



MEMORANDUM

To: Nicole Dobroski, Assistant Chief of the Marine Environmental Protection Division, California State Lands Commission

From: Kiya Gornik, Senior Science Officer, California Ocean Science Trust

CC: Jennifer Lucchesi Executive Officer, California State Lands Commission
Mark Gold, Deputy Secretary for Ocean and Coastal Policy, California Natural Resources Agency
Jenn Eckerle, Deputy Director, California Ocean Protection Council
Liz Whiteman, Executive Director, California Ocean Science Trust
Hayley Carter, Senior Science Officer, California Ocean Science Trust

Date: February 19, 2020

Re: California Ocean Science Trust scientific and technical review of the information and conclusions presented in the “2018 Assessment of the Efficacy, Availability, and Environmental Impacts of Ballast Water Treatment Technologies for Use in California Waters” on behalf of the California State Lands Commission

REVIEW REQUEST AND SCOPE

In order to ensure decisions are grounded in sound scientific conclusions, the California State Lands Commission (CSLC) staff requested that the Ocean Science Trust, an independent non-profit organization dedicated to convening science expertise to accelerating process for healthy oceans, coordinate an independent scientific and technical review of the report, “2018 Assessment of the Efficacy, Availability, and Environmental Impacts of Ballast Water Treatment Technologies for Use in California Waters.” CSLC staff intends to consider reviewer feedback and use the feedback to prepare comments to the U.S. Environmental Protection Agency and U.S. Coast Guard (USCG) during the development of regulations to implement the federal Vessel Incidental Discharge Act.

Reviewers conducted an assessment of whether:

- 1) the scientific information presented within the report was sound and reasonable;
- 2) the relevant science included in the report was comprehensive and representative of existing knowledge in this field of research; and,
- 3) the interpretations and conclusions drawn in the report were appropriate given the available scientific information.

REVIEW PROCESS OVERVIEW

Ocean Science Trust led the review process between November 2019 and February 2020. Steps included:

1. **Scoping the review.** Ocean Science Trust worked with CSLC staff at the outset to develop and formalize the review scope and process, which articulated shared expectations. This document is publicly available on the Ocean Science Trust [website](#)¹.
2. **Reviewer selection.** Ocean Science Trust led a process to select three external scientific experts, accepting recommendations from the Ocean Protection Council (OPC) Science Advisory Team, and Ocean Science Trust’s own professional network. The OPC Science Advisory Team Executive Committee, representing leadership from OPC, Ocean Science Trust and the OPC Science Advisory Team co-chairs, selected the final reviewers based on reviewer expertise following evaluation of any declared conflicts of interest. Reviewers were required to sign a form and declare whether they perceived a conflict of interest. Reviewers were informed of the client and authorship of the report. Reviewer names were kept anonymous to CSLC staff and the public during the review, and their comments were submitted anonymously without attribution to any single reviewer. With the release of this document, the reviewers are made public:
 - o Dr. Matthew First, Research Scientist, Naval Research Laboratory
 - o Allegra Cangelosi, Senior Researcher, Penn State University
 - o Dr. Michael K. Stenstrom, University of California Los Angeles
3. **Conducting the review.** Ocean Science Trust worked in collaboration with CSLC staff to develop instructions to focus reviewers on the scientific assessments and conclusions in the report and to provide the data and information underlying the report. Reviewers were asked to respond in writing to questions in the instructions.
4. **Providing deliverables.** Ocean Science Trust produced a public summary of the review (this memo). CSLC staff were also provided with additional technical details for consideration, including in-text comments on the CSLC report and individual responses to questions (for internal use only).

Ocean Science Trust valued the opportunity to provide scientific support to the State of California. We commend the CSLC’s commitment to ensuring decisions are grounded in sound scientific reasoning and conclusions, and appreciated their constructive engagement throughout the process. Ocean Science Trust appreciated the time and thoughtful reviews provided by selected experts and acknowledges the funding provided by the California Ocean Protection Council.

REVIEW SUMMARY

The report “2018 Assessment of the Efficacy, Availability, and Environmental Impacts of Ballast Water Treatment Technologies for Use in California Waters” concludes there are no available ballast water treatment technologies to enable vessels to meet the interim California Performance Standards, which set limits on the allowable concentrations of organisms in discharged ballast water. Reviewers were in support of the report’s emphasis on protecting California’s waters from non-native invasive species. In general, reviewers found the majority of the analysis and conclusions in the report to be pragmatic and

¹ Project page url: <https://www.oceansciencetrust.org/projects/ballast-technology-scientific-review/>

appropriate given the current technology and analytical approaches available. Reviewers agreed that these limitations do not reduce the need to provide as much protection from species invasions as is possible. One reviewer acknowledged that the authors should consider reviewing an additional technology – chlorine-based disinfection – before concluding that all treatment methods are inadequate to comply with the standards. Another reviewer recommends an additional analysis of the data (see bullet two under “Scientific Rigor” below).

Additional comments and suggestions are detailed below covering topics such as access to USCG testing data, the potential future use of Ballast Water Exchange + Ballast Water Treatment (BWE + BWT), and the limitations of shore-based treatment, among others. Reviewers noted that some new data and information has been made available since the report was published in 2018. Greater clarity in report structure, language, and data descriptions may improve the report.

See below for a summary of the review.

Scientific Rigor

Given the scope of the report was to assess ballast water treatment technology available to meet the interim California Performance Standards, reviewers were largely satisfied with the scientific rigor of the analysis. Reviewer recommendations and comments included:

- One reviewer recommended that the authors consider and report on chlorine-based disinfection methods more thoroughly, given the success of this method in wastewater treatment, before reaching the conclusion that no technologies are available to meet the standards.
- One reviewer recommended additional analysis focused on discharge data from specific Ballast Water Management Systems (BWMS), instead of from ships generally, as was done for BWMS performance against the USCG and California standards. Alternatively, they suggested revising conclusions to note that data are available, but the analysis is unnecessary because availability of data is thwarted by BWMS performance issues.
- One reviewer requested clarity on how the authors dealt with the interim California Performance Standards’ lack of definition for a volume of water sufficient to determine if there are no detectable living organisms in ballast water for the largest size class of organisms, as this has the potential to impact the analytical outcomes of the review. Reviewers acknowledged the problematic nature of measuring bacterial concentrations without sampling 100% of the flow stream, which is not possible.
- One reviewer found the access to USCG testing data to be a severe limitation in the analysis. However, another reviewer suggested that the value of the USCG test reports to the Commission should be tempered, as the test methods and analytical methods are optimized for determining whether a sample met the U.S. federal discharge standards and not the California standards. The California standards are, in some cases, much less than the federal discharge standards and would be below the limit of quantification for the USCG-approved test methods.

- Regarding the suitability of using shore-based treatment methods, one reviewer noted that while existing facilities may be able to provide the treatment necessary to disinfect bacteria and viruses using shore-based treatment methods, there will likely be significant challenges related to accepting saline ballast water.
- One reviewer called for greater clarity regarding table labels, headings, and units. The terms “availability” and “test”/ “test trial” need to be clarified and used consistently throughout the report.

Comprehensiveness of Cited Literature

Overall, reviewers were comfortable that the report cited relevant data. Reviewers noted where additional scientific references that would provide further support or would clarify language characterizing standards in California as more detailed than International Maritime Organization and USCG standards. Reviewers also noted that since this report was drafted, the USCG’s list of Type Approved BWMS has increased.

Science-Based Conclusions and Supported Decision-Making

The CSLC report concluded there is no ballast water treatment technology available to enable vessels to meet the interim California Performance Standards, and recommended that the California Legislature review the existing ballast water discharge performance standards and consider alternative, feasible options to reduce the risk of species introductions from ballast water. The reviewers agreed that these large-scale conclusions and recommendations appear warranted.

Reviewers noted several areas (also described in “Scientific Rigor” above) where additional analyses or further review would make the conclusions and recommendations more robust:

- One reviewer suggested considering chlorine-based disinfection methods more thoroughly as a potential technology.
- One reviewer commented that the prevalence of discharge samples in violation of standards does not mean that no BWMS are available to meet the standards and suggested additional analysis of existing data.
- Reviewers noted that caution should be exercised around conclusions regarding the benefits of BWE + BWT studies due to the limited nature of research on this topic. One reviewer commented on the need for an extensive data set or research to support consideration of an impactful regulation such as BWE + BWT in the future. They noted in the report’s recommendations that sampling for research purposes seemed like a higher priority than stating there is a possibility for requiring BWE +BWT.
- There is agreement that ballast water exchange may be helpful in meeting the proposed standards but will not support reaching the zero organism standard and furthermore may not be possible for safety reasons.

Additional Comments

One reviewer commented that repetitiveness in the text detracted from clarity and recommended improving organization and accessibility by including: (1.) a conclusion at the end of each major section for which the Commission took action, and (2.) a “finding” at the end of each subsection leading to it.