

# Discharge of Grey Water from Cruise Ships Operating in Arctic Waters – Impacts and Regulations

## Introduction

Grey water is generally considered to include discharges from sinks, showers, and galleys and is usually characterized as untreated wastewater that has not come into contact with toilet waste<sup>1</sup>. Grey water comprises 90% of the liquid waste produced on board cruise ships<sup>2</sup> and has been reported to contain a wide variety of polluting substances, such as: faecal coliform bacteria, organic pollutants, and suspended solids<sup>3,4</sup>. The pollutant levels in grey water are comparable to untreated municipal sewage on land<sup>5,6</sup> however, unlike sewage, grey water discharge from ships is not regulated globally. This paper discusses the impacts of grey water on marine environments, compares the Canadian regulations in waters north and south of 60 degrees latitude as well as Alaskan regulations, and provides recommendations for moving forward.

## Grey Water Impacts and Degradation

The key measurable constituents of grey water include: organics, petroleum hydrocarbons, oils and greases, metals, suspended solids, oxygen demand, nutrients, and coliform bacteria. In a study concerning cruise ships in Alaska, shockingly high levels of fecal coliform and total suspended solids were found in nearly all cruise ship grey water samples<sup>7,8</sup>. The discharge of oil and grease into the ocean can prevent fish respiration by coating their gills<sup>7</sup>. Debris from grey water can settle on the bottom of the ocean and asphyxiate benthic organisms<sup>8</sup>. Grey water has the potential to contain parasites and viruses, therefore being a vector for the introduction of invasive species<sup>9</sup>. Additionally, since phytoplankton are nutrient-dependent, the discharge of excess nutrients from grey water can cause harmful algal blooms, resulting in the loss of biodiversity, and disruption of food webs. In severe occurrences of over-enrichment, hypoxic dead zones can be created<sup>8,9</sup>.

The degradation of grey water in marine environments is influenced by a number of environmental factors, including solar radiation, water depth, dissolved oxygen content, sea ice, algal blooms, salinity, water currents, temperature, turbidity, and stratification. Due to the low light (for part of the year) and low temperatures in the Arctic, decomposition is slow, and therefore, the impacts of grey water are elevated compared to other marine environments. In addition, the Arctic has a heightened vulnerability due to the presence of sensitive wildlife species and sea ice.

## Canadian Grey Water Regulations South Vs. North of 60 Degrees Latitude

There is currently no global regulation of the discharge of grey water from ships, and its regulation is not under active consideration at the IMO. Some countries have introduced restrictions within their national jurisdictions. For Canadian regulations in waters south of 60 degrees latitude, grey water is defined as the drainage from sinks, laundry machines, bath tubs, shower-stalls or dishwashers and does not include sewage, or drainage from machinery spaces or workshop areas. Regulations state that a passenger vessel carrying more than 500 passengers must ensure that any release of grey water by or from the vessel into the water is passed through a marine sanitation device; or is made at a distance of at least three nautical miles from shore<sup>10</sup>.

For Canadian regulation in waters north of 60 degrees latitude, grey water is not specifically defined but falls into the classification of “waste”. Waste is defined by the Arctic Waters Pollution Prevention Act as any water that contains a substance in such a quantity or concentration that, if added to any other water, would alter quality to an extent that is detrimental to man or by any animal, fish or plant that is useful to man<sup>11</sup>. Under this act, the discharge of waste is prohibited, thereby prohibiting the discharge of both treated and untreated grey water. The classification of grey water as waste conflicts with how grey water is dealt with on ships south of 60 degrees latitude. The absence of a specific definition for grey water and the lack of grey water specific regulations in waters north of 60 degrees latitude results in multiple issues. Firstly, cruise ships, such as Crystal Serenity, can claim that none of the cleaning products used on board are technically classified as waste, and can therefore discharge untreated grey water. Secondly, prohibiting the discharge of grey water is not feasible given that ships are unable to carry large quantities of grey water for extended periods of time and the infrastructure to treat grey water ashore does not exist in the Arctic. And lastly, prohibiting the discharge of treated grey water does not make environmental sense and discourages ships from treating grey water onboard.

### **Alaskan Grey Water Regulations**

In Alaskan waters, the Commercial Passenger Vessel Environmental Compliance (CPVEC) program allows for careful monitoring and control of the cruise ship industry and has proved to be very effective in preventing pollution attributed to grey water discharge. Regulation 33CFR159 Subpart E, which has been introduced since 2001, sets the discharge standards for grey water from cruise ships carrying 500 or more passengers, where grey water is regulated to the same discharge standards as sewage. Untreated grey water cannot be discharged unless it meets stringent requirements concerning levels of suspended solids and faecal coliform. Alaska can also request the designation of no-discharge zones for grey water by petitioning the Environmental Protection Agency<sup>12</sup>.

Alaskan regulations also establish requirements for sampling, testing, reporting and record keeping. The Coast Guard examines the grey water discharge record book (tracks when, where, volume, type, flow rate and vessel speed), environmental compliance records, and performs a general examination of the vessel. Ships are also subject to unannounced, random sampling of treated grey water effluent by the Department of Environmental Conservation. None of these monitoring efforts are conducted in Canadian waters.

### **Recommendations**

1. Standardize the definitions and regulations for grey water in Canadian waters north and south of 60 degrees latitude.
2. Grey water is regulated to the same discharge standards as sewage.
3. Harmonize Canadian and Alaskan discharge regime to ensure common environmental protection standards.
4. Establish and strengthen effective inspection and enforcement systems, by introducing a monitoring and enforcement regime similar to that of Alaska regulation 33CFR159 Subpart E.

## References

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