



PORT of
vancouver



Enhancing Cetacean Habitat and Observation (ECHO) Program
2016 Annual Report

Canada

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ECHO program

British Columbia, Canada is a dynamic and growing international trade gateway. It also has a productive coastal ecosystem that sustains populations of whales, porpoises and dolphins (cetaceans). Fisheries and Oceans Canada has published *Species at Risk Act* recovery strategies and action plans for a number of endangered and threatened whale species in the region. Some of the key threats to whales include: acoustic disturbance (e.g. underwater noise from vessels), physical disturbance (e.g. vessel collisions), environmental contaminants, and the availability of prey.

Much of the commercial vessel activity within the southern coast of British Columbia transits critical habitat for endangered southern resident killer whales, as well as areas known to be of importance to other at-risk whales. The Vancouver Fraser Port Authority is committed to conducting operations in a responsible and sustainable manner. Our mission is to enable Canada's trade objectives, ensuring safety, environmental protection and consideration for local communities. We have a vision to be the world's most sustainable port and we define sustainability as delivering economic prosperity through trade, maintaining a healthy environment and enabling thriving communities. For these reasons, the Enhancing Cetacean Habitat and Observation (ECHO) program was developed in 2014.

The Enhancing Cetacean Habitat and Observation (ECHO) program is a Vancouver Fraser Port Authority-led collaborative initiative aimed at better understanding and managing the cumulative impacts of shipping activities on at-risk whales throughout the southern coast of British Columbia. Although the geographic scope of the Vancouver Fraser Port Authority's jurisdiction is limited, it is recognized that to adequately address the cumulative threats posed by commercial vessel activities, a larger, regional-scale collaborative approach is required. To this end, the ECHO program is advancing projects within the Salish Sea, as well as the waters off the western coast of Vancouver Island and the entrance to the Strait of Juan de Fuca.



Endangered southern resident killer whales in the Salish Sea, BC.

The ECHO program has benefited from early input and advice from scientists, maritime industries, conservation and environmental groups, First Nations individuals and government agencies, to help focus program efforts, and set goals and objectives. The long-term goal of the program is to quantifiably reduce threats from commercial vessel-related activities to at-risk whales.

Program structure

The ECHO program aims to engage and involve key regional interested parties to maximize program success and help ensure that mitigation and management measures developed through the program are informed by social, cultural, economic and environmental sustainability interests.

The ECHO program, led by the Vancouver Fraser Port Authority, is guided by the advice and input of an advisory working group, a federal government advisory committee and associated technical committees. The guidance provided by these volunteer advisors greatly assists the program management team in deciding which scientific studies, educational initiatives and other projects should be advanced to best meet program objectives.

Advisory Working Group

The ECHO advisory working group brings together a broad spectrum of relevant backgrounds, perspectives and interests from both Canada and the United States, who share the common goal of reducing threats to at-risk whales. The role of the advisory working group is to provide the ECHO program management team with timely input, advice and recommendations during the development and execution of the program. The group includes representatives from the following organizations:

- BC Coast Pilots*
- BC Ferries
- Chamber of Shipping of BC
- Cruise Lines International Association (North West & Canada)
- First Nations individuals
- Fisheries and Oceans Canada
- Hemmera Envirochem Inc.
- National Oceanic and Atmospheric Administration (NOAA)
- Pacific Pilotage Authority
- Shipping Federation of Canada*
- Transport Canada
- Vancouver Fraser Port Authority
- Vancouver Aquarium
- Washington State Ferries
- WWF-Canada

**Members new to the advisory working group in 2016*

Federal Government Advisory Committee

The federal government advisory committee offers strategic advice, recommendations and guidance to the ECHO program management team on the overall program direction, objectives and goals. This committee includes representatives from Environment Canada, Fisheries and Oceans Canada, Vancouver Fraser Port Authority and Transport Canada. The committee provides the opportunity for the ECHO program management team to collaborate and communicate with those federal agencies who have direct regulatory authority or decision-making responsibility pertinent to the goals of the program.

Acoustic Technical Committee

Acoustic disturbance has been identified by Fisheries and Oceans Canada as a key threat to the recovery of the endangered southern resident killer whales. Recognizing this, and given the complex technical nature of the subject area, the ECHO program management team has convened an acoustic technical committee. The role of the committee is to provide technical and scientific advice in the development and execution of ECHO research, mitigation and management projects and is composed of marine mammal biologists, acousticians, naval architects and others with specific technical knowledge around the sources and impacts of underwater noise. The acoustic technical committee includes representatives from:

- Fisheries and Oceans Canada
- JASCO Applied Sciences
- NOAA
- Oceans Networks Canada
- Robert Allan Naval Architects
- Sea Mammal Research Unit (SMRU) Consulting Canada
- Transport Canada
- University of British Columbia
- University of St. Andrews
- Vancouver Aquarium
- Washington State Ferries

Vessel Operators Committee

In 2016, the ECHO program convened the first meeting of the vessel operators committee. This committee was established to help provide the ECHO team with advice, support and guidance pertaining to potential mitigation options that may directly impact the shipping industry. In preparation for a proposed vessel slow down research trial (discussed in more detail later in this report), the committee was convened in December, 2016. The vessel operators committee includes industry representatives from:

- BC Coast Pilots
- BC Ferries
- Chamber of Shipping of BC
- Cruise Lines International Association – North West & Canada
- Hapag-Lloyd (Canada) Inc.
- Holland America Group
- Pacific Pilotage Authority
- Shipping Federation of Canada
- Transport Canada
- Vancouver Fraser Port Authority
- Washington State Ferries

Other program or project collaborators

The ECHO program is a collaborative undertaking which recognizes and highlights the value of sharing resources and information to meet common project or program goals. Along with the guidance and advice of the advisory working group, federal government advisory committee and technical committee members listed above, some of these members are also collaborating with the ECHO program on specific projects. Furthermore, the ECHO program has been fortunate to engage with additional parties to support the interests of the program and collaborate on specific aspects, such as data sharing initiatives and research projects. These additional collaborators include:

- Achieve Quieter Oceans (AQUO)
- BC Coast Pilots
- Green Marine
- Prince Rupert Port Authority
- Saturna Island Marine Research and Education Society
- University of Victoria Marine Environmental Observation
- Prediction and Response Network (MEOPAR)
- Scripps Institute of Oceanography
- Nanaimo Port Authority
- Port of Seattle
- Port of Tacoma
- The Whale Museum

Contributors

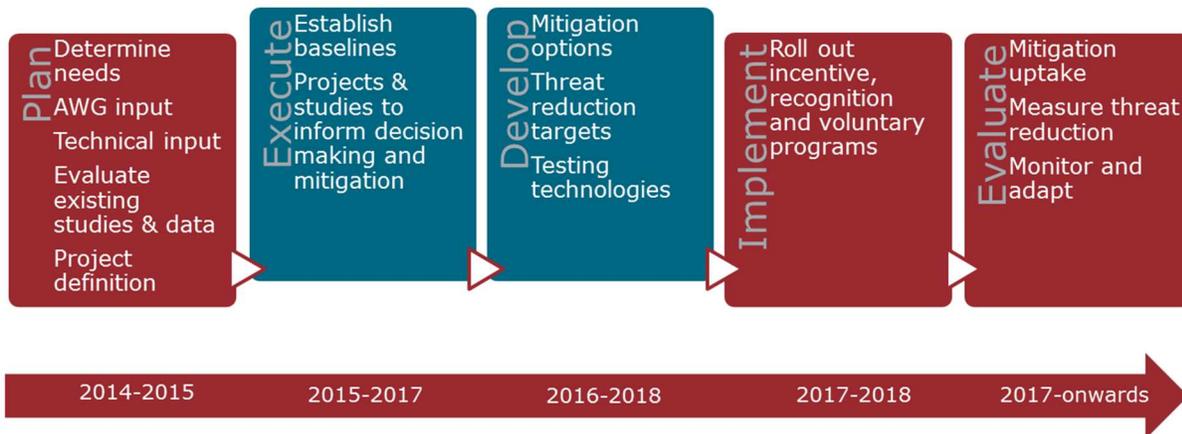
The Vancouver Fraser Port Authority has initiated and provided the seed funding for the ECHO program, however, the program has been very fortunate to also receive contributions from other industry and government stakeholders. Contributions have been received, or committed, either by way of direct financial support or in-kind contribution of equipment, resources and staffing on either the program level or for specific projects. These partners in funding include:

- Fraser River Pile & Dredge
- Trans Mountain
- Transport Canada
- Fisheries and Oceans Canada
- JASCO Applied Sciences
- Ocean Networks Canada

Program status

Road map

The ECHO program launched in November 2014 with the inaugural ECHO Advisory Working Group meeting. The program either initiates or supports short-term projects, scientific studies and educational initiatives to fill knowledge gaps and inform the development of threat reduction solutions and management options. As the program advances, multiple projects are being executed with the intention of developing voluntary mitigation options which will be implemented from 2017 onwards.



Engagement and consultation

Informing and engaging stakeholders, as well as raising the profile of the ECHO program not only in Canada, but internationally, is key to the success of this collaborative program. In 2016, the ECHO program met with the advisory working group three times, convened meetings of the federal government advisory committee and the acoustic technical committee, and launched the vessel operators committee in December, 2016.

Education

The ECHO program goals are to deliver credible, science-based information in a timely manner and to build trust and confidence in the program through collaboration. We also believe there is a need to educate and enhance awareness on the impacts of shipping on marine mammals. To achieve these goals, the ECHO program maintains regular communication with our advisors and collaborators, issues public newsletters, posts information to our [website](#) and creates educational materials to help raise awareness about the program.

The ECHO program delivered 41 presentations, reaching over 1,650 individuals in 2016. Presentations have been delivered to a variety of audiences ranging from regional and international industry stakeholders, environmental groups, acoustic scientists and naval architects. Presentation highlights include; an industry lunch and learn co-hosted with the Chamber of Shipping of BC, three international aquatic noise and environmental



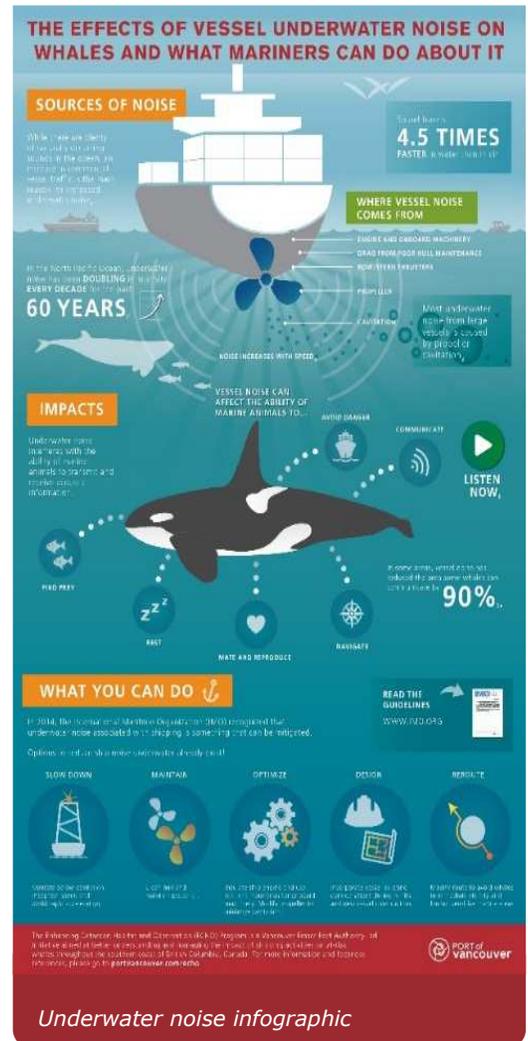
Fisheries & Oceans Canada's Species at Risk Recovery Planner, Sheila Thornton, speaking at industry lunch & learn, December 2016

conferences, session chair and presentation at the Salish Sea Conference, and hosting a public screening of the award-winning documentary *Sonic Sea* at the Vancouver Aquarium.

In 2016, the ECHO program created an underwater noise [infographic](#) designed to introduce the issue of underwater noise to mariners and provide suggestions on what can be done to reduce noise. This infographic has been published in both official languages, shared widely with mariners, and recognized and distributed by the International Maritime Organization through its [educational website](#). Additionally, *People of the Port* videos were created, highlighting two of our project partners: Dr. Peter Ross of the Vancouver Aquarium, speaking about the [PollutionTracker program](#), and Dr. Kate Moran of Ocean Networks Canada discussing their collaboration on the ECHO [underwater listening station](#). Combined, the videos have almost 10,000 views to date.

The ECHO program has also been highlighted and referenced in a number of media and industry publications, including the following stories:

- ECHO program support of *PollutionTracker* project, April 21, 2016
 - [Vancouver Sun](#)
 - [Vancouver Aquarium Aquablog](#)
- ECHO underwater listening station redeployed, October 7, 2016
 - [Vancouver Sun](#)
 - [Port Technology](#)
- Proposed underwater noise incentives, November 2016
 - [The MotorShip](#)
 - [NauticExpo E-magazine](#)
- General program stories
 - [GreenPorts Congress review](#), October 14, 2016
 - [Port Technology](#), December 12, 2016



ECHO projects and initiatives

Since inception, the ECHO program has initiated or provided support to 17 projects in three vessel-related threat categories that are identified in Fisheries and Oceans Canada’s Species at Risk action plans: acoustic disturbance, physical disturbance and environmental contaminants. Availability of prey is identified as another key threat category for at-risk whales. While this threat category is not a focus area for the ECHO program, this threat is being addressed by the port authority through a separate [Habitat Enhancement Program](#). The ECHO program’s advisory working group helped identify underwater noise as a priority focus area based on impacts to species-at-risk, in particular the southern resident killer whales.

A few of the ECHO program projects advanced in 2016 are highlighted here:

Acoustic disturbance/underwater noise

Regional ambient noise project - ONGOING

In consultation with the Acoustic Technical Committee, the ECHO program identified five priority sites at which to collect and analyze underwater ambient noise levels in the Salish Sea. In 2016, three of the five sites were collecting data which will be used to help establish current noise conditions. Partners on this project include: Fisheries and Oceans Canada, Sea Mammal Research Unit (SMRU) Consulting Canada, the Whale Museum, Ocean Networks Canada and Saturna Island Marine Research and Education Society.



Five hydrophone sites were selected as representative sites to monitor ambient noise levels in the region.

Regional ocean noise contributors – COMPLETE

The final report for this project, entitled *Regional Ocean Noise Contributors Analysis* was completed in 2016. The work was conducted by JASCO Applied Sciences Ltd., using a regional acoustic model combined with real traffic data to evaluate how much underwater noise different vessel sectors contribute to the soundscape. The study found that the commercial vessel sector (commercial deep-sea vessels, ferries, tugs, etc.) is the main contributor to underwater noise in the region, with different commercial sectors contributing in different geographical sub-regions. The study will help the ECHO program focus voluntary management efforts and inform the development of vessel noise reduction solutions that are appropriate for the vessel sectors and sub-regions.



In 2016, the regional ocean noise contributor’s project was completed.

The [report](http://portvancouver.com/echo) has been posted to portvancouver.com/echo.

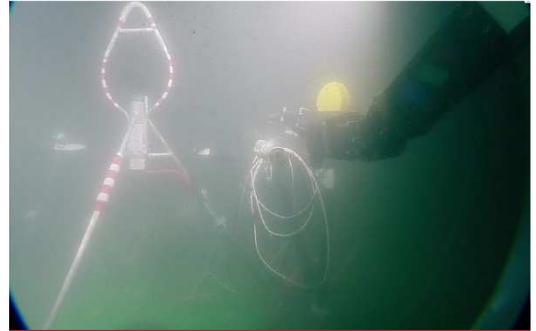
Vessel noise reduction options - COMPLETE

What makes ships quieter? This key question was explored in the *Vessel Quieting Design, Technology and Maintenance Options for Potential Inclusion in EcoAction Program* report completed by Hemmera Envirochem Inc. This desk-top study identified three quiet ship classifications and three propeller technologies shown to reduce underwater noise in support of new criteria for the port authority's EcoAction program. The new EcoAction underwater noise criteria came into effect as of January 1, 2017.

The [report](http://portvancouver.com/echo) has been posted to portvancouver.com/echo.

Underwater listening station – ONGOING

In partnership with Ocean Networks Canada, JASCO Applied Sciences and Transport Canada, the ECHO program installed an underwater listening station in the inbound shipping lane of the Strait of Georgia. The multi-hydrophone array, which allows for accurate measurement of vessel source levels, marine mammal detections and recording of ambient noise, was first deployed in September 2015. In October 2016, after a successful first year of data collection, the array was redeployed for an additional year. Over 1,000 vessel source level measurements were made in the first year of operation. Following each successful vessel pass of the ULS, JASCO PortListen software generates a two-page noise report which can be shared with vessel owners and operators.



Remote controlled robots maintain the underwater listening station in the murky waters 170m below the surface.

The information obtained through the underwater listening station is establishing one of the largest databases of vessel source levels in the world, providing valuable insight on vessel-generated noise, and how it can be reduced.

Physical Disturbance/Strike Risk

Large whale vessel strike risk assessment – ONGOING

Since 2015, the ECHO program has been supporting Fisheries and Oceans Canada in a project to evaluate the distribution and habitat of large whales, and the potential for ship strike. In early 2016, Fisheries and Oceans Canada published a preliminary [report](#) which detailed the use of whale distribution data obtained through aerial surveys, in a modelling exercise to assess the risk of lethal ship strikes to humpback and fin whales off the west coast of Vancouver Island. The ECHO program continues to support the Fisheries and Oceans-led project through funding of aerial surveys and satellite tagging. In the 2016 field season, nine temporary satellite tags were deployed on fin whales, six of which successfully transmitted data. Five additional aerial transect surveys were also completed. This work was conducted to collect fine scale habitat use and behaviour data for fin whales and humpback whales. Additional tags will be deployed in the 2017 field season.



Aerial surveys to estimate large whale distribution areas.

Photo Credit: DFO

Environmental Contaminants

Vancouver Aquarium Pollution Tracker - ONGOING

The Vancouver Aquarium successfully sampled ten ECHO program-funded locations in and around the Vancouver Fraser Port Authority's jurisdiction, and southern resident killer whale critical habitat, as part of the Vancouver Aquarium's [Pollution Tracker](#) project. This project aims to establish a baseline of environmental conditions in British Columbia's coastal waters through the sampling of sediment and shellfish. These sampling media represent the health of the habitat and food web for at-risk whale species in the region. Samples of sediment and mussels will be analyzed for an extensive suite of chemicals to help determine current contaminant loadings, identify priority contaminants and sources, and provide a baseline for assessing trends into the future. The ECHO program-funded sites are part of a coast-wide project, for which the Vancouver Aquarium will publish a report in 2018.

ECHO program – project list

A complete list of the projects completed, underway or being evaluated by the ECHO program include:

1. Regional ambient acoustic monitoring
2. Regional ocean noise contributors
3. Vessel noise reduction options
4. The underwater listening station
5. Underwater noise education initiative
6. Summary paper on underwater noise impacts to whales
7. Estimating the effects of noise from commercial vessels and whale watch boats on southern resident killer whales
8. Effect of ship noise on vocal behaviour of humpback whales in BC
9. Underwater listening station sea trials
10. Voluntary vessel slowdown trial
11. Feasibility study of underwater listening station locations in the Salish Sea
12. Large whale vessel strike risk assessment
13. Fisheries and Oceans Canada whale tagging and additional aerial transect surveys
14. Mariner's Guide to Whales of Western Canada
15. Whale sightings notification system
16. Vancouver Aquarium PollutionTracker Project
17. Management of contaminants during underwater hull cleaning

Looking ahead to 2017

In its third year, the ECHO program will continue to make progress on current projects and will be initiating new studies to advance research and inform potential mitigation solutions within the three threat categories.

Highlights of the 2017 ECHO program work plan are summarized below:

EcoAction program

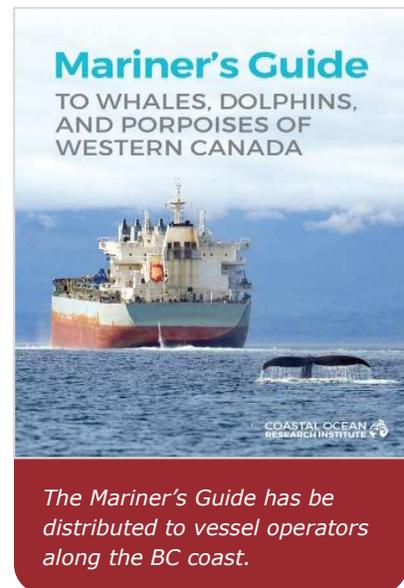
Effective January 1, 2017, the port authority's [EcoAction program](#)¹ includes [new incentive criteria](#) to provide harbour due rate discounts for quieter ships. This makes Canada the first country in the world with a marine noise reduction incentive.

Regional ambient noise project

In 2017, the ECHO program will continue to monitor and analyze ambient noise conditions through existing infrastructure in the Strait of Georgia, Boundary Pass and Haro Strait. Working with regional partners, additional sites may be brought on line in 2017, with consideration to locations in Active Pass, the Strait of Juan de Fuca and Burrard Inlet.

Mariner's guide to whales on B.C.'s coast

Working together with the Vancouver Aquarium and the Prince Rupert Port Authority, the *Mariner's Guide to Whales, Dolphins and Porpoises of Western Canada* was developed. This guide provides information on how to identify the most common whale species, where whales are frequently sighted, and the areas where the probability of a vessel encountering a whale is high. The guide is available online, and hard copy guides will be printed and distributed to mariners along the west coast. Other project collaborators include BC Coast Pilots, BC Ferries, Fisheries and Oceans Canada, Pacific Pilotage Authority and Chamber of Shipping of BC.



Underwater listening station

The final report for the first year (September 2015 – October 2016) of data collected from the underwater listening station will be released in 2017, and available at portvancouver.com/echo.

The ECHO program team will use the data obtained through the underwater listening station to better understand how vessel operating conditions such as speed and rotations per minute, as well as vessel characteristics like hull form, engine type, propeller size and shape may affect underwater noise. Working with local stakeholders, operational trials may be conducted to help develop best practices for vessel noise reduction in the region.

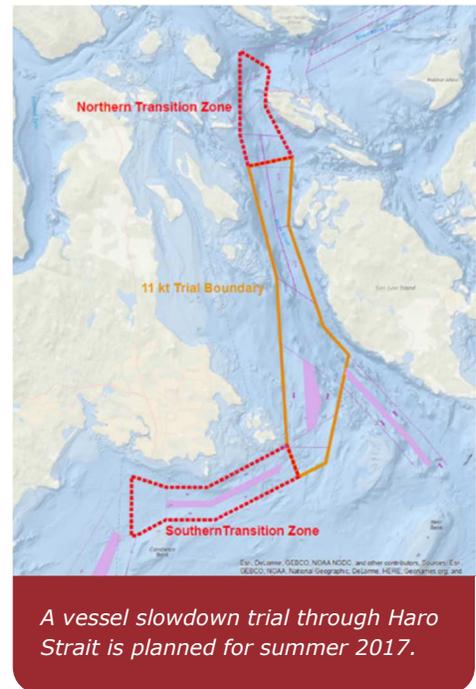
¹ The Vancouver Fraser Port Authority's use of the name "EcoAction" refers to a program specifically intended to promote improved environmental performance within the shipping industry and is not related to the EcoAction Community Funding Program administered by Environment Canada.

Voluntary vessel slowdown trial

In order to better understand the relationship between reduced vessel speed and underwater noise, the ECHO program has planned a voluntary trial to slow down commercial vessels.

The trial asks all vessels transiting Haro Strait to reduce their speed to 11 knots through the water for a distance of approximately 16 nautical miles between Discovery Island at the southern end, and Henry Island at the northern end. Average vessel speeds through this area currently range from 18 knots for containers to 13 knots for bulkers.

During the trial period, hydrophones will be used to monitor both vessel source levels at slower speeds, as well as total underwater noise. Computer modelling will then be used to simulate the resultant benefits to killer whale behaviour. The ECHO program team, in conjunction with industry experts, will also evaluate the potential benefits and implications to the shipping industry as a result of slowing vessels down.



In addition to advancing the projects listed above, we will continue our education and engagement activities, presenting at national and international conferences, convening regular meetings of our advisory and technical committees and promoting educational initiatives. The program team will work closely with our advisors, collaborators and government to find science-based solutions.

Conclusion

In 2016, the population of southern resident killer whales dropped to 78 individuals. The loss of each whale reminds us of the urgency and importance of a regional collaborative approach to better understand and address the threats affecting this iconic species, and other at-risk whales, in the Salish Sea.

The research is telling us that solutions exist to help minimize the impact of shipping on marine life. The ECHO program strives for a science-based approach to environmentally-responsible and sustainable shipping while safeguarding and promoting the protection of local wildlife. We are especially appreciative of the efforts of our advisors, collaborators and contributors who continue to make this goal a priority.

Thank you to our collaborators

Advisory Working Group

BC Coast Pilots
BC Ferries
Chamber of Shipping of BC
Cruise Lines International Association
(North West & Canada)
Fisheries and Oceans Canada
First Nations individuals
Hemmera Envirochem Inc.
National Oceanic and Atmospheric
Administration (NOAA)
Pacific Pilotage Authority
Shipping Federation of Canada
Transport Canada
Vancouver Aquarium
Vancouver Fraser Port Authority
Washington State Ferries
WWF-Canada

Federal Government Advisory Committee

Environment Canada
Fisheries and Oceans Canada
Transport Canada
Vancouver Fraser Port Authority

Project Collaborators

All-Sea Enterprises
BC Coast Pilots
BC Ferries
Chamber of Shipping of BC
NOAA
Prince Rupert Port Authority
Seaspan
Vancouver Aquarium

Funding Contributors

Fraser River Pile and Dredge
Trans Mountain Pipeline
Transport Canada
Vancouver Fraser Port Authority

Independent Facilitation

Fraser Basin Council

Acoustic Technical Committee

Fisheries and Oceans Canada
JASCO Applied Sciences
NOAA
Oceans Networks Canada
Robert Allan Naval Architects
SMRU Consulting
Transport Canada
University of British Columbia
University of St. Andrews
Vancouver Aquarium
Washington State Ferries

Vessel Operators Committee

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Hapag-Lloyd (Canada) Inc.
Holland America Group
Pacific Pilotage Authority
Shipping Federation of Canada
Transport Canada
Vancouver Fraser Port Authority
Washington State Ferries

Other Engagement

Achieve Quieter Oceans (AQUO)
Green Marine
Marine Environmental Observation
Prediction and Response Network
(MEOPAR)
Nanaimo Port Authority
Ports of Seattle and Tacoma
Scripps Institution of Oceanography

Significant In-kind Contributors

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JASCO Applied Sciences
Oceans Networks Canada
Vancouver Aquarium

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