UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

JUN 2 8 2019

REPLY TO THE ATTENTION OF:

WW-16J

Martin E. Klein, Hearing Officer
Illinois Pollution Control Board
100 West Randolph, Suite 11-500
Chicago, IL 60601

Re: Amendments to General Use Water Quality Standards for Chloride, R2018-032

Dear Illinois Pollution Control Board:

On May 21, 2018, Huff & Huff, Inc. submitted a petition (subsequently amended on March 14, 2019) to the Illinois Pollution Control Board proposing revised chloride criteria that would apply throughout Illinois. The petition uses the results of laboratory tests conducted at differing temperatures to modify the chloride criteria adopted by Iowa in 2009 to account for the effect of temperature on toxicity.

On May 16, 2019, the Illinois Pollution Control Board issued a Hearing Officer Order submitting questions to the petitioner and requesting comments from interested parties. On May 30, 2019, Illinois Environmental Protection Agency requested that EPA provide the Board with any feedback it may have on the proposal. Therefore, to assist the IPCB while it considers these criteria, EPA is providing the enclosed preliminary technical feedback on the proposal. These comments do not reflect a final EPA position on this proposal or constitute EPA approval of any criteria that may be adopted and submitted. Formal EPA review can occur only after Illinois has completed its processes for public participation and adoption and submitted the adopted criteria to EPA for review and approval.

Thank you for the opportunity to comment on the proposed chloride criteria. If you have any questions regarding our comments, please contact Aaron Johnson of my staff at 312-886-6845 or johnson.aaronk@epa.gov.

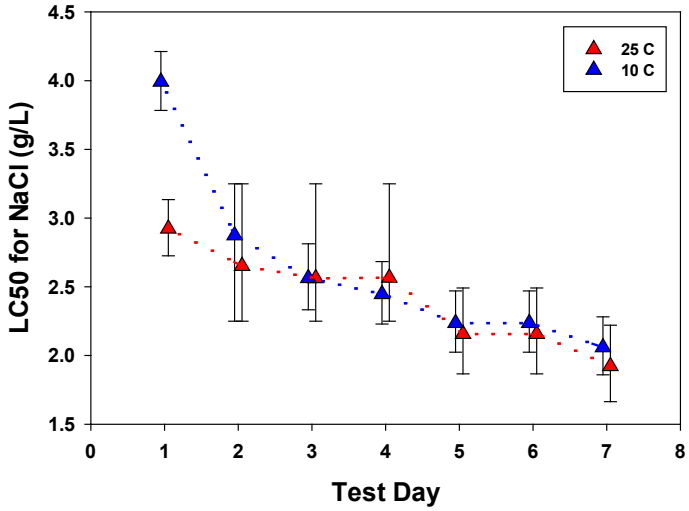
Sincerely,

David Pfeifer, Acting Chief
Watersheds and Wetlands Branch

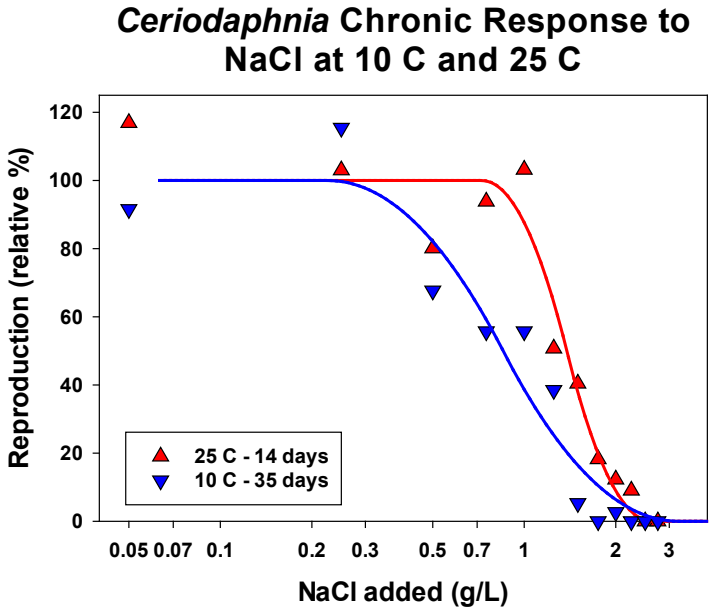
Enclosure

Enclosure – EPA Comments on R2018-032 Amendments to General Use Water Quality Standards for Chloride

1. EPA believes that the supporting documentation does not support the petition's stated premise, which is that chloride is less toxic at lower temperatures. Instead, the test results may indicate that toxicity takes longer to occur at lower temperatures.
   a. The acute studies cited in the petition report greater LC50 values at 10°C than at 25°C for tests of the same duration. However, the daily survival results from the chronic studies suggest that toxicity at 10°C is only delayed. If the exposure duration is extended, toxicity at 10°C appears to be comparable to toxicity at 25°C. For example, the figure below plots the daily survival results from the seven-day chronic studies using *C. dubia*.



   b. For many of the chronic studies, the endpoint of interest either did not occur (e.g., no reproduction observed) or was significantly reduced (e.g., inhibited growth) in tests conducted at 10°C. Since the endpoint of interest did not occur, those tests do not provide meaningful information about the toxicity of chloride under low temperature conditions. Based on EPA's preliminary review of the studies, the most meaningful chronic study appears to be the *C. dubia* study conducted at 10°C over 35 days. However, as seen in the figure below and similar to the acute studies discussed above, the results suggest that the chronic effects at 10°C are similar to the chronic effects at 25°C but the effect may be delayed.



c. In summary, the studies conducted do not appear to support a conclusion that chloride is less toxic at low temperatures but may suggest that toxicity takes longer to occur.

2. One way to account for the effect described above could be to adjust the averaging period associated with the criteria, rather than adjusting the criteria themselves. However, the studies included in the petition do not appear to provide the information necessary to develop an alternative averaging period for chloride in low temperatures that would be demonstrably protective of the designated use and based on a sound scientific rationale. If the petitioner and/or Illinois wished to develop a proposed alternate averaging period for chloride, a complex and rigorous testing protocol should be performed to fully explore the issue and ensure the protectiveness of such an averaging period. Some of the key issues that this protocol should address, at a minimum, are provided below.
   a. To the extent that specific endpoints (e.g., reproduction) can be documented to not occur at lower temperatures for certain organisms, the testing protocol should include studies capable of reliably measuring the effect of chloride on the endpoints for those organisms that are expected to occur at lower temperatures.
   b. Further studies should be conducted to produce data sufficient to calculate the appropriate duration of an alternative averaging period.
   c. As discussed in EPA's 1985 Guidelines, "[t]he durations of the averaging periods in national criteria have been made short enough to restrict allowable fluctuations in the concentration of the pollutant in the receiving water and to restrict the length of time that the concentration in the receiving water can be continuously above a criterion concentration" (p. 5-6). Any proposed alternative averaging period should be set similarly to restrict short-term fluctuations. Further studies should explore the relationship between longer-term averages and pulses to ensure that the longer averaging period would not be allowing short-term peaks of sufficient magnitude to have a toxic effect.

3. The temperature adjustment factor proposed in the March 14, 2019 amended petition is based on the temperature relationship described in an article by Jackson and Funk (2019)[1] to which the petitioner added the results of the toxicity tests included in the May 21, 2018 petition. EPA offers the following comments on the proposed temperature relationship.
   a. As discussed in Section II of EPA's 1985 Guidelines, numerical water quality criteria should be developed after "[c]ollect[ing] *all* available data on the material concerning (a) toxicity to … aquatic animals and plants" [emphasis added]. EPA recommends that the petitioner conduct a literature search to verify whether any other toxicity tests have been conducted at varying temperatures. If any additional toxicity tests are identified and are determined to be appropriate, the results of those tests should be included in the derivation of the temperature relationship.
   b. As noted in the March 14, 2019 amended petition, the slope estimates reported by Jackson and Funk (2019) differed from the slopes found in the petitioner's studies by a factor of 4.6 on average. For the one species included in both studies (*N. triangulifer*), the slope estimates differed by a factor of 9.8 between the two studies. As discussed in Section V.C of EPA's 1985 Guidelines, where toxicity is related to a water quality characteristic, the data should be evaluated to determine if it is useful, "taking into account … the degree of agreement within and between species." Given the difference in slope estimates between the two sets of studies both overall and specific to *N. triangulifer*, EPA recommends that the petitioner investigate the cause of that difference to determine what data would be useful for deriving a temperature relationship for Illinois waters.
   c. Jackson and Funk (2019) identified a linear relationship between temperature and chloride toxicity. However, that study only investigated one organism type (mayfly) and it is possible that the temperature relationship differs for other types of organisms. While the petitioner's studies included other types of organism (cladoceran, amphipod and fingernail clam), those studies were only conducted at two temperatures (10°C and 25°C) and, thus, those result may not be able to be extrapolated across the full range of temperatures expected in Illinois waters. To ensure that any adopted criteria would be protective of all aquatic life across all temperatures, further studies should be performed to better understand the temperature effect over the expected ambient range of temperature. In addition, EPA notes that if the studies suggest that toxicity is delayed at colder temperatures, that suggests that toxicity may be quicker and the averaging period should be shorter at warmer temperatures. Therefore, chloride toxicity at temperatures above 25°C should also be investigated.
4. While not related to the Board's specific questions, EPA recommends that any provisions related to a required sampling frequency be removed from the proposed water quality standards and instead be included in the State's implementation guidance.

[1] Jackson, J.K. and D.H. Funk. 2019. Temperature affects acute mayfly responses to elevated salinity: implications for toxicity of road de-icing salts. Philosophical Transactions of the Royal Society B 374:20180081.