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Alaska Department of Environmental Conservation (DEC)

Mid-Season Cruise Ship and Ferry Report for 2002

8/28/02

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FOREWORD BY DEC COMMISSIONER, MICHELE BROWN

We are midway through our first full cruise season in applying the new state law on cruise ships. This report provides information on where we stand mid-season, as of August 7, 2002. A final, more detailed report will be issued after the end of the season.

Alaska's Commercial Passenger Vessel Environmental Compliance (CPVEC) law was passed following evaluations of air emissions, wastewater discharges, and oil spill response readiness for the increasing frequency and size of cruise ships visiting Alaska's waters. The law requires that cruise ships register before coming to Alaska and provide for consistent testing, monitoring and inspection to ensure that Alaska's waters remain healthy and productive and continue to be a magnificent, pristine draw to visitors.

Forty-four cruise ships registered in 2002: 25 large vessels, 14 small vessels, and 5 ferries. The number of registrants in 2001 was 43: 24 large vessels, 14 small vessels, and 5 ferries.

The air quality data to date are very encouraging. DEC increased the areas where opacity readings are taken to include Seward, Valdez, Kodiak, Cordova and Whittier, Juneau, Sitka, Skagway, Haines, and Ketchikan. ADEC also increased the number of readings by 5 percent. Yet, the number of opacity violations and opacity complaints from the public have decreased in 2002 compared with 2001. Previous ambient air monitoring studies in downtown Juneau, the Alaska port with the highest volume of cruise ship traffic, indicate low levels of pollutants, well below regulated standards. The industry should be credited with its successful opacity improvements.

The wastewater data warrant a more mixed response. More large cruise ships have installed advanced wastewater treatment systems that are very effective at removing bacteria and solids. The number of large vessels that discharge their treated wastewater in Alaska marine waters rather than merely discharging their wastewater outside of the legal limits of Alaska marine waters, which excludes them from DEC requirements, increased in 2002 compared to 2001. Unfortunately, the levels of fecal coliforms and total suspended solids in the graywater of large vessel and the wastewater of small vessels were very high in 2001. It is too early to draw conclusions from the 2002 data, but we remain concerned that some large vessels will opt to simply move wastewater discharges outside state waters rather than improve treatment.

DEC continues to work with a Science Advisory Panel that consists of independent experts in fields such as marine pollution, oceanography, chemistry, and microbiology to assess the impact of wastewater discharges from cruise ships and ferries on human health and the Alaska environment. The panel's findings will be included in an assessment report on the impact of small commercial passenger vessels in Alaska. This report is due to the Governor in December 2002. Another assessment report on the impact of the entire cruise ship and ferry industry in Alaska due in January 2004.

The Alaska Department of Law is reviewing the recent federal settlements with Carnival Cruise Lines and Norwegian Cruise Lines in order to determine whether they warrant any legal action by the state.

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REGULATIONS

Last winter DEC worked with a Negotiated Regulations Committee in open public meetings to draft the most time-critical regulations to implement AS 46.03.460 – 46.03.490.

The proposed regulations went out to public comment on June 18th. DEC held a public workshop to discuss the regulations on July 2nd in Juneau that was teleconferenced to Anchorage, Ketchikan, Sitka, Seward, Petersburg, Valdez, Wrangell, and Kodiak. The public comment period closed on July 23. The proposed regulations can be reviewed at the following website: www.state.ak.us/dec/press/cruise/documents/regulations.htm or contact Denise Koch at (907) 465- 5272 or denise_koch@envircon.state.ak.us for a copy.

DEC is currently reviewing the public comments received. This first package of regulations is expected to become effective in late 2002. Additional regulations will be drafted this winter.

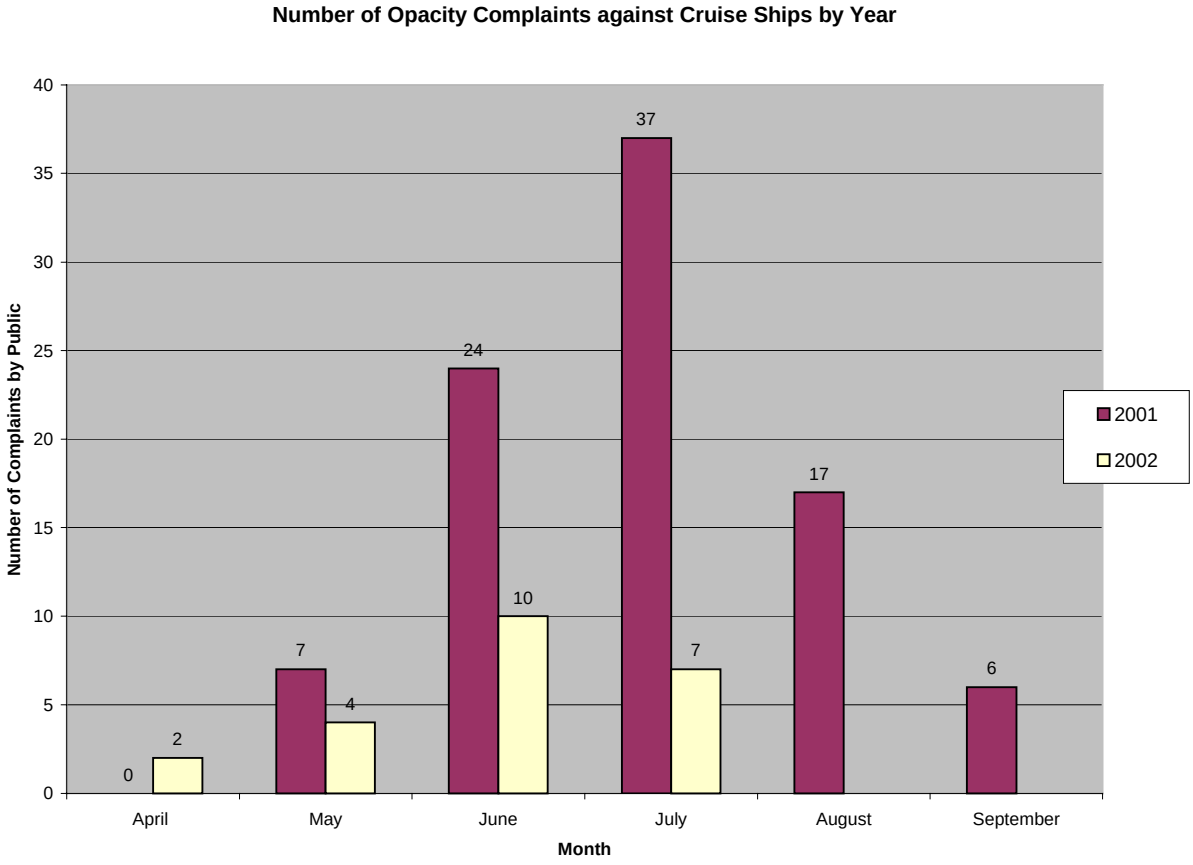
AIR EMISSIONS

COMPLAINTS BY THE PUBLIC

Over the past several years, the most frequent public complaint received by DEC about cruise ships was smokestack emissions. DEC staff are trained and certified to measure the level of visible emissions (opacity) from vessel stacks. Staff responds to opacity complaints by doing opacity readings when feasible. There has been a significant decrease in the number of these complaints during 2002.

Citizens with opacity complaints or other air quality concerns should call Carolyn Morehouse (465-5279) or Denise Koch (465-5272) at DEC.

Citizen Opacity Complaints



OPACITY MONITORING

In addition to DEC staff monitoring, an independent contractor does opacity readings on large vessels in Southeast Alaska every week during the cruise ship season and immediately reports any reading that may be a potential violation.

The contractor has done over 150 readings in Juneau this season. The contractor will perform a total of 250 readings of large vessels in Southeast Alaska ports (Ketchikan, Juneau, Haines, or Skagway) during this cruise ship season with no more than 220 readings in one port.

Since 5% of the ships visit Southcentral Alaska, DEC hired another contractor to conduct opacity readings on small and large vessels in that area of coastal Alaska. The contractor has read 13 vessels so far this season.

DEC also joined forces with the U.S. Forest Service to enable DEC to enforce opacity readings done by forest rangers in Tracy Arm, a popular fiord 30 miles south of Juneau.

OPACITY VIOLATIONS AND IMPROVEMENTS

The trend in opacity violations has shown consistent and significant improvement. During 2001 there were 11 opacity violations. There are no opacity violations to date for 2002, but DEC is currently investigating one potential violation.

There are a variety of reasons for the decrease in opacity complaints and violations. Princess vessels plug into shore power when in Juneau. The *Universe Explorer*, *Regal Princess*, and the *Mercury* are using fuel additives to lower visible emissions. The Celebrity *Infinity* and *Summit* and the Royal Caribbean *Radiance of the Seas* now have gas turbines instead of diesel engines. Other vessels may have made adjustments that DEC is not aware of.

AMBIENT AIR MONITORING IN JUNEAU

Juneau receives the highest volume of cruise ship traffic of any Alaska port. Due to concerns about the quality of downtown Juneau air, a DEC contractor set up ambient air monitors during 2000 and 2001 to measure the level of selected air pollutants that can be harmful to public health and the environment: sulfur dioxide, nitrogen dioxide, and PM 2.5 (microscopic particles). A committee of DEC employees, citizens, industry representatives, and U.S. Coast Guard employees selected the air monitor locations. The contractor installed three downtown ambient air monitoring stations in 2000 (Baranof Hotel, Capital Park, and Marine Way) and three monitoring stations during 2001 (Wickersham, Highlands, and Marine Way). DEC also installed an ambient air monitor atop the Court Plaza Building (a.k.a."Spam Can Building") in downtown Juneau in 2000. The results from the DEC monitor were consistent with the contractor's data.

Data from these monitors indicate that concentrations of measured air pollutants were appreciably below the state and national air quality standards. Since these standards are developed to protect health and welfare, DEC concluded that current air pollutant concentrations in Juneau would not result in adverse effects on health and welfare.

Because pollutant levels were low during the previous two years, DEC decided not to continue the ambient air monitoring during the 2002 season. However, DEC is looking into haze concerns expressed by local residents.

WASTEWATER DISCHARGES

STANDARDS AND DEFINITIONS

The Alaska law that regulates cruise ship and ferry waste streams, AS 46.03.460 – 46.03.490, sets a discharge standard of 150 milligrams per liter for total suspended solids (TSS) and 200 colonies per 100 milliliters for fecal coliform (FC) for wastewater discharged in Alaska marine waters. Alaska's waters extend 3 miles from the coastline and include all inside waters of the Alexander Archipelago. Mixed graywater and blackwater is considered to be blackwater. Small vessels are defined as vessels with overnight accommodations for between 50 and 249 passengers. Large vessels are defined as vessels with overnight accommodations for 250 or more passengers.

2001 SAMPLE RESULTS

The wastewater sample data from 2001 is highly variable. The minimum value and the maximum value are often extremely different. This is most likely due to the fact that vessels are using very different types of wastewater treatment systems. A geometric mean is a better summary statistic of this type of data than an arithmetic mean or "average" because it is less influenced by extreme values.

(For example, for the following set of numbers 1, 10, 30, and 10,000,000
average = (1 + 10 + 30 + 10,000,000) / 4 = 2,500,010
geometric mean = (1 x 10 x 30 x 10,000,000) ^1/4 = 234

Only three large vessels discharged blackwater in Alaska's waters in 2001. Two of these vessels had advanced wastewater treatment systems. One vessel treated water using a ROCHEM system, the other used a Zenon System. The third vessel, the Universe Explorer had a macerator chlorination system. The vessel with the macerator/chlorination received a warning letter from DEC based upon their elevated TSS results.

Table 1. 2001 Large Vessels – Blackwater Table
(3 vessels, 16 samples)

	Fecal Coliform (colonies/ 100 ml)	Total Suspended Solids (mg/l)
Min	1	0.7
Max	60	326.0
Geometric Mean	2	2.7

Large vessels that only discharged graywater in Alaska marine waters did not have advanced wastewater treatment systems. These vessels applied for and were approved for the Interim Protective Measures (IPM) granted in the law. IPM, which must be applied for annually, extend the time for compliance with graywater standards. Therefore, none of the large vessels that discharged graywater in the state received a violation based upon the 2001 samples. Large ships will no longer be eligible for IPM on January 1, 2003.

Table 2. 2001 Large Vessels – Graywater Table
(7 vessels, 90 samples)

	Fecal Coliform (colonies/ 100 ml)	Total Suspended Solids (mg/l)
Min	1	14.6
Max	16,000,000	26,000.0
Geometric Mean	6,445	139.4

The wastewater results for small vessels are also quite variable. The levels of fecal coliform and total suspended solids are high in both black and graywater, although they are lower in graywater. The law requires small vessels to sample their wastewater but extends the time for compliance with discharge standards until January 1, 2004. Therefore, no violations were cited to any small vessel in 2001.

Table 3. 2001 Small Vessels – Blackwater Table
(11 vessels, 17 samples)

	Fecal Coliform (colonies/100 ml)	Total Suspended Solids (mg/l)
Min	1	7.0
Max	16,000,000	880.0
Geometric Mean	1,413	88.0

Table 4. 2001 Small Vessels – Graywater Table
(8 vessels, 25 samples)

	Fecal Coliform (colonies/100 ml)	Total Suspended Solids (mg/l)
Min	1	2.5
Max	16,000,000	805.0
Geometric Mean	70	44.7

2002 PRELIMINARY SAMPLE RESULTS

The number of large vessels with advanced wastewater systems that are allowed to discharge continuously has increased from two in 2001 to six in 2002. They are the Celebrity *Mercury*, and the Holland America *Statendam, Ryndam, Zaandam, Volendam*, and *Veendam.* The *Seven Seas Navigator* also has an advanced wastewater system but has not received USCG approval for continuous discharge.

Only large vessels with advanced wastewater systems discharge blackwater in Alaska marine waters and are therefore required to take wastewater samples. Two of the ten samples exceed the fecal coliform standard. The ADEC is evaluating the quality assurance parameters to determine if these exceedences warrant enforcement. The fecal coliform level in the other eight samples is well below the standard. The amount of total suspended solids in the blackwater samples is also low.

Table 5. 2002 Large Vessels – Blackwater Table
(5 vessels, 10 samples)

	Fecal Coliform (colonies /100 ml)	Total Suspended Solids (mg/l)
Min	1	.7
Max	900*	7.1
Geometric Mean	9	.9

*The maximum is advanced treated water sent to a holding tank prior to certification and then discharged. This number does not reflect the treatment system

The limited graywater sample data from large vessels without advanced treatment systems indicate high levels of both fecal coliform and total suspended solids. Large vessels that only discharged graywater in Alaska marine waters did not have advanced wastewater treatment systems. These vessels applied for and were approved for the Interim Protective Measures (IPM) granted in the law. IPM, which must be applied for annually, extend the time for compliance with graywater standards. Therefore, none of the large vessels that discharged graywater in the state received a violation based upon the limited 2002 samples. Large ships will no longer be eligible for IPM on January 1, 2003.

Table 6. 2002 Large Vessels – Graywater Table
(6 vessels, 16 samples)

	Fecal Coliform (colonies/ 100 ml)	Total Suspended Solids (mg/l)
Min	1	46.6
Max	3,000,000	7,700.0
Geometric Mean	2,841	229.2

To date, DEC has only received two properly obtained wastewater samples from small ships, too few to analyze.

It is too early to draw conclusions from the limited 2002 data.

Tests in 2001 indicated no significant priority pollutants mixed in to the wastestream. Tests were also performed for 2002. However, no data was received as of the printing of this report.

LEVEL OF WASTEWATER TREATMENT AND LOCATION OF DISCHARGE

The large vessels that discharge their blackwater and graywater in Alaska marine waters in compliance with state law should be commended. The owners of these large vessels have invested large amounts of time and money to install advanced wastewater treatment systems that achieve high quality wastewater. This year six vessels (Holland America *Ryndam, Statendam, Veendam, Volendam, Zaandam,* and the Celebrity *Mercury*) have met stringent wastewater effluent standards that allow them to discharge their wastewater continuously.

The large vessels that discharge graywater under IPM must sample and test their graywater, but there is no compliance associated with these samples until next season. This is the last year that large vessels may receive IPM. All large vessels that discharge graywater or black water must be in compliance with the fecal and TSS standards in 2003. The type and location of wastewater discharge is illustrated in Table 7. Table 8 lists the wastewater technology that each large vessel is currently using and what technology they plan to use in the future.

Most small vessels must discharge their wastewater continuously. The *Hanseatic* and the *Seaborn Spirit,* however, hold their wastewater and discharge it outside of Alaska marine waters. Table 9 lists the wastewater technology that each small vessel is currently using.

The following graph and tables are meant to highlight the achievements of the vessel owners who strive to meet the spirit of the law by installing advanced wastewater systems on their vessels. The trend in the Alaska cruise ship industry indicates that more large vessels are installing advanced wastewater treatment systems that provide high quality wastewater that can be discharged continuously in Alaska's waters. However, it appears that other vessels may choose to hold wastes until they are outside Alaska's waters. Vessels that chose this course may not be treating wastes and also do not provide the monitoring and verification that the Alaska CPVEC program provides.

Table 7. Wastewater Discharge Location for Large Vessels

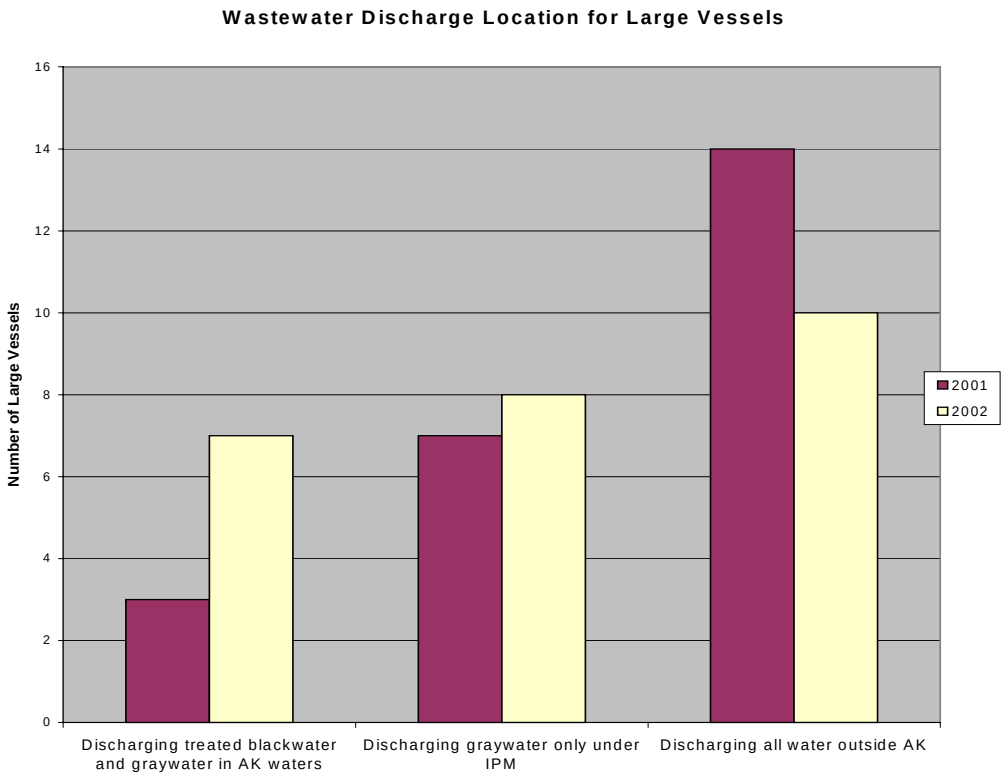


Table 8. Large Commercial Passenger Vessel Wastewater Treatment

Large Vessel Operator	Large Vessel Name	Discharging Graywater within AK?	Graywater Treatment System	Discharging Blackwater within AK?	Blackwater Treatment System	Comments
Carnival Cruise Lines	*Carnival Spirit*	No	Ultrafiltration	No	Ultrafiltration	Is currently testing new system.
Celebrity Cruises	*Mercury**	Yes	Ultrafiltration	Yes	Ultrafiltration	Wastewater samples meet stringent requirements. System certified by USCG to discharge continuously.
Celebrity Cruises	*Infinity*	No	Unknown	No	Biological & chemical	
Celebrity Cruises	*Summit*	No	Unknown	No	Biological & chemical	Installing a chemical/ultrafiltration system.
Crystal Cruise Lines	*Crystal Harmony*	No	Unknown	No	Biological & chemical	Upgraded existing system. Researching new technology.
Holland America	*Amsterdam*	No	Unknown	No	Unknown	Currently installing bioreactor and UV disinfection system. System not certified for 2002
Holland America	*Ryndam**	Yes	Bioreactor & UV disinfection	Yes	Bioreactor & UV disinfection	Wastewater samples meet stringent requirements. System certified by USCG to discharge continuously.
Holland America	*Statendam**	Yes	Bioreactor & UV disinfection	Yes	Bioreactor & UV disinfection	Wastewater samples meet stringent requirements. System certified by USCG to discharge continuously.
Holland America	*Veendam**	Yes	Bioreactor & UV disinfection	Yes	Bioreactor & UV disinfection	Wastewater samples meet stringent requirements. System certified by USCG to discharge continuously.

Large Vessel Operator	Large Vessel Name	Discharging Graywater within AK?	Graywater Treatment System	Discharging Blackwater within AK?	Blackwater Treatment System	Comments
Holland America	*Volendam**	Yes	Bioreactor & UV disinfection	Yes	Bioreactor & UV disinfection	Wastewater samples meet stringent requirements. System certified by USCG to discharge continuously.
Holland America	*Zaandam**	Yes	Bioreactor & UV disinfection	Yes	Bioreactor & UV disinfection	Wastewater samples meet stringent requirements. System certified by USCG to discharge continuously.
Mitsui O.S.K.	*Nippon Maru*	No	Macerator/ Chlorinator	No	Macerator/ Chlorinator	This vessel is in Alaska for 8 days only
Norwegian Cruise Lines	*Norwegian Sky*	Yes (IPM)	None	No	Biological & chemical	Testing treatment system that uses micro filtration and UV filters to partially treat graywater.
Norwegian Cruise Lines	*Norwegian Wind*	Yes (IPM)	None	No	Biological & Macerator/ Chlorinator	Researching new technology.
Princess Cruise Line	*Dawn Princess*	Yes (IPM)	Chlorine	No	Biological & chemical	Installed Hamworthy Bioreactor. System has not been certified for continuous discharge for 2002.
Princess Cruise Line	*Ocean Princess*	Yes (IPM)	Chlorine	No	Biological & chemical	
Princess Cruise Line	*Regal Princess*	Yes (IPM)	Chlorine	No	Biological & chemical	
Princess Cruise Line	*Sea Princess*	Yes (IPM)	Chlorine	No	Biological & chemical	
Princess Cruise Line	*Star Princess*	Yes (IPM)	Chlorine	No	Biological & chemical	Installed Hamworthy Bioreactor. System has not been certified for

Large Vessel Operator	Large Vessel Name	Discharging Graywater within AK?	Graywater Treatment System	Discharging Blackwater within AK?	Blackwater Treatment System	Comments
						continuous discharge for 2002.
Princess Cruise Line	*Sun Princess*	Yes (IPM)	Chlorine	No	Biological & chemical	Installed Hamworthy Bioreactor. System has not been certified for continuous discharge for 2002.
Radisson Seven Seas	*Seven Seas Navigator*	Yes	Membrane bioreactors and filtration	Yes	Membrane bioreactors and filtration	.
Royal Caribbean Cruises Ltd.	*Legend of the Seas*	No	Unknown	No	Biological & chemical	
Royal Caribbean Cruises Ltd.	*Radiance of the Seas*	No	Unknown	No	Biological & chemical	
Royal Caribbean Cruises Ltd.	*Vision of the Seas*	No	Unknown	No	Electro/ Mechanical	Testing Hydroxyl system during 2002 season.
World Explorer Cruises	*Universe Explorer*	No	Unknown	No	Unknown	

* Vessels have installed advanced wastewater treatment systems that meet stringent wastewater discharge standards. These vessels are therefore certified by the US Coast Guard to discharge wastewater continuously.

Table 9. Small Commercial Passenger Vessel Wastewater Treatment

Small Vessel Operator	Small Vessel Name	Discharging Graywater (GW) within Alaska?	Discharging Blackwater (BW) within Alaska?	Wastewater Treatment System Type****	Comments
Alaska Marine Highway System	*Columbia*	Yes	Yes	Macerator/ Chlorination	Treats BW & GW
Alaska Marine Highway System	*Kennicott*	Yes	Yes	Macerator/ Chlorination	Treats BW & GW
Alaska Marine Highway System	*Malaspina*	Yes	Yes	Macerator/ Chlorination	Treats BW & GW
Alaska Marine Highway System	*Matanuska*	Yes	Yes	Macerator/ Chlorination	Treats BW & GW
Alaska Marine Highway System	*Taku*	Yes	Yes	Macerator/Chlorination	Treats BW & GW
Clipper Cruise Lines	*Clipper Odyssey*	Yes	Yes	Macerator/ Chlorination	Graywater treated with Chorine
Clipper Cruise Lines	*Yorktown Clipper*	Yes	Yes	Macerator/ Electrocatalytic	Graywater treated with Chlorine
CruiseWest	*Spirit of 98*	Yes	Yes	Biological/Chemical	No graywater treatment
CruiseWest	*Spirit of Columbia*	Yes	Yes	Macerator/ Electrochemical	No graywater treatment
CruiseWest	*Spirit of Discovery*	Yes	Yes	Biological / Chemical	No graywater treatment
CruiseWest	*Spirit of Endeavour*	Yes	Yes	Macerator/ Chlorination	No graywater treatment
CruiseWest	*Spirit of Oceanus*	Yes	Yes	Biological & Chemical	No graywater treatment
Glacier Bay Tours	*Wilderness Adventurer*	Yes	Yes	Macerator/ Chlorination	Treats BW & GW
Glacier Bay Tours	*Wilderness Discoverer*	Yes	Yes	Macerator/ Chlorination	Treats BW & GW
Hapag-Lloyd	*Hanseatic*	No	No	Biological/ Chlorination	No graywater treatment
Lindblad Expeditions	*Sea Bird*	Yes	Yes	Macerator/ Chlorination	Graywater treated with Chlorine
Lindblad Expeditions	*Sea Lion*	Yes	Yes	Macerator/ Chlorination	Graywater treated with Chlorine
Seabourn Cruise Lines	*Seaborn Spirit*	No	No	Biological & Chemical	No graywater treatment
Society Expeditions	*World Discoverer*	Yes	Yes	Unknown	

**** Treats both black and gray water in the MSD unless indicated in the comments