A photograph of a large ship on the water with mountains in the background. The ship is dark and appears to be a cargo or industrial vessel. The water is blue and calm. The mountains in the background are hazy and blue. The sky is light blue with some clouds.

A Species at Risk Act Section 11
Conservation Agreement to support the
recovery of the southern resident killer
whale

Annual report

Period 3: May 2021 – May 2022



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Purpose of this report

The purpose of this annual report is to summarize progress and findings related to recovery measures undertaken during Period 3 (May 2021 to May 2022) of the five-year [Species at Risk Act Section 11 Conservation Agreement to Support the Recovery of the Southern Resident Killer Whale](#) (the “Conservation Agreement” or “agreement”).

As outlined in section 7.4 of the agreement, each year (period) the parties to the agreement will evaluate the completed actions and propose additional commitments to increase the likelihood of achieving reductions to acoustic and physical disturbance from large commercial vessels to support the recovery of southern resident killer whales.

The Vancouver Fraser Port Authority is the lead author of this report with review and input provided by the Enhancing Cetacean Habitat and Observation (ECHO) Program’s advisory working group and Conservation Agreement management committee.

Acknowledgements

The ECHO Program and the parties to the Conservation Agreement would like to recognize the members of the ECHO Program’s advisory working group, vessel operators committee, acoustic technical committee and all other partners for their support in the planning and implementation of the commitments and recovery measures of the agreement. For a full list of advisors and partners, please see the ECHO Program [website](#).

Parties to the Conservation Agreement



Fisheries and Oceans
Canada
Pêches et Océans
Canada



Background

Context

The Enhancing Cetacean Habitat and Observation (ECHO) Program is a collaborative regional initiative led by the Vancouver Fraser Port Authority and guided by the input and advice of government agencies, the marine transportation industry, Indigenous advisors and environmental organizations.

The ECHO Program was launched by the port authority in 2014 to better understand and reduce the cumulative impacts of shipping activities on at-risk whales throughout the southern coast of British Columbia, with the long-term goal of quantifiably reducing threats to whales as a result of shipping activities.



The ECHO Program's advisory working group, vessel operators committee, and acoustic technical committee assist the ECHO Program team in identifying research, educational, and threat reduction initiatives that best meet the program's goals and objectives, while taking a wide range of cultural, economic, and environmental factors into account.

With the support of the ECHO Program's many partners and advisors, the program has facilitated the design and implementation of numerous voluntary underwater noise reduction measures, focused primarily on reducing acoustic disturbances caused by large commercial vessels within key foraging areas of southern resident killer whales (SRKW) critical habitat.

In addition to coordinating large-scale underwater noise reduction efforts, the ECHO Program spearheads globally-reaching research and education efforts to broaden understanding of ship-generated underwater noise and inform the development of underwater noise reduction solutions.

References to the actions of the ECHO Program in this document generally refer to efforts led by the ECHO Program team, with support and inputs from relevant program advisors.

Conservation Agreement

On May 10, 2019, the Minister of Fisheries, Oceans and the Canadian Coast Guard entered into a five-year agreement entitled [*A Species at Risk Act Section 11 Conservation Agreement to Support the Recovery of the Southern Resident Killer Whale*](#), along with eight other parties.

The agreement formalizes the participation of all parties in the ECHO Program, towards the shared goal of reducing acoustic and physical disturbance resulting from large commercial vessels operating in southern resident killer whale critical habitat in the Pacific Canadian waters. The agreement outlines each party's commitment to the continuation of existing efforts and measures and the development of new voluntary threat reduction and research measures, to be implemented and applied in both the short and longer term. These measures are described in detail in Appendix A of the agreement.

The agreement also formalizes the port authority's commitment to continue managing the ECHO Program and working collaboratively with its program advisors and partners over a five-year term.

The nine parties to the agreement ('the parties') are, in alphabetical order:

1. Chamber of Shipping
2. Council of Marine Carriers
3. Cruise Lines International Association – North West & Canada
4. Fisheries and Oceans Canada
5. International Ship-Owners Alliance of Canada
6. Pacific Pilotage Authority
7. Shipping Federation of Canada
8. Transport Canada
9. Vancouver Fraser Port Authority

Appendix A of the Conservation Agreement highlights five key focus areas which support southern resident killer whale recovery:

- A. Regional engagement and collaborative efforts
- B. International engagement and collaborative efforts
- C. Data collection and research
- D. Initiatives to reduce underwater noise from large commercial vessels
- E. Initiatives to reduce physical disturbance from large commercial vessels

Under these five key focus areas, Appendix A outlines 28 measures and sub-measures, that required action in Period 3, which refers to the timeframe between May 2021 and May 2022. One measure did not require action in Period 3 and is therefore not included.

Conservation Agreement management committee

In accordance with Section 6.1 of the agreement, the parties established a committee (Conservation Agreement management committee) to oversee the implementation and effectiveness of the agreement and to provide a collaborative forum to discuss and resolve any issues that may arise over the term of the agreement.

In May 2021, the conservation agreement management committee and members of the advisory working group met to provide input into the development of the Period 3 conservation agreement measures. In July 2021, the conservation agreement committee met again to finalize the Period 3 measures and the Conservation Agreement Period 2 annual report.

Role of the port authority and ECHO Program advisory working group

As outlined in section 5.2.1 of the agreement, the Vancouver Fraser Port Authority has committed to continuing to manage the ECHO Program. This includes supporting the engagement of the Conservation Agreement parties and other ECHO Program participants.

In particular, the ECHO Program's advisory working group plays a key role in supporting the development and implementation of annual work plans to meet the goals of the agreement. In Period 3, the ECHO Program met with the advisory working group five times to share updates on annual measures, track progress on key performance indicators and seek input on measures requiring attention.

Monitoring and reporting

As described in Section 7 of the agreement, as part of the ECHO Program's annual planning process, a monitoring and assessment framework was developed and implemented to facilitate measurement of progress on measures identified in Appendix A of the Conservation Agreement.

Clear targets, metrics, and timelines were assigned to each measure, as well as designated lead parties and associated contacts responsible for reporting on the progress of measures. Key performance indicators (KPIs) and associated targets were developed for evaluating the effectiveness of the Conservation Agreement as a whole over the duration of the agreement.

The status of the implementation of the agreement's Period 3 measures and commitments, as well as key performance indicators are summarized in the following sections and Appendix 1 of this report.

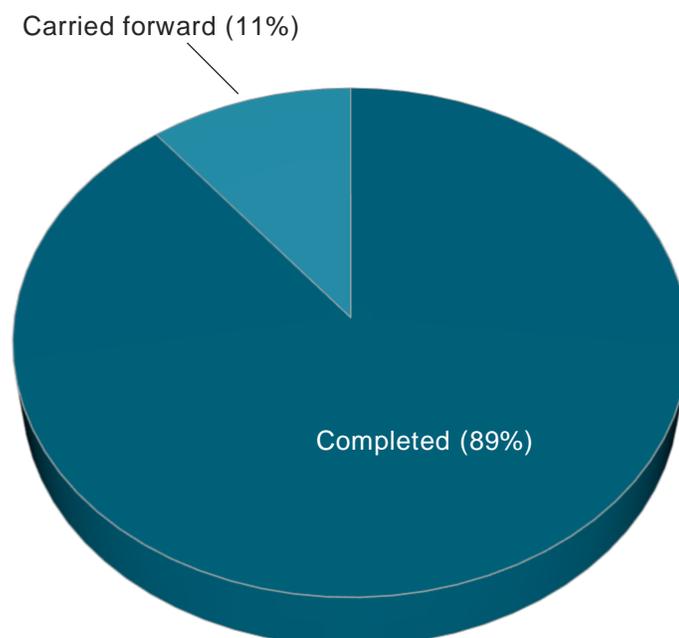
Period 3 highlights

Measure implementation status

All measures and sub-measures that required action in Period 3 are outlined in Appendix 1 of this report and grouped into one of the five key focus areas (Area A to E) identified as supporting southern resident killer whale recovery.

Of the 28 measures and sub-measures that required action in Period 3, 25 measures (89%) are complete, and three measures (11%) will be carried forward into Period 4 of the agreement. Figure 1 shows the status of Period 3 measures.

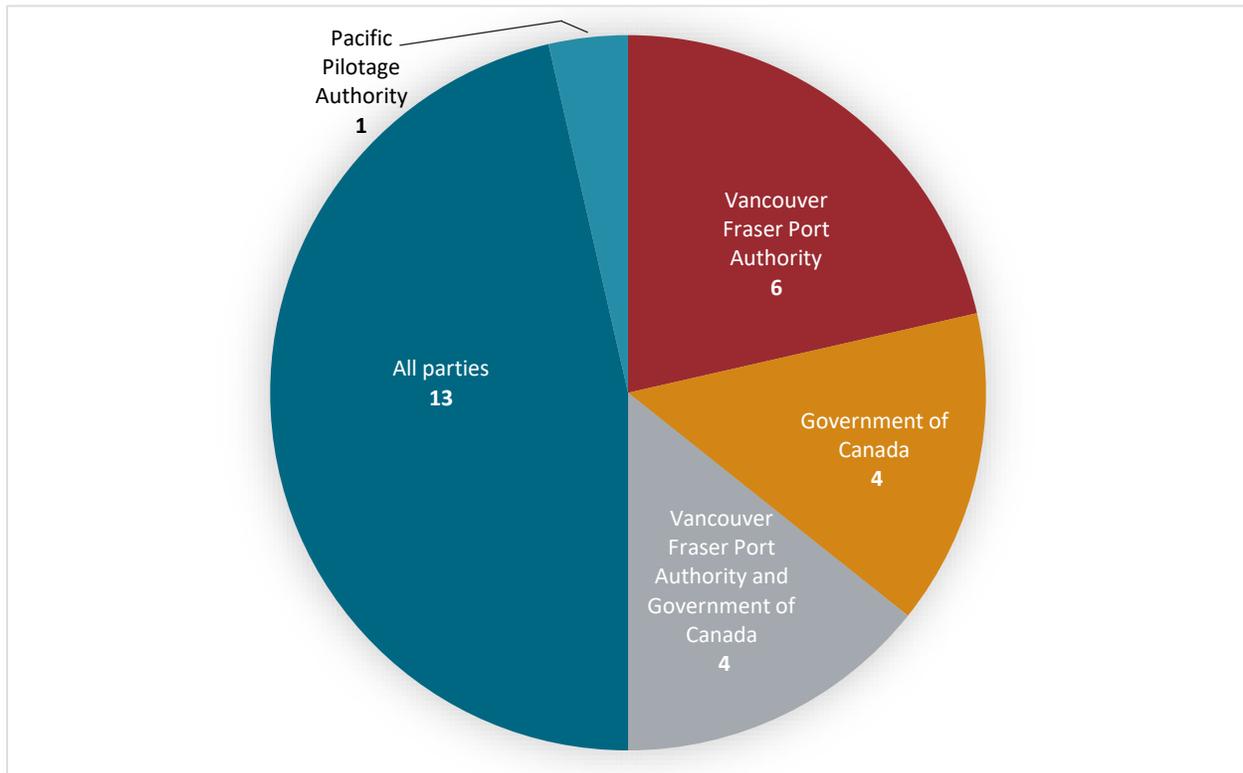
Figure 1: Summary of Period 3 measures status



Parties leading Period 3 measures

All 28 measures applicable in Period 3 were assigned to a lead party responsible for implementation. Figure 2 shows the breakdown of the parties leading Period 3 measures.

Figure 2: Parties leading Period 3 measures



Measuring overall Conservation Agreement effectiveness

In 2019, the ECHO Program team, advisory working group, and Conservation Agreement management committee identified the need to develop key performance indicators (KPIs) to evaluate the effectiveness of the Conservation Agreement as a whole over the duration of the agreement, focusing on its effectiveness at supporting the recovery of the southern resident killer whale.

The Conservation Agreement recognizes the need for an adaptive approach to guide and adjust conservation measures developed and implemented pursuant to the agreement. Accordingly, and through the lens of adaptive management, continuous improvement, maximizing conservation benefit, safety, operational and commercial feasibility, KPI targets associated with these measures are set annually based on the best available information at the time. These targets will be refined as appropriate through a process of continuous evaluation and reflection on whether a target was met, along with a clear explanation and justification for why any targets were modified or adapted on the basis of what has been learned.

The targets set for each of the KPIs in Period 3 are described in Table 1. Each KPI falls into one of the three categories of desired outcomes, which are closely aligned with the purpose and goals of the Conservation Agreement:

Conservation Agreement Desired Outcome 1 (KPI 1.1 - 1.3)

ECHO Program AWG members and other regional interests continue to remain engaged, informed and working together to implement measures which quantifiably reduce threats to SRKW from large commercial vessels through integrated consideration of biological, cultural, economic and safety impacts and benefits.

Conservation Agreement Desired Outcome 2 (KPI 2.1 - 2.3)

Quantifiable reduction in threats from large commercial vessels are measured and/or modelled in key areas of SRKW critical habitat as a result of threat reduction initiatives implemented through the Conservation Agreement.

Conservation Agreement Desired Outcome 3 (KPI 3.1 - 3.2)

National and international awareness about the need to reduce underwater noise from vessels is growing, and the number of ports with quiet vessel incentive programs, as well as vessels with quiet design, technologies and/or notations is increasing.

Period 3 KPI performance

In Period 3, twelve out of thirteen goals were achieved towards fulfilment of the eight KPIs, as outlined in Table 1. This strong achievement of KPI goals is a positive indication of the overall effectiveness of the agreement in Period 3, especially in light of ongoing global shipping challenges related to COVID-19 and regional extreme weather events.

For KPI 2.1, two out of three targets were achieved towards the Period 3 goal of reducing ambient underwater noise levels in key SRKW foraging areas in Haro Strait, Swiftsure Bank, and the Strait of Juan de Fuca.

While underwater noise reduction goals were achieved and exceeded for both the Haro Strait and Strait of Juan de Fuca areas, assessment of underwater noise levels in the Swiftsure Bank slowdown area is still being conducted and therefore has not been counted as a point towards the fulfilment of KPI 2.1.

A full overview of each KPI's performance in Period 3 is available at Table 1.

For additional information on the ECHO Program's Period 3 activities, please see the [2021 ECHO Program annual report](#) and specific project reports, which can be found on the [ECHO Program website](#).



Table 1: Conservation Agreement key performance indicators (KPI) for Period 3

KPI	KPI description	Period 3 goals		Period 3 achieved
1.1	Maintain effective engagement of advisory working group (AWG) members: 75% of AWG members (or alternates) attend ECHO Program AWG meetings and AWG meeting evaluations score a minimum average 4 out of 5 ranking, reflecting a high level of satisfaction with respect to the meeting quality.	75% attendance		✓
		Average 4 out of 5 score on meeting evaluation forms		✓
1.2	Maintain or improve commercial vessel participation rates: Vessel participation rates meet or exceed the participation goals for threat reduction initiatives (such as the Haro Strait and Boundary Pass slowdowns and Strait of Juan de Fuca lateral displacement (SJDF LD) trials) set by the ECHO Program AWG each year.	Meet or exceed vessel participation goal		✓ ✓ ✓
		H/B slowdown 90% Swiftsure 80%	SJDF LD: 80%	H/B 90% SJDF 88% Swiftsure 81%
1.3	Regional commercial mariners actively use whale awareness and educational tools: The ECHO Program undertakes at least 4 promotional activities per year to actively communicate with regional commercial mariners to encourage their ongoing use of available whale awareness and educational tools.	Four promotional activities		✓
2.1	Maintain or improve ambient noise reduction levels: Underwater noise reduction initiatives in SRKW critical habitat (such as slowdowns and lateral displacement trials) meet or exceed the ambient noise reduction goals set by the ECHO Program AWG each year.	Reduce ambient underwater noise levels in key SRKW foraging areas		✓ ✓
		H/B slowdown: 3 dB Swiftsure slowdown: 2 dB SJDF LD: 4dB		H/B slowdown: 3.2 dB Swiftsure slowdown: TBD SJDF LD: 4.5dB
2.2	Decrease affected SRKW foraging time: For threat reduction initiatives (such as slowdowns and lateral displacement trials) in areas where behavioral response modelling exists, decrease the amount of time SRKW foraging may be affected by vessel noise, to meet or exceed the goals set by the ECHO Program AWG each year.	Reduce affected foraging time in Haro Strait by an estimate of ~20%		✓
2.3	Explore new threat reduction measures: The ECHO Program advances at least one new research project annually intended to reduce underwater noise or physical disturbance threats from large commercial vessels in SRKW critical habitat.	Evaluate potential for expanding Swiftsure Bank slowdown to include inbound traffic		✓
3.1	Encourage application of quiet vessel design and technology: The Government of Canada, supported by the ECHO Program, convenes and/or participates in at least five meetings/initiatives per year with IMO member states, ship classification societies, ship owners, technical experts and industry experts to encourage consistency in, and uptake of, quiet vessel notations and application of quiet vessel design and technology internationally.	Five meetings / initiatives with international stakeholders		✓
3.2	Increase uptake of quiet vessel incentive programs: The Government of Canada, supported by the ECHO Program, engages with at least four Canadian port authorities and/or international ports per year to advise on the implementation of quiet vessel incentive programs, with a view to catalyzing an increase in the total number of ports that offer quiet vessel incentive programs annually.	Engage four+ ports		✓

✓ Indicates the achieved rate met or exceeded the goal.

Challenges and lessons learned

Despite the continued challenges posed by the COVID-19 pandemic, Period 3 of the Conservation Agreement resulted in many successful outcomes. As outlined in the [ECHO Program's 2021 Annual Report](#), the program spearheaded numerous research and education activities throughout the period, in addition to reaching participation rates of over 80% for all three of its voluntary underwater noise reduction initiatives.

Notably, in Period 3 of the Conservation Agreement, the ECHO Program began exploring the feasibility of trialing an inbound slowdown at Swiftsure Bank, which has required a deepening of the ECHO Program's transboundary approach to relationship-building and has reinforced the importance of engaging with groups early on to jointly develop threat reduction measures.

Reflecting on the challenges encountered in Period 3, the measurement and monitoring of underwater noise remains a complex and evolving field of study that is limited by available resources and technologies. In light of this, the ECHO Program will continue to work with its partners and advisors to explore opportunities to improve the processes used to monitor and measure underwater noise, and where necessary, make adjustments to applicable KPIs.

Looking forward

With 92% of the KPI goals achieved or exceeded in Period 3, the ECHO Program continues to track positively towards its goal of quantifiably reducing threats posed by acoustic and physical disturbances from large commercial vessels on at-risk whales.

In the period ahead, the ECHO Program team, with the ongoing support of the advisory working group and various committees, will continue to provide leadership towards the implementation, tracking, and progress reporting of the Conservation Agreement, building upon previous work and lessons learned.

Through the lens of adaptive management and continuous improvement, the ECHO Program will continue to work with the advisory working group and the Conservation Agreement management committee to further refine and enhance the measures in Appendix A as necessary, to reduce the acoustic and physical disturbance from large commercial vessels.

The ECHO Program would like to thank the parties to the Conservation Agreement, as well as the program's many advisors and partners for their ongoing support of and participation in these important Conservation Agreement measures to support the recovery of the southern resident killer whales.

Appendix 1: Period 3 Conservation Agreement measures tracking document

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Measure	Party leading activity	Activity (per description in CA Appendix A)	Objective over the term of the Agreement (per description in CA Appendix A)	Period 3 = 3 years from Agreement signing (descriptions in CA Appendix A updated per AWG/CAM input June 2021)	Year 3 Metric	Status/Tracking	Summary
A1	VFPA	Maintain management of ECHO Program	Maintain framework for ongoing engagement and collaboration; advancing research; coordinating, development, implementation, evaluation and reporting of voluntary Southern Resident Killer Whale (SRKW) threat reduction measures; and, promoting and raising awareness of research and threat reduction measures.	Convene ECHO Program Advisory Working Group to seek input and guidance. Convene ECHO Program Conservation Agreement and Technical Committee (Vessel Operator Committee and Acoustic Technical Committee) on an as needed basis throughout the year to seek input and advice. Rely on input and advice to adaptively manage program. Seek opportunities to increase engagement with Indigenous communities. Seek opportunities to increase awareness of the ECHO Program's work with general public.	4 AWG meetings 4 VOC meetings 1 CAM meeting Develop and implement Indigenous engagement and communications strategies	Complete	<ol style="list-style-type: none"> 1) 4 AWG meetings to date (June, Oct, Dec 2021, Feb/March 2022) 2) 6 VOC meetings to date (April, Aug, Sept, Oct 2021 and Mar, May 2022) 3) 1 CAM meeting (July 2021) 4) 3 special AWG/VOC meetings (October, November 2021, February 2022) 5) 1 special AWG/CAM meeting (May 2022) 6) ECHO Program communications advisor has created a list for communicating ECHO related materials with interested AWG members so that they can amplify 7) Considerable engagement efforts between ECHO Program team and the Makah Tribe undertaken
A2	GoC	GoC continue to engage with Indigenous groups and stakeholders on vessel related threats to SRKW and implementation of threat reduction measures	Continue to enable involvement of Indigenous groups in the development and implementation of SRKW-related initiatives. Identify annual forums for engagement.	Where vessel-related threat reduction measures contemplated under this agreement have the potential to impact section 35 rights, GoC will consult on these measures with Indigenous groups in meetings specific to these measures or as part of its annual consultations on SRKW-related initiatives.	Canada will consult where appropriate, and will also endeavour to engage, involve and work directly and collaboratively with Indigenous groups and act as a conduit for input into threat reduction measures	Carrying forward to Period 4	TC renewed discussions with Indigenous Advisors about whether or not an amendment to the text of this measure is required. A meeting was held to further clarify the intent and determine any necessary changes, but further discussion is needed prior to finalizing changes to the text, if any.

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A3	All	Provide relevant input to broader initiatives around the development of underwater noise targets	Contribute to ongoing discussions on the development of underwater noise reduction targets.	Engage with DFO Science to better understand timeline and output of regional ambient noise baseline work and how that might be utilized to establish a future regional noise target for the shipping sector. Evaluate existing ECHO Program and GoC regional noise modeling work with a view to potentially updating large commercial vessel noise contributions, projecting future vessel traffic scenarios, estimating benefits of various ship noise reduction measures.	Convene ATC meeting(s) to seek updates from DFO Science, the National Working Group on Underwater Vessel Noise Reduction Targets (UVNRT), and other regional experts to discuss and highlight potential opportunities to update/build on existing models	Complete	<p>1) ATC meetings held on November 22 and 23, 2021 did not address this specific topic, but discussed SRKW noise modelling , including DFO approach</p> <p>2) ECHO Program contributed to UVNRT meetings held November 17, 2021, February 10, 2022 and April 6, 2022. Recommendations on vessel noise targets were provided</p> <p>3) DFO paper on ambient noise was published September 2021, establishing current noise conditions against which future work may be compared (https://www.sciencedirect.com/science/article/pii/S0025326X21006810)</p>
B1	GoC	Engage US authorities, on vessel related threats to SRKW and implementation of threat reduction measures	Establish commitments on recovery measures from US authorities in shared waterways in SRKW critical habitat.	Ongoing consultation between Canada/U.S. on joint action that can be taken with a focus on implementing harmonized measures in shared waterways.	Participate in / convene 4 Canada-US coordination or collaboration meetings relating to SRKW actions involving large commercial vessels	Complete	Canada continues to meet regularly (approximately monthly) with officials from the United States, both federally and with Washington State, on multiple topics related to SRKW actions and recovery measures in shared waters.

B2	GoC	Encourage dialogue and technical discussions on reducing ship generated noise through the IMO and other international fora	Propose a new work output that may result in updates to IMO MEPC.1/Circ.833 (April 2014) guidelines for the reduction of underwater noise from commercial shipping.	Work with international partners to advance discussions at the IMO and other international bodies.	Participate in the meetings of ship design and construction subcommittee beginning in Jan 2022	Complete	<p>1) SDC Sub-committee: In June 2021, a new work output focusing on the review of the 2014 Guidelines for the reduction of underwater noise and identification of next steps was added to the agenda of MEPC. The issue was referred to the Ship Design and Construction (SDC) Sub-committee for action in January 2022 (SDC 8) where Canada, along with New Zealand, the UK and US, submitted a Scoping Document and Compendium Document in support of the work ahead at SDC 8. Canada also co-hosted a URN webinar with NGOs at the beginning of January 2022 in preparation for the SDC 8 meeting. During the SDC 8 meeting, a working group was established and recommended that a Correspondence Group (CG) be established for intersessional work to complete the review of the Guidelines in a timely manner. Canada will be chairing the correspondence group over the next year, reporting on its work at the SDC 9 meeting, planned for January 2023.</p> <p>2) K. Trounce represented the International Association of Ports and Harbours (IAPH) at the IMO's Ship Design and Construction Subcommittee meetings in Jan.2022.</p> <p>3) K. Trounce and M. Sanders on EU SATURN External Expert Advisory Board</p> <p>4) K.Trounce member of the EU PiAquo Advisory Group</p>
B3	VFPA & GoC	Encourage Canadian and other relevant international ports to consider implementing incentives for quiet vessels	Increase the number of vessels with quiet vessel design, technologies and/or notations.	Expand engagement and outreach efforts at both national and international level, as appropriate, to encourage a network of port incentive programs and to raise awareness of the need for quiet vessels with ship builders, ship owners, and shippers.	4+ dedicated communications with ports, ship builders, ship owners or shippers	Complete	<p>1) Port of Busan email communications</p> <p>2) FedNav engagement</p> <p>3) Ongoing research projects with BC Ferries on reducing noise from their vessels, and at advancing discussions on underwater vessel noise reduction targets</p> <p>4) K. Trounce represented the International Association of Ports and Harbours (IAPH) at the IMO's Ship Design and Construction Subcommittee meetings in Jan 2022</p> <p>5) K.Trounce and M. Sanders participating on EU SATURN External Expert Advisory Board</p> <p>6) K.Trounce a participating member of the EU PiAquo Advisory Group</p> <p>7) A coalition of ECHO Program, NRDC, TC, NOAA California and The Nature Conservancy have convened a 'Shippers Engagement Working Group' and have met multiple times throughout year to discuss potential options and concepts to engage those that ship goods (shippers) on quieter vessels and whale protection measures</p>

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B4	VFPA & GoC	Convene vessel classification societies and technical experts to develop and align category-specific quiet vessel notations	Establish consistent measurement and analysis procedures, and quiet vessel notations between ship classification societies such that incentives offered at Port of Vancouver and elsewhere are also consistent.	Refine draft methodology based on input from stakeholders and relevant research efforts. Host and report on 2nd international workshop.	Convene and report out on second workshop with class societies	Complete	Refined document distributed in August 2021 and 2nd annual workshops held November 9 and 10, 2021. Two additional project partners: Korean Register and China Classification Society. Workshop summary report distributed to project partners in December, 2021.
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C1	GoC	Support the development and maintenance of an underwater hydrophone network in SRKW critical habitat	Measure ambient underwater noise levels throughout SRKW critical habitat, assess contributions of Large Commercial Vessels, support whale detection activities, and monitor the effectiveness of implemented mitigation measures for Large Commercial Vessels.	Review on an ongoing basis the need for additional underwater hydrophones and build on improving the existing GoC hydrophone programs to address gaps. Consider long term monitoring and modelling approaches for implementation of mitigation measures.	Convene ATC meeting(s) as needed to seek updates from hydrophone operators and program leads to seek input on long term monitoring and modelling approaches for implementation of mitigation measures.	Complete	<p>1) DFO's Marine Ambient Acoustic Program is ongoing and has secured funding for continued data collection into March 2023. Ongoing research in modelling, defining and interpreting soundscapes within SRKW Critical Habitat in conjunction with Dr. Sheila Thornton and her team is underway and two publications are anticipated this year.</p> <p>2) ATC held in November 2021 (2 days) to discuss modelling and lost listening space</p> <p>Publications in 2021:</p> <p>3) Burnham, R.E., Vagle, S., O'Neill, C. 2021. Spatiotemporal patterns in the natural and anthropogenic additions to the soundscape in parts of the Salish Sea, British Columbia, 2018-2020. Marine Pollution Bulletin, 170: 112647. Doi: 10.1016/j.marpolbul.2021.112647.</p> <p>4) Vagle, S., Burnham, R., Thupaki, P., Konrad, C., Toews, S., Thornton, S.J. 2021. Vessel presence and acoustic environment within Southern Resident Killer Whale (Orcinus orca) critical habitat in the Salish Sea and Swiftsure Bank area. DFO Can. Sci. Advis. Sec. Res. Doc. 2021/058. x + 66 p.</p> <p>5) Burnham R.E, Vagle S, O'Neill C and Trounce K. 2021. The Efficacy of Management Measures to Reduce Vessel Noise in Critical Habitat of Southern Resident Killer Whales in the Salish Sea. Front. Mar. Sci. 8:664691. doi: 10.3389/fmars.2021.664691</p> <p>6) Vagle, S.; Burnham, R.E.; O'Neill, C.; Yurk, H. 2021. Variability in Anthropogenic Underwater Noise Due to Bathymetry and Sound Speed Characteristics. J. Mar. Sci. Eng. 2021, 9, 1047. https://doi.org/10.3390/jmse9101047</p> <p>New publications submitted for review:</p> <p>7) Granger, B., Burnham R.E, Vagle S, 2021. Soundscape additions from vessels related to transit speed, direction and maneuvers. (Submitted fall 2021)</p> <p>8) Burnham R.E, Vagle S, Thupaki, P., Thornton, S.J. 2022. Implications of wind and vessel noise on the sound fields experienced by southern resident killer whales in the Salish Sea. (Submitted January 2022)</p>
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C2	VFPA	Evaluate ECHO regional ambient noise data which was collected in 2016-2017	Establish what factors are contributing to existing ambient noise levels within SRKW critical habitat and determine ongoing monitoring needs for evaluating changes and trends into the future.	Continue sharing findings of study, and post best practices document to relevant online repository.	Publish ambient noise data collection best practices document	Complete	Posted to the ECHO Program webpage. Shared on the Ocean Best Practices website.
C3	VFPA & GoC	Establish underwater listening station in SRKW critical habitat	Implement listening station infrastructure to allow vessel operators to measure the individual noise profiles of their vessels; facilitate research testing of vessel quietening technologies/ operations; and, allow the ECHO Program to continue gathering and analyzing vessel noise data for research purposes and to evaluate the potential for offering new port incentives	Monitor vessel source levels in real time. Make data available to vessel owners upon request. Advance testing of vessel quietening options.	Analyze data from Boundary Pass ULS and prepare quarterly progress reports. Evaluate vessel quietening options on ≥1 vessel(s), if possible	Complete	Boundary Pass ULS has been operational since June 2020. Quarterly reports of ambient noise, marine mammal presence and vessel source levels have been provided. Over 18,000 vessel source level measurements collected at the station since 2018. Annual report for 2021 to be published in Q2-2022. Not possible to evaluate a quieting option due to challenges finding a partner.

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C4	VFPA	Evaluate existing ECHO Program database of vessel source level measurements	Evaluate how different vessel design characteristics may be driving the noise profile of vessels. Identify key characteristics/ commonalities of quietest and loudest vessels	Publish peer-reviewed article to share statistical model. Test statistical model against vessel source level datasets from other researchers.	Publish peer-reviewed article to share statistical model. Test statistical model against vessel source level datasets from 1 other researcher	Complete	Phase III of noise correlations project complete. Statistical model tested against data set from Santa Barbara Channel, California (Scripps Institution of Oceanography). Phase III report posted on ECHO Program webpage Q1-2022. Paper submitted for peer review and awaiting publication.
C5 a	All	Advance research studies to explore new underwater noise reduction measures for Large Commercial Vessels* (To be updated annually based on agreement of new/emerging potential measures)	Test/trial new design, technologies and /or operational measures that may reduce underwater noise from vessels, particularly in SRKW critical habitat and within key SRKW foraging areas	Evaluate potential for expanding Swiftsure Bank slowdown to include inbound traffic. Once available, evaluate DFO Science research and TSS feasibility study results for the mouth of the Fraser and facilitate discussion on the need for potential noise reduction measures in this area.	Convene ECHO Program AWG/VOC and other relevant interests to assess feasibility of expanding Swiftsure Bank slowdown to include inbound traffic.	Complete	Three special AWG-VOC meetings (October 2021, November 2021 and Feb 2022) as well as multiple one on one meetings between the program team, Makah Tribe and US Coast Guard were held to discuss feasibility of a potential inbound slowdown. Makah Tribe has agreed to an inbound slowdown trial at Swiftsure Banks for the 2022 season on a conditional basis.
C5 b	All	Advance research studies to explore new underwater noise reduction measures for Large Commercial Vessels* (To be updated annually based on agreement of new/emerging potential measures)	Test/trial new design, technologies and /or operational measures that may reduce underwater noise from vessels, particularly in SRKW critical habitat and within key SRKW foraging areas	Evaluate potential for expanding Swiftsure Bank slowdown to include inbound traffic. Once available, evaluate DFO Science research and TSS feasibility study results for the mouth of the Fraser and facilitate discussion on the need for potential noise reduction measures in this area.	Evaluate GOC study results for the mouth of the Fraser and facilitate discussion with AWG and VOC around potential next steps	Carrying forward to Period 4	DFO's Special Advisory Report 2021/025 provides updated SRKW habitat use and frequency of occurrence information using a new effort correction methodology but further work will be planned around the mouth of the Fraser. TC has received the results of the TSS feasibility study in March 2022 and will look to update the AWG/VOC on next steps after reviewing the report.

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C6	All	NEW for Year 3: Advance research studies to understand ship noise sources and factors in design that could reduce underwater noise.	Test/trial the impacts of new vessel design and/or technologies on underwater noise using the Boundary Pass underwater listening station.	Further advance high precision localization study to evaluate/identify potential underwater noise sources from one or more vessels.	Prepare high precision localization study report and post online	Complete	Report on high-precision localization of ship noise has been completed. Framing document and final report was posted to ECHO Program web site in Q1-2022.
D1 a - Vessel Slow downs	All	Establish voluntary seasonal slowdown of Large Commercial Vessels in Haro Strait*	Participation rates, ambient underwater noise levels and affected southern resident killer whale foraging time in Haro Strait meet or exceed the participation, ambient noise reduction and affected southern resident killer whale foraging time goals agreed to annually by the ECHO Advisory Working Group, or comply with underwater noise reduction targets when they are developed.	Review noise reduction levels achieved during the 2020 Haro Strait and Boundary Pass slowdown year and revisit voluntary maximum speed targets and slowdown duration as needed for implementation in 2022.	Publish 2020 slowdown report and implement 2021 slowdown in Haro-Boundary	Complete	2020 Haro Strait and Boundary Pass slowdown report posted to the ECHO Program webpage. The 2021 Haro Strait and Boundary Pass slowdown concluded on November 30.

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<p>D1 b - Vessel Slow downs</p>	<p>All</p>	<p>Establish voluntary seasonal slowdown of Large Commercial Vessels in Haro Strait*</p>	<p>Participation rates, ambient underwater noise levels and affected southern resident killer whale foraging time in Haro Strait meet or exceed the participation, ambient noise reduction and affected southern resident killer whale foraging time goals agreed to annually by the ECHO Advisory Working Group, or comply with underwater noise reduction targets when they are developed.</p>	<p>Review noise reduction levels achieved during the 2021 Haro Strait and Boundary Pass slowdown year and revisit voluntary maximum speed targets and slowdown duration as needed for implementation in 2022.</p>	<p>Revisit slowdown parameters for 2022 based on learnings from 2021</p>	<p>Complete</p>	<p>Haro Strait and Boundary Pass slowdown concluded on November 30, 2021. Slowdown parameters for 2022 have been finalized.</p>
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<p>D2 a - Vessel Slow downs</p>	<p>All</p>	<p>Based on SRKW usage and subject to navigational safety and operational considerations, identify other possible candidate areas within SRKW critical habitat to implement voluntary seasonal slowdowns of Large Commercial Vessels</p>	<p>Participation rates and ambient underwater noise levels in other key southern resident killer whale foraging areas meet or exceed the participation and ambient noise reduction goal agreed to annually by the ECHO Advisory Working Group, or comply with underwater noise reduction targets when they are developed. In other key southern resident killer whale foraging areas where behavioral response modelling exists, decrease the amount of time southern resident killer whale foraging may be affected by vessel noise, to meet or exceed the goals set by the ECHO Program AWG each year.</p>	<p>Review noise reduction levels achieved during the 2020 Swiftsure slowdown year and revisit voluntary maximum speed targets, slowdown duration and geographic extent, as needed for implementation in future year. <i>(Note: Advancing work to evaluate expanding Swiftsure Bank slowdown to include inbound traffic in 2022 is also reflected in measure C5.)</i></p>	<p>Publish 2020 slowdown report and implement 2021 slowdown in Swiftsure Bank</p>	<p>Complete</p>	<p>2020 report posted to the ECHO Program webpage. The 2021 Swiftsure Bank slowdown concluded on October 31, 2021. Slowdown parameters for 2022 have been finalized.</p>
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<p>D2 b - Vessel Slow downs</p>	<p>All</p>	<p>Based on SRKW usage and subject to navigational safety and operational considerations, identify other possible candidate areas within SRKW critical habitat to implement voluntary seasonal slowdowns of Large Commercial Vessels</p>	<p>Participation rates and ambient underwater noise levels in other key southern resident killer whale foraging areas meet or exceed the participation and ambient noise reduction goal agreed to annually by the ECHO Advisory Working Group, or comply with underwater noise reduction targets when they are developed. In other key southern resident killer whale foraging areas where behavioral response modelling exists, decrease the amount of time southern resident killer whale foraging may be affected by vessel noise, to meet or exceed the goals set by the ECHO Program AWG each year.</p>	<p>Review noise reduction levels achieved during the 2021 Swiftsure slowdown year and revisit voluntary maximum speed targets, slowdown duration and geographic extent, as needed for implementation in future year. <i>(Note: Advancing work to evaluate expanding Swiftsure Bank slowdown to include inbound traffic in 2022 is also reflected in measure C5.)</i></p>	<p>Revisit slowdown parameters for 2022 based on learnings from 2021</p>	<p>Complete</p>	<p>The 2021 outbound Swiftsure Bank slowdown completed October 31, 2021. Ambient noise analysis revealed a technical issue was experienced with DFO's hydrophone and data for the 2021 Swiftsure slowdown may not be available. DFO continues to explore the source of the problem. Slowdown parameters for 2022 have been finalized.</p>
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D3 - Vessel Slow downs	All	Address commercial and operational constraints to expanding the area and/or duration of vessel slowdowns*	Eliminate barriers to full participation and/or compensate those that are negatively affected economically such that they can fully participate.	Assess progress made on a yearly basis and re-adjust actions needed to eliminate barriers to implementation going forward (including framework for compensation as required)	Continue Transport Canada reimbursement program for additional pilotage costs in Haro-Boundary slowdown	Complete	Reimbursement payments were issued by VFPA (on behalf of TC) to PPA throughout the duration of the 2021 Haro-Boundary slowdown.
D4 - Vessel Slow downs	All	Improve direct effect of vessel speed reductions by implementing real-time tracking and notification of SRKW locations year round	Provide SRKW presence notification tools to professional mariners, to potentially reduce speed and associated noise impacts to SRKW in real time and year round.	Develop, test and/or refine tools and increase communication/collaboration between initiatives (e.g. Marine Mammal Desk, Whale Tracking Network, Whale Report Alert System, Whale Detection and Collision Avoidance Program) and based on the status and outcomes of these initiatives, assess feasibility of implementing real time SRKW and vessel tracking, and determine potential effectiveness of dynamic management.	Prepare memo on the feasibility of implementing a real-time notification slowdown trial in Boundary Pass	Complete	<p>Feasibility of implementing real-time notification slowdown trial in Boundary Pass in 2022 discussed at AWG meeting in Oct 2021. Memo is in final stages of completion and will be circulated to AWG members shortly.</p> <p>The Whale Detection and Collision Avoidance Program is a Science branch initiative developed to examine and evaluate different technologies and methodologies that will improve the ability to accurately detect and track cetaceans in near real-time to mitigate physical disturbance including ship strike risk . The results of an evaluation of shore-based thermal imaging (TI) systems to detect and track killer whales in nearshore environments is anticipated for publication in 2022. An evaluation of the effectiveness of shore-cabled acoustic monitoring systems as ship alert tools is also anticipated for publication this year.</p>

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D5 - Lateral displacement	All	Evaluate effect of lateral displacement outbound in Strait of Juan de Fuca based on 2018 trial results	If participation rates and ambient underwater noise levels meet or exceed the participation and ambient noise reduction goals agreed to annually by the ECHO Program advisory working group, or comply with underwater noise reduction targets when they are developed and if agreement with Indigenous groups and transboundary partners are reached, continue implementation of voluntary lateral displacement.	Where results continue to be positive and agreement with Indigenous groups and transboundary partners are reached, continue implementation of voluntary lateral displacement in Strait of Juan de Fuca in 2021.	Publish 2020 lateral displacement report and implement 2021 lateral displacement in Strait of Juan de Fuca	Complete	2020 report posted to the ECHO Program webpage. 2021 SJDF lateral displacement concluded on October 31, 2021.
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D6 - Lateral displacement	All	Based on the effectiveness of the 2018 Strait of Juan de Fuca trial results, SRKW usage and subject to navigational safety and operational considerations, identify other candidate areas within SRKW critical habitat to implement Large Commercial Vessel lateral displacement measures	Reduce underwater noise from Large Commercial Vessels in other key SRKW foraging areas comparable to that achieved in Haro Strait in 2017 or in line with underwater noise reduction targets when they are developed.	Continue to evaluate potential lateral displacement candidate areas as new results from TC's traffic separation scheme feasibility study and/or DFO SRKW CSAS study findings become available.	Evaluate GOC study results for potential LD candidate areas and facilitate discussion with AWG and VOC around potential next steps	Complete	Measure C5 and TC's Traffic Separation Scheme feasibility study is continuing to evaluate the potential for lateral displacement candidate areas, including the mouth of the Fraser. This measure will be addressed by the study outcomes of Measure C5 and is considered complete.
D7 - Incentives	VFPA	Continue to offer and potentially expand available VFPA EcoAction incentives for those who have taken action to reduce underwater noise from their vessel	Continue to promote the availability of EcoAction incentives to vessels calling Port of Vancouver with the goal of reducing underwater noise from Large Commercial Vessels in SRKW critical habitat.	Work with partners, including class societies, Green Marine, ship owners and technology companies to promote availability of EcoAction incentives. Evaluate new underwater noise reduction technologies/programs/certifications for inclusion in EcoAction, as applicable	5+ promotional communications about EcoAction program	Complete	<ol style="list-style-type: none"> 1) Port of Busan communications 2) Mitsubishi Heavy Industries communications 3) Last of the Right Whale movie event communications 4) International Association of Ports and Harbours targeted meeting and conference presentation 5) Salish Sea Conference presentation 6) North Shore Community Advisory Panel presentation 7) Impact Assessment Agency of Canada presentation 8) Paris University presentation 9) Shippers Engagement Working Group discussions

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D8 - Incentives	VFPA	Evaluate the potential for offering 'quiet vessels' an option to opt out of voluntary noise reduction operational mitigations such as slowdowns	Evaluate appropriate source level thresholds for 'quiet vessels', encourage and drive innovation towards application of quiet vessel technology and design.	Participate in and share data with TC's National Working Groups on Underwater Vessel Noise Reduction Targets (UVNRT). Consider further work around 'opt out thresholds' as outcomes of working group become available.	Participate in UVNRT meetings and bring findings forward to AWG/VOC for discussion, as applicable	Complete	UVNRT technical meeting was held on November 17, 2021, February 10, 2022 and April 6, 2022. UVNRT policy meeting held on December 7, 2021.
D9 - Other	All	Work to better understand and seek opportunities to test the optimization of vessel sailing times within existing shipping regime.	Subject to assessing benefits of such an approach, optimize existing sailing schedules to create longer windows where commercial vessels are not present in key SRKW foraging areas, when whales are present.	Engage with Vancouver Fraser Port Authority departments to better understand timeline and output of regional vessel optimization and supply chain visibility initiatives and to determine if and how whale protection measures can be incorporated. Through existing initiatives or a separate study, evaluate opportunities for sailing optimization within existing regime and assess potential impacts to both SRKW and industry.	Prepare summary memo on status of regional vessel optimization and supply chain visibility initiatives and the potential for opportunities to optimize sailing within existing regime	Carrying forward to Period 4	ECHO Program has been engaging with VFPA departments leading the Active Vessel Traffic Management (AVTM) and Supply Chain Visibility initiatives, as well as shipping industry advisors to support in preparing a summary memo. The memo is currently in draft form but is awaiting the release of a recommendations report from the AVTM Advisory report prior to finalization. It is anticipated that this report will be publicly available in May 2022 and memo will be updated and shared with AWG members in June 2022.
E1	VFPA & GoC	Test a real-time whale notification system for professional mariners called WhaleReport Alert System (WRAS) and evaluate its utility, benefits and effectiveness	Provide a notification tool to professional mariners which provides real time information on the location of whales with the goal of reducing threats from commercial vessels in SRKW critical habitat.	Support in the development of and participate in WRAS Advisory Committee. Continue building on the existing tool. Consider adding other whale detection data sources to WRAS.	Participate in WRAS Advisory Committee meeting(s) and support in enhancement efforts	Complete	ECHO Program team members and multiple AWG members participated in three WRAS Advisory Committee meetings between November 2021 and May 2022. App enhancements were completed in February 2022.

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E2	VFPA	Develop online training module for professional mariners to help them identify whales, reduce vessel related threats and safely navigate in their presence. ^{\$}	Make online training tutorial available to all mariners on ECHO Program website and encourage regional vessel operators to build the tutorial into their corporate training programs.	Refresh Whales in our Waters content. Promote and monitor uptake of online tutorial.	Re-launch updated WIOW tutorial. Reach 2,750 registrants	Complete	As of May 2022 there are 6,700 registrants. WIOW was relaunched with refreshed content in February 2022.
Section 5.2.2 E	PPA	Explore opportunities to improve efficiencies to the pilotage system to reduce barriers to participation in the voluntary initiatives.	Improve efficiencies to the pilotage system to reduce barriers to participation in the voluntary initiatives.	Document and evaluate efforts to date and engage relevant stakeholders to map out next steps for improving efficiencies to reduce pilotage barriers.	Prepare summary memo which documents efforts to date. Engage relevant stakeholders to map out next steps for improving efficiencies to reduce pilotage barriers	Complete	Summary memo documenting the efforts of the PPA was provided to TC and the ECHO Program and PPA intends to continue engaging relevant stakeholders, including the BCCP moving forward, with a view to further reducing terminal related pilotage delays and thereby decreasing the likelihood of excess pilotage hours as a result of any ECHO program measures.