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Ministry of Environment
Mining Operations Environmental Protection
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PERMIT 11678 WEEKLY REPORT – JANUARY 6 TO JANUARY 12, 2017

This report satisfies the requirements of Section 3.9 of *EMA* Permit 11678 (last amended September 19, 2016). Section 3.9 requires a weekly report with the following components;

- Summary of volume of treated effluent discharges
- Update on Springer Pit lake elevation
- Update on Springer pit monitoring well levels
- Water quality results for treated effluent
- Water quality results for Springer pit related wells
- Summarized analysis of treated effluent turbidity/TSS discharged.

Water Treatment and Discharge

Discharge of treated water continued this week; the total amount of treated water discharged between January 3 and January 9, 2017 was 104,971 m³ with an average discharge rate of 0.174 m³/s throughout this same period.

Springer Pit and Groundwater Wells

Water elevations of Springer Pit and the associated groundwater monitoring wells are provided in Table 1. Water quality monitoring is conducted on a monthly basis from the groundwater wells associated with Springer Pit. These wells were sampled on December 19th and 21st and these results, along with the previous six months' analytical results, for the parameters of interest are provided in Tables 2 through 7.

Table 1. Water elevations for Springer pit and groundwater wells

	Last Week	This Week	Change
	3-Jan-17	11-Jan-17	(m)
Springer	1012.00	1011.44	-0.56
GW12-2a	1014.22	1013.84	-0.38
GW12-2b	1014.45	1014.00	-0.46
GW15-1a	1015.62	1014.68	-0.94
GW15-1b	1015.50	1014.55	-0.95
GW15-2a	1021.41	1021.00	-0.41
GW15-2b	- ¹	1021.37	-

¹ GW15-2b inaccessible last week due to snow and ice buildup producing safety concerns.

Table 2. GW 12-2a water chemistry results

		GW 12-2A					
Date Sampled		12-Jul-16	18-Aug-16	15-Sep-16	24-Oct-16	08-Nov-16	19-Dec-16
Physical Tests							
Conductivity	µS/cm	232	231	230	232	228	238
Hardness (as CaCO3)	mg/L	50.8	46.2	48.5	48.3	47.0	46.5
pH	pH	7.95	7.92	7.99	8.02	7.92	8.07
Anions and Nutrients							
Nitrate (as N)	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Sulfate (SO4)	mg/L	64.1	62.8	63.8	65.1	65.5	65.8
Dissolved Metals							
Aluminum (Al)-Dissolved	mg/L	0.0046	0.0040	0.0045	0.0046	0.0041	0.0048
Arsenic (As)-Dissolved	mg/L	0.00234	0.00218	0.00237	0.00224	0.00240	0.00238
Cadmium (Cd)-Dissolved	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Copper (Cu)-Dissolved	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron (Fe)-Dissolved	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Lead (Pb)-Dissolved	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Molybdenum (Mo)-Dissolved	mg/L	0.0407	0.0388	0.0393	0.0403	0.0392	0.0370
Selenium (Se)-Dissolved	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050

Table 3. GW 12-2b water chemistry results

		GW 12-2B					
Date Sampled		12-Jul-16	17-Aug-16	15-Sep-16	24-Oct-16	08-Nov-16	19-Dec-16
Physical Tests							
Conductivity	µS/cm	660	668	638	617	606	612
Hardness (as CaCO3)	mg/L	343.0	324.0	312.0	305.0	291.0	271.0
pH	pH	7.81	8.25	8.16	8.22	8.19	8.06
Anions and Nutrients							
Nitrate (as N)	mg/L	2.98	2.96	2.98	3.08	2.95	2.75
Sulfate (SO4)	mg/L	166	174.0	169.0	166.0	158.0	150.0
Dissolved Metals							
Aluminum (Al)-Dissolved	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Arsenic (As)-Dissolved	mg/L	0.00057	0.00052	0.00057	0.00052	0.00057	0.00055
Cadmium (Cd)-Dissolved	mg/L	0.0000073	0.0000052	<0.0000050	0.0000074	0.0000066	0.0000062
Copper (Cu)-Dissolved	mg/L	0.00081	0.00081	0.00081	0.00084	0.00077	0.00071
Iron (Fe)-Dissolved	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Lead (Pb)-Dissolved	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Molybdenum (Mo)-Dissolved	mg/L	0.0219	0.0210	0.0210	0.0213	0.0208	0.0192
Selenium (Se)-Dissolved	mg/L	0.0111	0.011200	0.010200	0.009110	0.008730	0.006320

Table 4. GW 15-1a water chemistry results

		GW 15-1A					
Date Sampled		12-Jul-16	18-Aug-16	15-Sep-16	24-Oct-16	09-Nov-16	21-Dec-16
Physical Tests							
Conductivity	µS/cm	275	279	277	280	281	284
Hardness (as CaCO3)	mg/L	70.9	70.5	72.7	73.7	76.6	75.7
pH	pH	8.08	8.03	8.05	8.02	7.96	8.11
Anions and Nutrients							
Nitrate (as N)	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Sulfate (SO4)	mg/L	62.6	63.2	64.9	66.3	68.2	65.4
Dissolved Metals							
Aluminum (Al)-Dissolved	mg/L	0.0030	0.0082	<0.0030	0.0030	<0.0030	<0.0030
Arsenic (As)-Dissolved	mg/L	0.00450	0.00404	0.00460	0.00432	0.00416	0.00408
Cadmium (Cd)-Dissolved	mg/L	<0.0000050	<0.0000050	<0.0000050	0.0000099	<0.0000050	<0.0000050
Copper (Cu)-Dissolved	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron (Fe)-Dissolved	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Lead (Pb)-Dissolved	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Molybdenum (Mo)-Dissolved	mg/L	0.0263	0.0256	0.0256	0.0259	0.0265	0.0259
Selenium (Se)-Dissolved	mg/L	<0.000050	<0.000050	0.000067	0.000065	<0.000050	<0.000050

Table 5. GW 15-1b water chemistry results

		GW 15-1B					
Date Sampled		12-Jul-16	17-Aug-16	15-Sep-16	24-Oct-16	08-Nov-16	09-Dec-16
Physical Tests							
Conductivity	µS/cm	902	866	820	740	703	648
Hardness (as CaCO3)	mg/L	447.0	404.0	379.0	338.0	322.0	274.0
pH	pH	7.80	8.16	8.08	8.15	8.16	8.11
Anions and Nutrients							
Nitrate (as N)	mg/L	2.36	2.12	1.85	1.42	1.37	1.36
Sulfate (SO4)	mg/L	341	295.0	278.0	234.0	203.0	172.0
Dissolved Metals							
Aluminum (Al)-Dissolved	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Arsenic (As)-Dissolved	mg/L	0.00148	0.00149	0.00152	0.00149	0.00155	0.00156
Cadmium (Cd)-Dissolved	mg/L	0.0000095	0.0000091	0.0000119	0.0000094	0.0000101	0.0000060
Copper (Cu)-Dissolved	mg/L	<0.00050	0.00052	<0.00050	0.00072	<0.00050	<0.00050
Iron (Fe)-Dissolved	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Lead (Pb)-Dissolved	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Molybdenum (Mo)-Dissolved	mg/L	0.0046	0.0044	0.0046	0.0048	0.0049	0.0048
Selenium (Se)-Dissolved	mg/L	0.0107	0.008450	0.007090	0.007660	0.006670	0.003730

Table 6. GW 15-2a water chemistry results

		GW 15-2A					
Date Sampled		12-Jul-16	17-Aug-16	15-Sep-16	24-Oct-16	08-Nov-16	09-Dec-16
Physical Tests							
Conductivity	µS/cm	200	200	200	200	197	201
Hardness (as CaCO3)	mg/L	58.7	55.4	56.5	56.4	53.6	52.4
pH	pH	8.10	8.08	8.08	8.10	8.06	8.20
Anions and Nutrients							
Nitrate (as N)	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Sulfate (SO4)	mg/L	36.4	35.7	36.4	37.1	37.1	37.4
Dissolved Metals							
Aluminum (Al)-Dissolved	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Arsenic (As)-Dissolved	mg/L	0.00403	0.00394	0.00401	0.00388	0.00412	0.00370
Cadmium (Cd)-Dissolved	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Copper (Cu)-Dissolved	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron (Fe)-Dissolved	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Lead (Pb)-Dissolved	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Molybdenum (Mo)-Dissolved	mg/L	0.0433	0.0430	0.0430	0.0431	0.0417	0.0408
Selenium (Se)-Dissolved	mg/L	0.000054	<0.000050	0.000052	0.000074	0.000058	<0.000050

Table 7. GW 15-2b water chemistry results

		GW 15-2B					
Date Sampled		12-Jul-16	17-Aug-16	15-Sep-16	24-Oct-16	08-Nov-16	09-Dec-16
Physical Tests							
Conductivity	µS/cm	386	384	375	368	358	353
Hardness (as CaCO3)	mg/L	155.0	143.0	142.0	138.0	133.0	125.0
pH	pH	8.00	8.12	8.12	8.13	8.11	8.14
Anions and Nutrients							
Nitrate (as N)	mg/L	0.805	0.696	0.649	0.502	0.44	0.301
Sulfate (SO4)	mg/L	83.0	81.5	82.5	81.0	80.0	75.0
Dissolved Metals							
Aluminum (Al)-Dissolved	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Arsenic (As)-Dissolved	mg/L	0.00212	0.00197	0.00210	0.00195	0.00215	0.00236
Cadmium (Cd)-Dissolved	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Copper (Cu)-Dissolved	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Iron (Fe)-Dissolved	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Lead (Pb)-Dissolved	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Molybdenum (Mo)-Dissolved	mg/L	0.0444	0.0437	0.0436	0.0447	0.0437	0.0423
Selenium (Se)-Dissolved	mg/L	0.000303	0.000353	0.000339	0.000307	0.000377	0.000242

Water Quality Monitoring

Samples were collected at end of pipe at the water treatment plant (station HAD-03) and throughout Hazeltine Creek on January 10, 2017. There are no new results for HAD-03 this week, but results will be reported here when they become available.

The water treatment plant is currently operating in passive treatment mode and the Springer Pit is providing treatment for TSS and turbidity. Analytical results from the sample collected on January 3, 2017 for TSS was 3.3 mg/L.

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