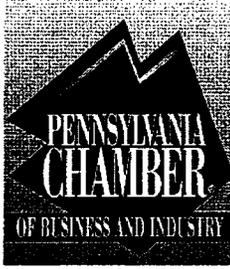


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August 21, 2012

Environmental Quality Board
Rachel Carson State Office Building
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400 Market Street
Harrisburg, PA 17101-2301

Re: Proposed Rulemaking for 25 Pa. Code Ch. 93; Triennial Review of Water Quality Standards, 42 Pa. Bulletin 4367 (July 7, 2012)

Members of the Board:

On behalf of its membership comprising thousands of businesses of all sizes and across all industry sectors, the Pennsylvania Chamber of Business and Industry (PA Chamber) respectfully offers the following comments concerning the proposed rulemaking for the Ch. 93 triennial water quality standards review.

The PA Chamber has significant concerns with the following proposed water quality standards:

1. Aquatic life and human health standards for molybdenum
2. Aquatic life standard for chlorides
3. Aquatic life standard for sulfates
4. Human health standard for 1,4-dioxane

Specific comments on each parameter of concern are provided below. In general, however, we are concerned that the PA Department of Environmental Protection (DEP) has failed to provide clear, specific scientific evidence that would justify establishing these identified proposed standards. The DEP has conducted no correlated chemical sampling and analysis, biological surveys, or acute bioassays to determine if there is a statewide need for these specific water quality standards. The economic impact from these proposed standards on the Commonwealth economy has been raised many times in public meetings with the DEP. The DEP has stated that it will not consider economic impacts in setting water quality standards, but we believe that position is contrary to U.S. EPA policy and guidance.¹ PA Chamber members are very concerned about the significant economic impact of these proposed water quality standards without any pressing need for such criteria.

We understand that discharges of treated Marcellus shale drilling fluids from Centralized Waste Treatment Facilities (CWT) and POTW's were a driver for the DEP's recent emphasis on chlorides, sulfates, and TDS standards.² However, since the Marcellus shale drilling industry is recycling a substantial portion of its flowback and produced water, and given the adoption and implementation of stringent TDS and chloride standard to this sector as part of 25 Pa. Code §95.10, as promulgated in 2010, there appears to be no continuing need to consider instream TDS and sulfate standards aimed at this particular industry. In

¹ See U.S. EPA. Interim Economic Guidance for Water Quality Standards. EPA-823-B-95-002. March 1995.

² Hays, T. Sampling and Analysis of Water Streams Associated with the Development of Marcellus Shale Gas. December 31, 2009.

addition, Hays 2009 clearly showed that molybdenum was not a parameter of concern with respect to Marcellus shale drilling fluids.

The PA Chamber also has specific requests or issues with the proposed dissolved oxygen standard and with the temperature rate-of-change standard.

Molybdenum

The DEP is proposing to add molybdenum aquatic life criteria of 1,900 µg/l (continuous – CCC) and 6,000 µg/l (maximum – CMC), and a Human Health criteria of 210 µg/l.

Lack of Basis

At the outset, the PA Chamber questions whether there is a real need to establish molybdenum (Mo) water quality criteria. The PA Chamber understands that the molybdenum standards were developed as a result of a request from one regional office for only one or two NPDES discharges. We believe that this is an inappropriate foundation for developing a statewide standard.

Further, as detailed in the comments filed by the International Molybdenum Association (IMO), the basis for claiming that Mo is a constituent of statewide significance is highly questionable. At the Water Resources Advisory Committee meeting, DEP staff cited to its water quality network data. After that meeting, in response to inquiries, the DEP released the printout of its data base containing what were characterized as representing the results of more than 400 samples from sites in Pennsylvania, with a purported "median value" of 543 µg/L and a 90th percentile value of 8,264 µg/L. A close review of that data reveals a combination of instream samples and what are clearly samples from specific effluent sources --and thus the mean values calculated by the DEP do *not* represent instream values, but rather some averaging of stream values and direct effluent samples. Moreover, of the samples that contained detectible levels of Mo, more than 60% were from one facility--a manufacturing facility in north central Pennsylvania that has since ceased the significant chemical process that previously produced molybdenum bearing wastewaters. Other than the samples associated with that one former discharger, the data set indicates that ambient Mo concentrations in Pennsylvania waters are well below the chronic criteria values advocated by the DEP.

As the DEP is aware, there is no drinking water standard or federal water quality standard for molybdenum. In correspondence between the DEP and U.S. EPA (Moore, 11/29/2006), DEP cited to 25 Pa. Code §16.32 as the basis for developing criteria for threshold level toxic effects for molybdenum. Section 16.32 indicates that DEP will establish criteria for "threshold toxics" under certain circumstances, but will not do so if inadequate data are available to characterize the human health hazard of a chemical. It is notable that in EPA's "National Recommended Water Quality Criteria, 2006," molybdenum is not listed as either a toxic pollutant or a non-priority pollutant. EPA correspondence to DEP (Hakowski, 6/7/2007) specifically acknowledges that molybdenum is a not a carcinogen.

With this background, why should Pennsylvania move forward at this point to establish molybdenum criteria? As explained in comments submitted by IMO and others, the studies upon which the DEP has attempted to justify its proposal are dated, while more recent studies indicating that a number of the "effects" observations cited could not be replicated by other researchers. The values calculated by the DEP are substantially at variance with the most recent scientific data. Absent any pressing problem or need, the PA Chamber believes that the appropriate course would be to step back and spend some concerted effort to examine the evolving scientific literature, and then--only if that literature indicates that molybdenum is a real toxic--set values that are based on the most recent data.

Improper and Inadequate Reference for Human Health Standard

The DEP is attempting to establish the same Human Health standard for molybdenum as was attempted, and rejected by the Independent Regulatory Review Commission (IRRC), during the previous triennial

water quality standard review. The DEP cited the use of the Fungwe et al (1990) study referenced in National Academies Press, "Dietary Reference Intakes for Vitamin A, Vitamin K, Arsenic, Boron, Chromium, Copper, Iodine, Iron, Manganese, Molybdenum, Nickel, Silicon, Vanadium, and Zinc (2000)", (based on the Fungwe study) as a basis for establishing the human health water quality standard for molybdenum.

First, the DEP's reference to the Dietary Reference Intake publication is an inappropriate and unintended use of this document. The purpose of that study was to establish Recommended Dietary Allowances (RDAs) for the nutrients cited in the document. It was not intended to be used to establish either drinking water standards or water quality standards. The study states that lack of molybdenum in the human diet leads to metabolic errors of several key enzymes, which result in neurological dysfunction and mental retardation. The study does establish Tolerable Upper Intake Levels (UL) for most of the nutrients in the study. According to the study, the UL is not a toxicity effect level, but rather an upper level of intake that can be tolerated biologically, and as a reference point to connote that intake levels above the UL will present *no beneficial effect to the individual*. From the study, the intent of the UL was to clearly communicate to individuals who take dietary supplements that "more is not better." It was not intended to establish toxic threshold levels. The UL for molybdenum is 2000 µg per day (2.0 mg per day). The UL for each nutrient is set to protect the most sensitive individuals.

Second, the 1990 Fungwe study referenced in the Dietary Reference Intake publication needs to be very closely examined in light of more recent studies that failed to replicate the Fungwe observations, even at much higher doses of molybdenum. The peer-reviewed studies that are appended to the IMOA comments, along with the results of other studies that are in process, are telling—and suggest that placing reliance on the Fungwe study is unwarranted.

In the preamble to this proposed rule, the DEP cites a public health assessment conducted at the Lincoln Park/Cotter Uranium Mill, Canon City, CO by the U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry (ATSDR)³ in attempting to justify resubmission of the proposed molybdenum human health standard. This document cites as reference levels the Tolerable Upper Intake Levels from the same Dietary Reference Intakes document utilized by the DEP in the previous triennial review. The DEP used ATSDR 2010 to conclude that proposed molybdenum human health standard is justified based on conclusions drawn by ATSDR. But upon review of the molybdenum public health evaluation in section V of ATSDR 2010, these conclusions may be inaccurate or misleading. In section V, ATSDR clearly states the following conclusions:

1. "Therefore, adverse health effects are not expected for the average adult or child who drank from a private well contaminated with molybdenum."
2. "The estimated dose for children and adults at this site did not exceed the Tolerable Upper Intake Level (UL) for molybdenum established by the Institute of Medicine."
3. "People who currently own private wells are not prevented from using their private wells for any purpose. New residents who move to the area may install new wells in the contaminated zone and use their well for any purpose."

In the preamble of the proposed rule, the DEP also interpreted ATSDR 2010 as stating that the molybdenum-sensitive population involves individuals that have insufficient dietary copper. Upon review of the molybdenum public health evaluation in section V of ATSDR 2010, the PA Chamber strongly disagrees with this characterization. ATSDR 2010 evaluated potential copper metabolism interference from high molybdenum with ruminant animals (grazing animals such as sheep or cows). This section of ATSDR 2010 clearly stated that this is an issue unique to ruminating animals due to digestive interactions in the first stomach, and further states that "this interaction between thiomolybdates and copper is not expected to a significant degree in humans."

³ U.S. Department of Health and Human Services, ATSDR, Public Health Assessment for Lincoln Park/Cotter Uranium Mill, Canon City, Fremont County, CO, EPA Facility ID COD042167585, September 9, 2010.

As stated previously, the DEP is proposing the same Human Health criterion that was rejected by IRRC during the previous triennial review. The studies and sources are the same as those utilized to develop this proposed standard three years ago. The PA Chamber studied and commented on those resources and the inappropriate use of that information in a letter to EQB in March 2008. In addition, the DEP's evaluation and conclusions of ATSDR 2010 conflict with conclusions clearly stated by the paper itself in the Public Health Evaluation section. Therefore, since nothing has changed regarding the sources and supporting information for this molybdenum Human Health standard, the evaluation of the ATSDR 2010 appears to be incomplete or inaccurate, and that this standard was previously rejected by IRRC, the PA Chamber questions why the DEP continues to force this very unsubstantiated as well as economically detrimental standard on the Commonwealth. The PA Chamber recommends removing the Human Health standard for molybdenum.

Lack of Sound Science for Aquatic Life Standards

At the same time, the proposed aquatic life standards for molybdenum are purportedly based on a study performed in 2008 by Tetra Tech for the state of Nevada⁴ (Tetra Tech 2008). Since that report, several more recent aquatic life impact studies of molybdenum have been published, including the following: Heijerick D, Van Sprang P. Derivation and Evaluation of partition coefficients for molybdenum in the freshwater environment. IMO. London, UK 2008; De Schampelaere KA, Stubblefield W, Rodriguez P, Vlemingckx K, Janssen CR, 2010. The chronic toxicity of molybdate to freshwater organisms I. Generating reliable effects data. *Sci.Total Environ.* 408(22), 5362-5371; and Heijerick DG, Regoli L, Carey S. 2012a. The toxicity of molybdate to freshwater and marine organisms. II. Effects assessment of molybdate in the aquatic environment under REACH. *Sci.Total Environ.* 435-436, 179-187.

The aquatic life criteria in the more recent Heijerick 2008 study were less restrictive than reflected in the Tetra Tech 2008 study. The principal author of Tetra Tech 2008, Mr. Henry Latimer, reviewed Heijerick 2008 and concluded that the data provided in that report filled and completed data gaps that existed at the time of Tetra Tech 2008, and that the criteria of Heijerick 2008 would be the more appropriate criteria. Based on this information, plus the two additional studies that have been recently published, the PA Chamber believes that the DEP's proposed aquatic life standards for molybdenum are premature, and therefore should be withdrawn from the proposed regulation to allow further study. This additional time for a sound scientific evaluation is very appropriate in that, according to the DEP, the need for this standard is based on, as previously indicated, one regional office requesting a molybdenum standard, and not due to water quality degradation or impairments.

Sulfates and Chlorides

The DEP is proposing an aquatic life standard for sulfates. The proposed standard is the lesser of 2,000 mg/l or the result of a calculated sulfate limit based on receiving stream hardness and chloride content. 25 PA Code Chapter 93 currently has a sulfate water quality standard of 250 mg/l applied at public water supply intakes.

The DEP is also proposing an aquatic life standard for chlorides. Similar to sulfates, this chloride aquatic life criterion is based on receiving stream hardness and sulfate content. Chapter 93 presently has a 250 mg/l standard for chlorides applied at public water supply intakes.

The proposed criteria will target new and existing industry and are based on Iowa Department of Natural Resources chloride and sulfate standards (Iowa DNR, 2009). Iowa DNR 2009 based its sulfate standard on studies performed by the Illinois EPA (Illinois EPA, 2006), while the chloride standard was based on an EPA-contracted study with the Great Lakes Environmental Center and the Illinois Natural History Survey

⁴ Tetra Tech, Inc. Aquatic Life Water Quality Criteria for Molybdenum prepared for the Nevada Division of Environmental Protection. July 9, 2009.

(GNEC, 2008). Both Iowa and Illinois adopted chloride and sulfate standards to replace existing Total Dissolved Solids (TDS) standards.

Statewide Surface Water Protection

In the preamble of the proposed rule, the DEP states (for proposed chlorides and sulfates) that existing criteria were developed primarily for the protection of potable water supplies and is not applied in all surface waters of the Commonwealth. This leaves the impression that there is no current related protection of aquatic life, but that suggestion is not accurate. There is a statewide Chapter 93 standard for osmotic pressure of 50 mOsm/kg that is intended to protect aquatic life from the adverse impacts of parameters such as chlorides and sulfates.

The DEP has indicated that proposed aquatic life standard is needed as a matter of administrative convenience (versus the current osmotic pressure standard) to protect aquatic life. The DEP developed that proposed water quality standard for chlorides because it is better suited to the mass-balance approach in order to maintain the existing osmotic pressure standard, while still retaining the current osmotic pressure standard. Therefore, the DEP was, and is now, developing a water quality standard that achieves the same objective as a current water standard. It is unclear, therefore, why (beyond considerations of administrative convenience) another set of water quality standards for chloride and sulfates is necessary to protect aquatic life. Such protection is already provided by the water quality standard for osmotic pressure.

Indeed, in the comment and response document that the DEP recently prepared in connection with §95.10 wastewater discharge regulations for Total Dissolved Solids (TDS), the department rejected certain comments urging that even more restrictive standards for TDS be adopted to protect aquatic life, expressly stating that “the Department has reviewed the relevant data and determined that the current osmotic pressure criterion in water quality standards regulations provides protection for aquatic life at the point of discharge.”⁵ The 25 PA Code § 95.10 rule adopted in 2010 established end-of-pipe limits for TDS as well as chlorides for any new or expanded discharges containing high concentrations of TDS. In addition, the related technical guidance manual⁶ also recognizes sulfates as a key contributor to TDS that must be monitored and evaluated.

In summary, the current Chapter 93 standards for TDS, sulfates, and chlorides, the existing water quality standard for osmotic pressure, and the Chapter 95 discharge standard for TDS together provide environmental protection for both human health and aquatic life in relation to any potential impact of chlorides and sulfates in all surface waters in the Commonwealth. New and additional aquatic life criteria for these two parameters are simply unnecessary. As stated in the extensive comments provided to DEP on the Chapter 95 TDS issue, if there are localized stream issues with elevated chloride or sulfate levels, then the DEP has current regulatory authority and tools to manage those impacts.

Significant Statewide Economic Impacts

For Pennsylvania industry, the impact from adopting the proposed statewide aquatic life standards for chlorides and sulfates is of serious concern. Promulgation of this proposal would result in extensive financial impacts on regulated dischargers who would be mandated to treat for chlorides and sulfates without environmental benefit for most Pennsylvania waterbodies. Treating effluent for chlorides and sulfates is basically treating effluent for TDS. During development of the Chapter 95 TDS regulations, exhaustive and detailed presentations were made by the PA Chamber, the WRAC TDS Task Force, and many other industries and regulated dischargers that the technologies involved in chloride and sulfate treatment: (1) require various treatment steps in advance of the chloride/sulfate/TDS treatment process to remove materials that would foul or ruin the reverse osmosis and evaporation/crystallization units; (2)

⁵ Comment and Response Document for Wastewater Treatment Requirements (25 Pa. Code Chapter 95). p. 35

⁶ PA DEP. Policy and Procedure for NPDES Permitting of Discharges of Total Dissolved Solids (TDS), Document Number 385-2100-002. November 12, 2011.

involve extremely high energy usage; (3) are extremely costly to install and maintain; and (4) result in the production of substantial volumes of concentrated brine and salt cake waste. Additionally, if the salt cake waste was in contact with a RCRA-listed hazardous waste material during the treatment process, then the salt cake waste would have to be treated as hazardous waste. The costs to Pennsylvania industries for the proposed aquatic life chloride and sulfate standards would equate to billions of dollars per year. Some examples include the following:

- an evaporation/crystallization facility designed to handle 1,000,000 gallons per day of brines would require some 87 million kilowatt hours of electricity annually (the equivalent electric demand of some 11,300 households); plus 262,800,000 cubic feet of natural gas annually, and would generate nearly 60,000 tons of greenhouse gas CO₂ emissions per year.
- For just one power plant, the estimated cost of a brine concentrator and crystallizer to handle air scrubber wastewater is \$62 million in capital, plus \$4.5 million per year for O&M. Multiplied across the fleet of electric generating stations with current and planned scrubber units, and including other plant wastewater streams that may need treated (e.g. cooling tower blowdown, etc.) the chloride and sulfates standards would engender a demand for *approximately 1 billion* dollars in investment for FGD wastewaters alone. If the balance of power plant wastewaters are required to be treated, that cost escalates to \$3 – 7.5 billion.
- A requirement to add chloride and sulfate removal technologies to CWT facilities that service the oil and gas industry will result in potential shutdown of a treatment facility (and subsequent job loss) due to unacceptable costs. This requirement will also substantially impact the conventional oil and gas industry due to the inability to dispose of their production fluids in a cost-effective manner.
- The Department will incur the additional costs to revive its Water Quality Network across the Commonwealth in order to obtain background chloride and sulfate data and establish receiving stream hardness, sulfate, and chloride criteria.

As was explained by the power generating industry (EPGA) during the TDS regulation process, the technology needed to remove chlorides and sulfates has not been developed for use in that industry's applications and is not in commercial use in the United States at flows that commonly occur from many of the electric generation plants in the Commonwealth. The types of wastewater that could be impacted in the power industry include, but are not limited to, the following: FGD purge water, cooling tower blowdown, landfill leachate, demineralizer regeneration water, ash pond effluent, coal pile runoff effluent, and wetland mitigation water. Costs to retrofit these technologies to existing systems are extremely high with no guarantee that the needed reductions will be obtained with that equipment. Further, annual operation and maintenance costs are very high because of the amount of energy, water and chemicals used by these systems. Also, the fact that these systems are not designed for Flue Gas Desulfurization (FGD) wastewater and cooling tower blowdown may create long periods of "down-time" for maintenance and overhaul.

For example in 2010, the Conemaugh Generating Station completed a study designed to evaluate currently available and emerging Zero Liquid Discharge (ZLD) technology and processes and assess their feasibility as FGD wastewater treatment alternatives. The FGD ZLD Technology Study Report was submitted to the Pennsylvania Department of Environmental Protection in July 2010.

The Conemaugh Generating Station is a coal-fired power generating facility consisting of two 900 MW boilers and two steam turbine driven generators. The Station was built in the late 1960s and is located on a 2,500-acre site along the Conemaugh River, 13 miles northwest of Johnstown in New Florence, Pennsylvania. The station burns about 4.8 million tons of Pennsylvania coal per year and operates a wet FGD System to remove SO₂.

Purge water generated from the wet FGD process is currently treated in a wastewater treatment plant (WWTP). The existing FGD WWTP is equipped with flow equalization, pH adjustment, chemical precipitation, coagulation, clarification, neutralization, ion exchange (boron removal), anaerobic biological treatment (selenium removal), aerobic biological treatment, and filtration unit processes. Although this WWTP is equipped with the latest in treatment technologies, the system does not significantly remove dissolved chlorides or sulfates proposed under this rulemaking.

The FGD ZLD Technology Study was initiated in August 2009 and completed in June 2010. The specific ZLD technologies are listed as follows with their final assessment:

1. ZLD Blending System (Pug Mill Blending)

This alternative was an add-on process to the existing Conemaugh wet limestone FGD system. The process relied on a pug mill mixer to blend controlled portions of dewatered gypsum cake, fly ash, quicklime and FGD purge water. The dissolved solids from the FGD absorber system would be captured in the stabilization/fixation process resulting in a blended mixture byproduct suitable for landfill disposal.

The capital cost estimate for the ZLD Blending System was \$70.7MM. The annual net operation and maintenance (O&M) cost estimate was \$3.84MM.

2. ZLD 1 (Softening + RO + Evaporation + Crystallization)

ZLD 1 included softening, reverse osmosis (RO), falling film evaporator (brine concentrator), and crystallization/dewatering centrifuge. A byproduct consisting of dry crystals would be produced for disposal or resale.

An initial conceptual budgetary capital cost estimate for the ZLD 1 process was \$111.9MM. The conceptual budgetary annual net O&M cost estimate for the ZLD 1 process was \$7.3MM.

3. ZLD 2 (1-Stage Evaporation + Brine Solidification)

This was a commercially available evaporation process that would produce an estimated 20 gallon per minute (gpm) brine stream that would be used in the existing fly ash wetting process and disposed of in the existing onsite landfill. The concept has been modified to include lime feed or Portland cement feed to a pug mill wetting process in order to ensure byproduct stabilization.

The capital cost estimate for the ZLD 2 process was \$79.6MM. The annual net O&M cost estimate was \$3.59MM.

4. ZLD 3 (2-Stage Evaporation + Offsite Concentrated Brine Disposal)

This was a commercially available two stage evaporation process that would produce a 10 gpm concentrated brine stream.

The capital cost estimate for the ZLD 3 process was \$73.4MM. The annual net O&M cost estimate was \$9.7MM.

5. Non-Fixated Gypsum Disposal

This alternative required the FGD absorbers to operate at chloride concentrations between 50,000 ppm and 100,000 ppm in order to maximize chloride retention within the unwashed gypsum byproduct. The chlorides are retained in the gypsum by increasing the moisture

content in the unwashed gypsum from approximately 10 percent to 20 percent. The gypsum byproduct would then be landfilled.

This alternative was determined to be technically unattractive due to significant technical and operation issues and potential environmental risks related to the corrosive effects of the potentially high chloride levels in the leachate return system, FGD system, and other exposed systems. A qualitative development of a detailed capital cost and O&M cost was not pursued for this alternative because it did not provide the technical or environmental merits to warrant further evaluation.

Similarly, the PA Chamber has serious concerns regarding potential significant impacts of the proposed sulfate standard on the coal mining industry. Illinois EPA 2006⁷ granted site-specific relief for sulfate "because there are no economically reasonable technologies that remove [sulfate] from water." Illinois EPA 2006 also referred to studies that were being initiated to study coal mine refuse handling practices to minimize or reduce sulfate discharges. Just as Illinois EPA recognized the significant cost to its coal mining industry and the need for additional study, the PA Chamber is concerned that the proposed Pennsylvania sulfate standard will result in a significant financial hardship on the Commonwealth's coal mining industry. Additional Pennsylvania-specific study is required prior to proposing any new sulfate standard.

Lack of Scientific Justification

In addition to the substantial economic burden on the Commonwealth, the DEP has failed to document any pressing threat to aquatic life or human health that would justify the need for establishing statewide standards for these chlorides or sulfates at this time.

The PA Chamber has grave concerns about the lack of specific scientific evidence to justify the inclusion of the constituents and the precedent such an action sets for the entire Triennial Review process.

The DEP has conducted no correlated chemical sampling and analysis, biological surveys or acute bioassays to determine if these constituents should be in this Triennial Review package. Additionally, a review of the DEP's Southwest regional website of chemical analysis data alone provides no support of the need for a statewide standard for chloride and sulfate.

In the July 7, 2012 PA Bulletin notice of the proposed rulemaking, the DEP states that it merely conducted a review/evaluation of the Iowa/Illinois standard. We believe extensive Pennsylvania-specific water quality sampling and analysis, biological surveys, and acute bioassays work should have been completed, given the differences in background ionic makeup between Iowa's and Pennsylvania's waters and the statewide impact to regulated industries, not to mention the economic costs associated with implementation of this proposed rulemaking, which as previously detailed, are the same as those of the originally proposed TDS rulemaking.

While we acknowledge the amount of work that such a comprehensive scientific review entails, in this situation, given the nature of the impact entailed, short cuts should not be taken in scientific approach and decision making.

While PA Chamber members have indicated in the TDS rulemaking and the prior proposed chloride standard proposal their support for a hardness-based approach to determining chloride and sulfate limits if they are truly needed, the proposed Iowa/Illinois standard is being inappropriately utilized. It is not appropriate to just drop the Iowa/Illinois work into Pennsylvania "as is" due to the difference in the ionic makeup of our waters. While the natural ionic makeup of waters in Iowa and Illinois is sodium based, the

⁷ Illinois Environmental Protection Agency. April 2006. Preliminary Technical Justification for Changing Water Quality Standards for Sulfates, Total Dissolved Solids and Mixing Zones.

natural ionic makeup of waters in Pennsylvania is calcium based. One cannot simply transfer studies done for Midwest sodium-based waters to Pennsylvania's calcium-based waters.

This is reinforced by independent comments submitted by Dr. David J. Soucek, Ph.D. from the Illinois Natural History Survey who was contracted to conduct the laboratory toxicity testing on the Iowa/Illinois work. Dr. Soucek has submitted public comments regarding Pennsylvania's proposed rulemaking expressing concerns that if the ionic composition used to develop the Illinois sulfate standard is not reflective of the ionic composition of Pennsylvania streams (which it is not), using the Iowa/Illinois standard "as is" in Pennsylvania would not be accurate.

EPA's May 15, 2012 letter to the DEP with its initial input on the proposed Triennial Review indicated that EPA is working on a national standard. If indeed EPA is working on a standard (and its website indicates no such action), PA Chamber members question why the DEP is taking unilateral action in setting such a standard, the result of which puts Pennsylvania industries at a competitive disadvantage.

The PA Chamber of Business and Industry strongly recommends that the aquatic life standard for chlorides and sulfates be removed from the rulemaking pending sound science and extensive study in Commonwealth waters.

1,4-Dioxane

The DEP has not demonstrated that a statewide 1,4-dioxane ambient water quality criterion (AWQC) at an extremely low level based on uncertain toxicological evidence is warranted, that laboratory methods exist to reliably and accurately measure 1,4-dioxane in complex aqueous samples to concentrations that would demonstrate compliance with the proposed standard and that feasible and cost-effective treatment technologies are available to reduce 1,4-dioxane in potentially complex aqueous samples to concentrations lower than the proposed standard. In addition, it is not apparent that the DEP conducted any analysis to identify potentially affected stakeholders or evaluated the economic impacts associated with the proposed standard. It seems that the only factor the DEP considered in proposing a statewide AWQC was the availability of a new toxicological dose-response value established by USEPA through its Integrated Risk Information System.

1,4-Dioxane is a stable clear liquid that can dissolve almost completely in water and has a broad range of solvent properties. It is relatively non-volatile, does not readily biodegrade in the environment or bioconcentrate in plants, aquatic organisms or animals, and is not highly toxic to aquatic life⁸ (ATSDR 2012).

It is widely used in a variety of commercial and industrial applications as a stabilizer in solvents, in the manufacture of chemicals (e.g., adhesives, cleaning and detergent preparations, deodorant fumigants, emulsions and polishing compositions, lacquers, varnishes, and waxes) and as a laboratory reagent. 1,4-Dioxane is also a trace contaminant in some cosmetics, detergents and shampoos⁹. 1,4-Dioxane is present at some hazardous waste sites, particularly those affected by chlorinated solvents (e.g., Bally Groundwater Superfund Site in Berks County). As a result of its presence in many consumer and commercial products, and at hazardous waste sites, 1,4-dioxane may be ubiquitous in the environment and is likely to be present in both the influent and effluent of publicly owned treatment works (ATSDR 2012).

Failure to Evaluate Impacts

The DEP's proposed ambient water quality criterion (AWQC) has the potential to affect many stakeholders. Because 1,4-dioxane has a wide variety of uses, is present in a number of products, and is a

⁸ Agency for Toxic Substances and Disease Registry (ATSDR). 2012. Toxicological Profile for 1,4 Dioxane. . April 2012.

⁹ National Toxicology Program (NTP). 2011. Report on Carcinogens, Twelfth Edition: 1,4-Dioxane

constituent of concern at some hazardous waste sites, it is likely to be relatively ubiquitous in Pennsylvania. Stakeholders that may be affected by the proposed AWQC include publicly owned treatment works (POTWs), drinking water treatment plants, manufacturing industries, solvent recycling facilities, hazardous waste facilities, and landfills. Facilities with national pollutant discharge elimination system (NPDES) permits throughout the state could be significantly impacted due to monitoring requirements and installation and operation of new advanced treatment technologies to remove 1,4-dioxane.

Lack of Need for Statewide Criterion

At present, the DEP regulates 1,4-dioxane with a site-specific water quality criterion of 3 µg/L which is presented in Chapter 16, Appendix A, Table 1A. The site-specific criterion applies to West Branch Perkiomen Creek in Berks County, a location affected by the Bally Groundwater Superfund Site.

The DEP's current proposed rulemaking would expand the 1,4-dioxane AWQC to a human health statewide criterion. The DEP states, "The Department currently has a human health cancer risk level in Chapter 16, Appendix A, Table 1A. 1,4-Dioxane is used as a solvent in the manufacture of other chemicals. This toxic criterion was developed using the EPA Methodology for Deriving Ambient Water Quality Criteria, which is used to develop statewide criteria and therefore statewide applicability is warranted" (July 7, 2012 Proposed Rulemaking, 42 Pa.B. 4367). Beyond this statement, the DEP provides essentially no supporting information for supporting information to demonstrate that statewide applicability across all surface waters is warranted, nor is any justification provided for the more stringent standard.

The levels of 1,4-dioxane that may be present in groundwater, drinking water and surface water in the Commonwealth of Pennsylvania have not been surveyed. Before moving forward with a statewide AWQC, the DEP should ensure that adequate data have been collected and evaluated to determine what levels of 1,4-dioxane are present in surface and drinking waters of the Commonwealth and whether 1,4-dioxane is present at sufficient frequency and concentrations to create a public health concern.

Position Taken by Other States and Agencies

The DEP has not provided sufficient justification for moving the treatment of 1,4-dioxane from a stream segment specific standard in Chapter 16, Appendix A, Table 1A to a statewide AWQC in Chapter 93, Table 5. The DEP's proposed AWQC is not supported by standards or guideline levels set by the USEPA. The USEPA has not proposed or promulgated federal standards or guidelines for 1,4-dioxane in either surface water or drinking water, even though the Agency added new carcinogenicity information on 1,4-dioxane to its Integrated Risk Information System (IRIS) in August 2010. A search of standards and guidelines for 1,4-dioxane shows that the DEP is the only agency that has recently proposed to apply a human health risk-based concentration for 1,4-dioxane as a statewide surface water ambient water quality criterion. No other state that has recently considered USEPA's revised cancer slope factor for 1,4-dioxane has proposed to apply a human health risk-based concentration to surface water. Several states and organizations, including California, New Hampshire, Connecticut, Maine, Massachusetts, and the World Health Organization, have evaluated EPA's toxicological assessment of 1,4-dioxane and concluded that drinking water criteria were not warranted at levels as low as have been proposed by the DEP. Their conclusions that drinking water criteria at levels as low as 0.35 µg/l bring into further question the validity of the human health standard proposed by the DEP. Drinking water standards are intended to be protective of human health similar to human health water quality criteria.

In December 2011, California considered USEPA's 2010 toxicological assessment of 1,4-dioxane and decided not to adopt a drinking water goal of 0.35 µg/L. Instead, California set a notification level of 1 µg/L. California's notification levels are health-based advisory levels established by the Department of Public Health for chemicals in drinking water that lack maximum contaminant levels (MCLs).

Similarly, the New Hampshire Department of Environmental Services (NHDES), after considering USEPA's revised cancer slope factor for 1,4-dioxane, decided not to adopt a new regulation that would

enforce an ambient groundwater quality standard (AGQS) of 0.35 µg/L¹⁰ (NHDES 2011). Instead, the state retained its current AGQS for 1,4-dioxane of 3.0 µg/L. In New Hampshire, ambient groundwater quality standards are also considered drinking water standards if an MCL has not been set for a particular compound. Unlike the DEP, NHDES did not rely on USEPA's revised cancer slope factor to set a drinking water based guideline level or standard for surface water. Also in contrast to the DEP, New Hampshire collected information to help gauge the potential presence of 1,4-dioxane in drinking water systems in the state and began to compile a list of labs that have confirmed they can analyze 1,4-dioxane in drinking water with a laboratory reporting limit of 0.30 µg/L or less. NHDES is also amending its approvals associated with permitted groundwater discharges and waste management sites to require that groundwater be analyzed for 1,4-dioxane using a reporting limit of 0.30 µg/L or less. In contrast to the DEP, NHDES has adopted a more balanced approach for addressing 1,4-dioxane, stating: "DES intends to assess the additional sampling data obtained from public water systems, groundwater discharge sites, and permitted waste management sites. After developing a better understanding of the occurrence of low concentrations of 1,4-dioxane in drinking water and groundwater throughout New Hampshire, DES can collaborate with stakeholders to formulate and recommend appropriate policies that will achieve an appropriate balance among human health, environmental, and economic impacts."

Connecticut also opted not to base its drinking water action level for 1,4-dioxane on USEPA's new slope factor. In October 2011, the Connecticut Department of Public Health (CTDPH) set a drinking water Action Level of 3 µg/L for 1,4-dioxane¹¹ (CTDPH 2011). At drinking water concentrations below this level, the state does not require treatment or remediation for 1,4-dioxane. At concentrations between 3 µg/L and 50 µg/L, the state has determined that bottled water should be used. Connecticut does not have an ambient water quality criterion for 1,4-dioxane.

The Maine Division of Environmental Health (MDEH) has set a drinking water guideline level for 1,4-dioxane of 4 µg/L¹² (MDEH 2012). The state does not apply this value to surface water. MDEH revisited its 1,4-dioxane Maximum Exposure Guideline (MEG) for drinking water in August 2011, taking into account the revised information available on USEPA's IRIS database at that time. MDEH decided not to change the MEG from the previously published value, although it was rounded to one significant figure. An MEG represents a level of a chemical in water below which there are minimal risks from lifetime ingestion of water.

In 2011, the Massachusetts Department of Environmental Protection (MassDEP) Office of Research and Standards Guidelines (ORSG) developed a drinking water guideline level for 1,4-dioxane of 0.3 µg/L based on USEPA's revised cancer slope factor for this compound¹³ (MassDEP 2011). Unlike the DEP, Massachusetts focused its attention on drinking water (not surface water) and developed a guideline concentration (not a standard). MassDEP states that ORSG drinking water guideline levels are not legally enforceable, but serve as technical guidance to assist officials when they are managing cases of drinking water contamination in order to protect public health. This is contrast to the DEP's legally enforceable proposed water quality standard for 1,4-dioxane.

The DEP proposed water quality standard purportedly aimed at human health protection is also inconsistent with health-protective drinking water guideline levels developed by other agencies and states or identified by scientific researchers. Except for the specific states mentioned above, other states have adopted guidelines, not standards, for groundwater cleanup, or drinking water at 1,4-dioxane levels ranging from 3 µg/L to 85 µg/L¹⁴ (Mohr 2010). The World Health Organization has set a health-based guideline value for

¹⁰ New Hampshire Department of Environmental Services (NHDES). 2011. Environmental Fact Sheet: 1,4-Dioxane and Drinking Water

¹¹ Connecticut Department of Public Health (CTDPH). 2012. Fact Sheet: What You Need to Know About 1,4-Dioxane in Well Water. February 2012

¹² Maine Division of Environmental Health (MDEH). 2012. Well Water Quality

¹³ Massachusetts Department of Environmental Protection (MassDEP). 2011. Current Regulatory Limit: 1,4-Dioxane. <http://www.mass.gov/dep/water/drinking/standards/14dioxan.htm>

¹⁴ Mohr. 2010. Regulation and Risk Assessment of 1,4-Dioxane. Ch. 6 in Environmental Investigation and Remediation: 1,4-Dioxane and Other Solvent Stabilizers. CRC Press

1,4-dioxane in drinking water of 50 µg/L, more than 100 times higher than the proposed DEP water quality criterion (WHO 2005). The Agency for Toxic Substances and Disease Registry (ATSDR) derived a chronic minimum risk level (MRL) of 0.1 mg/kg-day for 1,4-dioxane (ATSDR 2012). The chronic MRL is an estimate of daily human exposure that is likely to be without an appreciable risk of adverse noncancer effects over a long time period of time. Assuming ingestion of 2 L/day of water by a 70-kg adult, this MRL would translate to a drinking water concentration of 3,500 µg/L, a value 10,000 times higher than the proposed DEP standard. Dr. Bruckner, a professor from the University of Georgia and a peer reviewer of USEPA's draft toxicological profile for 1,4-dioxane, noted "I doubt that low, environmentally-encountered levels of dioxane pose a significant cancer risk to humans"¹⁵ (USEPA 2012c, p.28). Dr. Bruckner also commented that "environmental exposure levels are commonly some three orders of magnitude lower than carcinogenic doses in rodents" (USEPA 2012c, p.10). The authors of the study upon which USEPA relied to develop its cancer slope factor, and which in turn the DEP used to calculate the proposed water quality criterion, conclude that drinking water concentrations from 30-50 µg/L are protective of public health (Kano et al. 2009). Even USEPA's risk-based regional screening level concentration for drinking water, which relies on the same IRIS cancer slope factor used by the DEP of 0.1 (mg/kg/day)⁻¹ and a one in one million target cancer risk, is higher than the AWQC proposed by the DEP (0.67 µg/L versus the DEP's proposed value of 0.35 µg/L)¹⁶ (USEPA 2012a). The risk-based drinking water regional screening levels are not standards and do not apply to surface water—they are screening tools used at hazardous waste sites to determine whether further site-specific evaluation may be warranted and to help identify initial cleanup goals at such sites (USEPA 2012a).

Questionable Toxicological Cancer Slope Factor Basis

There are substantial uncertainties associated with the cancer slope factor used as the basis for calculating the DEP's proposed water quality criterion. These uncertainties cast doubt on the DEP's proposed water quality criterion and suggest that the department should not categorically rely on a one in one million target cancer risk level in this case.

USEPA's decision to solely rely on a linear low dose extrapolation model in calculating the cancer slope factor is controversial and likely to overestimate cancer risk at low doses. USEPA concluded that there is uncertainty in the low-dose extrapolation of tumor risk for 1,4-dioxane because of a lack of knowledge about the mode of action (MOA) by which exposure may contribute to an increase in cancer risk (USEPA 2011). The MOA is an important consideration affecting the shape of the dose-response curve when developing a cancer slope factor. Based on its conclusion that there was an absence of adequate information, the agency defaulted to a linear low-dose extrapolation and thus relied on the most conservative dose-response model option for calculating the cancer slope factor. However, according to comments submitted by the US Department of Defense (DOD) on USEPA's toxicological review, DOD, other agencies and almost all of the external peer reviewers of the 1,4-dioxane toxicological assessment did not fully concur with USEPA's decision¹⁷ (USDOD 2010). DOD and other agencies "urged USEPA to consider nonlinear low dose extrapolation since the data indicated it may be justified" (USDOD 2010, p.5). DOD also noted that most of the external peer reviewers concluded that "there were ample data to suggest that the MOA would be nonlinear" (USDOD 2010, p.5). One of the peer reviewers, Dr. Bruckner from the University of Georgia, concluded that "very high repeated doses that saturate the metabolism of dioxane appear to be necessary to cause cellular injury and ensuing regenerative hyperplasia in the nasal cavity, liver and kidney" (USEPA 2012c, p.6). DOD further noted that USEPA's reference to the agency's 2005 cancer guidelines in defense of its decision to only rely on a linear model was not entirely accurate. As DOD indicated, the 2005 guidelines specifically state that a nonlinear model may be supported even if the available data do not robustly support a specific model option. NASA, in its comments to USEPA,

¹⁵ U.S. Environmental Protection Agency (USEPA). 2012c. Peer Reviewer Comments: External Peer Review on the Toxicological Review of 1,4-Dioxane. May 2, 2012.

¹⁶ U.S. Environmental Protection Agency (USEPA). 2012a. Regional Screening Level (RSL) Summary Table, April 2012

¹⁷ U.S. Department of Defense (USDOD). 2010. Department of Defense Comments on the Final Draft Toxicological Review of 1,4-Dioxane (CAS No. 123-91-1). June 8, 2010

commented that reliance on only a linear dose-response model remains a significant issue¹⁸ (NASA 2011). Even the authors of the study upon which USEPA relied for its assessment developed cancer slope factors using both threshold and non-threshold approaches (Kano et al. 2009) and, based on their evaluation, concluded that drinking water concentrations from 30-50 µg/L would be protective of public health. The evidence that 1,4-dioxane is carcinogenic in humans is inadequate. There is no evidence of human carcinogenicity from 1,4-dioxane, a finding that USEPA acknowledges (USEPA 2011). Two well-documented epidemiology studies of workers exposure to 1,4-dioxane are available and these studies did not provide evidence of carcinogenic effects in humans. The evidence of carcinogenicity of this compound is based only on animal studies. In fact, concerns with USEPA's decision to classify 1,4-dioxane as a "likely human carcinogen" have been raised¹⁹ (InsideEPA 2012). Some of the peer reviewers of the agency's toxicological assessment concluded that a classification of "possible human carcinogen" would be more appropriate. Dr. Bruckner concluded that "upgrading dioxane from a possible to a likely human carcinogen under realistic exposure conditions is not warranted" (USEPA 2012c, p.6). Another peer reviewer, Dr. Frederick Miller, commented that the probability of 1,4-dioxane causing cancer is "virtually nonexistent because ambient exposure levels are about 500,000-fold lower than the lowest exposure level used" in the cancer study, and "because 1,4-dioxane is not genotoxic in the vast majority of mammalian assays and does not affect DNA repair" (USEPA 2012c, p.29). USEPA's decision to classify 1,4-dioxane as a likely human carcinogen overstates this compound's potential carcinogenicity.

Additionally, the USEPA cancer slope factor relied on by the DEP is excessively conservative and not consistent with other reported values. USEPA calculated cancer slope factors from data reported by Kano et al. (2009) that cover a range of about three orders of magnitude. USEPA states, "The human equivalent oral CSF estimated from liver tumor datasets with statistically significant increases ranged from 4.2×10^{-4} to 1.0×10^{-1} per mg/kg-day, a range of about three orders of magnitude, with the extremes coming from the combined male and female data for hepatocellular carcinomas (Kociba et al. 1974) and the female mouse liver adenoma and carcinoma dataset (Kano et al. 2009)" (USEPA 2010)²⁰. USEPA then selected the single highest value from this range for 1,4-dioxane, $0.1 \text{ (mg/kg/day)}^{-1}$. This USEPA value is at least 18 times higher than the cancer slope factors calculated by the authors of the study they relied upon. Kano et al. (2009) calculated slope factors ranging from $4.7 \times 10^{-4} \text{ (mg/kg/day)}^{-1}$ to $5.5 \times 10^{-3} \text{ (mg/kg/day)}^{-1}$. The DEP then compounds USEPA's conservatism further by basing its proposed ambient water quality criterion on a one in one million target cancer risk level, rather than consider alternative risk management strategies that, for example, take into consideration the relevancy of a drinking water-based AWQC for specific receiving surface water bodies in the state.

The issues raised by EPA's own peer reviewers regarding the adequacy of EPA's underlying data calls into question whether the DEP's reliance on that data for purposes of establishing an ambient water quality standard for 1,4-dioxane violates the Pennsylvania Data Quality Act that was signed into law by Governor Corbett on July 7, 2011. The Data Quality Act mandates that the DEP not only provide a detailed explanation of how the data were obtained, but it must also explain "why the data is acceptable data." Under the Act, "acceptable data" must be "empirical, replicable and testable data as evidenced in supporting documentation, statistics, reports, studies or research." In that regard, it is not enough for the DEP to simply say it is relying on data generated by EPA. The data must meet the criteria set forth in Pennsylvania's Data Quality Act, and the Act specifically puts the burden on the DEP to prove that the data are "acceptable data". There have been numerous other instances in which the DEP chose not to rely upon EPA data in setting environmental standards for the Commonwealth. One such example is the fact that the DEP has not adopted the vapor intrusion standards developed by EPA. Instead, the DEP developed its own vapor intrusion standards for use by the Act 2 program and the DEP's Cleanup Standards Scientific Advisory Board (CSSAB) has been tasked with determining whether changes are necessary to those vapor

¹⁸ National Aeronautics and Space Administration (NASA). 2011. Comments on the Interagency Science Consultation Draft IRIS Toxicological Review of 1,4-Dioxane (dated May 2011). June 13, 2011

¹⁹ Inside EPA. 2012. Reviewers Belatedly Question EPA's "Likely" Cancer Listing for Dioxane. July 12, 2012

²⁰ U.S. Environmental Protection Agency (USEPA). 2010. 1,4-Dioxane: Integrated Risk Information System. Last revised 8/11/2010

standards. Nowhere in the department's Rationale for the Development of Ambient Water Quality Criteria is there a finding that EPA's data are "acceptable data" for purposes of complying with the Pennsylvania Data Quality Act. As noted above, both Dr. Bruckner and Dr. Miller challenged the data that EPA used to justify the questionable finding that 1,4-dioxane is a likely human carcinogen. Under the Data Quality Act, the DEP needs to do more than simply cite an EPA study when it is proposing new regulatory requirements. It has to reach its own independent determination that the data are "acceptable data." Absent such a determination, the DEP's rationale for the new ambient water quality standard for 1,4-dioxane falls short of what is required under the Pennsylvania Data Quality Act.

In addition to the deficiencies under the Pennsylvania Data Quality Act, the DEP's justification for the proposed ambient water quality standard for 1,4-dioxane falls far short of what is required under the Pennsylvania Regulatory Review Act. Under the Regulatory Review Act, for each new regulatory standard, the DEP must provide an "estimate of the direct and indirect costs to the Commonwealth, to its political subdivisions and to the private sector." As noted elsewhere in this letter, it is unclear whether it is technically feasible to treat 1,4-dioxane to levels below 0.35 µg/l, and the DEP has made no effort to determine the costs of treating 1,4-dioxane to municipalities, municipal authorities and the private sector that will be impacted by the proposed ambient water quality standard. In order to comply with the Regulatory Review Act, the DEP's rationale for the new criteria must include an analysis of the fiscal and economic impacts of the proposed ambient water quality criteria.

Lack of Adequate Clean Water Act Laboratory Analytical Methods

There are several methods for measuring 1,4-dioxane in aqueous samples but none has been formally assessed or approved for use in order to comply with the DEP's proposed AWQC of 0.35 µg/L. This issue must be addressed before proceeding with any new rule because the DEP's proposed AWQC would require monitoring and demonstrations of compliance for a variety of potential sources (e.g., municipal wastewater treatment plants, manufacturing facilities) and for variable aqueous compositions (e.g., surface water, effluent). The DEP should formally evaluate, identify and approve sampling methods that can reliably and accurately measure 1,4-dioxane in the variety of aqueous sample matrices that may be affected by its proposed AWQC at levels low enough to properly document compliance. This is particularly important because it is difficult to accurately measure 1,4-dioxane at below part per billion (ppb) levels. Additionally, matrix effects, such as elevated organic content, could negatively impact and interfere with laboratory analyses for 1,4-dioxane.

In order to comply with an AWQC used in a discharge permit, a method that has been specifically approved for use under the Clean Water Act must be used. Among the available methods for measuring 1,4-dioxane in liquid samples, however, only one has been formally approved by USEPA under the Clean Water Act (EPA Method 1624) and this method has an estimated reporting limit of 10 µg/L. USEPA has developed a method for monitoring 1,4-dioxane in drinking water with estimated reporting limits below 0.2 µg/L (EPA Method 522) but this method has not been formally approved for use under the Clean Water Act. Additionally, actual reporting limits using EPA Method 522 may be variable depending on the composition of the matrix being analyzed. Other approved methods that can measure 1,4-dioxane typically have reporting limits higher than 0.35 µg/L, although some of these methods are not approved specifically for 1,4-dioxane, as shown in the table below. The table is not meant to be a comprehensive review of method capabilities; but, it does demonstrate that methods will yield variable reporting limits and accuracy depending on the specific procedures and instrumentation used at each testing laboratory. The reporting limits for complex aqueous samples, such as wastewater which can contain numerous treatment interferences, may be even higher than the values listed below. At this time, many laboratories do not perform analysis for 1,4-dioxane in the sub ppb range.

Sample of USEPA Methods for Determination of 1,4-Dioxane

Method for 1,4-Dioxane	Program	Estimated MDL Range (ug/l) (a)	Estimated Reporting Limit Range (ug/l) (a)	Additional Information
SW846 8260	RCRA	5 - 25	25 - 100	Standard purge and trap GC/MS
SW846 8260 SIM	RCRA	0.22 - 3	1 - 5	Selected ion monitoring
SW846 8270	RCRA	1 - 5	10 - 20	Standard methylene chloride extraction, GC/MS
SW846 8270 SIM	RCRA		1 - 2	Selected ion Monitoring
EPA 522	Drinking Water		0.05 - 0.2	Solid phase extraction, SIM GC/MS
EPA 1624	CWA		10	VOCs by isotope dilution
EPA 624	CWA (but not for this analyte)	5 - 20	50 - 200	Standard purge and trap GC/MS
EPA 625	CWA (but not for this analyte)	1 - 5	10 - 20	Standard methylene chloride extraction, GC/MS
Modified CLP SOM01.2	CLP		2	Modified Semivolatile analysis

(a) Limit ranges are variable estimates that depend upon the equipment and procedures used with the exceptions of EPA 522, SOM01.2, and EPA 1624, which contain method guidance for these limits.

Other states have recognized the difficulties of measuring 1,4-dioxane in water samples at below ppb levels. California recently set the recommended laboratory reporting limit for 1,4-dioxane in drinking water at 1 µg/L, the same as the State's drinking water notification level, because of the difficulty in monitoring 1,4-dioxane at very low concentrations (CDPH 2011). The reporting limit is the level at which CDPH is confident about quantification for a compound. However, California's reporting limit applies to drinking water not more broadly to effluent or surface water.

The Florida Department of Environmental Protection (FDEP) has studied several analysis methods for 1,4-dioxane but none were demonstrated to be able to reliably and accurately measure 1,4-dioxane at a concentration as low as the DEP's proposed AWQC²¹ (FDEP 2010). Florida has a groundwater action level for 1,4-dioxane of 3.2 µg/L. The state does not have a groundwater or drinking water standard or a surface water standard or guideline for 1,4-dioxane. FDEP concluded that EPA Method 8260C/SIM/ID (8260 with selective ion monitoring and isotope dilution) can only marginally achieve an MDL of 3.2 µg/L and, assuming a practical quantitation limit (PQL) of 4 times the MDL, would not be able to consistently provide data below the Florida action level. FDEP found that EPA Method 522 yielded an MDL of 0.1 µg/L and a PQL of 0.4 µg/L. Although FDEP concluded that this method could be used to analyze groundwater, drinking water and surface water samples, the Agency did not formally approve the method for any specific regulatory application. They also noted that EPA Method 522 has a narrow application for only one compound whereas other methods allow testing for multiple constituents.

The DEP should also compile a list of Pennsylvania laboratories that, based on actual experience with heterogeneous water samples, can reliably quantify 1,4-dioxane at levels necessary to be able to demonstrate compliance with a new AWQC. This task may, however, be difficult. A survey by Mohr (2010) revealed that commercially available methods to precisely and accurately measure 1,4-dioxane in groundwater at below ppb levels were not available. New Hampshire has begun to compile a list of

²¹ Florida Department of Environmental Protection (FDEP). 2010. Technical Bulletin: Analytical Methods and Recommendations for the Analysis of 1,4-Dioxane. October 2010

laboratories but their efforts have focused specifically on analysis of 1,4-dioxane in drinking water, not surface water or other types of aqueous samples (NHDES 2011).

Another issue that the DEP has not addressed relates to the specific type of analytical result limit that would be used to demonstrate compliance with a new AWQC. Specifically, the DEP should evaluate and provide detailed information on the analytical limits that would be required to demonstrate compliance (e.g., method detection limits, practical quantitation limits and/or reporting limits). When comparing a sample analytical result to a numeric standard, the DEP would want to have some assurance of the qualitative reliability of the sample result. This would imply that a quantitation limit would be put into use and that the quantitation limit would be supported with knowledge of the precision and bias achieved at that limit by way of laboratory quality control data measured at those concentrations.

Lack of Feasible and Cost-effective Treatment

The properties that make 1,4-dioxane difficult to analyze also make it difficult to treat. For example, 1,4-dioxane is not easily removed from water using conventional treatment techniques (e.g., air stripping, carbon adsorption, reverse osmosis, and ion exchange). Remediation technologies commonly used for solvents and treatment technologies commonly used at wastewater treatment plants are not highly effective at removing 1,4-dioxane (Mohr 2010). Yet, the DEP did not investigate the availability and potential costs of treatment technologies for 1,4-dioxane that might be needed to ensure compliance with the proposed AWQC.

There are some removal technologies, such as advanced oxidation, that are effective for 1,4-dioxane, but these have not been widely evaluated for application to surface water or industrial effluent waste streams or demonstrated to be capable of consistently reducing concentrations below 0.35 µg/L. For example, NHDES investigated information related to the treatability of 1,4-dioxane in drinking water (not effluent or surface water) and concluded the following: "Suitable treatment methods are not known to be readily available for reducing 1,4-dioxane in drinking water to a concentration that is below 0.35 µg/L. Granular activated carbon has been used by some drinking water systems to reduce the concentration of 1,4-dioxane to concentrations of less than 3.0 µg/L, but the performance of these treatment systems has not been consistently reliable. Research has shown that treatment methods using various combinations of ultra-violet light, ozone and hydrogen peroxide have been very effective in reducing the concentration of 1,4-dioxane in drinking water although studies have not generally focused on reducing the concentration of 1,4-dioxane below 0.35 µg/L."

Even if treatment of 1,4-dioxane in water to levels below 0.35 µg/L was technically feasible, such treatment could carry a high capital and operating cost and, for some affected facilities, costs could be prohibitive. Despite the likely significant economic implications of the DEP's proposed rule, the department apparently did not conduct a thorough regulatory or economic impact analysis to properly assess the impacts of a new statewide AWQC for 1,4-dioxane. The PA Chamber recommends removing the proposed standard for 1,4-dioxane pending further study and evaluation of these extensive concerns.

Dissolved Oxygen Conflict with Designated Use

The proposed changes to 25 Pa. Code Chapter 93 for dissolved oxygen standards to achieve consistency with EPA's risk level assessment and associated dissolved oxygen criteria are generally supported by the PA Chamber. The PA Chamber supports the change from discrete minimum daily averages to 7-day averages as this standard is more representative and better captures the temporal variability in streams and water bodies. However, the PA Chamber requests that the DEP consider potential implications of higher 7-day average and minimum dissolved oxygen requirements for the DO₂ and DO₃ specifically as they relate to water bodies throughout the Commonwealth where natural stream conditions, without anthropogenic point source discharges, exist that may not meet these revised criteria.

Temperature

For the triennial review of water quality standards and rulemaking, the DEP has indicated that it is reviewing the rate of temperature change provision in the temperature criteria found in Table 3—which states that “...these wastes may not result in a change by more than 2°F during a 1-hour period.” The preamble to the proposed rule states: “[T]he Board is seeking technical and scientific information, data and studies regarding the rate of temperature change and its effect on aquatic organisms. Only peer-reviewed or site-specific collections of acceptable quality will be considered.”

Site-specific data show that the rate of temperature change criterion cannot be met under naturally occurring conditions even during periods of no point source discharge. Similarly, instream temperature studies at a cement plant along the Lehigh River found swings in upstream instream temperatures (both upward and downward) that frequently exceeded the 2 degrees F per hour value contained in the current Pennsylvania regulations.

Several literature reviews have not been successful in discovering any scientific basis or support for the existing change in temperature criterion. Since there is no available basis for the temperature criterion, it is appropriate that the DEP retain this criterion.

In May 2009, PPL Corporation submitted to the DEP a report entitled, “Evaluating the Seasonal Effects of Short-Term Temperature Fluctuations on Macroinvertebrates and Fish in the Susquehanna River near the Brunner Island Steam Electric Station.” The DEP has had the report for review since that time. The report details a carefully controlled laboratory study of the effects of temperature change on aquatic organisms that has generated a body of scientific evidence that has not been available previously. The PA Chamber requests that the report be considered by the DEP in its evaluation of a revised temperature criterion.

The PA Chamber of Business and Industry appreciates this opportunity to comment on the proposed Chapter 93 water quality standards regulation.

Sincerely,



Samuel Denisco
Vice President, Government Affairs

cc: Ms. Kelly Heffner, Deputy Secretary, Water Management