



SUMMARY REPORT

NATIONAL VESSEL DUMPING ASSESSMENT: QUANTIFYING THE THREAT OF SHIP WASTE TO CANADA'S MARINE PROTECTED AREAS

Canada has protected more than 13 per cent of its oceans and coasts, with a commitment to reach 30 per cent by 2030. But ships are currently producing 147 billion litres of harmful waste in Canadian waters annually—nearly 10 per cent of which is dumped in protected areas.

This report shows the magnitude of sewage, greywater, scrubber washwater, and bilge water produced and the amount of these operational discharges potentially dumped in places intended to conserve ecosystems and at-risk species. As Canada works toward its long-term conservation goals for healthy ocean ecosystems, it is imperative that protections effectively safeguard our most sensitive marine areas now and into the future.



BACKGROUND: DUMPING AND MARINE PROTECTION IN CANADA

With the world's longest coastline, Canada's three oceans provide important habitat to at-risk species, underpin the livelihood, sustenance, and culture of coastal and Indigenous communities, and drive national economic activity. But as ship traffic increases, so too does the threat from chronic pollution to our oceans, wildlife, and climate.

Considerable legislation exists, both in Canada and internationally, to mitigate the impact of ship-source

pollution. However, current Canadian regulations still allow (with some limitations) the dumping of greywater, scrubber washwater, bilge water, and sewage as part of routine operations. These harmful discharges can contain acids, carcinogens, pathogens, and other toxic substances that can bioaccumulate in marine life and undermine the resiliency of our ocean ecosystems.

MINIMUM STANDARDS

Canada has committed to protecting 25 per cent of its marine and coastal areas by 2025 and 30 per cent by 2030 through the creation of marine protected areas (MPAs) and other effective area-based conservation measures (OECMs). As these areas are created using a variety of legislative tools, what is and isn't permitted within them has been determined on a case-by-case basis.

In April 2019, to establish a base level of protection for MPAs going forward, the federal government announced new "minimum standards" that prohibit dumping, oil and gas activities, mining, and bottom trawling. While a ban on dumping may seem straightforward, there is currently

no standardized definition of what dumping actually means in the context of marine protection in Canada. As a result, dumping from ships in MPAs remains subject to interpretation.

Moreover, these as-yet-undefined minimum standards will only apply to new federal MPAs, which means pre-existing federal MPAs, as well as provincial and territorial MPAs and OECMs, won't have a clearly defined "no dumping" standard, despite counting toward Canada's protected area targets. Whether these minimum standards will be retroactively applied to pre-existing federal MPAs as part of their regular review processes remains to be seen.



METHODS:

HOW WE CALCULATED OPERATIONAL WASTE

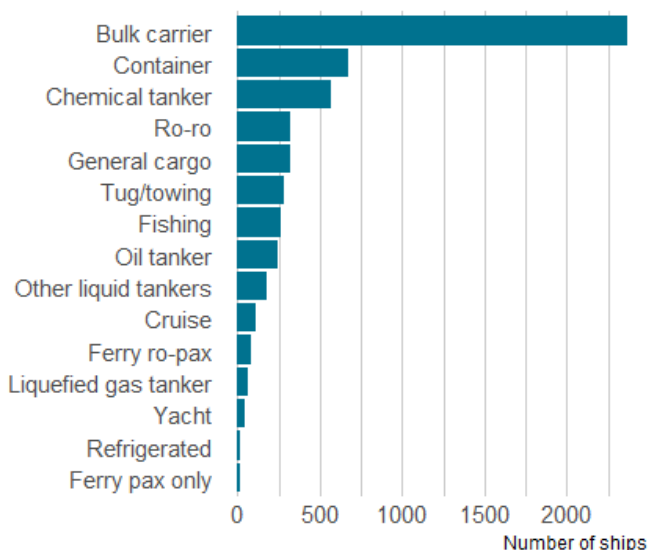
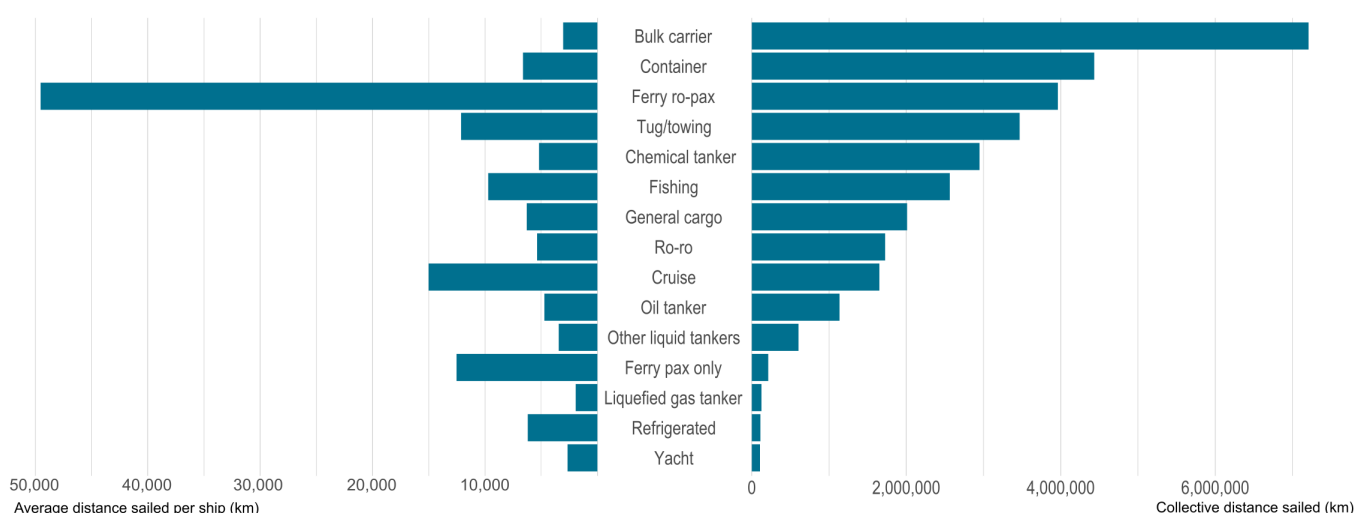
Despite the risks posed by chronic ship-source pollution to the marine environment, information has not been readily available on exactly how much operational waste ships are producing, where it is likely being dumped, and by what types of vessels—until now.

WWF-Canada’s National Vessel Dumping Assessment has modelled, for the first time, how much greywater, bilge water, sewage, and scrubber washwater is generated annually in Canadian waters using automatic identification systems (AIS) data from exactEarth Ltd. and ship attribute data from Clarksons Research.

To provide a pre-pandemic baseline, the analysis is based on ship traffic data for 5,546 ships active in Canadian waters in 2019. The actual volume of operational waste generated is likely greater than our estimates; our study only included ships with registered International Maritime

Organization (IMO) numbers, and some ship types, such as naval vessels, were excluded from the analysis. As a result, nearly 9,000 vessels that appear in the 2019 AIS dataset are not represented. It’s also worth noting that this study models four major operational waste streams, but does not include others such as garbage and ballast water.

After calculating how much of each waste stream is produced annually by ships, this data was overlaid with MPAs and OECMs to determine how much waste is created within protected areas. This includes *Oceans Act* MPAs, marine refuges (OECMs), National Marine Conservation Areas, marine National Wildlife Areas (NWAs) and marine components of NWAs, National Parks, and Migratory Bird Sanctuaries.



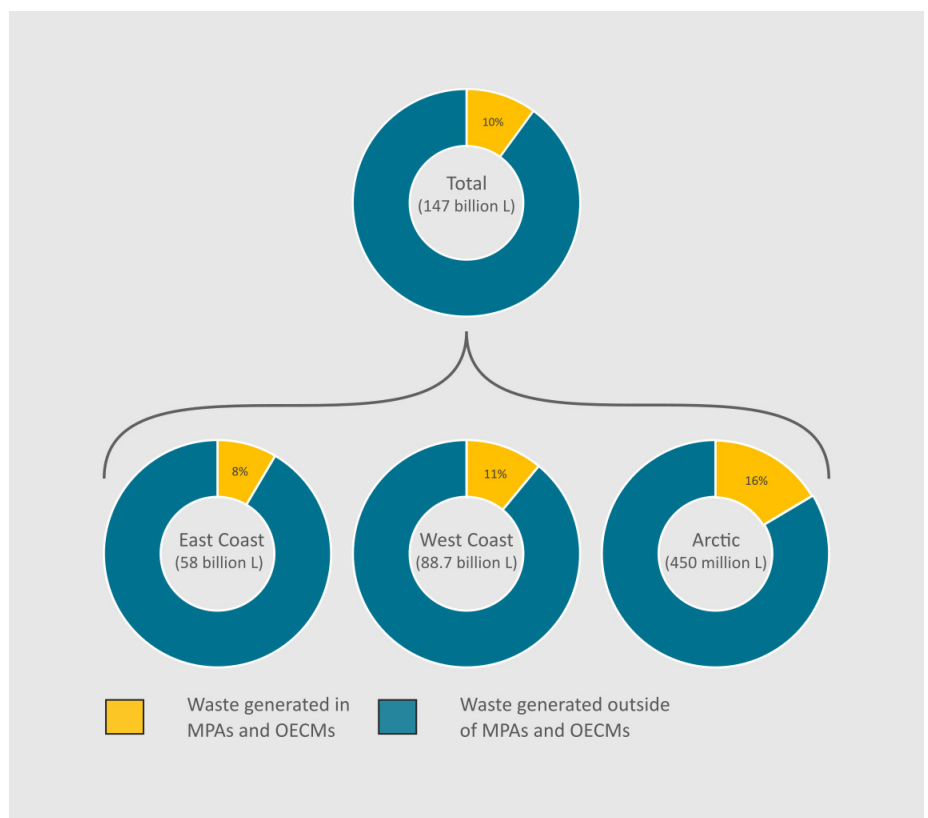
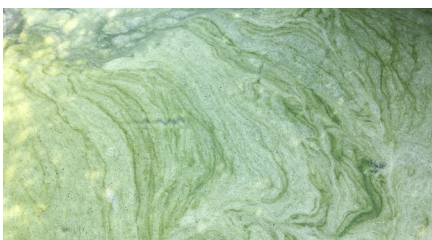
Modelling looked at distance travelled, location, and ship attributes such as vessel type, number of people on board, installed engine power, vessel speed, and scrubber installation to calculate the volume of waste generated.



DUMPING IN CANADIAN WATERS: KEY FINDINGS

WWF-Canada’s National Vessel Dumping Assessment found that ships produce, and potentially dump, 147 billion litres of harmful waste each year while in Canadian waters—the equivalent of 59,000 Olympic-sized swimming pools. Dumping threatens wildlife even in the protected parts of our oceans, with roughly 10 per cent of waste, or 14.7 billion litres, generated annually in these sensitive habitats. The vast majority of this waste is dumped as it’s created.

Ship traffic in this study is primarily driven by merchant shipping to and from Canada’s major ports as well as passenger ships such as ferries and cruises along established routes. On the east and west coasts, traffic is densely clustered in areas like the St. Lawrence Seaway and in the Salish Sea. Since high traffic areas are correlated with the greatest waste generation, these regions stand to be most impacted by dumping. Although there is less ship activity in the Arctic relative to the east and west coasts, the proportion of waste produced in Arctic MPAs is greater.

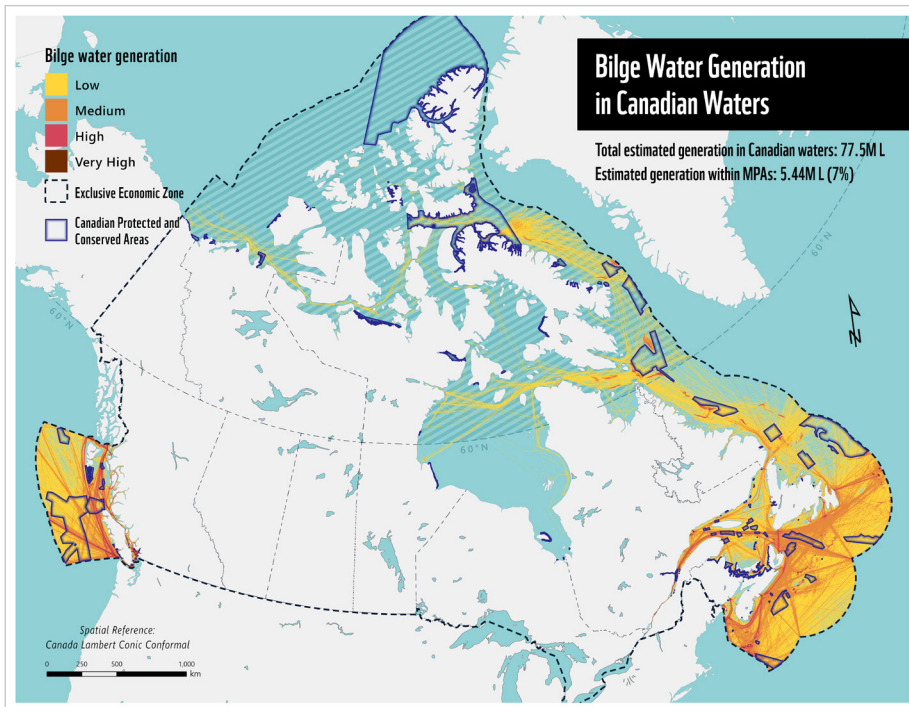


TOP WASTE STREAMS

Of the four waste streams studied, scrubber washwater was by far the largest. Although only one in eight ships in this analysis is outfitted with a scrubber system, the amount of scrubber washwater generated each year is 34 times the volume of all the other waste streams combined, equaling 97 per cent of total waste.

Most ships with scrubbers use open-loop systems, which means nearly all toxic washwater is dumped where it's generated—including in MPAs. Ships can retain greywater, sewage, and bilge water for finite periods of time, in contrast to scrubber washwater. However, there are many factors that determine

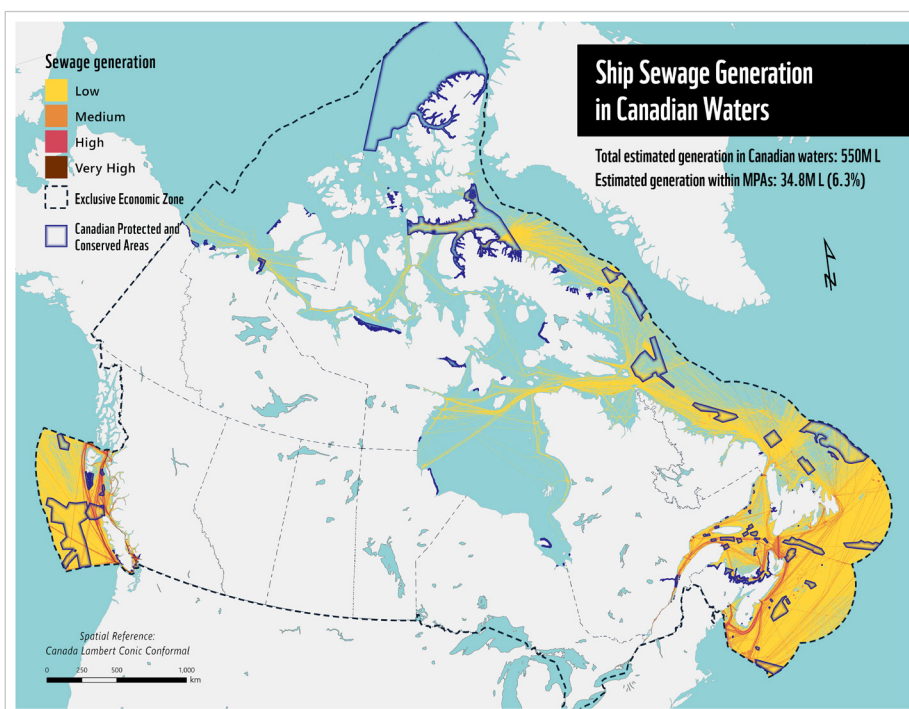
whether ships will opt to dump these waste types at sea or dispose of them at port reception facilities, making it difficult to estimate exactly how much of this remaining 3 per cent of waste ends up in the ocean.



BILGE WATER

Ships generate 77.5 million litres of bilge water annually in Canadian waters, the equivalent of 31 Olympic swimming pools. About 5.2 million litres of this is generated and potentially dumped in MPAs and OECMs. Bilge water generated in the Arctic was not included in our analysis because Canadian law prohibits the discharge of oil, in any concentration, in Arctic waters.

Bilge water is the oily liquid that collects at the lowest part of a ship. It contains liquids from machinery spaces, drainage systems, and sludge tanks, as well as fluids from various other sources. It is generally foul and often contains toxic and carcinogenic substances.



SEWAGE

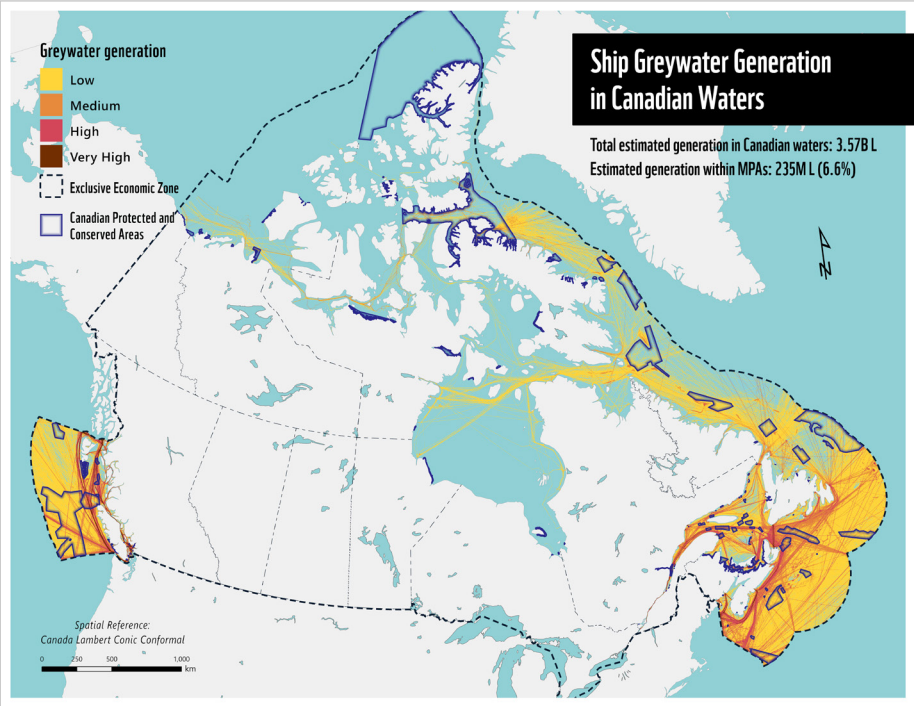
Ships generate 549.8 million litres of sewage annually in Canadian waters, the equivalent of 220 Olympic swimming pools. About 34.6 million litres is generated in MPAs and OECMs.

Also known as blackwater, sewage includes drainage from toilets and waste from medical facilities and live animal areas. Sewage contains bacteria and viruses, which can pose a risk to seafood consumers. Generally, sewage discharged within 12 nautical miles of shore must be treated first. However, MPAs and OECMs often extend well beyond the 12 nautical mile limit. Additionally, reports submitted to the IMO by multiple countries suggest that ship sewage treatment plants regularly fail to meet minimum effluent requirements.

GREYWATER

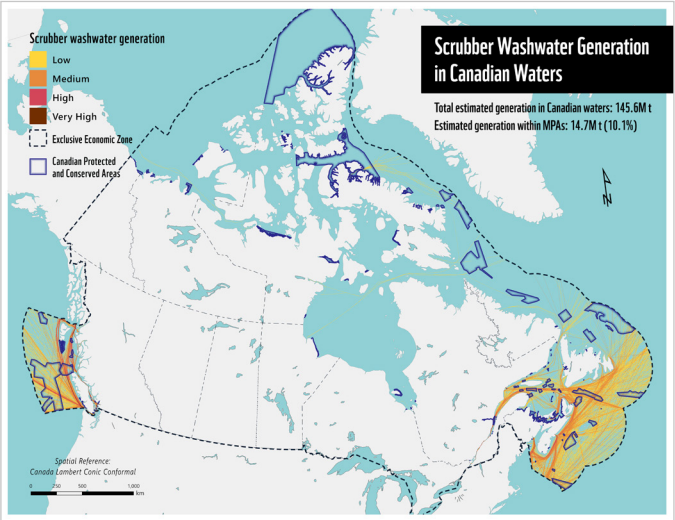
Ships generate 3.6 billion litres of greywater annually in Canadian waters, the equivalent of 1,440 Olympic swimming pools. About 233 million litres is generated in MPAs and OECEMs.

Greywater includes drainage from sinks, showers, galleys, and laundry facilities. It can be as environmentally damaging as untreated sewage in equivalent amounts and can contain a wide variety of pollutants, nutrients, microplastics, oils and grease, detergent and soap residues, toxic cleaning products and solvents, and dissolved metals. Greywater can contribute to excessive nutrient loading and algal growth when dumped, leading to ocean dead zones with low or no oxygen.



SCRUBBER WASHWATER

Ships generate 143 billion litres of scrubber washwater annually in Canadian waters, the equivalent of 57,200 Olympic swimming pools. Roughly 10 per cent of this, or 14.5 billion litres, is produced and subsequently dumped in MPAs and OECEMs.



Exhaust gas cleaning systems, also called “scrubbers,” are devices that remove sulfur oxides from the engine and boiler exhaust produced when ships burn heavy fuel oil. The waste by-product of this process is called scrubber washwater. Washwater is acidic and contains large amounts of heavy metals and polycyclic aromatic hydrocarbons, which can be toxic and have carcinogenic properties. It also reduces the ocean’s ability to buffer climate change—for every tonne of sulfur dioxide discharged by scrubbers, the ocean will be unable to absorb about half a tonne of carbon dioxide from the atmosphere.

THE TROUBLE WITH SCRUBBERS

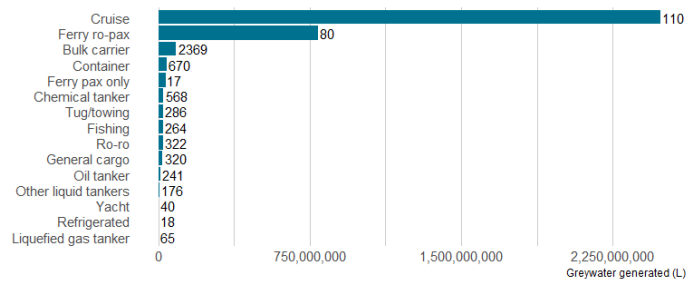
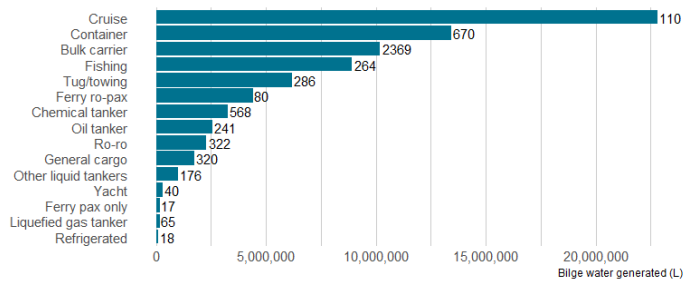
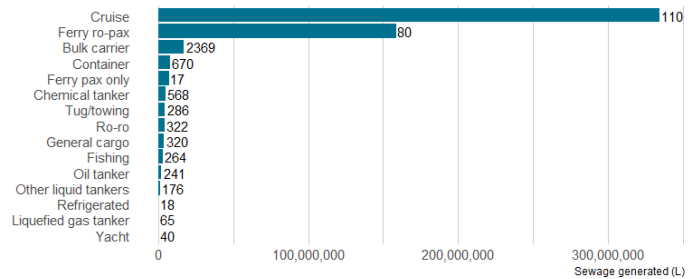
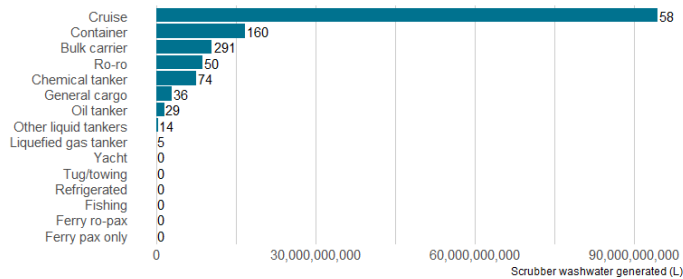
The global shipping fleet has been primarily powered by heavy fuel oil (HFO) for decades due to its relatively low cost, despite it being highly toxic when burned and notoriously difficult to clean when spilled.

HFO risks are especially high in the Arctic. Navigational hazards like sea ice increase the likelihood of an oil spill and even standard usage produces disproportionate particulate matter emissions, including black carbon, which has a fivefold climate-warming impact in the Arctic compared to when it is emitted at lower latitudes. While the shipping industry has attempted to mitigate HFO impacts via scrubbers, these devices simply convert air pollution into water pollution while encouraging continued use of dirty residual fuels.

Transport Canada guidelines are silent on scrubber washwater discharges in the Arctic, and the system of exemptions and waivers provided under the IMO’s HFO ban will allow widespread HFO use even after coming into effect in 2024. If Canada grants these waivers and exemptions, HFO use in the Canadian Arctic could only be reduced by 20 per cent, meaning that there would still be incentive for ships to use scrubbers in the region. A comprehensive ban on dumping in MPAs that includes scrubber washwater will help discourage the use of HFO and reduce the overall amount of scrubber washwater produced and dumped in the Arctic.

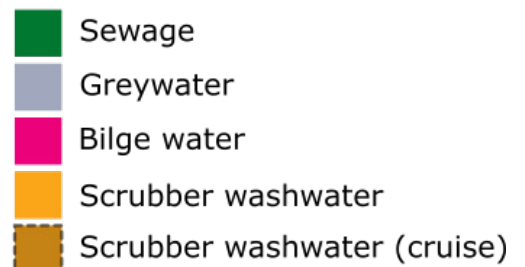
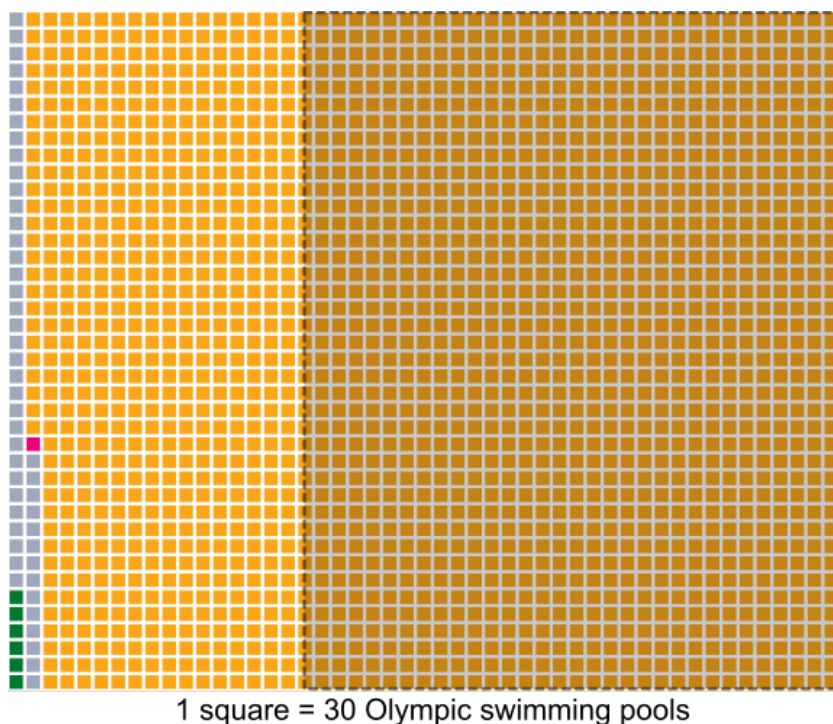
TOP PRODUCERS OF OPERATIONAL WASTE

The number to the right of each bar indicates the number of ships in each category.



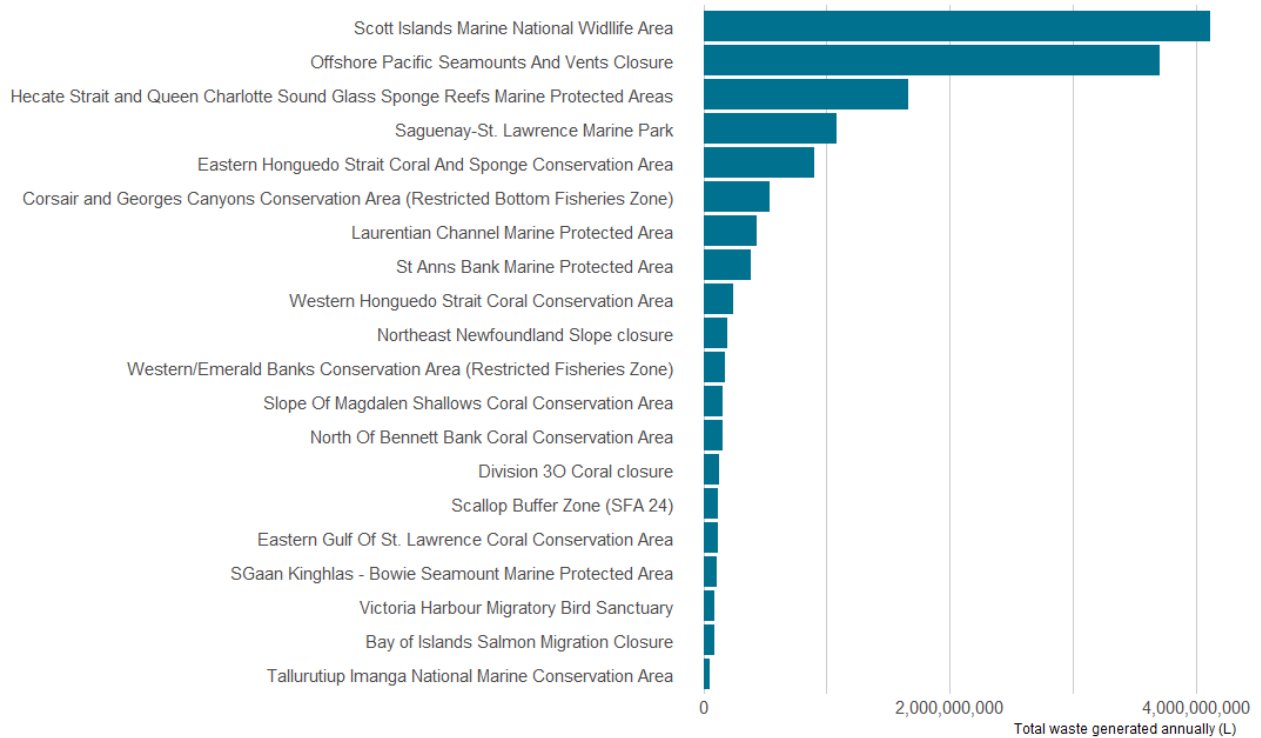
WWF-Canada's assessment also calculated how much of each waste stream is produced by different ship types. The findings reveal that cruise ships are by far the top producer of each of the four waste streams nationally despite only making up 2 per cent of the ships in our analysis. Cruise ships account for 69.6 per cent of greywater, 66 per cent of

scrubber washwater, 60.8 per cent of sewage, and 29.4 per cent of bilge water produced in Canadian waters annually. The percentages are even higher in MPAs and OECMS, where cruise ships account for 78 per cent of greywater, 70 per cent of sewage, 59 per cent of scrubber washwater, and 32 per cent of bilge water.



A CLOSER LOOK AT DUMPING IN MARINE PROTECTED AREAS

Like national parks on land, Canada’s MPAs are meant to be places where wildlife can take refuge and recover from the consequences of human activities.



This chart shows the MPAs and OECMs where the highest amounts of waste are generated.

SCOTT ISLANDS MARINE NATIONAL WILDLIFE AREA

A busy route for ferries, cruise ships, and freighters, Scott Islands marine National Wildlife Area in British Columbia sustains some of the largest rookeries of stellar sea lions in the world. And each spring, more than one million seabirds—including 90 per cent of the country’s tufted puffins and 50 per cent of the world’s Cassin’s auklets—arrive on island cliffs to breed.

This MPA has potentially more waste dumped in it than any other protected area in our assessment. More than 722,421 litres of bilge water, 56.6 million litres of greywater, 7.64 million litres of sewage, and 4.1 billion litres of scrubber washwater were generated here in 2019, the year after it received protected status.

SAGUENAY-ST. LAWRENCE MARINE PARK

At the confluence of Quebec’s St. Lawrence estuary and Saguenay River, the Saguenay-St. Lawrence Marine Park is home to over 2,000 species, including at-risk species like blue whales, Atlantic cod, and the endangered St. Lawrence beluga. One billion litres of operational waste is generated, and potentially discharged, by ships in this ecologically unique region each year.

Historically, the St. Lawrence beluga population has suffered from abnormally high cancer rates from industrial pollution produced by local aluminum smelters. Polycyclic aromatic hydrocarbons (PAHs), which also occur in elevated concentrations in scrubber washwater and bilge water, are thought to be a primary contributing factor. One of the key measures introduced by Canada’s *Species at Risk Act* (SARA) to help recover this whale population is to reduce toxic chemical compound discharges, yet levels of many contaminants remain high in St. Lawrence belugas.

TALLURUTIUP IMANGA NATIONAL MARINE CONSERVATION AREA

Polar bear, beluga whales, narwhal, and other iconic species share the vast and beautiful Canadian Arctic where 15 per cent of marine and coastal areas are protected, including Tallurutiup Imanga National Marine Conservation Area. Although less waste is produced in the Arctic relative to the east and west coasts, a greater proportion of the waste is produced in protected areas. For example, 28 per cent of total greywater produced in the Arctic is generated within protected areas compared to the west coast, where 5 per cent of greywater is generated in MPAs.

With Arctic shipping and tourism set to dramatically increase as multiyear sea ice melts—and given that cruise ships produce the majority of greywater—even a small increase in the number of passenger ships will have a big impact on the amount of greywater and other wastes being dumped.

A previous [WWF-Canada study](#) found that the amount of greywater dumped in the Arctic is anticipated to double by 2035.



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RECOMMENDATIONS: “NO DUMPING” SHOULD ACTUALLY MEAN NO DUMPING

To truly safeguard our country’s vast marine biodiversity now and into the future, Canada must ensure protected areas are more than just lines on a map.

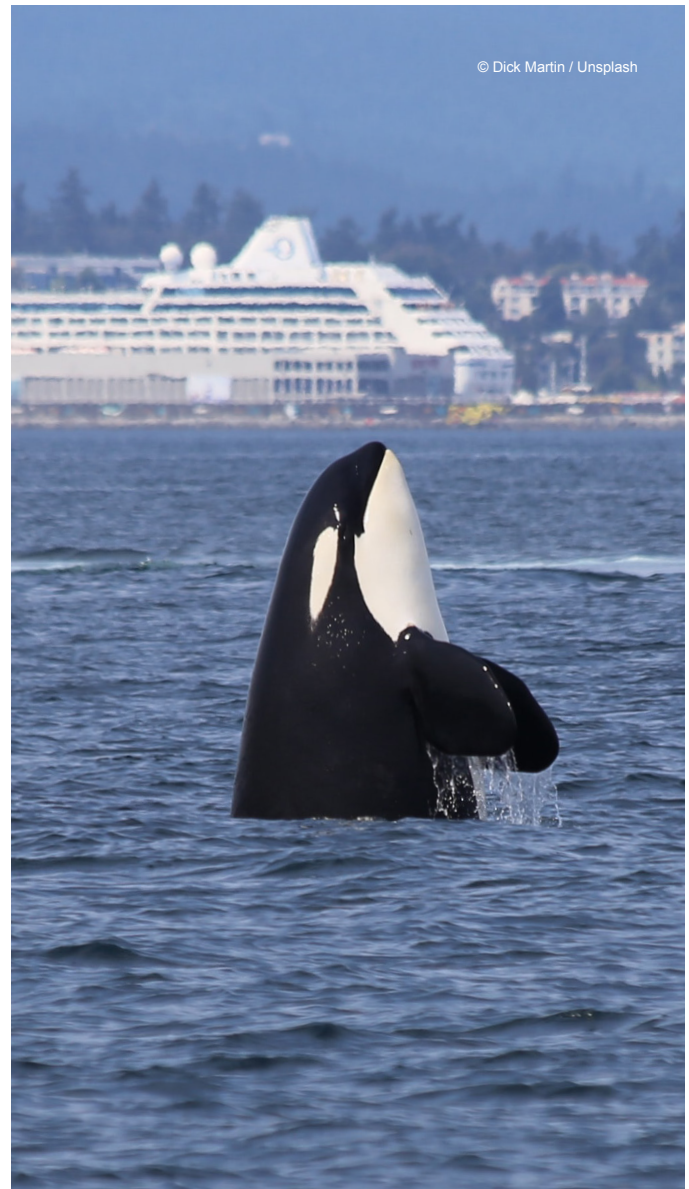
By painting a clearer picture of the magnitude of ship waste being generated in Canadian waters, and more specifically in protected areas that are intended to provide refuge to wildlife, WWF-Canada’s unprecedented research raises the question: are Canada’s MPAs really safe from harmful and toxic dumping?

Current regulations are inadequate or contain gaps that leave wildlife and ecosystems vulnerable. With Canada increasing protected ocean areas to 25 per cent by 2025 and 30 per cent by 2030, it’s imperative that the minimum standards are strong enough to deliver on their promise.

To that end, WWF-Canada recommends that the Government of Canada:

- **Create a comprehensive definition of “dumping”** so that minimum standards for MPAs prohibit discharging *all* operational wastes, including sewage, greywater, bilge water, and scrubber washwater.
- **Extend minimum standards to all areas counting toward Canada’s marine conservation targets**, not just new federal MPAs.
- **Enforce the minimum standards in all existing MPAs and OECMs through the management planning process.** These results highlight the ongoing issue of dumping, especially in high-traffic MPAs like Scott Islands marine National Wildlife Area and the Saguenay-St. Lawrence Marine Park.
- **Ban scrubbers and promote the use of cleaner alternative fuels.** Not only is scrubber washwater the most prevalent waste stream in our assessment, but scrubbers also encourage continued reliance on heavy fuel oil, which produces harmful black carbon and poses a severe environmental risk if spilled.
- **Close the Arctic greywater regulatory gap.** Explicitly regulating greywater in the Canadian Arctic would add a needed layer of protection inside and outside Arctic MPAs and OECMs.

As Canada creates a network of protected and conserved areas, it is increasingly important that these sites have the best possible outcomes for wildlife and the people who depend on them. Banning the dumping of operational wastes known to harm wildlife is key to ensuring MPAs are protected in more than name only.



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WWF-Canada. 2022. National Vessel Dumping Assessment: Quantifying the threat of ship waste to Canada's marine protected areas. Prepared by Davin S., Saunders. S., Liang C., Merritt W. World Wildlife Fund Canada. Toronto, Canada.

This WWF-Canada report could not have been developed without the expertise, analytical skills and contributions of several individuals: Dr. Jukka-Pekka Jalkanen of the Finnish Meteorological Institute; Liudmila Osipova, Dr. Bryan Comer and Elise Georgeff of International Council on Clean Transportation; Sarah Bobbe of Ocean Conservancy; Melissa Parks of Pew Charitable Trusts; and Sigrid Kuehnemund and Kimberley Dunn of WWF-Canada.

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A Canada with abundant
wildlife, where nature and
people thrive.

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