HALL & ASSOCIATES

Suite 203
1101 15th Street, N.W.
Washington, D.C. 20005-5002
Telephone: 202-463-1166 Web Site: http://www.hall-associates.com Fax: 202-463-4207
Reply to E-mail:

jhall@hall-associates.com

December 2, 2009

Via Email

Dr. Thomas Armitage
U.S. Environmental Protection Agency
Ariel Rios Building
1200 Pennsylvania Ave, N.W.
Mail Code 1400F
Washington, DC 20460

Re: Comments on SAB Ecological Processes and Effects Committee Draft Report

Dear Dr. Armitage:

The attached comments are submitted by Hall & Associates, Dr. Domenic Di Toro (University of Delaware), and Mr. Thomas Gallagher (HydroQual, Inc.) on behalf of the Pennsylvania Periphyton Coalition. Overall, we find that the detailed draft comments ("Draft") prepared by the Science Advisory Board Ecological Processes and Effects Committee ("Committee") on EPA's *Empirical Approaches for Nutrient Criteria Derivation* ("EPA Document") accurately characterize the numerous fundamental deficiencies in the EPA Document. We concur that these deficiencies must be addressed in order to develop scientifically defensible nutrient water quality criteria. To that end, the utility of the Draft would be greatly enhanced if the key Committee findings were consolidated and summarized as the Committee recommendations for developing nutrient criteria. In addition, while the detailed findings make explicit recommendations for developing nutrient criteria, the cover letter to Administrator Jackson and the Draft's Executive Summary present ambiguous language on the scientific acceptability of the EPA Document. The ambiguous language should be corrected to avoid misinterpretation of the Committee's findings. A clear and concise position would provide greater assistance to state regulatory agencies who will be the primary users of this document. Additional details on these concerns are provided below.

Key Report Findings

It is axiomatic that the most fundamental component in water quality criteria derivation is a clearly demonstrated cause and effect relationship between the pollutant of concern and

the unacceptable adverse impact caused by the pollutant. (Guidelines[1] at 5) Where multiple factors significantly influence the effect of the pollutant, these must be incorporated into criteria derivation. (Guidelines at 32, 44) The rational for these requirements is straight forward. Unless these criteria derivation components are properly established and considered, there is no assurance that the criteria will serve their intended purpose – to limit pollutants to the level necessary to protect beneficial uses. The Draft reflects these requirements of the Guidelines:

> "For criteria that meet EPA's stated goal of "protecting against environmental degradation by nutrients," the underlying causal models must be correct. Habitat condition is a crucial consideration in this regard (e.g., light [for example, canopy cover], hydrology, grazer abundance, velocity, sediment type) that is not adequately addressed in the Guidance. Thus, a major uncertainty inherent in the Guidance is accounting for factors that influence biological responses to nutrient inputs. Addressing this uncertainty requires adequately accounting for these factors in different types of water bodies". (Draft at 36-37, line 43) (Emphasis added);

We have identified what we believe are the key technical findings of the Committee on the deficiencies in the EPA Document that must be addressed to render scientifically defensible nutrient water quality criteria. This important listing should be attached to the cover letter so that there is no uncertainty on the need to address these fundamental considerations as the states proceed to develop nutrient water quality criteria. Moreover, these considerations necessarily apply to the evaluation of all evidence that may be incorporated into a "weight of evidence" analysis. Therefore, we ask the Committee to specifically note that any other information used in a weight of evidence approach to develop nutrient criteria must be assessed in light of these fundamental components.

Concerns with Cover Letter and Executive Summary

As noted throughout the Draft, EPA's empirical approach does not result in the necessary cause-effect relationships necessary to derive defensible criteria and provides no objective scientific means to ensure the criteria generated are either necessary or appropriate for their intended purpose. The cover letter to Administrator Jackson and the Executive Summary, however, use language that implies the statistical methods presented in the EPA Document "could" be used to derive nutrient criteria, but "improvements" are needed prior to implementation. These statements imply that the EPA Document can be fixed to address the Committee's basic concerns, but the detailed comments suggest otherwise. For example:

> "The Committee emphasizes that understanding the causative link between nutrient levels and impairment is necessary in order to assure that managing for particular nutrient levels will lead to desired outcomes". (Draft at 4, line 7) (Emphasis added)

[1] USEPA. 1985. Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses. PB85-227049.

"The Guidance needs to clearly indicate that the empirical stressor-response approach does not result in cause-effect relationships; it only indicates correlations that need to be explored further". (Draft at 39, line 38) (Emphasis added);

As noted in the Draft, to develop scientifically defensible criteria, cause and effect must be demonstrated, but none of the empirical stressor-response approaches demonstrate cause and effect. Rather, in addition to the empirical methods, some form of validated causal model must be developed to account for the significant habitat, physical, and chemical factors affecting designated use attainment. Such a model should be sufficient to derive scientifically defensible nutrient criteria for the specific ecological conditions present. To avoid confusion, the ambiguous language should be changed to leave no doubt that these six empirical approaches cannot be used as the basis to derive water quality criteria. It is critical that these changes be made in the cover letter and Executive Summary because some potential users will only read these sections before deciding on a course of action. Suggested changes to the cover letter to avoid such confusion are attached.

Other Concerns

- Conditional Probability Analysis

The Draft does not explicitly indicate that Conditional Probability Analysis (CPA) should not be used to derive nutrient water quality criteria. While the Committee expressed this conviction during its meeting on September 9 – 11, the Draft does not appear to specifically address this issue. For example, the Committee made the following statement:

"The use of non-parametric change point analysis and discontinuous regression analysis **must** be associated with biological significance and the designated uses to be protected by numeric nutrient criteria. ... However, although these methods may be able to identify and characterize breakpoints, such breakpoints may not necessarily have any biological significance, nor will they necessarily be related to designated uses that are to be protected by numeric nutrient criteria. Use of these methods **must** be associated with designated uses". (Draft at 22, line 6) (Emphasis in **bold**)

EPA's draft guidance expressly recommends the use of CPA where no impairment threshold has been set (The exact opposite of what the Committee recommended). (EPA Document at 52) None of the CPA examples presented in the EPA Document relate nutrient concentrations to recognized designated use impairments and no attempt is made to assess whether the change point identified was biologically significant or how such significance could be demonstrated. In addition, no effort is made to show the pollutant actually caused the response being evaluated. These fatal flaws are compounded by the fact that the methodology presented by EPA attempts to relate discrete instantaneous measurements of nutrient concentration to biological metrics

that do not respond to instantaneous concentrations. The analysis framework ignores all relevant physical factors that greatly influence whether nutrients will cause impairment. The presentations regarding actual application of this method confirm it was even applied to address "impairments" in severely habitat-altered receiving waters that clearly were not related to nutrients. As noted throughout the Draft, such an evaluation framework is not scientifically defensible and cannot be used for criteria derivation. The SAB cover letter needs to unequivocally reject such methods as scientifically indefensible.

- Downstream Impacts

Finally, we note that it is procedurally and technically inappropriate for the Draft criteria guidance to refer to consideration of "downstream impacts" as suggested in the cover letter. On a procedural basis, there is no charge question that addresses the consideration of downstream impacts with regard to nutrient criteria derivation. No information is provided in the EPA Document on the basis for or the need to consider downstream impacts. And, no analysis was provided to the Committee to show why such considerations are necessary or appropriate. In our view, downstream impacts are irrelevant to criteria derivation and, to our knowledge, have not been considered in setting water quality criteria. For example, consider copper – the marine criteria are much more restrictive than the freshwater requirements, and yet EPA approves both sets of criteria. If upstream loads cause adverse effects on downstream designated uses (e.g., violate the water quality criteria set for those waters), those effects must be addressed using individual wasteload allocations or through the TMDL process, considering the fate characteristics and confounding factors that influence the cause-effect relationship. However, the criteria established for the downstream waters are intended to protect the designated uses of the downstream waters. The criteria for the upstream waters must protect the designated uses of the upstream waters "with only a small possibility of considerable overprotection or underprotection". [2] There is no legal, regulatory or scientific basis presented to this panel or the public that requires upstream criteria to be amended to reflect downstream ecosystem needs.

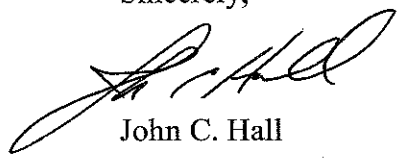
Summary

Given the findings by the Committee regarding the need for scientifically defensible causal models that directly relate nutrients to use impairments and appropriately account for significant physical and biological factors affecting designated uses, it is apparent that the approaches presented in the EPA Document are wholly inadequate and cannot be used to derive water quality criteria for nutrients. The cover letter and the Executive Summary should explicitly note that the suggested, stand-alone methods are (1) not scientifically defensible and (2) any approach to scientifically defensible nutrient criteria must be based on:

[2] USEPA. 1985. Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses. PB85-227049. at 5

- A properly documented underlying causal model which incorporates all significant confounding factors, and
- Response variables that are clearly related to designated-use impairment thresholds.

Sincerely,



John C. Hall

Enclosures

cc: Dr. Domenic Di Toro
Mr. Thomas Gallagher
Pennsylvania Periphyton Coalition