occurring radioactive materials (TENORM); and a wide range of poorly characterized chemicals in injected fluids including surfactants, biocides, wetting agents, scale inhibitors, and organic compounds". DRBC draft gas regulations do not explain how these contaminants will be removed, how stream health would be tracked, and such degradation avoided. This threatens the water quality of millions of people who receive their drinking water from the Delaware River and jeopardizes the aquatic life and the ecosystems of the Delaware.

6. "As summarized in Section 9.3, CWT effluent has been reported to contain high concentrations of halides, including bromide and chloride. Halides are precursors for DBPs, which can form when drinking water disinfection processes interact with organic and inorganic matter in intake waters. DBPs can have potential adverse effects on human health (Hladik et al., 2014). Because brominated species of these compounds tend to be more toxic than chlorinated analogs (e.g., McTigue et al., 2014), one of the primary human health concerns related to CWT effluent is the downstream formation of brominated DBPs during drinking water treatment. An increase in halides in intake waters could also affect the ability of conventional drinking water plants to comply with the Stage 2 Disinfectants/Disinfection Byproducts Rule (DBPR)." (p. 9-20) (more detailed information on this at p. 9-20-21.)

   "Documented increases in bromide concentrations in rivers receiving CWT effluent, combined with the known human health effects of brominated THMs in drinking water, demonstrate that CWT effluent poses human health risks related to drinking water contamination. In watersheds where O&G activities are active and CWT facilities are present, studies have shown evidence of a shift in surface water ionic composition toward relatively greater amounts of bromide (McTigue et al., 2014)." (p. 9-23-24)

   "High levels of bromide and iodide, such as those found in effluent from CWT facilities accepting O&G wastewater, can pose greater human health risks than other halides because brominated and iodinated DBPs tend to be more cyto- and genotoxic than their chlorinated analogues (Harkness et al., 2015). Regli et al. (2015) estimated that bromide concentration increases in drinking water sources can increase the risk of bladder cancer. Wang et al. (2016) also estimated that brominated DBPs significantly increase the cancer risk level if bromide is not properly removed or reduced in source waters." (p. 9-26)

EPA documents in the report the high concentrations of halides – including bromide and chloride - in frack wastewater that has been processed to current treatment standards and the dangers that presents to human health. Studies show that disinfection by-products (DBPs) can form when the frack wastewater effluent mixes with halides during drinking water treatment. Brominated and iodinated DBPs are known to increase the risk of bladder cancer. (DBPs are a drinking water hazard because of the propensity for the brominated DBP's to form trihalomethanes and haloacetic acid, which can cause cancer. http://www.duq.edu/academics/schools/natural-and-environmental-sciences/academic-programs/environmental-science-and-management/3-rivers-quest**) DRBC's draft regulations do not confront this problem that will affect the ability of water treatment facilities and water providers to deliver safe water to people and meet required drinking water standards. There are many water intakes on the Delaware River that could be located downstream of centralized wastewater treatment plants under DRBC's draft regulations. In addition, water intakes that are upstream of possible discharge locations in the Delaware Estuary and Bay are also at risk due to tidal influences. Philadelphia get its drinking water from the Delaware River from withdrawals on the Delaware and Schuylkill Rivers, serving about 1.5 million Philadelphia region residents every day. The New Jersey American-Delran intake, the Burlington City water intake, and many municipal groundwater wells known to be under the direct influence of the river are all at risk due to upriver tidal movement of downstream discharges. DRBC allows relaxation of water standards in Zones 4 to 6, covering most of the Estuary and Bay (not protected as a drinking water source, less protective TDS standard, less protective calculation of background concentrations of pollutants such as TDS, etc.).**

7. "Documented and potential impacts to both aquatic life and human health related to discharges from CWT facilities treating oil and gas extraction wastewater exist due to the prevalence of some pollutants. Levels of pollutants downstream from CWT facility discharges have been reported to exceed applicable thresholds, such as primary and secondary drinking water standards and acute and chronic water quality criteria for protection of aquatic life." (p. 1-4)
   "A study by PA DEP documented shifts in population structure for macroinvertebrate and phytoplankton communities upstream and downstream of CWT discharges. Based on this study, upstream locations contained a higher percentage of pollution-intolerant macroinvertebrate species compared to pollution-tolerant species. Macroinvertebrate populations located downstream of

brine discharges (Short et al., 1991) and CWT facilities (PA DEP, 2009, 2013) showed reduce species richness and contained a higher percentage of pollution-tolerant compared to pollution-intolerant species. Phytoplankton communities followed a similar pattern shift in taxa, with an elevated percentage of brackish water taxa found in downstream locations compared to upstream locations (PA DEP, 2009). (p. 9-26)

"In another study, native unionid mussel composition was also negatively affected downstream of CWT discharge (Patnode et al., 2015). In the Patnode et al. (2015) study, stream locations with elevated conductivity measurements downstream of CWT discharge had reduced abundance and diversity compared to upstream locations with lower conductivity." (9-27) "Patnode et al. (2015) performed an in-situ study on the lethality of CWT effluent to juvenile unionid mussels, which are a federally listed endangered species. Using caged mussels at an array of sites downstream of a CWT facility, these authors found that mussel survival decreased significantly at sites with high specific conductivity related to the CWT discharge." (p. 9-27) (more detail on Index of Biotic Integrity data at p. 9-27)

EPA states in their study that frack wastewater can negatively affect aquatic life and documents that with studies by scientists and PADEP. It was found in one study that juvenile federally listed northern riffleshell mussels (Epioblasma torulosa rangiana, in the Unionidae family) had very low survival rates when in waterways downstream of frack wastewater effluent discharges. DRBC's draft regulations provide no assurance that freshwater mussels, including the federally endangered dwarf wedge mussel, so important to the health of the Delaware River and its tributaries, will not be harmed by discharges of effluent from frack wastewater plants. (DRBC's proposed Whole Effluent Toxicity (WET) testing will not provide the information necessary to assess whether a species will be negatively impacted. WET testing should only be the first stage in a risk assessment; WET testing identifies a hazard(s), not how much risk is associated with that hazard. WET testing used to assess the effect of all pollutants in a facility's effluent is not conclusive. (PETER M. CHAPMAN, "WHOLE EFFLUENT TOXICITY TESTING—USEFULNESS, LEVEL OF PROTECTION, AND RISK ASSESSMENT", Environmental Toxicology and Chemistry, Vol. 19, No. 1, pp. 3–13, 2000, q 2000, SETAC, 0730-7268/00.) DRBC should not rely on WET testing to predict toxic effects. The protection of these species and their habitat is a responsibility of DRBC but that protection is not being provided and EPA flags the impact of frack wastewater effluent as having the potential to harm these species.

8. "Another pathway for environmental releases of pollutants from disposal of O&G wastewater at CWTs is the potential for spills of wastewater during transportation from O&G wells or at treatment facilities. Spills of untreated wastewaters can negatively impact water quality and aquatic life, and those impacts can persist in

the environment for years. Flowback water spills in the Marcellus Shale region have been shown to negatively impact aquatic life including fish and macroinvertebrates (Grant et al., 2016). Impacts from reported O&G wastewater spills in North Dakota persisted for up to four years after the spill events and included elevated TDS, contaminants (including selenium, lead, and ammonia), and accumulation of radium in soil and sediment (Lauer et al., 2016).
The likelihood of spills during transportation increases as the volume of wastewater and number of trips increases (Belcher and Resnikoff, 2013; Rahm et al., 2013; Hansen, 2014). Maloney et al. (2017) studied accidental spills in Pennsylvania, New Mexico, Colorado, and North Dakota and determined that wastewater is one of the top three materials spilled in HF-related activities." (p. 9-8)

According to EPA's study, spills and pollution releases occur during transportation of wastewater. EPA documents that these releases have negative impacts on water quality and aquatic life; the harm can persist for years after a spill. EPA also states that studies show that the likelihood of spills increase as the volume of wastewater and number of trips increase. We know that the volume of wastewater being produced today is very large – larger even than DRBC predicted in its analysis. (This is due to the longer well bores being drilled at shale gas wells that require much more water (an average 11.4 million gallons of water per fracked Marcellus shale well last year) and subsequently produce more wastewater. (FracTracker 2018)) EPA cites a study that says wastewater is one of the top 3 materials spilled in fracking activities. This means substantial risk of pollution from spills and accidents if wastewater were to be transported into the Delaware River Basin for treatment and disposal. In the draft gas regulations, DRBC has not acknowledged the occurrence of spills and accidental releases that will occur with transportation of the wastewater and proposes no plan to prevent the spills and accidents that are so prevalent where wastewater is now handled. This is especially concerning considering DRBC has no enforcement division and presumably would rely on the states to carry out oversight and enforcement (NOTE: Taking into account that PADEP data shows that pollution incidents occur regularly at oil and gas sites. PADEP data shows that there are 309 cases of private water well contamination caused by oil and gas operations in the Commonwealth (as of 6.6.2018) and over 4,400 water complaints related to oil and gas have been filed by the public with PADEP. Much of the pollution is caused by spills and accidents.)

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