2026 Halifax OAE Joint Learning Opportunity: Request for Proposals

Introduction

The scientific community agrees that, in addition to drastically cutting our greenhouse gas emissions, we need a portfolio of approaches that can clean up the carbon pollution already in our air. Meeting the ambitious climate targets of limiting warming to below 2°C necessitates the removal of hundreds of billions of tons of CO_2 from the atmosphere this century, alongside urgent reductions in greenhouse gas emissions.

While current carbon dioxide removal (CDR) efforts have predominantly focused on land-based solutions, like afforestation and reforestation, achieving climate-relevant targets demands continued innovation of CDR methods beyond existing practices. The ocean covers 70% of the Earth's surface and already absorbs approximately 25% of excess atmospheric carbon. For this reason, scientists and practitioners are exploring ocean-based approaches, which are in varying stages of development. Ocean Alkalinity Enhancement (OAE) is emerging as a promising method because it mimics a well-understood natural geological process called weathering, converting dissolved CO_2 into forms of carbon considered stable for more than 10,000 years and naturally present in the ocean in very large quantities. Ocean Alkalinity Enhancement may increase the ocean's ability to safely store carbon without increasing ocean acidification.

In the summer of 2024, the Carbon to Sea Initiative (Carbon to Sea), COVE, and Planetary Technologies (Planetary) hosted a Joint Learning Opportunity (JLO) in Halifax, Nova Scotia. This opportunity supported research on OAE's long-term effects on bacteria and phytoplankton, the impact of OAE on benthic communities, measurement of key indicators of OAE, and fostering community involvement in learning about OAE projects

and shellfish farming enhancements, with a focus on integrating traditional Indigenous knowledge with modern technological approaches.

Today, Carbon to Sea, the Marine Environmental Observation Prediction and Response Network (MEOPAR), and Planetary are excited to announce a new Joint Learning Opportunity (JLO) that will accompany the ongoing coastal OAE deployment at Tufts Cove planned for spring and summer 2026 in Halifax, Nova Scotia. This controlled addition (dosing) of an alkaline material into an existing coastal outfall by Planetary is one of the only ongoing OAE deployments in the world, providing a one-of-a-kind research opportunity for a range of scientific questions *(see Summary of Planned Field Research Activities section below)*.

This JLO will provide additional funding to enable new applicants from across scientific, technical, social science, and community engagement fields interested in evaluating Ocean Alkalinity Enhancement's viability as a climate solution. Applicants may contribute to our understanding of scientific questions, develop and refine Measurement, Reporting, and Verification (MRV) instrumentation and techniques, and advance community engagement and understanding of the potential social benefits of OAE.

This JLO recognizes the Mi'kmaw Nation's traditional and ongoing stewardship of Tufts Cove and the Bedford Basin and welcomes Indigenous organizations, local community groups, fishers, youth, non-profits, and knowledge holders to lead or co-lead proposals. We encourage proposals that integrate Indigenous Knowledge Systems through methodologies like Two-Eyed Seeing, co-create engagement and communication strategies, or explore the social, cultural, and community dimensions of Ocean Alkalinity Enhancement (OAE). A diverse applicant pool is encouraged for this JLO, and consideration will be given to proposals that consider Equity, Diversity, Inclusion, and Accessibility (EDIA), Indigenous reconciliation, and/or new and emerging researchers.

This JLO provides logistical support, operational assistance, permits, and funding for applicants to leverage a planned alkalinity addition, maximizing the research value and cost-efficiency of their study and field work.

Successful applicant(s) will **demonstrate** strong alignment with the priorities shared in this Request For Proposal (RFP), whether through scientific merit, technical innovations, social science, or community engagement. Proposals should show a clear and pragmatic vision for executing the work, appropriate qualifications or relevant experience to deliver on that vision, and readiness to begin by **May 2026**. Applicants are encouraged to submit proposals that demonstrate innovative methodologies, community-driven approaches, or engagement strategies that make significant new contributions to the field's scientific, social, or cultural understanding of OAE.

The award package will reflect the unique needs of the work and may include: in-kind services and support for research logistics, access to the alkalinity dosing data package, and research funding. The total budget allotted to this program is up to $500,000 CAD, divided among winning awardees. In previous JLOs, the total budget has been divided between approximately 4-6 awardees.

The JLO is delivered through a partnership between the Carbon to Sea Initiative, MEOPAR, and Planetary Technologies, and builds on research being conducted by experts from Planetary Technologies and Dalhousie University. For a more detailed definition of JLO roles, refer to the Terms and Conditions.

Carbon to Sea Initiative (Carbon to Sea) is a non-profit ocean science program to evaluate whether the ocean can help mitigate climate change through carbon dioxide removal. Carbon to Sea is building a global network of field research hubs to advance our understanding of OAE in real-world environments. Carbon to Sea provides grant funding for field research and Joint Learning Opportunities in an effort to investigate whether increasing ocean alkalinity is an effective, safe, and sustainable way to remove CO_2 from the atmosphere.

Marine Environmental Observation Prediction and Response Network (MEOPAR) is a Canadian not-for-profit organization with funding from the Strategic Science Fund that links top marine researchers and highly qualified personnel across Canada with partner organizations and communities. MEOPAR funds leading-edge research, overcomes barriers to collaborative research, and helps to train the next generation of marine professionals.

Planetary Technologies Inc. is a Canadian private corporation based in Dartmouth, NS, working to remove carbon dioxide permanently from the atmosphere by restoring the ocean's natural balance. Through Ocean Alkalinity Enhancement, Planetary doses alkaline materials to existing coastal outfalls, where they react with dissolved CO_2 and convert it into stable bicarbonate stored in seawater for thousands of years. At the same time, this process reduces local ocean acidity and can help to restore local marine ecosystems. Planetary's Tufts Cove project has already delivered the world's first verified OAE credits and has commitments in place to continue dosing over the next five years through Frontier.

MEOPAR and Carbon to Sea are co-funding this Joint Learning Opportunity, which is enabled by Planetary Technology's alkalinity addition site, creating an opportunity for new research in a critically important field.

Important Dates

Table 1: List of important dates for the Joint Learning Opportunity

Event	Date
Q&A Webinar (Register here)	November 17, 2025
Proposal submission deadline	January 9, 2026
Awardees notified	February 2026
Agreement signing	February - March 2026
Funding disbursed to awardees	By March 31, 2026
Field Research dates (approximate)	May - September 2026
Final Reports due	January 31, 2027

Joint Learning Opportunity Strategic Objectives

The objective of this JLO is to advance the scientific, technical, social, and community-based understanding of OAE's viability and desirability as a method for climate change mitigation. By collaborating with the planned research activities of Planetary at Tufts Cove, we can extend the impacts of this work to collect additional data or test novel methods.

There are three strategic objectives that are key to advancing the research and implementation of OAE and establishing a strong community of practice in the field. These include:

1. **Scientific**: Understanding the biological, physical, and chemical impacts of OAE on marine systems throughout the water column, within sediments, and along the air-sea interface. The aim is to gather comprehensive data and build skillful models to strengthen the global evidence base on the efficacy, durability, and ecological safety of OAE. Also, to improve credible risk profiles and adaptive management practices in field trial and demonstration-relevant settings to create a foundation for responsible sector development.

2. **Technical**: Developing and enhancing sensing methods, modeling capabilities, autonomous missions, and data analysis to improve monitoring quality, cost efficiency, and reduce uncertainty and time delay of measurements.

3. **Social**: Engaging with interested and affected parties, including local communities, Indigenous rights holders, organizations, and other community groups, about their perceptions of climate change, perceived risks and benefits, and details of the proposed ocean research. The aim is to seek feedback, co-create approaches, and advance engagement, public outreach, and collaboration through innovative,

culturally grounded, and inclusive practices, while also supporting skill development, local capacity building, and initiatives identified by communities as beneficial.

Knowledge Gaps and Strategic Research Priorities

This JLO invites applicants (researchers, private sector, Indigenous organizations, community groups, and non-profits) to submit proposals that build on existing work and deepen our shared understanding of Ocean Alkalinity Enhancement (OAE) and its community benefits. Projects may focus on scientific, technical, or community-based activities that complement ongoing OAE research activities at Tufts Cove. Priority will be given to projects that help close knowledge gaps and address strategic priorities beyond the scope of the existing, planned research activities at Tufts Cove. New applicants are strongly encouraged through this JLO. (Please note: applicants are not expected to address all of the below, and some data may not be available until later in the year due to analytical and sampling processing timelines.)

In addition to the robust analysis being conducted by the researchers studying OAE in the Bedford Basin (*see Organizations & Team Members section below*), the following are a range of research areas and strategic priorities that the management team considers most *additional and/or complementary* to the planned OAE field activity:

1. **Biological Impact Monitoring:** Study potential ecosystem responses to changes in water or benthic habitat to inform real-time field decision-making and responsible scale-up. Develop new approaches for species selection that may offer credible risk profiles for longer-term or indirect impact monitoring. *Note: Some historic baseline data (pg 8) will be available; minimal to no biological impacts are expected based on earlier studies conducted in the lab and mesocosm.*

2. **Trace Metals and Suspended Solids:** Propose new or improved methods for measurement, monitoring, and/or certified lab testing of trace metals (water column, benthic) and total suspended solids. Examine chemical parameters, such as abundance and/or speciation of metals in the water column and/or sediments, or interactions with trace metals on-site due to Halifax's history as an industrial harbor. *Note: Existing metals and TSS monitoring data and approaches can be found on pages 8-17.*

3. **Near-field Measurements**: Expand in-situ measurements within ~1km of the outfall to generate quantitative or operational evidence of OAE efficiency for MRV. For example, approaches could target feedstock dissolution proxies (equivalent hydroxide (EQOH), particle size distribution, acoustic backscatter), parameters indicative of plume dynamics (turbulence, vertical mixing), or expansion of carbonate system parameters (total alkalinity, air-sea gas exchange

measurements, etc.). It may also involve cost-efficient scaling tools to expand the spatial coverage of currently monitored or new parameters.

4. **Near-Field Data Synthesis and Modeling:** Transform existing near-field datastreams into new syntheses, visualizations, or small-scale (<100 meters) models that clarify how key parameters respond and shape processes during alkalinity addition. Valuable outputs could include small-scale near-field modeling of feedstock dissolution and transport, uncertainty analyses, or cost–benefit assessments of monitoring data.

5. **Community Benefit Development:** Explore how OAE and field research connect with local livelihoods, education opportunities, Two-Eyed Seeing and traditional knowledge-exchange, adjacent sectors (e.g., aquaculture), local climate goals, and workforce training and development. Projects that deliver lasting community benefits and enduring engagement are encouraged.

6. **OAE Public Sentiment Exploration:** Explore public perceptions, beliefs, attitudes, and interest areas related to climate interventions through educational outreach, surveys, workshops, or other processes with a focus on co-creating a framework for ongoing participation and decision-making. May involve testing of various communications materials with the community to explore attitudes and perceptions of OAE, with conclusions that can be drawn for other research projects moving forward. May build upon the community engagement work led by the Ocean Alk-Align project and other organizations in the region.

Summary of Planned Field Research Activities

The project site is located in Halifax, Nova Scotia, Canada, at the Nova Scotia Power (NSP) Tufts Cove Power Generating Station. A cooling water loop, operated by NSP, continuously draws water from the surface of Halifax Harbour and discharges it at a nominal rate of ~190,000 L/min into the receiving waters of Tufts Cove (inset, Fig. 1.1). The discharge is at a tide-dependent depth of ~2-3 m below the surface.

On site, a high-solids slurry is created by mixing dry feedstock with ambient seawater drawn from the cooling loop outfall. The slurry is then dosed into the outfall via parallel metering pumps, which are controlled and monitored by Planetary's dosing system. The alkaline feedstock material is imported in approximately 1.2 metric tonne bulk bags, and stored on-site in a dry, ventilated shelter. The bags are weighed by a calibrated scale at an intermediary warehouse in Dartmouth, NS, before being transported to the dosing site. Samples are obtained from a representative subset of bulk bags prior to dosing in order to quantify feedstock hydroxide content and metal content. It is important to note that future iterations of the dosing system will likely move away from the use of bulk bags.

The impact of alkalinity addition on water quality in the outfall and ocean is monitored using sensor packages installed upstream (unalkalized water) and downstream (approx. 1 m beyond the discharge point) of the alkalinity dosing point, and via routine ocean sampling. During dosing, outfall sensor data are collected continuously, and discrete calibration, alkalinity, and metals samples are obtained weekly. In the ocean, up to seven stations are routinely monitored (markers in Fig. 1.1) for a range of biogeochemical properties. Ocean monitoring takes place at approximately 2-week intervals during dosing. A shore-tethered moored instrument package, installed approximately 10 m to the west and downstream of the ocean discharge point, provides ancillary biogeochemical sensor data, used primarily for research and development purposes.

Measurements from the outfall and ocean are assessed against a compilation of guidelines and standards from Federal (CCME) and Provincial (NSE/Atlantic RBCA) sources, and the Isometric OAE Protocol. A voluntary/self-imposed stop trigger framework, consisting of criteria for pausing dosing, is followed.

A detailed description of Planetary's activities is contained in the Operations & Monitoring Report as well as Planetary's project page on the Isometric credit registry.

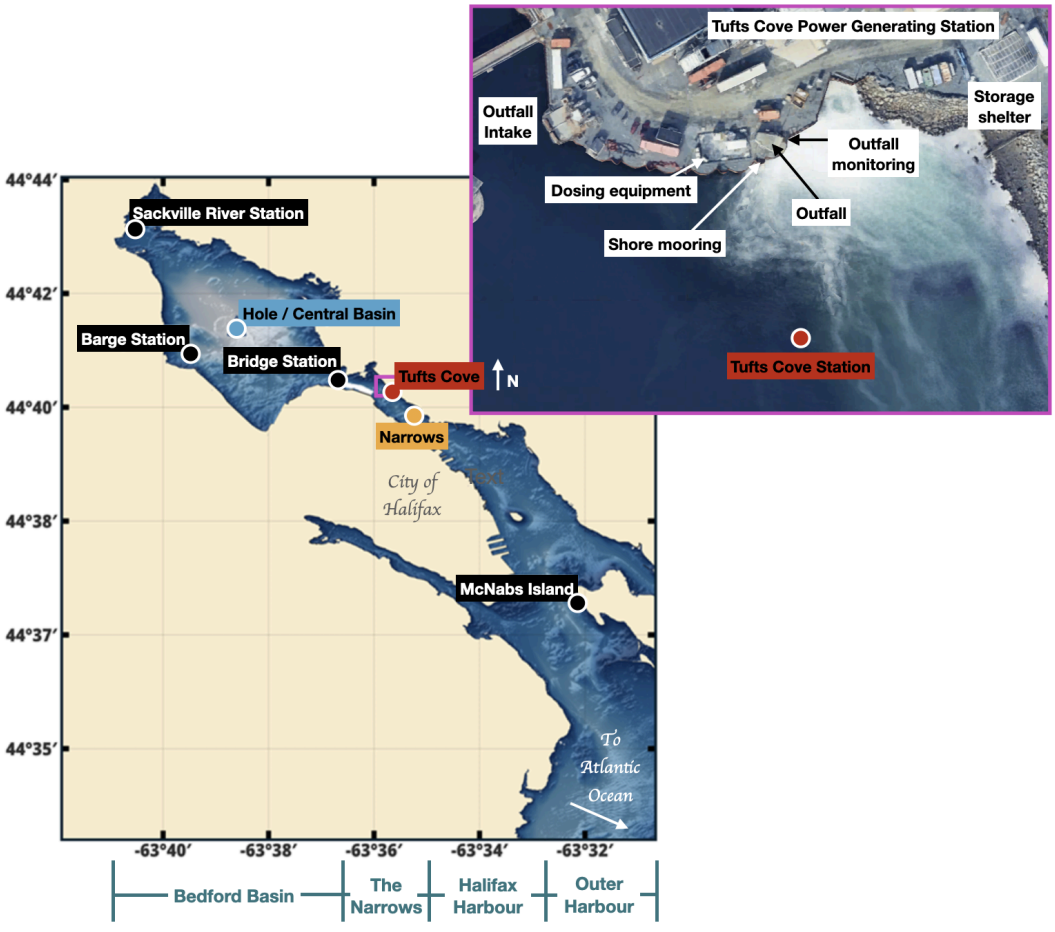

Figure 1.1 - Map of Bedford Basin and Halifax Harbour sampling stations.

Selection Methodology

Proposals for the JLO initiative will be independently reviewed by an experienced and technically proficient advisory committee, and final selection will be conducted by the JLO Management Team (members of the Carbon to Sea Initiative, MEOPAR, and Planetary Technologies). In addition to considering the thoroughness and completeness of the proposal, they will be evaluated against the criteria below:

A. **Scientific merit:** The proposal demonstrates scientific rigor and advances OAE knowledge, and the applicant has the necessary experience, qualifications, and capacity to deliver the proposed activities.
B. **Strategic alignment:** The proposal addresses key gaps and generates significant and timely insights beyond the scope of existing field activity.
C. **Technical feasibility:** The proposal presents a clear, achievable approach with a high likelihood of success.
D. **Equity considerations:** The proposal takes into consideration Equity, Diversity, Inclusion, and Accessibility (EDIA) principles and opportunities to reflect these values in its research.
E. **Value Proposition:** The proposal demonstrates efficient use of funds, clear value for investment, leverages existing resources where possible, and includes contributions from the research proponent.

A preview of the evaluation rubric to be used by the advisory committee is available in the Terms and Conditions.

Eligibility Criteria

Eligible recipients of MEOPAR funds include post-secondary institutions, not-for-profit organizations, Indigenous organizations and governments, municipalities, research networks, public engagement networks, organizations and companies that deliver public engagement activities, or start-up companies (including those housed in Canadian post-secondary-linked incubators). Eligible recipients do not include federal departments, agencies, or crown corporations of the Government of Canada. Applicants should have a strong track record in marine science, environmental research, marine technology, social research, or related fields. While the JLO is based in Canada, international proposals are welcome. Term definitions and additional participation requirements for proposals are provided in the Terms and Conditions.

Instructions for Submission

Proposals must be submitted directly to the JLO Management Team at research-network@carbontosea.org with the title of your project as the subject line by **January 9, 2026, by 5:00 PM AST** using the Proposal Application Guidelines. For additional questions related to the JLO, the proposal process, or questions surrounding the OAE activities in Halifax, Nova Scotia, please contact the JLO Management Team directly or raise questions at the JLO Q&A Webinar hosted on November 17, 2025, 1:00 PM - 2:00 PM AST. Please register for the event here.

Data Management Policy

All data should be managed and shared in compliance with Carbon to Sea, NOAA, and Submarine Scientific's published OAE Data Management Protocol. The protocol outlines recommendations for producing consistent data and metadata for Ocean Alkalinity Enhancement (OAE) research projects. With broad adoption, this protocol will make it possible to compare and interpret field research and more quickly advance our understanding of the field. For a full description of the Data Management Policy, see the Terms and Conditions.

The awardee agrees to publicly share data generated from the funded research as soon as it is readily available, or within 2 months of the end of an experiment (except for biological data). Data (including metadata) must be archived to the Canadian Integrated Ocean Observation System (CIOOS) within 6 months of the end of an experiment. This includes QA and QC'd data. For biological data, such as for phytoplankton taxonomy, extracted chl-a concentrations, HPLC, and phytoplankton abundance, the deadline for submission is extended to 8 months, as these samples take much longer to analyze than nutrient or carbonate samples, for example.

Applicants must outline plans for making data accessible to other researchers and the public, including timelines for data release. In addition to CIOOS, data can be stored in any additional scientific data repository that provides long-term preservation of data (ideally with version control capabilities), metadata hosting, and that provides data citations with a unique DOI (See 'Where to archive data' section of OAE Data Management Protocol). Data may be stored in more than one repository if necessary; however, it is strongly recommended to choose a single repository to aid in discoverability. The choice of data repository may be dictated by funder requirements.

Where proposals are Indigenous-led or involve Indigenous Knowledge, data management and sharing will respect Indigenous data sovereignty principles. Applicants may work with the JLO Management Team to develop appropriate agreements that balance open science goals with Indigenous governance and consent. If applicable, proposals are strongly encouraged to follow the CARE Principles of Indigenous Data Governance and First

Nations Principles of OCAP. Expeditions occurring in Indigenous waters should contact the local Nation(s) to determine how the expedition may proceed in a responsible way.

Organizations & Team Members

We are grateful to the experts and leaders from the organizations below, who have helped conceptualize and deliver these important scientific contributions and have generously opened the research to additional parties. The table below summarizes the team members and their involvement in this project. For more detailed descriptions of the roles of these teams and the review process, please see the Terms & Conditions. *Important note for JLO Applicants: Please direct all communications to the JLO Management Team (research-network@carbontosea.org), who can coordinate with the Research Team if necessary.*

Table 1: JLO Management & Research Teams with organizations & members

	Organization	**Team Members**	**Scope & Role**
JLO Management Team			
Research Site Leadership	Planetary Technologies	Kelsey Cuddihy	Organizational lead for Joint Learning Opportunity; responsible for the administration of awards and operational support in Canada
Funding & Strategic R&D Alignment	Carbon to Sea Initiative	Irene Polnyi Miriam Zitner Nick Kleinert David Keller Anna Madlener	Strategic alignment with global R&D priorities for OAE efficacy, safety, and measurability. Scientific, technical, and operational funding.
	MEOPAR	Jamie Snook Brent Else Isabelle Tremblay	
Research Team			
Key Scientific Measurements and CDR Quantification	Planetary Technologies	Will Burt	Discrete samples and sensor data from effluent and ocean (e.g., TSS, metals, CTD, see registry reports for details). CDR Quantification
CDR Quantification	Dalhousie University	Katja Fennel	Regional Ocean Modeling
Biological Monitoring	Dalhousie University	Chris Algar	Sediment biogeochemistry: coring, benthic landers, modeling
		Carly Buchwald	Nutrients, N2O, and nitrogen cycling
		Julie LaRoche	Phytoplankton and eDNA
Carbonate Chemistry	Dalhousie University	Dariia Atamanchuk	Monitoring of carbonate system parameters (bottles, sensor packages, autonomous platforms)

	Organization	Team Members	Scope & Role
Physical Oceanography	Dalhousie University	Ruth Musgrave	Current measurements (vertical and horizontal), T/S/O2/Chl/Backscatter, circulation, dispersion, dilution, and air-sea gas exchange
Community Engagement	Planetary Technologies	Diana Philip	Community engagement and liaison