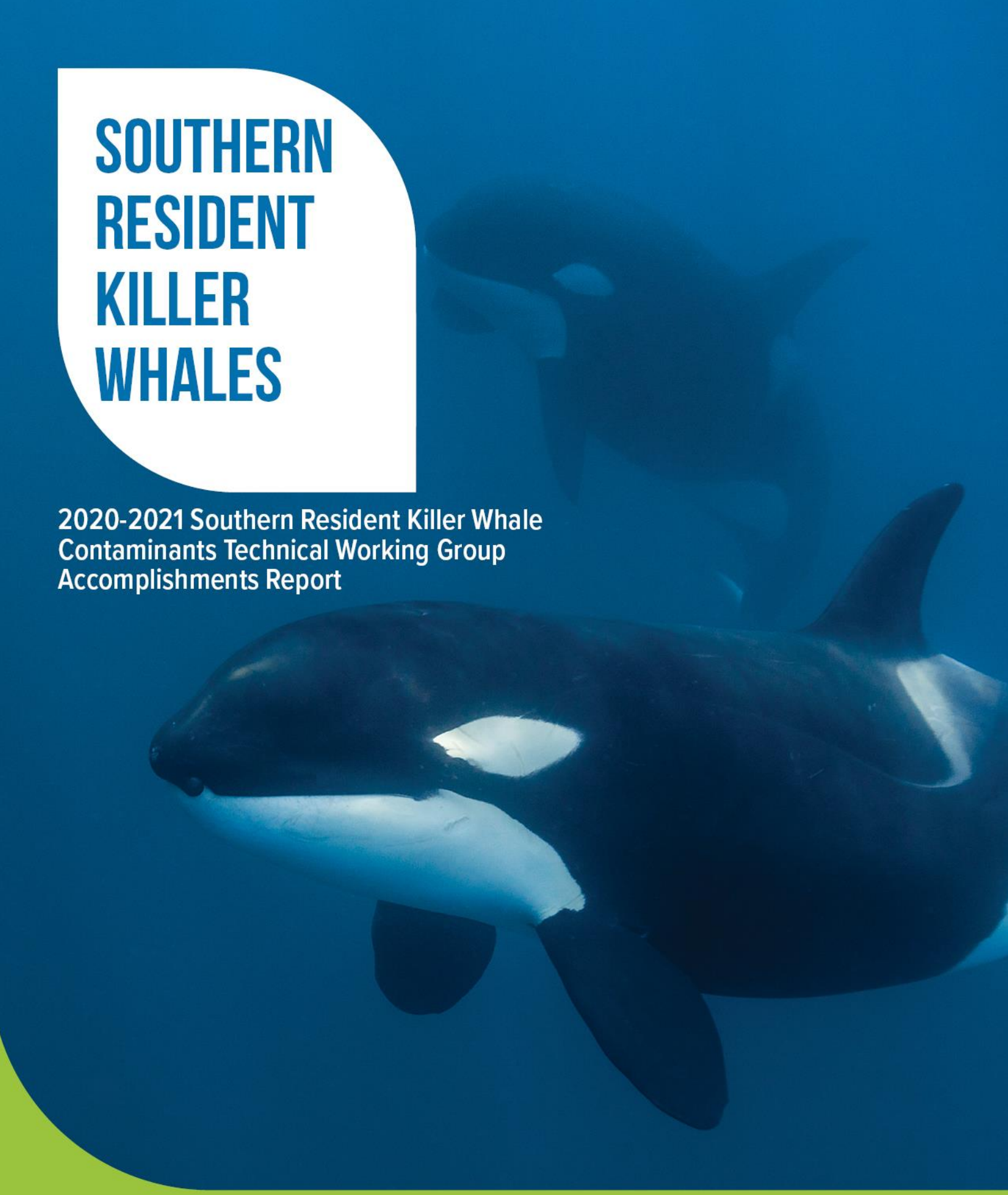
# SOUTHERN RESIDENT KILLER WHALES

## 2020-2021 Southern Resident Killer Whale Contaminants Technical Working Group Accomplishments Report



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Environnement et Changement climatique Canada

Canada

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Cat. No.: En4-416/2021E-PDF
ISBN: 978-0-660-39142-7
EC21106



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# 2020-2021 Southern Resident Killer Whale Contaminants Technical Working Group Accomplishments Report

The Contaminants Technical Working Group (TWG) was formed in 2018 in response to the imminent threat assessed by the Government of Canada (GoC) to the Southern Resident Killer Whale. Together, the GoC in partnership with the Province of British Columbia, municipalities, environmental non-governmental organizations (ENGOs) and academic groups, has focused its efforts to ensure the survival and recovery of the Southern Resident Killer Whale by addressing the threat of contaminants through the Contaminants TWG.

In March 2020, the Contaminants TWG released its recommendations centered in four areas of action including those already underway to address contaminants affecting the Southern Resident Killer Whale, their habitat and their prey:

- **Develop and implement further controls** to reduce the threat of contaminants;
- **Conduct research and monitoring** to further our understanding of contaminants in the environment and their impacts;
- **Share data, information, and knowledge among partners** to inform decision-making; and
- **Undertake outreach, education, and engagement** activities to inform the public and involve them in solutions.

## Accomplishments 2020-2021

Although there were limitations due to the global pandemic, especially for field and laboratory research, many actions were able to continue. The following provides an update of progress between March 2020 and March 2021. It includes both direct actions taken by the Contaminants TWG members, as well as complementary actions across multiple programs, agencies and collaborators that support the implementation of the Contaminants TWG recommendations.

## Develop and implement further controls

**Develop guideline derivation protocol for the protection of marine mammals from bioaccumulative substances:** A steering committee with a terms of reference and a budget will develop a protocol outlining how to derive environmental quality guidelines (EQGs) for sediment, water, tissue and diet for bioaccumulative substances to protect marine mammals. The committee has contracted an external panel with expertise in human health and ecosystem modelling to contribute to and review methodologies.

**Recommend guidelines for use:** Fifty-nine (59) EQGs (XLS) for priority contaminants have been recommended for use based on a scientific decision framework to protect the Southern Resident Killer Whale and/or its prey the Chinook salmon.

**Address environmental quality guideline data gaps:** Guidelines for perfluorooctanoic acid (PFOA) are in development for water, sediment, soil, tissue and diet by Environment and Climate Change Canada (ECCC), as well as water and sediment quality guidelines for triclocarban and metformin.

**Compare environmental concentrations to recommended guidelines and toxicity reference values:**

- Fisheries and Oceans Canada (DFO) is prioritizing and ranking over 13 contaminant classes (>400 analytes) in the Fraser River estuary using recent data (2018-present) in collaboration with ECCC and Metro Vancouver in water, sediment, juvenile Chinook salmon tissue and wastewater treatment effluent. The concentration of pharmaceutical and personal care products (PPCPs) is shown to decrease as products are further from wastewater treatment plants (WWTPs) and urban areas. A number of compounds detected in juvenile Chinook, water, and sediment have concentrations that exceed EQGs and/or toxicity reference values (TRVs) that have the potential to cause adverse health effects in fish.
- ECCC has advanced its work using historical freshwater quality and contaminant data (2003-2018) in the Fraser River basin to characterize inputs of contaminants. Analysis showed that recommended guidelines were exceeded for three pesticides, chlorpyrifos, diazinon and permethrin, as well as for polychlorinated biphenyl (PCB) 126 and total PCBs. Exceedances for cadmium were also highlighted, where a recommended EQG is being considered. Exceedances of contaminants are mapped using the Pollutants Affecting Whales and their Prey Inventory Tool (PAWPIT).

**Adopt guidelines protective of the Southern Resident Killer Whale as a policy:** The B.C. Ministry of the Environment and Climate Strategy (BC ENV) updated their working water quality guidelines (PDF) to incorporate the guidelines recommended by the Contaminants TWG. This includes the more stringent PCB guidelines.

**Burrard Inlet water quality objectives:** Water quality objectives (WQOs) for Burrard Inlet are being updated or developed and are being co-approved by Tsleil-Waututh Nation and BC ENV. Water, sediment and tissues objectives for cadmium, microplastics, and PPCPs have been completed and objectives for copper, lead, nickel, zinc, microbiological indicators, polycyclic aromatic hydrocarbons (PAHs) and polybrominated diphenyl ethers (PBDEs) are being finalized. A broad range of other contaminants in the Inlet is being screened and additional objectives are in development. ECCC-recommended guidelines for the Southern Resident Killer Whale and their prey are being considered in the development of the WQOs, and human-health-based screening values for tissue were calculated. All reports and updated policy are posted on the Government of BC website.

**Encourage and coordinate with other nations to reduce contamination:** Canada is actively engaged internationally as a party to the Minamata Convention on Mercury and the Stockholm Convention on Persistent Organic Pollutants.

- Minamata Convention: Canada is participating in the development of guidance for monitoring mercury in air, humans and biota under the treaty effectiveness evaluation. In addition, Canada is developing passive air sampler technology to help developing countries conduct mercury air monitoring.
- Stockholm Convention: Canada participates in the review of suspected persistent organic pollutants (POPs) and in the negotiations leading to the listing of new substances to the Stockholm Convention, which are then eliminated or restricted by Parties in accordance with the Convention obligations. Canada also actively participated in the development and update of various guidance documents for substances listed to the Stockholm Convention with exemptions. This includes guidance for PBDEs including decabromodiphenyl ether (decaBDE), perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctanesulfonyl fluoride, PFOA and its salts, and PFOA-related compounds; all were identified as priority contaminants of concern for the Southern Resident Killer Whale and their prey. Furthermore, in February 2020, Canada withdrew from the exemption allowing the recycling of articles containing certain PBDEs, reinforcing domestic efforts and helping global efforts towards the elimination of these harmful substances.

**Enforcement of regulations:** ECCC's Enforcement Branch completed an analysis to identify intervention opportunities to reduce pollution affecting whales, their natural habitat and food sources to focus enforcement efforts on areas of higher risk for non-compliance.

**Wastewater treatment plant upgrades:** The new McLoughlin Point wastewater treatment plant is now operating. This tertiary wastewater treatment plant can treat 108 megalitres of wastewater per day and will significantly improve the quality of water released into its surrounding waters and Southern Resident Killer Whale habitat.

**Extended producer responsibility, disposal of plastic waste to the environment, ban on plastics:** The Government of British Columbia has made commitments regarding plastic waste in the marine environment and single-use plastics:

- In June 2020, BC ENV amended its Recycling Regulation, immediately increasing the minimum deposit on beverage containers (from 5 cents to 10 cents/unit) to incentivize greater returns. Over the next two years it is expanding the range of materials collected under the regulation to include all single-use items such as 'disposable' plastic cutlery, plates, stir sticks, etc. and all milk and milk alternative containers.
- Through the Clean Coast Clean Waters Initiative, the Province committed $19.83 million to clear B.C.'s shores of marine debris and derelict vessels, which helps to create jobs and support coastal communities as they recover from the COVID-19 economic downturn.
- The $5 million Recycled Plastics Manufacturing Stimulus fund will expand the use of innovative technologies to turn used plastics into new products, support the circular economy of plastics, increase processing capacity for recycling and create new jobs.

***Prohibition of Certain Toxic Substances Regulations*** **(PCTSR):** The proposed amendments to the PCTSR should be published in fall 2021. They include further restrictions for PFOS its salts and precursors, PFOA its salts and precursors, long-chain perfluorocarboxylic acids (LC-PFCA) and their salts and precursors, hexobromocyclododecane (HBCD), and PBDEs. The amendment will also prohibit two additional flame retardants Declorane Plus (DP) and decarbromodiphenyl ethane (DBDPE), should their final screening assessment reports confirm that they are toxic under section 64 of the *Canadian Environmental Protection Act, 1999* (CEPA).

**Oceans Plastics Charter and Canada-Wide Strategy on Zero Plastic Waste:** In October 2020, the Government of Canada announced its next step in its plan to achieve zero plastic waste by 2030. Part of the plan is a ban on harmful single-use plastic items where there is evidence that they are found in the environment, are often not recycled, and have readily available alternatives, including: plastic checkout bags, straws, stir sticks, six-pack rings, cutlery, and food ware made from hard-to-recycle plastics.

# Conduct Research and Monitoring

## Monitoring

**Air contaminants:** Passive air samplers were deployed starting in February 2020 at 25 locations across the Salish Sea to identify and quantify atmospheric contaminant sources to local areas. Not all were deployed at the same time due to restrictions and permission to install the samplers. Samples were retrieved in summer/fall of 2020 and tested for non-polar organic contaminants. To assess distant sources of non-polar contaminants at background sites (atmospheric loading), active air (24 hours once per month) and precipitation (monthly aggregates) samplers were deployed on Saturna Island from December 2019 to November 2020. Samples were retrieved and are undergoing analysis. Passive water samplers designed to identify and quantify atmospheric contaminant sources to rivers and coastal waters for non-polar chemicals were also deployed at the Pacific Science Enterprise Centre for various lengths of time (10 to 40 days) to test performance. Additional sites are being considered for future passive water sampler deployment. Reduced access to laboratory space due to COVID-19 restrictions led to analysis delays.

**Freshwater / sediment:** Freshwater and sediment monitoring was significantly affected by COVID-19 restrictions starting in March 2020. In addition to data lost due to several months of sampling inactivity, some samples that were taken prior to the March 2020 shutdown were lost due to hold time exceedances. ECCC was able to return to the field in December 2020 to three out of six monitoring sites. As of January 2021, five out of six sites have been sampled for water on a monthly basis. Sampling at the remaining site (Thompson River) has not been restarted due to COVID-19 travel restrictions. Sediment sampling, which is conducted annually, was completed for five of the sites. Due to COVID-19 restrictions and ECCC laboratory capacity, some sample analysis has been shifted to external laboratories.

**Wastewater:** Fieldwork was not possible due to COVID-19 restrictions. Planning is underway to resume wastewater sampling in 2021 at previous sites should restrictions be lifted.

**Landfill leachate:** Landfill leachate sampling occurred at all four designated sites. Three sampling events have occurred (next in spring 2021) and data are currently being interpreted.

**Disposal at Sea (DAS):** Sampling by ECCC was suspended at DAS sites due to COVID-19 restrictions. However, DFO was able to collect eight sediment samples in July 2020 at the Johnstone Strait site and results are expected in summer 2021. Planning for the 2021 sampling season is underway and ECCC is coordinating with DFO and other groups to conduct opportunistic sampling if possible.

**Southern Resident Killer Whale food web:** Sampling by DFO was not affected by COVID-19 restrictions: 400 adult Chinook, 15 juvenile Chinook, 15 Pacific sand lance, and over 200 Pacific herring samples were collected in partnership with DFO colleagues and recreational anglers, Pacheedaht First Nation, Raincoast Conservation Foundation and the Albion Test Fishery. Stock analysis and sub-sampling is underway for dietary tracers and contaminant analysis.

## Scientific Research

**Fisheries and Oceans Canada:**

- To identify which contaminants pose the greatest threat; biological effects studies are underway in the Southern Resident Killer Whale and their prey. A total of 48 fecal samples for Southern Resident Killer Whale and Northern Resident Killer Whale are being analyzed using metabolomic, proteomic and transcriptomic techniques to identify biological responses to contaminants of concern including PCBs, PBDEs, organochlorine pesticides (OCPs), HBCD, chlorinated alkanes, 254 metabolites and 21 steroid hormones.
- Validation work is underway across different killer whale tissues and the study on characterizing mercury concentrations in Southern Resident Killer Whales and its related effects will continue in 2021 after delays in 2020. Four hundred (400) different contaminants were analyzed from 12 Chinook salmon (resident stock). This will support characterization and ranking of contaminants of concern for both adult Chinook salmon and Resident Killer Whales.
- Samples from 58 adult Chinook salmon from eight priority Southern Resident Killer Whale and Northern Resident Killer Whale stocks, aged four or five years, have been analyzed for PCBs, PBDEs, OCPs, HBCD, dioxin/furans, alkylphenols, PFOS, PFOA, mercury and chlorinated paraffins. Food web bioaccumulation models will be developed to estimate the body burden of emerging contaminants of concern in Southern Resident Killer Whales and Northern Resident Killer Whales, as well as new EGQs that will be protective of marine mammals.
- In addition, microchemical techniques are being used to evaluate priority contaminants sources along the migration routes of Chinook and Coho salmon. A comprehensive health effects assessment is being carried out in juvenile Chinook in the Fraser River estuary, which compliments the ranking and characterization of over 400 contaminants

in water, sediment, fish tissue and wastewater treatment effluent work previously mentioned in the Contaminants TWG accomplishments section above.

- **Fire at New Westminster:** Additional surveillance fieldwork was completed due to a fire at New Westminster from the burning of creosote. Water and sediment samples were analyzed for PAHs, dioxins/furans and metals, and very high levels (over 30,000 above the sediment quality guideline and threshold for effects) were found for certain PAH analytes. The results of the work prompted a remedial clean up.

**Ocean Wise – Pollution Tracker:** Phase 2 of Ocean Wise's Pollution Tracker is winding down with additional data expected to become available in spring 2021. Phase 3 of Pollution Tracker will begin in 2021 using new sampling sites. A characterization of hotspots for PCBs, PBDEs, OCPs, PFAS, HBCD, and mercury is underway in sediment collected in collaboration with DFO and ECCC-DAS from over 100 sites in the Salish Sea.

**Biological effects of contaminants on the Southern Resident Killer Whale:** Ocean Wise and DFO are collaborating to assess biological effects of contaminants on Southern Resident Killer Whales and their prey. Analysis of mercury, PCBs and PBDEs is being done using skin and blubber biopsy samples and endocrine disruption is being assessed through gene expression. Ocean Wise and Metro Vancouver are also collaborating to learn more about microplastics, especially microfibers found in wastewater.

**Microplastics:**

- The Ocean Pollution Research Unit, which is part of the Institute for the Oceans and Fisheries (IOF) at the University of British Columbia, seeks to understand the exposure, persistence, toxicity and bioaccumulation of pollutants in the global ocean using models for top predators like the Killer Whale. The research unit is assessing the exposure risk of microplastics in the Chinook salmon/Southern Resident Killer Whale food web and the risk of emerging halogenated flame retardants, among others. Additional studies related to food chain transfer of contaminants to the same trophic level as the Southern Resident Killer Whale is underway to better understand the uptake of contaminants and contaminant sources.
- ECCC is updating a literature review to determine the feasibility of a standard protocol to assess microplastics in various environmental media including water, sediment, and biota. Microplastics are also being assessed by DFO in juvenile Chinook from the Fraser River estuary and Vancouver Island.

**Identifying Contaminant Hotspots and Sources:**

- **Pollutants Affecting Whales and their Prey Inventory Tool (PAWPIT):** The development of PAWPIT has advanced with a focus on data acquisition, improving estimates of contaminant releases and source characterization, as well as refinement of the mapping tool. This includes the addition of a new geospatial layer for exceedances of recommended EQGs. The Contaminants TWG has supported the development of the

tool with their expertise and final preparations for a launch of the PAWPIT are underway.

- **Contaminants Load Analysis (CLA):** The CLA, which utilizes historical freshwater quality and contaminants monitoring data for the Fraser River watershed, has focused its efforts to quantify ambient loads of priority contaminants in the Fraser River and its tributaries. It has identified exceedances of recommended EQGs mentioned previously, which are also visualized through PAWPIT.
- **Comparing releases of contaminants from sources to ambient loads:** The comparison of releases of contaminants to ambient loads in PAWPIT indicates that additional source identification and characterization may be required for areas like runoff, sediment and deposition.

## Share data, information, and knowledge among partners

ECCC hosted a Whales Contaminants Science meeting on February 23 and 24, 2021. The objectives of the meeting included giving researchers an opportunity to share scientific advances with colleagues to identify synergies and potential areas of collaboration. The meeting also served to facilitate discussion on potential avenues to share data amongst partners. ECCC will seek additional information on the process of using the Government of Canada's Open Data portal to share data publicly.

## Undertake outreach and education

### Raising public awareness

- Overall, outreach and education plays an important role for all Technical Working Groups to reduce the multiple threats to Southern Resident Killer Whales. Pursuant to the Contaminants TWG recommendation, ECCC launched a webpage in November 2020 outlining actions the Government of Canada is taking to reduce the threat of contaminants to Southern Resident Killer Whales and their prey. With restrictions on public gatherings due to COVID-19, many public awareness activities were conducted virtually. Nonetheless, ECCC strove to expand education and outreach related to contaminants by taking part in events hosted by DFO and the Royal BC Museum, as well as the Ocean Protection Plan Dialogue Forum (hosted by Transport Canada). In 2021, ECCC will also participate with other Contaminants TWG members in a webinar hosted by Sea Smart on "forever chemicals".
- Georgia Strait Alliance (GSA) launched e-blast messaging on the 2020 Southern Resident Killer Whale management measures – including the Contaminants TWG recommendations – to the boating community and organized Orca Month activities in June, community coffee breaks and media interviews. GSA updated their guide to Green Boating and provided Clean Marine BC with guidance on green practices for boaters in the Salish Sea region. In addition, the work of the Contaminants TWG was noted during

a plenary session chaired by the GSA at the Salish Sea Ecosystem Conference on harmonizing USA and Canada Southern Resident Killer Whale measures.
- Ocean Wise contributed to public awareness through their blog posts, public webinars and Ocean Watch reports.
- Fisheries and Oceans Canada's science programs will be featured on the Discovery Channel increasing awareness of its work including the Fraser Estuary ecosystem.

## Look ahead

The Contaminants TWG made good progress implementing its March 2020 recommendations that support the recovery of the Southern Resident Killer Whale and their prey from the threat of contaminants. While a solid foundation of work was completed over the last year, continued efforts will be required to further advance the recommendations. This includes launching the PAWPIT, finalizing EQGs protective of marine mammals, scientific studies on health effects in Southern Resident Killer Whales and their prey and continuing to collaborate on monitoring, science, and outreach and education. As Contaminants TWG members continue to implement key actions over the short, medium and long-term, the Contaminants TWG will begin to look beyond its recommendations by responding to new science and evaluating emerging threats related to contaminants. This will ensure the collective response to support the recovery and survival of the Southern Resident Killer Whale is agile and effective.