



Alaska DEC

Large Cruise Ship 2009

Wastewater Sampling Results

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1. EXECUTIVE SUMMARY

The Alaska Department of Environmental Conservation (DEC) issued a Cruise Ship General Permit authorizing discharge of treated wastewater into Alaskan waters on March 25, 2008. The permit was issued as a result of [Ballot Measure 2](#) (Cruise Ship Measure) that Alaskan voters passed in 2006. Prior to this ballot initiative cruise ships were required to meet a limited number of effluent limits that were established in state law. The new law required that cruise ships get a permit and required Alaska Water Quality Standards be met at the point of discharge (i.e. no mixing zone). The resulting permit also expanded reporting and sampling requirements, and contained new limits for several wastewater parameters. It contained less stringent interim (2008 and 2009) limits for ammonia, copper, nickel, and zinc to allow ship owners and operators time to improve effluent quality before being required to meet the strict long-term (Alaska Water Quality) limits.

In 2009, there were 61 exceedances of permitted limits. The highest number of exceedances was for ammonia (31). The 61 exceedances resulted in the issuance of 32 Notices of Violation (NOVs). Princess Cruise Line had the largest number of vessels discharging in 2009 (8 total) and received 26 NOVs. Four other companies received NOVs (Holland America received 3; Royal Caribbean, Norwegian Cruise Line, and Silversea each received 1). See Table 1 for discharge status, exceedances, and treatment system manufacturer information.

Compared with 2008, there was an increase from 45 traditional and interim limit exceedances that resulted in Notices of Violation to 61. A large part of this increase was due to ammonia exceedances (21 in 2008 to 31 in 2009). DEC issued 12 more wastewater effluent limit NOVs in 2009 (32). Part of this increase was due to the number of increased exceedances, but the biggest reason for the increase was that DEC issued NOVs in a more timely basis. In 2008 DEC combined several months' samples in some NOVs. In 2009 NOVs were issued monthly. An additional NOV was issued for a wastewater spill at a dock from wastewater being pumped for shoreside treatment in Juneau.

Table 1: 2009 Large Cruise Ship General Permit Exceedances

2009 Large ¹ Commercial Passenger Vessel General Permit Exceedances							
Vessel Operator	Vessel Name	Voyages	Blackwater (BW) Treatment System	Permitted to discharge in		Exceedances of	NOVs Issued ⁴
				BW	Graywater		
1 Carnival Cruise Lines	<i>Carnival Spirit</i>	16	Triton/Rochem	Yes	Yes ³	0	0
2 Celebrity Cruises	<i>Infinity</i>	19	Zenon	No	No	0	0
3 Celebrity Cruises	<i>Mercury</i>	19	Biopure/Rochem	No	No	0	0
4 Celebrity Cruises	<i>Millennium</i>	18	Hydroxyl Cleansea	No	No	0	0
5 Crystal Cruises	<i>Serenity</i>	1	Unknown	No	No	0	0
6 Fred Olsen	<i>Balmoral</i>	1	Scanship	No	No	0	0
7 Holland America	<i>Amsterdam</i>	20	Unknown	No	No	0	0
8 Holland America	<i>Ryndam</i>	20	Zenon	Yes	Yes	2	1
9 Holland America	<i>Statendam</i>	20	Zenon	Yes	Yes	1	1
10 Holland America	<i>Veendam</i>	19	Zenon	Yes	Yes	0	0
11 Holland America	<i>Volendam</i> ⁵	19	Zenon	Yes	Yes	3	1
12 Holland America	<i>Westerdam</i>	20	Rochem Bio-filtration	No	No	0	0
13 Holland America	<i>Zaandam</i>	21	Zenon	Yes	Yes	0	0
14 Holland America	<i>Zuiderdam</i>	20	Rochem Bio-filtration	No	No	0	0
15 Japan Cruise Line	<i>Pacific Venus</i>	1	Unknown	No	No	0	0
16 Norwegian Cruise Lines	<i>Norwegian Pearl</i>	19	Scanship	Yes	Yes	2	1
17 Norwegian Cruise Lines	<i>Norwegian Star</i>	21	Scanship	Yes	Yes	0	0
18 Norwegian Cruise Lines	<i>Norwegian Sun</i>	20	Scanship	Yes	Yes	0	0
19 Princess Cruise Line	<i>Coral Princess</i>	18	Hamworthy Bioreactor	Yes	Accommodations Only	1	1
20 Princess Cruise Line	<i>Diamond Princess</i>	18	Hamworthy Bioreactor	Yes	Accommodations Only	6	4
21 Princess Cruise Line	<i>Golden Princess</i>	20	Hamworthy Bioreactor	Yes	Accommodations Only	8	4
22 Princess Cruise Line	<i>Island Princess</i>	18	Hamworthy Bioreactor	Yes	Accommodations Only	10	5
23 Princess Cruise Line	<i>Pacific Princess</i>	9	Hamworthy Bioreactor	Yes	Accommodations Only	3	2
24 Princess Cruise Line	<i>Sapphire Princess</i>	19	Hamworthy Bioreactor	Yes	Accommodations Only	16	5
25 Princess Cruise Line	<i>Sea Princess</i>	11	Hamworthy Bioreactor	Yes	Accommodations Only	6	5
26 Princess Cruise Line	<i>Star Princess</i>	19	Hamworthy Bioreactor	Yes	Accommodations Only	0	0
27 Regent	<i>Seven Seas Mariner</i>	17	Hamworthy Bioreactor	Yes	Yes	0	0
28 Royal Caribbean Cruises Ltd.	<i>Radiance of the Seas</i>	18	Hamman	Yes	Yes	0	0
29 Royal Caribbean Cruises Ltd.	<i>Serenade of the Seas</i>	20	Scanship	Yes	Yes	1	1
30 Royal Caribbean Cruises Ltd.	<i>Rhapsody of the Seas</i>	19	Hamman	No	No	0	0
31 Silver Seas	<i>Silver Shadow</i>	12	Biopure/Marisan	Yes	Yes	2	1
32 World	<i>Residencea</i>	2	Scanship	No	No	0	0
TOTALS:						61	32

In Light Blue- Only discharged treated graywater

In Orange- These vessels were permitted by DEC to discharge but have not.

In Grey- These vessels registered to not discharge in Alaska waters during the 2009 season.

¹ A large vessel has overnight accommodations for 250 or more passengers.

² Alaska water includes the Alexander Archipelago and extends 3 miles from the coastline. Only vessels that discharge into Alaska waters are required to meet wastewater sampling and reporting requirements.

³ Galley graywater not discharged

⁴ Some NOVs are for multiple exceedances

⁵ Stopped discharging in late May 2009.

2. INTRODUCTON

In August 2006, the Alaska Public passed [Ballot Measure 2](#) (Cruise Ship Measure). This initiative contained provisions pertaining to taxation, gambling, sale of shore-side excursions, and environmental practices of commercial passenger vessels.

The Department of Environmental Conservation (DEC) is responsible for implementing the changes in the environmental statutes. As a result the Department must:

- Issue wastewater discharge permits to large cruise ships (A.S. 46.03.462)

- Place U.S. Coast Guard licensed engineers (Ocean Rangers) onboard all large cruise ships. (This subject was included in a separate [2008 Report](#)).
- Collect hourly vessel positional tracking data and monthly discharge logs

A General Permit (GP) was developed to satisfy the permitting requirement. On March 25th, 2008 DEC issued the cruise ship [General Permit](#), number 2007DB0002. The 2008 General Permit required owners and operators of large cruise ships (those that provide overnight accommodations for over 250 passengers) to obtain a wastewater discharge permit from DEC for the discharge of any treated sewage, graywater, or other wastewater into marine waters of the state. The permit was updated May 1st 2008 to correct a regulation citation and change the sampling and Source Reduction Evaluation deadlines. Further information on the 2008 cruise ship General Permit and associated forms and an information sheet can be found at: www.dec.state.ak.us/water/cruise_ships/gp/08gp.html

In 2009, 20 of the 32 large cruise ships that had Alaskan voyage were authorized to discharge under the General Permit. A list of 2009 authorized vessels and copies of authorization letters can be found at: http://www.dec.state.ak.us/water/cruise_ships/gp/Auth_08.html

3. GENERAL PERMIT REQUIREMENTS

Provisions of the 2008 Large Cruise Ship General Permit required that:

- Wastewater discharge must comply with Alaska Water Quality Standards (18 AAC 70) at the point of discharge. Less stringent interim limits were established for copper, nickel, zinc, and ammonia for the first two years of the permit. (See Appendix 1.)
- Prohibited discharge into Skagway Harbor and potentially in other impaired waterways.
- No discharge of foam, oily wastes, garbage, sludge, or grease into State waters.
- Permittees must submit a signed Notice of Intent to Discharge, that provided treatment, storage, and contact information. Companies must also certify that tributyltin paints are not used. Discharge is prohibited until DEC approves and authorization to discharge.
- Twice a month sampling is required for the following parameters: biological oxygen demand (BOD), fecal coliform bacteria, total residual chlorine, ammonia, some dissolved metals (copper, nickel and zinc), pH, and total suspended solids (TSS). The General Permit specifies limits for all of these parameters. (See Appendix 1.) All samples for the GP must be taken in Alaskan waters while the ship is discharging.
- Twice a season sampling for Volatile Organic Compounds, Base Neutral Acids, and several other parameters.

- Monthly submission of Discharge Monitoring Reports containing sample data.
- When applying for interim limits, an operator had to submit a Source Reduction Evaluation (SRE).

4. WASTEWATER SAMPLE RESULTS SUMMARY

Wastewater treatment systems used on large cruise ships discharging in Alaskan waters have generally performed well at treating effluent parameters that have been under close observation by ADEC and the US Coast Guard since 2001. This includes fecal coliform bacteria counts (an indicator of potential pathogens), pH, chlorine, biological oxygen demand, and total suspended solids. An exceedance of one of these parameters may indicate improperly working equipment. In most cases, a vessel will discontinue discharging when results indicate an exceedance. Typically equipment will be inspected and cleaned, and samples will be taken outside of Alaskan waters to verify that equipment is functioning properly prior to discharging again in Alaska.

The additional focus in 2008 and 2009 was on the new limits included in the large cruise ship General Permit, specifically ammonia, copper, nickel, and zinc. Of the 32 large cruise ships that visited Alaska in 2009, 20 large cruise ships discharged treated wastewater into Alaskan waters and were sampled. One of these, the Carnival Spirit, only discharged selected streams of accommodations graywater. The number of exceedances of interim limits and traditional parameters are listed in Table 1 on page four. Exceedances of the long-term limits (Alaska Water Quality Standards) were not a violation of the permit.

For the long-term limits, ammonia and copper were the most difficult parameter to meet in 2009. Only two ships (Carnival Spirit and Silver Shadow) met the long-term limits (Alaska Water Quality standards) for ammonia (2.9 mg/ L). Both ships discharged Graywater only in 2009. All ships had at least one exceedance of the long-term copper limit. The Carnival Spirit was close to meeting long-term limit for copper (3.1 micrograms/ L) with only one sample result (11 micrograms/ L) above the limit.

Only the Carnival Spirit was able to meet the long-term limits for nickel (8.2 micrograms/ L). Zinc long-term limits (81 micrograms/ L) were exceeded on all but four ships: the Carnival Spirit, Statendam, Norwegian Sun, and Silver Shadow.

The 2009 season include several re-sample events. Several re-sample events were caused by the temperature of ammonia samples being above QA/ QC allowed. Additional samples were also taken to reduce the monthly average for fecal coliform. The re-samples were only required to sample for the parameter that was missing, or had an exceedance of the monthly maximum.

In the results tables the parameters that were not sampled for are shown in dark blue.

5. RESULTS BY COMPANY

Explanation of color codes			
	Exceedance of interim limits or Alaska Water Quality Standards if no interim limit		
	Exceedance of long-term limits		
	Discharging only treated graywater		
	Parameter not sampled		
	No Discharge in Alaska in 2009		

Alaska General Permit Limits			
Ammonia		Copper	
interim (mg/ L)	Alaska WQS (mg/ L)	interim (µg/ L)	Alaska WQS (µg/ L)
80.4	2.9	66	3.1
Nickel		Zinc	
interim (µg/ L)	Alaska WQS (µg/ L)	interim (µg/ L)	Alaska WQS (µg/ L)
180	8.2	230	81
pH		Biological oxygen demand (BOD)	
Minimum	Maximum	Maximum	Monthly Average
6.5	8.5	60 mg/ L	30 mg/ L
Fecal Coliform			
Maximum	Monthly Average		
43/ 100 ml	14/ 100 ml		
Total Suspended Solids (TSS)		Total Residual Chlorine	
Maximum	150 mg/ L	Maximum	0.0075 mg/ L

ND= Not detected

This section lists wastewater sample results for pollutants with effluent limits by company. There are more pollutants for which ships that discharged must take samples but which have no effluent limits under the general permit. For those sample results, please see Appendix 2 Tables 4 and 5.

Carnival Cruise Lines

Carnival operated one ship in Alaska in 2009, the Carnival Spirit. The Carnival Spirit met the long-term limits for ammonia and all metals except for copper (1 exceedance of long-term limits). This ship only discharged accommodation graywater. The graywater was treated through a Rochem wastewater treatment system.

2009 Semimonthly General Permit Sample Results for Carnival Cruise Lines

Company	Vessel	Sample Date	mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L		
			Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliorm	TSS	BOD	Total Residual Chlorine
Carnival	Spirit	5/8/2009	ND	1.7	0.26	11.2	7.7	ND	ND	2.81	ND
Carnival	Spirit	5/30/2009	ND	0.65	ND	3.42	7.7	ND	ND	4.47	ND
Carnival	Spirit	6/20/2009	ND	0.66	ND	9.86	7.6	ND	ND	5.65	ND
Carnival	Spirit	6/27/2009	ND	0.97	ND	11.8	7.6	ND	ND	4.37	ND
Carnival	Spirit	7/11/2009	ND	ND	0.49	32.4	7.8	ND	ND	3.63	ND
Carnival	Spirit	7/25/2009	ND	0.34	0.22	5.8	7	ND	ND	4.67	ND
Carnival	Spirit	8/8/2009	ND	0.38	1.41	3.82	7.6	ND	ND	2.81	ND
Carnival	Spirit	8/15/2009	ND	11.7	ND	10	8.1	ND	ND	2.66	ND
Carnival	Spirit	9/4/2009	ND	0.55	0.20	2.93	7.6	ND	ND	3.94	ND
Carnival	Spirit	9/11/2009	ND	0.26	0.26	4.33	7.1	ND	ND	5.79	ND
Max			ND	11.7	1.41	32.4	8.1	ND	ND	5.79	ND
Min			ND	ND	ND	2.93	7	ND	ND	2.66	ND
Median			ND	0.65	0.26	7.83	7.6	ND	ND	4.155	ND
Std Dev			N/A	3.69	0.47	8.72	0.31	N/A	N/A	1.13	N/A
2008 Median			ND	0.55	ND	6.15	7.25	ND	ND	4.96	ND

Celebrity Cruises

Royal Caribbean International (RCI), owner of Celebrity, submitted Notices of Intent to Discharge for the Celebrity Infinity and the Celebrity Millennium. In 2009 Celebrity requested that the authorizations to discharge wastewater in Alaska be withdrawn and the ships did not discharge in Alaska.

Holland America Line (HAL)

Holland America operated 8 cruise ships in Alaska in 2009. In 2009, 4 vessels discharged and were sampled. All used Zenon treatment systems. The Volendam only discharged in May. After the first sample result detected the presence of fecal coliform bacteria, discharge was halted.

2009 Semimonthly General Permit Sample Results Holland America

Company	Vessel	Sample Date	mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
			Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliorm	TSS	BOD	Total Residual Chlorine
Holland America	Ryndam	May	No Discharge								
Holland America	Ryndam	6/9/2009	6	6.4	16	100	7.4	ND	ND	ND	ND
Holland America	Ryndam	6/16/2009	13	13	15	110	7.2	ND	ND	2.1	ND
Holland America	Ryndam	6/23/2009	30	4.6	14	190	7.3	ND	ND	3.4	ND
Holland America	Ryndam	7/7/2009	34	3.8	14	100	7.5	ND	ND	ND	ND
Holland America	Ryndam	7/21/2009	30	3.6	17	150	7.3	72	ND	3.9	ND
Holland America	Ryndam	8/25/2009	45	6.9	15	160	7.4	ND	ND	ND	ND
Holland America	Ryndam	8/30/2009	32	7.3	12	82	7.6	ND	ND	ND	ND
Holland America	Ryndam	9/1/2009	36	5.4	13	110	7.3	ND	ND	ND	ND
Holland America	Ryndam	9/8/2009	28	3.3	12	100	7.3	ND	ND	3.5	ND
Holland America	Ryndam	9/15/2009	31	4.3	11	68	7.4	ND	ND	ND	ND
Holland America	Statendam	May	No Discharge								
Holland America	Statendam	6/3/2009	47	2.8	18	ND	7.7	ND	ND	5.2	ND
Holland America	Statendam	6/4/2009	36	2	18	22	7.6	ND	ND	5.5	ND
Holland America	Statendam	6/18/2009	21	7.7	3.6	31	7.6	ND	ND	14.6	ND
Holland America	Statendam	7/2/2009	29	9.4	15	32	7.6	ND	ND	13.4	ND
Holland America	Statendam	7/16/2009	27	1.6	14	24	7.3	ND	ND	27	ND
Holland America	Statendam	8/13/2009	45	9.5	16	29	7.3	ND	ND	27.9	ND
Holland America	Statendam	8/19/2009	26	15	15	5.6	7.4	ND	ND	21.1	ND
Holland America	Statendam	8/27/2009	19	24	22	32	7.4	ND	ND	12.7	ND
Holland America	Statendam	9/10/2009	37	2.1	18	30	7.7	ND	ND	11.1	ND
Holland America	Statendam	9/16/2009	52	2.8	18	26	6.3	ND	ND		ND
Holland America	Statendam	9/25/2009					7			7.04	
Holland America	Volendam	5/18/2009	18	5.4	23	110	7.1	4800	18	44.1	ND
Holland America	Volendam	No further discharges or samples									
Holland America	Zaandam	5/10/2009	19	8.1	9.9	88	7.7	ND	ND	ND	ND
Holland America	Zaandam	5/17/2009	12	9.8	9.1	55	7.8	ND	ND	8.6	ND
Holland America	Zaandam	5/27/2009	1.7	3.3	9	55	7.5	ND	ND	ND	ND
Holland America	Zaandam	6/7/2009	6.3	5.9	6.8	46	7.6	ND	ND	4.4	ND
Holland America	Zaandam	6/14/2009	15	5.8	6.7	78	7.6	ND	ND	ND	ND
Holland America	Zaandam	7/12/2009	2.9	5	9.1	110	7.1	ND	ND	5	ND
Holland America	Zaandam	7/19/2009					7.6	ND	ND	18.5	ND
Holland America	Zaandam	7/22/2009	3.5	4.8	11	30	7.2	ND	ND	15	ND
Holland America	Zaandam	8/2/2009	39	8	12	85	7.4	ND	ND	6.8	ND
Holland America	Zaandam	8/9/2009		4.1	17	63	7.5	ND	ND	14.1	ND
Holland America	Zaandam	8/16/2009	20				7.5				ND
Holland America	Zaandam	9/6/2009	14	3.9	15	76	7.4	ND	ND	ND	ND
Holland America	Zaandam	9/13/2009	8	4.5	9.4	46	7.5	ND	ND	ND	ND

2009 Semimonthly General Permit Sample Results Holland America

	mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
	Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliorm	TSS	BOD	Total Residual Chlorine
Max	52	24	23	190	7.83	4800	18	44.1	ND
Min	1.7	1.6	3.6	ND	6.28	ND	ND	ND	ND
Median	26.5	5.2	14	65.5	7.42	ND	ND	5	ND
Std Dev	13.94	4.46	4.36	44.75	0.27	835.28	N/A	10.28	N/A
2008 Medians¹	10.5	6.6	11.9	63.85	7.32	ND	ND	ND	ND

¹Only includes Zenon AWTS ships in 2008 and 2009.

The samples taken from the Ryndam, Statendam, Volendam, and Zaandam were all within the General Permit interim limits for ammonia, copper, nickel, and zinc. The Volendam had a fecal and monthly BOD average exceedance on the sample taken May 18th, 2009. The Volendam did not discharge in Alaskan waters after this sample was analyzed. All Holland America vessels had exceedances of the long-term limits for metals and ammonia.

Norwegian Cruise Line (NCL)

Norwegian Cruise Line operated three cruise ships in Alaska in 2009. All three ships have a Scanship wastewater treatment system and were authorized to discharge wastewater in Alaska.

2009 Semimonthly General Permit Sample Results Norwegian Cruise Line

Company	Vessel	Sample Date	mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
			Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliorm	TSS	BOD	Total Residual Chlorine
Norwegian	Pearl	5/12/2009	9.6	15	5.4	110	6.9	ND	7	6.9	ND
Norwegian	Pearl	5/19/2009	41	20	6.2	71	6.7	ND	6	4.7	ND
Norwegian	Pearl	5/26/2009	45	9.3	5	77	6.9	ND	ND	2.8	ND
Norwegian	Pearl	6/2/2009	45	11	5.2	110	6.9	ND	4	ND	ND
Norwegian	Pearl	6/9/2009	50	12	4.9	93	6.9	ND	14	4.8	ND
Norwegian	Pearl	7/7/2009	56	26	8.5	52	6.8	112	26	ND	ND
Norwegian	Pearl	7/14/2009	35	14	5.2	77	6.7	ND	ND	2.1	ND
Norwegian	Pearl	7/14/2009						ND			
Norwegian	Pearl	7/14/2009					6.6	ND			ND
Norwegian	Pearl	7/21/2009						2			

2009 Semimonthly General Permit Sample Results for Norwegian Cruise Line

Company	Vessel	Sample Date	mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
			Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliorm	TSS	BOD	Total Residual Chlorine
Norwegian	Pearl	7/21/2009						2			
Norwegian	Pearl	7/21/2009						2			
Norwegian	Pearl	7/28/2009	38	43	12	31	6.3	ND	ND	2.6	ND
Norwegian	Pearl	8/4/2009	41	18	6.1	87	6.6	ND	ND	ND	ND
Norwegian	Pearl	8/18/2009	42	13	5.7	66	6.7	ND	ND	5	ND
Norwegian	Pearl	9/1/2009	48	22	6.2	86	6.6	ND	ND	ND	ND
Norwegian	Pearl	9/8/2009	43	22	6.2	100	6.7	ND	4	ND	ND

Norwegian	Star	4/29/2009	33	3.4	14	91	7	ND	5	3.6	ND
Norwegian	Star	5/5/2009	26	5.6	12	82	7	ND	ND	ND	ND
Norwegian	Star	5/12/2009	28	6	7.1	35	7	ND	9	3.6	ND
Norwegian	Star	5/18/2009	2.3	5.5	6.9	47	6.9	ND	ND	2.6	ND
Norwegian	Star	6/9/2009	66	4.2	8.7	51	7.1	ND	4	3	ND
Norwegian	Star	6/16/2009	11	3.4	8.3	44	6.8	ND	ND	5.9	ND
Norwegian	Star	7/7/2009	28	4.2	11	82	6.9	ND	4	7	ND
Norwegian	Star	7/14/2009	28	2.5	14	70	6.9	ND	ND	12.3	ND
Norwegian	Star	7/28/2009	32	7.1	13	58	7.1	ND	ND	11	ND
Norwegian	Star	8/4/2009	20	5.4	18	95	7	2	ND	13	ND
Norwegian	Star	8/11/2009	21	3.8	14	86	7.1	2	4	14.1	ND
Norwegian	Star	9/1/2009	21	4.1	13	73	6.7	4	ND	ND	ND
Norwegian	Star	9/8/2009	25	3.5	18	90	6.8	5	ND	18	ND

Norwegian	Sun	5/6/2009	42	4.7	14	17	6.6	ND	ND	10.1	ND
Norwegian	Sun	5/19/2009	45	2.2	8.8	ND	6.6	2	8	14.3	ND
Norwegian	Sun	5/20/2009	43	4	11	30	6.5	ND	ND	13.8	ND
Norwegian	Sun	6/3/2009	44	3	6.7	30	6.6	26	ND	5.6	ND
Norwegian	Sun	6/10/2009	36	2.8	8.2	40	6.6	ND	4	3.1	ND
Norwegian	Sun	7/1/2009		3.7	12	34	6.7	ND	ND	4.8	ND
Norwegian	Sun	7/8/2009	36	4.7	10	68	6.8	ND	ND	4.3	ND
Norwegian	Sun	7/22/2009	30				6.8				ND
Norwegian	Sun	8/5/2009	41	3.2	11	44	6.7	ND	11	12.9	ND
Norwegian	Sun	8/12/2009	38	3	11	49	6.6	ND	ND	3.6	ND
Norwegian	Sun	8/19/2009	44	4.4	9.8	23	7	ND	ND	7.8	ND
Norwegian	Sun	9/2/2009	29	8.6	13	62	6.9	ND	ND	7.1	ND
Norwegian	Sun	9/9/2009	30	8.4	13	69	6.9	ND	5	10.5	ND

The Norwegian Pearl had an exceedance of the fecal coliform daily maximum on July 7th and had a pH result on July 28th that was lower than the General Permit limits. Norwegian Sun met long-term limits for zinc.

2009 Semimonthly General Permit Sample Results Norwegian Cruise Line

	mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
	Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliorm	TSS	BOD	Total Residual Chlorine
Max	66	43	18	110	7.14	112	26	18	ND
Min	2.3	2.2	4.9	0	6.28	ND	ND	0	ND
Median	37	5.4	9.8	68	6.78	ND	ND	4.8	ND
Std Dev	12.29	8.59	3.65	27.26	0.19	17.59	5.3	4.97	ND
2008 Medians	26	4.84	6.8	63.6	6.71	ND	ND	5.6	ND

Princess Cruises

Princess operated eight ships that visited Alaska regularly and discharged wastewater in 2009. All eight ships were authorized to discharge wastewater in Alaska. Princess wastewater treatment systems are all manufactured by Hamworthy.

2009 Semimonthly General Permit Sample Results Princess Cruises

			mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
			Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliorm	TSS	BOD	Total Residual Chlorine
Company	Vessel	Sample Date	Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliorm	TSS	BOD	Total Residual Chlorine
Princess	Coral	5/21/2009	91	35	9.1	190	7.6	2	ND	ND	ND
Princess	Coral	5/29/2009	67	26	7.9	100	7.6	ND	ND	ND	ND
Princess	Coral	6/4/2009	74	20	7.9	180	7.6	ND	ND	ND	ND
Princess	Coral	6/12/2009	75	25	8.7	110	7.6	ND	ND	2.1	ND
Princess	Coral	6/18/2009	64	11	6.9	170	7.4	ND	ND	3.1	ND
Princess	Coral	7/2/2009	59	8.4	21	88	7.2	ND	ND	2.5	ND
Princess	Coral	7/16/2009	65	11	9.2	150	7.2	ND	ND	3.92	ND
Princess	Coral	7/20/2009	67	8.3	7.5	56	7.5	ND	ND	4	ND
Princess	Coral	8/13/2009	68	9.5	20	190	7.4	ND	ND	3	ND
Princess	Coral	8/27/2009	31	13	8.5	150	7.3	ND	ND	ND	ND
Princess	Coral	9/10/2009	67	16	6.7	130	7.5	ND	ND	4.9	ND
Princess	Coral	9/18/2009	51	11	8	140	7.4	ND	ND	4.3	ND
Princess	Diamond	5/20/2009	69	9.7	10	100	7.5	ND	ND	4.1	ND
Princess	Diamond	5/26/2009	79	10	9.5	100	7.6	ND	ND	2.7	ND
Princess	Diamond	6/3/2009	82	5	13	81	7.5	ND	ND	4.3	ND

2009 Semimonthly General Permit Sample Results Princess Cruises

Company	Vessel	Sample Date	mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
			Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliorm	TSS	BOD	Total Residual Chlorine
Princess	Diamond	6/13/2009	68	6.1	9.6	79	7.5	ND	ND	5.6	ND
Princess	Diamond	6/17/2009	100	6.7	12	120	7.8	ND	ND	2.8	ND
Princess	Diamond	7/1/2009		8.6	11	150	7.6	ND	ND	ND	ND
Princess	Diamond	7/15/2009	74	4.1	14	160	7.4	ND	ND	2	ND
Princess	Diamond	7/29/2009	92	7.2	14	170	7.7	ND	ND	3.5	ND
Princess	Diamond	8/12/2009	86	21	15	240	7.6	ND	ND	2.6	ND
Princess	Diamond	8/31/2009	45	11	11	150	7.1	ND	ND	ND	ND
Princess	Diamond	9/9/2009	55	11	19	200	7.2	ND	ND	7.3	ND
Princess	Diamond	9/15/2009	41	8.9	16	240	7.1	ND	ND	ND	ND
Princess	Golden	5/11/2009	43	14	7.9	250	7.7	ND	4	2.5	ND
Princess	Golden	5/18/2009	35	23	6.8	290	7.1	ND	4	3.5	ND
Princess	Golden	6/1/2009	17	13	7.5	250	7.1	ND	ND	ND	ND
Princess	Golden	6/8/2009	59	37	7.7	200	7.5	ND	ND	2	ND
Princess	Golden	6/15/2009	27	15	11	220	7.4	ND	ND	ND	ND
Princess	Golden	7/6/2009	17	10	7.7	130	7.6	ND	ND	ND	ND
Princess	Golden	7/13/2009	70	15	11	190	7.6	ND	5	ND	ND
Princess	Golden	7/20/2009	40	12	6.6	130	7.5	ND	ND	3.6	ND
Princess	Golden	8/3/2009	35	39	12	450	7.2	ND	ND	20.1	0.11
Princess	Golden	8/10/2009	23	51	10	300	7.5	ND	ND	ND	ND
Princess	Golden	9/7/2009	28	18	6.2	280	7.7	ND	ND	ND	ND
Princess	Golden	9/14/2009	37	35	12	330	7.5	ND	ND	2.2	ND
Princess	Island	5/14/2009	130	13	6.5	140	7.7	ND	ND	2.1	ND
Princess	Island	5/27/2009	120	5.2	8.6	88	7.7	ND	ND	9.3	ND
Princess	Island	5/28/2009	160	10	8.2	88	7.6	ND	ND	2.4	ND
Princess	Island	6/11/2009	130	5.5	9.9	87	7.6	ND	ND	4.7	ND
Princess	Island	6/25/2009	110	8	7.1	130	7.7	ND	ND	4	ND
Princess	Island	7/9/2009	85	5.2	6	130	7.5	ND	ND	3.2	ND
Princess	Island	7/22/2009	80	6.1	5.8	160	7.6	ND	ND	4.5	ND
Princess	Island	8/6/2009		12	7	140	7.7	ND	ND	2.2	ND
Princess	Island	8/20/2009	120	14	9.8	200	7.6	ND	ND	19.2	ND
Princess	Island	8/14/2009	120				7.6				ND
Princess	Island	9/3/2009	100	7.9	6.9	190	7.7	ND	ND	ND	ND
Princess	Island	9/11/2009	97	4	9	50	7.5	ND	ND	26	ND
Princess	Pacific	5/16/2009	40	54	19	110	7	ND	ND	ND	ND
Princess	Pacific	5/25/2009	26	66	19	130	7.2	ND	4	ND	ND
Princess	Pacific	6/8/2009	35	36	16	84	7.6	ND	ND	ND	ND
Princess	Pacific	6/22/2009	31	33	21	100	7.4	ND	ND	2.4	ND
Princess	Pacific	7/6/2009	41	110	25	150	7.3	ND	ND	ND	ND

2009 Semimonthly General Permit Sample Results Princess Cruises

Company	Vessel	Sample Date	mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
			Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliorm	TSS	BOD	Total Residual Chlorine
Princess	Pacific	7/20/2009	45	100	23	72	7.7	ND	ND	3.2	ND
Princess	Pacific	8/3/2009	51	76	17	87	7.9	ND	ND	5.3	ND
Princess	Pacific	8/31/2009	10	6.2	14	120	7.1	ND	ND	4.9	ND
Princess	Pacific	9/5/2009	47	28	18	150	7.5	ND	1.5	ND	ND
Princess	Pacific	9/14/2009	41	12	13	160	7	ND	ND	ND	ND
Princess	Sapphire	5/19/2009	99	7.5	10	30	7.5	ND	ND	14.1	ND
Princess	Sapphire	5/27/2009	120	42	14	94	7.8	ND	ND	6.7	ND
Princess	Sapphire	6/2/2009	100	130	420	67	7.7	2	ND	20	ND
Princess	Sapphire	6/16/2009	93	46	70	43	6.8	ND	ND	14.6	ND
Princess	Sapphire	6/30/2009	89	130	170	110	7.7	ND	ND	15.8	ND
Princess	Sapphire	7/13/2009	81	56	30	66	7.7	ND	ND	8.3	ND
Princess	Sapphire	7/14/2009	140	21	17	63	7.8	ND	ND	18.9	ND
Princess	Sapphire	7/28/2009	99	60	20	96	7.8	ND	ND	9.4	ND
Princess	Sapphire	8/11/2009	86	44	16	76	7.7	ND	ND	21	ND
Princess	Sapphire	8/25/2009	78	41	17	100	7.4	17	ND	45	ND
Princess	Sapphire	9/2/2009					7.8			4.1	ND
Princess	Sapphire	9/8/2009	63	47	26	270	7.6	ND	12	3.5	ND
Princess	Sapphire	9/16/2009	100	87	48	170	7.7	2	ND	3.1	ND
Princess	Sea	5/27/2009	99	63	12	48	8.1	ND	8	ND	ND
Princess	Sea	5/28/2009	46	58	12	50	6.9	2	9	ND	ND
Princess	Sea	6/7/2009	45	16	7.1	50	7.1	ND	ND	ND	ND
Princess	Sea	6/17/2009	130	14	7.7	77	7.4	ND	ND	3.4	ND
Princess	Sea	6/27/2009	76	12	7.8	69	7.5	ND	ND	4.1	ND
Princess	Sea	7/8/2009	59	9.4	7.7	50	7.1	ND	ND	2.7	ND
Princess	Sea	7/17/2009	62	17	7.9	62	7.3	ND	ND	2.5	ND
Princess	Sea	7/27/2009	85	12	8.3	41	7.2	ND	ND	10.6	ND
Princess	Sea	8/6/2009		12	7	64	7.6	ND	ND	5.2	ND
Princess	Sea	8/16/2009	150	20	9.5	81	7.6	ND	ND	4.2	ND
Princess	Sea	8/26/2009	81				7.4				ND
Princess	Sea	9/4/2009	120	12	7.9	83	7.4	ND	ND	4.3	ND
Princess	Sea	9/5/2009	41	5.8	6.7	84	7.1	ND	ND	6.4	ND
Princess	Star	5/13/2009	48	11	9.2	140	7.5	ND	ND	ND	ND
Princess	Star	5/19/2009	35	12	5.9	93	7.6	ND	ND	3.5	ND
Princess	Star	5/20/2009	27	17	9.6	160	7.3	ND	ND	9	ND
Princess	Star	6/3/2009	49	15	9.8	150	7.4	ND	ND	5.9	ND
Princess	Star	6/10/2009	72	15	8.5	150	7.5	10	ND	8.2	ND
Princess	Star	7/8/2009	39	9	6.9	140	7.5	ND	ND	6	ND

2009 Semimonthly General Permit Sample Results Princess Cruises

Company	Vessel	Sample Date	mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
			Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliorm	TSS	BOD	Total Residual Chlorine
Princess	Star	7/15/2009	76	12	7.2	150	7.5	ND	2	8.7	ND
Princess	Star	7/29/2009	47	14	6	120	7.6	ND	ND	3.8	ND
Princess	Star	8/5/2009	46	17	8.1	150	7.6	ND	ND	6.6	ND
Princess	Star	8/19/2009	49	15	6.5	140	7.6	ND	ND	4.7	ND
Princess	Star	9/2/2009	34	15	6.2	160	7.5	ND	ND	ND	ND
Princess	Star	9/9/2009	64	26	6.6	170	7.5	ND	ND	8.95	ND

2009 Semimonthly General Permit Sample Results Princess Cruises

	mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
	Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliorm	TSS	BOD	Total Residual Chlorine
Max	160	130	420	450	8.06	17	12	45	0.11
Min	10	4	5.8	30	6.75	ND	ND	ND	ND
Median	67	14	9.5	130	7.52	ND	ND	3.5	ND
Std Dev	32.75	26.51	46.02	71.74	0.23	2.06	1.93	6.84	0.01
2008 Medians	45	14.1	9.17	119.5	7.32	ND	ND	2.65	ND

Princess received 26 wastewater parameter exceedances Notices of Violation in 2009. The majority of the notices were for violating the interim limits for ammonia, copper, and zinc. One NOV included a BOD monthly average exceedance (the Sapphire Princess August samples), and one incorporated a total residual chlorine result (the Golden Princess on August 3rd). Princess also received a Notice of Violation for a spill of wastewater from a ruptured hose while docked in Juneau. The greywater was being pumped ashore for treatment.

Royal Caribbean International (RCI)

Royal Caribbean International operated three ships in Alaskan waters in 2009. Only the Serenade of the Seas discharged and was sampled. The Serenade did not discharge in Alaska in 2008. The Serenade used a Scanship wastewater treatment system.

2009 Semimonthly General Permit Sample Results Royal Caribbean

Company	Vessel	Sample Date	mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg /L	mg/L	mg/L
			Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliorm	TSS	BOD	Total Residual Chlorine
RCI	Serenade	5/21/2009	28	2.98	9.61	102	6.8	9.47	13	11.8	ND
RCI	Serenade	5/28/2009	17	3.93	17.2	141	6.9	ND	16	8.54	ND
RCI	Serenade	6/4/2009	23	3.79	10.6	94.5	6.9	ND	6	2.92	ND
RCI	Serenade	6/25/2009	16	3.02	12	94	6.8	ND	12	5.89	ND
RCI	Serenade	7/2/2009	23	3.84	12.5	133	6.9	ND	ND	2.15	ND
RCI	Serenade	7/23/2009	16	4.96	22.1	135	7	ND	5	2.66	ND
RCI	Serenade	8/6/2009	23	3.7	12.4	267	6.8	ND	10	4.87	ND
RCI	Serenade	8/20/2009	14	5.02	9.13	60.3	7	ND	4	5.66	ND
RCI	Serenade	9/17/2009	15	8.15	28.2	77.8	6.9	ND	4	ND	ND
RCI	Serenade	9/24/2009	10	4.71	21.1	81.4	6.8	ND	5	3.06	ND

2009 Semimonthly General Permit Sample Results Royal Caribbean

	mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
	Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliorm	TSS	BOD	Total Residual Chlorine
Max	28	8.15	28.2	267	7	9.47	16	11.8	ND
Min	10	2.98	9.13	60.3	6.8	ND	ND	ND	ND
Median	16.5	3.89	12.45	98.25	6.9	ND	5.5	3.97	ND
Std Dev	5.48	1.50	6.41	58.60	0.08	2.99	4.99	3.43	N/A

The Serenade of the Seas had one exceedance and one NOV, for zinc on the August 6th sample.

Regent Seven Seas Mariner

The Seven Seas Mariner, operated by Regent, uses a Hamworthy treatment system. The Seven Seas Mariner was authorized to discharge under the general permit.

2009 Semimonthly General Permit Sample Results Regent											
Company	Vessel	Sample Date	mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg /L	mg/L	mg/L
			Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliorm	TSS	BOD	Total Residual Chlorine
Regent	Seven Seas Mariner	5/29/09	16	2.7	8.5	23	7.2	ND	ND	6.8	ND
Regent	Seven Seas Mariner	5/30/09	29	5.5	9.4	50	7.4	ND	ND	2.1	ND
Regent	Seven Seas Mariner	6/19/09	8.3	2.5	5	56	7.4	ND	ND	2.4	ND
Regent	Seven Seas Mariner	6/20/09	1.8	2.8	4.6	62	7.2	ND	ND	ND	ND
Regent	Seven Seas Mariner	7/17/09	7.8	4.4	3.8	41	7.1	ND	ND	ND	ND
Regent	Seven Seas Mariner	7/18/09	3.4	2.2	4.1	61	7.1	ND	ND	ND	ND
Regent	Seven Seas Mariner	8/7/09	6.7	6.7	4	59	7.2	ND	ND	ND	ND
Regent	Seven Seas Mariner	8/8/09	0.23	6	3.3	50	7.3	ND	5	ND	ND
Regent	Seven Seas Mariner	9/4/09	7.4	10	5.7	96	7.2	ND	ND	ND	ND
Regent	Seven Seas Mariner	9/5/09	6.9	6.6	6.1	110	7.3	ND	ND	2.3	ND

2009 Semimonthly General Permit Sample Results Regent									
	mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
	Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliorm	TSS	BOD	Total Residual Chlorine
Max	29	10	9.4	110	7.37	ND	5	6.8	ND
Min	0.23	2.2	3.3	23	7.1	ND	ND	ND	ND
Median	7.15	4.95	4.8	57.5	7.235	ND	ND	ND	ND
Std Dev	8.32	2.50	2.04	25.26	0.10	N/A	1.58	2.19	N/A
2008 Medians	16	5.29	4.5	55	7.32	ND	ND	ND	ND

The Seven Seas Mariner had no exceedances of the General Permit interim limits in 2009, and received no NOVs.

Silver Shadow (Silversea)

The Silver Shadow, operated by Silversea, is the smallest of the large cruise ships that discharged into Alaskan waters in 2009. This vessel uses a unique wastewater treatment system manufactured by Marisan.

The Silver Shadow had consistently low results for ammonia and zinc. The Silver Shadow received a Notice of Violation for copper exceedances on the July 2nd and July 24th samples.

2009 Semimonthly General Permit Sample Results Silversea

Company	Vessel	Sample Date	mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
			Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliorm	TSS	BOD	Total Residual Chlorine
Silver	Shadow	6/1/2009	1.2	51	15	27	6.8	ND	88	3	ND
Silver	Shadow	6/9/2009	2.3	58	17	16	7	ND	29	4.1	ND
Silver	Shadow	6/11/2009	0.23	53	15	25	7.4	ND	115	6.9	ND
Silver	Shadow	7/2/2009	0.54	67	23	38	7.1	ND	20	4.3	ND
Silver	Shadow	7/13/2009	0.28	64	13	31	7.6	ND	74	2	ND
Silver	Shadow	7/24/2009	ND	72	16	18	8.3	ND	21	2.3	ND
Silver	Shadow	8/5/2009	0.46	59	15	24	7.3	ND	116	8.3	ND
Silver	Shadow	8/21/2009	0.32	50	14	18	6.9	ND	16	4.9	ND
Silver	Shadow	8/28/2009					7	ND	13	ND	ND

2009 Semimonthly General Permit Sample Results Silversea

	mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
	Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliorm	TSS	BOD	Total Residual Chlorine
Max	2.3	72	23	38.0	8.3	ND	116.0	8.3	ND
Min	ND	50	13	16.0	6.8	ND	13.0	ND	ND
Median	0.39	58.5	15	24.5	7.09	ND	29	4.1	ND
Std Dev	0.75	7.92	3.07	7.44	0.46	N/A	43.46	2.54	N/A
2008 Medians	0.18	6.84	10	4.42	7.16	ND	24	9.27	ND

APPENDIX 1. GENERAL PERMIT LIMITS

The 2008 General Permit required that tested wastewater parameters meet Alaska Water Quality Standards at the point of discharge (no mixing zone) by 2010. These effluent limits are summarized in the table below. ADEC realized that vessels would have difficulty meeting some of these limits (ammonia, copper, nickel, and zinc) and allowed a compliance schedule with the General Permit. Under the compliance schedule operators could apply for less stringent interim limits for ammonia, copper, nickel, and zinc for the 2008 and 2009 season. The long term effluent limits for ammonia and metals were due to apply in 2010. The interim limits are shown in Table 2 in parentheses.

Table 2: Effluent Limits and Discharge Reporting

Effluent Characteristics	Minimum Value ¹	Monthly Average ¹	Daily Maximum ¹	Minimum Frequency	Sample Type
Total Flow (cubic meters per day of effluent)	N/A	Not to exceed design capacity Report	Not to exceed design capacity Report	Daily	Metered or estimated
Biochemical Oxygen Demand (5-day)	N/A	30 mg/L	60 mg/L	Twice Monthly	Grab
Fecal Coliform Bacteria	N/A	14 per 100 mL ₂	43 per 100 mL	Twice Monthly	Grab
Total Residual Chlorine	N/A	N/A	0.0075 mg/L ^{3,4}	Twice Monthly	Field test
Ammonia	N/A	N/A	(80.4 mg/L ⁵) 2.9 mg/L ⁶	Twice Seasonally	Grab
Copper	N/A	N/A	(0.066 mg/L ⁵) 0.0031 mg/L ⁶	Twice Seasonally	Grab
Nickel	N/A	N/A	(0.18 mg/L ⁵) 0.0082 mg/L ⁶	Twice Seasonally	Grab
Zinc	N/A	N/A	(0.23 mg/L ⁵) 0.081 mg/L ⁶	Twice Seasonally	Grab
pH	6.5 S.U.	N/A	8.5 S.U.	Twice Monthly	Field test, grab, or continuous
Total Suspended Solids	N/A	N/A	150 mg/L	Twice Monthly	Grab or Continuous
Conductivity	N/A	N/A	Report	Twice Seasonally	Field test, grab, or continuous
Chemical Oxygen Demand	N/A	N/A	Report	Twice Seasonally	Grab
Nitrate-Nitrogen (N-NO ₃)	N/A	N/A	Report	Twice Seasonally	Grab
Total phosphorus	N/A	N/A	Report	Twice Seasonally	Grab
Total Kjeldahl Nitrogen (TKN)	N/A	N/A	Report	Twice Seasonally	Grab
Total Organic Carbon	N/A	N/A	Report	Twice Seasonally	Grab
Base-Neutral Acid extractables (BNA)	N/A	N/A	Report	Twice Seasonally	Grab
Volatile Organic Compounds (VOCs)	N/A	N/A	Report	Twice Seasonally	Grab

1. Milligrams per liter (mg/L); milliliter (mL); Standard Units (S.U.)

2. The "monthly average" is the average of all samples taken during the calendar month. If only one sample is collected, the result of that sample is the monthly average.

3. Analytical results below the method detection limit shall be deemed compliant with the effluent limits.

4. Testing and reporting for total residual chlorine is not required if chlorine is not used as disinfectant in the wastewater treatment works process.

5. These interim compliance limits are effective during the 2008 and 2009 cruise ship seasons for vessels with approved compliance schedules that comply with Section 1.9.

6. These limits become effective for all permittees at the beginning of the 2010 cruise ship season.

APPENDIX 2: 2009 LARGE CRUISE SHIP WASTEWATER SAMPLE DATA

Table 3: Semi-monthly parameters

2009 SemiMonthly General Permit Sample Results											ND= Non-detect				
Company	Vessel	Ship Class	Treatment System	Wastewater Type	Sample Date	Type	mg/L				pH	col per 100 ml			
							Ammonia	Copper	Nickel	Zinc		Fecal Coliform	TSS	BOD	Chlorine Residual
Carnival	Spirit	Spirit	Rochem BIP	Graywater	5/8/2009	CC	ND	1.7	0.26	11.2	7.7	ND	ND	2.81	ND
Carnival	Spirit	Spirit	Rochem BIP	Graywater	5/30/2009	UA	ND	0.65	ND	3.42	7.7	ND	ND	4.47	ND
Carnival	Spirit	Spirit	Rochem BIP	Graywater	6/20/2009	CC	ND	0.66	ND	9.86	7.6	ND	ND	5.05	ND
Carnival	Spirit	Spirit	Rochem BIP	Graywater	6/27/2009	CC	ND	0.97	ND	11.8	7.6	ND	ND	4.37	ND
Carnival	Spirit	Spirit	Rochem BIP	Graywater	7/11/2009	CC	ND	ND	0.49	32.4	7.8	ND	ND	3.63	ND
Carnival	Spirit	Spirit	Rochem BIP	Graywater	7/25/2009	CC	ND	0.34	0.22	5.8	7	ND	ND	4.67	ND
Carnival	Spirit	Spirit	Rochem BIP	Graywater	8/8/2009	CC	ND	0.38	1.41	3.82	7.6	ND	ND	2.81	ND
Carnival	Spirit	Spirit	Rochem BIP	Graywater	8/15/2009	UA	ND	11.7	ND	19	8.1	ND	ND	2.66	ND
Carnival	Spirit	Spirit	Rochem BIP	Graywater	9/4/2009	CC	ND	0.55	0.20	2.93	7.6	ND	ND	3.94	ND
Carnival	Spirit	Spirit	Rochem BIP	Graywater	9/11/2009	CC	ND	0.26	0.26	4.33	7.1	ND	ND	5.79	ND
Celebrity	Infinity	Millennium	Zenon	Mixed	Permit Authorization Withdrawn by Company Request 5/12/2009										
Celebrity	Millennium	Millennium	Hydroxyl	No Discharge	Permit Authorization Withdrawn by Company Request 5/12/2009										
Holland America	Oosterdam	Vista	Rochem	No Discharge	Permit Authorization Withdrawn by Company Request 5/22/2009										
Holland America	Ryndam	S-Class	Zenon	Mixed	May	NDW									
Holland America	Ryndam	S-Class	Zenon	Mixed	6/9/2009	UA	6	6.4	16	100	7.4	ND	ND	ND	ND
Holland America	Ryndam	S-Class	Zenon	Mixed	6/16/2009	CC	13	13	15	31	7.2	ND	ND	2.1	ND
Holland America	Ryndam	S-Class	Zenon	Mixed	6/23/2009	CC	30	4.6	14	100	7.3	ND	ND	3.4	ND
Holland America	Ryndam	S-Class	Zenon	Mixed	7/7/2009	CC	34	3.8	14	100	7.5	ND	ND	ND	ND
Holland America	Ryndam	S-Class	Zenon	Mixed	7/21/2009	CC	30	3.6	17	150	7.3	7.2	ND	3.9	ND
Holland America	Ryndam	S-Class	Zenon	Mixed	8/25/2009	CC	45	6.9	15	160	7.4	ND	ND	ND	ND
Holland America	Ryndam	S-Class	Zenon	Mixed	8/30/2009	CC	32	7.3	12	82	7.6	ND	ND	ND	ND
Holland America	Ryndam	S-Class	Zenon	Mixed	9/1/2009	CC	36	5.4	13	110	7.3	ND	ND	ND	ND
Holland America	Ryndam	S-Class	Zenon	Mixed	9/8/2009	CC	28	3.3	12	100	7.3	ND	ND	3.5	ND
Holland America	Ryndam	S-Class	Zenon	Mixed	9/15/2009	UA	31	4.3	11	68	7.4	ND	ND	ND	ND
Holland America	Statendam	S-Class	Zenon	Mixed	May	NDW									
Holland America	Statendam	S-Class	Zenon	Mixed	6/3/2009	UA	47	2.8	18	ND	7.7	ND	ND	5.2	ND
Holland America	Statendam	S-Class	Zenon	Mixed	6/4/2009	CC	36	2	18	22	7.6	ND	ND	5.5	ND
Holland America	Statendam	S-Class	Zenon	Mixed	6/18/2009	CC	21	7.7	3.6	31	7.6	ND	ND	14.6	ND
Holland America	Statendam	S-Class	Zenon	Mixed	7/2/2009	CC	29	9.4	15	32	7.6	ND	ND	13.4	ND
Holland America	Statendam	S-Class	Zenon	Mixed	7/16/2009	CC	27	1.6	14	24	7.3	ND	ND	27	ND
Holland America	Statendam	S-Class	Zenon	Mixed	8/13/2009	CC	45	9.5	16	29	7.3	ND	ND	27.9	ND
Holland America	Statendam	S-Class	Zenon	Mixed	8/19/2009	UA	26	15	15	5.6	7.4	ND	ND	21.1	ND
Holland America	Statendam	S-Class	Zenon	Mixed	8/27/2009	CC	19	24	22	32	7.4	ND	ND	12.7	ND
Holland America	Statendam	S-Class	Zenon	Mixed	9/10/2009	CC	37	2.1	18	30	7.7	ND	ND	11.1	ND
Holland America	Statendam	S-Class	Zenon	Mixed	9/16/2009	CC	52	2.8	18	26	6.8	ND	ND	ND	ND
Holland America	Statendam	S-Class	Zenon	Mixed	9/25/2009	CC					7			7.04	
Holland America	Veendam	S-Class	Zenon	Mixed	NDW										
Holland America	Volendam	R-Class	Zenon	Mixed	5/18/2009	UA	18	5.4	23	110	7.1	4800	18	44.1	ND
Holland America	Volendam	R-Class	Zenon	Mixed	No Further Discharges										
Holland America	Westerdam	Vista	Rochem	Some CW mix	Permit Authorization Withdrawn by Company Request 5/22/2009										
Holland America	Zaandam	R-Class	Zenon	Mixed	5/10/2009	CC	19	8.1	9.9	88	7.7	ND	ND	ND	ND
Holland America	Zaandam	R-Class	Zenon	Mixed	5/17/2009	CC	12	9.8	9.1	55	7.8	ND	ND	8.6	ND
Holland America	Zaandam	R-Class	Zenon	Mixed	5/27/2009	UA	1.7	3.3	9	55	7.5	ND	ND	ND	ND
Holland America	Zaandam	R-Class	Zenon	Mixed	6/7/2009	CC	6.3	5.9	6.8	46	7.6	ND	ND	4.4	ND
Holland America	Zaandam	R-Class	Zenon	Mixed	6/14/2009	CC	15	5.8	6.7	78	7.6	ND	ND	ND	ND
Holland America	Zaandam	R-Class	Zenon	Mixed	7/12/2009	CC	2.9	5	9.1	110	7.1	ND	ND	5	ND
Holland America	Zaandam	R-Class	Zenon	Mixed	7/19/2009	CC					7.6	ND	ND	18.5	ND
Holland America	Zaandam	R-Class	Zenon	Mixed	7/22/2009	UA	3.5	4.8	11	30	7.2	ND	ND	15	ND
Holland America	Zaandam	R-Class	Zenon	Mixed	8/2/2009	CC	39	8	12	85	7.4	ND	ND	6.8	ND
Holland America	Zaandam	R-Class	Zenon	Mixed	8/9/2009	CC		4.1	17	63	7.5	ND	ND	14.1	ND
Holland America	Zaandam	R-Class	Zenon	Mixed	8/16/2009	CC	20				7.5				
Holland America	Zaandam	R-Class	Zenon	Mixed	9/6/2009	CC	14	3.9	15	76	7.4	ND	ND	ND	ND
Holland America	Zaandam	R-Class	Zenon	Mixed	9/13/2009	CC	8	4.5	9.4	46	7.5	ND	ND	ND	ND
Norwegian	Pearl	Jewel	Scanship	Mixed	5/12/2009	CC	9.6	15	5.4	110	6.9	ND	7	6.9	ND
Norwegian	Pearl	Jewel	Scanship	Mixed	5/19/2009	CC	41	20	6.2	71	6.7	ND	6	4.7	ND
Norwegian	Pearl	Jewel	Scanship	Mixed	5/26/2009	UA	45	9.3	5	77	6.9	ND	ND	2.8	ND
Norwegian	Pearl	Jewel	Scanship	Mixed	6/2/2009	CC	45	11	5.2	110	6.9	ND	4	ND	ND
Norwegian	Pearl	Jewel	Scanship	Mixed	6/9/2009	CC	50	12	4.9	93	6.9	ND	14	4.8	ND
Norwegian	Pearl	Jewel	Scanship	Mixed	7/7/2009	CC	56	26	8.5	52	6.8	18.2	26	ND	ND
Norwegian	Pearl	Jewel	Scanship	Mixed	7/14/2009	CC	35	14	5.2	77	6.7	ND	ND	2.1	ND
Norwegian	Pearl	Jewel	Scanship	Mixed	7/14/2009	CC									
Norwegian	Pearl	Jewel	Scanship	Mixed	7/14/2009	CC					6.6				ND
Norwegian	Pearl	Jewel	Scanship	Mixed	7/21/2009	CC									
Norwegian	Pearl	Jewel	Scanship	Mixed	7/21/2009	CC									
Norwegian	Pearl	Jewel	Scanship	Mixed	7/21/2009	CC									
Norwegian	Pearl	Jewel	Scanship	Mixed	7/28/2009	UA	38	43	12	31	6.8	ND	ND	2.6	ND
Norwegian	Pearl	Jewel	Scanship	Mixed	8/4/2009	CC	41	18	6.1	87	6.6	ND	ND	ND	ND
Norwegian	Pearl	Jewel	Scanship	Mixed	8/18/2009	CC	42	13	5.7	66	6.7	ND	ND	5	ND
Norwegian	Pearl	Jewel	Scanship	Mixed	9/1/2009	CC	48	22	6.2	86	6.6	ND	ND	ND	ND
Norwegian	Pearl	Jewel	Scanship	Mixed	9/8/2009	CC	43	22	6.2	100	6.7	ND	4	ND	ND
Norwegian	Star	Libra	Scanship	Mixed	4/29/2009	CC	33	3.4	14	91	7	ND	5	3.6	ND
Norwegian	Star	Libra	Scanship	Mixed	5/5/2009	CC	26	5.6	12	82	7	ND	ND	ND	ND
Norwegian	Star	Libra	Scanship	Mixed	5/12/2009	CC	28	6	7.1	35	7	ND	9	3.6	ND
Norwegian	Star	Libra	Scanship	Mixed	5/18/2009	UA	2.3	5.5	6.9	47	6.9	ND	ND	2.6	ND
Norwegian	Star	Libra	Scanship	Mixed	6/5/2009	CC	66	4.2	8.7	51	7.1	ND	ND	4	2
Norwegian	Star	Libra	Scanship	Mixed	6/16/2009	CC	11	3.4	8.3	44	6.8	ND	ND	5.9	ND
Norwegian	Star	Libra	Scanship	Mixed	7/7/2009	CC	28	4.2	11	82	6.9	ND	4	7	ND
Norwegian	Star	Libra	Scanship	Mixed	7/14/2009	CC	28	2.5	14	70	6.9	ND	ND	12.3	ND
Norwegian	Star	Libra	Scanship	Mixed	7/28/2009	CC	32	7.1	13	58	7.1	ND	ND	11	ND
Norwegian	Star	Libra	Scanship	Mixed	8/4/2009	CC	20	5.4	18	95	7	ND	ND	13	ND
Norwegian	Star	Libra	Scanship	Mixed	8/11/2009	UA	21	3.8	14	86	7.1	2	4	14.1	ND
Norwegian	Star	Libra	Scanship	Mixed	9/1/2009	CC	21	4.1	13	73	6.7	4	ND	ND	ND
Norwegian	Star	Libra	Scanship	Mixed	9/8/2009	CC	25	3.5	18	90	6.8	5	ND	18	ND
Norwegian	Sun	Sky	Scanship	Mixed	5/6/2009	CC	42	4.7	14	17	6.6	ND	ND	10.1	ND
Norwegian	Sun	Sky	Scanship	Mixed	5/19/2009	UA	45	2.2	8.8	ND	6.6	2	8	14.3	ND
Norwegian	Sun	Sky	Scanship	Mixed	5/20/2009	CC	43	4	11	30	6.5	ND	ND	13.8	ND
Norwegian	Sun	Sky	Scanship	Mixed	6/2/2009	CC	44	3	6.7	30	6.6	26	ND	5.6	ND
Norwegian	Sun	Sky	Scanship	Mixed	6/10/2009	CC	36	2.8	8.2	40	6.6	ND	4	3.1	ND
Norwegian	Sun	Sky	Scanship	Mixed	7/1/2009	CC		3.7	12	34	6.7	ND	ND	4.8	ND
Norwegian	Sun	Sky	Scanship	Mixed	7/8/2009	CC	36	4.7	10	68	6.8	ND	ND	4.3	ND
Norwegian	Sun	Sky	Scanship	Mixed	7/22/2009	CC	30				6.8				
Norwegian	Sun	Sky	Scanship												

2009 SemiMonthly General Permit Sample Results										ND= Non-detect									
Company	Vessel	Treatment System	Wastewater Type	Sample Date	Type	mg/L				pH	Fecal Coliform	TSS	BOD	Chlorine	col. per 100 ml	S.U.	mg/L	mg/L	mg/L
						Ammonia	Copper	Nickel	Zinc										
Princess	Coral	Hamworthy	Mixed acc. Gr	5/21/2009	CC	91	35	91	190	7.6	2	ND	ND	ND					
Princess	Coral	Hamworthy	Mixed acc. Gr	5/29/2009	CC	67	26	7.9	100	7.6	ND	ND	ND	ND					
Princess	Coral	Hamworthy	Mixed acc. Gr	6/4/2009	CC	74	20	7.9	180	7.6	ND	ND	ND	ND					
Princess	Coral	Hamworthy	Mixed acc. Gr	6/12/2009	UA	75	25	8.7	110	7.6	ND	ND	2.1	ND					
Princess	Coral	Hamworthy	Mixed acc. Gr	6/18/2009	CC	64	11	6.9	170	7.4	ND	ND	3.1	ND					
Princess	Coral	Hamworthy	Mixed acc. Gr	7/2/2009	CC	59	8.4	21	88	7.2	ND	ND	2.5	ND					
Princess	Coral	Hamworthy	Mixed acc. Gr	7/16/2009	CC	65	11	9.2	150	7.2	ND	ND	3.92	ND					
Princess	Coral	Hamworthy	Mixed acc. Gr	7/20/2009	UA	67	8.3	7.5	56	7.5	ND	ND	4	ND					
Princess	Coral	Hamworthy	Mixed acc. Gr	8/13/2009	CC	68	9.5	20	190	7.4	ND	ND	3	ND					
Princess	Coral	Hamworthy	Mixed acc. Gr	8/20/2009	CC	31	13	8.5	150	7.3	ND	ND	ND	ND					
Princess	Coral	Hamworthy	Mixed acc. Gr	9/10/2009	CC	67	16	6.7	130	7.5	ND	ND	4.9	ND					
Princess	Coral	Hamworthy	Mixed acc. Gr	9/18/2009	CC	51	11	8	140	7.4	ND	ND	4.3	ND					
Princess	Dawn	Hamworthy	Mixed acc. Gr	NDW Not in Alaska in 2009															
Princess	Diamond	Hamworthy	Mixed acc. Gr	5/20/2009	CC	69	9.7	10	100	7.5	ND	ND	4.1	ND					
Princess	Diamond	Hamworthy	Mixed acc. Gr	5/26/2009	CC	79	10	9.5	100	7.6	ND	ND	2.7	ND					
Princess	Diamond	Hamworthy	Mixed acc. Gr	6/13/2009	UA	5	13	81	7.5	ND	ND	4.3	ND						
Princess	Diamond	Hamworthy	Mixed acc. Gr	6/13/2009	UA	68	6.1	9.6	79	7.5	ND	ND	5.6	ND					
Princess	Diamond	Hamworthy	Mixed acc. Gr	6/17/2009	CC	100	6.7	12	120	7.8	ND	ND	2.8	ND					
Princess	Diamond	Hamworthy	Mixed acc. Gr	7/1/2009	CC	82	8.6	11	150	7.6	ND	ND	ND	ND					
Princess	Diamond	Hamworthy	Mixed acc. Gr	7/15/2009	CC	74	4.1	14	160	7.4	ND	ND	2	ND					
Princess	Diamond	Hamworthy	Mixed acc. Gr	7/29/2009	UA	62	7.2	14	170	7.7	ND	ND	3.5	ND					
Princess	Diamond	Hamworthy	Mixed acc. Gr	8/12/2009	CC	86	21	15	240	7.6	ND	ND	2.6	ND					
Princess	Diamond	Hamworthy	Mixed acc. Gr	8/31/2009	CC	45	11	11	150	7.1	ND	ND	ND	ND					
Princess	Diamond	Hamworthy	Mixed acc. Gr	9/9/2009	CC	55	11	19	200	7.2	ND	ND	7.3	ND					
Princess	Diamond	Hamworthy	Mixed acc. Gr	9/15/2009	CC	41	8.9	16	240	7.1	ND	ND	ND	ND					
Princess	Golden	Hamworthy	Mixed acc. Gr	5/11/2009	CC	43	14	7.9	250	7.7	ND	4	2.5	ND					
Princess	Golden	Hamworthy	Mixed acc. Gr	5/18/2009	CC	35	23	6.8	290	7.1	ND	4	3.5	ND					
Princess	Golden	Hamworthy	Mixed acc. Gr	6/1/2009	UA	17	13	7.5	180	7.1	ND	ND	ND	ND					
Princess	Golden	Hamworthy	Mixed acc. Gr	6/15/2009	CC	59	37	7.7	200	7.5	ND	ND	2	ND					
Princess	Golden	Hamworthy	Mixed acc. Gr	6/15/2009	CC	27	15	11	220	7.4	ND	ND	ND	ND					
Princess	Golden	Hamworthy	Mixed acc. Gr	7/6/2009	CC	17	10	7.7	130	7.6	ND	ND	ND	ND					
Princess	Golden	Hamworthy	Mixed acc. Gr	7/13/2009	CC	70	15	11	190	7.6	ND	5	ND	ND					
Princess	Golden	Hamworthy	Mixed acc. Gr	7/20/2009	UA	40	12	6.6	130	7.5	ND	ND	3.6	ND					
Princess	Golden	Hamworthy	Mixed acc. Gr	8/3/2009	CC	35	30	12	450	7.2	ND	ND	20.1	ND					
Princess	Golden	Hamworthy	Mixed acc. Gr	8/10/2009	CC	23	51	10	300	7.5	ND	ND	ND	ND					
Princess	Golden	Hamworthy	Mixed acc. Gr	9/7/2009	CC	28	18	6.2	280	7.7	ND	ND	ND	ND					
Princess	Golden	Hamworthy	Mixed acc. Gr	9/14/2009	CC	37	35	12	330	7.5	ND	ND	2.2	ND					
Princess	Island	Hamworthy	Mixed acc. Gr	5/14/2009	CC	190	13	6.5	140	7.7	ND	ND	2.1	ND					
Princess	Island	Hamworthy	Mixed acc. Gr	5/27/2009	UA	120	5.2	8.6	88	7.7	ND	ND	9.3	ND					
Princess	Island	Hamworthy	Mixed acc. Gr	5/28/2009	CC	180	10	8.2	88	7.6	ND	ND	2.4	ND					
Princess	Island	Hamworthy	Mixed acc. Gr	6/11/2009	CC	130	5.5	9.9	87	7.6	ND	ND	4.7	ND					
Princess	Island	Hamworthy	Mixed acc. Gr	6/25/2009	CC	110	8	7.1	130	7.3	ND	ND	4	ND					
Princess	Island	Hamworthy	Mixed acc. Gr	7/9/2009	CC	85	5.2	6	130	7.5	ND	ND	3.2	ND					
Princess	Island	Hamworthy	Mixed acc. Gr	7/22/2009	UA	80	6.1	5.8	160	7.6	ND	ND	4.5	ND					
Princess	Island	Hamworthy	Mixed acc. Gr	8/6/2009	CC	120	12	7	140	7.7	ND	ND	2.2	ND					
Princess	Island	Hamworthy	Mixed acc. Gr	8/20/2009	CC	120	14	9.8	200	7.6	ND	ND	19.2	ND					
Princess	Island	Hamworthy	Mixed acc. Gr	8/14/2009	CC	120	14	9.8	200	7.6	ND	ND	19.2	ND					
Princess	Island	Hamworthy	Mixed acc. Gr	9/3/2009	CC	100	7.9	6.9	190	7.7	ND	ND	ND	ND					
Princess	Island	Hamworthy	Mixed acc. Gr	9/11/2009	CC	97	4	9	50	7.5	ND	ND	26	ND					
Princess	Pacific	Hamworthy	Mixed acc. Gr	5/16/2009	CC	40	54	19	110	7	ND	ND	ND	ND					
Princess	Pacific	Hamworthy	Mixed acc. Gr	5/25/2009	CC	26	66	19	130	7.2	ND	4	ND	ND					
Princess	Pacific	Hamworthy	Mixed acc. Gr	6/8/2009	UA	35	36	16	84	7.6	ND	ND	ND	ND					
Princess	Pacific	Hamworthy	Mixed acc. Gr	6/22/2009	CC	31	33	21	100	7.4	ND	ND	2.4	ND					
Princess	Pacific	Hamworthy	Mixed acc. Gr	7/6/2009	CC	41	19	25	150	7.3	ND	ND	ND	ND					
Princess	Pacific	Hamworthy	Mixed acc. Gr	7/20/2009	UA	45	100	23	72	7.7	ND	ND	3.2	ND					
Princess	Pacific	Hamworthy	Mixed acc. Gr	8/3/2009	CC	51	26	17	87	7.9	ND	ND	5.3	ND					
Princess	Pacific	Hamworthy	Mixed acc. Gr	8/31/2009	CC	10	6.2	14	120	7.1	ND	ND	4.9	ND					
Princess	Pacific	Hamworthy	Mixed acc. Gr	9/5/2009	CC	47	28	18	150	7.5	ND	1.5	ND	ND					
Princess	Pacific	Hamworthy	Mixed acc. Gr	9/14/2009	CC	41	12	13	160	7	ND	ND	ND	ND					
Princess	Sapphire	Hamworthy	Mixed acc. Gr	5/19/2009	CC	99	7.5	10	30	7.5	ND	ND	14.1	ND					
Princess	Sapphire	Hamworthy	Mixed acc. Gr	5/27/2009	CC	130	42	14	94	7.8	ND	ND	6.7	ND					
Princess	Sapphire	Hamworthy	Mixed acc. Gr	6/2/2009	UA	160	180	20	838	67	7.7	2	ND	20					
Princess	Sapphire	Hamworthy	Mixed acc. Gr	6/16/2009	CC	93	46	70	43	6.8	ND	ND	14.6	ND					
Princess	Sapphire	Hamworthy	Mixed acc. Gr	6/30/2009	CC	89	130	170	110	7.7	ND	ND	15.8	ND					
Princess	Sapphire	Hamworthy	Mixed acc. Gr	7/13/2009	UA	81	56	30	66	7.7	ND	ND	8.3	ND					
Princess	Sapphire	Hamworthy	Mixed acc. Gr	7/14/2009	CC	140	21	17	63	7.8	ND	ND	18.9	ND					
Princess	Sapphire	Hamworthy	Mixed acc. Gr	7/28/2009	CC	99	60	20	98	7.8	ND	ND	9.4	ND					
Princess	Sapphire	Hamworthy	Mixed acc. Gr	8/11/2009	CC	86	44	16	76	7.7	ND	ND	21	ND					
Princess	Sapphire	Hamworthy	Mixed acc. Gr	8/25/2009	CC	78	41	17	100	7.4	ND	ND	45	ND					
Princess	Sapphire	Hamworthy	Mixed acc. Gr	9/2/2009	CC	63	47	26	120	7.8	ND	ND	4.1	ND					
Princess	Sapphire	Hamworthy	Mixed acc. Gr	9/8/2009	CC	74	37	26	120	7.7	ND	ND	12	5.6					
Princess	Sapphire	Hamworthy	Mixed acc. Gr	9/16/2009	CC	100	37	48	170	7.7	2	ND	3.1	ND					
Princess	Sea	Hamworthy	Mixed acc. Gr	5/27/2009	CC	99	63	12	48	8.1	ND	8	ND	ND					
Princess	Sea	Hamworthy	Mixed acc. Gr	5/28/2009	CC	46	58	12	50	6.9	2	9	ND	ND					
Princess	Sea	Hamworthy	Mixed acc. Gr	6/7/2009	UA	45	16	7.1	50	7.1	ND	ND	ND	ND					
Princess	Sea	Hamworthy	Mixed acc. Gr	6/17/2009	CC	130	14	7.7	77	7.4	ND	ND	3.4	ND					
Princess	Sea	Hamworthy	Mixed acc. Gr	6/27/2009	CC	76	12	7.8	69	7.5	ND	ND	4.1	ND					
Princess	Sea	Hamworthy	Mixed acc. Gr	7/8/2009	CC	59	9.4	7.7	50	7.1	ND	ND	2.7	ND					
Princess	Sea	Hamworthy	Mixed acc. Gr	7/17/2009	CC	62	17	7.9	61	7.3	ND	ND	2.5	ND					
Princess																			

Table 5: Full Suite Semi-seasonal Metal Sample Results

Vessel	Date	Antimony (TR)	Antimony dissolved	Arsenic (TR)	Arsenic dissolved	Beryllium (TR)	Beryllium dissolved	Cadmium (TR)	Cadmium dissolved	Chromium (TR)	Chromium dissolved	Copper (TR)	Copper diss	Lead (TR)	Lead, diss	Mercury (Total)	Nickel (TR)	Nickel, diss	Selenium (TR)	Selenium, dissolved	Silver (TR)	Silver, diss	Thallium (TR)	Thallium, dissolved	Zinc (TR)	Zinc, diss	
Carnival Spirit	5/30/09	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	44.1	0.648	2.27	0.1	ND	0.236	ND	ND	ND	ND	ND	ND	ND	12.3	3.42	
Carnival Spirit	8/15/09	ND	ND	ND	ND	ND	ND	ND	ND	0.236	0.284	11.7	0.894	0.931	0.196	ND	ND	ND	ND	ND	ND	ND	ND	ND	10	4.89	
Ryndam	6/9/09	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.2	5.4	6.4	ND	ND	ND	15	16	2.7	5.6	ND	ND	ND	23	100	
Ryndam	9/15/09	ND	ND	ND	1.7	ND	ND	ND	ND	ND	ND	4.3	4.3	ND	ND	ND	10	11	6	9.7	ND	ND	2.7	ND	59	68	
Statendam	6/3/09	ND	1.8	3.1	1.5	ND	ND	ND	ND	3	1.9	1.6	2.8	ND	ND	ND	19	18	8.4	5.8	ND	ND	ND	2.9	ND	ND	
Statendam	8/19/09	ND	2.3	ND	ND	ND	ND	ND	ND	3.4	ND	7.2	15	ND	ND	ND	14	15	5.5	6.3	ND	ND	ND	2.8	4.7	5.6	
Volendam	5/18/09	ND	ND	1.9	1.7	ND	ND	ND	ND	ND	ND	6.6	5.4	ND	ND	ND	24	23	1.7	4.8	ND	ND	ND	2.7	110	110	
Zaandam	6/15/09	ND	ND	ND	ND	ND	ND	ND	ND	3.3	6.4	3.7	3.3	ND	ND	ND	7.6	9	ND	14	ND	ND	ND	ND	20	55	
Zaandam	7/22/09	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.3	4.8	4.8	ND	ND	ND	11	11	5.9	7.7	ND	ND	ND	2.8	27	30	
Coral Princess	6/12/09	ND	1.2	3.4	ND	ND	ND	ND	ND	ND	3.4	25	25	ND	ND	ND	8.4	8.7	7.7	7.4	ND	ND	1.4	ND	100	110	
Coral Princess	7/20/09	ND	ND	ND	ND	ND	ND	ND	ND	4.1	3.5	8.4	8.3	ND	ND	ND	7	7.5	3.6	6.3	ND	ND	ND	2.5	52	56	
Diamond Princess	6/13/09	ND	1	ND	ND	ND	ND	ND	ND	ND	1.7	7.2	6.1	ND	ND	ND	8.1	9.6	6.7	8.1	ND	ND	ND	2.1	63	79	
Diamond Princess	7/29/09	ND	ND	1.8	1.9	ND	ND	ND	ND	ND	ND	7.3	7.2	ND	ND	ND	14	14	10	11	ND	ND	ND	ND	150	170	
Golden Princess	6/1/09	1.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	12	13	ND	ND	ND	7.5	7.5	ND	5.2	ND	ND	ND	2.9	240	250	
Golden Princess	7/20/09	ND	ND	2.4	2.4	ND	ND	ND	ND	2.5	8.8	12	12	ND	ND	ND	6.3	6.6	12	17	ND	ND	1.2	ND	130	130	
Island Princess	5/27/09	ND	ND	ND	ND	ND	ND	ND	ND	2.6	2.5	4.8	5.2	ND	ND	ND	7.8	8.6	ND	5.9	ND	ND	ND	2.3	83	88	
Island Princess	7/22/09	ND	1.2	ND	ND	ND	ND	ND	ND	ND	ND	5.6	6.1	ND	ND	ND	5.6	5.8	2.8	ND	ND	ND	ND	ND	150	160	
Pacific Princess	6/8/09	ND	ND	4.2	ND	ND	ND	ND	ND	2.5	ND	35	36	ND	ND	ND	16	16	12	11	ND	ND	2.2	3	82	84	
Pacific Princess	7/20/09	ND	ND	3.4	5.7	ND	ND	ND	ND	3.3	9	110	100	ND	ND	ND	22	23	22	32	ND	ND	ND	ND	140	72	
Sapphire Princess	6/2/09	ND	ND	ND	ND	ND	ND	ND	ND	2	5.7	280	130	ND	ND	ND	430	420	10	8.1	ND	ND	1.3	ND	61	67	
Sapphire Princess	7/13/09	ND	1.6	ND	ND	ND	ND	ND	ND	1.4	ND	160	56	ND	ND	ND	30	30	11	8.1	ND	ND	ND	ND	51	66	
Sea Princess	6/7/09	ND	ND	10	5.3	ND	ND	ND	ND	ND	ND	24	16	ND	ND	ND	7.7	7.1	31	16	ND	ND	1	ND	55	50	
Sea Princess	7/27/09	ND	ND	3.3	9.7	ND	ND	ND	ND	3	4	7.6	12	ND	ND	ND	6.7	8.3	15	35	ND	ND	ND	1	53	41	
Star Princess	6/11/09	ND	ND	1.7	ND	ND	ND	ND	ND	ND	ND	15	12	ND	ND	ND	6	5.9	4.4	1.2	ND	ND	ND	ND	80	93	
Star Princess	7/29/09	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	14	14	ND	ND	ND	5.7	6	1.9	ND	ND	ND	ND	2.5	120	120	
Norwegian Pearl	5/26/09	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.3	14	9.3	ND	ND	ND	5.1	5	5.2	5	ND	ND	ND	2.2	73	77	
Norwegian Pearl	7/28/09	ND	ND	ND	22	ND	ND	ND	ND	ND	2.8	6.7	43	ND	ND	ND	11	12	2	84	ND	ND	ND	ND	55	31	
Norwegian Star	5/18/09	ND	ND	1.9	ND	ND	ND	ND	ND	ND	ND	5.4	5.5	ND	ND	ND	6.7	6.9	1.8	1.5	ND	ND	ND	1.9	30	47	
Norwegian Star	7/28/09	ND	ND	1.7	3.4	ND	ND	ND	ND	3.6	3.4	6.4	7.1	ND	ND	ND	11	13	4.9	11	ND	ND	ND	ND	50	58	
Norwegian Sun	5/19/09	ND	ND	ND	2.2	ND	ND	ND	ND	ND	ND	3.4	2.2	ND	ND	ND	9	8.8	1.6	4.3	ND	ND	ND	1.9	ND	ND	
Norwegian Sun	8/19/09	ND	1	ND	ND	ND	ND	ND	ND	3.7	ND	5.2	4.4	ND	ND	ND	11	9.8	ND	ND	ND	ND	ND	ND	24	23	
Sereande of the	6/4/09	ND	ND	2.13	2.07	ND	ND	ND	ND	5.95	1.61	4.59	3.79	1.41	1.37	ND	11.4	10.6	ND	ND	ND	ND	ND	ND	98.2	94.5	
Sereande of the	8/20/09	ND	ND	1.7	1.63	ND	ND	ND	ND	ND	ND	5.02	3.8	ND	ND	ND	9.13	8.7	ND	ND	ND	ND	ND	ND	60.3	60.9	
Seven Seas	5/29/09	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.1	2.7	ND	ND	ND	8.9	8.5	4	4.4	ND	ND	1.6	3	21	23	
Seven Seas	7/17/09	ND	ND	ND	ND	ND	ND	ND	ND	4.7	4	4	4.4	ND	ND	ND	3.3	3.8	1.7	ND	ND	ND	ND	ND	37	41	
Silver Shadow	6/9/09	ND	ND	40	17	ND	ND	ND	ND	4.9	ND	55	58	ND	ND	ND	16	17	180	85	ND	ND	ND	ND	96	16	
Silver Shadow	7/24/09	ND	ND	74	35	ND	ND	ND	ND	6.7	5.7	76	72	ND	ND	ND	16	16	280	130	ND	ND	1.5	3.2	9.3	18	
All results in ND= Non-detect																											

APPENDIX 3: USEFUL WEBSITES

Alaska Department of Environmental Conservation (ADEC) Cruise Ship Home Page

http://www.dec.state.ak.us/water/cruise_ships/index.htm

General Permit Authorizations by ADEC

http://www.dec.state.ak.us/water/cruise_ships/gp/Auth_08.html

2008 Large Cruise Ship General Permit

http://www.dec.state.ak.us/water/cruise_ships/gp/2008GP_Mod_CPVEC.pdf

Alaska Cruise Ship Laws and Regulations

http://www.dec.state.ak.us/water/cruise_ships/Law_and_Regs/index.htm

Sample reports from prior years

http://www.dec.state.ak.us/water/cruise_ships/reports.htm

EPA NPDES Vessel Discharges Page

http://cfpub.epa.gov/npdes/home.cfm?program_id=350