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1011 SW Klickitat Way, Suite 207, Seattle, WA 98134-1162
T **206.624.9349** F **206.624.2839** www.ensr.aecom.com

Memorandum

Date: October 15, 2008

To: Paul Agid – Port of Seattle

From: Shannon Ashurst

Subject: PY1.3 Quarterly Groundwater Monitoring Report

Distribution: Don Robbins – Port of Seattle

Stephen Howard, Dean Kinney, File 05482-020-300

The Embankment Fill Monitoring Program (EFMP) was established by the Port of Seattle (the Port) for compliance with the requirements of several permits issued for the Port's construction of a Third Runway at Seattle-Tacoma International Airport (Airport). These include the State of Washington's Section 401 Water Quality Certification (401WQC) issued by the Washington Department of Ecology (Ecology) and the US Army Corps of Engineers Section 404 Permit. As part of the EFMP, the Port monitors groundwater along the toe of the Third Runway embankment.

Construction of the Third Runway embankment was completed in 2007; no additional fill will be placed, nor will any major changes be made to the embankment. With Ecology's concurrence, EFMP monitoring shifted from construction to post-construction monitoring effective January 1, 2008[1]. Future sampling will follow the schedule and criteria put forth in the Groundwater Monitoring Plan (work plan)[2].

This report presents the EFMP groundwater monitoring data (collected in July 2008) from the third quarter of the first year of Post-Construction Period Monitoring (PY1.3). No monthly baseline sampling occurred during PY1.3, as all existing wells had completed the 12-month baseline monitoring period in January 2008.

Groundwater sampling activities were completed in accordance with the protocols outlined in the work plan. All sampled monitoring wells were in good condition, and site conditions around the wellheads appeared usual for the area. The wells were purged until field parameters stabilized, in accordance with the work plan.

[1] Kelly, A., 2008. Washington Department of Ecology, Bellevue, Washington, letter to P. Agid, Port of Seattle, Seattle, Washington.

[2] *Embankment Fill Monitoring Program, Groundwater Monitoring Plan. Final, Revision 1.* Prepared by Port of Seattle, April 17, 2006.

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Quarterly Monitoring – July 2008

Quarterly groundwater samples were collected from eleven of the fourteen existing EFMP groundwater monitoring wells on July 28 through 30, 2008 (Table 1). Monitoring wells MW-13B, MW-14, and MW-15A were not sampled because they did not contain sufficient water for sampling.

The groundwater samples were analyzed for total petroleum hydrocarbons (TPH), the 14 trace metals that are the constituents of interest for the embankment, and also for field parameters and other chemical parameters selected by the Port ("conventionals"). Both dissolved (filtered) metals and total (unfiltered) metals were analyzed during this quarterly event.

Analytical data quality was evaluated in general accordance with USEPA protocols[3] as they applied to the reported methodologies. The precision, accuracy, method compliance and completeness of the data set have been determined to be acceptable. All qualifiers assigned through the data validation process are included with the groundwater data in Table 1.

As seen in Table 1, results of the PY1.3 groundwater monitoring event are as follows:

- No TPH was detected in any of the samples.
- No trace metals were reported at concentrations above their respective EFMP action levels, with the exception of mercury in well MW-8A. Total (0.0157 ug/L) and dissolved (0.0144 ug/L) mercury in well MW-8A exceeded the surface water action level of 0.012 ug/L. This well was re-sampled for these analytes per the work plan, as described below.
- All arsenic results are below the sitewide baseline Upper Tolerance Limit (UTL).

As provided for in the work plan, arsenic data above the site-wide baseline UTL are to be corrected for seasonality (as applicable) and further evaluated using the combined Shewhart-CUSUM control chart method. The result of this further analysis of arsenic in MW-6 indicates that the seasonally-adjusted concentration of dissolved arsenic is 20.2 µg/L, well below the control chart limit of 63.6 µg/L (Tables 2 and 3). The baseline dataset does not contain any total arsenic data, and therefore no statistical analysis was performed on the total arsenic concentration.

Verification Re-sampling

Verification re-sampling for total and dissolved mercury in well MW-8A occurred within one week of receipt of the validated data, consistent with the work plan. The re-sample results (0.0203 ug/L total, 0.0166 ug/L dissolved) also exceeded the mercury action level. In accordance with the work plan, this constitutes a verified exceedance for total and dissolved mercury in well MW-8A. Ecology received the required notice from the Port that a verification re-sample exceeded action levels on October 9, 2008. The Port is now preparing a Groundwater Assessment Plan for Ecology's review, due on October 16, 2008.

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[3] Including the *USEPA Contract Laboratory Program (CLP) National Functional Guidelines for Organic/Inorganic Data Review*, document numbers EPA540/R-99/008 and EPA540/R-01/008 of October 1999 (Organic) and July 2002 (Inorganic), and the *USEPA CLP National Functional Guidelines for Superfund Organic Methods Data Review*, document number USEPA-540-R-04-009, January 2005.

Table 1 Analytical Results for July 2008 Quarterly EFMP Groundwater Monitoring

		Sample ID	MW-1A			MW-2A			MW-2A (Dup)			MW-4A			MW-5		
		Sample Date	7/28/2008			7/30/2008			7/30/2008			7/30/2008			7/30/2008		
Chemical Name	Groundwater Action Levels	Surface Water Action Levels	Result & Qualifier	Method Detection Limit	Reporting Detection Limit	Result & Qualifier	Method Detection Limit	Reporting Detection Limit	Result & Qualifier	Method Detection Limit	Reporting Detection Limit	Result & Qualifier	Method Detection Limit	Reporting Detection Limit	Result & Qualifier	Method Detection Limit	Reporting Detection Limit
Field Parameters																	
pH			7.74	NA	NA	6.62	NA	NA	6.62	NA	NA	6.64	NA	NA	6.10	NA	NA
Temperature in °C			17.9	NA	NA	13.5	NA	NA	13.5	NA	NA	13.7	NA	NA	13.2	NA	NA
Conductivity in mS/cm			0.382	NA	NA	0.542	NA	NA	0.542	NA	NA	0.362	NA	NA	0.326	NA	NA
Dissolved Oxygen in mg/L			0.43	NA	NA	0.39	NA	NA	0.39	NA	NA	0.93	NA	NA	1.02	NA	NA
Redox Potential in mV			95	NA	NA	4.1	NA	NA	4.1	NA	NA	36.9	NA	NA	187	NA	NA
Turbidity in NTU			0.21	NA	NA	0.55	NA	NA	0.55	NA	NA	2.99	NA	NA	3.04	NA	NA
Metals in µg/L																	
Antimony, Dissolved		30	0.037 J-	0.01	0.05	0.04 J	0.02	0.05	0.05 J	0.02	0.05	0.13	0.02	0.05	0.14	0.02	0.05
Antimony, Total	6		ND J	0.01	0.05	0.05	0.02	0.05	0.04 J	0.02	0.05	0.12	0.02	0.05	0.15	0.02	0.05
Arsenic, Dissolved		190	14.1	0.2	0.5	1.62	0.07	0.5	1.66	0.07	0.5	0.9	0.07	0.5	0.11 J	0.07	0.5
Arsenic, Total	17.4[a]		13.9	0.2	0.5	1.57	0.07	0.5	1.52	0.07	0.5	1.03	0.07	0.5	0.18 J	0.07	0.5
Barium, Dissolved		1450	35	0.02	0.05	33.8	0.02	0.05	35.2	0.02	0.05	37.3	0.02	0.05	15.8	0.02	0.05
Barium, Total	1000		36.2	0.02	0.05	33.9	0.02	0.05	34	0.02	0.05	36.6	0.02	0.05	15.9	0.02	0.05
Beryllium, Dissolved		51	ND	0.02	0.02	ND	0.003	0.02	ND	0.003	0.02	ND	0.003	0.02	ND	0.003	0.02
Beryllium, Total	4		ND	0.02	0.02	ND	0.003	0.02	ND	0.003	0.02	ND	0.003	0.02	0.022 J+	0.003	0.02
Cadmium, Dissolved		1.2	ND	0.005	0.02	ND	0.008	0.02	ND	0.008	0.02	0.02 J+	0.008	0.02	0.026 J+	0.008	0.02
Cadmium, Total	5		ND	0.005	0.02	ND	0.008	0.02	ND	0.008	0.02	0.033 J+	0.008	0.02	0.032 J+	0.008	0.02
Chromium, Dissolved		205	0.47	0.05	0.2	0.33 J+	0.03	0.2	0.23 J+	0.03	0.2	0.25 J+	0.03	0.2	ND	0.03	0.2
Chromium, Total	50		0.35	0.05	0.2	1.74 J	0.03	0.2	0.29 J+	0.03	0.2	0.27 J+	0.03	0.2	0.38 J+	0.03	0.2
Copper, Dissolved		13	0.31	0.02	0.1	0.21 J+	0.02	0.1	0.23 J+	0.02	0.1	1.04	0.02	0.1	0.58	0.02	0.1
Copper, Total	1000		0.34	0.02	0.1	0.23 J+	0.02	0.1	0.23 J+	0.02	0.1	1.09	0.02	0.1	0.66	0.02	0.1
Lead, Dissolved		3	0.031	0.006	0.02	0.022 J+	0.003	0.02	ND	0.003	0.02	ND	0.003	0.02	ND	0.003	0.02
Lead, Total	15		0.035	0.006	0.02	ND	0.003	0.02	0.026 J+	0.003	0.02	0.029 J+	0.003	0.02	0.045 J+	0.003	0.02
Mercury, Dissolved			ND	0.00005	0.001	ND	0.00005	0.001	ND	0.00005	0.001	ND	0.00005	0.001	ND	0.00005	0.001
Mercury, Total	2	0.012	ND	0.00005	0.001	ND	0.00005	0.001	ND	0.00005	0.001	0.00154	0.00005	0.001	ND	0.00005	0.001
Nickel, Dissolved		182	3.71	0.04	0.2	2.27	0.07	0.2	2.4	0.07	0.2	2.31	0.07	0.2	6.43	0.07	0.2
Nickel, Total	100		3.73	0.04	0.2	2.85	0.07	0.2	2.44	0.07	0.2	2.32	0.07	0.2	5.29	0.07	0.2
Selenium, Dissolved			ND	0.5	1	ND	0.2	1	ND	0.2	1	ND	0.2	1	0.2 J	0.2	1
Selenium, Total	10	5	ND	0.5	1	ND	0.2	1	ND	0.2	1	0.2 J	0.2	1	0.2 J	0.2	1
Silver, Dissolved		1	ND	0.009	0.02	ND	0.003	0.4	ND	0.003	0.4	ND	0.003	0.4	ND	0.003	0.4
Silver, Total	50		ND	0.009	0.02	ND	0.003	0.4	ND	0.003	0.4	ND	0.003	0.4	ND	0.003	0.4
Thallium, Dissolved		40	0.014 J	0.005	0.02	ND	0.003	0.02	ND	0.003	0.02	ND	0.003	0.02	ND	0.003	0.02
Thallium, Total	2		0.011 J	0.005	0.02	ND	0.003	0.02	ND	0.003	0.02	ND	0.003	0.02	ND	0.003	0.02
Zinc, Dissolved		121	1.45	0.08	0.5	1.62 J+	0.06	0.5	2.4 J+	0.06	0.5	1.12 J+	0.06	0.5	2.03 J+	0.06	0.5
Zinc, Total	5000		1.25	0.08	0.5	0.6 J+	0.06	0.5	0.93 J+	0.06	0.5	1.22 J+	0.06	0.5	1.18 J+	0.06	0.5
TPH in µg/L																	
Diesel Range Hydrocarbons	670	670	ND	630	630	ND	630	630	ND	630	630	ND	630	630	ND	630	630
Gasoline Range Hydrocarbons	270	270	ND	250	250	ND	250	250	ND	250	250	ND	250	250	ND	250	250
Residual Range Organics (RRO)	670	670	ND	630	630	ND	630	630	ND	630	630	ND	630	630	ND	630	630
Conventionals in mg/L																	
Alkalinity			193	1	2	272	1	2	270	1	2	180	1	2	116	1	2
Calcium, Dissolved			39.4	0.03	0.05	47	0.03	0.05	48.7	0.03	0.05	58.4	0.03	0.05	33.8	0.03	0.05
Chloride			4.2	0.04	1	6	0.016	0.4	6	0.016	0.4	4.5	0.016	0.4	2.3	0.016	0.4
Hardness as CaCO3			178	NP	0.4	267	NP	0.4	260		0.4	206	NP	0.4	129	NP	0.4
Iron, Dissolved			0.169	0.004	0.02	1.43	0.004	0.02	1.4	0.004	0.02	0.0617	0.004	0.02	0.005 J	0.004	0.02
Iron, Total			0.191	0.004	0.02	1.55	0.004	0.02	1.5	0.004	0.02	0.167	0.004	0.02	0.0744	0.004	0.02
Magnesium, Dissolved			18.7	0.002	0.02	31.8	0.002	0.02	33.2	0.002	0.02	19.3	0.002	0.02	13.8	0.002	0.02
Manganese, Dissolved			0.208	0.0002	0.005	0.909	0.00001	0.0001	0.926	0.00001	0.0001	0.072	0.00001	0.0001	0.0526	0.00001	0.0001
Manganese, Total			0.222	0.0002	0.005	0.919	0.00001	0.0001	0.931	0.00001	0.0001	0.0841	0.00001	0.0001	0.0209	0.00001	0.0001
Nitrate as Nitrogen			0.031 J	0.008	0.2	ND	0.008	0.2	ND	0.008	0.2	1.1	0.008	0.2	0.04 J	0.008	0.2
Nitrite as Nitrogen			ND	0.004	0.2	ND	0.004	0.2	ND	0.004	0.2	ND	0.004	0.2	ND	0.004	0.2
Phosphorus, Total			0.23	0.004	0.01	0.12	0.004	0.01	0.12	0.004	0.01	0.13	0.004	0.01	0.02	0.004	0.01
Potassium, Dissolved			6.49	0.1	2	4.41	0.1	2	4.5	0.1	2	4.13	0.1	2	2.36	0.1	2
Sodium, Dissolved			14.5	0.07	0.1	14	0.07	0.1	14.4	0.07	0.1	16.2	0.07	0.1	9.76	0.07	0.1
Solids, Total Suspended (TSS)			ND	NP	5	ND	NP	5	ND		5	ND	NP	5	ND	NP	5
Sulfate			20.6	0.03	1	20.6	0.03	1	20.8	0.03	1	41.5	0.03	1	37.5	0.03	1
Total Organic Carbon			1.8	0.07	0.5	3.6	0.07	0.5	3.5	0.07	0.5	2.4	0.07	0.5	2	0.07	0.5

Notes

ND Not detected

NP Not provided by the analytical laboratory

J Estimated concentration with possible high (indicated with +) and low (indicated with -) bias based on laboratory QC results.

NA Not applicable for field parameters

[a] The arsenic action level is the upper tolerance limit calculated from the sitewide pooled baseline arsenic data set that give 95% coverage (with 95% confidence), per the Section 5.5.1 in the *Embankment Fill Monitoring Program, Groundwater Monitoring Plan, Final, Revision 1.*

Table 1 Analytical Results for July 2008 Quarterly EFMP Groundwater Monitoring

		Sample ID	MW-6			MW-7			MW-8A			MW-8A Re-Sample			MW-9A		
		Sample Date	7/29/2008			7/29/2008			7/29/2008			9/17/2008			7/29/2008		
Chemical Name	Groundwater Action Levels	Surface Water Action Levels	Result & Qualifier	Method Detection Limit	Reporting Detection Limit	Result & Qualifier	Method Detection Limit	Reporting Detection Limit	Result & Qualifier	Method Detection Limit	Reporting Detection Limit	Result & Qualifier	Method Detection Limit	Reporting Detection Limit	Result & Qualifier	Method Detection Limit	Reporting Detection Limit
Field Parameters																	
pH			7.10	NA	NA	6.33	NA	NA	6.23	NA	NA	5.89	NA	NA	6.49	NA	NA
Temperature in °C			16.0	NA	NA	15.5	NA	NA	16.2	NA	NA	22.6	NA	NA	17.6	NA	NA
Conductivity in µS/cm			0.264	NA	NA	0.539	NA	NA	1.135	NA	NA	0.099	NA	NA	0.930	NA	NA
Dissolved Oxygen in mg/L			0.62	NA	NA	3.00	NA	NA	2.14	NA	NA	0.00	NA	NA	1.19	NA	NA
Redox Potential in mV			-61	NA	NA	141	NA	NA	132	NA	NA	68	NA	NA	-87	NA	NA
Turbidity in NTU			20.1	NA	NA	7.11	NA	NA	1.19	NA	NA	0.41	NA	NA	0.41	NA	NA
Metals in µg/L																	
Antimony, Dissolved		30	ND	0.02	0.05	0.32	0.02	0.05	0.19	0.02	0.05	NA			0.12	0.02	0.05
Antimony, Total	6		ND	0.02	0.05	0.32	0.02	0.05	0.2	0.02	0.05	NA			0.12	0.02	0.05
Arsenic, Dissolved		190	11.6	0.07	0.5	0.84	0.07	0.5	3.6	0.07	0.5	NA			2.47	0.07	0.5
Arsenic, Total	17.4[a]		19.1	0.07	0.5	1.01	0.07	0.5	4.27	0.07	0.5	NA			2.58	0.07	0.5
Barium, Dissolved		1450	11.1	0.02	0.05	17.9	0.02	0.05	32.9	0.02	0.05	NA			58.7	0.02	0.05
Barium, Total	1000		15	0.02	0.05	17.6	0.02	0.05	32.8	0.02	0.05	NA			57.9	0.02	0.05
Beryllium, Dissolved		51	ND	0.003	0.02	ND	0.003	0.02	ND	0.003	0.02	NA			ND	0.003	0.02
Beryllium, Total	4		ND	0.003	0.02	ND	0.003	0.02	ND	0.003	0.02	NA			ND	0.003	0.02
Cadmium, Dissolved		1.2	ND	0.008	0.02	0.053 J+	0.008	0.02	0.039 J+	0.008	0.02	NA			ND	0.008	0.02
Cadmium, Total	5		0.024	0.008	0.02	0.06	0.008	0.02	0.037	0.008	0.02	NA			0.008 J	0.008	0.02
Chromium, Dissolved		205	ND	0.03	0.2	ND	0.03	0.2	0.21 J+	0.03	0.2	NA			0.76	0.03	0.2
Chromium, Total	50		ND	0.03	0.2	ND	0.03	0.2	ND	0.03	0.2	NA			0.88	0.03	0.2
Copper, Dissolved		13	ND	0.02	0.1	1.1 J	0.02	0.1	0.89 J	0.02	0.1	NA			0.21 J+	0.02	0.1
Copper, Total	1000		0.13 J+	0.02	0.1	1.22 J	0.02	0.1	0.87 J	0.02	0.1	NA			0.28 J+	0.02	0.1
Lead, Dissolved		3	ND	0.003	0.02	0.028 J+	0.003	0.02	ND	0.003	0.02	NA			ND	0.003	0.02
Lead, Total	15		0.026 J+	0.003	0.02	0.043 J+	0.003	0.02	0.021 J+	0.003	0.02	NA			0.024 J+	0.003	0.02
Mercury, Dissolved			ND	0.00005	0.001	0.00119	0.00005	0.001	0.0144	0.00005	0.001	0.0166	0.00008	0.001	0.00132	0.00005	0.001
Mercury, Total	2	0.012	ND	0.00005	0.001	0.00135	0.00005	0.001	0.0157	0.00005	0.001	0.0203	0.00008	0.001	0.00119	0.00005	0.001
Nickel, Dissolved		182	0.34	0.07	0.2	9.08	0.07	0.2	30.4	0.07	0.2	NA			2.29	0.07	0.2
Nickel, Total	100		0.39	0.07	0.2	9.07	0.07	0.2	30.1	0.07	0.2	NA			2.34	0.07	0.2
Selenium, Dissolved			ND	0.2	1	ND	0.2	1	0.2 J	0.2	1	NA			0.3 J	0.2	1
Selenium, Total	10	5	ND	0.2	1	ND	0.2	1	0.3 J	0.2	1	NA			0.3 J	0.2	1
Silver, Dissolved		1	ND	0.003	0.02	ND	0.003	0.02	ND	0.003	0.02	NA			ND	0.003	0.02
Silver, Total	50		ND	0.003	0.02	ND	0.003	0.02	ND	0.003	0.02	NA			ND	0.003	0.02
Thallium, Dissolved		40	ND	0.003	0.02	ND	0.003	0.02	ND	0.003	0.02	NA			ND	0.003	0.02
Thallium, Total	2		ND	0.003	0.02	ND	0.003	0.02	ND	0.003	0.02	NA			ND	0.003	0.02
Zinc, Dissolved		121	0.89 J+	0.06	0.5	1.67 J+	0.06	0.5	1.59 J+	0.06	0.5	NA			0.56 J+	0.06	0.5
Zinc, Total	5000		1.66 J+	0.06	0.5	1.01 J+	0.06	0.5	1.4 J+	0.06	0.5	NA			0.99 J+	0.06	0.5
TPH in µg/L																	
Diesel Range Hydrocarbons	670	670	ND	630	630	ND	630	630	ND	630	630	NA			ND	630	630
Gasoline Range Hydrocarbons	270	270	ND	250	250	ND	250	250	ND	250	250	NA			ND	250	250
Residual Range Organics (RRO)	670	670	ND	630	630	ND	630	630	ND	630	630	NA			ND	630	630
Conventionals in mg/L																	
Alkalinity			112	1	2	241	1	2	566	1	2	NA			480	1	2
Calcium, Dissolved			20.6	0.03	0.05	53	0.03	0.05	103	0.03	0.05	NA			92.3	0.03	0.05
Chloride			4	0.016	0.4	6	0.04	1	8.9	0.08	2	NA			6.3	0.08	2
Hardness as CaCO3			91.9	NP	0.4	245	NP	0.4	546	NP	0.4	NA			430	NP	0.4
Iron, Dissolved			0.639	0.004	0.02	0.0322 J+	0.004	0.02	0.19	0.004	0.02	NA			1.19	0.004	0.02
Iron, Total			2.08	0.004	0.02	0.0976	0.004	0.02	0.282	0.004	0.02	NA			1.19	0.004	0.02
Magnesium, Dissolved			10.1 J-	0.002	0.02	28.8 J-	0.002	0.02	74.4 J-	0.002	0.02	NA			52.6 J-	0.002	0.02
Manganese, Dissolved			0.361	0.0002	0.005	0.0577	0.0002	0.005	0.0884	0.0002	0.005	NA			4.4	0.0002	0.005
Manganese, Total			0.375	0.0002	0.005	0.0515	0.0002	0.005	0.0841	0.0002	0.005	NA			4.23	0.0002	0.005
Nitrate as Nitrogen			0.033 J	0.008	0.2	0.059 J	0.008	0.2	ND	0.008	0.2	NA			ND	0.008	0.2
Nitrite as Nitrogen			ND	0.004	0.2	ND	0.002	0.1	ND	0.02	1	NA			ND	0.01	0.5
Phosphorus, Total			0.28	0.004	0.01	0.02	0.004	0.01	0.07	0.004	0.01	NA			0.06	0.004	0.01
Potassium, Dissolved			3.04	0.1	2	3.03	0.1	2	6.9	0.1	2	NA			3.78	0.1	2
Sodium, Dissolved			6.55	0.07	0.1	13.5	0.07	0.1	22.6	0.07	0.1	NA			18.4	0.07	0.1
Solids, Total Suspended (TSS)			6	NP	5	ND	NP	5	ND	NP	5	NA			ND	NP	5
Sulfate			13.2	0.012	0.4	27.7	0.03	1	14.7	0.012	0.4	NA			2.1	0.012	0.4
Total Organic Carbon			0.9	0.07	0.5	3.3	0.07	0.5	9.3	0.07	0.5	NA			12.2	0.07	0.5

Notes

ND Not detected

NP Not provided by the analytical laboratory

J Estimated concentration with possible high (indicated with +) and low (indicated with -) bias based on laboratory QC results.

NA Not applicable for field parameters

[a] The arsenic action level is the upper tolerance limit calculated from the sitewide pooled baseline arsenic data set that give 95% coverage (with 95% confidence), per the Section 5.5.1 in the *Embankment Fill Monitoring Program, Groundwater Monitoring Plan, Final, Revision 0.*

Table 1 Analytical Results for July 2008 Quarterly EFMP Groundwater Monitoring

		Sample ID	MW-10			MW-11			MW-12		
		Sample Date	7/29/2008			7/30/2008			7/28/2008		
Chemical Name	Groundwater Action Levels	Surface Water Action Levels	Result & Qualifier	Method Detection Limit	Reporting Detection Limit	Result & Qualifier	Method Detection Limit	Reporting Detection Limit	Result & Qualifier	Method Detection Limit	Reporting Detection Limit
Field Parameters											
pH			5.91	NA	NA	6.45	NA	NA	6.20	NA	NA
Temperature in °C			12.5	NA	NA	15.9	NA	NA	20.1	NA	NA
Conductivity in µS/cm			0.448	NA	NA	0.399	NA	NA	0.380	NA	NA
Dissolved Oxygen in mg/L			1.60	NA	NA	2.59	NA	NA	2.31	NA	NA
Redox Potential in mV			100	NA	NA	94	NA	NA	107	NA	NA
Turbidity in NTU			3.59	NA	NA	0.87	NA	NA	2.89	NA	NA
Metals in µg/L											
Antimony, Dissolved		30	0.13	0.02	0.05	0.06	0.02	0.05	0.076 J-	0.01	0.05
Antimony, Total	6		0.14	0.02	0.05	0.05 J	0.02	0.05	0.032 J-	0.01	0.05
Arsenic, Dissolved		190	0.11 J	0.07	0.5	0.76	0.07	0.5	0.75	0.2	0.5
Arsenic, Total	17.4[a]		0.26 J	0.07	0.5	0.75	0.07	0.5	0.77	0.2	0.5
Barium, Dissolved		1450	17.3	0.02	0.05	10.4	0.02	0.05	13.6	0.02	0.05
Barium, Total	1000		18.1	0.02	0.05	10.3	0.02	0.05	13.9	0.02	0.05
Beryllium, Dissolved		51	ND	0.003	0.02	ND	0.003	0.02	ND	0.02	0.02
Beryllium, Total	4		ND	0.003	0.02	ND	0.003	0.02	ND	0.02	0.02
Cadmium, Dissolved		1.2	0.081 J+	0.008	0.02	ND	0.008	0.02	0.012 J	0.005	0.02
Cadmium, Total	5		0.114	0.008	0.02	ND	0.008	0.02	ND	0.005	0.02
Chromium, Dissolved		205	0.28 J+	0.03	0.2	2.59	0.03	0.2	1.34	0.05	0.2
Chromium, Total	50		0.3 J+	0.03	0.2	2.55	0.03	0.2	1.34	0.05	0.2
Copper, Dissolved		13	1.11 J	0.02	0.1	0.37 J+	0.02	0.1	0.53	0.02	0.1
Copper, Total	1000		1.08 J	0.02	0.1	0.39 J+	0.02	0.1	0.55	0.02	0.1
Lead, Dissolved		3	ND	0.003	0.02	ND	0.003	0.02	0.032	0.006	0.02
Lead, Total	15		ND	0.003	0.02	ND	0.003	0.02	0.059	0.006	0.02
Mercury, Dissolved			0.00346	0.00005	0.001	ND	0.00005	0.001	ND	0.00005	0.001
Mercury, Total	2	0.012	0.0038	0.00005	0.001	ND	0.00005	0.001	ND	0.00005	0.001
Nickel, Dissolved		182	2.59	0.07	0.2	5.66	0.07	0.2	3.51	0.04	0.2
Nickel, Total	100		2.49	0.07	0.2	5.75	0.07	0.2	3.57	0.04	0.2
Selenium, Dissolved			0.2 J	0.2	1	ND	0.2	1	ND	0.5	1
Selenium, Total	10	5	ND	0.2	1	ND	0.2	1	ND	0.5	1
Silver, Dissolved		1	ND	0.003	0.02	ND	0.003	0.4	ND	0.009	0.02
Silver, Total	50		ND	0.003	0.02	ND	0.003	0.4	ND	0.009	0.02
Thallium, Dissolved		40	ND	0.003	0.02	ND	0.003	0.02	0.016 J	0.005	0.02
Thallium, Total	2		ND	0.003	0.02	ND	0.003	0.02	0.01 J	0.005	0.02
Zinc, Dissolved		121	1.92 J+	0.06	0.5	1.62 J+	0.06	0.5	2.47	0.08	0.5
Zinc, Total	5000		1.07 J+	0.06	0.5	3.02 J+	0.06	0.5	2.34	0.08	0.5
TPH in µg/L											
Diesel Range Hydrocarbons	670	670	ND	630	630	ND	630	630	ND	630	630
Gasoline Range Hydrocarbons	270	270	ND	250	250	ND	250	250	ND	250	250
Residual Range Organics (RRO)	670	670	ND	630	630	ND	630	630	ND	630	630
Conventionals in mg/L											
Alkalinity			186	1	2	138	1	2	114	1	2
Calcium, Dissolved			34.7	0.03	0.05	25.8	0.03	0.05	23.3	0.03	0.05
Chloride			5.6	0.04	1	5.3	0.016	0.4	6.3	0.04	1
Hardness as CaCO3			180	NP	0.4	157	NP	0.4	124	NP	0.4
Iron, Dissolved			0.612	0.004	0.02	ND	0.004	0.02	ND	0.004	0.02
Iron, Total			0.701	0.004	0.02	0.0056 J	0.004	0.02	0.0761	0.004	0.02
Magnesium, Dissolved			22 J-	0.002	0.02	21.4	0.002	0.02	16.8	0.002	0.02
Manganese, Dissolved			2.18	0.0002	0.005	0.00048 J+	0.00001	0.0001	0.00362	0.00001	0.00005
Manganese, Total			2.14	0.0002	0.005	0.00016 J+	0.00001	0.0001	0.00542	0.00001	0.00005
Nitrate as Nitrogen			0.1	0.008	0.2	0.7	0.008	0.2	0.4	0.008	0.2
Nitrite as Nitrogen			ND	0.01	0.5	ND	0.004	0.2	ND	0.004	0.2
Phosphorus, Total			0.01	0.004	0.01	0.04	0.004	0.01	0.02	0.004	0.01
Potassium, Dissolved			ND	0.1	2	1.46 J	0.1	2	1.16 J	0.1	2
Sodium, Dissolved			14.6	0.07	0.1	12.9	0.07	0.1	13.8	0.07	0.1
Solids, Total Suspended (TSS)			ND	NP	5	ND	NP	5	ND	NP	5
Sulfate			32.5	0.03	1	38	0.03	1	28.8	0.03	1
Total Organic Carbon			5.7	0.07	0.5	1.3	0.07	0.5	1.5	0.07	0.5

Notes

ND Not detected

NP Not provided by the analytical laboratory

J Estimated concentration with possible high (indicated with +) and low (indicated with -) bias based on laboratory QC results.

NA Not applicable for field parameters

[a] The arsenic action level is the upper tolerance limit calculated from the sitewide pooled baseline arsenic data set that give 95% coverage (with 95% confidence), per the Section 5.5.1 in the *Embankment Fill Monitoring Program, Groundwater Monitoring Plan, Final, Revision 0.*

Table 2 Dissolved Arsenic in MW-6: Original and Seasonally-Corrected Data

Monitoring Quarter	Uncorrected Data 2003	2004	2005	2006	2007	2008	Quarterly Means	Corrected Data 2003	2004	2005	2006	2007	2008
January	13.9	16.9	20.6	6.64	10.5	11.3	13.31	22.8	25.8	29.5	15.5	19.4	20.2
April	14.8	30.5	14.8	9.5	10.9	5.88	14.40	22.6	38.3	22.6	17.3	18.7	13.7
July	35.6	39.6	28.7	19	15.1	11.6	24.93	32.8	36.8	25.9	16.2	12.3	8.8
October	25.3	58.7	27	23.3			33.58	13.9	47.3	15.6	11.9		
Average	22.18	StDev	12.69					23.43	StDev	9.74			

Note: Seasonality Correction applied per Appendix E of Ecology (1996)

Zij = Xij - Mi + M, where

Zij = seasonally corrected value (month i, year j)
Xij = uncorrected value (month i, year j)
Mi = mean concentration for month i over the period of record
M = universal mean over the period of record
Dissolved arsenic was not detected in October 2007.

Date	Uncorrected	Corrected
01/15/03	13.9	22.8
04/15/03	14.8	22.6
07/15/03	35.6	32.8
10/15/03	25.3	13.9
01/15/04	16.9	25.8
04/15/04	30.5	38.3
07/15/04	39.6	36.8
10/15/04	58.7	47.3
01/15/05	20.6	29.5
04/15/05	14.8	22.6
07/15/05	28.7	25.9
10/15/05	27.0	15.6
01/19/06	6.6	15.5
04/01/06	9.5	17.3
07/18/06	19	16.2
10/10/06	23.3	11.9
01/16/07	10.5	19.4
04/18/07	10.9	18.7
07/17/07	15.1	12.3
10/09/07		
01/23/08	11.3	20.2
04/15/08	5.88	13.7
07/29/08	11.6	8.8

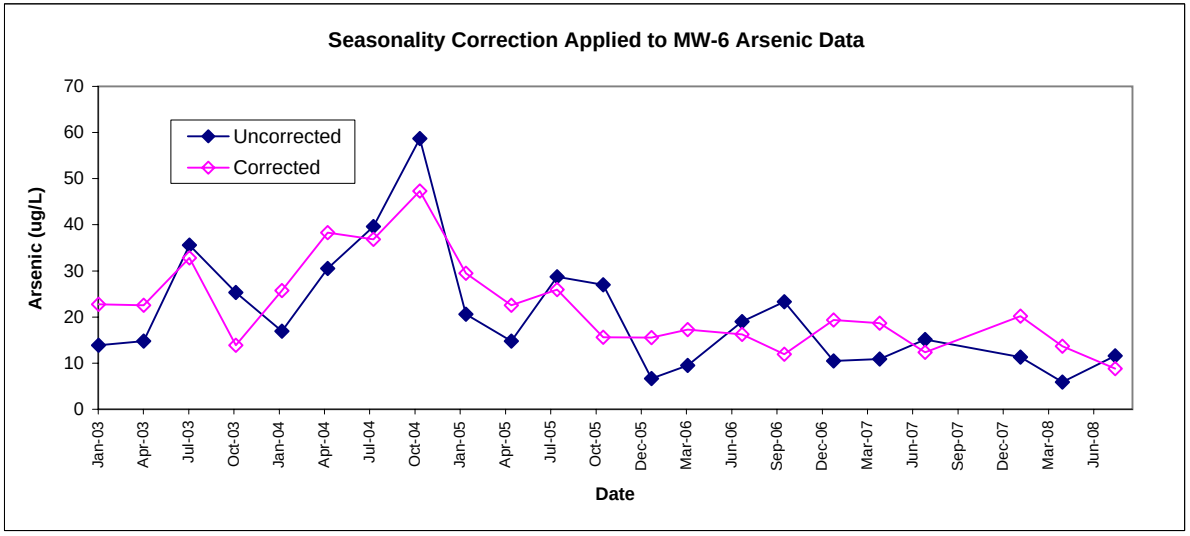

Table 3 Arsenic in MW-6: Combined Shewhart-CUSUM Chart for Seasonally-Corrected Arsenic Data

Chart SCL =	4.5	Zi is the standardized As (in standard deviations)
Chart h =	5	Si is the standardized CUSUM (in standard deviations)
Chart k =	1	CUSUM and SCL adj are adjusted to ug/L values
		CUSUM = prior mean + prior StDev*Si
		SCL adj = prior mean + prior StDev*4.5

Date	Ti	Corrected As	Zi	Si	h	SCL	Corrected (Dissolved)	Uncorrected (Total)	CUSUM	SCL adj
01/15/03	3	22.8	-0.17	0.00	5	4.5	22.8		24.3	63.6
04/15/03	6	22.6	-0.19	0.00	5	4.5	22.6		24.3	63.6
07/15/03	9	32.8	0.98	0.00	5	4.5	32.8		24.3	63.6
10/15/03	12	13.9	-1.18	0.00	5	4.5	13.9		24.3	63.6
01/15/04	15	25.8	0.17	0.00	5	4.5	25.8		24.3	63.6
04/15/04	18	38.3	1.60	0.60	5	4.5	38.3		29.5	63.6
07/15/04	21	36.8	1.44	1.04	5	4.5	36.8		33.4	63.6
10/15/04	24	47.3	2.63	2.68	5	4.5	47.3		47.7	63.6
01/15/05	27	29.5	0.60	2.27	5	4.5	29.5		44.1	63.6
04/15/05	30	22.6	-0.19	1.08	5	4.5	22.6		33.7	63.6
07/15/05	33	25.9	0.19	0.28	5	4.5	25.9	35.2	26.7	63.6
10/15/05	36	15.6	-0.99	0.00	5	4.5	15.6	29.3	24.3	63.6
01/19/06	39	15.5	-1.00	0.00	5	4.5	15.5	10.0	24.3	63.6
04/01/06	42	17.3	-0.80	0.00	5	4.5	17.3	11.0	24.3	63.6
07/18/06	45	16.2	-0.92	0.00	5	4.5	16.2	20.9	24.3	63.6
10/10/06	48	11.9	-1.41	0.00	5	4.5	11.9	26.9	24.3	63.6
01/16/07	51	19.4	-0.56	0.00	5	4.5	19.4	28.5	24.3	63.6
04/18/07	54	18.7	-0.64	0.00	5	4.5	18.7	19.3	24.3	63.6
07/17/07	57	12.3	-1.36	0.00	5	4.5	12.3	18.8	24.3	63.6
10/09/07	60									
01/23/08	63	20.2	-0.47	0.00	5	4.5	20.2	18.8	24.3	63.6
04/15/08	66	13.7	-1.21	0.00	5	4.5	13.7	5.9	24.3	63.6
07/29/08	69	8.8	-1.76	0.00	5	4.5	8.8	11.6	24.3	63.6

Prior mean	24.25	from Figure E-5 (Port of Seattle, 2005)
Prior StDev	8.75	from Figure E-5 (Port of Seattle, 2005)