



**Alaska Department of
Environmental Conservation
Large Cruise Ship 2012
Wastewater Sampling Results**



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1. INTRODUCTION

This report shows the results of sampling and laboratory testing of large cruise ship treated wastewater effluent during the 2012 cruise ship season.

Large cruise ships that chose to discharge treated wastewater into Alaskan waters in 2012 were required by the terms and conditions (Appendix 1) of the 2010 Large Commercial Passenger Vessel Wastewater General Permit (2010 General Permit) and Alaska Statutes to conduct wastewater sampling and analytical testing, and report the sample and analytical testing results to the Alaska Department of Environmental Conservation (DEC). No cruise ship may discharge untreated wastewater into Alaskan waters.

In order to comply with permit terms and Alaska Statutes, permittees must perform sampling events while discharging treated effluent into the marine waters of the state, follow the provisions of the ship's DEC approved vessel specific sampling plan (VSSP), and follow the provisions of the DEC approved quality assurance project plan (QAPP). The VSSP is designed to obtain a sample which is representative of a typical treated water discharge. The QAPP includes approved sampling techniques and methods of analytical testing. Laboratory analysis of samples must also be in compliance with the VSSP and the QAPP.

A sampling event is an activity where a sampler collects enough treated wastewater effluent for laboratories to conduct analytical testing for all of the pollutants to be tested. A sample is a container of effluent collected for a specific analysis or set of analyses. DEC requires permittees to conduct two types of sampling events: sampling for pollutants with permit limits and sampling for pollutants that do not have permit limits but must be reported.

Permitted ships must conduct two sampling events during each month that they discharge into Alaskan waters. Reports from twice-per-month sampling events must include results for each pollutant with permit limits. Two sampling events each season must include analyses of the complete list of pollutants in the permit, including those that do not have limits (i.e., pollutants listed as "report only.") This is required in order for DEC to determine whether or not there is a basis of concern to establish limits in the future and to collect information on the performance of AWTs systems. Permittees are also required to report the results of sampling taken to meet federal requirements (i.e. US Coast Guard random sampling) to DEC.

In 2012, 28 large cruise ships operated in Alaskan waters; however, only 17 of the 28 large ships sought permit coverage to discharge, and 15 of those 17 permitted ships chose to actually discharge. Table 1 has a list of ships that visited Alaska in 2012 and their permit status. Appendix 3 contains a summary of vessel specific information for 2012. A list of 2012 authorized vessels and copies of authorization letters can be found at: http://www.dec.state.ak.us/water/cruise_ships/gp/Auth_10.html

Table 1: 2012 Large Cruise Ship General Permit Authorizations

Vessel Operator	Vessel Name	Permit Authorization in 2012	Discharged in Alaska in 2012?
Carnival CL	<i>Carnival Spirit</i>	Stationary and Underway for graywater only	Yes
Celebrity Cruises	<i>Celebrity Century</i>	None	No
Celebrity Cruises	<i>Celebrity Infinity</i>	None	No
Celebrity Cruises	<i>Celebrity Millennium</i>	None	No
Crystal Cruises	<i>Crystal Serenity</i>	None	No
Disney	<i>Disney Wonder</i>	Underway	Yes
Holland America	<i>Amsterdam</i>	None	No
Holland America	<i>Oosterdam</i>	None	No
Holland America	<i>Statendam</i>	Stationary and Underway	Yes
Holland America	<i>Volendam</i>	Stationary and Underway	Yes
Holland America	<i>Westerdam</i>	None	No
Holland America	<i>Zaandam</i>	Stationary and Underway	Yes
Holland America	<i>Zuiderdam</i>	None	No
Norwegian CL	<i>Norwegian Jewel</i>	Underway	Yes
Norwegian CL	<i>Norwegian Pearl</i>	Underway	Yes
NYK	<i>Asuska II</i>	None	No
Princess CL	<i>Coral Princess</i>	Underway	Yes
Princess CL	<i>Dawn Princess</i>	Underway	Yes
Princess CL	<i>Diamond Princess</i>	Underway	Yes
Princess CL	<i>Golden Princess</i>	Stationary and Underway for graywater, Underway for mixed wastewater	Yes
Princess CL	<i>Island Princess</i>	Underway	Yes
Princess CL	<i>Sapphire Princess</i>	Stationary and Underway for graywater, Underway for mixed wastewater	Yes
Princess CL	<i>Sea Princess</i>	Underway	Yes
Princess CL	<i>Star Princess</i>	Underway	Yes
Prestige Cruises	<i>Seven Seas Navigator</i>	Underway	Yes
Royal Caribbean	<i>Radiance of the Seas</i>	None	No
Royal Caribbean	<i>Rhapsody of the Seas</i>	None	No
Silver Seas	<i>Silver Shadow</i>	Stationary and Underway	No

2. RESULTS BY COMPANY

Wastewater sampling results for pollutants with effluent limits are listed in Section 2.2, by company. Please see Appendix 2, Tables 5 and 6 for pollutant sampling results for which there are no effluent limits.

In the following tables, sampling results highlighted in red are exceedances of 2010 General Permit limits. Exceedances of Alaska Water Quality Criteria are highlighted in yellow and are not exceedances of permitted limits. Dark blue highlights indicate no sample data was received or accepted. In some cases the parameter was not required to be sampled, and in other cases the sample did not meet sampling requirements; for example, the holding time was not met. Light blue highlights graywater-only sample events.

Samples taken twice per month or more frequently for the General Permit are identified as “GP.” Sampling events that include all parameters listed in the General Permit (two per season) are identified as “PP” for priority pollutants. In reports prior to 2011, they have been identified as unannounced or “UA” because they are often also taken to meet US Coast Guard sampling requirements. The 2010 General Permit does not require unannounced sampling, but does allow samples taken for federal agencies to be accepted as meeting DEC requirements. Sample types labeled “USCG” are US Coast Guard random, unannounced, and unscheduled samples.

Explanation of color codes in sampling results tables	
	Exceedance of permitted limits
	Exceedance of Alaska Water Quality Standards
	Discharging only treated graywater
	Parameter not sampled or did not meet quality objectives
	No Discharge in Alaska
ND	Not detected

Two categories of permit limits exist in the 2010 General Permit: Limits for underway discharge, and limits for continuous discharge. Cruise ships can be permitted to discharge only while underway at a speed of six knots or greater, or can be permitted for continuous discharge, which includes discharge underway and discharge while stationary (moored, stopped, and underway at a speed of less than six knots). The limits for continuous discharge are more stringent than those for underway discharge.

2.1. Large cruise ships that did not discharge

Celebrity Cruises

In 2012 Celebrity Cruises operated three ships in Alaska. All three ships did not discharge in Alaskan waters.

Royal Caribbean International (RCI)

Royal Caribbean International operated two ships in Alaskan waters in 2012. Neither ship discharged wastewater in Alaskan waters in 2012.

Silver Shadow (Silversea)

The Silver Shadow, operated by Silversea, was authorized to discharge under the General Permit but did not discharge in Alaskan waters in 2012 and was not required to sample.

2.2. Discharging large cruise ships

Carnival Cruise Lines

Carnival operated one ship, the Carnival Spirit, in Alaska in 2012. The Carnival Spirit was authorized to discharge graywater continuously (underway and while docked or anchored). The Carnival Spirit had one pH exceedance of the 2010 General Permit limits in 2012. This ship only discharged accommodation graywater, which was treated through a Rochem low pressure reverse osmosis (LPRO) wastewater treatment system. All samples were taken while the Carnival Spirit was stationary.

Carnival Spirit 2012 Sampling

Sample Date	Units	mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
	Type	Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliform	TSS	BOD	TR Chlorine
5/19/2012	GP	0.47	2.1	0.25	11	7.53	ND	ND	6.2	ND
5/26/2012	GP	0.64	3	0.25	10	7.42	ND	ND	13	ND
6/2/2012	PP	0.44	3.2	0.25	10	7.84	ND	ND	11	ND
6/9/2012	GP	0.65	2.1	0.25	5.6	7.05	ND	ND	8.8	ND
7/7/2012	GP	0.71	2.9	0.25	4.4	7.85	ND	ND	10	ND
7/14/2012	GP	0.64	2.8	0.25	6.6	8.7	ND	ND	9.5	ND
7/21/2012	USCG					6.91	14	ND	16	ND
8/4/2012	PP	0.63	2.9	0.25	3.5	7.47	ND	ND	12	ND
8/18/2012	GP	0.63	2.3	0.25	4.7	7.95	ND	ND	12	ND
9/1/2012	GP	0.57	3.5	0.25	9.1	7.34	ND	ND	11	ND
9/8/2012	GP	0.71	2.9	0.25	24	7.25	ND	ND	8.9	ND
Average		0.61	2.77	0.25	8.89					
Max		0.71	3.5	0.25	24					
Min		0.44	2.1	0.25	3.5					
Median		0.64	2.90	0.25	7.85					
STD Dev		0.09	0.46	0.00	5.95					
Alaska WQC		1	3.1	8.2	81	<6.5, >8.5	43			0.0075
Stationary Limits		12	10	10	118	<6.5, >8.5	43	150	60	0.01

Disney

Disney Cruise Line operated one ship, the Disney Wonder, in Alaska in 2012. The Disney Wonder was permitted for underway discharge of mixed blackwater and graywater treated by a Hamworthy Advanced Wastewater Treatment System (AWTS). Discharges and sampling only occurred while the vessel was underway, at a speed of six knots or greater. The Disney Wonder had no exceedances of the general permit limits in 2012.

Disney Wonder 2012 Sampling

Sample Date	Units	mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
	Type	Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliform	TSS	BOD	TR Chlorine
5/25/2012	GP	1.4	4.4	11	190	6.72	ND	ND	ND	ND
6/8/2012	GP	39	7.1	11	140	7.09	ND	5	ND	ND
6/15/2012	PP	12	5.5	10	150	6.92	ND	ND	ND	ND
7/13/2012	GP	27	17	16	210	7.11	ND	ND	ND	ND
7/20/2012	GP	21	4.4	18	170	7.02	ND	ND	ND	ND
8/10/2012	GP	8.8	12	18	220	6.83	ND	ND	ND	ND
8/17/2012	PP	17	7.6	14	160	7.01	ND	ND	ND	ND
9/7/2012	GP	7	18	13	180	6.73	ND	ND	ND	ND
Average		16.65	9.50	14	177.50					
Max		39.00	18.00	18	220					
Min		1.40	4	10	140					
Median		14.5	7.35	14	175					
STD Dev		12.16	5.51	3	28.16					
Alaska WQC		1	3.1	8.2	81	<6.5, >8.5	43			0.0075
Permit Limits		143	133	63	395	<6.5, >8.5	43	150	60	0.01

Holland America Line (HAL)

Holland America operated seven cruise ships in Alaska in 2012; of these, three vessels discharged and were sampled. All three vessels were authorized for stationary discharge of treated wastewater. The Statendam discharged only while underway in 2012. All HAL ships used Zenon treatment systems.

- The Statendam had one exceedance of the pH limits. The Statendam had an exceedance of the quality assurance plan allowed holding time for fecal coliform due to weather delays on the transporting aircraft on September 13th, this result could not be used and is shown as dark blue in the results.
- The Voldendam had one exceedance of dissolved copper.
- The Zaandam had one exceedance of the ammonia daily maximum limit.

Holland America 2012 Sampling

Ship Name	Sample Date	Discharge status	Units	mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
			Type	Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliform	TSS	BOD	TR Chlorine
Statendam	5/24/2012	Underway	GP	36	2.2	24	12	7.25	ND	ND	ND	ND
Statendam	5/31/2012	Underway	GP	46	1.8	19	9.4	7.12	ND	ND	2.3	ND
Statendam	6/14/2012	Underway	PP	32	1.5	13	16	7.16	ND	ND	3.2	ND
Statendam	6/28/2012	Underway	GP	34	1.8	12	8.4	7.2	ND	ND	5.8	ND
Statendam	7/12/2012	Underway	GP	28	2.6	13	7.3	7.25	ND	ND	2.5	ND
Statendam	7/19/2012	Underway	GP	33	2	14	9.6	7.42	ND	ND	ND	ND
Statendam	8/9/2012	Underway	GP	46	2.3	17	4.3	7.23	ND	ND	2.1	ND
Statendam	8/29/2012	Underway	GP	3.8	2.7	15	5.6	7.52	ND	ND	ND	ND
Statendam	9/13/2012	Underway	GP	30	2.9	18	7.5	7.22		ND	3	ND
Statendam	9/20/2012	Underway	GP	33	3	19	7.2	6.05	ND	ND	47	ND
Volendam	5/4/2012	Stationary	GP	13	58	19	110	7.04	ND	ND	ND	ND
Volendam	5/11/2012	Stationary	GP	13	13	12	71	6.78	ND	ND	ND	ND
Volendam	6/1/2012	Stationary	PP	14	4.4	6.3	69	7.17	ND	ND	ND	ND
Volendam	6/15/2012	Stationary	GP	6.3	12	6.3	50	6.98	ND	ND	ND	ND
Volendam	7/6/2012	Stationary	GP	15	6.9	7.8	58	7.27	ND	ND	ND	ND
Volendam	7/20/2012	Stationary	GP	14	5.5	8.4	64	7.06	ND	ND	ND	ND
Volendam	8/3/2012	Stationary	GP	21	5.1	8.3	100	7.28	ND	ND	ND	ND
Volendam	8/10/2012	Stationary	PP	11	7	7.4	70	7.2	ND	ND	ND	ND
Volendam	9/7/2012	Stationary	GP	11	4.1	9.1	43	7.12	ND	ND	ND	ND
Volendam	9/14/2012	Stationary	GP	27	4.2	7.6	42	7.31	ND	ND	ND	ND
Zaandam	5/8/2012	Stationary	GP	0.68	3.6	14	42	7.07	ND	ND	ND	ND
Zaandam	5/16/2012	Stationary	PP	36	34	13	40	7.56	ND	ND	ND	ND
Zaandam	6/7/2012	Stationary	GP	1.8	6.9	7.8	67	7.14	ND	ND	ND	ND
Zaandam	6/13/2012	Stationary	GP	0.31	3.7	9.7	53	7.3	ND	ND	35	ND
Zaandam	7/5/2012	Stationary	GP	6.8	3.2	9.4	47	7.22	ND	ND	ND	ND
Zaandam	7/19/2012	Stationary	GP	28	2.5	9.1	43	7.33	ND	ND	ND	ND
Zaandam	8/2/2012	Stationary	PP	8.8	4.8	12	55	6.81	ND	ND	ND	ND
Zaandam	8/16/2012	Stationary	GP	21	12	4	17	7.32	ND	ND	ND	ND
Zaandam	9/5/2012	Stationary	GP	22	3	8.1	59	7.14	ND	ND	ND	ND
Zaandam	9/13/2012	Stationary	GP	17	4.1	8.3	55	7.08	ND	ND	ND	ND
Average				20.32	7.36	11.72	41.41					
Max				46	58	24	110					
Min				0.31	1.5	4	4.3					
Median				19.0	3.9	10.9	43.0					
STD Dev				13.17	11.38	4.77	28.97					
Alaska WQC				1	3.1	8.2	81	<6.5, >8.5	43	0.0075		
Underway Permit Limits				51	50	40	188	<6.5, >8.5	43	150	60	0.01
Stationary Permit Limits				28	50	40	188	<6.5, >8.5	43	150	60	0.01

Norwegian Cruise Line (NCL)

Norwegian Cruise Line operated two cruise ships in Alaska in 2011. Both ships use a Scanship wastewater treatment system and were authorized to discharge wastewater in Alaska while underway. All samples were taken while underway.

- The Norwegian Pearl had one exceedance of the fecal coliform daily maximum.
- The Norwegian Pearl also had two exceedances of the pH daily minimum that were within the method error for pH, these are not included in the violations list.

Norwegian Cruise Line 2012 Sampling

Ship Name	Sample Date	Units	mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
		Type	Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliform	TSS	BOD	TR Chlorine
Jewel	5/23/2012	GP	32	1.7	4	24	6.73	ND	ND	2.3	ND
Jewel	5/30/2012	GP	35	1.3	5.3	32	6.75	ND	ND	4.6	ND
Jewel	6/13/2012	PP	41	1.1	4.3	55	6.81	ND	4	2.1	ND
Jewel	6/20/2012	GP	34	1.5	5.6	46	6.67	ND	ND	3.8	ND
Jewel	7/11/2012	GP	29	2.9	5.7	95	6.74	ND	ND	2.1	ND
Jewel	7/18/2012	PP	37	3.4	7.1	110	6.8	ND	4	3.7	ND
Jewel	8/15/2012	PP	32	2.1	10	160	6.89	ND	ND	3.5	ND
Jewel	8/28/2012	GP	3.5	2.9	5.7	150	6.76	ND	ND	ND	ND
Jewel	9/5/2012	GP	31	2.6	5.3	140	6.61	ND	ND	2.8	ND
Jewel	9/18/2012	GP	23	3	5.2	130	6.61	ND	4	ND	ND
Pearl	5/9/2012	GP	33	4.8	6.6	40	6.47	ND	ND	5.1	ND
Pearl	5/16/2012	PP	21	4.4	5.8	93	6.67	6	ND	9	ND
Pearl	6/13/2012	GP	28	1.8	4.2	150	6.59	ND	ND	11	ND
Pearl	6/20/2012	GP	24	2.6	4.9	77	7.12	52	6	11	ND
Pearl	7/18/2012	PP	20	6.7	7	57	6.8	ND	ND	12	ND
Pearl	7/25/2012	GP	19	2.8	6.3	67	6.91	2	ND	5.5	ND
Pearl	8/8/2012	GP	18	2.7	4.4	49	6.93	40	19	18	ND
Pearl	8/15/2012	GP	22	6.3	4.7	22	6.45	ND	ND	6.4	ND
Pearl	9/5/2012	GP	21	2.9	8	86	6.76	2	4	6.9	ND
Pearl	9/19/2012	GP	24	4.5	4.8	57					
Average			26.38	3.10	5.75	82.00					
Max			41	7	10	160					
Min			3.5	1.1	4.0	22					
Median			26.0	2.9	5.5	72.0					
STD Dev			8.54	1.54	1.46	44.68					
Alaska WQC			1	3.1	8.2	81	<6.5, >8.5	43			0.0075
Underway Permit Limits			68	26	28	267	<6.5, >8.5	43	150	60	0.01

Princess Cruises

Princess Cruises operated eight ships that visited Alaska and discharged wastewater in 2012. All eight ships were authorized to discharge treated wastewater while underway in Alaska. Two ships (the Golden Princess and the Sapphire Princess) were permitted to discharge treated graywater-only continuously (stationary and while underway). Princess wastewater treatment systems were all manufactured by Hamworthy. The Dawn Princess and Sea Princess had no exceedances of the 2010 General Permit limits in 2012. The Dawn Princess was allowed to take only one wastewater sample because it had only one voyage to Alaska. Several ammonia sample results are not available due to holding time or temperature exceedances during shipping.

- The Coral Princess had one exceedance of Biochemical Oxygen Demand (BOD) for Daily Maximum and one exceedance of the BOD Monthly Average.
- The Diamond Princess had one exceedance of the BOD monthly average.
- The Sapphire Princess had one exceedance each for chlorine and pH from the graywater only (stationary) samples. The Sapphire Princess also had two samples where the fecal coliform was reported as too numerous to count (TNTC) due to the possible presence of other bacteria.

- The Star Princess reported two exceedances of the fecal coliform daily maximum, two exceedances of dissolved copper, and one exceedance of dissolved nickel.

Princess 2012 Sampling

Ship Name	Sample Date	Units	mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
		Type	Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliform	TSS	BOD	TR Chlorine
Coral	5/18/2012	GP	69	19	10	54	7.22	ND	ND	110	ND
Coral	5/25/2012	PP	84	9.7	10	72	7.51	ND	ND	32	ND
Coral	6/8/2012	GP	23	16	13	100	7.04	ND	ND	ND	ND
Coral	6/22/2012	GP	28	6.7	13	89	6.96	ND	ND	3.2	ND
Coral	7/20/2012	GP	23	12	6.4	100	7.16	ND	ND	ND	ND
Coral	7/26/2012	GP	23	18	20	85	7.3	ND	ND	3.6	ND
Coral	8/10/2012	GP	29	13	12	100	7.33	ND	ND	ND	ND
Coral	8/17/2012	PP	19	22	7.5	110	7.33	ND	4	ND	ND
Coral	9/7/2012	GP	23	23	11	86	7.07	ND	ND	ND	ND
Diamond	5/22/2012	GP	87	4.4	14	57	7.86	ND	ND	21	ND
Diamond	5/30/2012	PP	99	5.2	15	40	7.63	ND	ND	27	ND
Diamond	6/13/2012	GP	110	4.9	23	60	7.5	ND	ND	21	ND
Diamond	6/20/2012	GP	96	7.2	20	58	7.48	ND	ND	13	ND
Diamond	7/11/2012	GP	0.1	5.2	24	31	7.56	6.6	ND	49	ND
Diamond	7/18/2012	GP	34	4.7	14	55	7.48	ND	ND	26	ND
Diamond	8/1/2012	PP	96	6.4	15	52	7.62	ND	ND	22	ND
Diamond	8/15/2012	GP	8.7	11	15	85	7.68	ND	ND	3.8	ND
Diamond	9/5/2012	GP	37	14	12	180	7.15	ND	ND	2.2	ND
Diamond	9/12/2012	GP	54	24	15	160	7.36	ND	ND	2	ND
Dawn	9/7/2012	PP	7.4	4.8	7.2	82	7.02	ND	ND	ND	ND
Golden	5/29/2012	GP	14	22	10	240	6.6	ND	ND	ND	ND
Golden	6/12/2012	PP	8.7	5.5	9.1	120	7.05	ND	ND	4.5	ND
Golden	6/19/2012	GP	0.27	5.4	9.4	150	7.01	ND	ND	2.3	ND
Golden	7/10/2012	GP	9	7.6	6.9	200	6.77	ND	ND	ND	ND
Golden	7/17/2012	GP	74	33	7	110	8.06	10	ND	2.8	ND
Golden	8/7/2012	GP	50	26	8.9	150	6.63	15	ND	6.8	ND
Golden	8/21/2012	PP	1.5	7.4	12	140	6.94	ND	ND	ND	ND
Golden	9/4/2012	GP	0.12	5.1	7.3	80	7.11	ND	ND	ND	ND
Golden	9/11/2012	GP	0.13	3.8	7.3	120	7.01	ND	ND	ND	ND
Island	5/19/2012	GP	51	13	7.8	72	7.17	ND	ND	3.5	ND
Island	5/27/2012	GP	110	8.2	6.3	11	7.31	ND	ND	ND	ND
Island	6/17/2012	PP	62	16	4.7	71	7.31	ND	ND	ND	ND
Island	6/24/2012	GP	49	6.2	7.9	33	7.18	ND	ND	8.9	ND
Island	7/1/2012	GP	32	11	5.4	73	7.22	ND	ND	ND	ND
Island	7/15/2012	GP	52	15	5.7	64	7.31	ND	ND	ND	ND
Island	8/12/2012	PP	79	11	5	39	7.4	ND	ND	ND	ND
Island	8/19/2012	GP	40	13	6.7	42	7.37	ND	ND	2.6	ND
Island	9/16/2012	GP	91	17	5.4	23	7.57	ND	ND	36	ND
Island	9/23/2012	GP	94	28	5.1	22	7.35	4	ND	3.2	ND
Sapphire	5/23/2012	GP	59	9.6	17	170	7.37	ND	ND	32	ND
Sapphire	5/30/2012	PP	6.5	11	20	160	7.27	ND	ND	3.2	ND
Sapphire	6/6/2012	GP	61	14	16	140	8.01	ND	ND	11	ND
Sapphire	6/27/2012	GP	1.3	13	19	220	6.96	ND	ND	ND	ND
Sapphire	7/11/2012	PP	23	11	17	230	7.72	ND	ND	ND	ND
Sapphire	7/25/2012	GP	74	12	13	230	7.98	ND	ND	6.3	ND
Sapphire	8/8/2012	GP	59	7.7	12	190	7.85	1100	ND	37	ND
Sapphire	8/14/2012	GP	42	18	17	300	7.57	ND	ND	5.6	ND
Sapphire	8/22/2012	GP	43	9	17	240	7.8	10	ND	9.6	ND
Sapphire	9/5/2012	GP	59	13	17	240	7.83	ND	ND	3.6	ND
Sapphire	9/19/2012	GP	37	10	17	160	8.27	ND	ND	13	ND
Sea	5/17/2012	GP	28	24	5.1	43	7.04	ND	ND	ND	ND
Sea	5/28/2012	GP	46	24	3.6	45	7.24	ND	9	ND	ND
Sea	6/7/2012	PP	26	23	3.6	51	7.14	ND	4	4.3	ND
Sea	6/27/2012	GP	48	0.25	4.8	21	7.47	ND	5	5.4	ND
Sea	7/6/2012	GP	48	18	4.1	17	7.45	ND	ND	5.1	ND
Sea	7/27/2012	GP	55	16	5	33	7.49	ND	ND	2.3	ND
Sea	8/6/2012	GP	53	13	5.5	29	7.5	ND	ND	6.1	ND
Sea	8/16/2012	PP	52	16	4.4	18	7.38	ND	ND	6.8	ND
Sea	9/5/2012	GP	33	16	3.3	23	7.27	ND	13	ND	ND
Sea	9/6/2012	GP	40	9.4	3.2	36	7.33	ND	ND	13	ND
Star	5/24/2012	GP	0.29	94	8.7	4.7	8.26	96	27	ND	ND
Star	5/31/2012	GP	75	150	210	34	7.17	ND	ND	6.2	ND
Star	6/7/2012	PP	0.8	120	42	32	7.5	ND	ND	ND	ND
Star	6/21/2012	GP	1.6	6.9	9.7	31	8.07	ND	15	2.8	ND
Star	7/12/2012	GP	86	160	28	56	7.42	ND	ND	3.4	ND
Star	7/19/2012	PP	17	75	15	53	7.28	33	ND	ND	ND
Star	8/9/2012	GP	0.32	27	2.7	4	8.17	110	8	2.9	ND
Star	8/16/2012	GP	70	48	17	56	7.36	ND	ND	3	ND
Star	8/23/2012	GP	85	66	16	70	7.43	2	ND	6.2	ND
Star	9/6/2012	GP	66	18	11	57	7.27	ND	ND	3	ND
Star	9/19/2012	GP	91	46	7	59	7.35	N	ND	2.6	ND

Average	44.43	22.31	14.18	91.11
Max	110	160	210	300
Min	0.1	0.3	2.7	4.0
Median	43	13	10	70
STD Dev	31.59	30.31	24.53	69.58

Alaska WQC	1	3.1	8.2	81	<6.5, >8.5	43			0.0075
Underway Permit Limits	51	50	40	188	<6.5, >8.5	43	150	60	0.01
Stationary Permit Limits	28	50	40	188	<6.5, >8.5	43	150	60	0.01
Monthly Permit Limits						14		30	

Princess 2012 Graywater Only Sampling

Ship Name	Sample Date	Units	mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
		Type	Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliform	TSS	BOD	TR Chlorine
Golden	5/28/2012	GP	0.21	7.3	7.3	170	7.51	ND	ND	ND	ND
Golden	6/11/2012	PP	1.8	4.6	6.3	100	6.93	2	ND	27	ND
Golden	6/18/2012	GP	0.21	8.6	6.2	120	6.98	ND	ND	ND	ND
Golden	7/9/2012	GP	7.4	9.4	4.9	75	6.75	ND	ND	ND	ND
Golden	7/16/2012	GP	0.3	6.5	5.8	110	6.73	ND	ND	ND	ND
Golden	8/6/2012	GP	0.12	4.9	8.9	90	6.79	40	ND	8	ND
Golden	8/20/2012	PP	0.55	9.1	9.9	140	7.06	ND	ND	ND	ND
Golden	9/3/2012	GP	0.1	6.2	11	100	7.25	ND	ND	ND	ND
Golden	9/10/2012	GP	0.13	6.4	7.8	110	6.75	ND	ND	ND	ND
Sapphire	5/22/2012	GP	0.94	16	19	150	7.08	ND	ND	ND	0.25
Sapphire	5/30/2012	PP	0.93	14	21	200	7.01	ND	ND	ND	ND
Sapphire	6/5/2012	GP	0.35	15	19	170	6.88	ND	ND	2.5	ND
Sapphire	6/27/2012	GP	0.77	13	17	190	7.12	ND	ND	ND	ND
Sapphire	7/11/2012	PP	0.56	12	18	220	6.91	ND	ND	ND	ND
Sapphire	7/25/2012	GP	2.5	16	16	220	6.81	ND	ND	ND	ND
Sapphire	8/8/2012	GP	1	9.5	14	240	6.87	1470	ND	8.5	ND
Sapphire	8/14/2012	GP	2.7	65	22	260	6.05	ND	ND	8.1	ND
Sapphire	8/22/2012	GP	0.65	9.6	18	330	7.04	ND	ND	2.6	ND
Sapphire	9/5/2012	GP	0.67	14	19	270	7.08	ND	ND	ND	ND
Sapphire	9/19/2012	GP	0.19	12	19	190	7.08	ND	ND	2.6	ND

Average	1.10	12.96	13.51	172.75
Max	7	65	22	330
Min	ND	4.6	4.9	75.0
Median	0.6	9.6	15.0	170.0
STD Dev	1.66	12.78	5.89	69.35

Alaska WQC	1	3.1	8.2	81	<6.5, >8.5	43				0.0075
Stationary Permit Limits	28	50	40	188	<6.5, >8.5	43	150	60		0.01
Underway Permit Limits	51	50	40	188	<6.5, >8.5	43	150	60		0.01

Regent Seven Seas Cruises

The Seven Seas Navigator, operated by Regent, uses a Scanship treatment system, and was authorized to discharge while underway under the 2010 General Permit. The Seven Seas Navigator only sampled once in June, the ship stopped discharging after the fecal coliform exceedance that occurred that month.

- The Seven Seas Navigator had two exceedances of General Permit limits in 2012 for fecal coliform bacteria daily maximum, and one exceedance each for each dissolved copper and pH.

Seven Seas Navigator 2012 Sampling

Sample Date	Units	mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
	Type	Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliform	TSS	BOD	TR Chlorine
5/5/2012	GP	26	34	28	63	6.98	ND	20	17	ND
5/7/2012	GP	12	5.4	26	76	6.52	ND	39	38	ND
6/3/2012	PP	8.4	7.1	8.6	33	6.9	320	13	17	ND
7/21/2012	GP	42	7.7	7.6	22	6.81	37	9	13	ND
7/27/2012	GP	16	12	7.9	37	6.72	16	ND	6.9	ND
7/29/2012	GP	6.3	20	8.3	41	6.61	ND	ND	5.2	ND
8/4/2012	PP	34	23	22	86	6.35	56	38	11	ND
8/11/2012	GP	45	0.25	0.25	23	6.73	2	6	8.2	ND

Average	23.71	13.68	13.58	47.63
Max	45	34	28	86
Min	6.3	0.3	0.3	22
Median	21.0	9.9	8.5	39.0
STD Dev	15.27	11.15	10.22	24.34

Alaska WQC	1	3.1	8.2	81	<6.5, >8.5	43				0.0075
Underway Permit Limits	68	26	28	267	<6.5, >8.5	43	150	60		0.01

3. 2012 SUMMARY

Large cruise ships have been required to meet federal secondary treatment standards (fecal coliform, pH, total residual chlorine, biochemical oxygen demand, and total suspended solids) for wastewater discharges since 2001. Treatment systems installed during or after the year 2001 were designed to meet these secondary treatment standards. Ballot Measure 2 of 2006 required DEC to issue wastewater discharge permits to cruise ships and required cruise ships to meet Alaska Water Quality Criteria (AWQC) at the point of discharge (i.e. no mixing zone). Cruise ships were able to meet this requirement for all constituents except ammonia and dissolved copper, nickel, and zinc. The 2008 and 2010 General Permit allowed interim limits more stringent than AWQC while working towards meeting long-term limits of AWQC at the point of discharge.

3.1. 2010 Large Cruise Ship General Permit limit exceedances

Under the 2010 General Permit, ammonia and dissolved copper were expected to be the most difficult limits for cruise ships to meet. Cruise ships reported 22 exceedances of permit limits in 2012, as follows:

- 6 exceedances for pH (n=167 samples, 96.4% compliance);
- 1 exceedance for residual chlorine (n=168, 99.4% compliance);
- 1 exceedance for ammonia (n=167, 99.4% compliance);
- 4 exceedances for dissolved copper (n=167, 97.6% compliance);
- 1 exceedance for dissolved nickel (n=167, 99.4% compliance);
- 3 exceedances for biochemical oxygen demand (including monthly average exceedances; n=168, 98.2%); and
- 6 exceedances for fecal coliform bacteria (including monthly limit exceedances; n=166, 96.4% compliance)
- There were no exceedances of dissolved zinc or total suspended solids.

In 2012, exceedances of the limits established before Ballot Measure 2 (BOD, fecal coliform, pH) was greater than the number of exceedances of ammonia and dissolved metals permit limits.

3.2. Exceedances of Alaska water quality criteria at the point of discharge

Every discharging ship had at least one exceedance of Alaska Water Quality criteria at the point of discharge for either ammonia or dissolved metals. The Carnival Spirit was the only ship that met Alaska Water Quality criteria for ammonia 100% of the time (n=10.) The Statendam was the only ship that met Alaska Water Quality criteria for dissolved copper 100% of the time (n=10.) Four large cruise ships (Carnival Spirit, Island Princess, Norwegian Pearl, and Sea Princess) met the Alaska Water Quality criteria for dissolved nickel 100% of the time (n=10 for each ship.) Six large cruise ships (Carnival Spirit, Island Princess, Sea Princess, Star Princess, Statendam, and Zaandam) met the Alaska Water Quality criteria for dissolved zinc 100% of the time (n=10 for each ship.)

APPENDIX 1. GENERAL PERMIT LIMITS

The 2010 Large Cruise Ship General Permit:

- Required that discharges meet effluent limits for listed sampled parameters¹. The permitted limits are based on the stricter of either the Water Quality criteria multiplied by the dilution factor used; or the historical (2004-2009) effluent performance of each treatment system.
- Created limits for two types of discharge- underway (speed of over six knots) and stationary².
- Prohibited discharge into impaired waterways such as Skagway Harbor.
- Prohibited discharge of foam, oily wastes, garbage, or grease into State waters.
- Required owners/operators to submit signed Notice of Intent to Discharge that lists treatment, storage, and contact information. Discharge is prohibited until DEC authorization.
- Required companies to certify that they don't use tributyltin paints.
- Required sampling twice per month for: biological oxygen demand (BOD), fecal coliform bacteria, total residual chlorine, ammonia, dissolved metals (copper, nickel and zinc), pH, and total suspended solids (TSS). Samples must be taken while the ship is discharging in Alaskan waters.
- Required sampling for Volatile Organic Compounds, Base Neutral Acids, metals, and several other parameters twice per season.
- Required Monthly submission of Discharge Monitoring Reports containing sample data.

The effluent limits listed in the 2010 Wastewater General Permit are summarized in the table below. Limits for ammonia, copper, nickel, and zinc are listed in Table A-2.

Table A-1: 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	Twice Monthly	Field test
Ammonia	N/A	N/A	Varies by treatment system	Twice Seasonally	Grab
Copper	N/A	N/A	Varies by treatment system	Twice Seasonally	Grab
Nickel	N/A	N/A	Varies by treatment system	Twice Seasonally	Grab
Zinc	N/A	N/A	Varies by treatment system	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

¹ Listed in Tables 1 through 7 of the 2010 ADEC wastewater General Permit

² Geometric mean

Effluent Characteristics	Minimum Value ¹	Monthly Average ¹	Daily Maximum ¹	Minimum Frequency	Sample Type
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

Notes:

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.

Table A-2: 2010 Effluent Limits for Ammonia and Dissolved Metals

Ammonia Limits as mg/L	2008 Long Term Limit	2008 Interim Limit	2010 Underway Limit	2010 Stationary Limit
Hamworthy	2.9	80.4	143	28
Marisan	2.9	80.4	20	20
Other	2.9	80.4	130	28
Rochem	2.9	80.4	12	12
Scanship	2.9	80.4	68	28
Zenon	2.9	80.4	51	28
Copper Limits as µg/L	2008 Long Term Limit	2008 Interim Limit	2010 Underway Limit	2010 Stationary Limit
Hamworthy	3.1	66	133	87
Marisan	3.1	66	157	87
Other	3.1	66	130	87
Rochem	3.1	66	10	10
Scanship	3.1	66	26	26
Zenon	3.1	66	50	50
Nickel Limits as µg/L	2008 Long Term Limit	2008 Interim Limit	2010 Underway Limit	2010 Stationary Limit
Hamworthy	8.2	180	63	63
Marisan	8.2	180	24	24
Other	8.2	180	43	43
Rochem	8.2	180	10	10
Scanship	8.2	180	28	28
Zenon	8.2	180	40	40
Zinc Limits as µg/L	2008 Long Term Limit	2008 Interim Limit	2010 Underway Limit	2010 Stationary Limit
Hamworthy	82	230	395	395
Marisan	82	230	112	112
Other	82	230	360	360
Rochem	82	230	118	118
Scanship	82	230	267	267
Zenon	82	230	188	188

APPENDIX 2: 2012 LARGE CRUISE SHIP WASTEWATER SAMPLE DATA

Table A-3: Semi-monthly parameters

Explanation of color codes	
	Exceedance General Permit Limits
	Exceedance of Alaska WQC
	Exceedance of a monthly average
	Discharging only treated graywater
	Parameter not tested
	Not Discharging in Alaska Waters
Results from 2011 Discharge monitoring reports and attached sample results, all sample results taken while discharging and in Alaska	

2012 SemiMonthly General Permit Sample Results										ND= Non-detect				
Company	Vessel	Treatment System	Wastewater Type	Sample Date	Type	mg/L Ammonia	ug/L Copper	ug/L Nickel	ug/L Zinc	S.U. pH	col. per 100 ml Fecal Coliform	mg/L TSS	BOD	mg/L Chlorine
Total Residual														
Carnival	Spirit	Rochem BIP	Graywater	5/19/2012	GP	0.47	2.1	0.25	11	7.53	ND	ND	6.2	ND
Carnival	Spirit	Rochem BIP	Graywater	5/26/2012	GP	0.64	3	0.25	10	7.42	ND	ND	13	ND
Carnival	Spirit	Rochem BIP	Graywater	6/2/2012	PP	0.44	3.2	0.25	10	7.84	ND	ND	11	ND
Carnival	Spirit	Rochem BIP	Graywater	6/9/2012	GP	0.65	2.1	0.25	5.6	7.05	ND	ND	8.8	ND
Carnival	Spirit	Rochem BIP	Graywater	7/7/2012	GP	0.71	2.9	0.25	4.4	7.85	ND	ND	10	ND
Carnival	Spirit	Rochem BIP	Graywater	7/14/2012	GP	0.64	2.8	0.25	6.6	7.85	ND	ND	9.5	ND
Carnival	Spirit	Rochem BIP	Graywater	7/21/2012	USCG					6.91	14	ND	16	ND
Carnival	Spirit	Rochem BIP	Graywater	8/4/2012	PP	0.63	2.9	0.25	3.5	7.47	ND	ND	12	ND
Carnival	Spirit	Rochem BIP	Graywater	8/18/2012	GP	0.63	2.3	0.25	4.7	7.95	ND	ND	12	ND
Carnival	Spirit	Rochem BIP	Graywater	9/1/2012	GP	0.57	3.5	0.25	9.1	7.34	ND	ND	11	ND
Carnival	Spirit	Rochem BIP	Graywater	9/8/2012	GP	0.71	2.9	0.25	24	7.25	ND	ND	8.9	ND
Disney	Wonder	Hamworthy	Mixed	5/25/2012	GP	1.4	4.4	11	190	6.72	ND	ND	ND	ND
Disney	Wonder	Hamworthy	Mixed	6/8/2012	GP	39	7.1	11	140	7.09	ND	5	ND	ND
Disney	Wonder	Hamworthy	Mixed	6/15/2012	PP	12	5.5	10	150	6.92	ND	ND	ND	ND
Disney	Wonder	Hamworthy	Mixed	7/13/2012	GP	27	17	16	210	7.11	ND	ND	ND	ND
Disney	Wonder	Hamworthy	Mixed	7/20/2012	GP	21	4.4	18	170	7.02	ND	ND	ND	ND
Disney	Wonder	Hamworthy	Mixed	8/10/2012	GP	8.8	12	18	220	6.83	ND	ND	ND	ND
Disney	Wonder	Hamworthy	Mixed	8/17/2012	PP	17	7.6	14	160	7.01	ND	ND	ND	ND
Disney	Wonder	Hamworthy	Mixed	9/7/2012	GP	7	18	13	180	6.73	ND	ND	ND	ND
Holland America	Statendam	Zenon	Mixed	5/24/2012	GP	36	2.2	24	12	7.25	ND	ND	ND	ND
Holland America	Statendam	Zenon	Mixed	5/31/2012	GP	46	1.8	19	9.4	7.12	ND	ND	2.3	ND
Holland America	Statendam	Zenon	Mixed	6/14/2012	PP	32	1.5	13	16	7.16	ND	ND	3.2	ND
Holland America	Statendam	Zenon	Mixed	6/28/2012	GP	34	1.8	12	8.4	7.2	ND	ND	5.8	ND
Holland America	Statendam	Zenon	Mixed	7/12/2012	GP	28	2.6	13	7.3	7.25	ND	ND	2.5	ND
Holland America	Statendam	Zenon	Mixed	7/19/2012	GP	33	2	14	9.6	7.42	ND	ND	ND	ND
Holland America	Statendam	Zenon	Mixed	8/9/2012	GP	46	2.3	17	4.3	7.23	ND	ND	2.1	ND
Holland America	Statendam	Zenon	Mixed	8/16/2012	GP	35	2.7	15	5.6	7.52	ND	ND	ND	ND
Holland America	Statendam	Zenon	Mixed	9/13/2012	GP	30	2.9	18	7.5	7.22	ND	ND	3	ND
Holland America	Statendam	Zenon	Mixed	9/20/2012	GP	33	3	19	7.2	6.95	ND	ND	4.7	ND
Holland America	Volendam	Zenon	Mixed	5/4/2012	GP	13	58	19	110	7.04	ND	ND	ND	ND
Holland America	Volendam	Zenon	Mixed	5/11/2012	GP	13	15	32	71	6.78	ND	ND	ND	ND
Holland America	Volendam	Zenon	Mixed	6/5/2012	GP	14	4.4	6.3	69	7.17	ND	ND	ND	ND
Holland America	Volendam	Zenon	Mixed	6/15/2012	GP	6.3	12	6.3	50	6.98	ND	ND	ND	ND
Holland America	Volendam	Zenon	Mixed	7/6/2012	GP	15	6.9	7.8	58	7.27	ND	ND	ND	ND
Holland America	Volendam	Zenon	Mixed	7/20/2012	GP	14	5.5	8.4	64	7.06	ND	ND	ND	ND
Holland America	Volendam	Zenon	Mixed	8/3/2012	GP	21	5.1	8.3	100	7.28	ND	ND	ND	ND
Holland America	Volendam	Zenon	Mixed	8/10/2012	PP	11	7	7.4	70	7.2	ND	ND	ND	ND
Holland America	Volendam	Zenon	Mixed	9/7/2012	GP	11	4.1	9.1	43	7.12	ND	ND	ND	ND
Holland America	Volendam	Zenon	Mixed	9/14/2012	GP	27	4.2	7.6	42	7.31	ND	ND	ND	ND
Holland America	Westerdam	Some GW mixed												
Holland America	Zaandam	Zenon	Mixed	5/8/2012	GP	0.68	3.6	14	42	7.07	ND	ND	ND	ND
Holland America	Zaandam	Zenon	Mixed	5/16/2012	PP	36	34	13	40	7.56	ND	ND	ND	ND
Holland America	Zaandam	Zenon	Mixed	6/7/2012	GP	1.8	6.9	7.8	67	7.14	ND	ND	ND	ND
Holland America	Zaandam	Zenon	Mixed	6/13/2012	GP	0.31	3.7	9.7	53	7.3	ND	ND	35	ND
Holland America	Zaandam	Zenon	Mixed	7/5/2012	GP	6.8	3.2	9.4	47	7.22	ND	ND	ND	ND
Holland America	Zaandam	Zenon	Mixed	7/19/2012	GP	28	2.5	9.1	43	7.33	ND	ND	ND	ND
Holland America	Zaandam	Zenon	Mixed	8/2/2012	GP	8.8	4.8	12	55	6.81	ND	ND	ND	ND
Holland America	Zaandam	Zenon	Mixed	8/16/2012	GP	21	12	4	17	7.32	ND	ND	ND	ND
Holland America	Zaandam	Zenon	Mixed	9/5/2012	GP	22	3	8.1	59	7.14	ND	ND	ND	ND
Holland America	Zaandam	Zenon	Mixed	9/13/2012	GP	17	4.1	8.3	55	7.08	ND	ND	ND	ND
Norwegian	Jewel	Scanship	Mixed	5/23/2012	GP	32	1.7	4	24	6.73	ND	ND	2.3	ND
Norwegian	Jewel	Scanship	Mixed	5/30/2012	GP	35	1.3	5.3	32	6.75	ND	ND	4.6	ND
Norwegian	Jewel	Scanship	Mixed	6/13/2012	PP	41	1.1	4.3	55	6.81	ND	4	21	ND
Norwegian	Jewel	Scanship	Mixed	6/20/2012	GP	34	1.5	5.6	46	6.67	ND	ND	3.8	ND
Norwegian	Jewel	Scanship	Mixed	7/11/2012	GP	29	2.9	5.7	95	6.74	ND	ND	2.1	ND
Norwegian	Jewel	Scanship	Mixed	7/18/2012	PP	37	3.4	7.1	110	6.8	ND	4	3.7	ND
Norwegian	Jewel	Scanship	Mixed	8/15/2012	GP	32	2.1	30	160	6.89	ND	ND	3.5	ND
Norwegian	Jewel	Scanship	Mixed	8/28/2012	GP	3.5	2.9	5.7	150	6.76	ND	ND	ND	ND
Norwegian	Jewel	Scanship	Mixed	9/5/2012	GP	31	2.6	5.3	140	6.61	ND	ND	2.8	ND
Norwegian	Jewel	Scanship	Mixed	9/18/2012	GP	23	3	5.2	130	6.61	ND	4	ND	ND
Norwegian	Pearl	Scanship	Mixed	5/9/2012	GP	33	4.8	6.6	40	6.73	ND	ND	5.1	ND
Norwegian	Pearl	Scanship	Mixed	5/16/2012	PP	21	4.4	5.8	93	6.67	ND	ND	9	ND
Norwegian	Pearl	Scanship	Mixed	6/13/2012	GP	28	1.8	4.2	150	6.67	6	ND	11	ND
Norwegian	Pearl	Scanship	Mixed	6/20/2012	GP	24	2.6	4.9	77	6.59	ND	ND	7.9	ND
Norwegian	Pearl	Scanship	Mixed	7/18/2012	PP	20	6.7	7	57	7.12	6.2	6	11	ND
Norwegian	Pearl	Scanship	Mixed	7/25/2012	GP	19	2.8	6.3	67	6.8	ND	ND	12	ND
Norwegian	Pearl	Scanship	Mixed	8/8/2012	GP	18	2.7	4.4	49	6.91	2	ND	5.5	ND
Norwegian	Pearl	Scanship	Mixed	8/15/2012	GP	22	6.3	4.7	22	6.93	40	19	18	ND
Norwegian	Pearl	Scanship	Mixed	9/5/2012	GP	21	2.9	8	86	6.65	ND	ND	6.4	ND
Norwegian	Pearl	Scanship	Mixed	9/19/2012	GP	24	4.5	4.8	57	6.76	2	4	6.9	ND
Princess	Coral	Hamworthy	Mixed acc. Gray	5/18/2012	GP	69	19	10	54	7.22	ND	ND	110	ND
Princess	Coral	Hamworthy	Mixed acc. Gray	5/25/2012	PP	84	9.7	10	72	7.51	ND	ND	32	ND
Princess	Coral	Hamworthy	Mixed acc. Gray	6/8/2012	GP	23	16	13	100	7.04	ND	ND	ND	ND
Princess	Coral	Hamworthy	Mixed acc. Gray	6/22/2012	GP	28	6.7	13	89	6.96	ND	ND	3.2	ND
Princess	Coral	Hamworthy	Mixed acc. Gray	7/20/2012	GP	23	12	6.4	100	7.16	ND	ND	ND	ND
Princess	Coral	Hamworthy	Mixed acc. Gray	7/26/2012	GP	23	18	20	85	7.3	ND	ND	3.6	ND
Princess	Coral	Hamworthy	Mixed acc. Gray	8/10/2012	GP	29	13	12	100	7.33	ND	ND	ND	ND
Princess	Coral	Hamworthy	Mixed acc. Gray	8/17/2012	PP	19	22	7.5	110	7.33	ND	4	ND	ND
Princess	Coral	Hamworthy	Mixed acc. Gray	9/7/2012	GP	23	23	15	86	7.07	ND	ND	ND	ND
Princess	Dawn	Hamworthy	Mixed acc. Gray	9/7/2012	PP	7.4	4.8	7.2	82	7.02	ND	ND	ND	ND
Princess	Diamond	Hamworthy	Mixed acc. Gray	5/22/2012	GP	87	4.4	14	57	7.86	ND	ND	21	ND
Princess	Diamond	Hamworthy	Mixed acc. Gray	5/25/2012	GP	89	5.2	15	40	7.63	ND	ND	27	ND
Princess	Diamond	Hamworthy	Mixed acc. Gray	6/13/2012	GP	110	4.9	23	60	7.5	ND	ND	21	ND
Princess	Diamond	Hamworthy	Mixed acc. Gray	6/20/2012	GP	96	7.2	20	58	7.48	ND	ND	13	ND
Princess	Diamond	Hamworthy	Mixed acc. Gray	7/11/2012	GP	0.1	5.2	24	31	7.56	6.6	ND	49	ND
Princess	Diamond	Hamworthy	Mixed acc. Gray	7/18/2012	GP	34	4.7	14	55	7.48	ND	ND	26	ND
Princess	Diamond	Hamworthy	Mixed acc. Gray	8/1/2012	PP	96	6.4	15	52	7.62	ND	ND	22	ND
Princess	Diamond	Hamworthy	Mixed acc. Gray	8/15/2012	GP	8.7	11	15	85	7.68	ND	ND	3.8	ND
Princess	Diamond	Hamworthy	Mixed acc. Gray	9/5/2012	GP	37	14	12	180	7.15	ND	ND	2.2	ND
Princess	Diamond	Hamworthy	Mixed acc. Gray	9/12/2012	GP	54	24	15	160	7.36	ND	ND	2	ND

Explanation of color codes	
	Exceedance General Permit Limits
	Exceedance of Alaska WQC
	Exceedance of a monthly average
	Discharging only treated graywater
	Parameter not tested
	Not Discharging in Alaska Waters
Results from 2011 Discharge monitoring reports and attached sample results, all sample results taken while discharging and in Alaska	

2012 SemiMonthly General Permit Sample Results Part 2					ND= Non-detect									
Company	Vessel	Treatment System	Wastewater Type	Sample Date	Type	mg/L	ug/L	ug/L	ug/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
						Ammonia	Copper	Nickel	Zinc	pH	Coliform	TSS	BOD	Chlorine
														Total Residual
Princess	Golden	Hamworthy	Mixed acc. Gray	5/29/2012	GP	14	22	10	240	6.6	ND	ND	ND	ND
Princess	Golden	Hamworthy	Mixed acc. Gray	6/12/2012	PP	8.7	5.5	9.1	120	7.05	ND	ND	4.5	ND
Princess	Golden	Hamworthy	Mixed acc. Gray	6/19/2012	GP	0.27	5.4	9.4	150	7.01	ND	ND	2.3	ND
Princess	Golden	Hamworthy	Mixed acc. Gray	7/10/2012	GP	9	7.6	6.9	200	6.77	ND	ND	ND	ND
Princess	Golden	Hamworthy	Mixed acc. Gray	7/17/2012	GP	74	33	7	110	8.06	10	ND	2.8	ND
Princess	Golden	Hamworthy	Mixed acc. Gray	8/7/2012	GP	50	26	8.9	150	6.63	15	ND	6.8	ND
Princess	Golden	Hamworthy	Mixed acc. Gray	8/21/2012	PP	1.5	7.4	12	140	6.94	ND	ND	ND	ND
Princess	Golden	Hamworthy	Mixed acc. Gray	9/4/2012	GP	0.12	5.1	7.3	80	7.11	ND	ND	ND	ND
Princess	Golden	Hamworthy	Mixed acc. Gray	9/11/2012	GP	0.13	3.8	7.3	120	7.01	ND	ND	ND	ND
Princess	Golden	Hamworthy	Graywater	5/28/2012	GP	0.21	7.3	7.3	170	7.51	ND	ND	ND	ND
Princess	Golden	Hamworthy	Graywater	6/11/2012	PP	1.8	4.6	6.3	100	6.93	2	ND	27	ND
Princess	Golden	Hamworthy	Graywater	6/18/2012	GP	0.21	8.6	6.2	120	6.98	ND	ND	ND	ND
Princess	Golden	Hamworthy	Graywater	7/9/2012	GP	7.4	9.4	4.9	75	6.75	ND	ND	ND	ND
Princess	Golden	Hamworthy	Graywater	7/16/2012	GP	0.3	6.5	5.8	110	6.73	ND	ND	ND	ND
Princess	Golden	Hamworthy	Graywater	8/5/2012	GP	0.12	4.9	8.9	90	6.79	40	ND	8	ND
Princess	Golden	Hamworthy	Graywater	8/20/2012	PP	0.55	9.1	9.9	140	7.06	ND	ND	ND	ND
Princess	Golden	Hamworthy	Graywater	9/3/2012	GP	0.1	6.2	11	100	7.25	ND	ND	ND	ND
Princess	Golden	Hamworthy	Graywater	9/10/2012	GP	0.13	6.4	7.8	110	6.75	ND	ND	ND	ND
Princess	Island	Hamworthy	Mixed acc. Gray	5/19/2012	GP	51	13	7.8	72	7.17	ND	ND	3.5	ND
Princess	Island	Hamworthy	Mixed acc. Gray	5/27/2012	GP	110	8.2	6.3	11	7.31	ND	ND	ND	ND
Princess	Island	Hamworthy	Mixed acc. Gray	6/17/2012	PP	62	16	4.7	71	7.31	ND	ND	ND	ND
Princess	Island	Hamworthy	Mixed acc. Gray	6/24/2012	GP	49	6.2	7.9	33	7.18	ND	ND	8.9	ND
Princess	Island	Hamworthy	Mixed acc. Gray	7/1/2012	GP	32	11	5.4	73	7.22	ND	ND	ND	ND
Princess	Island	Hamworthy	Mixed acc. Gray	7/15/2012	GP	52	15	5.7	64	7.31	ND	ND	ND	ND
Princess	Island	Hamworthy	Mixed acc. Gray	8/12/2012	PP	79	11	5	39	7.4	ND	ND	ND	ND
Princess	Island	Hamworthy	Mixed acc. Gray	8/19/2012	GP	40	13	6.7	42	7.37	ND	ND	2.6	ND
Princess	Island	Hamworthy	Mixed acc. Gray	9/16/2012	GP	91	17	5.4	23	7.57	ND	ND	36	ND
Princess	Island	Hamworthy	Mixed acc. Gray	9/23/2012	GP	94	28	5.1	22	7.35	4	ND	3.2	ND
Princess	Sapphire	Hamworthy	Mixed acc. Gray	5/23/2012	GP	59	9.6	17	170	7.37	ND	ND	32	ND
Princess	Sapphire	Hamworthy	Mixed acc. Gray	5/30/2012	PP	6.5	11	20	160	7.27	ND	ND	3.2	ND
Princess	Sapphire	Hamworthy	Mixed acc. Gray	6/6/2012	GP	61	14	16	140	8.01	ND	ND	11	ND
Princess	Sapphire	Hamworthy	Mixed acc. Gray	6/27/2012	GP	1.3	13	19	220	6.96	ND	ND	ND	ND
Princess	Sapphire	Hamworthy	Mixed acc. Gray	7/11/2012	PP	23	11	17	230	7.72	ND	ND	ND	ND
Princess	Sapphire	Hamworthy	Mixed acc. Gray	7/25/2012	GP	74	12	13	230	7.98	ND	ND	6.3	ND
Princess	Sapphire	Hamworthy	Mixed acc. Gray	8/8/2012	GP	59	7.7	12	190	7.85	ND	ND	37	ND
Princess	Sapphire	Hamworthy	Mixed acc. Gray	8/14/2012	GP	42	18	17	300	7.57	ND	ND	5.6	ND
Princess	Sapphire	Hamworthy	Mixed acc. Gray	8/22/2012	GP	43	9	17	240	7.8	10	ND	9.6	ND
Princess	Sapphire	Hamworthy	Mixed acc. Gray	9/5/2012	GP	59	13	17	240	7.83	ND	ND	3.6	ND
Princess	Sapphire	Hamworthy	Mixed acc. Gray	9/19/2012	GP	37	10	17	160	8.27	ND	ND	13	ND
Princess	Sapphire	Hamworthy	Graywater	5/22/2012	GP	0.94	16	19	150	7.08	ND	ND	ND	0.25
Princess	Sapphire	Hamworthy	Graywater	5/30/2012	GP	0.93	14	21	200	7.01	ND	ND	ND	ND
Princess	Sapphire	Hamworthy	Graywater	6/5/2012	GP	0.35	15	19	170	6.88	ND	ND	2.5	ND
Princess	Sapphire	Hamworthy	Graywater	6/27/2012	GP	0.77	13	17	190	7.12	ND	ND	ND	ND
Princess	Sapphire	Hamworthy	Graywater	7/11/2012	PP	0.56	12	18	220	6.91	ND	ND	ND	ND
Princess	Sapphire	Hamworthy	Graywater	7/25/2012	GP	2.5	16	16	220	6.81	ND	ND	ND	ND
Princess	Sapphire	Hamworthy	Graywater	8/8/2012	GP	1	9.5	14	240	6.87	ND	ND	8.5	ND
Princess	Sapphire	Hamworthy	Graywater	8/14/2012	GP	2.7	65	22	260	6.88	ND	ND	8.1	ND
Princess	Sapphire	Hamworthy	Graywater	8/22/2012	GP	0.65	9.6	18	330	7.04	ND	ND	2.6	ND
Princess	Sapphire	Hamworthy	Graywater	9/5/2012	GP	0.67	14	19	270	7.08	ND	ND	ND	ND
Princess	Sapphire	Hamworthy	Graywater	9/19/2012	GP	0.19	12	19	190	7.08	ND	ND	2.6	ND
Princess	Sea	Hamworthy	Mixed acc. Gray	5/17/2012	GP	28	24	5.1	43	7.04	ND	ND	ND	ND
Princess	Sea	Hamworthy	Mixed acc. Gray	5/28/2012	GP	46	24	3.6	45	7.24	ND	9	ND	ND
Princess	Sea	Hamworthy	Mixed acc. Gray	6/7/2012	PP	26	23	3.6	51	7.14	ND	4	4.3	ND
Princess	Sea	Hamworthy	Mixed acc. Gray	6/27/2012	GP	48	0.25	4.8	21	7.47	ND	5	5.4	ND
Princess	Sea	Hamworthy	Mixed acc. Gray	7/6/2012	GP	48	18	4.1	17	7.45	ND	ND	5.1	ND
Princess	Sea	Hamworthy	Mixed acc. Gray	7/27/2012	GP	55	16	5	33	7.49	ND	ND	2.3	ND
Princess	Sea	Hamworthy	Mixed acc. Gray	8/6/2012	GP	53	13	5.5	29	7.5	ND	ND	6.1	ND
Princess	Sea	Hamworthy	Mixed acc. Gray	8/16/2012	PP	52	16	4.4	18	7.38	ND	ND	6.8	ND
Princess	Sea	Hamworthy	Mixed acc. Gray	9/5/2012	GP	31	16	3.3	23	7.27	ND	13	ND	ND
Princess	Sea	Hamworthy	Mixed acc. Gray	9/6/2012	GP	40	9.4	3.2	36	7.33	ND	ND	13	ND
Princess	Star	Hamworthy	Mixed acc. Gray	5/24/2012	GP	0.29	94	8.7	4.7	8.26	96	27	ND	ND
Princess	Star	Hamworthy	Mixed acc. Gray	5/31/2012	GP	75	150	210	34	7.17	ND	ND	6.2	ND
Princess	Star	Hamworthy	Mixed acc. Gray	6/7/2012	PP	0.8	120	42	32	7.5	ND	ND	ND	ND
Princess	Star	Hamworthy	Mixed acc. Gray	6/21/2012	GP	1.6	6.9	9.7	31	8.07	ND	15	2.8	ND
Princess	Star	Hamworthy	Mixed acc. Gray	7/12/2012	GP	86	160	28	56	7.42	ND	ND	3.4	ND
Princess	Star	Hamworthy	Mixed acc. Gray	7/19/2012	PP	17	75	15	53	7.28	33	ND	ND	ND
Princess	Star	Hamworthy	Mixed acc. Gray	8/9/2012	GP	0.32	27	2.7	4	8.17	110	8	2.9	ND
Princess	Star	Hamworthy	Mixed acc. Gray	8/16/2012	GP	70	48	17	56	7.36	ND	ND	3	ND
Princess	Star	Hamworthy	Mixed acc. Gray	8/23/2012	GP	85	66	16	70	7.43	2	ND	6.2	ND
Princess	Star	Hamworthy	Mixed acc. Gray	9/6/2012	GP	66	18	11	57	7.27	ND	ND	3	ND
Princess	Star	Hamworthy	Mixed acc. Gray	9/19/2012	GP	91	46	7	59	7.35	N	ND	2.6	ND
Seven Seas	Navigator	Scanship	Mixed	5/5/2012	GP	26	34	28	63	6.98	ND	20	17	ND
Seven Seas	Navigator	Scanship	Mixed	5/7/2012	GP	12	5.4	26	76	6.52	ND	39	38	ND
Seven Seas	Navigator	Scanship	Mixed	6/3/2012	PP	8.4	7.1	8.6	33	6.9	220	13	17	ND
Seven Seas	Navigator	Scanship	Mixed	7/21/2012	GP	42	7.7	7.6	22	6.81	37	9	13	ND
Seven Seas	Navigator	Scanship	Mixed	7/27/2012	GP	16	12	7.9	37	6.72	16	ND	6.9	ND
Seven Seas	Navigator	Scanship	Mixed	7/29/2012	GP	6.3	20	8.3	41	6.61	ND	ND	5.2	ND
Seven Seas	Navigator	Scanship	Mixed	8/4/2012	PP	34	23	22	86	6.35	56	38	11	ND
Seven Seas	Navigator	Scanship	Mixed	8/11/2012	GP	45	0.25	0.25	23	6.73	2	6	8.2	ND
Silver	Silver Shadow	Marisan	Mixed											

Table A-4: Semi-seasonal conventional parameters

Vessel	Sample Date	Chemical O ₂ Demand	Free Chlorine	Residual Chlorine	Conductivity	Hexane Extractable Material	Total Organic Carbon	Alkalinity, Total (As CaCO ₃)	Nitrate as N	Nitrogen, Nitrate-Nitrite (as N)	Total Phosphorus	Total Kjeldahl Nitrogen	Total Settable Solids
	Detection Limit Units	10.00 mg/l	0.10 mg/l	0.10 mg/l	2.00 umhos/cm	5.00 mg/l	1.00 mg/l	2.00 mg/l	1.00 mg/L	1.00 mg/L	0.05 mg/l	1.00 mg/l	mg/l
Alaska Water Quality Standards		None	None	0.0075	None	None	None	None	None	None	None	None	None
Carnival Spirit	6/2/12	22	ND	ND	84.3	ND	5.1	46	ND	ND	ND	3.7	ND
Carnival Spirit	8/4/12	31	ND	ND	72.5	ND	7.4	35	ND	ND	ND	1.2	ND
Carnival Spirit	8/18/12		ND	ND					ND				
Disney Wonder	6/15/12	54	ND	ND	751	ND	14	100		4	5.7	18	ND
Disney Wonder	8/17/12	25	ND	ND	678	ND	8.6	120	2.18	1.2	1.9	18	ND
Disney Wonder	9/7/12		ND	ND					10.3				
Statendam	6/14/12	70	ND	ND	764	ND	270	200		ND	0.24	36	ND
Statendam	8/29/12	59	ND	ND	787	ND	12	210	ND	ND	ND	44	ND
Statendam	9/13/12		ND	ND					ND				
Volendam	6/1/12	17	ND	ND	520	ND	6.5	150		ND	2.2	12	ND
Volendam	8/10/12	52	ND	ND	530	ND	1.7	150		1.5	3	14	ND
Volendam	9/7/12		ND	ND					0.905				
Zaandam	5/16/12	52	ND	ND	679	ND	15	220		1	2.6	31	ND
Zaandam	8/2/12	59	ND	ND	615	ND	8.4	110		6.7	4.2	11	ND
Zaandam	8/16/12		ND	ND					ND				
Zaandam	9/5/12		ND	ND					2.72				
Norwegian Jewel	6/13/12	77	ND	ND	915	ND	16	180		ND	ND	49	ND
Norwegian Jewel	7/13/12	43	ND	ND	1130	ND	11	140		ND	ND	38	ND
Vessel	Sample Date	Chemical O ₂ Demand	Free Chlorine	Residual Chlorine	Conductivity	Hexane Extractable Material	Total Organic Carbon	Alkalinity, Total (As CaCO ₃)	Nitrate as N	Nitrogen, Nitrate-Nitrite (as N)	Total Phosphorus	Total Kjeldahl Nitrogen	Total Settable Solids
	Detection Limit Units	10.00 mg/l	0.10 mg/l	0.10 mg/l	2.00 umhos/cm	5.00 mg/l	1.00 mg/l	2.00 mg/l	1.00 mg/L	1.00 mg/L	0.05 mg/l	1.00 mg/l	mg/l
Alaska Water Quality Standards		None	None	0.0075	None	None	None	None	None	None	None	None	None
Norwegian Jewel	8/15/12		ND	ND					ND				
Norwegian Jewel	9/5/12		ND	ND					ND				
Norwegian Pearl	5/16/12	61	ND	ND	700	ND	14	120		ND	ND	21	ND
Norwegian Pearl	7/18/12	110	ND	ND	1880	ND	19	160		ND	0.3	24	ND
Norwegian Pearl	8/15/12		ND	ND					ND				
Norwegian Pearl	9/5/12		ND	ND					ND				
Coral Princess	5/25/12	120	ND	ND	1460	ND	38	500		ND	16	83	ND
Coral Princess	8/17/12	70	ND	ND	1970	ND	15	120	0.71	2.1	13	25	ND
Coral Princess	9/7/12		ND	ND					0.77				
Dawn Princess	9/7/12	31	ND	ND	852	ND	10	110	ND	ND	4.7	12	ND
Diamond Princess	5/30/12	110	ND	ND	1370	ND	27	480		ND	8.9	91	ND
Diamond Princess	8/1/12	144	ND	ND	1310	ND	25	480		ND	6.4	98	ND
Diamond Princess	8/15/12		ND	ND					8.87				
Diamond Princess	9/5/12		ND	ND					0.96				
Golden Princess- GW	6/11/12	54	ND	ND	372	ND	12	55		0.65	0.66	3.1	ND
Golden Princess- GW	8/20/12	43	ND	ND	1440	ND	3.1	42	ND	ND	ND	2.6	ND
Golden Princess	6/12/12	63	ND	ND	3780	ND	9.7	74		5.4	1.1	11	ND
Golden Princess	8/21/12	43	ND	ND	2720	ND	2.8	46	ND	ND	0.22	2	ND
Island Princess	6/17/12	120	ND	ND	3410	ND	21	270		ND	11	68	ND
Island Princess	8/12/12	100	ND	ND	3390	ND	19	340		ND	10	93	ND
Vessel	Sample Date	Chemical O ₂ Demand	Free Chlorine	Residual Chlorine	Conductivity	Hexane Extractable Material	Total Organic Carbon	Alkalinity, Total (As CaCO ₃)	Nitrate as N	Nitrogen, Nitrate-Nitrite (as N)	Total Phosphorus	Total Kjeldahl Nitrogen	Total Settable Solids
	Detection Limit Units	10.00 mg/l	0.10 mg/l	0.10 mg/l	2.00 umhos/cm	5.00 mg/l	1.00 mg/l	2.00 mg/l	1.00 mg/L	1.00 mg/L	0.05 mg/l	1.00 mg/l	mg/l
Alaska Water Quality Standards		None	None	0.0075	None	None	None	None	None	None	None	None	None
Island Princess	8/19/12		ND	ND					0.72				
Island Princess	9/16/12		ND	ND					7.15				
Sapphire Princess- GW	5/30/12	13	ND	ND	945	ND	3.6	54		3.6	0.32	1.8	ND
Sapphire Princess- GW	7/11/12	ND	ND	ND	298	ND	2.5			1.4	0.41	0.63	ND
Sapphire Princess- GW	8/8/12		ND	ND				31					
Sapphire Princess- GW	8/14/12		ND	ND					12.5	13	1.6	0.94	ND
Sapphire Princess- GW	8/22/12		ND	ND					0.69				
Sapphire Princess	5/30/12	22	ND	ND	731	ND	11	140		1.1	0.92	7.8	ND
Sapphire Princess	7/11/12	12	ND	ND	616	ND	4.8			0.5	2.4	29	ND
Sapphire Princess	8/8/12		ND	ND				230					
Sapphire Princess	8/14/12		ND	ND					13.5	16	5.1	56	ND
Sapphire Princess	8/22/12		ND	ND					0.51				
Sea Princess	6/7/12	78	ND	ND	10800	ND	4.9	150		2.3	3.3	31	ND
Sea Princess	8/16/12	150	ND	ND	6880	ND	13	260	12.2	ND	4.7	54	ND
Sea Princess	9/5/12		ND	ND					14.5				
Star Princess	6/7/12	2000	ND	ND	29500	ND	ND	80		ND	ND	1.1	ND
Star Princess	7/19/12	37	ND	ND	842	ND	9.2	330		ND	6.4	ND	ND
Star Princess	8/16/12		ND	ND					0.5				
Star Princess	8/23/12		ND	ND					ND				
Seven Seas Mariner	6/3/12	71	ND	ND	1840	ND	17	86		ND	0.25	14	ND
Seven Seas Mariner	8/4/12	67	ND	ND	971	ND	13	48	2.4	0.21	1.3	31	ND
Seven Seas Mariner	8/11/12		ND	ND					5.97				
	MAX	2000	ND	ND	29500	ND	270	500	14.5	16	16	98	ND
	MIN	ND	ND	ND	72.5	ND	ND	31	ND	ND	ND	ND	ND
This table has ND=0													
	MEDIAN	59	NA	NA	915	NA	11.5	140	NA	NA	2.6	19.5	NA

Parameter not sampled

Includes parameters not found on the twice a month sample tables
ND= Non-detect

Table A-5: Full Suite Semi-seasonal Metal Sample Results

Semiseasonal Metal Samples																											
		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	
Vessel	Date																										
Carnival Spirit	6/2/12	ND	ND	ND	ND	ND	ND	ND	ND	1.3	ND	3.5	3.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	11	10
Carnival Spirit	8/4/12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.5	2.9	ND	ND	ND	ND	ND	ND	3.5	ND	ND	ND	ND	ND	5.7	3.5
Disney Wonder	6/15/12	ND	ND	1.5	1.5	ND	ND	ND	ND	1.8	1.6	6.2	5.5	ND	ND	ND	11	10	2.6	2.2	ND	ND	ND	ND	ND	150	150
Disney Wonder	8/17/12	1	ND	1.4	1.2	ND	ND	ND	ND	ND	1.4	10	7.6	1	1	ND	14	14	2.5	1.8	ND	ND	ND	ND	ND	170	160
Statendam	6/14/12	ND	ND	1.8	1.5	ND	ND	ND	ND	2.5	1.3	1.8	1.5	ND	ND	ND	13	13	5.6	4.2	ND	ND	ND	ND	ND	9.4	16
Statendam	8/29/12	1.1	ND	2.2	ND	ND	ND	ND	ND	ND	1.5	1.8	2.7	ND	ND	ND	14	15	4.1	4.2	ND	ND	ND	ND	ND	13	5.6
Statendam	9/13/12		1.1		1		ND		ND		1.2		2.9		ND			18		6.6		ND		ND		7.5	
Volendam	6/1/12	ND	ND	1.1	ND	ND	ND	ND	ND	1.5	1.5	4.5	4.4	ND	ND	ND	6.2	6.3	2.6	3.4	ND	ND	ND	ND	ND	57	69
Volendam	8/10/12	ND	ND	1.8	ND	ND	ND	ND	ND	1.3	1.2	6.1	7	ND	ND	ND	7.8	7.4	3.5	2.6	ND	ND	ND	ND	ND	68	70
Zaandam	5/16/12	ND	2	1.3	1.9	ND	ND	ND	ND	ND	ND	34	34	ND	ND	ND	13	13	2.5	ND	ND	ND	ND	ND	ND	38	40
Zaandam	8/2/12	ND	ND	1.1	ND	ND	ND	ND	ND	ND	ND	3.4	4.8	ND	ND	ND	14	12	3.3	3.3	ND	ND	ND	ND	ND	59	55
Norwegian Jewel	6/13/12	ND	1.1	ND	1.3	ND	ND	ND	ND	ND	ND	2.1	1.1	ND	ND	ND	4.4	4.3	1.4	2.1	ND	ND	ND	ND	ND	80	55
Norwegian Jewel	7/18/12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.3	3.4	ND	ND	ND	7.2	7.1	1.1	ND	ND	ND	ND	ND	ND	100	110
Norwegian Pearl	5/16/12	ND	ND	1	1	ND	ND	ND	ND	ND	ND	3.9	4.4	ND	ND	ND	5.8	5.8	1.6	ND	ND	ND	ND	ND	ND	92	93
Norwegian Pearl	7/18/12	ND	ND	8	ND	ND	ND	ND	ND	ND	ND	10	6.7	ND	ND	ND	4.1	7	25	12	ND	ND	ND	ND	ND	42	57
Coral Princess	5/25/12	ND	1	1.7	2.1	ND	ND	ND	ND	ND	ND	8.5	9.7	ND	ND	ND	9.9	10	3.7	3.4	ND	ND	ND	ND	ND	63	72
Coral Princess	8/17/12	1.5	1.4	4.1	2.7	ND	ND	ND	ND	1.2	ND	23	22	ND	ND	ND	7.3	7.5	11	6.9	ND	ND	ND	ND	ND	110	110
Dawn Princess	9/7/12	ND	ND	ND	1.2	ND	ND	ND	ND	3.9	ND	210	4.8	270	ND	ND	25	7.2	3.6	2.7	ND	ND	ND	ND	ND	960	82
Diamond Princess	5/30/12	ND	ND	2.3	2.2	ND	ND	ND	ND	ND	1.2	5.8	5.2	ND	ND	ND	15	15	5.6	5	ND	ND	ND	ND	ND	41	40
Diamond Princess	8/1/12	ND	ND	1.9	ND	ND	ND	ND	ND	1.2	1.7	6.6	6.4	ND	ND	ND	17	15	3.3	4.1	ND	ND	ND	ND	ND	64	52
Golden Princess- GW	6/11/12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.9	4.6	ND	ND	ND	6.1	6.3	3.3	3.1	ND	ND	ND	ND	ND	100	100
Golden Princess- GW	8/20/12	ND	ND	2.8	3	ND	ND	ND	ND	1.3	1.2	6.6	9.1	ND	ND	ND	9.5	9.9	12	14	ND	ND	ND	ND	ND	140	140
Golden Princess	6/12/12	ND	1.3	6.4	5.1	ND	ND	ND	ND	ND	ND	9.6	5.5	ND	ND	ND	8.9	9.1	23	19	ND	ND	ND	ND	ND	110	120
Golden Princess	8/21/12	ND	ND	4.2	4.6	ND	ND	ND	ND	1.3	1.7	7.9	7.4	ND	ND	ND	12	12	17	19	ND	ND	ND	ND	ND	140	140
Island Princess	6/17/12	ND	ND	5.6	6.2	ND	ND	ND	ND	1.2	1	16	16	ND	ND	ND	4.9	4.7	16	19	ND	ND	ND	ND	ND	73	71
Island Princess	8/12/12	ND	ND	8.1	3.4	ND	ND	ND	ND	ND	ND	11	11	ND	ND	ND	6.3	5	14	12	ND	ND	ND	ND	ND	42	39
Sapphire Princess- GW	5/30/12	ND	ND	2.4	2.3	ND	ND	ND	ND	1.6	1.5	14	14	ND	ND	ND	21	21	9.5	8.7	ND	ND	ND	ND	ND	200	200
Sapphire Princess-GW	7/11/12	ND	ND	1.2	1.1	ND	ND	ND	ND	ND	ND	11	12	ND	ND	ND	18	18	ND	ND	ND	ND	ND	ND	ND	220	220
Sapphire Princess	5/30/12	ND	ND	1.8	1.5	ND	ND	ND	ND	1.1	ND	12	11	ND	ND	ND	19	20	6.9	6	ND	ND	ND	ND	ND	150	160
Sapphire Princess	7/11/12	ND	ND	1.2	1.4	ND	ND	ND	ND	ND	ND	11	11	ND	ND	ND	17	17	ND	ND	ND	ND	ND	ND	ND	230	230
Sea Princess	6/7/12	ND	ND	18	14	ND	ND	ND	ND	ND	ND	25	23	ND	ND	ND	4.6	3.6	61	50	ND	ND	ND	ND	ND	53	51
Sea Princess	8/16/12	1	ND	8.7	9.5	ND	ND	ND	ND	ND	ND	16	16	ND	ND	ND	4.2	4.4	30	33	ND	ND	ND	ND	ND	16	18
Star Princess	6/7/12	ND	ND	1.3	1.1	ND	ND	ND	ND	ND	ND	180	120	ND	ND	ND	47	42	4	2.9	ND	ND	ND	ND	ND	30	32
Star Princess	7/19/12	ND	ND	1.3	15	ND	ND	ND	ND	ND	ND	220	75	ND	ND	ND	39	15	2.6	53	ND	ND	ND	ND	ND	40	17
Seven Seas Navigator	6/3/12	ND	ND	2.6	2.7	ND	ND	ND	ND	1.6	ND	14	7.1	ND	ND	ND	8.6	8.6	16	10	ND	ND	ND	ND	ND	36	33
Seven Seas Navigator	8/4/12	ND	ND	2.3	ND	ND	ND	ND	ND	ND	ND	110	23	1.4	ND	ND	26	22	ND	8.8	ND	ND	ND	ND	ND	190	86
All results in micrograms/L (ug/L)																											
ND= Non-detect																											
Not sampled or not analyzed		Additional dissolved metals results found on the twice a month sample result tables																									

APPENDIX 3: VESSEL SPECIFIC INFORMATION

Vessel Operator	Vessel Name	Passenger Capacity	Voyages	Total Passengers ²	Total Persons on Board ³	Blackwater (BW) Treatment System	Graywater (GW) Treatment if different	ADEC Permitted to discharge in Alaska in 2012 ⁴		Alaska DEC Approval Discharge Type	Exceedances of GP Limits
								BW	GW		
Carnival Cruise Lines	<i>Carnival Spirit</i>	2400	20	48,000	3334	Rochem Bio-filtration	Rochem RO	No	Yes ⁵	Continuous	1
Celebrity Cruises	<i>Century</i>	1812	19	34,428	1812+crew	Unknown	Unknown	No	No	No	0
Celebrity Cruises	<i>Infinity</i>	2449	19	46,531	3379	Zenon	Unknown	No	No	No	0
Celebrity Cruises	<i>Millennium</i>	2449	15	36,735	3450	Hydroxyl Cleansea	Unknown	No	No	No	0
Crystal Cruises	<i>Serenity</i>	1140	1	1,140	1140+crew	Unknown	Unknown	No	No	No	0
Disney	<i>Wonder</i>	2834	16	45,344	3754	Hamworthy Bioreactor		Yes	Yes	Underway	0
Holland America	<i>Amsterdam</i>	1380	11	15,180	2027	Unknown	Unknown	No	No	No	0
Holland America	<i>Oosterdam</i>	1916	21	40,236	2716	Unknown	Unknown	No	No	No	0
Holland America	<i>Statendam</i>	1260	18	22,680	1848	Zenon		Yes	Yes	Continuous	1
Holland America	<i>Volendam</i>	1432	21	30,072	2079	Zenon		Yes	Yes	Continuous	1
Holland America	<i>Westerdam</i>	1916	20	38,320	1916+crew	Rochem Bio-filtration	Ovivo	No	No	No	0
Holland America	<i>Zaandam</i>	1432	21	30,072	2079	Zenon		Yes	Yes	Continuous	1
Holland America	<i>Zuiderdam</i>	1916	20	38,320	1916+crew	Rochem Bio-filtration	Unknown	No	No	No	0
Norwegian Cruise Lines	<i>Norwegian Jewel</i>	2376	18	42,768	3476	Scanship		Yes	Yes	Underway	0
Norwegian Cruise Lines	<i>Norwegian Pearl</i>	2394	20	47,880	3494	Scanship		Yes	Yes	Underway	3
NYK	<i>Asuka II</i>	872	1	872	872+Crew	Unknown	Unknown	No	No	No	0
Princess Cruise Line	<i>Coral Princess</i>	1974	18	35,532	2800	Hamworthy Bioreactor		Yes	Yes	Underway	2
Princess Cruise Line	<i>Dawn Princess</i>	1998	1	1,998	2845	Hamworthy Bioreactor		Yes	Yes	Underway	0
Princess Cruise Line	<i>Diamond Princess</i>	2678	20	53,560	3916	Hamworthy Bioreactor		Yes	Yes	Underway	1
Princess Cruise Line	<i>Golden Princess</i>	2598	18	46,764	3658	Hamworthy Bioreactor		Yes	Yes	Continuous (GW)/Underway (BW and GW)	0
Princess Cruise Line	<i>Island Princess</i>	1974	19	37,506	2874	Hamworthy Bioreactor		Yes	Yes	Underway	0
Princess Cruise Line	<i>Sapphire Princess</i>	2678	19	50,882	3916	Hamworthy Bioreactor		Yes	Yes	Continuous (GW)/Underway (BW and GW)	2
Princess Cruise Line	<i>Sea Princess</i>	2016	12	24,192	2870	Hamworthy Bioreactor		Yes	Yes	Underway	0
Princess Cruise Line	<i>Star Princess</i>	2598	19	49,362	3658	Hamworthy Bioreactor		Yes	Yes	Underway	5
Prestige Cruises	<i>Seven Seas Navigator</i>	540	13	7,020	890	Scanship		Yes	Yes	Underway	4
ResidenSea	<i>The World⁶</i>	240	1	240	500	Scanship		No	No	No	0
Royal Caribbean Cruises	<i>Radiance of the Seas</i>	2501	19	47,519	3360	Unknown	Unknown	No	No	No	0
Royal Caribbean Cruises	<i>Rhapsody of the Seas</i>	2435	18	43,830	2435+crew	Unknown	Unknown	No	No	No	0
Silver Seas	<i>Silver Shadow</i>	382	14	5,348	687	Bio Epure/Marisan	Unknown	Yes	Yes	Continuous	0
Totals			452	922,331							21

Vessels highlighted in Gray in the above table are not registered to discharge wastewater in Alaskan waters during the 2012 season.

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

² Assumes full capacity on every voyage

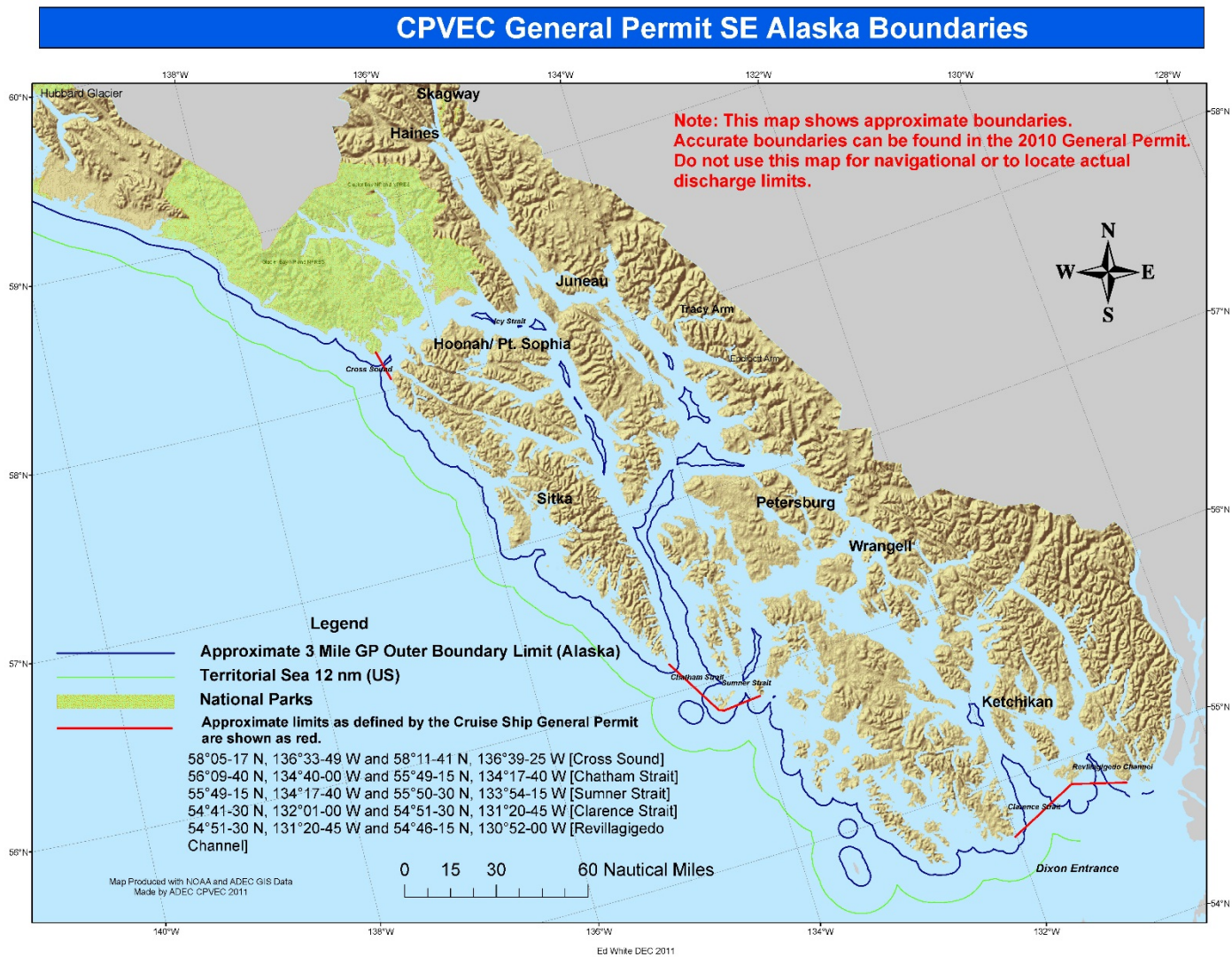
³Capacity is the number of lower berths and is calculated from Registration, Vessel Specific Sampling Plan, or Notice of Intent. Actual number of passenger aboard varies.

⁴ 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.

⁵ Galley graywater not discharged

⁶ The World is a large ship with a low density of passengers. It is not a large cruise ship under the State of Alaska definition with regard to number of berths, it is included here based on large physical size.

APPENDIX 4: GP BOUNDARIES MAP FOR SOUTHEAST ALASKA



APPENDIX 5: USEFUL WEBSITES

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

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

2010 Large Cruise Ship General Permit

http://www.dec.state.ak.us/water/cruise_ships/gp/10gp.html

General Permit Authorizations by ADEC

http://www.dec.state.ak.us/water/cruise_ships/gp/Auth_10.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