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June 14, 2010

Via E-Mail to: RegComments@state.pa.us

Environmental Quality Board
Rachel Carson State Office Building
16th Floor, 400 Market Street
P.O. Box 8477
Harrisburg, PA 17105-2301

RE: 25 PA. CODE CH. 93
Ambient Water Quality Criterion; Chloride (Ch)
[40 Pa.B. 2264]
Saturday, May 1, 2010

Dear Members of the Board:

CONSOL Energy Inc. (CONSOL) submits these comments to the Environmental Quality Board (EQB) in response to the above referenced amendments to 25 Pa. Code Chapter 93 proposed by the Department of Environmental Protection (DEP)

CONSOL operates four underground coal mines in Pennsylvania. In addition, CONSOL operates a number of mine water treatment plants in Pennsylvania for the purpose of maintaining mine pools at levels low enough to prevent uncontrolled discharges of mine water to streams and rivers. CONSOL's Pennsylvania employees number over 2300 with an annual payroll of nearly $300 million. Annual taxes paid to state and local governments are nearly $200 million. CONSOL also operates the only privately held coal research facility, located in South Park Township, Allegheny County, Pennsylvania, that is working with the US Department of Energy on clean coal advanced technologies.

Pennsylvania is the 4th leading coal producing state and its mining industry is a major source of employment and tax revenue. Last year, it created 59,970 direct and indirect jobs with a total payroll in excess of $2.2 billion. Taxes on these wages netted over $720 million to the coffers of federal, state and local governments.

CONSOL also has subsidiaries that produce gas from conventional wells, from coalbed methane wells and from the Marcellus shale formation wells. Both the coal and gas operations produce water that may contain chlorides. Thus, the proposed instream aquatic life water quality criteria for chloride are of vital interest to CONSOL.

CONSOL requests that the proposed amendments not be approved because the Department failed to conduct an adequate scientific analysis to determine the appropriate water quality criteria to protect aquatic life and to also minimize the economic impact of the proposed amendments on the Commonwealth and its citizens. Instead of relying upon the latest scientific information, which the Department is required to do under Section 304(a)(1) of the federal Clean Water Act, the only scientific inquiry the Department made was rely upon EPA's *Ambient Water Quality Criteria for Chloride* (EPA 1988) and to agree with the EPA development document for the 1988 Criteria Document. This reliance is misplaced because of significant scientific information that has been developed since 1988. Additionally, the 1988 Criteria Document does not establish national criteria, but instead merely sets out criteria that were recommended 22 years ago and which are not binding on any state.

Even before the 1988 Criteria Document was finalized, information was being developed which showed the limitations of the then proposed chloride criteria. Since that time, much additional information has become available on chloride toxicity, all of which was ignored by the Department when they proposed to accept the outdated criteria from the 1988 Criteria Document. For a detailed discussion of the currently available scientific information and how recalculation of the acute and chronic chloride criteria using EPA's recalculation procedure would result in instream aquatic life criteria of approximately 1200 mg/l chlorides acute and 800 mg/l chlorides chronic, please see the attached *Synopsis of Information on Chloride Toxicity Prepared to Assist in Review of Pennsylvania/s Proposed Chloride Rules.* Without higher scientifically based instream limits unnecessary economic burdens will be imposed on the regulated community.

In addition to the comments contained in this letter and the information contained in the attached Synopsis, CONSOL joins in the comments of the Pennsylvania Coal Association.

CONSOL appreciates the opportunity to submit these comments. Please contact the undersigned if there are any questions.

Sincerely,

Stan Geary

Stan Geary
Senior Counsel

Enclosure

SYNOPSIS OF INFORMATION ON CHLORIDE TOXICITY PREPARED TO ASSIST IN REVIEW OF PENNSYLVANIA'S PROPOSED CHLORIDE RULES

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Project No. 0101-09-0408

June 15, 2010

POTESTA

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SYNOPSIS OF INFORMATION ON CHLORIDE TOXICITY PREPARED TO ASSIST IN REVIEW OF PENNSYLVANIA'S PROPOSED CHLORIDE RULES

1.0 BACKGROUND

The information presented herein was prepared to support a review of the Pennsylvania Department of Environmental Protection's (DEP) proposed chloride rules (40 Pa.B. 2264), published in the *Pennsylvania Bulletin* on Saturday May 1, 2010. The information contained in Section D, Background of the Preamble to the proposed amendments, is sparse and misleading. As several states (Iowa, Illinois, Ohio and others), and the EPA themselves have questioned the appropriateness of the current national recommended criteria, it is misleading not to provide a synopsis of this readily available information in the Preamble.

Much of the information presented herein has been compiled to support recalculation of the water quality criteria for chloride for watersheds located in the central Appalachian and the Western Allegheny Plateau eco-regions using updated data (available since the original recommended criteria were calculated 22 years ago), and the consideration of resident taxa. This recalculation included correcting data from the previous calculation as well as expanding the database used for the calculation and the deletion of nonresident species. The proposed criteria resulting from the recalculation were 1200 and 800 mg/l Cl^- as acute and chronic criteria, respectively. The protectiveness to aquatic life of changes to the 1988 criteria was supported using an extensive survey of peer-reviewed literature, much of which is described herein.

2.0 CHLORIDE WATER QUALITY STANDARDS

Section D of the Preamble indicates that chloride occurs naturally in the aquatic environment and that freshwater fish and aquatic communities cannot survive in elevated concentrations of chlorides, but fails to describe the importance of chlorides in natural systems. Chloride is widely distributed in nature, usually occurring either as a dissolved anion or as a solid in the form of calcium, magnesium, sodium chloride or potassium chlorides (salts). It is an **essential element** for aquatic and terrestrial organisms that is involved in maintaining proper osmotic pressure, water balance, and acid base balance in animal tissues (Government of British Columbia, 2003). Chloride salts are extremely water soluble; easily cross cell membranes, and are generally excreted from animal tissues via the kidneys, or equivalent renal organs, to achieve osmoregulatory balance. Thus, aquatic organisms are designed to regulate internal chloride levels and to use their ability to regulate ion concentrations, within an acceptable range, to maintain other internal conditions. Because chloride can be excreted as necessary, bioaccumulation potential is low, and the toxic effects of chloride salts generally result from elevated or fluctuating chloride levels causing osmoregulatory imbalance which leads to impaired survival, growth, or reproduction (Government of British Columbia, 2003).

Section D in the Preamble notes that maintaining a proper salt-to-water balance in a freshwater environment challenges most aquatic life, but does not clearly describe that the "challenge" is because freshwater chloride concentrations are often very low, creating a situation where the organism must expend significant energy to actively "collect" chloride ions that are useful in maintaining the proper osmoregulatory balance. Although Section D does indicate that macroinvertebrate actively transport chloride ions in and out of their bodies, it does not make the point that the addition of chloride ions to aquatic systems is not inherently unfavorable. The referenced "disruption in water balance and ion exchange....causing stress or death" can occur when chloride concentrations are EITHER too high or too low, basically when the concentrations fall outside of the range of concentrations which the organisms prefer and/or can tolerate.

Chloride is elevated in natural systems primarily as a result of deicing salt, urban and agricultural runoff, discharges from municipal wastewater plants and industrial plants, and the drilling of oil and gas wells (USEPA, 1988). Chloride in mine water tends to be elevated due to weathering of increased rock surface area, concentration of naturally occurring chlorides in treatment plants where water is re-circulated, or in underground mines where saline groundwater is encountered.

The aquatic life chloride water quality criteria proposed to be adopted for the Commonwealth of Pennsylvania were derived from the USEPA's recommended water quality criteria for chloride of 230 mg/l for chronic aquatic life, and 860 mg/l for acute aquatic life protection. Section D of the Preamble indicates that the Pennsylvania Department of Environment Protection (Department) has reviewed the EPA's ambient water quality criteria development document for chloride (Criteria Document) and agrees with the data analysis, interpretation, and methods used to develop the criteria. This statement irresponsibly ignores the plethora of more recent data, some of which directly dispute the accuracy of the 1988 Criteria Document. The acute criterion was developed based on a limited database of only 12 species with the chronic criterion based on three acute-to-chronic ratios (ACR) (USEPA, 1988). One of the ACRs used in the document has been shown to be flawed and has been revised. Several states have calculated different chloride criteria since 1988 using new and alternative data. Studies conducted by Birge, et al., in 1985 indicated that chlorides tested in laboratory water produced twice the toxicity as when natural waters were used. Based on this information, the Kentucky Natural Resources and Environmental Protection Cabinet adopted the criteria recommended by the Birge study which consist of an acute criterion of 1200 mg/l and a chronic criterion of 600 mg/l. The State of Wisconsin also developed its own toxicity data which was used in conjunction with the EPA database in determination of standards and considers biological survey data in determining when to impose Water Quality Board limits for chloride. A more thorough description of the limitations of the 1988 criteria document, which the Department has failed to recognize, is given below.

3.0 CRITERIA FOR CHLORIDES

Currently, the nationally recommended water quality criteria are an acute criterion of 860 mg/l and a chronic criterion of 230 mg/l, based on the USEPA's 1988 document. These criteria have been shown to be flawed based on:

- Updates to the ACR used for chronic criterion development.
- Discovery of contamination of salts used in older toxicity testing.
- Development of standard testing methods which improved test acceptability.
- General expansion of the limited database used in the original criteria calculation.

Additionally, work conducted by Wes Birge (University of Kentucky) has indicated a higher toxicity of chlorides in laboratory water as compared with natural water, and the presence of healthy aquatic communities in a second order stream at higher chloride concentrations. More recent work by Soucek (2005 and 2007) and Mount (1997) has supported this finding by demonstrating that toxicity occurs from an ion imbalance if single salts are "spiked" into laboratory water. For these reasons, which are described in greater detail below, the recalculation of the chlorides criteria is appropriate and warranted.

3.1 Contaminated Salts and Updated Methods

The last 20 to 25 years have seen great advances in the development of whole effluent toxicity tests (WET tests) traditionally employed in developing water quality criteria for single constituents. Tests done decades ago had variable methods and were not subject to quality-assurance procedures necessary to generate acceptable data today. Tests were not standardized for such things as control mortality, temperature control, or the culturing methods of test organisms as they are now. For these reasons, data generated prior to the incorporation of standardized methods (first published by the USEPA in 1975 and updated in 1978, 1985, 1993 and 2002) should be used with caution and great attention to the methods. For example, the Ambient Water Quality Criteria for Chlorides (1988) (Criteria) specifically excluded data from literature that did not describe their test procedures, used inappropriate dilution waters, conducted tests without controls or had high control mortality, or did not provide other relevant information. Also of concern, with respect to earlier testing, was the purity of reagents used to produce test solutions and testing and culturing water due to limitation in analytical methodology. The Illinois Environmental Protection Agency has indicated that, when salts were tested, particularly those requiring a high level to produce a response, heavy metal contamination in the reagents was likely and might have contributed to the toxicity ultimately seen in the tests (IEPA, 2007). For these reasons, the incorporation of newer data into the database used to calculate the water quality criterion is appropriate and warranted.

3.2 Acute-to-Chronic Ratio Updates

In recent work on sulfate by the Illinois EPA, it was concluded that common salt is not a toxicant in the category of heavy metals, pesticides or other toxic substances. With regard to chronic toxicity, it was concluded that, if an organism can withstand the osmotic shock initially, it will probably continue to survive and function at a given sulfate level indefinitely (IEPA, 2007). This is similar to the United States Environmental Protection Agency's conclusions regarding chloride salts that, if freshwater animals do not die within the first 24 hours of the test, they will probably not die during periods ranging from 48 hours to 11 days (USEPA, 1988). Due to the propensity of organisms to acclimate to increased ion concentrations, if not immediately lethal, ACRs for exposure to chlorides would be expected to be fairly low. The ACRs used to calculate the chronic standard in 1988 were 3.951, 7.308, and 15.17 for *Daphna pulex*, rainbow trout and fathead minnows, respectively. Newer data summarized by the Iowa Department of Natural Resources (DNR) (June 2007) indicated that the unexpectedly high 15.17 ACR for fathead minnows has not been substantiated in subsequent testing. Separate evaluations by Wisconsin State Laboratory of Hygiene and National Exposure Research Laboratory in Cincinnati, Ohio (Pickering, 1996) have produced higher chronic values and lower ACRs. The two independent labs have produced ACRs of 2.39 and 1.96 which have a geometric mean of 2.16. Substituting this value for the anomalous value, and utilizing a newly-calculated ACR for Ceriodaphnia (WISLOH, 2007) to replace the rainbow trout, which is a coldwater species, provides a final acute-to-chronic ratio (FACR) of 3.16, rather than the value of 7.594 used in the original 1988 calculation. The ACR can be further updated to include the expanded database as described below.

3.3 Expanded National Dataset

The database of toxicity tests used in 1988 to calculate the current standard has expanded substantially since that time, allowing for a more accurate calculation of protective criteria. The original chloride criteria calculations involved 12 genera, with Daphnia being the most sensitive taxa. Major points from the original calculation include the finding that 24- and 48- hour acute tests could be used in conjunction with the 96-hour acute tests recommended in the USEPA's criteria development guidance document (1985) because the acute values changed little from the first 24 hours (USEPA, 1988). The Criteria went on to conclude that if freshwater animals do not die within the first 24 hours of the test, they will probably not die during periods ranging from 48 hours to 11 days (USEPA, 1988). The Criteria also found that invertebrates were generally more sensitive than vertebrates and that sodium chloride was an appropriate chloride salt for use in calculation of the criteria. Most anthropogenic chloride in ambient water is associated with sodium and a more extensive database exists for this chemical as compared to other chloride salts; although chlorides associated with potassium, magnesium, and calcium are generally more toxic to aquatic organisms (USEPA, 1988). Additionally, sodium is the most common cation in stream water associated with the outfalls described herein. Another significant contribution of the 1988 Criteria Document was the general description of available data which was acceptable for use in criteria calculation.

The national dataset (ECOTOX) currently available for consideration in generating water quality criteria contains over 500 data points for sodium chloride toxicity representing 54 organisms. The USEPA maintains this comprehensive toxicity database which provides information on adverse effects of chemical stressors to both aquatic and terrestrial species. The primary sources of data for the ECOTOX database are peer-reviewed literature sources; however; it also includes data from the USEPA, US Geological Survey and other organizations. As the database is used for the derivation of water quality standards, it has focused on encoding standard calculated test endpoints, such as the LC50 (ECOTOX website). The database is generally updated quarterly.

4.0 RECALCULATION OF THE CHLORIDE CRITERIA WITH THE EXPANDED NATIONAL DATASET

Clearly, the Department is remiss in their statement that it agrees with the data analysis, interpretation, and methods used to develop the 1988 chloride criteria. For the above-stated reasons, updated chloride criteria are warranted. The mechanism for updating water quality criteria using the current national database is provided by the USEPA. It is the Recalculation Procedure (USEPA-823-B-94-001). The recalculation procedure involves making corrections and additions to the national dataset and may be used to update criteria or to create site-specific criteria. The latter application involves deleting species if they are not found in a specific area or at a specific site. Using the recalculation procedure to develop site-specific criteria develops criteria which are intended to come closer than the national criteria to providing the intended level of protection to the aquatic life, usually by taking into account the site-specific biological and/or chemical conditions (USEPA-823-B-94-001). A recalculation procedure was recently designed for streams located in the central Appalachian and the Western Allegheny Plateau eco-regions. For the purpose of developing this site-specific criterion, the database was corrected and updated to include additional data. The deletion procedure was implemented to develop site-specific criteria using resident taxa. The dataset satisfied the applicable minimum data requirements for the Eight-Family Rule. As described previously, the newly-calculated criteria for the streams would be 1,200 mg/l and 800 mg/l chlorides, as acute and chronic criteria respectively. It is anticipated that implementing the recalculation procedure to calculate updated criteria for Pennsylvania would result in similar increases from the outdated criteria.

4.1 Summary of Updated Database

Even before the 1988 Criteria Document was finalized, information was being developed which showed the limitations of the then proposed chloride criteria (Birge, et al, 1985). Since that time, much additional information has become available on chloride toxicity, all of which was ignored by the Department when they proposed to accept the outdated criteria. The following discussion is a summary of available peer-reviewed scientific data or agency-generated data which should be considered in the development of chloride criteria.

Although the national dataset are described as being updated quarterly, there is generally a lag between current literature and data included in the database. As such, the most current data in the database was published in 1999 and many recent studies on the toxicity of chlorides and other salts are not included. Attention has recently focused on salinity and dissolved solids toxicity, in part, because the toxicity of significantly toxic chemicals has been well characterized and, in part, because of recognition of toxicity associated with high-dissolved ions such as in produced brine waters, road salt runoff and treated mine discharges. The discussion below focuses on summarizing the findings of recent literature, some of which may not be included in the recalculation procedure discussed herein.

Studies on salts in general (without specific chloride information) are used in the present discussion to evaluate the relative sensitivities of benthic macroinvertebrates. Toxicity levels are variable, just as ion toxicity is variable, based on specific ion toxicity and relative ion concentrations (Goodfellow, et al, 2000). Where possible, studies are included which report results in mg/l chlorides. However, when studies reporting toxicity of organisms to NaCl are included, they must be evaluated based on the relative chloride ion concentration which is about 60 percent of the total concentration. For consideration, when reviewing the toxicity data, Horrigan and others (2007) found that organism occurrence in salinity-affected streams generally correlates well with laboratory toxicity values.

Exposure to road salt runoff has prompted studies to determine the effects of sodium chloride in laboratory and field settings. A study by Blasius and Merritt (2002) summarized available toxicity data for aquatic macroinvertebrates and contributed additional data. Separating the data into those collected prior to the early 1980s and later data (due to the possible contamination mentioned above) indicates the following information from the older data: No effect on drift or mortality for *Gammarus psuedolimnaeus* at 800 mg/l NaCl concentrations, no mortality after 10 days of exposure of *Hydropsyche betteni, H. bronta*, and *H. slossonae* to 800 mg/l NaCl, some drift of organisms in field studies at concentrations greater than 1,000 mg/l NaCl and no effect on drift or mortality of *Hydropshyche betteni* and *Cheumatopsyche analis* at a concentration of 1,650 mg/l NaCl. Organism mortality was observed at high concentrations of the salt such as 80 percent mortality to *H. betteni* exposed to 6,000 mg/l NaCl (3,600 mg/l Cl^-), 100 percent mortality of *Chironomus attenatus* exposed for 12 hours to 9,995 mg/l (5,997 mg/l Cl^-), and 100 percent mortality for 48 hour exposure of *Nias variabilis*, *Cricoptus Trifascia* and *Hydroptila angusta* to 3,735, 8,865 and 10,136 mg/l NaCl, (2,241, 5,319, and 6,082 mg/l Cl^-) respectively. These data indicate no effects at lower concentrations and that significant salt concentrations are necessary to generate toxicity. Clearly, even in the older dataset, organisms common to Pennsylvania streams, such as Cheumatopsyche, Hydropsyche, Chironomus, Hydroptila, and Gammarus, exhibit effects at chloride concentrations much higher than the proposed criteria and would be protected at the 1,200 mg/l and 800 mg/l chloride criteria (as acute and chronic criteria) which were proposed in the aforementioned recalculation procedure.

Later studies, likely undertaken with less contamination of the testing material, indicated similar growth rates among different treatments for *Hexagenia limbate* at concentrations of 0, 2,000, 4,000 and 8,000 mg/l NaCl. LC50 values were 2,400 and 6,300 mg/l NaCl at 28° and 18°C for 96-hour exposures which provides a species mean acute value of 2,333 mg/l Cl^- for this traditionally sensitive organism. Similarly, *Tricorythus* had LC50 values greater than 1,568 mg/l Cl^-. Laboratory experiments indicated no significant drift for *Hydropsyche betteni* at 2,000 to 8,000 mg/l NaCl and mortality was observed for *H. betteni* at 13,308 mg/l (LC50). *Lepidostoma sp, Nemoura trispinosa, and Gammarus psuedolimnaeus* exhibited mortality of 50 percent, 70 percent and 100 percent at concentrations of 6,000mg/l NaCl (3,600 mg/l Cl^-) in 96-hour exposure periods. Again, the genera described herein are common sensitive organisms in streams of Pennsylvania. The most sensitive organisms, the mayfly taxa, still report conservative LC50s (higher temperatures) which are above the water quality criterion calculated using the recalculation procedure.

A summary paper by Kefford and others in 2003 reported on the tolerance of freshwater macroinvertebrates to salts in general and found that the most salt-sensitive groups were Baetidae, Chironomidae, and several soft-bodied non-arthropods (Oligochaeta, Gastropoda, Nematomorpha, Tricladida, and Hirudinea). Other salt-sensitive groups, from least to most tolerant, included: Non-baetid Ephemeroptera, Plecoptera, Trichoptera, Corixidae, non-corixid Hemiptera, Coleoptera, Hydracarina, Odonata, and macrocrustaceans (Decapoda, Isopoda, and Amphipoda). Similarly, Dunlop, et al. (2007), evaluated salinity tolerance of 102 macroinvertebrates in Eastern Australia and found the most sensitive to be a mayfly from the family Leptophlebiidae, followed by a representative of the family Baetidae. Chronic testing in the AQUIRE database, using a Baetid mayfly, puts the effect concentration in the 4,500 to 8,000 mg/l NaCl range (2,700 to 4,800 mg/l Cl^-) for these organisms which Kefford found to be the most sensitive. The species geometric mean for the Baetid mayfly in the national dataset is 3,661 mg/l Cl^- and is well above the 230 mg/l Cl^- chronic criteria proposed in the Preamble and the calculated chronic criteria of 800 mg/l chlorides proposed in the aforementioned recalculation. Chironomidae were represented in the original 1988 database with a species mean acute value of 4,900 mg/l Cl^- and are represented in the new AQUIRE database with a similar genus geometric mean value of 4,952 mg/l Cl^- and a single chronic value of 6,000 mg/l Cl^-. Soft-bodied arthropods were represented in the original dataset by a snail (Physidae) with a species mean acute value of 2,540 mg/l Cl^- and are well represented in the newer database by snails, mussels, nematodes, oligochaetes, and leeches.

Horrigan and others (2007) also reported Leptophlebidae to be the most sensitive family, followed by: Notonectidiae, Baetidae, Caenidae, Calamoceratidae, Corixidae, Chironomidae, and Physidae, which were also determined to be sensitive to salinity. In their study comparing laboratory and field-derived salinity-tolerance data, Horrigan and others found LC50s were correlated with maximum salinity at which species were collected in the field. They concluded that laboratory studies of acutely lethal salinity tolerances are predictive of the salinity levels that macroinvertebrates are known to inhabit in the field.

In 2004, Benbow and Merritt conducted testing on road salt with four species, *Callibaetis fluctuans, Choaborus americanus, Physella integra,* and *Hyallela azteca,* and found acute (96-hour) LC50s greater than 5000 mg/l road salt for the mayfly and the mollusk and greater than 10,000 mg/l salt for the dipteran and the amphopod. In 15-day exposures, the mortality of mayflies was never greater than 30 percent at concentrations less than 10,000 mg/l salt. For the dipteran and the amphipod, 16-day mortality was generally less than 20 percent under all road salt concentrations, and the mollusk had no 15-day mortality at road salt concentrations less than 5,000mg/l NaCl. The estimated 96-hour LC50s for the organisms of >5,000mg/l or >10,000 mg/l NaCl corresponds to chloride ion concentrations of >3,000 mg/l and >6,000 mg/l chloride.

In a study conducted to evaluate the effect of current on toxicity in laboratory testing, Baetidae were exposed to sodium chloride solutions of varying concentration with multiple flow regimens. Lowell and others (1995), report that previous studies have shown that freshwater animals are fairly similar in their sensitivity to NaCl with EC50s and LC50s ranging from 3.3 (Daphnia) to 10.2 g/l (Culex) in studies utilizing the Baetid *Centroptilum*, the Dipteran *Culex*, Crustaceans (*Daphnia*), and fish (*Pimephales promelas, Carassius auratus*). Their findings are similar to those reported literature values, which places the Baetidae less sensitive than Daphna but more sensitive than the other organisms. Lowell, et al. (1995) also report that their data supports previous studies which indicate that NaCl toxicity does not change much with increasing time of exposure and, in fact, a flat sensitivity versus time curve appears to be a general feature of freshwater animals exposed to high concentrations of NaCl.

Consideration of the above-described literature supports several conclusions. First, the data pertaining to the toxicity of chlorides is not sparse. Due to the reference toxicant status of sodium chloride, and recent interest in road salt and brine water toxicity, a substantial database exists for chloride. Second, chlorides have been demonstrated, in multiple studies, to produce toxicity primarily in the first 24 hours of exposure. This finding has significant implication for the establishment of chronic criteria, particularly when the current criterion was established based on unsubstantiated (now corrected) data. Third, of significance, is the finding from field surveys that benthic organisms begin to disappear from in-stream communities at chloride concentrations similar to those predicting toxicity in laboratory studies. This finding supports the conclusion that criteria established, based on toxicity testing (as described in the 1985 Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses (USEPA, 1985)), will be protective of aquatic communities in the streams.

These three points support the finding that development of updated chloride criteria is warranted and that reliance on the outdated Criteria Document is unjustified. These data further support that updated criteria, which are higher than the existing criteria, can be shown to be protective of the aquatic life use in the streams because the size of the database, and the number of organisms represented, gives confidence that it is representative of the organisms in the streams.

4.2 Toxicity to Resident Organisms

Pennsylvania's topography supports a diverse and abundant aquatic fauna, including coldwater and warm water fish species, and a diverse benthic macroinvertebrate assemblage. As has been well described in the literature, representatives of the mayfly, stonefly, and caddis fly orders (Ephemeroptera, Plecoptera, and Trichoptera) are widely considered the most sensitive taxa in Appalachian streams.

Toxicity information for many taxa, which are represented in Pennsylvania, has been generated. The lethal concentration to 50 percent of the test organisms (LC50) is the value most often reported for acute toxicity testing. At this concentration, half of the test organisms survived the treatment and half did not. Table 1 lists LC50 values (as species means or from individual test results and other endpoints) and other endpoints for several taxa with representatives native to Pennsylvania streams. As is evidenced by the table, the proposed acute water quality criteria are substantially overprotective of even the most sensitive organisms in Pennsylvania waters. Higher acute criteria, such as the 1,200 mg/l Cl^- criteria in the previously-referenced recalculation procedure, would be adequately protective of the sensitive mayfly taxa in Table 1, as well as the other taxa. Although these comparisons are made with acute toxicity tests, due to the propensity of organisms to acclimate to higher salt concentrations and the low acute-to-chronic ratios associated with sodium chloride, they are also likely protective of chronic exposures.

5.0 CONCLUSIONS

The Pennsylvania DEP has proposed chloride rules (40 Pa.B 2264), published in the Pennsylvania Bulletin on Saturday May 1, 2010, which include the adoption of the USEPA's recommended water quality criteria for chloride of 230 mg/l for chronic aquatic life, and 860 mg/l for acute aquatic life protection. As several states (Iowa, Illinois, Ohio, and others), and the EPA themselves, have questioned the appropriateness of these current nationally-recommended criteria, it is inappropriate to adopt the outdated criteria without appropriately considering errors and limitations of the 1988 criteria and information generated since the original criteria development.

The information contained in Section D, Background of the Preamble, is sparse and misleading. This section indicates that the Pennsylvania Department of Environmental Protection (Department) has reviewed the EPA's ambient water quality criteria development document for chloride (Criteria Document) and agrees with the data analysis, interpretation, and methods used to develop the criteria. This statement irresponsibly ignores the plethora of more recent data, some of which directly disputes the accuracy of the 1988 criteria document. Updates to the original criteria calculations are warranted due to:

- Corrections to the acute-to-chronic ratio used for chronic criterion development.
- Discovery of contamination of salts used in older toxicity testing.
- Development of standard testing methods which improved test acceptability.
- General expansion of the limited database used in the original criteria calculation.
- Findings of higher toxicity of chlorides in laboratory water, as compared with natural water.

Clearly, the Department is remiss in their statement that it agrees with the data analysis, interpretation, and methods used to develop the 1988 chloride criteria. For the above-stated reasons, acceptance of the outdated chloride criteria is improper. If the Department believes the application of chloride water quality criteria are preferable to the osmotic pressure standard, appropriate and scientifically defensible standards should be calculated and presented for consideration rather than relying on outdated and flawed standards which are readily available.

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TABLE 1
Chloride Tolerance of Organisms Representative of Those Present in Pennsylvania Streams

Order	Organism	Endpoint	LC50 (mg/L Cl-)	Reference
Amphipoda	*Hyallela azteca*	96 h LC50	>6000	Benbow and Merrit, 2004
	Gammarus psuedolimnaeus	drift or mortality	>480	Blasius and Merritt, 2002
	Gammarus psuedolimnaeus	100% mortality	3600	Blasius and Merritt, 2002
	Gammarus psuedolimnaeus	96 hour LC50	4620	Blasius and Merritt, 2002
Diptera	*Chironomus attenatus*	100% mortality	5997	Blasius and Merritt, 2002
	Chironomus attenuatus	Acute LC50 - geomean of 2 references	4900	Thorton and Sauer, 1972 and Hamilton et. Al., 1975
	Chironomus attenuatus	Chronic - 33 days, endpoint not reported	3600	Thornton, K., and J. Wilhm, 1974
	Choaborus americanus	96 h LC50	>6000	Benbow and Merrit, 2004
	Cricoptus trifascia	100% mortality	5319	Blasius and Merritt, 2002
	Nias variabilis	100% mortality	2241	Blasius and Merritt, 2002
	Tipula abdominalis	96 hour LC50	>6,000	Blasius and Merritt, 2002
Ephemeroptera	*Baetis tricaudatus*	geomean of acute EC50 and LC50s	4071	Lowell, R.B., J.M. Culp, and F.J. Wrona, 1995
	Callibaetis fluctuans	96 h LC50	>3000	Benbow and Merrit, 2004
	Hexagenia limbate	growth rates	>4800	Blasius and Merritt, 2002
	Hexagenia limbate	LC50 - species mean acute	2333	Blasius and Merritt, 2002
	Stenonema modestum	geomean 7 day growth and mortality	2778	Diamond,Winchester,Mackler, and Gruber, 1992*
	Tricorythus sp.	LC50	>1568	Blasius and Merritt, 2002
Gastropoda	*Physella integra*	96 h LC50	>3000	Benbow and Merrit, 2004
	Physidae	LC50	2540	Birge, Black, Westerman, Short, Taylor, Bruser, and Wallingford, 1985
Plecoptera	*Acroneuria abnormis*	96 hour LC50	>6,000	Blasius and Merritt, 2002
	Agnetina capitata	96 hour LC50	>6,000	Blasius and Merritt, 2002
	Nemoura trispinosa	70% mortality	3600	Blasius and Merritt, 2002
Tricoptera	*Cheumatopsyche analis*	drift or mortality	>990	Blasius and Merritt, 2002
	Hydropsyche betteni	10 day mortality	>480	Blasius and Merritt, 2002
	Hydropsyche betteni	drift or mortality	>990	Blasius and Merritt, 2002
	Hydropsyche betteni	80% mortality	3,600	Blasius and Merritt, 2002
	Hydropsyche betteni	drift or mortality	>4800	Blasius and Merritt, 2002
	Hydropsyche betteni	LC50	7985	Blasius and Merritt, 2002
	Hydropsyche bronta	10 day mortality	>480	Blasius and Merritt, 2002
	Hydropsyche slossonae	10 day mortality	>480	Blasius and Merritt, 2002
	Hydroptila angusta	100% mortality	6082	Blasius and Merritt, 2002
	Lepidostoma sp.	96 hour LC50	3600	Blasius and Merritt, 2002
	Pycnopsyche sp	96 hour LC50	2116	Blasius and Merritt, 2002

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From: Geary, Stan [StanGeary@consolenergy.com]
Sent: Tuesday, June 15, 2010 2:28 PM
To: EP, RegComments
Cc: Tate, Michele
Subject: 25 Pa Code Ch 93 - Ambient Water Quality Criterion; Chloride
Attachments: Consol Ch 93 Comments 6-14-10.pdf; Consol Comments Attachment Chloride Synopsis MYA.pdf

Attached is a second set of comments of Consol Energy Inc. The first set of comments is missing Table 1 of the Attachment.

RECEIVED
JUN 15 2010
4:19 pm
INDEPENDENT REGULATORY REVIEW COMMISSION

Stan Geary
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-----Original Message-----
From: Geary, Stan
Sent: Tuesday, June 15, 2010 2:21 PM
To: Owsiany, John
Subject: Emailing: Consol Ch 93 Comments 6-14-10.pdf, Consol Comments Attachment Chloride Synopsis MYA.pdf

John:

Attached is the final version of the Ch 93 comments to IRRC.

Stan

The message is ready to be sent with the following file or link attachments:

Consol Ch 93 Comments 6-14-10.pdf
Consol Comments Attachment Chloride Synopsis MYA.pdf

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