



2015 Wastewater Sampling Results For Large Cruise Ships

11/30/2015

Alaska Department of
Environmental Conservation
Commercial Passenger Vessel Environmental Compliance Program



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1. SUMMARY

This is a summary of the results of onboard sampling and laboratory testing of large cruise ship treated wastewater effluent in Alaska during 2015. This summary provides information on wastewater treatment sampled results obtained under the requirements of the [2014 Large Commercial Passenger Vessel Wastewater Discharge General Permit](#) (General Permit). Tables of sample results are included in Appendix 1. Information on the sampling techniques and requirements can be found in the Methods section of this report. This report does not include the results of receiving water and ambient water sampling taken in the harbors.

Thirty-two large cruise ships operated in Alaska in 2015, of those eighteen ships were authorized to discharge treated wastewater in Alaska, and seventeen ships discharged treated wastewater and conducted sampling. Table 1 lists large cruise ships in Alaska and their discharge status in 2015. No ships operated under the [2010 General Permit](#) in 2015.

2. INTRODUCTON

Sampling of wastewater effluent is a requirement under the General Permit for all large cruise ships discharging in Alaska waters. Sampling is needed to:

- Check for compliance of permit effluent limits
- Obtain information on treatment system performance for future discharge permits
- Compile information on potential environmental effects

Sample result data for cruise ships has been collected by the Department of Environmental Conservation since 2000. Reports and summaries for prior years can be found on the cruise program's report webpage.

3. METHODS

Samples are grab wastewater samples taken from a sample port prior to discharge. Sampling may occur while underway or while docked. All samples were obtained in Southeast Alaska in 2015, with the majority of samples obtained in or near Juneau. The samples were taken according to requirements in the [2015 Cruise Line International Association North West and Canada Quality Assurance Project Plan for Sampling and Analysis of Treated Sewage and Graywater from Commercial Passenger Vessels](#) (QAPP). The QAPP specifies minimum requirements for sampling and analysis of wastewater. It includes a list of approved methods, sample collection requirements, and laboratory analysis requirements. Samplers must follow the QAPP and the [Vessel Specific Sampling Plan](#) (VSSP) for each cruise ship when collecting a sample. The number of required samples and what parameters measured

are required to be analyzed are listed in the 2014 General Permit and for the US Coast Guard in the QAPP. The Commercial Passenger Vessel Environmental Compliance (cruise ship) program spot checked results submitted by the cruise ship operators for compliance with the QAPP and checked all results for compliance with 2014 General Permit limits.

4. RESULTS

Wastewater sample results are listed in Appendix 1 with tables for parameters with General Permit limits, conventional and nutrient results with no limits, and metals. Full results of volatile organic compounds (VOCs) and base neutral acids (BNAs) are available on request. Sample results presented in this report only include data collected while a cruise ship was discharging in Alaska.

In the tables of results those values highlighted in red are exceedances of the 2014 Wastewater Discharge General Permit limits. Orange highlighted results were below a daily maximum, but were an exceedance of a monthly average limit. Dark blue highlights indicate that either no sample data was received or accepted. Results below the method detection limit (MDL) are recorded as zero. Full sample suites of all QAPP listed parameters are identified as “PP” for priority pollutants, and all other samples are identified as “GP” (General Permit).

Table 1: 2015 Large Cruise Ship Summary

2015 Large ¹ Commercial Passenger Vessel Discharge Status and Wastewater Treatment												
Vessel Operator	Vessel Name	Passenger Capacity ²	Crew Capacity	Wastewater Treatment System	Permitted to discharge in Alaska in 2015 ³		Stationary Discharge Permitted?	Bikeway docks discharge permitted?				
					Underway	Stationary		Railroad	Ore	Broadway		
Carnival Cruise Lines	Carnival Legend	2124	17	Unknown	N	N	None	No	No	No		
Celebrity Cruises	Celebrity Infinity	2170	14	Unknown	N	N	None	No	No	No		
Celebrity Cruises	Celebrity Millennium	2442	17	Unknown	N	N	None	No	No	No		
Celebrity Cruises	Celebrity Solstice	2145	20	Unknown	N	N	None	No	No	No		
Crystal	Symphony	975	1	Unknown	N	N	None	No	No	No		
Diane's	Wonder	2524	15	920	Harmfuly Biodeclar	Y	N	None	No	No	No	
Holland America	Amsterdam	1360	17	Unknown	N	N	None	No	No	No		
Holland America	Noordam	1916	20	Unknown	N	N	None	No	No	No		
Holland America	Oosterdam	1916	22	Unknown	Unknown	N	None	No	No	No		
Holland America	Schipdam	1260	9	955	Zeron	Y	N	None	No	No		
Holland America	Vandam	1432	20	647	Zeron	Y	Y	Yes	Yes	Yes	Yes	
Holland America	Westerdam	1216	21	Unknown	Unknown	N	N	None	No	No	No	
Holland America	Zaandam	1422	15	647	Zeron	Y	Y	Yes	Yes	Yes	Yes	
Norwegian Cruise Line	Norwegian Jewel	2376	20	1100	Scanship	Y	Y	Yes	Yes	Yes	Yes	
Norwegian Cruise Line	Norwegian Pearl	2394	20	1100	Scanship	Y	Y	Yes	Yes	Yes	Yes	
Norwegian Cruise Line	Norwegian Sun	1926	20	950	Scanship	Y	Y	Yes	Yes	Yes	Yes	
NMK	Aurora II	872	1	Unknown	Unknown	N	N	None	No	No	No	
Oceania	Regatta	711	12	373	Triton	Y	N	None	No	No	No	
Ponant	Le Azur	264	9	136	Pochem Biodecl	Y	Y	Yes	Yes	Yes	Yes ⁴	
Ponant	Le Boreal	264	1	Unknown	Unknown	N	N	None	No	No	No	
Ponant	Le Soleil	264	1	Unknown	Unknown	N	N	None	No	No	No	
Princess Cruise Line	Coral Princess	1955	20	900	Harmfuly Biodeclar	Y	N	None	No	No	No	
Princess Cruise Line	Crown Princess	2050	15	1120	Harmfuly Biodeclar	Y	Y	Graywater only	Yes	No	No	
Princess Cruise Line	Golden Princess	2026	12	1060	Harmfuly Biodeclar	Y	Y	Graywater only	Yes	No	No	
Princess Cruise Line	Grand Princess	2006	15	1100	Harmfuly Biodeclar	Y	Y	Graywater only	No	No	No	
Princess Cruise Line	Pacific Princess	272	15	272	Harmfuly Biodeclar	Y	Y	Graywater only	Yes	No	No	
Princess Cruise Line	Ruby Princess	2054	20	1201	Harmfuly Biodeclar	Y	Y	Graywater only	No	No	No	
Princess Cruise Line	Star Princess	2000	15	1150	Harmfuly Biodeclar	Y	Y	Graywater only	No	No	No	
Prestige Cruises	Seven Seas Navigator	544	17	350	Scanship	Y	N	None	No	No	No	
Royal Caribbean Cruises	Jewel of the Seas	2902	17	Unknown	Unknown	N	N	None	No	No	No	
Royal Caribbean Cruises	Radiance of the Seas	2902	15	Unknown	Unknown	N	N	None	No	No	No	
Silver Seas	Silver Shadow	382	19	305	Bio-Equilibrium	Y	N	None	No	No	No	
Totals					487							

Vessels highlighted in gray in the above table did not discharge wastewater in Alaskan waters in 2015.

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

²Capacity 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.

³Alaska water includes the Alexander Archipelago and extends 3 miles from the coastline.

⁴Discharge allowed unless another ship is discharging at the One Dock.

APPENDIX 1: 2015 LARGE CRUISE SHIP WASTEWATER SAMPLE DATA

Table 3: Semi-monthly parameters and general permit limits

SemiMonthly General Permit Sample Results												Non-detects set to zero												Explanation of color codes		
Company	Vessel	Treatment System	Wastewater Type	Sample Date	Type	mg/L	ug/L	ug/L	ug/L	S.U.	C	col. per 100 ml	mg/L	mg/L	mg/L	umhos/cm	mg/L	mg/L	Total	Frac	Residual					
						Ammonia	Copper	Nickel	Zinc	pH	Temp	Fecal Coliform	TSS	BOD	Hardine ss	Specific Conductance	Chlorine	Exceedance General Permit Limits	Exceedance of Alaska WQS							
Disney	Wonder	Haworth	Mixed	5/29/2015	GP							7.44	30.4	0	0	4.4				0	0					
Disney	Wonder	Haworth	Mixed	6/12/2015	PP	12	3.8	17	190			6.87	28.1	0	0	0	41	986		0	0					
Disney	Wonder	Haworth	Mixed	6/26/2015	GP							7.33	30.4	0	0	0				0	0					
Disney	Wonder	Haworth	Mixed	7/17/2015	GP							7.25	29.7	0	0	2.6				0	0					
Disney	Wonder	Haworth	Mixed	7/31/2015	GP							7.22	30.3	0	0	0				0	0					
Disney	Wonder	Haworth	Mixed	8/7/2015	GP							6.9	3.4	18	290	7.33	31.6	0	0	6.8	57	1200	0	0		
Disney	Wonder	Haworth	Mixed	8/21/2015	GP							7.3	29.8	0	0	5.3				0	0					
Disney	Wonder	Haworth	Mixed	9/4/2015	GP							7.25	33.1	0	0	0				0	0					
Holland America	Statendam	Zenon	Mixed	5/23/2015	GP							7.21	23	0	0	2.6				0	0					
Holland America	Statendam	Zenon	Mixed	6/6/2015	PP	0	2.2	19	34			6.83	26	0	0	0	28	519		0	0					
Holland America	Statendam	Zenon	Mixed	6/20/2015	GP							6.78	26.8	0	0	18				0	0					
Holland America	Statendam	Zenon	Mixed	7/3/2015	GP							7.35	25.6	0	0	0				0	0					
Holland America	Statendam	Zenon	Mixed	7/18/2015	GP							7.58	27.1	0	0	0				0	0					
Holland America	Statendam	Zenon	Mixed	8/15/2015	PP	42	2.3	28	6			7.38	26.1	0	0	0	50	1090		0	0					
Holland America	Statendam	Zenon	Mixed	8/28/2015	GP							7.27	27	0	0	2.5				0	0					
Holland America	Statendam	Zenon	Mixed	9/11/2015	GP							7.3	23.8	0	0	0				0	0					
Holland America	Statendam	Zenon	Mixed	9/12/2015	GP							7.46	23.8	0	0	0				0	0					
Holland America	Volendam	Zenon	Mixed	5/15/2015	GP	0	20					7.15	22.3	0	0	0	21	812		0	0					
Holland America	Volendam	Zenon	Mixed	5/22/2015	GP	0	20					7.7	25.9	0	0	0	21	863		0	0					
Holland America	Volendam	Zenon	Mixed	6/19/2015	PP	6.3	4.5	9.8	75			7.14	24.1	0	0	3.6	27	602		0	0					
Holland America	Volendam	Zenon	Mixed	7/10/2015	GP	0	5.9					7.38	29.0	0	0	9.5	31	700		0	0					
Holland America	Volendam	Zenon	Mixed	7/17/2015	PP	8.8	3.7	11	100			7.14	26.8	0	0	0	33	659		0	0					
Holland America	Volendam	Zenon	Mixed	8/14/2015	GP	10	4.9					7.21	29.4	0	0	0	31	738		0	0					
Holland America	Volendam	Zenon	Mixed	8/28/2015	GP	25	3.7					7.16	27.6	0	0	0	37	698		0	0					
Holland America	Volendam	Zenon	Mixed	9/11/2015	GP	26	4.2					7.26	26.9	0	0	0	23	675		0	0					
Holland America	Volendam	Zenon	Mixed	9/18/2015	PP	37	4.4					7.37	26.1	0	0	0	31	829		0	0					
Holland America	Zaandam	Zenon	Mixed	5/20/2015	GP	4.4	99					7.1	25.1	0	0	3.5	0	371		0	0					
Holland America	Zaandam	Zenon	Mixed	5/28/2015	PP	29	4.8					6.88	26.8	0	0	15	50	768		0	0					
Holland America	Zaandam	Zenon	Mixed	6/11/2015	GP	22	1.8					7.32	25.6	0	0	2.2	50	683		0	0					
Holland America	Zaandam	Zenon	Mixed	6/17/2015	PP	52	1.5	6.1	42			7.44	26.4	0	0	3.4	34	760		0	0					
Holland America	Zaandam	Zenon	Mixed	7/23/2015	GP	36	1.1					7.25	25	0	0	0	24	700		0	0					
Holland America	Zaandam	Zenon	Mixed	7/23/2015	PP	41	1.9					7.05	26	0	0	4.2	40	552		0	0					
Holland America	Zaandam	Zenon	Mixed	8/6/2015	PP	20	5.9	7.2	61			7.4	28.8	0	0	0	39	763		0	0					
Holland America	Zaandam	Zenon	Mixed	8/20/2015	GP	3.8	72					7.44	27.9	0	0	5.2	19	909		0	0					
Holland America	Zaandam	Zenon	Mixed	9/9/2015	PP	45	1.9					7.37	26.5	0	0	31	33	968		0	0					
Holland America	Zaandam	Zenon	Mixed	9/17/2015	GP	36	20					7.32	27	0	0	4.5	67	1100		0	0					
Norwegian	Jewel	Scanship	Mixed	5/10/2015	GP	27	7.8					6.63	26.1	0	0	5.4	78	823		0	0					
Norwegian	Jewel	Scanship	Mixed	5/19/2015	GP	30	1					6.85	27	0	0	4.9	88	828		0	0					
Norwegian	Jewel	Scanship	Mixed	6/2/2015	PP	26	1.3	7.3	49			6.42	27.7	0	0	3.5	70	756		0	0					
Norwegian	Jewel	Scanship	Mixed	6/16/2015	GP	28	1.8					6.57	30	0	0	4	88	821		0	0					
Norwegian	Jewel	Scanship	Mixed	7/14/2015	PP	0	0					6.52	26.6	0	0	9.2	10	71	490		0	0				
Norwegian	Jewel	Scanship	Mixed	7/21/2015	GP	0	0					6.87	26.8	0	0	7.2	11	75	477		0	0				
Norwegian	Jewel	Scanship	Mixed	8/4/2015	PP	0	4.7	9	70			6.89	28.1	0	0	7.2	9.2	64	2150		0	0				
Norwegian	Jewel	Scanship	Mixed	8/13/2015	GP	30	1.0					6.48	29.1	0	0	6.4	11	140	1400		0	0				
Norwegian	Jewel	Scanship	Mixed	9/8/2015	PP	32	1.5					6.42	27.2	0	0	4.4	51	814		0	0					
Norwegian	Jewel	Scanship	Mixed	9/8/2015	GP	27	1.5					6.8	27.7	0	0	4.8	41	831		0	0					
Norwegian	Pearl	Scanship	Mixed	5/9/2015	GP	56	9.6					6.88	24	330	7	7.6	40	947		0	0					
Norwegian	Pearl	Scanship	Mixed	5/12/2015	PP	47	3.2					6.97	24.5	120	4.4	5.4	66	906		0	0					
Norwegian	Pearl	Scanship	Mixed	5/19/2015	GP	60	2.1					6.78	27.2	18	7.6	19	54	1139		0	0					
Norwegian	Pearl	Scanship	Mixed	6/2/2015	PP	33	3.2	4.9	71			6.86	27.4	0	0	2.6	78	2800		0	0					
Norwegian	Pearl	Scanship	Mixed	6/9/2015	GP	46	3.4					6.68	26	3	0	4.2	100	1480		0	0					
Norwegian	Pearl	Scanship	Mixed	7/14/2015	PP	8.1	27					6.78	27.3	30	6.4	2.1	2900	22900		0	0					
Norwegian	Pearl	Scanship	Mixed	7/21/2015	GP	42	2.3					6.83	27.3	12	5.2	4.9	44	879		0	0					
Norwegian	Pearl	Scanship	Mixed	7/28/2015	PP	50						6.41	26.1	18												
Norwegian	Pearl	Scanship	Mixed	9/8/2015	GP	41	1.8					6.42	27.2	78	5.5	3.2	53	1040		0	0					
Norwegian	Pearl	Scanship	Mixed	9/15/2015	PP	14	1.5	6.7	67			6.53	27.2	27	7.2	11	36	683		0	0					
Norwegian	Pearl	Scanship	Mixed	9/16/2015	GP	57	2.2					6.66	27.2	0	0	9.6	47	35	1110		0	0				
Ponant	L'Austral	Rochem	Mixed	6/18/2015	GP	39	24					7.56	31.5	0	0	2.8	23	976		0	0					
Ponant	L'Austral	Rochem	Mixed	6/20/2015	PP	45	15	7.7	220			7.2	31.3	0	0	0	69	1362		0	0					
Ponant	L'Austral	Rochem	Mixed	7/1/2015	GP	69	3.8					7.38	31	0	0	0	30	1350		0	0					
Ponant	L'Austral	Rochem	Mixed	7/15/2015	PP																					

SemiMonthly General Permit Sample Results												Explanation of color codes													
Company	Vessel	Treatment System	Wastewater Type	Sample Date	Type	Non-detects set to zero												Exceedance General Permit Limits							
						mg/L	ug/L	ug/L	ug/L	S.U.	C	col. per 100 ml	mg/L	mg/L	umhos/cm	mg/L	mg/L	Total Free Chlorine	mg/L	mg/L	Exceedance Alaska WQS	Exceedance monthly average	Discharging only treated graywater	Parameter not tested	
Princess	Golden	Hamworth	Mixed	5/27/2015	GP						7.97	27.7	0	0	0			0	0						
Princess	Golden	Hamworth	Mixed	6/5/2015	GP						8.16	32.1	0	0	34			0	0						
Princess	Golden	Hamworth	Mixed	6/15/2015	PP	32	7.2	5.6	87		8.15	32.8	0	0	0	12	964		0	0					
Princess	Golden	Hamworth	Mixed	7/16/2015	GP						8.18	34.3	5	0	3.3			0	0						
Princess	Golden	Hamworth	Mixed	7/25/2015	GP						6.63	1.39	0	0	65			0	0						
Princess	Golden	Hamworth	Mixed	8/1/2015	PP	120	7.8	9.5	53		8.33	33.6	200	0	0	26	1174		0	0					
Princess	Golden	Hamworth	Mixed	8/14/2015	GP						8.40	32.5	0	0	51			0	0						
Princess	Golden	Hamworth	Mixed	9/4/2015	GP						7.48	30.8	0	0	2.6			0	0						
Princess	Golden	Hamworth	Mixed	9/13/2015	GP						6.8	31.6	0	0	20			0	0						
Princess	Golden	Hamworth	Graywater	5/15/2015	GP	0.93	8.2				7.02	31.6	250	0	8.4	39	457	0	0						
Princess	Golden	Hamworth	Graywater	5/26/2015	GP	0					7.11	28.9	0	0				0	0						
Princess	Golden	Hamworth	Graywater	5/27/2015	GP	0	7.1				7.02	31.6	0	0	4.5	14	251	0	0						
Princess	Golden	Hamworth	Graywater	6/4/2015	PP	0	8.6	4.9	97		7.73	30.3	0	0	17	18	320	0	0						
Princess	Golden	Hamworth	Graywater	6/14/2015	GP	0	8.4				7.11	31.5	0	0	3	19	303	0	0						
Princess	Golden	Hamworth	Graywater	7/15/2015	GP	0	9.1				7.33	32.6	3NTC	16	44	60	645	0	0						
Princess	Golden	Hamworth	Graywater	7/24/2015	GP	2.5	2.2				6.86	32.4	0	0	40	14	380	0	0						
Princess	Golden	Hamworth	Graywater	8/5/2015	PP	4.7	1.4	12	31		6.74	31.4	0	0	29	11	244	0	0						
Princess	Golden	Hamworth	Graywater	8/12/2015	GP	3	4				7.03	31.6	0	0	23	50	765	0	0						
Princess	Golden	Hamworth	Graywater	9/3/2015	GP	0	4.6				6.05	29.0	0	0	15	281	0	0							
Princess	Golden	Hamworth	Graywater	9/12/2015	GP	0	8.5				7.21	32	0	0	2.8	47	425	0	0						
Princess	Grand	Hamworth	Mixed	5/20/2015	PP	76	6	12	59		7.88	30	0	0	2.7	73	1661	0	0						
Princess	Grand	Hamworth	Mixed	5/26/2015	GP						7.68	31	0	0	0			0	0						
Princess	Grand	Hamworth	Mixed	6/17/2015	GP						7.79	27.6	0	0	0			0	0						
Princess	Grand	Hamworth	Mixed	6/24/2015	GP						8.2	31.7	0	0	3.2			0	0						
Princess	Grand	Hamworth	Mixed	7/1/2015	GP						7.77	31.6	0	0	10			0	0						
Princess	Grand	Hamworth	Mixed	7/15/2015	GP						7.97	31	0	0	4			0	0						
Princess	Grand	Hamworth	Mixed	8/5/2015	GP						7.95	31.5	0	0	2.1			0	0						
Princess	Grand	Hamworth	Mixed	8/12/2015	PP	78	0	14	35		7.93	30	0	0	0			130	1750	0	0				
Princess	Grand	Hamworth	Mixed	9/7/2015	GP						7.62	31.6	0	0	0			0	0						
Princess	Grand	Hamworth	Mixed	9/9/2015	GP						7.8	31.9	0	0	2.6			0	0						
Princess	Grand	Hamworth	Graywater	5/12/2015	GP	0	2.5				7.41	30.7	0	0	0	94	1102	0	0						
Princess	Grand	Hamworth	Graywater	5/20/2015	PP	1.4	1.3	11	17		7.07	29	0	0	0	38	539	0	0						
Princess	Grand	Hamworth	Graywater	6/9/2015	GP	0	2.4				7.51	30.4	0	0	0	67	924	0	0						
Princess	Grand	Hamworth	Graywater	6/23/2015	GP	1.8	4.5				6.98	30.7	0	0	0	47	723	0	0						
Princess	Grand	Hamworth	Graywater	7/1/2015	GP	0	3.7				7.28	30.5	0	0	0	100	1370	0	0						
Princess	Grand	Hamworth	Graywater	7/21/2015	GP	3.2	0				7.02	27.8	0	0	3.2	99	1246	0	0						
Princess	Grand	Hamworth	Graywater	8/4/2015	PP	0	3.3				7.54	28.5	0	0	0	79	1180	0	0						
Princess	Grand	Hamworth	Graywater	8/12/2015	PP	1.1	0	12	27		7.23	28.1	0	0	0	2.3	170	1900	0	0					
Princess	Grand	Hamworth	Graywater	9/1/2015	GP	1.5	3.2				7.38	30.5	0	0	0	16	374	0	0						
Princess	Grand	Hamworth	Graywater	9/3/2015	GP	3.4	3.2				7.43	31.7	0	0	10			0	0						
Princess	Pacific	Hamworth	Mixed	5/22/2015	GP						7.12	32	0	0	0	5			0	0					
Princess	Pacific	Hamworth	Mixed	5/29/2015	GP						6.92	32.4	0	0	0	60	742	0	0						
Princess	Pacific	Hamworth	Mixed	6/12/2015	GP						7.41	32.8	0	0	4			0	0						
Princess	Pacific	Hamworth	Mixed	6/19/2015	PP	21	25	14	70		7.25	31.9	0	0	4	58	812	0	0						
Princess	Pacific	Hamworth	Mixed	7/10/2015	GP						7.27	29.9	0	0	2.4			0	0						
Princess	Pacific	Hamworth	Mixed	7/24/2015	GP						6.98	29.9	0	0	3.7			0	0						
Princess	Pacific	Hamworth	Mixed	8/7/2015	PP	57	9.2	17	81		7.34	34.8	0	0	4.2	64	1180	0	0						
Princess	Pacific	Hamworth	Mixed	8/21/2015	GP						7.43	31.7	0	0	10			0	0						
Princess	Pacific	Hamworth	Graywater	9/4/2015	GP	18	34				7.25	32	0	0	2.9	40	685	0	0						
Princess	Ruby	Hamworth	Mixed	5/22/2015	GP						7.21	30.5	0	0	5			0	0						
Princess	Ruby	Hamworth	Mixed	5/29/2015	GP	24	32				7.44	33	0	0	0	68	949	0	0						
Princess	Ruby	Hamworth	Mixed	6/5/2015	PP	6.5	67				6.59	30	0	0	0	60	742	0	0						
Princess	Ruby	Hamworth	Graywater	6/12/2015	GP	4.2	11				7.66	31.4	0	0	3.8	84	989	0	0						
Princess	Ruby	Hamworth	Graywater	6/18/2015	PP	1.9	46	17	90		7.16	32.5	0	0	2.3	59	797	0	0						
Princess	Ruby	Hamworth	Graywater	7/24/2015	GP	5.2	42				7.34	32.6	0	0	0	2.5	435	0	0						
Princess	Ruby	Hamworth	Graywater	8/7/2015	PP	12	17	23	140		6.76	30.8	0	0	11	28	390	0	0						
Princess	Ruby	Hamworth	Graywater	8/19/2015	GP	0.57	17				6.48	31.4	0	0	70	130	1420	0	0						
Princess	Ruby	Hamworth	Graywater	9/2/2015	GP	3.6	21				6.35	28.1	0	0	150	300	3210	0	0						
Princess	Ruby	Hamworth	Graywater	9/9/2015	GP	0	3.4				6.82	30.2	0	0	15	54	665	0.33	0.57						
Princess	Star	Hamworth	Mixed	5/20/2015	GP						7.31	31.1	0	0	0	12	201	0	0						
Princess	Star	Hamworth	Mixed	5/13/2015	PP	0	8	7.5	85		7.47	31.7	0	0	4.7	10	226	0	0						
Princess	Star	Hamworth	Mixed	6/10/2015	GP	0.5	12				7.16	28.9	0	0	0	17	279	0	0						
Princess	Star	Hamworth	Mixed	6/24/2015	GP						6.82	30.4	0	0	7.6			0	0						
Princess	Star	Hamworth	Mixed	7/8/2015	GP						6.94														

Table 4: Semi-seasonal nutrients and other conventional parameters with no General Permit Limits

Vessel	Sample Date	E. coli	Chemical O ² Demand	Hexane Extractable Material	Total Organic Carbon	Alkalinity	Hardness	Nitrite/Nitrate as N	Total Phosphorus	Total Kjeldahl Nitrogen	Total Settable Solids
	Detection Limit	1 Units /100ml	5.00 mg/l	5.00 mg/l	1.00 mg/l	5.00 mg/l	5.00 mg/L	0.50 mg/L	0.05 mg/l	1.00 mg/l	0.10 ml/l
Disney Wonder	6/12/15	0	18	0	13	120	41	0	0.72	15	0
Disney Wonder	8/7/15	0	44	0	15	300	57	0	0.8	79	0
Statendam	6/6/15	0	38	0	11	82	28	0.78	4.5	1.8	0
Statendam	8/15/15	0	35	0	13	200	50	0	7.9	33	0
Volendam	6/5/15	0	21	0	9.1	140	27	0.14	4.1	8.3	0
Volendam	7/17/15	0	25	0	8.6	120	27	1.7	3.8	11	0
Zaandam	6/17/15	0	27	0	12	250	34	0	1.5	71	0
Zaandam	8/6/15	0	24	0	8.6	160	39	0.29	0	41	0
Norwegian Jewel	6/2/15	8.4	43	0	15	130	70	0	0	39	0
Norwegian Jewel	8/4/15	0	57	0	16	68	64	0	0	2.2	0
Norwegian Pearl	6/2/15	6.3	37	0	14	140	78	0	0	44	0
Norwegian Pearl	9/15/15	24.9	63	0	23	78	36	0	2.4	21	0
Norwegian Sun	5/22/15	72.8	59	0	17	120	22	0	0.32	35	0
Norwegian Sun	7/9/15	0	40	0	15	130	26	0	0	44	0
Vessel	Sample Date	E. coli	Chemical O ² Demand	Hexane Extractable Material	Total Organic Carbon	Alkalinity	Hardness	Nitrite/Nitrate as N	Total Phosphorus	Total Kjeldahl Nitrogen	Total Settable Solids
	Detection Limit		5.00 Units /100ml	5.00 mg/l	1.00 mg/l	5.00 mg/l	5.00 mg/L	0.50 mg/L	0.05 mg/l	1.00 mg/l	0.10 ml/l
L'Austral	6/20/15	0	36	0	14	200	69	11	6.2	55	0
L'Austral	7/18/15	0	23	0	7.4	190	18	0	4.2	40	0
Coral Princess	5/24/15	0	52	6	16	100	180	0	11	17	0
Coral Princess	8/16/15	0	52	0	17	68	57	9.7	11	15	0
Crown Princess-GW	6/15/15	0	27	0	11	70	15	0	0	0.85	0
Crown Princess-GW	8/3/15	0	50	0	17	74	22	0	0	5.1	0
Crown Princess	6/16/15	0	43	0	15	72	16	0	0	3.1	0
Crown Princess	8/4/15	0	39	0	12	450	42	0	0.8	35	0
Golden Princess- GW	6/4/15	0	22	0	6.1	40	18	1.7	0	0.56	0
Golden Princess- GW	8/4/15	0	95	0	29	46	11	0	0.33	6.6	0
Golden Princess	6/15/15	0	52	0	18	350	12	0	0.67	25	0
Golden Princess	8/5/15	2	160	0	71	350	26	0.27	23	510	0
Grand Princess-GW	5/20/15	0	22	0	6.2	50	38	0.7	0	2.1	0
Grand Princess-GW	8/12/15	0	16	0	7.2	62	170	0.47	0	1.6	0
Grand Princess	5/20/15	0	65	0	7.7	400	73	1.8	5.6	71	0
Grand Princess	8/12/15	0	50	0	13	300	130	0.26	8.7	72	0
Vessel	Sample Date	E. coli	Chemical O ² Demand	Hexane Extractable Material	Total Organic Carbon	Alkalinity	Hardness	Nitrite/Nitrate as N	Total Phosphorus	Total Kjeldahl Nitrogen	Total Settable Solids
	Detection Limit		5.00 Units /100ml	5.00 mg/l	1.00 mg/l	5.00 mg/l	5.00 mg/L	0.50 mg/L	0.05 mg/l	1.00 mg/l	0.10 ml/l
Pacific Princess-GW	6/18/15	0	25	0	7.5	30	59	12	4.3	2.3	0
Pacific Princess-GW	8/7/15	0	35	0	11	66	57	29	1.6	6.1	0
Pacific Princess	6/19/15	0	41	0	13	98	58	12	9.5	30	0
Pacific Princess	8/7/15	0	49	0	18	180	64	30	9.4	63	0
Ruby Princess-GW	5/13/15	0	55	0	22	58	10	0	0.25	0.76	0
Ruby Princess-GW	7/22/15	4.1	22	0	6	38	43	0.6	0.27	0.76	0
Ruby Princess	5/14/15	13.4	110	0	22	86	67	40	8.4	44	0
Ruby Princess	7/23/15	0	36	0	9.5	200	45	16	0.33	44	0
Star Princess-GW	6/10/15	0	43	7.1	12	110	20	0	0	11	0
Star Princess-GW	7/22/15	0	92	0	30	78	24	0	0.39	6.7	0
Star Princess	6/10/15	0	56	0	18	200	23	0	0.95	41	0
Star Princess	7/22/15	0	63	0	15	77	18	0	0	3.6	0
Regatta-Port	6/1/15	6	166		35	74	490	170	38	47	0
Regatta-Port	8/6/15	0	41	0	12	88	320	43	1	0	0
Seven Seas Navigator	5/24/15	5.2	70	0	19	170	30	0	0.27	57	0
Seven Seas Navigator	7/18/15	0	85	0	32	150	22	0	0	42	0
	MAX	72.8	166	7.1	71	450	490	170	38	510	0
	MIN	0	16	0	6	30	10	0	0	0	0
	MEDIAN	0	43	0	14.5	105	38.5	0	0.695	19	0
	Parameter not sampled										
Non-detects set to zero or ND											

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 diss	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			
Disney Wonder	6/12/15	0	0	0	0	0	0	0	0	0	24	3.8	1.6	0	0	18	17	1.3	1.4	0	0	0	0	300	190			
Disney Wonder	8/7/15	3.7	5	1.6	1.2	0	0	0	0	1.2	1.4	3.8	2.3	2.5	0	17	18	2.2	2.3	0	0	0	0	270	290			
Statendam	6/6/15	0	0	0	1	0	0	0	0	0	2.1	2.2	0	0	0	20	19	2.1	2.4	0	0	0	0	33	34			
Statendam	8/15/15	0	0	0	1.7	0	0	0	0	2.7	2.6	2.2	2.3	0	0	28	28	3.7	5.8	0	0	0	0	4.9	6			
Volendam	6/5/15	0	0	0	0	0	0	0	0	0	0	3.8	4.8	0	0	0	8.1	9.8	2.3	2.7	0	0	0	0	71	75		
Volendam	7/17/15	0	0	0	0	0	0	0	0	0	0	3.9	3.7	0	0	0	11	11	1.4	0	0	0	0	0	97	100		
Zaandam	6/17/15	0	0	0	0	0	0	0	0	0	1.5	1.5	0	0	0	6.1	6.1	2	2	0	0	0	0	0	34	42		
Zaandam	8/6/15	0	0	1.1	1	0	0	0	1	1.1	7.2	5.9	0	0	0	6.8	7.2	2.6	3.3	0	0	0	0	60	61			
Norwegian Jewel	6/2/15	0	0	0	0	0	0	0	0	0	1.6	1.3	0	0	0	6.9	7.3	0	0	0	0	0	0	0	48	49		
Norwegian Jewel	8/4/15	0	0	0	0	0	0	0	0	0	7	4.7	0	0	0	5.6	9	0	0	0	0	0	0	0	71	70		
Norwegian Pearl	6/2/15	0	0	0	0	0	0	0	0	0	0	3.6	3.2	0	0	0	4.7	4.9	1.9	1.5	0	0	0	0	71	71		
Norwegian Pearl	9/15/15	0	0	0	0	0	0	0	0	0	0	2.1	1.5	0	0	0	6.5	6.7	0	0	0	0	0	0	65	67		
Norwegian Sun	5/22/15	0	0	0	0	0	0	0	0	0	0	5.2	3.4	0	0	0	29	29	0	0	0	0	0	0	80	81		
Norwegian Sun	7/9/15	0	0	0	0	0	0	0	0	0	3.7	3.7	0	0	0	9.1	9.2	0	0	0	0	0	0	0	52	64		
Ponant	6/20/15	1	1.4	1.5	1.3	0	0	0	1.2	1.2	17	15	0	0	0	7.8	7.7	2.3	2.1	0	0	0	0	0	220	220		
Ponant	7/18/15	0	0	0	0	0	0	0	1.1	0	7.5	3.7	0	0	0	5.3	5	1.2	0	0	0	0	0	0	73	57		
Coral Princess	5/24/15	0	0	2.8	3.4	0	0	0	0	0	9.4	8.2	0	0	0	8.9	9.2	6.2	8.1	0	0	0	0	0	49	52		
Coral Princess	8/16/15	0	1.5	0	0	0	0	0	0	1.7	1.5	18	17	0	0	0	11	10	1.5	1.9	0	0	0	0	0	65	66	
Crown Princess-GW	6/15/15	0	0	0	0	0	0	0	0	0	0	2.7	2.3	0	0	0	9.7	9.7	0	0	0	0	0	0	0	16	18	
Crown Princess-GW	8/3/15	0	1.3	0	0	0	0	0	0	0	0	3.8	1.9	0	0	0	11	12	2.4	2.6	0	0	0	0	0	44	41	
Crown Princess	6/16/15	0	0	0	0	0	0	0	0	0	0	2.6	2.4	0	0	0	12	12	0	0	0	0	0	0	0	20	24	
Crown Princess	8/4/15	0	0	0	0	0	0	0	0	0	0	2.5	3.9	0	0	0	13	14	3.1	3	0	0	0	0	0	47	46	
Golden Princess- GW	6/4/15	0	0	0	0	0	0	0	0	0	0	9.5	8.6	0	0	0	4.9	4.9	0	0	0	0	0	0	0	90	97	
Golden Princess- GW	8/4/15	0	0	0	0	0	0	0	0	0	0	1.4	1.4	0	0	0	11	12	0	0	0	0	0	0	0	31	31	
Golden Princess	6/15/15	0	0	0	0	0	0	0	0	0	0	7.2	10	0	0	0	5.6	6	0	0	0	0	0	0	0	87	98	
Golden Princess	8/5/15	0	0	1.7	1.3	0	0	0	0	1.1	1.2	8.2	7.8	0	0	0	9.3	9.5	2	0	0	0	0	0	0	57	53	
Grand Princess-GW	5/20/15	0	0	0	0	0	0	0	0	1.7	1.7	1.4	1.3	0	0	0	11	11	0	0	0	0	0	0	0	15	17	
Grand Princess-GW	8/12/15	0	0	1.2	0	0	0	0	0	1.2	0	3.8	0	0	0	0	11	12	5.5	6.2	0	0	0	0	0	28	27	
Grand Princess	5/20/15	0	0	0	1.7	0	0	0	1.9	1.8	2.3	6	0	0	0	12	12	1.4	2.6	0	0	0	0	0	23	59		
Grand Princess	8/12/15	0	0	1.1	0	0	0	0	2.5	0	3.2	0	0	0	0	14	14	3.7	5.2	0	0	0	0	0	35	35		
Pacific Princess-GW	6/18/15	0	0	0	0	0	0	0	0	0	0	45	46	0	0	0	16	17	1.7	1.8	0	0	0	0	0	87	90	
Pacific Princess-GW	8/7/15	0	0	0	0	0	0	0	0	0	0	17	17	0	0	0	23	23	1.9	1.8	0	0	0	0	0	130	140	
Pacific Princess	6/19/15	0	0	0	0	0	0	0	0	0	0	27	25	0	0	0	15	14	1.2	2.7	0	0	0	0	0	73	70	
Pacific Princess	8/7/15	0	0	1.1	0	0	0	0	0	0	0	14	9.2	0	0	0	17	17	2	2.3	0	0	0	0	0	81	81	
Ruby Princess-GW	5/3/15	0	0	0	0	0	0	0	0	0	0	9	8	0	0	0	7.9	7.5	0	0	0	0	0	0	0	74	85	
Ruby Princess-GW	7/22/15	0	0	0	1.1	0	0	0	0	1.6	1.5	8.9	9	0	0	0	7	7.3	2.7	3.8	0	0	0	0	0	110	110	
Ruby Princess	5/14/15	0	0	1.6	0	0	0	0	0	1.3	0	20	13	0	0	0	8.3	7.9	2.3	1.2	0	0	0	0	0	120	100	
Ruby Princess	7/23/15	0	1.1	1.1	1.2	0	0	0	0	1.6	1.5	12	12	0	0	0	7.2	7.1	3.2	3.9	0	0	0	0	0	97	110	
Star Princess-GW	6/10/15	0	0	0	0	0	0	0	0	0	0	3.2	2.9	0	0	0	14	14	0	0	0	0	0	0	0	68	69	
Star Princess-GW	7/22/15	0	0	0	0	0	0	0	0	0	1.7	1.8	2	1.8	0	0	0	15	15	0	0	0	0	0	0	20	21	
Star Princess	6/10/15	0	0	0	1.1	0	0	0	0	0	0	3.3	2.6	0	0	0	14	14	2.1	2.7	0	0	0	0	0	71	52	
Star Princess	7/22/15	0	0	0	0	0	0	0	0	1.5	1.4	1.7	1.7	0	0	0	15	15	0	0	0	0	0	0	0	20	22	
Regatta-Port	6/1/15	0	0	9.4	7.1	0	0	0	0	0	94	76	0	0	0	15	15	18	17	0	0	0	0	0	0	0	140	130
Regatta-Port	8/6/15	0	0	6.4	6.3	0	0	0	0	0	0	26	18	0	0	0	21	20	16	18	0	0	0	0	0	52	44	
Seven Seas Navigator	5/24/15	0	0	1.2	1.2	0	0	0	0	0	1.6	6.9	4.2	0	4.5	0	8.2	8.5	0	1.1	0	0	0	0	0	74	78	
Seven Seas Navigator	7/18/15	0	0	1.9	1.8	0	0	0	0	0	0	5	2.5	0	0	0	7.6	7.8	0	0	0	0	0	0	0	34	33	

All results in micrograms/L (ug/L)

Non detects recorded as zero

APPENDIX 2: REFERENCES

Alaska Department of Environmental Conservation (ADEC) Cruise Ship Program

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

Quality Assurance Project Plan

http://dec.alaska.gov/water/cruise_ships/pdfs/2015_CLIA-NWC_QAPP.pdf

2014 Large Cruise Ship General Permit

http://dec.alaska.gov/water/cruise_ships/gp/2014gp.html

2010 Large Cruise Ship General Permit

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

Alaska Cruise Ship Laws and Regulations

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

Sample reports and summaries from prior years

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