

## 2007 Small Ship Wastewater Sampling Results

In 2001, Alaska Statute (AS) 46.03.460-46.03.490 established the Commercial Passenger Vessel Environmental Compliance Program (CPVEC), which is administered by the Alaska Department of Environmental Conservation (ADEC) and applies to large<sup>1</sup> and small<sup>2</sup> commercial passenger vessels. The law requires small vessels to sample their wastewater discharges twice per season. Several key aspects of the CPVEC program, such as payment of environmental compliance fees and compliance with wastewater discharge standards, became effective for small commercial passenger vessels on January 1, 2004.

Small cruise ships are now required to meet standard terms and conditions, or seek alternative terms and conditions in order to discharge blackwater<sup>3</sup> and graywater<sup>4</sup> in Alaska marine waters. Under standard terms and conditions blackwater, graywater and other wastewater must contain no more than 200 fecal coliform per 100 milliliters and no more than 150 milligrams per liter of total suspended solids.

Alaska's original CPVEC law in 2001 established the standard terms and conditions and the alternative terms and conditions. Changes to Alaska's CPVEC law in 2004 established additional alternative terms and conditions AS 46.03.462 (e) also known as a best management practices plan. As part of the 2004 law, the interim protective measures allowed under AS 46.03.463(b) and (c) are now the same as the alternative terms and conditions permitted under AS 46.03.462. For more information about best management practices please see the cruise ship web site at the following address.

[http://www.dec.state.ak.us/water/cruise\\_ships/small\\_vessel\\_dischargeoptions.htm](http://www.dec.state.ak.us/water/cruise_ships/small_vessel_dischargeoptions.htm)

In 2007, all registered small vessels obtained approved Best Management Practices plans and operated under these plans. The AMHS ferries operated under approved conditional status Best Management Practices plans, which were renewed in 2007. The Best Management Practices regulations, 18 AC 69.046, became effective on May 18, 2006.

Eighteen small ships registered with the CPVEC program in 2007, including five state ferries that operate in Alaska year-round. One small ship, the Hanseatic did not discharge into Alaskan waters and was not sampled. Table 1 (Parts 1 & 2) summarizes the 2007 small ship sampling results using the median<sup>5</sup> results for each pollutant. Data from the 17 ships were combined and results show that small-ship effluent does not meet water quality standards at the end of pipe for fecal coliform, ammonia, chlorine, arsenic, copper, nickel, and zinc.

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<sup>1</sup> A large vessel has >250 overnight passengers as defined in AS 46.03.490(13)

<sup>2</sup> A small vessel has 50-249 overnight passengers as defined in AS 46.03.490(7)

<sup>3</sup> Wastewater from toilets as defined in AS 46.03.490(12).

<sup>4</sup> As defined in AS 46.03.490(6). Wastewater from galley, dishwasher, bath and laundry.

<sup>5</sup> The median is the middle of a distribution: half the scores are above the median and half are below the median. The median is less sensitive to extreme scores than an average and is thus a better measure for skewed distributions.

Table 1. Summary 2007 Small Vessels Median Sampling Results –Part 1 (17 vessels)

	Ammonia as N	pH	Biochemical O <sub>2</sub> Demand	Chemical Oxygen Demand	Total Suspended Solids	Total Chlorine, Residual	Fecal Coliform Bacteria by MPN
<b>Alaska Water Quality Standards</b>	<b>2.9 *</b>	<b>6.5-8.5</b>	<b>n/a</b>	<b>n/a</b>	<b>150***</b>	<b>0.0075</b>	<b>200 **</b>
<b>Units</b>	<b>mg/L</b>	<b>s.u.</b>	<b>mg/L</b>	<b>mg/L</b>	<b>mg/L</b>	<b>mg/L</b>	<b>mg/L</b>
Graywater (12 samples)	0.98	7.26	215	310	52	0.3	250
Blackwater (15 samples)	30	7.68	165	470	154	0.1	3,350
Mixed Blackwater & Graywater (15 Samples)	10	7.54	105	270	110	1.5	410

\* Ammonia standards are based on temperature, pH and salinity. This standard is from Table IX in the *Alaska Water Quality Criteria Manual for Toxics and Other Deleterious Organic and Inorganic Substances*.

\*\* The standard in receiving water for consumption of raw shellfish is 14 fecal coliform bacteria per 100 ml. Effluent levels below 200 fc/100ml means that with dilution, the 14 fc/100ml standard will be met in the receiving water.

\*\*\* Federal MSD requirements.

Table 1. Summary 2007 Small Vessels Median Sampling Results – Part 2 (17 vessels)

	Arsenic, dissolved	Copper, dissolved	Lead, dissolved	Nickel, dissolved	Selenium, dissolved	Zinc, dissolved
<b>Alaska Water Quality Standards</b>	<b>36</b>	<b>3.1</b>	<b>8.1</b>	<b>8.2</b>	<b>71</b>	<b>81</b>
<b>Units</b>	<b>ug/L</b>	<b>ug/L</b>	<b>ug/L</b>	<b>ug/L</b>	<b>ug/L</b>	<b>ug/L</b>
<b>Median (17 samples)</b>	<b>49.5</b>	<b>16.8</b>	<b>1.31</b>	<b>10</b>	<b>9.2</b>	<b>69.9</b>

### Wastewater results for individual ships

Tables 2 through 5 show the 2007 twice-per-season sampling results for each of the 17 ships that reported. Samples were analyzed for conventional and priority pollutants (see Table 6). Results highlighted in yellow are outside the standard terms and conditions or appropriate water quality standard. The small ships operating under best management practice plans do not need to meet standard terms and conditions, so no enforcement action was required. DEC does look for progress on wastewater sample results, and requires improvements prior to issuing extensions to the Best Management Practices plans.

### Bacteria

Small ships continue to try to balance bacterial disinfection and chlorine use. Chlorine is used to disinfect bacteria, but it is toxic to marine organisms and high residuals must be avoided. The median total residual chlorine result for mixed black and graywater is 10 times the Alaska’s marine water quality standard (AMWQS). The maximum total

residual chlorine results for small-ship graywater and blackwater were 3.5 mg/L and 2.5 mg/L, respectively. The maximum total residual chlorine for mixed graywater and blackwater was 33.2 mg/L—more than 4400 times (AMWQS). The fecal coliform standard is 200 colonies per 100 ml to meet AMWQS for secondary-contact recreation. The most stringent AMWQS is 14 colonies per 100 ml to collect shellfish for raw consumption, and is the standard used to protect all uses of all waters. Blackwater has the highest median fecal coliform results. At over 2,300,000 colonies per 100 ml, the median is more than 160,000 times the AMWQS for raw consumption of shellfish. The maximum fecal coliform result for mixed blackwater or graywater was from the Spirit of Oceanus. At 20,000,000 colonies per 100 ml, this is over 1 million times AMWQS for raw shellfish consumption.

### ***Other Pollutants***

One of the two samples for each ship was analyzed for 167 “priority pollutants:” 13 total metals, 12 dissolved metals; 72 volatile organic compounds (VOCs); 70 bases, neutral, acids (BNAs). Some small ships have separate graywater and blackwater discharges. The department allowed these ships to sample priority pollutants<sup>6</sup> on only one of their wastewater discharges per season.

Most of the priority pollutants were not detected in small ship discharges. Table 5 includes only priority pollutants with medians that exceeded the practical quantitation limit (PQL) or a pollutant with a maximum value 10 times the PQL. Alaska uses dissolved metal concentration (a subset of total recoverable metals) for its water quality standards, but Table 5 also includes the total recoverable metals results for informational purposes. The pollutants not listed here are considered not detected and the analysis of those pollutants is unnecessary.

Currently there are no AMWQS for 3&4-methylphenol, 2-cholorphenol, bromoform, chloroform, benzoic acid and phenol. However, there are Alaska Marine Water Quality Standards (AMWQS) for arsenic, chromium, copper, lead, selenium, nickel and zinc.

All small ships met the AMWQS for dissolved chromium. Most small ships that operated in Alaska in 2007 exceeded the AMWQS for nickel and arsenic. All small ships that were sampled exceeded the AMWQS for copper. Two ships exceeded the AMWQS for lead, one for selenium, and seven for zinc.

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<sup>6</sup> The priority pollutants analysis can be found in the Large Ship Unannounced Sampling Report.

Table 2. 2007 Small Ship Graywater Unannounced Sampling (not including priority pollutants)

		Ammonia as N	pH	Biochemical O <sub>2</sub> Demand	Chemical Oxygen Demand	Total Suspended Solids	Total Chlorine	Free Chlorine	Fecal Coliform Bacteria by MPN	Conductivity	Hexane- Extractable Matreials	Total Organic Carbon	Alkalinity	Total Nitrate & Nitrite	Total Phospho rus	Total Kjeldahl Nitrogen	Total Settleabl e Solids
Reportable Limit (PQL)		0.1	0.1	2	10	4	0.1	0.1	2	2	5	1	2	1	0.05	1	0.1
Units		mg/L	s.u.	mg/L	mg/L	mg/L	mg/L	mg/L	MPN/100ml	umhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ml/L
Alaska Marine Water Quality Standards		2.9	6.5-8.5	n/a	n/a	150	0.0075	n/a	200	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Vessel Name	Sample Date																
Clipper Odyssey	7/25/07	5.60	8.69	265	620	64	3.5	0.1	140,000	736	61.0	190.0	92.5	0.00	4.10	10.30	0.00
Spirit of 98	7/12/07	0.00	7.15	3	0	4	0.0	0.0	*	85	0.0	0.0	27.2	0.00	0.26	0.00	0.50
Spirit of Alaska	6/12/07	1.60	10.30	403	590	60	0.4	0.0	0	853	0.0	330.0	339.0	0.00	5.50	18.00	0.00
Spirit of Alaska	8/7/07	1.10	7.23	117	230	36	0.00	0.00	700	305	0.0	79.0	49.2	0.00	0.89	9.29	0.00
Spirit of Columbia	6/15/07	0.85	7.60	224	210	76	1.00	1.10	2,300	221	11.0	82.0	27.0	0.00	2.40	6.90	0.00
Spirit of Columbia	8/13/07	0.63	5.00	410	530	156	1.90	2.00	190,000	555	6.6	180.0	27.6	0.00	1.80	9.65	3.00
Spirit of Endeavor	8/14/07	2.40	8.96	311	600	106	0.75	1.20	100	7,500	7.5	140.0	384.0	0.00	2.00	8.97	0.00
Spirit of Yorktown	6/20/07	3.90	6.72	106	150	43	0.00	0.00	220	143	0.0	43.0	35.0	0.00	2.50	7.81	0.00
Sea Bird	6/2/07	0.00	6.35	101	180	6	0.10	0.10	0	1,080	0.0	7.7	1.2	0.00	0.19	0.89	0.00
Sea Bird	8/20/07	0.14	6.15	187	200	7	0.00	0.00	0	980	0.0	130.0	40.3	0.17	0.69	2.00	0.00
Sea Lion	7/1/07	1.70	7.29	782	950	150	0.00	0.00	3,200	340	12.0	170	75.5	0.00	2.90	16.50	0.60
Sea Lion	8/26/07	0.75	7.30	206	390	32	2.13	1.30	250	1,180	28.0	140.0	21.0	0.17	1.30	9.90	0.00
<b>Minimum</b>		<b>0.00</b>	<b>5.00</b>	<b>3</b>	<b>0</b>	<b>4.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0</b>	<b>85</b>	<b>0.0</b>	<b>0.0</b>	<b>1.2</b>	<b>0.00</b>	<b>0.19</b>	<b>0.00</b>	<b>0.00</b>
<b>Maximum</b>		<b>5.60</b>	<b>10.30</b>	<b>782</b>	<b>950</b>	<b>156.0</b>	<b>3.5</b>	<b>2.0</b>	<b>190,000</b>	<b>7,500</b>	<b>61.0</b>	<b>330.0</b>	<b>384.0</b>	<b>0.17</b>	<b>5.50</b>	<b>18.00</b>	<b>3.00</b>
<b>Median</b>		<b>0.98</b>	<b>7.26</b>	<b>215</b>	<b>310</b>	<b>51.5</b>	<b>0.3</b>	<b>0.1</b>	<b>250</b>	<b>646</b>	<b>3.3</b>	<b>135.0</b>	<b>37.7</b>	<b>0.00</b>	<b>1.90</b>	<b>9.13</b>	<b>0.00</b>

\* Missing sample, results not analyzed. This issue is being addressed in 2008.

Table 3. 2007 Small Ship Blackwater Unannounced Sampling (not including priority pollutants)

	Ammonia as N	pH	Biochemical O <sub>2</sub> Demand	Chemical Oxygen Demand	Total Suspended Solids	Total Chlorine	Fecal Coliform Bacteria by MPN	Conductivity	Free Chlorine	Hexane-Extractable Matreials	Total Organic Carbon	Alkalinity	Total Nitrate & Nitrite	Total Phosphorus	Total Kjeldahl Nitrogen	Total Settleable Solids	
Reportable Limit (PQL)	0.1	0.1	2	10	4	0.1	2	2	0.1	5	1	2	1	0.05	1	0.1	
Units	mg/L	s.u.	mg/L	mg/L	mg/L	mg/L	MPN/100ml	umhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ml/L	
Alaska Marine Water Quality	2.9	6.5-8.5	n/a	n/a	150	0.0075	200	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Vessel Name	Sample Date																
Clipper Odyssey	7/25/07	180.0	7.75	165	540	192	0.00	9,400,000	12,000	0.00	11.0	170	595.0	0.00	7.60	199.00	6.30
Spirit of 98	7/12/07	98.0	7.39	266	400	120	0.00	*	22,200	0.00	6.7	91	669.0	0.00	14.00	110.00	0.00
Spirit of Alaska	6/12/07	30.0	8.15	21	320	180	2.50	0	28,500	0.30	0.0	25	211.0	0.00	6.50	36.10	57.00
Spirit of Alaska	8/7/07	1.0	8.05	8	63	29	1.90	200,000	19,000	0.20	0.0	200	70.8	0.00	0.00	2.11	8.60
Spirit of Columbia	6/15/07	23.0	6.10	86	350	108	1.30	0	42,700	2.10	0.0	99	162.0	0.00	8.60	76.10	8.00
Spirit of Discovery	6/11/07	85.0	7.40	169	470	120	0.00	2,700,000	34,200	0.00	0.0	99	709.0	*	13.00	94.90	0.00
Spirit of Discovery	9/3/07	130.0	7.91	194	720	348	0.17	6,000,000	31,600	0.10	0.0	120	718.0	0.00	17.00	161.00	12.00
Spirit of Endeavor	6/5/07	12.0	7.52	215	590	276	0.00	14,000,000	33,700	0.00	0.0	80	259.0	0.00	11.00	51.10	4.50
Spirit of Endeavor	8/14/07	21.0	7.68	424	950	652	0.75	2,000	3,180	1.20	11.0	230	201.0	0.00	18.00	80.30	29.00
Spirit of Yorktown	6/20/07	77.0	7.90	115	280	154	0.00	430	33,400	0.00	0.0	83	445.0	0.00	6.00	78.80	0.00
Spirit of Yorktown	8/30/07	150.0	7.68	439	2,800	393	0.00	350,000	22,200	0.00	7.6	260	590.0	0.00	34.00	186.00	8.00
Sea Bird	6/2/07	0.0	7.57	18	72	21	0.10	0	25,100	0.10	0.0	13	68.5	0.00	0.00	0.00	0.00
Sea Bird	8/25/07	0.4	7.34	22	160	21	0.40	122	11,400	0.40	0.0	45	19.7	0.00	0.38	2.50	0.00
Sea Lion	7/1/07	21.0	7.46	185	620	246	0.00	0	24,800	0.00	7.7	130	149.0	0.00	8.20	62.90	15.00
Sea Lion	8/26/07	36.0	7.91	118	1,400	120	1.94	4,700	22,800	0.19	10.0	84	35.0	0.22	6.80	72.00	21.00
<b>Minimum</b>	<b>0</b>	<b>6.1</b>	<b>7.54</b>	<b>63</b>	<b>21</b>	<b>0</b>	<b>0</b>	<b>3180</b>	<b>0</b>	<b>0</b>	<b>13</b>	<b>19.7</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	
<b>Maximum</b>	<b>180</b>	<b>8.15</b>	<b>439</b>	<b>2800</b>	<b>652</b>	<b>2.5</b>	<b>14000000</b>	<b>42700</b>	<b>2.1</b>	<b>11</b>	<b>260</b>	<b>718</b>	<b>0.22</b>	<b>34</b>	<b>199</b>	<b>57</b>	
<b>Median</b>	<b>30</b>	<b>7.68</b>	<b>165</b>	<b>470</b>	<b>154</b>	<b>0.1</b>	<b>3,350</b>	<b>24800</b>	<b>0.1</b>	<b>0</b>	<b>99</b>	<b>211</b>	<b>0</b>	<b>8.2</b>	<b>76.1</b>	<b>8</b>	

\* Missing sample or data. This issue is being addressed in 2008.

Table 4. 2007 Small Ship Unannounced Sampling Blackwater and Graywater Mixed Results (not including priority pollutants)

	Ammonia as N	pH	Biochemical O <sub>2</sub> Demand	Chemical Oxygen Demand	Total Suspended Solids	Total Chlorine	Free Chlorine	Fecal Coliform Bacteria by MPN	Conductivity	Hexane-Extractable Matreials	Total Organic Carbon	Alkalinity	Total Nitrate & Nitrite	Total Phosphorus	Total Kjeldahl Nitrogen	Total Settleable Solids	
Reportable Limit (PQL)	0.1	0.1	2	10	4	0.1	0.1	2	2	5	1	2	1	0.05	1	0.1	
Units	mg/L	s.u.	mg/L	mg/L	mg/L	mg/L	mg/L	MPN/100ml	umhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ml/L	
Alaska Marine Water Quality	2.9	6.5-8.5	n/a	n/a	150	0.0075	n/a	200	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Vessel Name	Sample Date																
Columbia	6/25/07	18.00	7.59	132	300	76.0	0.2	3.8	210	27,300	0.0	65.0	271.0	0.00	4.30	38.70	0.00
Columbia	8/13/07	17	7.54	115	1100	160	1.5	12	40	24400	17	12	130	0.45	3.7	31	0.5
Kennicott	4/28/07	0.97	8.21	12.3	200	50	7.7	6.4	410	40300	0	0	107	0	0	0.492	0
Kennicott	5/29/07	0	7.64	4.71	40	15	4.6	3.9	0	28900	0	4.5	89	0	0.064	0.8	0
Malaspina	5/5/07	0	7.33	51.3	180	43	33.2	24.8	0	33.2	0	30	118	0	1.2	2.86	0
Malaspina	8/4/07	45	7.15	207	1100	110	0	0	7,700,000	12400	15	460	2700	0	1.2	57	0
Matanuska	4/25/07	13	6.68	121	300	118	13.1	1.9	0	3340	0	64	135	0	3.9	29.8	0
Matanuska	6/20/07	10	7.36	105	240	82	14	1.1	0	25600	0	55	116	0	4.7	254	0
Taku	7/25/07	7.5	7.99	63.2	220	124	2.6	1.7	52	22000	16	55	90.9	0	4.3	32.3	7
Taku	8/25/07	7	8.13	63.2	12000	160	16	9	1900	22300	6.5	68	0	0.14	2.6	2.1	8
Spirit of Oceanus	6/12/07	37	8.1	311	680	360	0	0	20,000,000	28400	19	380	269	0	7.8	50.4	6
Contessa	9/12/07	150	8.14	171	240	148	0	*	2,700,000	30900	6.1	180	541	0	9	129	2.8
Empress of the North	9/8/07	9.3	7.28	245	270	82	0	0	140,000	34100	0	46	124	0	2.1	9.81	0
Empress of the North <sup>1</sup>	9/15/07	5.6	7.08	69.2	200	54	0	*	29,000	24500	12	34	92.5	0	1.8	9.19	0.3
Empress of the North <sup>1</sup>	9/15/07	12	6.83	102	370	153	0	*	39,200	20800	24	78	122	0	3.5	20	3
<b>Minimum</b>	0.0	6.68	4.71	40	15	0	0	0	0	33.2	0.0	0.0	0.0	0.00	0.00	0.49	0.00
<b>Maximum</b>	150.0	8.21	311.00	12,000	360	33.20	24.80	20,000,000	40,300.0	24.0	460.0	2,700.0	0.45	9.00	254.00	8.00	
<b>Median</b>	10.0	7.54	105.00	270	110	1.50	2.85	410	24,500.0	6.1	55.0	122.00	0.00	3.50	29.80	0.00	

1- One sample from port discharge, one sample from starboard.

\* Results not available. Issue to be addressed in 2008.

Table 5. 2007 Small Ship Sampling Priority Pollutants

			3&4-Methyl phenol	2-choloro phenol	bromoform	chloroform	Benzoic Acid	Phenol	Arsenic, total	Arsenic, dissolved	Chromium, total	Chromium, dissolved
Reportable Limit (PQL)			5	5	2	2	130	5	2.5	2.5	2.5	2.5
Units			ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Alaska Marine Water Quality Standards			N/A	N/A	N/A	N/A	N/A	N/A	N/A	36	N/A	50
Vessel Name	Sample Date	Sample										
Columbia	8/13/07	Mixed	24	0	36	2.6	160	0	44	24	0	0
Kennicott	5/29/07	Mixed	0	0	81	0	0	0	62.4	65.9	13.9	15.6
Malaspina	8/4/07	Mixed	190	0	0	13	590	14	21	16	5.3	6.7
Matanuska	6/20/07	Mixed	0	0	137	0	390	0	106	63.5	24.8	6.6
Taku	8/25/07	Mixed	0	0	260	2.1	17	0	32	22	0	0
Clipper Odyssey	7/25/07	Black	0	0	0	36.6	0	6.6	47.7	2.22	18.6	3.2
Clipper Odyssey	7/25/07	Grey	0	0	7.31	466	0	0	2.35	41.7	9.18	10.5
Spirit of Alaska	8/7/07	Black	0	0	8	0	0	0	66.3	64.3	7.8	5.72
Spirit of Columbia	8/13/07	Black	48	0	29.6	8.27	0	4.5	94.4	68.4	17.1	14.5
Spirit of Discovery	9/3/07	Black	50	0	0	0	0	13	56	52.7	27.9	26.7
Spirit of Endeavor	8/14/07	Black	0	0	8.2	25	350	25	101	67.5	23.7	23.4
Spirit of Yorktown	8/30/07	Black	0	0	0	0	0	230	76.6	51.9	57	18.2
Sea Bird	8/25/07	Black	0	0	22	0	0	0	13	11	1.2	0
Sea Lion	8/26/07	Grey	0	0	0	230	74	0	1.3	2.7	0	0
Contessa	9/12/07	Mixed	*	0	*	*	*	42	76.2	67.3	26.7	25.2
Empress of the North	9/8/07	Mixed	*	0	0	3.9	*	8.7	67.8	46.5	17.4	12.4
Empress of the North	9/15/07	Mixed	*	0	2.2	5.9	*	6.2	47.9	49.5	12.6	12.6
<b>MIN</b>			<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>1.30</b>	<b>2.22</b>	<b>0.00</b>	<b>0.00</b>
<b>MAX</b>			<b>190.00</b>	<b>0.00</b>	<b>260.00</b>	<b>466.00</b>	<b>590.00</b>	<b>230.00</b>	<b>106.00</b>	<b>68.40</b>	<b>57.00</b>	<b>26.70</b>
<b>MEDIAN</b>			<b>0.00</b>	<b>0.00</b>	<b>7.66</b>	<b>3.25</b>	<b>0.00</b>	<b>4.50</b>	<b>56.00</b>	<b>49.50</b>	<b>13.90</b>	<b>10.50</b>

\* Results not available. Issue to be addressed in 2008.

Table 5. 2007 Small Ship Sampling Priority Pollutants continued

			Copper, total	Copper, dissolved	Lead, total	Lead, dissolved	Nickel, total	Nickel, dissolved	Selenium, total	Selenium, dissolved	Zinc, total	Zinc, dissolved
Reportable Limit (PQL)			1	1	1	1	1	1	2.5	2.5	2.5	2.5
Units			ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Alaska Marine Water Quality Standards			N/A	3.1	N/A	8.1	N/A	8.2	N/A	71	N/A	81
Vessel Name	Sample Date	Sample										
Columbia	8/13/07	Mixed	56	21	0	0	8.1	8.3	18	9.2	100	69
Kennicott	5/29/07	Mixed	51	36.5	2.34	0	22.4	23.1	146	95.5	89.9	92.9
Malaspina	8/4/07	Mixed	110	9.5	1.2	0	18	14	28	23	79	34
Matanuska	6/20/07	Mixed	349	167	8.63	1.31	26.9	28	35.6	0	205	154
Taku	8/25/07	Mixed	130	48	4.5	0	15	10	0	0	110	24
Clipper Odyssey	7/25/07	Black	45	66.9	4.18	1.68	55.4	3.24	30.9	3.11	216	136
Clipper Odyssey	7/25/07	Grey	126	9.33	2.95	3.01	3.16	414	0	30.7	220	119
Spirit of Alaska	8/7/07	Black	15.6	10.9	0.83	0.462	10.2	19.2	0	0	15.1	6.91
Spirit of Columbia	8/13/07	Black	141	83.7	13.2	2.37	14	9.91	53.9	57.6	684	185
Spirit of Discovery	9/3/07	Black	141	14.6	3.85	1.09	24.5	26.4	76.9	57.7	280	17.3
Spirit of Endeavor	8/14/07	Black	128	50.3	6.94	6.86	19.1	19.9	0	0	851	521
Spirit of Yorktown	8/30/07	Black	257	4.98	8.68	2.08	44	9.93	25.9	20.3	985	0
Sea Bird	8/25/07	Black	5.1	3.2	0	0	2.6	2.6	0	0	17	11
Sea Lion	8/26/07	Grey	200	160	3.7	1.6	6.3	6.7	0	0	160	140
Contessa	9/12/07	Mixed	32.1	9.2	7.34	8.91	4.35	1.64	0	0	84.7	69.9
Empress of the North	9/8/07	Mixed	42.3	16.8	2.11	0	14.3	10.5	69.2	62	167	112
Empress of the North	9/15/07	Mixed	158	4.87	22.6	10.4	3.78	3.16	72.3	70.4	242	17
<b>MIN</b>			<b>5.10</b>	<b>3.20</b>	<b>0.00</b>	<b>0.00</b>	<b>2.60</b>	<b>1.64</b>	<b>0.00</b>	<b>0.00</b>	<b>15.10</b>	<b>0.00</b>
<b>MAX</b>			<b>349.00</b>	<b>167.00</b>	<b>22.60</b>	<b>10.40</b>	<b>55.40</b>	<b>414.00</b>	<b>146.00</b>	<b>95.50</b>	<b>985.00</b>	<b>521.00</b>
<b>MEDIAN</b>			<b>126.00</b>	<b>16.80</b>	<b>3.85</b>	<b>1.31</b>	<b>14.30</b>	<b>10.00</b>	<b>25.90</b>	<b>9.20</b>	<b>167.00</b>	<b>69.90</b>



Tables 6 Conventional and Priority Pollutants

<b>Conventional Pollutants</b>	<b>Method</b>	<b>Reportable Limit (PQL) mg/L</b>
Ammonia- Total	350.3	0.10
Biochemical Oxygen Demand	405.1	2.0
Chemical Oxygen Demand	410.4	10
Chlorine, residual	SM 4500	0.1
Chlorine, free	SM 4500	0.1
Alkalinity	SM 2320 B	2.0
Settable Solids	160.5	0.10 (ml/L)
Total Suspended Solids	160.2	4.0
Fecal Coliform	SM 9221E or SM 9222 D	2 (FC/100 ml)
Specific Conductance-Conductivity	120.1	2 (µmHos/cm)
Total Organic Carbon	SM 5310 B	1.0
Oil and Grease	1664	5.0
Total Kjeldahl Nitrogen	EPA various	1.0
Total Phosphorus	EPA 365.2	0.050
pH	150.1	0.10 standard units
<b>Priority Pollutants</b>	<b>Method</b>	<b>Reportable Limit (PQL)</b>
<b>Total Recoverable Metals</b>		<b>Ug/l</b>
Antimony	200.8	2.5
Arsenic	200.8	2.5
Beryllium	200.8	1.0
Cadmium	200.8	1.0
Chromium	200.8	2.5
Copper	200.8	1.0
Lead	200.8	1.0
Mercury (Total)	245.1	1.0
Nickel	200.8	1.0
Selenium	200.8	2.5
Silver	200.8	1.0
Thallium	200.8	1.0
Zinc	200.8	2.5
<b>Dissolved Metals</b>		
Antimony	200.8	2.5
Arsenic	200.8	2.5
Beryllium	200.8	1.0
Cadmium	200.8	0.5

Chromium	200.8	2.5
Copper	200.8	1.0
Lead	200.8	1.0
Nickel	200.8	1.0
Selenium	200.8	2.5
Silver	200.8	1.0
Thallium	200.8	1.0
Zinc	200.8	2.5
<b>VOCs</b>		
1,1,1,2-Tetrachloroethane	624	2
1,1,1-Trichloroethane	624	2
1,1,2,2-Tetrachloroethane	624	2
1,1,2-Trichloroethane	624	2
1,1-Dichloroethane	624	2
1,1-Dichloroethene	624	2
1,1-Dichloropropene	624	2.5
1,2,3-Trichlorobenzene	624	2.8
1,2,3-Trichloropropane	624	2.5
1,2,4-Trichlorobenzene	624	2.8
1,2,4-Trimethylbenzene	624	2.7
1,2-Dibromo-3-Chloropropane	624	10
1,2-Dichlorobenzene	624	2
1,2-Dichloroethane	624	2
1,2-Dichloroethane	624	2
1,2-Dichloropropane	624	2
1,3,5-Trimethylbenzene	624	2
1,3-Dichlorobenzene	624	2
1,3-Dichloropropane	624	2
1,4-Dichlorobenzene	624	2
2,2-Dichloropropane	624	2
2-Butanone	624	50
2-Chloroethyl Vinyl Ether	624	10
2-Chlorotoluene	624	2.1
2-Hexanone	624	20
4-Chlorotoluene	624	2
4-Isopropyltoluene	624	2.8
4-Methyl-2-Pentanone	624	20
Acetone	624	50
Acrolein	624	100
Acrylonitrile	624	10

<b>VOCs continued</b>		
Benzene	624	2
Bromobenzene	624	2
Bromochloromethane	624	2
Bromodichloromethane	624	2
Bromoform	624	2
Bromomethane	624	5
Carbon Disulfide	624	2
Carbon Tetrachloride	624	2
Chlorobenzene	624	2
Chloroethane	624	5
Chloroform	624	2
Chloromethane	624	5
Cis-1,2-Dichloroethene	624	2
Cis-1,3-Dichloropropene	624	2.3
Dibromochloromethane	624	2
Dibromomethane	624	2
Dichlorodifluoromethane	624	5
Ethylbenzene	624	2
Hexachlorobutadiene	624	2
Iodomethane	624	5
Isopropylbenzene	624	2.6
m&p Xylenes	624	2
Methylene Chloride	624	5
Naphthalene	624	2.8
n-Butylbenzene	624	2.8
n-Propylbenzene	624	2
O-Xylene	624	2.3
sec-Butylbenzene	624	2.3
Styrene	624	2.6
tert-Butyl Methyl Ether	624	2
tert-Butylbenzene	624	3.0
Tetrachloroethene	624	2
Toluene	624	2
Trans 1,2-Dichloroethene	624	2
trans-1,3-Dichloropropene	624	2.1
trans-1,4-Dichloro-2 Buten	624	10
Trichloroethene	624	2
Trichlorofluoromethane	624	2
Trichlorotrifluoroethane	624	2

Vinyl Acetate	624	5
Vinyl Chloride	624	2
<b>BNAs</b>		
1,2,4-Trichlorobenzene	625	5
1,2-Dichlorobenzene	625	5
1,2-Diphenylhydrazine	625	5
1,3-Dichlorobenzene	625	5
1,4-Dichlorobenzene	625	5
2,4,5-Trichlorophenol	625	5
2,4,6-Trichlorophenol	625	5
2,4-Dichlorophenol	625	5
2,4-Dimethylphenol	625	25
2,4-Dinitrophenol	625	100
2,4-Dinitrotoluene	625	5
2,6-Dinitrotoluene	625	5
2-Chloronaphthalene	625	10
2-Chloronaphthalene	625	10
2-Chlorophenol	625	5
2-Methylnaphthalene	625	5
2-Methylphenol	625	5
2-Nitroaniline	625	100
2-Nitrophenol	625	5
3&4-Methylphenol	625	5
3,3'-Dichlorobenzidine	625	20
3-Nitroaniline	625	50
4,6-Dinitro-2-methylphenol	625	25
4-Bromophenyl Phenyl ether	625	5
4-chloro-3-methylphenol	625	5
4-Chloroaniline	625	5
4-Chlorophenyl methylsulfone	625	20
4-Chlorophenyl Phenyl ether	625	5
4-Nitroaniline	625	50
4-Nitrophenol	625	100
Acenaphthene	625	5
Acenaphthylene	625	5
Anthracene	625	5
Benzidine	625	200
Benzo (A) Anthracene	625	5
Benzo (A) Pyrene	625	5
Benzo (B) Fluoranthene	625	5

<b>BNAs continued</b>		
Benzo (g,h,i) Perylene	625	5
Benzo (K) Fluoranthene	625	5
Benzoic Acid	625	130
Benzyl Alcohol	625	10
Bis (2-Chloroethoxy) methane	625	5
Bis (2-chloroethyl) ether	625	5
Bis (2-Chloroisopropyl) ether	625	5
Bis (2-Ethylhexyl) Phthalate	625	2.5
Butyl Benzyl Phthalate	625	5
Chrysene	625	5
Dibenzo (a,h) Anthracene	625	5
Dibenzofuran	625	5
Diethyl Phthalate	625	5
Dimethyl Phthalate	625	5
Di-N-Butyl Phthalate	625	5
Di-N-Octyl Phthalate	625	5
Fluoranthene	625	5
Fluorene	625	5
Hexachlorobenzene	625	5
Hexachlorobutadiene	625	5
Hexachlorocyclopentadiene	625	10
Hexachloroethane	625	5
Indeno (1,2,3-CD) Pyrene	625	5
Isophorone	625	5
Napthalene	625	10
Nitrobenzene	625	5
N-Nitrosodimethylamine	625	5
N-Nitrosodi-N-Propylamine	625	5
N-Nitrosodiphenylamine	625	10
Pentachlorophenol	625	5
Phenanthrene	625	5
Phenol	625	5
Pyrene	625	5