

Appendix B: Sample Results - Cruise Ships Approved for Discharge into MOU Waters

SHIP: NORWEGIAN PEARL											
		pH	BOD <sup>3</sup>	TSS <sup>4</sup>	Chlorine Residual <sup>5</sup>	Fecal Coliform <sup>6</sup>	Ammonia	Copper (dissolved)	Nickel (dissolved)	Zinc (dissolved)	Comments
		St. Units	mg/l	mg/l	mg/l	#/100 ml	mg/l	ug/l	ug/l	ug/l	
MOU/Alaska Limits <sup>1</sup>		6-9	30/45	30/45	10 ug/l	20 / 40					
WA State Water Quality Standards <sup>2</sup>		7.0-8.5	NA	NA	13 / 7.5 ug/l	14 / 43					
Sample Date	Location/ Lab										
5/12/2009	Juneau/Admiralty/Microbac	6.92	6.9	7	ND	ND	9.6	15	5.4	110	
5/17/2009	Seattle/Pace Analytical	6.7	ND	5	ND	ND	NA	NA	NA	NA	
5/19/2009	Juneau/Admiralty/Microbac	6.74	4.7	6	ND	ND	41	20	6.2	71	
5/26/2009	Juneau/Admiralty/Microbac	6.93	2.8	ND	ND	ND	45	9.3	5	77	
6/2/2009	Juneau/Admiralty/Microbac	6.90	ND	4	ND	ND	45	11	5.2	110	
6/9/2009	Juneau/Admiralty/Microbac	6.90	4.8	14	ND	ND	50	12	4.9	93	
6/14/2009	Seattle/Pace Analytical	6.5	ND	10	ND	ND	NA	NA	NA	NA	
7/7/2009	Juneau/Admiralty/Microbac	6.80	ND	26	ND	112	56	26	8.5	52	
7/12/2009	Seattle/Pace Analytical	6.7	ND	2	ND	ND	NA	NA	NA	NA	
7/14/2009	Juneau/Admiralty/Microbac	6.64	NA	NA	ND	ND	NA	NA	NA	NA	
7/14/2009	Juneau/Admiralty	NA	NA	NA	NA	ND	NA	NA	NA	NA	
7/14/2009	Juneau/Admiralty	6.65	2.1	ND	ND	ND	35	14	5.2	77	
7/21/2009	Juneau/Admiralty	NA	NA	NA	NA	ND	NA	NA	NA	NA	
7/21/2009	Juneau/Admiralty	NA	NA	NA	NA	ND	NA	NA	NA	NA	
7/21/2009	Juneau/Admiralty	NA	NA	NA	NA	ND	NA	NA	NA	NA	
7/28/2009	Juneau/Admiralty/Microbac	6.28	2.6	ND	ND	ND	38	43	12	31	
7/28/2009	Juneau/Admiralty	NA	NA	NA	NA	4	NA	NA	NA	NA	
7/28/2009	Juneau/Admiralty	NA	NA	NA	NA	ND	NA	NA	NA	NA	
8/4/2009	Juneau/Admiralty/Microbac	6.60	ND	ND	ND	ND	41	18	6.1	87	
8/18/2009	Juneau/Admiralty/Microbac	6.68	5	ND	ND	ND	42	13	5.7	66	
8/30/2009	Seattle/Spectra	6.42	ND	2	ND	ND	NA	NA	NA	NA	
9/1/2009	Juneau/Admiralty/Microbac	6.59	ND	ND	ND	ND	48	22	6.2	86	
9/8/2009	Juneau/Admiralty/Microbac	6.67	ND	4	ND	ND	43	22	6.2	100	
9/13/2009	Seattle/Spectra	6.8	4.8	2.8	ND	ND	NA	NA	NA	NA	
	MINIMUM	6.28	ND	ND	ND (<0.1)	ND	9.6	9.3	4.9	31	met Seattle sampling requirement
	AVERAGE		3.0	6.3			41.1	18.8	6.4	80	
	MAXIMUM	6.93	6.9	26	ND (<0.1)	112	56.0	43.0	12.0	110	
	GEOMETRIC MEAN					2.43					

SHIP: NORWEGIAN STAR											
		pH	BOD <sup>3</sup>	TSS <sup>4</sup>	Chlorine Residual <sup>5</sup>	Fecal Coliform <sup>6</sup>	Ammonia	Copper (dissolved)	Nickel (dissolved)	Zinc (dissolved)	Comments
		St. Units	mg/l	mg/l	mg/l	#/100 ml	mg/l	ug/l	ug/l	ug/l	
MOU/Alaska Limits <sup>1</sup>		6-9	30/45	30/45	10 ug/l	20 / 40					
WA State Water Quality Standards <sup>2</sup>		7.0-8.5	NA	NA	13 / 7.5 ug/l	14 / 43					
Sample Date	Location/ Lab										
4/29/2009	Juneau/Admiralty/Microbac	7.03	3.6	5	ND	ND	33	3.4	14	91	
5/5/2009	Juneau/Admiralty/Microbac	7.01	ND	ND	ND	ND	26	6	12	82	
5/12/2009	Juneau/Admiralty/Microbac	7.02	3.6	9	ND	ND	28	6.0	7.1	35	
5/16/2009	Seattle/Pace Analytical	6.9	ND	ND	ND	ND	NA	NA	NA	NA	
5/18/2009	Juneau/Admiralty/Microbac/R4	6.9	2.6	ND	ND	ND	2.3	5.5	6.9	47	
6/9/2009	Juneau/Admiralty/Microbac	7.1	3	4	ND	ND	66	4.2	8.7	51	
6/13/2009	Seattle/Pace Analytical	7.1	4.2	5	ND	ND	NA	NA	NA	NA	
6/16/2009	Juneau/Admiralty/Microbac	6.76	5.9	ND	ND	ND	11	3.4	8.3	44	
7/7/2009	Juneau/Admiralty/Microbac	6.93	7	4	ND	ND	28	4.2	11	82	
7/11/2009	Seattle/Pace Analytical	7.0	6.6	2	ND	ND	NA	NA	NA	NA	
7/14/2009	Juneau/Admiralty/Microbac	6.88	12.3	ND	ND	ND	28	2.5	14	70	
7/28/2009	Juneau/Admiralty/Microbac	7.14	11	ND	ND	ND	32	7.1	13	58	
7/28/2009	Juneau/Admiralty/Microbac	NA	8.2	4	ND	ND	30	3.7	12	53	Blind Duplicate

8/4/2009	Juneau/Admiralty/Microbac	7.04	13	ND	ND	2	20	5.4	18	95	
8/11/2009	Juneau/Admiralty/Microbac	7.05	14.1	4	ND	2	21	3.8	14	86	
8/15/2009	Seattle/Spectra	7.07	ND	5.5	ND	ND	NA	NA	NA	NA	
9/1/2009	Juneau/Admiralty/Microbac	6.74	ND	ND	ND	4	21	4.1	13	73	
9/8/2009	Juneau/Admiralty/Microbac	6.78	18	ND	ND	5	25	3.5	18	90	
9/12/2009	Seattle/Spectra	6.6	17	5.2	ND	21	NA	NA	NA	NA	
*fecal coliform analysis demonstrated confluent growth, so results not quantifiable. Re-sample ordered.											
	<b>MINIMUM</b>	<b>6.6</b>	<b>ND</b>	<b>ND</b>	<b>ND (&lt;0.1)</b>	<b>ND</b>	<b>2.3</b>	<b>2.5</b>	<b>6.90</b>	<b>35</b>	met Seattle sampling requirement
	<b>AVERAGE</b>		<b>7.3</b>	<b>4.4</b>			<b>26.5</b>	<b>4.5</b>	<b>12.1</b>	<b>68.4</b>	
	<b>MAXIMUM</b>	<b>7.14</b>	<b>18</b>	<b>9</b>	<b>ND (&lt;0.1)</b>	<b>21</b>	<b>66</b>	<b>7</b>	<b>18</b>	<b>95</b>	
	<b>GEOMETRIC MEAN</b>					<b>2.46</b>					

ND = Non Detect, value in box is the detection level. Unannounced sampling includes other parameters not listed above.

BOD = Biochemical Oxygen Demand - or organics; TSS = Total Suspended Solids

mg/l = milligrams per liter; ug/l = micrograms per liter; #/100 ml = coliforms per 100 milliliters

<sup>1</sup>MOU/Alaska limits from Title XIV, Certain Alaska Cruise Ship Operations, Section 1404(c) /40CFR 133.102

BOD and TSS: 30-day average shall not exceed 30 mg/l, 7-day average shall not exceed 45 mg/l

Fecal Coliform: geometric mean of any 30-day period shall not exceed 20 fecal coliform/100 ml and not more than 10% of the samples exceed 40 fecal coliform/100 ml

<sup>2</sup>Washington State Water Quality Standards for Surface Waters of the State of Washington Chapter 173-201A WAC

Fecal Coliform: shall not exceed a geometric mean of 14 colonies/100 ml and not more than 10% of a samples shall exceed a geometric mean of 43 colonies/100 ml

pH: 7-8.5 with a human-caused variation within less than 0.2

chlorine: 13 ug/l is the acute limit (1-hour average); 7.5 ug/l is the chronic limit (4-day average)

<sup>3</sup>BOD detection level = 2 mg/l

<sup>3</sup>TSS detection level = 4 mg/l

<sup>3</sup>Chlorine Residual detection level = 0.1 mg/l

<sup>3</sup>Fecal Coliform detection level = 2 #/100 ml