Great Lakes Ballast Water Research and Development Plan – Research Area 1, Project 3:
Shipboard Evaluation of Ballast Water Management Systems in Great Lakes Water

I. INTRODUCTION

The Lake Superior Research Institute (LSRI) - Great Waters Research Collaborative (GWRC), in collaboration with the U.S. Department of Transportation Maritime Administration (MARAD), is issuing this Request for Proposals (RFP) for shipboard platforms, Great Lakes ports, and/or ballast water management system (BWMS) manufacturers interested in partnering to determine the biological and operational effectiveness of BWMS operating within the Great Lakes System.

A. Eligibility for Federally-Funded Testing Services

Federal funding is available to underwrite the cost of testing services for up to three technologies that demonstrate potential for the treatment of ballast water in the Great Lakes in alignment with the spirit of the US Great Lakes and Lake Champlain Invasive Species Program (GLLCISP). Public and private nonprofit institutions, universities, and colleges, as well as for-profit firms inside or outside the US are eligible to apply.

Solicitation Opening Date: 11 July 2022
Letter of Intent Due Date: 29 August 2022
Solicitation Closing Date: 30 September 2022

II. BACKGROUND

The Vessel Incidental Discharge Act of 2018 (VIDA) established the Great Lakes and Lake Champlain Invasive Species Program (GLLCISP). The LSRI-GWRC, in collaboration with MARAD, has prepared a *Great Lakes Ballast Water Research and Development Plan* (*R&D Plan*), which addresses the stated goals of GLLCISP related to ballast water. The primary goal of the *R&D Plan* is to identify approaches, methods, and best available technologies for reduction of propagules in Great Lakes ballast water, thereby decreasing the environmental risk associated with the ballast water vector from vessels operating within the Great Lakes System.

Ideally, a BWMS installed onboard a vessel will reduce the number of propagules to meet the discharge standard (2013 VGP, 33 CFR Part 151, IMO D-2 Standard). However, aspects of water quality (e.g., low salinity, low temperature, high turbidity) and the unique operations of Great Lakes vessels (e.g., high ballast flow rates, large ballast volumes, short voyage times) have proven difficult obstacles to overcome

in the development of effective and practicable BWMS for treatment of Laker vessel ballast water. Further, a substantial portion of the vessels operating exclusively within the Great Lakes System are uniquely constructed, unlike seagoing ships of similar size, making installation and operation of a BWMS more complicated. This RFP applies to unique and/or enhanced technologies and methods with potential for use within the Laurentian Great Lakes, supporting the collaborative efforts of vessel owner/operators and BWT developers to specifically test BWT processes, such as, novel components, active substances, procedures, mechanisms, and activities that may be able to reduce or eliminate introductions and secondary spread of invasive species associated with commercial shipping in the Great Lakes. Ideally, BWT technologies will be suitable for freshwater ports with challenging water quality, align with the Laker vessel operational profile and anticipated voyage patterns, and demonstrate that the principal "approved" treatment methods/components are capable of functioning as installed.

Research Area 1 – Project 3 of the *R&D Plan* describes the project *Shipboard Evaluation of the Effectiveness of IMO Compliant and U.S. Coast Guard Type Approved BWMS in Great Lakes Water* (*Shipboard BWMS Evaluation Project*) is a seven-year project as described in the *R&D Plan*. A total of $1,985,000 is available for projects conducted under this RFP, and additional funding for subsequent years is currently being pursued. This RFP is applicable to:

- Companies with vessel(s) operating primarily within the Great Lakes that either:
    - Have an installed BWMS, or
    - Can feasibly install a BWMS, in partnership with a BWMS manufacturer or
    - Test individual BWMS components or processes from a BWMS installed on a vessel.

If selected, applicants are provided with engineering/BWMS acquisition and installation, if applicable, onboard a vessel. Following installation, subsequent project years are designed to gather data on the operational and biological effectiveness of the BWMS under normal vessel operating conditions. All BWMS will be evaluated by GWRC staff during several test trials conducted over at least two Great Lakes shipping seasons. Over the course of this project, the impact of BWMS operation on normal vessel operations will also be evaluated.

III. AWARD INFORMATION

Estimated Number of Awards: Maximum of 2
Funding Amount: $1,985,000 total

The LSRI-GWRC and MARAD acknowledge that the funding amount may be insufficient to cover all the costs associated with BWMS procurement, installation, and operation. In-kind contribution from the vessel owner/operator and BWMS manufacturer will likely be necessary. Successful implementation of this project hinges on the partnership that will be formed between LSRI-GWRC, MARAD, vessel owner/operator or port, and BWMS manufacturer. The LSRI-GWRC and MARAD will work with funded proposal teams to ensure the data needs of this project are met, while also addressing any data needs

that the proposal teams may have above and beyond the scope of this project.

A. Eligibility for Funds

A collaborative partnership between the vessel owner/operator or Great Lakes port and BWMS manufacturer must be established prior to submitting a proposal. Vessels serving as shipboard platforms must be commercial vessels with cargo-carrying capacity greater than 1,600 gross registered tons that trade primarily within the Great Lakes System. For purposes of this RFP, the Great Lakes System encompasses the waters upstream of the St. Lawrence River and west of a rhumb line drawn from Cap-des-Rosiers, Quebec, Canada to West Point, Anticosti Island and west of a line along 63°W longitude from Anticosti Island to the north shore of the St. Lawrence River. A BWMS must be installed on the vessel prior to May 2023 (i.e., when the first shipboard trial is planned), and GWRC researchers must be allowed on board/at port during test trials.

IV. PROJECT GOALS

To date, there have been very few land-based and shipboard regulatory test trials of BWMS conducted within the Great Lakes System (Mueller & Dooley, 2017; Cangelosi et al. 2017 and 2018). The goal of Shipboard BWMS Evaluation Project *(Research Area 1 – Project 3)* is to increase the publicly-available data on BWMS performance under operational conditions in a variety of Great Lakes commercial ports.

The research objectives associated with this RFP are:

1. Determine operational and biological efficacy of BWMS, either installed onboard vessels trading primarily within the Great Lakes under normal operating conditions using the *ETV Protocol*.
2. Evaluate the impact of BWMS operation on vessel operations (e.g., cargo loading/off-loading).
3. Evaluate the impact of targeted water quality parameters on BWMS operation.

For those Great Lakes vessels or commercial ports without an installed BWMS, time is provided for BWMS acquisition, planning/engineering, and BWMS installation. This RFP provides funding to incentivize a project partnership between willing research platforms (e.g., Great Lakes vessels or commercial ports) and manufacturers of BWMS. For research platforms without an installed BWMS, interested vessel owner/operators/Great Lakes ports and BWMS manufacturers are asked to apply together, and funding will be awarded to selected applicant pairs.

Pending available funding, applicants may receive additional awards to offset the costs associated with this project in subsequent years.

A. Scope of Work, Project Timeline, and Deliverables

Each BWMS will be evaluated according to the methods outlined in the *ETV Protocol*. Table 1 outlines the timeline for project milestones associated with the work being funded under this RFP. Please note: this timeline would be substantially accelerated for vessels with installed BWMS.

Table 1. Project Milestones and Anticipated Timeline for Great Lakes Shipboard Evaluation of Market-Available Ballast Water Management Systems / Components (Research Area 1, Project 3).

Project Milestone	Projected Timing
Notification of Acceptance into Project	October 2022
Funding Awarded to Applicant(s)	November 2022
Engineering/BWMS Acquisition/Installation	December 2022 – April 2023
Development of Test/Quality Assurance Plan	February 2023 – April 2023
Trial #1 ETV Protocol	April – June 2023
Trial #2 ETV Protocol	July – September 2023
Trial #3 ETV Protocol	October – December 2023

1. BWMS Installation

Temporary BWMS or BWMS component installation is accepted as part of this project; however, the vessel owner/operator must commit to installation for up to a three-year duration (ending approximately 30 September 2025). For vessel-based installations, the BWMS must treat a minimum of 10% of total ballast capacity and ensure isolation of treated ballast from untreated ballast to avoid contamination. The BWMS manufacturer is expected to support and confirm proper installation of the BWMS, and either operate or provide training for its continuous operation during the test trials. For vessel-based installations, the vessel owner/operator and crew must commit to installation of sample ports within the ballasting system that will allow for connection to GWRC's shipboard sampling system.

2. GWRC Sampling and Analysis

Ballast water sample collection and analysis will be conducted by LSRI-GWRC staff, at no expense to the vessel owner/operator or Great Lakes port, and with minimal disruption of normal vessel/port operations. The total LSRI-GWRC time onboard vessel/in port will be less than four hours. LSRI-GWRC's sampling and analysis plan will be unique to the type of installation and BWMS, and LSRI-GWRC will work collaboratively with proposal teams to finalize a Test/Quality Assurance Plan prior to the start of test trials.

3. Deliverables

The data from this project will be published and publicly available. This project will produce data on the

operational and biological efficacy of BWMS used during normal Great Lakes vessel/port operations. Drafting of the publication will be a collaborative process, and applicants will be asked to provide feedback on potential (Great Lakes-specific) technology improvements, lessons learned, cost/benefit of technology, etc., for inclusion in the publication.

V. CONFIDENTIALITY

The proposal team is responsible for providing any confidentiality or non-disclosure agreement desired **prior to planning the test design**. LSRI-GWRC will maintain confidentiality of any declared proprietary information relative to the technology subject to testing and will work with award recipients to ensure that proprietary technologies are referred to in a generic and categorical way in all planning and reporting documents.

This effort is supported with U.S. federal funds, and the data generated will be made available to the public. GWRC, in collaboration with the proposal team, will also publish findings in peer-reviewed scientific or technical journals, or other publications as deemed appropriate. GWRC will not publish declared proprietary information in publicly available documents.

VI. APPLICATION PREPARATION AND SUBMISSION

A. Letter of Intent

Submit a letter of intent to jmaki@uwsuper.edu by 29 August 2022 that briefly describes the project and how it aligns with the goals of R&D Plan – Research Area 1, Project 3. Within five working days of receipt, an upload link to the LSRI Egnyte Ballast Water Server will be sent to the applicant for proposal submission.

B. Proposals

Proposals will be accepted until 5:00 pm CST on 30 September 2022 via the provided Egnyte upload link. Applications must be collaborative in nature and submitted jointly by the vessel owner/operator/port-BWMS manufacturer. Proposals are limited to 15 pages, not including the cover page, and must include the following information:

I. **Cover Page**
   PDF-fillable form provided by LSRI-GWRC that includes applicant contact information and other information required for administration of funds.
II. **Proposal Team, Scope of Partnership, and Roles in the Project**
   Brief introduction of each member of the proposal team, explanation of their role in the project, and any experience with shipboard and/or port-based evaluation of BWMS (research and development testing or regulatory testing).
III. **For Onboard Installations: Vessel Description and Trade Pattern/Routes**
   Vessel operational characteristics and typical/historical trade route.
IV. **Ballast Water Management System Description**

Model and operational characteristics, description of any previous testing (either research and development or regulatory) performed in freshwater (not limited to the Great Lakes System).

V. **Project Design**
Timeline and plan for installation of BWMS or description of BWMS location within vessel (if already installed), project milestones, plan for operation of BWMS (continuous operation or operation only during test trials), plan for maintenance of BWMS, crew training plan (if BWMS will be operated by vessel crew).

VI. **Budget**
Itemized budget describing how the funding will be used, including but not limited to, engineering support, BWMS acquisition, BWMS installation, and/or BWMS/vessel operational costs. In-kind costs and other contributions from the vessel owner/operator and/or BWMS manufacturer must be described.

VII. **Referenced Documents**
List the documents cited in the proposal.

We encourage technology manufacturers to exclude proprietary information from application materials. If inclusion of such information is necessary, a confidentiality or non-disclosure agreement must be provided to LSRI-GWRC and completed prior to the submission of application materials.

VII. REVIEW PROCESS

Completed proposals will be reviewed by a MARAD-convened panel within four weeks of receipt. Notification of award will occur no more than three months after solicitation closing date. Review criteria are, in order of priority:

- Application completeness
- Anticipated vessel trade route or description of the port
- Readiness of the vessel/port and BWMS/components for Great Lakes shipboard evaluation
- Demonstrated partnership of project participants, including applicant team experience and roles in project
- Feasibility of shipboard/port-based evaluation
- Budget and cost sharing
- Compatibility of project design and overall timeline with stated goals
- Technology training and operation plan

Any questions that come up during this review will be transmitted to the applicant for feedback by email.

VIII. FUNDING CONTACTS

For any questions relating to the technical or programmatic aspects of this RFP, please contact Jen Maki, GWRC Project Lead, at jmaki@uwsuper.edu or +1(715)394-8422.

For any questions about the administration of this funding opportunity, please contact Matthew TenEyck, LSRI Director, at mteneyck@uwsuper.edu or +1(715)394-8160.

IX. REFERENCED LITERATURE

Cangelosi, A., Aliff, M., Anders, O., Balcer, M., Beesley, K., Estepp, L., Fanberg, L., Gebhard, S., Mays, N., Polkinghorne, C., Prihoda, K., Reavie, E., Regan, D., Ruzycki, E., Saillard, H., Schaefer, H., Schwerdt, T., TenEyck, M., … Wilczewski, S. (2017). *Outcomes of United States Coast Guard Certification Testing of the JFE Engineering Corporation BallastAce® (Algorithm v.2 48H) Ballast Water Management System at the Shipboard Scale* (p. 37) [Technical]. Great Waters Research Collaborative.

Cangelosi, A., Aliff, M., Anders, O., Balcer, M., Beesley, K., Bramburger, A., Eliot, A., Estepp, L., Fanberg, L., Gebhard, S., Krumrie, L., Mays, N., Polkinghorne, C., Prihoda, K., Reavie, E., Regan, D., Ruzycki, E., Saillard, H., Schaefer, H., Schwerdt, T., TenEyck, M., … Tudor, K. (2018). *Report to the NSF International Laboratory on United States Coast Guard Type Approval Testing at the Land-Based Scale in Freshwater of the Evoqua Water Technologies LLC Ballast Water Management System Model SeaCURE™* (p. 107) [Technical]. Great Waters Research Collaborative.

Frank Lobiondo Coast Guard Authorization Act of 2018, Pub. L. No. 115–282, 176 (2018).

International Maritime Organization. (2004). *Regulation D-2 Ballast Water Performance Standard*. International Convention for the Control and Management of Ships' Ballast Water and Sediments. London, United Kingdom.

Mueller, J., & Dooley, J. P. (2017). *Technical Engineering Analysis & Economic Feasibility Study for Ballast Water Management System (BWMS) Installation and Operation on Board U.S. Flag Great Lakes Fleet (Lakers)* (Lake Carriers' Association No. 014766, v.2; p. 134).

U.S. Environmental Protection Agency. (2010). *Generic Protocol for the Verification of Ballast Water Treatment Technology,* EPA/600/R-10/146. Environmental Technology Verification Program.

U.S. Environmental Protection Agency. (2013). Vessel General Permit for Discharges Incidental to the Normal Operation of Vessels (VGP), Clean Water Act.