



Odum School of Ecology

Dr. Peter Thorne
Chair, Science Advisory Board
US Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460
VIA EMAIL peter-thorne@uiowa.edu

7 March 2016

Dear Dr. Thorne,

I am the former chair of the SAB Ballast Water Advisory Panel that wrote the 2011 report (*Efficacy of Ballast Water Treatment Systems*) cited in the letter you have received from Dr. Burke. I am writing to provide some perspective on the Panel's deliberations and conclusions. I am not an expert in testing of ballast water management systems; hence in writing this letter I have consulted with two of the former members of the Panel who are experts in this field, Mario Tamburri and Lisa Drake. They were particularly helpful in providing information on availability of new testing data.

The Panel consisted of members of SAB's Ecological Processes and Effects Committee as well as experts in ballast water issues, marine engineering, and engineering treatment technologies. We were asked to evaluate the ability of shipboard Ballast Water Management Systems (BWMS) to meet numeric standards. To address the 4 charge questions, the panel divided into subcommittees. All subcommittee deliberations and conclusions were discussed by the entire panel before being incorporated into the report.

To address Charge Question 1 on performance of shipboard systems with available effluent testing data, a 3-member subcommittee was charged with reviewing the data provided. This evaluation was based on testing data collected up until May 2010. Members of that subcommittee had direct experience with ballast water effluent testing, the testing procedures necessary to provide reliable test results, and the interpretation of testing data. The results of their deliberations were reviewed by 2 other committee members and then presented to the Panel. As described in sections 4.2 - 4.5 of the report (pp. 30 – 36), they first rated packages on data reliability (criteria described on pp. 30 – 31) and then scored packages rated “reliable” into one of 4 categories (pp. 31 - 32):
A - Demonstrated to meet this standard in accordance with the approach suggested in the IMO G8 guidelines (and G9 guidelines, if the BWMS employs an active substance).
B - Likely to meet this standard if the more detailed ETV Protocol (and corresponding sample volumes) were to be used.

C - May have the potential to meet this standard with reasonable/feasible modifications to the existing BWMS.

D - Unlikely, or not possible, to meet this standard, even with reasonable/feasible modifications to the existing BWMS.”

Using this procedure, the subcommittee considered whether the testing data showed that a standard of 100 or 1000 times IMO D2-Phase 1 could be achieved because that is what Charge Question 1 asked. The Executive Summary of the report states the conclusion reached by the Panel: “The detection limits for currently available test methods preclude a complete statistical assessment of whether BWMS can meet standards more stringent than IMO D-2/Phase 1. However, based on the available testing data, it is clear that while five types of BWMS are able to reach IMO D-2/Phase 1, none of the systems evaluated by the Panel performed at 100 times or 1000 times the Phase 1 standard.” (p. 4)

Although it was not part of the Charge Question, the subcommittee also considered whether the testing data showed that a standard 10 times IMO D2-Phase 1 could be achieved. Based on this analysis, the Panel concluded: “Regarding the discharge standard 10X more stringent than the IMO D-2 Phase 1, the criterion used was whether the number of living organisms in all size classes was consistently low following testing (below the detection limit, often reported as zero, or not more than twice the standard). If so, the BWMS was given a ‘C’ indicating it had the potential to meet the standard. However, as described in the response to charge question 4 (Section 6), *current testing methods do not provide the resolution required to conclude that 10X standards can be met.*” (p. 32, italics added) This conclusion is also presented in the Executive Summary: “New or improved methods will be required to increase detection limits sufficiently to statistically evaluate a standard 10x more stringent than IMO D-2/Phase 1; such methods may be available in the near future.” (p. 3)

Data quality is the crux of the issue of whether there was a mistake in the report: the testing methods used in the data provided to the Panel were not adequate to conclude that any system met a 10X standard. Just because the data were considered “reliable” does not mean the procedures used provided the resolution or data quality needed to judge whether a 10 X standard could be met. Adequate sample size for a particular level of resolution was not one of the criteria used to judge if the testing data were “reliable.” One cannot simply use numbers in a spreadsheet to evaluate system performance; understanding of sample collection methods, analytical detection limits, appropriateness of analytical methods used, and overall data quality is essential to reach a conclusion on whether a certain standard can be met. These are the issues considered by the subcommittee that evaluated the testing data and judged the data inadequate to resolve whether a 10X standard could be met. The data and review procedures were presented to the entire Panel on several occasions, over several months, and there were no objections regarding these methods or conclusions.

The Panel recognized the central importance of testing methods and devoted sections of the report to the statistical and logistical challenges of effluent testing and the quality of the data used to draw the report’s conclusions. The following quotes illustrate these

issues:

“Existing information about ballast water treatment is limited in many respects, including significant limitations in data quality, shortcomings in current methods for testing BWMS [ballast water management systems] and reporting results...” (p. 6)

“A major challenge of sampling at low organism concentrations is that many samples will have zero live organisms because the few live organisms present are missed. To improve the probability of detecting them, impractically large volumes must be sampled and excellent techniques must be used to enable detection (Figure 3-1).” (p. 23)

“At present, confirmation of the Phase 1 standard (< 10 protist-sized organisms mL^{-1}) represents the practical limit that can currently be achieved by testing facilities in the U.S. (e.g., MERC 2009a, 2010a, 2010b; Great Ships Initiative 2010).” (p. 25)

“According to Table 3-1, to meet a standard 10 times more stringent than D-2/ Phase 1 would require anywhere from 120-600 m^3 of whole-water sample volumes, which is impracticable; test facilities in the U.S. typically analyze $\sim 5 \text{ m}^3$ of water per test (e.g., MERC 2009a, 2010a, 2010b; Great Ships Initiative 2010).” (p. 26)

“First, improved methods for testing and reporting are needed to ensure that high quality data are available with which to assess BWMS performance.” (This passage was written in response to charge question 4 regarding limitations of the available data; p. 58)

Given the sampling and analytical methods used in the very early days of testing ballast water management systems, the data available to the Panel in 2010 were not adequate to conclude that any system could meet a 10X D-2/Phase 1. However, testing methods have improved considerably since that time following release of the Protocol for the Verification of Ballast Water Treatment Technologies (Version 5.1, EPA 2010) by the Environmental Technology Verification (ETV) Program. The Panel recognized this and concluded: “Measuring adherence to a standard that is 10x more stringent may be possible if a continuously isokinetically taken representative sample is used “ (p. 29), one of the aspects of the ETV protocol. Hence the data collected since 2010 using the ETV protocol may enable scientists to determine if a more stringent standard could be met.

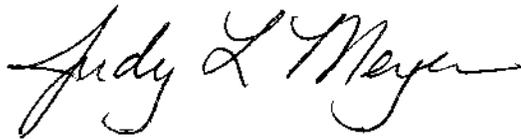
Four years after publication of the report, Drs. Cohen and Dobbs composed a letter to the EPA Administrator outlining their new interpretation of the 2010 data, which is the interpretation cited by Dr. Burke in her letter. All former Panel members were sent a draft of the letter and asked if they wanted to sign it, and 15 of the 21 former Panel members elected not to sign. Hence, there is no agreement or consensus among the former Panel members that there is an error in the conclusions reached. This approach of contacting former Panel members by email is not how the SAB operates and fundamentally not how to conduct a productive scientific debate. Clearly there is now disagreement on the interpretation of very limit and questionable data collected prior to May 2010, but this does not mean that the minority opinion is correct. A more productive approach would be to review new data collected with more appropriate and

robust methods and quality assurance systems. Although it is now 2016, the US Coast Guard has not granted Type Approval Certification to *any* ballast water management system under their Phase 1 standards; this is counter to the claims made that there was an error in the SAB report and that systems can perform far better than the SAB concluded in 2011.

Over the past 5 years, several reports on the performance of BWMS tested under the more appropriate and rigorous ETV Protocols have been made available on public websites (e.g., <http://www.maritime-enviro.org/Reports> and www.greatshipsinitiative.org/reports) and several formal application packages (including testing under the ETV Protocols) have been submitted to the USCG for Type Approval Certification. The next Vessel General Permit must be in place by January 2018 with a draft released for public comment in 2017. You may wish to contact EPA staff for more information on the timing. It seems to me that this schedule gives the SAB an opportunity to convene a group of ballast water experts to provide input on achievable standards based on higher quality data than were available to the Panel in 2010.

I hope these details prove useful in the SAB's future deliberations on this issue.

Sincerely,

A handwritten signature in cursive script that reads "Judy L. Meyer". The signature is written in black ink and is positioned above the typed name and title.

Judy L. Meyer
Professor Emeritus

Cc:

Dr. Chris Zarba, Director SAB Staff Office

Dr. Thomas Carpenter, Designated Federal Officer

Former Ballast Water Panel Members:

Dr. E. Fred Benfield, Department of Biological Sciences, Virginia Tech, Blacksburg, VA

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Dr. Fred Dobbs, Ocean, Earth and Atmospheric Sciences, Old Dominion University, Norfolk, VA

Ms. Lisa Drake, Center for Corrosion Science and Engineering, Naval Research Laboratory, Key West, FL

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Dr. Mario Tamburri, Chesapeake Biological Laboratory, Solomons, MD

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