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January 26, 2016

The Honorable Gina McCarthy  
Administrator  
U.S. Environmental Protection Agency  
1200 Pennsylvania Ave. NW  
Washington, DC 20460

Dear Administrator McCarthy:

I am a member of the EPA Science Advisory Board (SAB), and the previous chair of the SAB's Ecological Processes and Effects Committee (EPEC). I'm writing you today on a matter of serious concern, which not only has major environmental and public health implications, but also raises questions about the thoroughness of our process, if not the scientific integrity of the SAB and EPA.

My concerns stem from the work of the EPEC Ballast Water Advisory Panel in 2010-2011, from an egregious error in the Panel's main conclusion that was brought to the attention of SAB staff in October 2014 and to your attention in March 2015. Thus far, the SAB and EPA itself have not acknowledged the error, nor that it is critical to reverse a conclusion that is demonstrably false and harmful to the environment and very likely public health.

I was briefly a member of the Ballast Water Advisory Panel and attended its first meeting, but resigned because my area of expertise—arid land ecology—was not appropriate for the Panel. I was unaware of the Panel's subsequent deliberations and conclusions until they were brought to my attention earlier this year. I did approve the final document, along with the rest of the SAB, as on the surface it seemed logical and the experts had spoken.

During the Panel's deliberations, a subcommittee was appointed to review a set of studies testing the efficacy of existing ballast water treatment technologies. The Panel's final report was based upon the subcommittee's findings, and the SAB approved the report. In October 2014, one of the members of the original Panel was conducting a separate but related literature review, and dug into the data and reports that were cited as the foundation for the Panel's conclusions. He found that the Panel report was in error, and reported the opposite of the results of the treatments tests. This is the way objective science proceeds: errors are found because of thorough evaluation. He sent the relevant information to the Panel members, who forwarded this to you and the SAB staff.

I looked into the issues after we were alerted about the mistake. Even though my expertise is not in this area, any scientist who dug just one layer deeper into the reports cited as reviewed by the subcommittee of the Panel would find that the

Panel's error is hard to believe. The Panel was tasked with determining what level of treatment can be achieved for ballast water discharges, as a basis for the development of EPA's discharge permit conditions pursuant to the Clean Water Act, and U.S. Coast Guard regulations under the National Invasive Species Act.<sup>1</sup> The EPA Office of Water specifically asked the Panel to assess the capabilities of available ballast water treatment systems relative to a series of increasingly stringent discharge standards, labeled the (existing) IMO standard and the 10x IMO, 100x IMO and 1000x IMO standards.

The IMO standard for the zooplankton size class<sup>2</sup> is <10 organisms per m<sup>3</sup> in ballast water discharges; the 10x IMO standard is <1 organism per m<sup>3</sup>. Panel members looked at data from 10 trials of a commercially available treatment system that uses filtration and chlorine dioxide. The highest zooplankton concentration in the treated water in any of these trials was 0.3 organisms per m<sup>3</sup>, which is well below the limit set by the 10x IMO standard, but the Panel concluded that these data show that available treatment systems using filtration and chlorine dioxide are not capable of meeting the 10x IMO standard, but "may be able to reach 10x IMO" standards in the future if improvements are made.<sup>3</sup> This is *exactly the opposite* of what the data show.

The Panel also looked at data for the phytoplankton size class<sup>4</sup> for the same treatment system, wherein the 10x IMO standard is <1 organism per mL and the 100x IMO standard is <0.1 organism per mL. For this size class, the reported concentration in the treated water in every trial was <0.1.<sup>5</sup> The Panel concluded, again, that these data show that available treatment systems using filtration and chlorine dioxide are not capable of meeting the 10x IMO standard for this size class but might be able to do so if improvements are made<sup>3</sup>, and further that these treatment systems cannot meet the 100x IMO standard, that it is "highly unlikely" that they could meet the 100x IMO standard even with improvements, and that instead "wholly new systems [would] need to be developed to meet" the 100x IMO standard.<sup>6</sup> Again, this is exactly the opposite of what the data show.

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<sup>1</sup> U.S. Federal Register 75(37): 8700-8701 (Feb. 25, 2010).

<sup>2</sup> In the standards this size class is defined as organisms that are greater than or equal to 50 micrometers in minimum dimension, which roughly corresponds to the group of aquatic organisms known as zooplankton.

<sup>3</sup> SAB Report page 37 (Conclusion 1b); also see page 37 (discussion of Question 2), page 38 (Conclusion 2) and Table 4-1 (Performance of Ballast Water Management Systems). Also see Chapter 5, which lists a variety of improvements (including better filters, higher chlorine dioxide concentrations, longer contact time and manipulations of other water chemistry parameters to enhance the effect of chlorine dioxide) "could be made to these treatment processes, perhaps yielding performance greater than" the IMO standard, though these would "add costs and engineering complexity."

<sup>4</sup> The standards define this size class as organisms that are less than 50 micrometers and greater than or equal to 10 micrometers in minimum dimension, which roughly corresponds to phytoplankton.

<sup>5</sup> Although the entries of "<0.1" per mL in the test report suggest that the treatment system met the 100x IMO standard of <0.1 per mL in every trial, this isn't quite correct. Nine 1 mL samples were analyzed in these trials, so the actual detection limit was 1 organism per 9 mL, or 0.111... organisms per mL, slightly greater than 0.1 per mL. Thus, the test results show that the treatment system came very close to meeting the 100x IMO D-2 in every trial, but the volumes analyzed were not quite large enough to show whether it did in fact meet it.

<sup>6</sup> SAB Report, Page 36 (Conclusion 1b), page 38 (discussion of Question 2) and Cover Letter; also see the Executive Summary at pages 4 and 5 and Table 4-1.

The Panel then went on to do the same thing with two other treatment systems, one using a filter and electrochlorination, the other using a hydrocyclone, filter and peracetic acid. That is, the Panel concluded that these types of systems couldn't meet certain treatment standards when the data unambiguously showed that they had.<sup>7</sup>

In fact, the Panel concluded that no type of available treatment system could meet the 10x IMO standard, even though the test data that the Panel examined showed that fully half of the treatment system types that the Panel examined had met that standard.

These false conclusions have had far-reaching consequences. The SAB issued its final report on ballast water treatment technology in 2011. In 2012, the U.S. Coast Guard adopted the IMO standard as a regulatory requirement under the National Invasive Species Act, citing the SAB report as the basis for its determination that the IMO standard is the most stringent that can be met.<sup>8</sup> In 2013, EPA similarly adopted the IMO standard as the Clean Water Act discharge permit conditions for ballast water, citing the SAB report as the basis for its own, independent determination that the IMO standard is the most stringent that can be met.<sup>9</sup> The EPA, the Coast Guard, the Fish and Wildlife Service, NOAA and numerous other authorities have attested that ballast water discharges transport and release a variety of non-native organisms that have caused major ecological and economic harm, as well as human pathogens that have resulted in widespread disease and deaths.<sup>10</sup> To protect the environment and public health, ballast water regulations must be based on the best available science. Clearly, that did not happen in this case. Rather, it appears that the regulations adopted in 2012 and 2013 are 10 times or 100 times less stringent than required by the Clean Water Act, which states that EPA's discharge permit conditions must be based on the "best available technology."<sup>11</sup>

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<sup>7</sup> The test data for all three treatment systems are provided in the attachment to the letter that six former members of the Panel sent to you on Mar. 2, 2015.

<sup>8</sup> "The numeric limitations in today's final rule represent the most stringent standards that BWMS [ballast water management systems] currently safely, effectively, credibly, and reliably meet (US EPA SAB, 2011)." U.S. Coast Guard, "Standards for Living Organisms in Ships' Ballast Water Discharged in U.S. Waters: Final Rule," *Federal Register* 77(57): 17256 (March 23, 2012).

<sup>9</sup> "The numeric limitations in today's permit represent the most stringent standards that ballast water management (treatment) systems currently safely, effectively, credibly, and reliably meet (US EPA SAB, 2011)." U.S. Environmental Protection Agency, 2013 *Final Issuance of National Pollutant Discharge Elimination System (NPDES) Vessel General Permit (VGP) for Discharges Incidental to the Normal Operation of Vessels: Fact Sheet*, pp. 74-75. Also see *Fact Sheet*, p. 76, and U.S. Environmental Protection Agency, 2013 *VGP: EPA's Response to Public Comments*, p. 551.

<sup>10</sup> In addition, in 1994 USFDA scientists concluded that ballast water had transported a novel strain of epidemic cholera into U.S. waters where it infected fish and oysters and posed a threat to individuals consuming these; and in 2012 scientists from the Centers for Disease Control and the EPA published an analysis arguing that there is a serious risk that ballast water could introduce a different strain of epidemic cholera from Haiti into the U.S.

<sup>11</sup> You're probably aware that the 2nd Circuit Court of Appeals found that the EPA failed to base its ballast water discharge standards on the best available technology. However, the Court was unaware of the fact that the Panel's conclusion about the performance of ballast water treatment systems was wrong, as that error had not been discovered at the time the case went to trial. Not knowing that available treatment systems can meet the 10x IMO standard and nearly meet the 100x IMO standard, the Court allowed the existing discharge permit requirements based on the IMO standard to stand.

My greatest concern now is not with how the Panel managed to produce a conclusion that is the opposite of what the data showed – though I suspect that there are important lessons that EPA and the SAB should learn from that, at some point. My strongest concern is that when some of the former Panel members discovered that the conclusion was wrong, informed the SAB and the EPA, and asked that the incorrect conclusion be corrected, the SAB and EPA did not respond with the will to look into the matter. The EPA has also kept in force discharge permit conditions that are based on the erroneous conclusion.

I am deeply concerned about our process: the SAB and the EPA have the responsibility to base decisions on the best available science. It is clear to me that we have thus far failed in this regard. We know now, after having been alerted, that the data support a different conclusion; a stronger set of standards is achievable with current technology, and would better protect the environment and health. This was not reflected accurately in a report approved by the SAB, on which I serve, and it is important to reverse that conclusion. Failing to correct a conclusion *that is known to be false* may even constitute scientific misconduct as defined by federal policy. Even if it doesn't, I feel that this situation threatens our collective credibility, unless and until we fix it. Meanwhile the EPA and Coast Guard continue to implement and enforce regulations based on a false review of analytical results, ensuring that we are not protecting waters, allowing an order of magnitude greater likelihood of damage to ecosystems from biological invasions, and possibly also human disease and deaths. These can be prevented.

I urge you as strongly as I can to attend to this issue in the near future.

Sincerely,

Ingrid C. Burke  
Director, Haub School of Environment and Natural Resources  
Wyoming Excellence Chair of Ecology, and  
Member, EPA Science Advisory Board

attached: March 2, 2015 letter to EPA Administrator Gina McCarthy from six members of the Ballast Water Advisory Panel

xc: Christopher Zarba, Director, EPA Science Advisory Board Staff Office  
Joel Beauvais, Acting Deputy Assistant Administrator, EPA Office of Water  
Michael H. Shapiro, Principal Deputy Assistant Administrator, EPA Office of Water  
Andrew Sawyers, Director, EPA Office of Wastewater Management  
Deborah Nagle, Director, Water Permits Division, EPA Office of Wastewater Management  
Members of the Chartered Science Advisory Board and SAB Standing Committees  
Members of the Science Advisory Board's Ballast Water Advisory Panel