

**Comments from Members of the Chartered SAB on the SAB Draft Report:  
Early Advice on an Ensemble Modeling Approach for  
Developing Lake Erie Phosphorus Objectives (2-10-15)**  
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## Comments from Lead Reviewers

### Comments from Dr. Sylvie M. Brouder

Q1) Charge questions adequately addressed?

Overall assessment is that the Draft Consultation Report gives good and fairly comprehensive coverage to the general essence of all four charge questions and highlights the specific issues that are major limitations of the Draft Technical Approach (dated 11/4/2014). Specifically, the Draft Consultation Report highlights that:

- Lake biogeochemistry appears to have changed and therefore relevance of traditional indicators should not be assumed and indicators may need to be expanded to include other characterizations including monitoring changes in lake biology;
- The Draft Technical Approach does not provide sufficient evidence that P content of Cladophora is a useful / meaningful indicator;
- The Draft Technical Approach assumes that P remains the primary limitation / driver and does not appear to adequately consider potential synergies of P with other nutrients or factors (especially nitrogen); this assumption has driven both the selection of indicators and models and should be carefully examined for its validity, and
- The Draft Technical Approach provides no substantive details on technical protocols for combining models or actually using models in aggregate versus individually to inform the objectives.

Specific suggestions regarding the charge questions are as follows:

Charge Question 1 on suitability and scientific robustness of the proposed indicators for Lake Ecosystem Objectives, other metrics, availability of methodology...

- Under the Load and Concentration Targets section of the Draft Consultation Report (and elsewhere in the document) understanding the nutrient balance of the lake is mentioned and N loading is specifically mentioned (pg. 3, lines 7-8). To the extent that nutrient loads may be synergistic as implied by the comments, should the recommendation on monitoring biological communities – made under Eutrophication Response Indicators section (pg. 1, line 34) – be expanded to be more inclusive of other potential important aspects of biogeochemistry and nutrient cycling?

Charge Question 2 on appropriateness (best available scientific knowledge) of selected models for evaluation of eutrophication response...

- While the text of the Draft Consultation Report does call attention to the Draft Technical Approach's assumptions regarding P as the primary driver and consequent selection of indicators and drivers, it does not directly comment on the fact that the Technical Approach provides relatively little information on how models (and indicators) were

selected. Should the authors of the Technical Approach be requested to provide greater detail on the model (and indicator) selection process to substantiate that the models do, in fact, represent the best available scientific knowledge? Were other models considered and jettisoned as inferior? What were model inclusion / exclusion criteria and was it driven by the selection of indicators or vice versa?

Charge Question 3 on appropriateness of the ensemble modeling approach and sufficiency for P load targets...

- The Draft Consultation Report raises the issue of “regime shift” and that process models may be more relevant than empirical or statistical models (pg. 2, lines 37 - 40) but the comment is not really followed with a recommendation or question / challenge to the Draft Technical Approach. Does this point warrant further clarification regarding a recommendation, caution, challenge, etc.?

Charge Question 4 on efficacy of establishing target values for both phosphorus loads and concentrations in order to meet Lake Ecosystem Objectives...

- The charge question itself seems somewhat ambiguous on the question of concentration versus loads making the formulation of response challenging. Nonetheless, the coverage of the question in the Draft Consultation Report seems a bit meager, incomplete and does not seem to directly address the question. The question seems to be about the models and whether they provided a scientifically grounded basis for load targets and the answer is about biological response to concentrations and loads (pg. 3, line 7-9).

Q2) Technical errors or omissions / issues not adequately addressed?

In addition to the comments noted above, the question of sufficiency of data per se seems an omission in the Draft Technical Report and may be worth commenting on in the Consultation Report even though it does not appear as a direct charge question. It seems a reasonable expectation that the quality and/or quantity of data available for this effort may be at least as restricting as the limitations of the models themselves. How will that potential limitation be understood and/or addressed?

Q3) Draft report clear and logical?

Overall, the Draft Consultation Report is clear and easy to read / follow. Comments above under the Charge Questions highlight a couple of points that may require additional clarity.

Additionally, the clarity might be enhanced by consolidation of all comments relevant to suitability of indicators under that heading. For example, direct and indirect comments on indicators appear throughout Selection of Models section (e.g. pg. 2, line 42 – 43) and it may be more logical to consolidate all comments on indicators under the response to charge question 1.

Q4) Conclusions drawn / recommendations provided supported by body of draft report?

The Draft Consultation Report generally endorses the overall approach of ensemble modelling and adaptive management while clearly highlighting major gaps in the Draft Technical Approach

regarding protocols and methodology. The comment that “at this stage, there was insufficient information available to the SAB to provide specific recommendations about the efficacy of individual models...” is accurate and could be extended to encompass the use of these individual models in the ensemble approach.

### **Comments from Dr. Ingrid Burke**

1. Were the charge questions adequately addressed?

The report is pithy. It is hard to write much of a review of a 3 page document that is that clear! It addresses all of the relevant questions though at times I wondered if more detail was necessary:

- The report suggests that P content of Cladophora may not have a sufficient history of data. This seems a bit short. What would be necessary?
- On the top of page 2, the report comments that there should be “monitoring of biological communities”. An elaboration here would be good. Would this be a functional group approach? A simple citation might be sufficient.
- It is unclear what the sentence means “The agency should be mindful that factors such as nutritional status and physical environment can add uncertainty to predictions...”. This seems incomplete. What does “being mindful” mean for the agency (doing different work? Being careful with interpretation?), and further, “nutritional status” is unclear – meaning multiple nutrient levels within lakes, or within organisms?

2. Are there any technical errors or omissions in the report or issues that are not adequately dealt with in the draft report? (see above)

3. Is the draft report clear and logical? Yes,

Very much so.

4. Are the conclusions drawn or recommendations provided supported by the body of the draft report?

Yes.

### **Comments from Dr. Amanda D. Rodewald**

1. Were the charge questions adequately addressed?

Yes.

2. Are there any technical errors or omissions in the report or issues that are not adequately dealt with in the draft report?

I did not find any technical errors or omissions.

Additional detail would be helpful on page 2, lines 4-9, where the report cautions that (a) traditional indicators should be supplemented by monitoring changes in the biological communities and (b) other factors (e.g., nutritional status and physical environment) can add uncertainty. If the panel has more specific recommendations on the most important metrics of community changes or mediating factors to measure, that would be helpful to include.

3. Is the draft report clear and logical?

Yes. It is well-written and well-conceived.

There was one part that struck me as a bit of a contradiction. On page 2, lines 10-20, the paragraph makes a strong case that total phosphorous loading is not a particularly useful indicator because its effect is strongly mediated by other factors. However, on lines 28-29, the report states that phosphorous is a robust measure, but other factors may need to be considered. Based on the earlier statements, it seems that more definitive language could be used – that phosphorous alone is not a robust measure and other factors must be considered.

Lines 39-40: I was not clear why the regime shift meant that empirical or statistical models would not be useful.

4. Are the conclusions drawn or recommendations provided supported by the body of the draft report?

Yes

## Comments from other SAB Members

### Comments from Dr. George Daston

We were asked to address four specific questions as part of the quality review.

1. whether the original charge questions to SAB Standing or Ad Hoc Committees were adequately addressed;
2. whether there are any technical errors or omissions in the report or issues that are inadequately dealt with in the Committee's report;
3. whether the Committee's report is clear and logical; and
4. whether the conclusions drawn or recommendations provided are supported by the body of the Committee's report.

Question 1: I believe that the charge questions were adequately addressed if one considers not just the letter report but the totality of the comments on the SAB website (hyperlinked in the letter to Administrator McCarthy). There was a wealth of information in the individual written comments from panelists, only some of which appears in the letter report. It is not clear whether the individual comments should be considered as part of the report (and as such reflect the consensus of the committee) or as individual comments that may or may not be a majority view. It would be more helpful to the Agency if the 75 pages of individual comments had been summarized so that EPA could distinguish between major comments that the panel believes are critical to improving water quality from other comments.

Question 2: The report provides guidance on phosphorus, and also states that nitrogen load is probably important in algal blooms. However, it tees up a couple of other potential problems but does not provide guidance on what to do about them. The two that struck me were 1) the probable role of invasive species (quagga and zebra mussels) in changing the dynamic relationship between P load and algal growth; and 2) the possibility of an ecological regime change in the lake. Regarding the invasive mussel problem, can the report be expanded to provide guidance as to whether the presence of these species changes the output and reliability of the models being used to estimate the relationship between P and algal growth? If so, then what additional information needs to be gathered to make the models adequate? The report suggests that the way to deal with the algal problem is a direct limitation of P input, but if the invasive mussels are part of the problem, does this suggest a different strategy (mussel control) that could be effective, either by itself or along with P decrease?

As for the second question, it would be helpful to the Agency if the report provides more of a description of what the regime change consists of (are there different species present, or are they in different places, or different ratios to each other), and how it might change the way the Agency approaches the problem of managing algal growth. If it matters to the way the models predict, or the way the lake is expected to respond, then it deserves more attention in the report. If it doesn't, then is it worth speculating on in such a short report?

I also wondered about whether the data being collected and the management steps being considered include Canadian input? I realize this is not a scientific question, but would help

clarify whether EPA can do enough to control the algal problem by changing P inputs from the US side of the lake, or this needs to be an international exercise.

Question 3: The report was logical but as noted above, insufficient in detail.

Question 4: The conclusions and recommendations are supported by the body of the report but may be incomplete depending on the response to my comments above

#### **Comments from Dr. Joel Ducoste**

- 1) Were the charge questions to the committee adequately addressed?  
Yes
- 2) Are there any technical errors or omissions or issues that are not adequately dealt with in the draft report?  
No.
- 3) Is the draft report clear and logical?  
Yes,
- 4) Are the conclusions drawn or recommendations provided supported by the body of the draft report?  
Yes

#### **Comments from Dr. Robert J. Johnston**

- 1) Were the charge questions to the committee adequately addressed?

Yes, the report has adequately addressed the charge questions.

- 2) Are there any technical errors or omissions or issues that are not adequately dealt with in the draft report?

No, there are no technical errors or omissions that are not adequately addressed by the draft report

- 3) Is the draft report clear and logical?

Yes

- 4) Are the conclusions drawn or recommendations provided supported by the body of the draft report?

Yes

#### **Comments from Dr. Nancy K. Kim**

The charge to the SAB for this review is “to provide early advice on the modeling approach being applied to inform the updated phosphorus targets for Lake Erie.” A subsequent review

will ask for advice on the process to develop targets and if the recommended targets reflect the best available information. Given the charge, the SAB advice is direct and limited.

1. Were the charge questions adequately addressed?

Yes.

2. Are there any technical errors or omissions in the report or issues that are not adequately dealt with in the draft report?

Not that I noticed although this is not my area of expertise.

3. Is the draft report clear and logical?

Yes for the most part.

- a. A sentence in the 4<sup>th</sup> full paragraph on page 2 of the letter states, “Also, there are questions about the efficacy of the specific models included in the ensemble, some of which do not include much of the lake’s biology.” I was unsure how important this problem is and what recommendation may be worthwhile making. Should a specific recommendation be added or to address the “questions about efficacy?”
- b. Page 3, paragraph beginning line 5. Does the SAB want to make a recommendation about loadings versus concentrations? See last sentence in the charge. If the adaptive management approach is the answer, should the letter state that directly on page 3?

4. Are the conclusions drawn or recommendations provided supported by the body of the draft report?

Yes. See comments under charge question 3.

### **Comments from Dr. Kristina D. Mena**

1. Were the charge questions adequately addressed?

Yes

2. Are there are any technical errors or omissions in the report or issues that are not adequately dealt with in the draft report?

The draft report adequately highlights issues related to the eutrophication response indicators, and the modeling described in EPA’s Draft Technical Approach for Lake Erie Phosphorus Load-Response Modeling (2014). Regarding the comments of the modeling approach, perhaps peer-reviewed references could be included to provide helpful information, and the importance of sensitivity analyses should be emphasized. In addition, based on this stage of the Technical Approach document, does the modeling approach address issues of consistent model output interpretation and appropriate application?

3. Is the draft report clear and logical?

Yes, the draft report is logical. Clarity (or example questions) may be helpful, however, regarding the comment that there are questions about the combining of models. Also, in the statement – “The SAB notes that there are methods to conduct uncertainty and sensitivity analyses individually and across the models, yet at this stage, there was insufficient information available to the SAB to provide specific recommendations about the efficacy of individual models” – it isn’t clear what the SAB is suggesting or requesting.

4. Are the conclusions drawn or recommendations provided supported by the body of the draft report?

Yes

**Comments from Dr. James R. Mihelcic**

1) Were the charge questions to the committee adequately addressed?

The three charge questions were adequately addressed except my comment below. The first charge question ask that during the SAB’s evaluation of the eutrophication response indicators, that they would identify other metrics appropriate for measuring eutrophication response in Lake Erie and other Great Lakes. It was not clear to me if the three reasonable indicator choices were applicable to “other Great Lakes.”

2) Are there any technical errors or omissions or issues that are not adequately dealt with in the draft report?

See my comment on charge question 1.

3) Is the draft report clear and logical?

The draft is clear and logical

4) Are the conclusions drawn or recommendations provided supported by the body of the draft report?

Yes

**Comments from Dr. Daniel O. Stram**

1. Were the charge questions adequately addressed?

Yes

2. Are there any technical errors or omissions in the report or issues that are not adequately dealt with in the draft report?

Not that I am aware

3. Is the draft report clear and logical?

Yes

4. Are the conclusions drawn or recommendations provided supported by the body of the draft report?

Yes

### **Comments from Dr. Charles Werth**

#### **1) Were the charge questions to the committee adequately addressed?**

Yes, the committee clearly addressed the charge questions.

#### **2) Are there any technical errors or omissions or issues that are not adequately dealt with in the draft report?**

The report appears technically sound and thorough. I found only one potential error that is likely a typo:

Page 2, line 8: Should this be phytoplankton mass and not cyanobacterial mass, because the indicator above is "phytoplankton as represented by chlorophyll a"?

#### **3) Is the draft report clear and logical?**

Page 2, line 5: Is this macrobiological communities, or microbiological communities? If the former, are there specific communities to monitor that are more important? If the latter, is there enough research to support such an effort or is it experimental?

Page 2, line 28: Is there sufficient data to support considering nitrogen in models? Are there unique indicators for nitrogen limited biological growth? Increasing complexity of models without needed data might not be adequate.

I wonder if a little more explanation of regime shift is needed to help the EPA. From my perspective, it's not clear what this means, if or how process models would capture (or be modified to capture), and why empirical or statistical models would fail to capture.

Page 3, line 8: It's not clear from the text here if the report is making a recommendation here. For example, is there a recommendation that the EPA should more directly relate nitrogen and phosphorus loadings to concentration.

#### **4) Are the conclusions drawn or recommendations provided supported by the body of the draft report?**

Yes, the conclusions drawn and recommendations provided are supported by the body of the draft report.

## **Comments from Dr. Peter J. Wilcoxon**

### **1. Were the charge questions to the committee adequately addressed?**

Yes. One minor point is that Charge Question 2 requested comments on *each* of the models and the SAB report discusses broad *classes* of models. However, the SAB response appears to address the Agency's underlying concern and does not need to be revised.

### **2. Are there any technical errors or omissions or issues that are not adequately dealt with in the draft report?**

Not to my knowledge.

### **3. Is the draft report clear and logical?**

Generally yes. The only exception is the discussion related to the last part of Charge Question 3 (embedded in the paragraph below the numbered charge question): "Please comment on efficacy and value of establishing target values for both phosphorus loads and concentrations in order to meet to the Lake Ecosystem Objectives. How can we ensure the phosphorus concentration and loading targets are internally consistent with respect to the eutrophication response indicators of concern?" The response seems to be that concentration and loading targets serve different purposes and both are needed, and that adaptive management will be needed to update the targets over time. However, the link between the response and the questions could be clearer.

### **4. Are the conclusions drawn or recommendations provided supported by the body of the draft report?**

Yes.

## **Comments from Dr. Dawn J. Wright**

(1) The charge questions were adequately addressed.

(2) In terms of technical errors or omissions in the report itself, I was a little confused by the section on lake bathymetry data on p. 18. If 1-m resolution data are indeed available for the lake, maps should be available at scales less than 1:100,000 or 1:50,000 (e.g., maps should be available at 1:24,000 or more detailed). And in terms of the varying data sources used as inputs to the models, it would be helpful to have a table provided at some point indicating not only what the available data are (e.g., phosphorus loads, water quality data, tributary flow and nutrient data, meteorological data, biological data and bathymetry), but where these datasets are available digitally for inspection (including any descriptive metadata) and download.

(3) I find the draft report to be mostly clear and logical.

(4) I find the conclusions drawn to be supported by the body of the draft report.