Associated Environmental

REPORT

BC Ministry of Environment

South Shawnigan Creek
Water Quality Study
Quarterly Summary Report #3

June 2017

ISO 9001 and 14001 Certified | An Associated Engineering Company

Cover photo taken by N. Basaraba on Shawnigan Creek downstream of Van Horne Creek confluence (S-6), November 16, 2016.

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1 Introduction

Associated Environmental Consultants Inc. (Associated) was retained by the Ministry of Environment (MOE) to provide an independent Water Quality Study in the mainstem and selected tributaries of South Shawnigan Creek, including near Stebbings Road Lot 23 (the Cobble Hill Holdings [CHH] contaminated soil treatment facility and contaminated soil landfill) and Stebbings Road Lot 21. The Water Quality Study is being conducted to address the concerns of residents, First Nations, local politicians, and other interested parties in the area about water quality in South Shawnigan Creek in relation to development around this key inflow to Shawnigan Lake. Concerns include the health of the aquatic habitat and the water quality in the lake, which is used as a drinking water source.

This third quarterly report represents the results of sampling on one day in each of January, February and March 2017. Details of the background, objectives and methods were previously described in the two preceding quarterly reports provided to all interested parties (Associated 2016a, 2017).

2 Sampling Sites

The sampling sites include those identified in the Study Design report, and represent locations upstream and downstream of the Lot 21 seepage and the ephemeral creek downstream of Lot 23 (Associated 2016b). Table 2-1 lists the eight sites included in the Water Quality Study. Figure 2-1 shows the locations of the sites. Samples were collected from each site on January 18, February 20, and March 20.

Table 2-1
List of sampling sites and Environmental Monitoring Site identification numbers

Site Number	EMS ID[1]	Description of sample location
S-1	E294426	South Shawnigan Creek upstream of Lots 21 and 23 (control sample, far upstream) – downstream of Elkington Forest
S-2	E306323	South Shawnigan Creek upstream of Lots 21 and 23
S-3	E306324	Ephemeral creek downstream of Lot 23, near water treatment facility discharge,[1] upstream of the confluence with South Shawnigan Creek
S-4	E294425	South Shawnigan Creek downstream of Lot 21 and upstream of the Lot 23 ephemeral creek inflow
S-5	E306325	South Shawnigan Creek downstream of the confluence with ephemeral creek and upstream of Van Horne Creek confluence
S-6	E306326	South Shawnigan Creek downstream of Van Horne Creek
S-7	E306327	South Shawnigan Creek at Sooke Lake Road (upstream of disturbed area)
S-8	1199906	South Shawnigan Creek as near as possible to the inflow to Shawnigan Lake (downstream of all other sites).

Note: [1]EMS = Environmental Monitoring Site

[1] Discharge from the containment/settling pond is intermittent based on storm event and other inflows.

South Shawnigan Creek flows from S-1 and S-2 (both of which are upstream of Lots 21 and 23) towards S-4, which is immediately downstream of the soil treatment facility and landfill (Figure 2-1). Site S-5 is downstream of S-4 on South Shawnigan Creek and downstream of the small inflowing tributary ("ephemeral creek") that flows near Lot 23 (S-3). Site S-6 is downstream of S-5 and below the confluence with Van Horne Creek, and usually receives flows from both creeks. Sites S-7 and S-8 are in the lower reach of South Shawnigan Creek and receive water from all upstream locations.

Site S-3 is the only site not on South Shawnigan Creek. It is located on the ephemeral creek downstream of Lot 23, near the CHH water treatment facility discharge. Field observations indicate that S-3 receives a combination of water from the discharge pipe from the settling pond treatment facility at Lot 23 and from groundwater seepage.

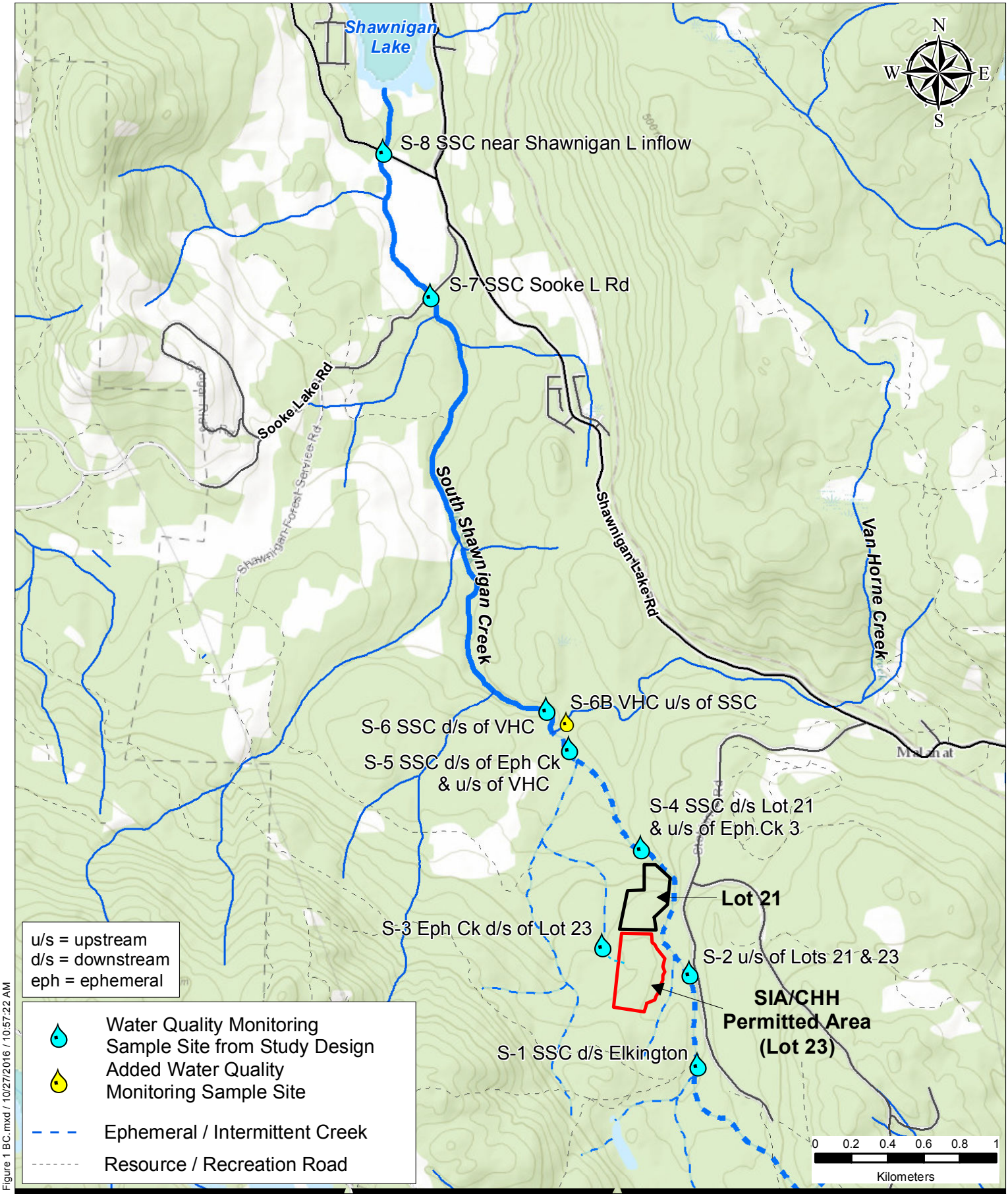

Figure 1 BC.mxd / 10/27/2016 / 10:57:22 AM

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PROJECT NO.: 2016-8097.000.000
DATE: October 2016
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FIGURE 2-1: WATER QUALITY MONITORING SITES ON AND NEAR SOUTH SHAWNIGAN CREEK

South Shawnigan Creek Water Quality Monitoring Study

3 Results and Discussion

3.1 OVERVIEW OF FLOW CONDITIONS

Water monitoring during this quarterly period represents the winter/early spring season. Flowing water was observed in South Shawnigan Creek at all sites during all sampling events. Therefore, the sites were considered connected, and comparisons of water quality upstream and downstream can be made. The exception is S-3, which is the only site not on South Shawnigan Creek. This site is believed to receive a combination of water from the discharge pipe from the settling pond treatment facility at Lot 23 and from groundwater seepage. During the sampling in January, flows were noted to be more turbid than usual at most sites, likely related to the rainfall that was occurring at the time.

The following sections discuss the noted differences in water quality between sites and between winter/early spring sampling events (Section 3.2) and the parameters that were found to exceed either aquatic life or drinking water guidelines (Section 3.3).

3.2 COMPARISON OF WATER QUALITY BETWEEN SITES AND SAMPLE EVENTS

3.2.1 General Parameters

The average water temperature for the January, February and March sampling dates was similar across all sites on South Shawnigan Creek (2.5°C on average), with the exception of S-3 which was about 2°C higher (average of 4.4°C) than the sites on the mainstem South Shawnigan Creek. This is likely a result of groundwater contributing to the flow in S-3. Groundwater temperatures are more consistent over time, and are typically warmer than weather-influenced surface water during colder months.

With the exception of S-3, which had an average chloride concentration of 31.8 mg/L, average chloride levels were very low (less than 4 mg/L) at all sites. All concentrations were well below the most stringent guideline (250 mg/L for drinking water and 600 mg/L for aquatic life). Dissolved and total sodium showed a similar pattern to chloride: higher levels in S-3 (at approximately 15 mg/L total sodium) relative to the other sites, which averaged less than 3 mg/L; but all concentrations were below the most stringent guideline of 200 mg/L.

Both turbidity and total suspended solids (TSS) were higher at nearly all sites in January than in February and March. This was most pronounced for S-2, S-3, S-4, S-5, and S-6. During the January sampling event at S-1, turbidity and TSS were much lower than at other sites. Table 3-1 shows the turbidity and TSS results from each site during each sampling event.

Table 3-1
Turbidity and TSS measurements at each site

	Turbidity (NTU)			TSS (mg/L)		
	January	February	March	January	February	March
S-1	0.57	0.22	0.26	1.30	<1.0	<1.0
S-2	43.8	0.65	0.33	67.7	0.85	5.9
S-3	21.7	8.20	1.42	13.0	<1.0	28.2
S-4	18.0	0.81	0.38	25.9	<1.0	<1.0
S-5	20.5	0.72	0.39	20.1	<1.0	<1.0
S-6	13.5	1.84	3.28	10.6	1.5	2.5
S-7	8.9	2.20	3.30	8.70	6.1	3.7
S-8	5.9	1.65	2.90	7.60	22	3.4

During the January sampling event it was raining and the air temperature was approximately 7°C. Daily maximum temperature data from the Malahat climate station (ID 1014820), which is about 7 km southeast of the southern tip of Shawnigan Lake, shows that the maximum daily temperature over the proceeding five days was approximately 5°C on average (Environment Canada 2017). Daily rainfall data were not available at the time of writing this report, but total precipitation values show that 43 mm of total precipitation (rain and snow) occurred between January 16 and January 19.

The water at many of the sample sites in January was visibly turbid. The relatively warm temperatures and rainfall contributed to snowmelt and runoff, resulting in the higher than usual turbidity and TSS levels found (Table 3-1). The low turbidity at S-1 is likely because it is near the Elkington Forest, and drains a less disturbed and smaller area than the other sites.

3.2.2 Nutrients

Nitrate was relatively low at all sites and in most cases, nitrite was not detected. The highest and lowest average nitrate-N concentrations were at S-3 (0.48 mg/L) and S-1 (0.060 mg/L), respectively. Within South Shawnigan Creek, average concentrations were higher (0.12 to 0.13 mg/L) at sites downstream of the confluence with Van Horne Creek. All nitrate-N concentrations were below the most stringent guideline of 3 mg/L. Ammonia was detected at S-2, S-3, S-4, S-6, S-7 and S-8 in January only. The highest concentration was at S-3 (0.0166 mg/L). By comparison, the lowest acute aquatic life guideline for ammonia (which is calculated based on the water pH and temperature) is 0.681 mg/L. Water quality results are included in Tables 3-2, 3-3, and Appendix A.

Total phosphorus concentrations were low to moderate with the highest concentration found well upstream of the lake. The highest and lowest average total phosphorus concentrations were at S-2 (0.018 mg/L) and S-1 (0.003 mg/L), respectively. Total phosphorus was generally highest in January, likely as a result of the elevated turbidity and runoff. Orthophosphate (dissolved P) was below detection (<0.001 mg/L) at S-1, S-2, S-4, S-5, or S-6 but was detected occasionally at S-7 and S-8 at low levels from 0.0011 mg/L to 0.0016

mg/L. At S-3, orthophosphate was low during all sampling events and ranged from 0.0022 mg/L to 0.0032 mg/L.

3.2.3 Dissolved and Total Metals

Similar to the findings of the last quarterly report, concentrations of several dissolved metals (in this case, calcium, magnesium, potassium, sodium) were noted to be higher at locations downstream of the confluence with Van Horne Creek (S-6, S-7, and S-8) than at locations upstream of the confluence (S-1, S-2, S-4, and S-5). S-3 continues to show different chemistry than the other sites (most notably, higher total and dissolved calcium, magnesium, nickel, potassium, sodium, strontium, and uranium (Appendix A).

In some cases, total metals were found to be higher during the January sampling event and exceeded aquatic life guidelines (Section 3.3.1). This finding is attributed to the precipitation that caused high flows and associated elevated turbidity and TSS at the time of sampling, and is discussed further in Section 3.3.1.

3.2.4 Hydrocarbons

Hydrocarbons fluoranthene (0.00001 mg/L and 0.000018 mg/L) and phenanthrene (0.000023 mg/L and 0.000033 mg/L) were detected in both the primary and duplicate sample at S-8 in January. Pyrene was detected in one of the duplicate samples only (0.000014 mg/L, compared with <0.000010 mg/L in the other duplicate). The findings were below aquatic life and drinking water guidelines. At the time of sampling in January, a hydrocarbon sheen was observed on the surface of the water (J. Budgen, pers. comm. [field sheet notation]).

During all other sampling events and at all other sites (including S-7), hydrocarbons were not detected.[2] Therefore, the source of the hydrocarbons at S-8 is likely either runoff from Sooke Lake Road, West Shawnigan Lake Road (bridge crossings) or various unidentified land uses between S-7 and S-8 (Figure 3-1).

[2] These substances are more likely to be associated with sediments as they are not very water soluble.

Figure 3-1
Land use near South Shawnigan Creek between Sites S-7 and S-8 (Google Earth image, 8/18/2016)

3.3 EXCEEDANCES OF WATER QUALITY GUIDELINES

Tables 3-2 to 3-3 show the measured concentrations of key detected parameters at each site, with results exceeding the aquatic life or drinking water guidelines highlighted. Further discussion of guideline exceedances is found following the tabulated key data.

All tabulated water quality data, including all tested parameters that were undetectable, are provided in Appendix A.

Table 3-2
Concentrations of key detected parameters at S-1, S-2, S-3, and S-4

Analyte	Units	Guideline			S-1 (EMS E294426)			S-2 (EMS E306323)				S-3 (EMS E306324)			S-4 (EMS E294425)			
		BCAWQG AL	GCDWQ AO	GCDWQ MAC	18-Jan-17	20-Feb-17	20-Mar-17	18-Jan-17	20-Feb-17		20-Mar-17	18-Jan-17	20-Feb-17	20-Mar-17	18-Jan-17	20-Feb-17		20-Mar-17
General Parameters																		
Temperature	°C				1.6	3.0	2.7	1.1	2.7	2.7	2.7	3.2	4.4	5.6	1.4	2.7	2.7	2.7
Conductivity	uS/cm	-	-	-	30.6	25.7	24.4	35.5	29.5	27.1	27	358	392	327	45.7	32.2	31.1	29.5
Hardness (as $CaCO_3$)	mg/L	-	-	-	10.6	9.06	7.95	10.2	9.34	9.44	9.76	112	151	124	15.5	11.6	11.1	10.7
pH	pH	6.5 - 9	7-10.5	-	7.12	7.05	7.15	7.06	7.42	7.28	6.96	7.76	7.77	7.69	7.44	7.52	7.44	7.27
Total Suspended Solids	mg/L	-	-	-	1.3	<1.0	<1.0	67.7	1.2	<1.0	5.9	13	<1.0	28.2	25.9	<1.0	<1.0	<1.0
Turbidity	NTU	-	-	-	0.57	0.22	0.26	43.8	0.55	0.75	0.33	21.7	8.2	1.42	18	0.8	0.82	0.38
Chloride (Cl)	mg/L	150	250	-	2.77	1.95	1.53	2.95	2.25	2.27	1.99	40.4	33.6	21.5	3.52	2.31	2.32	1.81
Sulfate (SO4)	mg/L	128	500	-	1.22	1.31	1.29	1.24	1.32	1.33	1.33	52.2	74.7	60.9	2.01	1.69	1.69	1.63
Nutrients																		
Ammonia, Total (as N)	mg/L	0.102	-	-	<0.0050	<0.0050	<0.0050	0.0051	<0.0050	<0.0050	<0.0050	0.0166	<0.0050	<0.0050	0.0058	<0.0050	<0.0050	<0.0050
Nitrate (as N)	mg/L	3	-	10	0.117	0.0375	0.0243	0.125	0.0404	0.0403	0.0328	0.427	0.553	0.454	0.136	0.044	0.0436	0.032
Nitrite (as N)	mg/L	0.02	-	1	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0029	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Nitrogen	mg/L	-	-	-	0.199	0.096	0.093	0.229	0.095	0.088	0.115	0.481	0.591	0.52	0.237	0.094	0.128	0.099
Orthophosphate-Dissolved (as P)	mg/L	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0032	0.0022	0.0031	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total	mg/L	-	-	-	0.0046	<0.0020	0.0025	0.0482	0.0025	0.0021	0.0046	0.0214	0.0042	0.0081	0.0179	0.0022	0.0024	0.0027
Organic Carbon																		
Dissolved Organic Carbon	mg/L	-	-	-	2.91	2.66	2.86	3.04	2.68	2.66	2.92	1.12	0.99	1.26	3.15	2.6	2.68	2.96
Total Organic Carbon	mg/L	-	-	-	3.09	2.68	2.99	3.62	2.74	2.65	2.75	1.22	1.03	1.37	3.48	2.65	3.06	2.79
Total Metals																		
Aluminum (Al)-Total	mg/L	-	0.1	-	0.0828	0.0794	0.0681	1.14	0.0747	0.0776	0.108	0.941	0.0951	0.0958	0.422	0.0763	0.075	0.0688
Arsenic (As)-Total	mg/L	0.005	-	0.01	0.000051	0.00007	0.000052	0.000188	0.000047	0.000058	0.000058	0.000238	0.000103	0.000114	0.00011	0.000057	0.000055	0.000048
Barium (Ba)-Total	mg/L	1	-	1	0.00227	0.00211	0.002	0.0125	0.00211	0.00208	0.00267	0.0146	0.00955	0.00875	0.00714	0.00217	0.00218	0.00224
Cadmium (Cd)-Total	mg/L	-	-	0.005	<0.0000050	0.0000055	<0.0000050	0.0000074	<0.0000050	<0.0000050	<0.0000050	0.0000069	<0.0000050	<0.0000050	<0.0000050	0.0000612	0.000101	<0.0000050
Calcium (Ca)-Total	mg/L	-	-	-	3.24	3.48	2.88	3.49	2.89	2.93	3.21	35.7	48.1	45.8	4.44	3.6	3.36	3.45
Chromium (Cr)-Total	mg/L	0.001[A]	-	0.05	0.0001	0.00016	0.00013	**0.00178**	0.00011	0.00013	0.00016	**0.00198**	0.00015	0.00018	0.00055	0.00012	0.00012	0.00013
Copper (Cu)-Total	mg/L	Calculated[B]	1	-	0.000498	0.00063	0.000499	**0.00367**	0.000526	0.000514	0.000704	0.003	0.00144	0.00144	0.00156	0.000554	0.000529	0.000582
Iron (Fe)-Total	mg/L	1	0.3	-	0.0461	0.0318	0.0281	**1.1**	0.0381	0.0394	0.0577	**0.933**	0.0436	0.0467	**0.473**	0.0444	0.048	0.0402
Lead (Pb)-Total	mg/L	0.003	-	0.01	0.0000392	0.0000165	0.0000266	0.000335	0.0000275	0.0000182	0.00008	0.000578	0.0000937	0.000174	0.000174	0.0000232	0.0000285	0.000042
Magnesium (Mg)-Total	mg/L	-	-	-	0.591	0.669	0.537	0.886	0.582	0.612	0.617	6.05	7.39	6.21	1.06	0.772	0.74	0.683
Manganese (Mn)-Total	mg/L	0.768	0.05	-	0.00695	0.00182	0.00205	0.0396	0.00352	0.00338	0.0109	0.0245	0.0326	0.0197	0.0311	0.00496	0.00503	0.00551
Nickel (Ni)-Total	mg/L	0.025	-	-	0.00012	0.000137	0.000117	0.00123	0.000125	0.000125	0.000162	0.00213	0.000627	0.000564	0.000571	0.000177	0.000156	0.000159
Sodium (Na)-Total	mg/L	-	200	-	1.73	1.84	1.5	1.78	1.55	1.56	1.64	15.8	16.4	12.7	2.18	1.83	1.67	1.66
Zinc (Zn)-Total	mg/L	0.0075	5	-	0.00044	0.00061	0.00043	0.00291	0.0004	0.00039	0.00122	0.00294	0.00045	0.00141	0.00151	0.0005	0.00047	0.00067
Dissolved Metals																		
Aluminum (Al)-Dissolved	mg/L	0.1	0.1	-	0.06	0.0626	0.0576	0.0713	0.0584	0.0587	0.0622	0.00655	0.00252	0.00402	0.0707	0.0606	0.0599	0.0598
Arsenic (As)-Dissolved	mg/L	0.005	-	0.01	0.000043	0.000053	0.000045	0.000052	0.000053	0.000048	0.000052	0.000067	0.00008	0.000085	0.000057	0.000052	0.000051	0.000046
Barium (Ba)-Dissolved	mg/L	1	-	1	0.00223	0.00154	0.00189	0.000956	0.00194	0.00188	0.00232	0.00724	0.00842	0.00761	0.00167	0.00201	0.00202	0.00208
Cadmium (Cd)-Dissolved	mg/L	Calculated[C]	-	0.005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000009	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000309	0.000023	<0.0000050
Calcium (Ca)-Dissolved	mg/L	4	-	-	3.27	2.72	2.4	3.11	2.8	2.85	2.98	35.3	48.5	40.5	4.49	3.45	3.25	3.18
Chromium (Cr)-Dissolved	mg/L	0.001[A]	-	0.05	<0.00010	0.00013	0.00012	0.00012	0.00011	0.00011	0.00012	<0.00010	<0.00010	<0.00010	0.00012	0.00011	0.00011	0.00011
Copper (Cu)-Dissolved	mg/L	Calculated[B]	1	-	0.00047	0.00045	0.000423	0.000532	0.000458	0.000455	0.000458	0.000705	0.00081	0.000751	0.000575	0.000655	0.000484	0.000499
Iron (Fe)-Dissolved	mg/L	0.35	0.3	-	0.0281	0.0219	0.0228	0.0388	0.0253	0.0257	0.0311	0.0059	0.0016	0.0027	0.0466	0.0286	0.0284	0.0298
Lead (Pb)-Dissolved	mg/L	0.003	-	0.01	0.0000647	0.0000093	0.000011	0.0000551	0.0000096	0.0000169	0.0000165	0.0000176	<0.0000050	0.0000081	0.000125	0.000092	0.0000171	0.0000109
Magnesium (Mg)-Dissolved	mg/L	-	-	-	0.588	0.552	0.474	0.599	0.568	0.567	0.567	5.71	7.26	5.53	1.04	0.73	0.723	0.674
Manganese (Mn)-Dissolved	mg/L	0.768	0.05	-	0.00261	0.000776	0.00083	0.00649	0.00261	0.00252	0.00692	0.00577	0.000149	0.000108	0.0102	0.00378	0.00385	0.0039
Nickel (Ni)-Dissolved	mg/L	0.025	-	-	0.00011	0.000097	0.00009	0.000128	0.000109	0.000104	0.000123	0.000441	0.000363	0.000303	0.000181	0.000182	0.000143	0.000131
Sodium (Na)-Dissolved	mg/L	-	200	-	1.69	1.49	1.28	1.73	1.51	1.47	1.54	16	16.2	11.3	2.26	1.74	1.69	1.6
Zinc (Zn)-Dissolved	mg/L	0.0075	5	-	0.00071	0.0006	0.00027	0.00119	0.00034	0.00081	0.00075	0.00026	0.00011	0.00018	0.0009	0.00135	0.00098	0.00044
Hydrocarbons																		
EPH10-19	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
EPH19-32	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
LEPH	mg/L	0.05	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
HEPH	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Fluoranthene	mg/L	0.0002	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Phenanthrene	mg/L	0.0003	-	-	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Pyrene	mg/L	0.00002	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010

BCAWQG/BCWWQG AL = BC Approved/Working Water Quality Guidelines for Freshwater Aquatic Life (MAY, 2015)
GCDWQ AO = Guidelines for Canadian Drinking Water Quality Aesthetic Objectives
GCDWQ MAC = Guidelines for Canadian Drinking Water Quality Maximum Acceptable Concentration
Result exceeds the acute BCAWQG/BCWWQG AL
Result exceeds the GCDWQ
Result exceeds both the BCAWQG AL and the GCDWQ

Notes:
Guideline values are provided by ALS Laboratories, using their online Webtrieve system.
A: The BCWWQG AL for chromium is 0.001 mg/L for Cr (III) and 0.0089 mg/L for Cr (VI).
B: The BCAWQG AL for copper in mg/L is calculated as follows: (0.094(hardness [mg/L $CaCO_3$]) + 2)*1000
C: The BCAWQG AL for cadmium in mg/L is calculated as follows: e^(1.03*ln(hardness[mg/L $CaCO_3$])-5.274)*1000

Table 3-3
Concentrations of key detected parameters at S-5, S-6, S-7, and S-8

Analyte	Units	Guideline			S-5 (EMS E306325)			S-6 (EMS E306326)			S-7 (EMS E306327)					S-8 (EMS 1199906)				
		BCAWQG AL	GCDWQ AO	GCDWQ MAC	18-Jan-17	20-Feb-17	20-Mar-17	18-Jan-17	20-Feb-17	20-Mar-17	18-Jan-17		20-Feb-17	20-Mar-17	20-Mar-17	18-Jan-17		20-Feb-17	20-Mar-17	
General Parameters																				
Temperature	°C				1.6	3.2	2.8	1.6	3.2	2.8	2.0	2.0	3.5	3.2	3.2	1.9	1.9	3.5	3.4	3.4
Conductivity	uS/cm	-	-	-	46.9	33.5	31.5	51.4	39	37.1	50.2	50.2	39.5	40.9	40.5	52.2	51.9	40.4	39.5	39.2
Hardness (as $CaCO_3$)	mg/L	-	-	-	15.3	12.3	11.4	15.8	13	12.9	17	16.3	13.5	13.7	14	15.5	15.3	13.7	13.6	13.6
pH	pH	6.5 - 9	7-10.5	-	7.34	7.16	7.19	7.3	7.17	7.19	7.26	7.29	7.38	7.14	7.19	7.29	7.28	7.4	7.24	7.22
Total Suspended Solids	mg/L	-	-	-	20.1	<1.0	<1.0	10.6	1.5	2.5	8.7	8.6	6.1	3.4	4	9.8	5.3	22	3.5	3.2
Turbidity	NTU	-	-	-	20.5	0.72	0.39	13.5	1.84	3.28	9.6	8.21	2.2	3.29	3.26	6.03	5.86	1.65	2.96	2.9
Chloride (Cl)	mg/L	150	250	-	3.99	2.48	1.93	5.16	3.22	2.59	5.09	5.09	3.35	3.02	3.02	5.23	5.25	3.4	2.83	2.81
Sulfate (SO4)	mg/L	128	500	-	2.58	2.09	1.95	3.13	2.71	2.56	2.79	2.79	2.6	2.65	2.66	2.83	2.83	2.6	2.48	2.48
Nutrients																				
Ammonia, Total (as N)	mg/L	0.102	-	-	<0.0050	<0.0050	<0.0050	0.0052	<0.0050	<0.0050	<0.0050	0.0066	<0.0050	<0.0050	<0.0050	0.0058	0.0066	<0.0050	<0.0050	<0.0050
Nitrate (as N)	mg/L	3	-	10	0.144	0.047	0.0328	0.184	0.0955	0.0728	0.174	0.172	0.11	0.0869	0.0868	0.183	0.182	0.114	0.0903	0.0904
Nitrite (as N)	mg/L	0.02	-	1	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Nitrogen	mg/L	-	-	-	0.236	0.092	0.088	0.302	0.163	0.158	0.3	0.32	0.196	0.158	0.169	0.311	0.376	0.25	0.184	0.226
Orthophosphate-Dissolved (as P)	mg/L	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0013	0.0012	<0.0010	<0.0010	0.0011	0.0011	0.0013	<0.0010	0.0016	0.0013
Phosphorus (P)-Total	mg/L	-	-	-	0.019	0.0023	0.0027	0.0183	0.005	0.0057	0.012	0.0089	0.0052	0.0052	0.0063	0.0082	0.0086	0.0065	0.006	0.0068
Organic Carbon																				
Dissolved Organic Carbon	mg/L	-	-	-	2.9	2.62	2.97	3.28	3.07	3.18	3.82	3.65	3.29	3.12	3.2	3.23	3.29	3.35	3.18	3.17
Total Organic Carbon	mg/L	-	-	-	3.13	2.9	2.72	3.47	3.16	2.98	3.22	3.7	3.18	2.95	3.02	3.44	3.76	4.08	3.08	3.21
Total Metals																				
Aluminum (Al)-Total	mg/L	-	0.1	-	0.404	0.0725	0.065	0.56	0.121	0.162	0.235	0.246	0.146	0.172	0.141	0.248	0.265	0.114	0.145	0.14
Arsenic (As)-Total	mg/L	0.005	-	0.01	0.000106	0.000054	0.00005	0.000176	0.000077	0.000084	0.000116	0.00012	0.000076	0.000088	0.00008	0.000117	0.000111	0.000093	0.000082	0.000092
Barium (Ba)-Total	mg/L	1	-	1	0.00782	0.00229	0.00224	0.00821	0.00325	0.00361	0.00494	0.00526	0.00352	0.00366	0.00381	0.00488	0.00496	0.003	0.00326	0.00333
Cadmium (Cd)-Total	mg/L	-	-	0.005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000078	0.0000068	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium (Ca)-Total	mg/L	-	-	-	4.67	3.66	3.61	4.75	4.55	3.89	4.67	4.56	4.29	4.53	4.05	4.39	4.56	4.21	4.26	4.46
Chromium (Cr)-Total	mg/L	0.001[A]	-	0.05	0.00056	0.00013	0.00012	0.00083	0.0002	0.00028	0.00039	0.00039	0.0002	0.00027	0.00023	0.00039	0.00039	0.00021	0.00022	0.00023
Copper (Cu)-Total	mg/L	Calculated[B]	1	-	0.00156	0.000529	0.000474	0.00137	0.000588	0.000654	0.00119	0.00107	0.000734	0.000764	0.000629	0.000937	0.000971	0.000654	0.000781	0.000948
Iron (Fe)-Total	mg/L	1	0.3	-	**0.433**	0.0393	0.0355	**0.496**	0.0841	0.136	0.245	0.25	0.103	0.132	0.114	0.245	0.256	0.0753	0.124	0.105
Lead (Pb)-Total	mg/L	0.003	-	0.01	0.00014	0.0000158	0.0000125	0.000237	0.0000564	0.0000687	0.000251	0.000294	0.000105	0.0000867	0.0000743	0.000216	0.000179	0.0000482	0.0000625	0.0000714
Magnesium (Mg)-Total	mg/L	-	-	-	1.11	0.828	0.777	1.19	1	0.887	1.19	1.17	1.02	1.06	0.94	1.11	1.11	1.02	0.953	0.947
Manganese (Mn)-Total	mg/L	0.768	0.05	-	0.02	0.00266	0.00313	0.0265	0.00509	0.00625	0.0142	0.0156	0.0129	0.00759	0.00586	0.0128	0.0121	0.00416	0.00495	0.00521
Nickel (Ni)-Total	mg/L	0.025	-	-	0.000509	0.000153	0.000146	0.000753	0.000211	0.000281	0.000392	0.000397	0.000225	0.000297	0.000239	0.000394	0.000391	0.000224	0.000258	0.000275
Sodium (Na)-Total	mg/L	-	200	-	2.33	1.83	1.77	2.97	2.68	2.26	3.24	3.18	2.58	2.83	2.63	3.01	2.94	2.47	2.43	2.54
Zinc (Zn)-Total	mg/L	0.0075	5	-	0.00138	0.00028	0.00025	0.0018	0.00073	0.00077	0.00224	0.00335	0.00172	0.0013	0.00115	0.00139	0.00144	0.00099	0.0012	0.00183
Dissolved Metals																				
Aluminum (Al)-Dissolved	mg/L	0.1	0.1	-	0.0626	0.0554	0.0525	0.0666	**0.107**	0.0617	0.068	0.0619	0.0607	0.0593	0.0527	0.0764	0.0753	0.0579	0.0596	0.0604
Arsenic (As)-Dissolved	mg/L	0.005	-	0.01	0.000062	0.000057	0.000049	0.000069	0.000069	0.000061	0.000092	0.000081	0.000057	0.000061	0.000056	0.000082	0.000081	0.000065	0.000072	0.000071
Barium (Ba)-Dissolved	mg/L	1	-	1	0.00234	0.00212	0.00219	0.00268	0.00298	0.00241	0.0028	0.00285	0.00247	0.00231	0.00235	0.00288	0.00291	0.00238	0.0025	0.00235
Cadmium (Cd)-Dissolved	mg/L	Calculated[C]	-	0.005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium (Ca)-Dissolved	mg/L	4	-	-	4.42	3.6	3.39	4.61	3.75	3.8	4.73	4.61	3.8	4.06	3.7	4.45	4.36	3.96	3.96	3.88
Chromium (Cr)-Dissolved	mg/L	0.001[A]	-	0.05	0.00016	0.00011	<0.00010	0.00011	0.00017	0.00014	0.00013	0.00013	0.00013	0.00013	0.00013	0.00021	0.00014	0.00013	0.00013	0.00012
Copper (Cu)-Dissolved	mg/L	Calculated[B]	1	-	0.000521	0.000483	0.000453	0.000509	0.000562	0.00046	0.000544	0.000535	0.00048	0.000465	0.000455	0.000531	0.000568	0.000519	0.000468	0.000471
Iron (Fe)-Dissolved	mg/L	0.35	0.3	-	0.0382	0.0231	0.0235	0.0448	0.0771	0.0352	0.047	0.0429	0.0339	0.0335	0.0339	0.0627	0.0593	0.0334	0.0347	0.0359
Lead (Pb)-Dissolved	mg/L	0.003	-	0.01	0.000354	0.0000191	0.0000137	0.0000646	0.0000796	0.0000159	0.0000712	0.000107	0.0000161	0.0000178	0.0000181	0.000206	0.0000607	0.0000188	0.0000151	0.0000337
Magnesium (Mg)-Dissolved	mg/L	-	-	-	1.03	0.807	0.709	1.05	0.885	0.82	1.27	1.17	0.973	0.858	1.01	1.06	1.08	0.928	0.892	0.937
Manganese (Mn)-Dissolved	mg/L	0.768	0.05	-	0.00588	0.0017	0.0017	0.00699	0.00397	0.00241	0.00465	0.00426	0.00166	0.00183	0.00177	0.00551	0.00581	0.00179	0.00196	0.00202
Nickel (Ni)-Dissolved	mg/L	0.025	-	-	0.000177	0.000145	0.000129	0.000151	0.000181	0.000132	0.000154	0.000154	0.000131	0.000136	0.000124	0.000159	0.000159	0.000125	0.000137	0.000125
Sodium (Na)-Dissolved	mg/L	-	200	-	2.31	1.86	1.59	2.89	2.35	2.19	3.48	3.35	2.53	2.39	2.42	3.01	3	2.37	2.19	2.28
Zinc (Zn)-Dissolved	mg/L	0.0075	5	-	0.00069	0.00037	0.00024	0.00077	0.0009	0.00039	0.00115	0.00084	0.00138	0.00057	0.00064	0.00101	0.00097	0.00064	0.00051	0.00054
Hydrocarbons																				
EPH10-19	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
EPH19-32	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
LEPH	mg/L	0.05	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
HEPH	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Fluoranthene	mg/L	0.0002	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.00001	0.000018	<0.000010	<0.000010	<0.000010
Phenanthrene	mg/L	0.0003	-	-	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000023	0.000033	<0.000020	<0.000020	<0.000020
Pyrene	mg/L	0.00002	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000014	<0.000010	<0.000010	<0.000010

BCAWQG/BCWWQG AL = BC Approved/Working Water Quality Guidelines for Freshwater Aquatic Life (MAY, 2015)
GCDWQ AO = Guidelines for Canadian Drinking Water Quality Aesthetic Objectives
GCDWQ MAC = Guidelines for Canadian Drinking Water Quality Maximum Acceptable Concentration
Result exceeds the acute BCAWQG/BCWWQG AL
Result exceeds the GCDWQ
Result exceeds both the BCAWQG AL and the GCDWQ

Notes:
Guideline values are provided by ALS Laboratories, using their online Webtrieve system.
A: The BCWWQG AL for chromium is 0.001 mg/L for Cr (III) and 0.0089 mg/L for Cr (VI).
B: The BCAWQG AL for copper in mg/L is calculated as follows: (0.094(hardness [mg/L $CaCO_3$]) + 2)*1000
C: The BCAWQG AL for cadmium in mg/L is calculated as follows: e^(1.03*ln(hardness[mg/L $CaCO_3$])-5.274)*1000

3.3.1 Exceedances of Aquatic Life Guidelines

Results were compared with the BC Approved and Working Water Quality Guidelines for the protection of freshwater aquatic life (MOE 2015, 2016). For some parameters, the two guidelines are listed: the long-term average (i.e., chronic) guidelines, which are intended to protect the most sensitive species and life-stage to long-term exposure, and the short-term maximum (i.e., acute) guidelines, which are set to protect against severe effects such as lethality to the most sensitive species and life stage over a defined short-term exposure period (e.g., 96 hours).

Compliance with the chronic guidelines is assessed by calculating the average concentration from five weekly samples collected in a period of 30 days (5-in-30), and was completed as part of the previous quarterly reports (Associated 2016a, 2017). For this quarterly report, which includes three monthly sampling events only, results were assessed against the acute guidelines.

The parameters found to exceed the acute aquatic life guidelines during the January to March sampling period included total chromium, total copper, total iron and dissolved aluminum. The exceedances are noted in Tables 3-2 and 3-3, with all data shown in Appendix A and summarized by sampling event below:

<u>January</u>

- Total chromium exceeded the working guideline[3] of 0.001 mg/L at S-2 (0.00178 mg/L) and S-3 (0.00198 mg/L). However, the guideline of 0.001 mg/L is specifically for chromium (VI). For chromium (III), the guideline is 0.0089 mg/L. Because only total chromium was tested and the different oxidation states were not determined, the more conservative guideline of 0.001 mg/L was applied.
- Total copper at S-2 (0.00367 mg/L) exceeded the approved guideline, which is calculated based on the water hardness. For S-2, which had a water hardness of 10.2 mg/L, the calculated guideline is 0.0030 mg/L (MOE 2016).
- Total iron at S-2 (1.1 mg/L) exceeded the approved guideline of 1 mg/L.
- **Note:** While turbidity was somewhat higher than usual at several sites, it was raining during sampling, which likely caused increased turbidity and other parameters at the time.

The guideline exceedances of total chromium, copper, and iron at the three sites during the January sampling event are likely attributed to the rainfall and associated elevated turbidity and TSS (Section 3.2.1, Table 3-1). The *dissolved* concentration of chromium, copper, and iron in the same samples accounted for less than 15% of the total concentration indicating the affiliation of these metals with particulates.

<u>February</u>

In February, dissolved aluminum at S-6 (0.107 mg/L) marginally exceeded the approved guideline of 0.10 mg/L (which applies when pH > 6.5).

[3] BC Working Guidelines are ones that have been obtained from another jurisdiction, but have not been fully assessed/endorsed by the Ministry of Environment (MOE 2015).

March
In March, all results met aquatic life guidelines.

3.3.2 Exceedances of Drinking Water Maximum Acceptable Concentration and Aesthetic Objective

Results were also compared with the Maximum Acceptable Concentrations and Aesthetic Objectives from the Guidelines for Canadian Drinking Water Quality (Health Canada 2017), because Shawnigan Lake is used as a drinking water source. This comparison is conservative because it assumes that the lake water is consumed without treatment.

The results at all sites generally met the drinking water guidelines, with the exception of total iron at S-2, S-3, S-4, S-5, and 2-6 in January. Total iron in these samples ranged from 0.433 mg/L (in S-5) to 1.1 mg/L (in S-2). As summarized in Section 3.4.1, these elevated results may be due to the higher turbidity levels noted in January. The guideline for iron is based on *aesthetic concerns* (i.e., staining of plumbing fixtures) and not on health-based concerns (Health Canada 2017). Note the sites closer to the lake did not have total iron or any other drinking water guideline exceedances.

4 Conclusions and Next Steps

4.1 CONCLUSIONS AND KEY FINDINGS

The third quarterly water quality sampling was designed to capture results from the winter and early spring period. During this period, flowing water was consistently found (unlike during the first quarterly sampling, which occurred during the dry season). This allowed for good comparisons between upstream and downstream conditions.

Water quality samples were collected from all eight sites in January, February, and March. Key findings were as follows:

- With a few notable exceptions, the water quality overall was relatively good considering the many anthropogenic disturbances in the watershed.
- Concentrations of some parameters increased from upstream to downstream locations, and often the greatest increases occurred downstream of Van Horne Creek.
- Levels of some parameters were higher at S-3, the ephemeral creek fed by groundwater and the discharge from CHH. More information is needed about upgradient and nearby groundwater quality and the settling pond discharge itself, to make further conclusions about whether the concentrations at this site are normal for the area or not. There was no evidence that the next nearest site downstream on South Shawnigan Creek (S-5) was influenced by the levels found at S-3.
- With one exception, all of the water quality guideline exceedances were in January, corresponded to rainfall events, and included the following:
    - **Total chromium** at S-2 and S-3 exceed the aquatic life guideline for chromium (VI).
    - **Total copper** at S-2 exceeded the aquatic life guideline.

    - **Total iron** at S-2 exceeded the aquatic life guideline, and total iron at S-2, S-3, S-4, S-5, and S-6 exceeded the drinking water guideline.
- Both turbidity and total suspended solids (TSS) were higher at nearly all sites in January than in February and March. The exceedances of total metals during this sample period were most likely attributed to the increased precipitation and associated higher levels of surface water runoff and turbidity. Turbidity and TSS were lower at S-1 than the further downstream sites; likely because S-1 is near the Elkington Forest, and drains a less disturbed and smaller area than the other sites.
- Hydrocarbons (fluoranthene, phenanthrene, and pyrene) were detected at S-8 in January. Concentrations remained below drinking water and aquatic life guidelines. During sampling, a hydrocarbon sheen was observed on the surface near S-8. Hydrocarbons were not detected at any other site or during any other sampling event. The detected concentrations at S-8 could be from roadways and/or land uses between S-7 and S-8.

4.2 COMMENTS AND NEXT STEPS

The contaminated soil treatment facility and contaminated soil landfill have been closed and non-operational since January 23, 2017, when MOE suspended CHH's permit to operate and issued a Spill Prevention Order (MOE 2017a). Since the CHH site closed, it has sometimes been challenging to gain access; however, the company has been cooperative in this regard. On February 23, 2017, MOE cancelled CHH's permit (MOE 2017b). Reasons for the permit suspension and cancellation can be found on MOE's website: http://www2.gov.bc.ca/gov/content/environment/air-land-water/site-permitting-compliance/sia.

A sediment monitoring report based on samples collected in fall 2016 was provided by MOE, dated 31 January 2017 (MOE 2017c).

Monthly sampling is scheduled to continue through to June, with samples collected once in each of April, May and June. The overall results for the one-year study will be summarized in a final report, and discussed at a final meeting.

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Appendix A – Water Quality Data: January to March 2017

Quarterly Summary Report #3
Water Quality Results (all sites)

Analyte	Units	Guideline			S-1 (EMS E294426)			S-2 (EMS E306323)				S-3 (EMS E306324)			S-4 (EMS E294425)				S-5 (EMS E306325)		
		BCAWQG AL	GCDWQ AO	GCDWQ MAC	18-Jan-17	20-Feb-17	20-Mar-17	18-Jan-17	20-Feb-17		20-Mar-17	18-Jan-17	20-Feb-17	20-Mar-17	18-Jan-17	20-Feb-17		20-Mar-17	18-Jan-17	20-Feb-17	20-Mar-17
General Parameters																					
Temperature	°C				1.6	3.0	2.7	1.1	2.7	2.7	2.7	3.2	4.4	5.6	1.4	2.7	2.7	2.7	1.6	3.2	2.8
Conductivity	uS/cm	-	-	-	30.6	25.7	24.4	35.5	29.5	27.1	27	358	392	327	45.7	32.2	31.1	29.5	46.9	33.5	31.5
Hardness (as $CaCO_3$)	mg/L	-	-	-	10.6	9.06	7.95	10.2	9.34	9.44	9.76	112	151	124	15.5	11.6	11.1	10.7	15.3	12.3	11.4
pH	pH	6.5 - 9	7-10.5	-	7.12	7.05	7.15	7.06	7.42	7.28	6.96	7.76	7.77	7.69	7.44	7.52	7.44	7.27	7.34	7.16	7.19
Total Suspended Solids	mg/L	-	-	-	1.3	<1.0	<1.0	67.7	1.2	<1.0	5.9	13	<1.0	28.2	25.9	<1.0	<1.0	<1.0	20.1	<1.0	<1.0
Turbidity	NTU	-	-	-	0.57	0.22	0.26	43.8	0.55	0.75	0.33	21.7	8.2	1.42	18	0.8	0.82	0.38	20.5	0.72	0.39
Chloride (Cl)	mg/L	150	250	-	2.77	1.95	1.53	2.95	2.25	2.27	1.99	40.4	33.6	21.5	3.52	2.31	2.32	1.81	3.99	2.48	1.93
Sulfate (SO4)	mg/L	128	500	-	1.22	1.31	1.29	1.24	1.32	1.33	1.33	52.2	74.7	60.9	2.01	1.69	1.69	1.63	2.58	2.09	1.95
Nutrients																					
Ammonia, Total (as N)	mg/L	0.102	-	-	<0.0050	<0.0050	<0.0050	0.0051	<0.0050	<0.0050	<0.0050	0.0166	<0.0050	<0.0050	0.0058	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrate and Nitrite (as N)	mg/L	-	-	10	0.117	0.0375	0.0243	0.125	0.0404	0.0403	0.0328	0.43	0.553	0.454	0.136	0.044	0.0436	0.032	0.144	0.047	0.0328
Nitrate (as N)	mg/L	3	-	10	0.117	0.0375	0.0243	0.125	0.0404	0.0403	0.0328	0.427	0.553	0.454	0.136	0.044	0.0436	0.032	0.144	0.047	0.0328
Nitrite (as N)	mg/L	0.02	-	1	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0029	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	-	-	-	0.083	0.059	0.069	0.104	0.055	<0.050	0.083	0.052	<0.059	0.067	0.1	<0.050	0.084	0.067	0.093	<0.050	0.056
Total Nitrogen	mg/L	-	-	-	0.199	0.096	0.093	0.229	0.095	0.088	0.115	0.481	0.591	0.52	0.237	0.094	0.128	0.099	0.236	0.092	0.088
Total Organic Nitrogen	mg/L	-	-	-	0.078	0.057	0.067	0.099	0.054	<0.050	0.081	<0.096	<0.12	<0.10	0.095	<0.050	0.082	0.066	0.091	<0.050	0.055
Dissolved Kjeldahl Nitrogen	mg/L	-	-	-	0.062	0.071	0.075	0.067	0.052	0.051	0.088	0.065	<0.059	<0.050	0.115	0.054	0.051	0.069	0.08	0.05	0.057
Total Dissolved Nitrogen	mg/L	-	-	-	0.179	0.108	0.099	0.192	0.092	0.091	0.121	0.494	0.591	0.503	0.251	0.098	0.095	0.101	0.224	0.097	0.09
Orthophosphate-Dissolved (as P)	mg/L	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0032	0.0022	0.0031	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (P)-Total	mg/L	-	-	-	0.0046	<0.0020	0.0025	0.0482	0.0025	0.0021	0.0046	0.0214	0.0042	0.0081	0.0179	0.0022	0.0024	0.0027	0.019	0.0023	0.0027
Organic Carbon																					
Dissolved Organic Carbon	mg/L	-	-	-	2.91	2.66	2.86	3.04	2.68	2.66	2.92	1.12	0.99	1.26	3.15	2.6	2.68	2.96	2.9	2.62	2.97
Total Organic Carbon	mg/L	-	-	-	3.09	2.68	2.99	3.62	2.74	2.65	2.75	1.22	1.03	1.37	3.48	2.65	3.06	2.79	3.13	2.9	2.72
Total Metals																					
Aluminum (Al)-Total	mg/L	-	0.1	-	0.0828	0.0794	0.0681	1.14	0.0747	0.0776	0.108	0.941	0.0951	0.0958	0.422	0.0763	0.075	0.0688	0.404	0.0725	0.065
Antimony (Sb)-Total	mg/L	-	-	0.006	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000149	0.000189	0.000176	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Arsenic (As)-Total	mg/L	0.005	-	0.01	0.000051	0.00007	0.000052	0.000188	0.000047	0.000058	0.000058	0.000238	0.000103	0.000114	0.00011	0.000057	0.000055	0.000048	0.000106	0.000054	0.00005
Barium (Ba)-Total	mg/L	1	-	1	0.00227	0.00211	0.002	0.0125	0.00211	0.00208	0.00267	0.0146	0.00955	0.00875	0.00714	0.00217	0.00218	0.00224	0.00782	0.00229	0.00224
Beryllium (Be)-Total	mg/L	0.00013	-	-	<0.000010	<0.000010	<0.000010	0.000028	<0.000010	<0.000010	<0.000010	0.000022	<0.000010	<0.000010	0.000012	<0.000010	<0.000010	<0.000010	0.000012	<0.000010	<0.000010
Bismuth (Bi)-Total	mg/L	-	-	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Boron (B)-Total	mg/L	1.2	-	5	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0131	0.015	0.0138	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cadmium (Cd)-Total	mg/L	-	-	0.005	<0.0000050	0.0000055	<0.0000050	0.0000074	<0.0000050	<0.0000050	<0.0000050	0.0000069	<0.0000050	<0.0000050	<0.0000050	0.0000612	0.000101	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium (Ca)-Total	mg/L	-	-	-	3.24	3.48	2.88	3.49	2.89	2.93	3.21	35.7	48.1	45.8	4.44	3.6	3.36	3.45	4.67	3.66	3.61
Chromium (Cr)-Total	mg/L	0.001[A]	-	0.05	0.0001	0.00016	0.00013	**0.00178**	0.00011	0.00013	0.00016	**0.00198**	0.00015	0.00018	0.00055	0.00012	0.00012	0.00013	0.00056	0.00013	0.00012
Cobalt (Co)-Total	mg/L	0.004	-	-	0.0000793	0.0000419	0.000041	0.000777	0.0000478	0.0000461	0.000111	0.000563	0.000241	0.000199	0.000348	0.0000511	0.0000509	0.000049	0.000269	0.0000398	0.0000401
Copper (Cu)-Total	mg/L	Calculated[B]	1	-	0.000498	0.00063	0.000499	**0.00367**	0.000526	0.000514	0.000704	0.003	0.00144	0.00144	0.00156	0.000554	0.000529	0.000582	0.00156	0.000529	0.000474
Iron (Fe)-Total	mg/L	1	0.3	-	0.0461	0.0318	0.0281	**1.1**	0.0381	0.0394	0.0577	**0.933**	0.0436	0.0467	**0.473**	0.0444	0.048	0.0402	**0.433**	0.0393	0.0355
Lead (Pb)-Total	mg/L	0.003	-	0.01	0.0000392	0.0000165	0.0000266	0.000335	0.0000275	0.0000182	0.00008	0.000578	0.0000937	0.000174	0.000174	0.0000232	0.0000285	0.000042	0.00014	0.0000158	0.0000125
Lithium (Li)-Total	mg/L	0.014	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00075	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Magnesium (Mg)-Total	mg/L	-	-	-	0.591	0.669	0.537	0.886	0.582	0.612	0.617	6.05	7.39	6.21	1.06	0.772	0.74	0.683	1.11	0.828	0.777
Manganese (Mn)-Total	mg/L	0.768	0.05	-	0.00695	0.00182	0.00205	0.0396	0.00352	0.00338	0.0109	0.0245	0.0326	0.0197	0.0311	0.00496	0.00503	0.00551	0.02	0.00266	0.00313
Mercury (Hg)-Total	mg/L	0.00001	-	0.001	-	-	<0.000050	-	-	-	<0.000050	-	-	<0.000050	-	-	-	<0.000050	-	-	<0.000050
Molybdenum (Mo)-Total	mg/L	1	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.0006	0.00067	0.000714	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel (Ni)-Total	mg/L	0.025	-	-	0.00012	0.000137	0.000117	0.00123	0.000125	0.000125	0.000162	0.00213	0.000627	0.000564	0.000571	0.000177	0.000156	0.000159	0.000509	0.000153	0.000146
Potassium (K)-Total	mg/L	373	-	-	0.0994	0.102	0.0887	0.193	0.08	0.0834	0.103	0.914	0.894	0.823	0.171	0.0987	0.0949	0.101	0.199	0.115	0.113
Selenium (Se)-Total	mg/L	0.001	-	0.05	<0.000040	0.000048	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	0.000162	0.000267	0.000303	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040
Silicon (Si)-Total	mg/L	-	-	-	2.5	3.59	2.47	4.39	2.43	2.48	2.63	4.98	3.7	4.02	3.1	2.51	2.42	2.73	3.2	2.51	2.96
Silver (Ag)-Total	mg/L	0.00005	-	-	<0.0000050	0.000008	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Sodium (Na)-Total	mg/L	-	200	-	1.73	1.84	1.5	1.78	1.55	1.56	1.64	15.8	16.4	12.7	2.18	1.83	1.67	1.66	2.33	1.83	1.77
Strontium (Sr)-Total	mg/L	-	-	-	0.0136	0.0112	0.0103	0.0174	0.0115	0.0115	0.0116	0.125	0.144	0.129	0.019	0.0131	0.0127	0.0121	0.0204	0.0147	0.0138
Thallium (Tl)-Total	mg/L	0.0008	-	-	0.000003	0.0000056	0.0000022	0.0000051	0.0000069	0.0000033	<0.0000020	0.0000075	0.000003	0.0000023	0.0000035	0.0000032	0.0000037	<0.0000020	0.0000036	0.0000057	<0.0000020
Tin (Sn)-Total	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000021	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Uranium (U)-Total	mg/L	0.0085	-	0.02	0.0000085	0.0000057	0.0000068	0.0000529	0.0000071	0.0000066	0.0000102	0.000398	0.000713	0.000621	0.0000179	0.0000077	0.0000079	0.0000076	0.0000176	0.000007	0.0000064
Vanadium (V)-Total	mg/L	0.006	-	-	<0.00020	<0.00020	<0.00020	0.00346	<0.00020	<0.00020	0.00024	0.0031	0.0007	0.00078	0.00137	<0.00020	<0.00020	<0.00020	0.00127	0.00021	<0.00020
Zinc (Zn)-Total	mg/L	0.0075	5	-	0.00044	0.00061	0.00043	0.00291	0.0004	0.00039	0.00122	0.00294	0.00045	0.00141	0.00151	0.0005	0.00047	0.00067	0.00138	0.00028	0.00025
Dissolved Metals																					
Aluminum (Al)-Dissolved	mg/L	0.1	0.1	-	0.06	0.0626	0.0576	0.0713	0.0584	0.0587	0.0622	0.00655	0.00252	0.00402	0.0707	0.0606	0.0599	0.0598	0.0626	0.0554	0.0525
Antimony (Sb)-Dissolved	mg/L	-	-	0.006	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000142	0.000179	0.000169	<0.000020	<0.000020	<0.000020	<0.000020	0.000021	0.000029	<0.000020
Arsenic (As)-Dissolved	mg/L	0.005	-	0.01	0.000043	0.000053	0.000045	0.000052	0.000053	0.000048	0.000052	0.000067	0.00008	0.000085	0.000057	0.000052	0.000051	0.000046	0.000062	0.000057	0.000049
Barium (Ba)-Dissolved	mg/L	1	-	1	0.00223	0.00154	0.00189	0.000956	0.00194	0.00188	0.00232	0.00724	0.00842	0.00761	0.00167	0.00201	0.00202	0.00208	0.00234	0.00212	0.00219
Beryllium (Be)-Dissolved	mg/L	0.00013	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000022	<0.000010
Bismuth (Bi)-Dissolved	mg/L	-	-	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Boron (B)-Dissolved	mg/L	1.2	-	5	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.013	0.0157	0.0138	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cadmium (Cd)-Dissolved	mg/L	Calculated[C]	-	0.005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000009	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000309	0.000023	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium (Ca)-Dissolved	mg/L	4	-	-	3.27	2.72	2.4	3.11	2.8	2.85	2.98	35.3	48.5	40.5	4.49	3.45	3.25	3.18	4.42	3.6	3.39
Chromium (Cr)-Dissolved	mg/L	0.001[A]	-	0.05	<0.00010	0.00013	0.00012	0.00012	0.00011	0.00011	0.00012	<0.00010	<0.00010	<0.00010	0.00012	0.00011	0.00011	0.00011	0.00016	0.00011	<0.00010

Quarterly Summary Report #3
Water Quality Results (all sites)

Analyte	Units	Guideline			S-1 (EMS E294426)			S-2 (EMS E306323)				S-3 (EMS E306324)			S-4 (EMS E294425)				S-5 (EMS E306325)		
		BCAWQG AL	GCDWQ AO	GCDWQ MAC	18-Jan-17	20-Feb-17	20-Mar-17	18-Jan-17	20-Feb-17		20-Mar-17	18-Jan-17	20-Feb-17	20-Mar-17	18-Jan-17	20-Feb-17		20-Mar-17	18-Jan-17	20-Feb-17	20-Mar-17
Cobalt (Co)-Dissolved	mg/L	0.004	-	-	0.0000379	0.0000325	0.000027	0.0000556	0.000037	0.000037	0.000063	0.000058	0.0000317	0.0000291	0.0000611	0.0000359	0.0000393	0.0000368	0.0000423	0.0000333	0.0000281
Copper (Cu)-Dissolved	mg/L	Calculated[B]	1	-	0.00047	0.00045	0.000423	0.000532	0.000458	0.000455	0.000458	0.000705	0.00081	0.000751	0.000575	0.000655	0.000484	0.000499	0.000521	0.000483	0.000453
Iron (Fe)-Dissolved	mg/L	0.35	0.3	-	0.0281	0.0219	0.0228	0.0388	0.0253	0.0257	0.0311	0.0059	0.0016	0.0027	0.0466	0.0286	0.0284	0.0298	0.0382	0.0231	0.0235
Lead (Pb)-Dissolved	mg/L	0.003	-	0.01	0.0000647	0.0000093	0.000011	0.0000551	0.0000096	0.0000169	0.0000165	0.0000176	<0.0000050	0.0000081	0.000125	0.000092	0.0000171	0.0000109	0.000354	0.0000191	0.0000137
Lithium (Li)-Dissolved	mg/L	0.014	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Magnesium (Mg)-Dissolved	mg/L	-	-	-	0.588	0.552	0.474	0.599	0.568	0.567	0.567	5.71	7.26	5.53	1.04	0.73	0.723	0.674	1.03	0.807	0.709
Manganese (Mn)-Dissolved	mg/L	0.768	0.05	-	0.00261	0.000776	0.00083	0.00649	0.00261	0.00252	0.00692	0.00577	0.000149	0.000108	0.0102	0.00378	0.00385	0.0039	0.00588	0.0017	0.0017
Molybdenum (Mo)-Dissolved	mg/L	1	-	-	<0.000050	0.000057	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000622	0.000814	0.000808	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000076	<0.000050
Nickel (Ni)-Dissolved	mg/L	0.025	-	-	0.00011	0.000097	0.00009	0.000128	0.000109	0.000104	0.000123	0.000441	0.000363	0.000303	0.000181	0.000182	0.000143	0.000131	0.000177	0.000145	0.000129
Potassium (K)-Dissolved	mg/L	373	-	-	0.0988	0.079	0.0758	0.103	0.0819	0.0806	0.0905	0.787	0.909	0.707	0.146	0.0984	0.0937	0.092	0.169	0.118	0.105
Selenium (Se)-Dissolved	mg/L	0.001	-	0.05	<0.000040	0.000045	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	0.000147	0.00026	0.000236	0.000041	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040
Silicon (Si)-Dissolved	mg/L	-	-	-	2.4	2.9	2.19	2.43	2.34	2.32	2.31	2.7	3.46	3.42	2.67	2.36	2.34	2.71	2.62	2.38	2.61
Silver (Ag)-Dissolved	mg/L	0.00005	-	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000069	<0.0000050
Sodium (Na)-Dissolved	mg/L	-	200	-	1.69	1.49	1.28	1.73	1.51	1.47	1.54	16	16.2	11.3	2.26	1.74	1.69	1.6	2.31	1.86	1.59
Strontium (Sr)-Dissolved	mg/L	-	-	-	0.013	0.0106	0.0105	0.0124	0.0108	0.0113	0.0114	0.12	0.141	0.116	0.0169	0.0126	0.0129	0.0117	0.0189	0.0148	0.0134
Thallium (Tl)-Dissolved	mg/L	0.0008	-	-	0.0000024	0.0000044	<0.0000020	0.0000022	0.0000036	0.0000034	<0.0000020	0.0000026	0.0000032	0.0000022	0.0000023	0.0000045	0.0000034	<0.0000020	0.0000026	0.0000025	<0.0000020
Tin (Sn)-Dissolved	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000029	<0.000010
Uranium (U)-Dissolved	mg/L	0.0085	-	0.02	0.0000066	0.0000061	0.0000064	0.0000069	0.0000065	0.0000066	0.0000069	0.000362	0.000676	0.000555	0.0000087	0.000007	0.0000069	0.0000067	0.0000073	0.000006	0.0000063
Vanadium (V)-Dissolved	mg/L	0.006	-	-	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0004	0.00049	0.00052	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Zinc (Zn)-Dissolved	mg/L	0.0075	5	-	0.00071	0.0006	0.00027	0.00119	0.00034	0.00081	0.00075	0.00026	0.00011	0.00018	0.0009	0.00135	0.00098	0.00044	0.00069	0.00037	0.00024
Hydrocarbons																					
EPH10-19	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
EPH19-32	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
LEPH	mg/L	0.05	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
HEPH	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
2-Bromobenzotrifluoride	%	-	-	-	95.8	104	100	94.6	106.7	106.6	100.2	98.5	95.9	106.7	90.3	108.6	86.5	98.1	94.5	97.5	106.3
Acenaphthene	mg/L	0.006	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Acenaphthylene	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Acridine	mg/L	0.00005	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Anthracene	mg/L	0.0001	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benz(a)anthracene	mg/L	0.0001	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benzo(a)pyrene	mg/L	0.00001	-	0.00004	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.000020	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Benzo(b)fluoranthene	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benzo(g,h,i)perylene	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benzo(k)fluoranthene	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chrysene	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dibenz(a,h)anthracene	mg/L	-	-	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Fluoranthene	mg/L	0.0002	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Fluorene	mg/L	0.012	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Indeno(1,2,3-c,d)pyrene	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Naphthalene	mg/L	0.001	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Phenanthrene	mg/L	0.0003	-	-	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Pyrene	mg/L	0.00002	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Quinoline	mg/L	0.0034	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Acridine d9	%	-	-	-	92	92	120.2	79.6	99.5	94.5	124	95.8	92.4	121.9	82.6	85.4	90.4	116.2	95.1	85.4	119.4
Chrysene d12	%	-	-	-	80.4	87.4	94.9	86.9	105.6	102.1	98.3	80.3	99.3	89.9	85.1	99.4	100.3	90.2	85.1	93.5	93
Naphthalene d8	%	-	-	-	88.4	87.3	79.9	85.1	100.4	97	83.4	94.7	97	81.1	92.4	89.8	92.5	75.6	96.7	85	76.2
Phenanthrene d10	%	-	-	-	100.5	95.5	110.4	94.2	107	102.7	113.7	103	102.8	109.7	101.5	94.4	98.5	104.8	102.5	91.8	108.7

BCAWQG/BCWWQG AL = BC Approved/Working Water Quality Guidelines for Freshwater Aquatic Life (MAY, 2015)

GCDWQ AO = Guidelines for Canadian Drinking Water Quality Aesthetic Objectives

GCDWQ MAC = Guidelines for Canadian Drinking Water Quality Maximum Acceptable Concentration

Result exceeds the acute BCAWQG/BCWWQG AL

Result exceeds the GCDWQ

Result exceeds both the BCAWQG AL and the GCDWQ

Notes:

Guideline values are provided by ALS Laboratories, using their online Webtrieve system.

A: The BCWWQG AL for chromium is 0.001 mg/L for Cr (III) and 0.0089 mg/L for Cr (VI).

B: The BCAWQG AL for copper in mg/L is calculated as follows: (0.094(hardness [mg/L CaCO3]) + 2)*1000

C: The BCAWQG AL for cadmium in mg/L is calculated as follows: e^(1.03*ln(hardness[mg/L $CaCO_3$])-5.274)*1000

Quarterly Summary Report #3
Water Quality Results (all sites)

Analyte	Units	Guideline			S-6 (EMS E306326)			S-7 (EMS E306327)					S-8 (EMS 1199906)				
		BCAWQG AL	GCDWQ AO	GCDWQ MAC	18-Jan-17	20-Feb-17	20-Mar-17	18-Jan-17		20-Feb-17	20-Mar-17	20-Mar-17	18-Jan-17		20-Feb-17	20-Mar-17	
General Parameters																	
Temperature	°C				1.6	3.2	2.8	2.0	2.0	3.5	3.2	3.2	1.9	1.9	3.5	3.4	3.4
Conductivity	uS/cm	-	-	-	51.4	39	37.1	50.2	50.2	39.5	40.9	40.5	52.2	51.9	40.4	39.5	39.2
Hardness (as $CaCO_3$)	mg/L	-	-	-	15.8	13	12.9	17	16.3	13.5	13.7	14	15.5	15.3	13.7	13.6	13.6
pH	pH	6.5 - 9	7-10.5	-	7.3	7.17	7.19	7.26	7.29	7.38	7.14	7.19	7.29	7.28	7.4	7.24	7.22
Total Suspended Solids	mg/L	-	-	-	10.6	1.5	2.5	8.7	8.6	6.1	3.4	4	9.8	5.3	22	3.5	3.2
Turbidity	NTU	-	-	-	13.5	1.84	3.28	9.6	8.21	2.2	3.29	3.26	6.03	5.86	1.65	2.96	2.9
Chloride (Cl)	mg/L	150	250	-	5.16	3.22	2.59	5.09	5.09	3.35	3.02	3.02	5.23	5.25	3.4	2.83	2.81
Sulfate (SO4)	mg/L	128	500	-	3.13	2.71	2.56	2.79	2.79	2.6	2.65	2.66	2.83	2.83	2.6	2.48	2.48
Nutrients																	
Ammonia, Total (as N)	mg/L	0.102	-	-	0.0052	<0.0050	<0.0050	<0.0050	0.0066	<0.0050	<0.0050	<0.0050	0.0058	0.0066	<0.0050	<0.0050	<0.0050
Nitrate and Nitrite (as N)	mg/L	-	-	10	0.184	0.0955	0.0728	0.174	0.172	0.11	0.0869	0.0868	0.183	0.182	0.114	0.0903	0.0904
Nitrate (as N)	mg/L	3	-	10	0.184	0.0955	0.0728	0.174	0.172	0.11	0.0869	0.0868	0.183	0.182	0.114	0.0903	0.0904
Nitrite (as N)	mg/L	0.02	-	1	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	-	-	-	0.118	0.067	0.086	0.127	0.148	0.086	0.071	0.083	0.127	0.194	0.136	0.094	0.135
Total Nitrogen	mg/L	-	-	-	0.302	0.163	0.158	0.3	0.32	0.196	0.158	0.169	0.311	0.376	0.25	0.184	0.226
Total Organic Nitrogen	mg/L	-	-	-	0.113	0.066	0.084	0.122	0.142	0.084	0.069	0.08	0.122	0.187	0.132	0.092	0.133
Dissolved Kjeldahl Nitrogen	mg/L	-	-	-	0.139	0.065	0.116	0.191	0.182	0.092	0.165	0.146	0.117	0.118	0.196	0.095	0.092
Total Dissolved Nitrogen	mg/L	-	-	-	0.324	0.161	0.189	0.365	0.354	0.202	0.252	0.232	0.3	0.301	0.31	0.185	0.182
Orthophosphate-Dissolved (as P)	mg/L	-	-	-	<0.0010	<0.0010	<0.0010	0.0013	0.0012	<0.0010	<0.0010	0.0011	0.0011	0.0013	<0.0010	0.0016	0.0013
Phosphorus (P)-Total	mg/L	-	-	-	0.0183	0.005	0.0057	0.012	0.0089	0.0052	0.0052	0.0063	0.0082	0.0086	0.0065	0.006	0.0068
Organic Carbon																	
Dissolved Organic Carbon	mg/L	-	-	-	3.28	3.07	3.18	3.82	3.65	3.29	3.12	3.2	3.23	3.29	3.35	3.18	3.17
Total Organic Carbon	mg/L	-	-	-	3.47	3.16	2.98	3.22	3.7	3.18	2.95	3.02	3.44	3.76	4.08	3.08	3.21
Total Metals																	
Aluminum (Al)-Total	mg/L	-	0.1	-	0.56	0.121	0.162	0.235	0.246	0.146	0.172	0.141	0.248	0.265	0.114	0.145	0.14
Antimony (Sb)-Total	mg/L	-	-	0.006	0.000023	<0.000020	<0.000020	0.000024	0.000026	0.00002	0.000021	0.000022	0.000025	0.000024	0.000022	0.000021	0.000024
Arsenic (As)-Total	mg/L	0.005	-	0.01	0.000176	0.000077	0.000084	0.000116	0.00012	0.000076	0.000088	0.00008	0.000117	0.000111	0.000093	0.000082	0.000092
Barium (Ba)-Total	mg/L	1	-	1	0.00821	0.00325	0.00361	0.00494	0.00526	0.00352	0.00366	0.00381	0.00488	0.00496	0.003	0.00326	0.00333
Beryllium (Be)-Total	mg/L	0.00013	-	-	0.000016	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Bismuth (Bi)-Total	mg/L	-	-	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Boron (B)-Total	mg/L	1.2	-	5	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cadmium (Cd)-Total	mg/L	-	-	0.005	<0.0000050	<0.0000050	<0.0000050	0.0000078	0.0000068	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium (Ca)-Total	mg/L	-	-	-	4.75	4.55	3.89	4.67	4.56	4.29	4.53	4.05	4.39	4.56	4.21	4.26	4.46
Chromium (Cr)-Total	mg/L	0.001[A]	-	0.05	0.00083	0.0002	0.00028	0.00039	0.00039	0.0002	0.00027	0.00023	0.00039	0.00039	0.00021	0.00022	0.00023
Cobalt (Co)-Total	mg/L	0.004	-	-	0.000301	0.0000736	0.000085	0.000151	0.000164	0.000114	0.0001	0.0000785	0.000149	0.000151	0.0000751	0.0000695	0.0000764
Copper (Cu)-Total	mg/L	Calculated[B]	1	-	0.00137	0.000588	0.000654	0.00119	0.00107	0.000734	0.000764	0.000629	0.000937	0.000971	0.000654	0.000781	0.000948
Iron (Fe)-Total	mg/L	1	0.3	-	**0.496**	0.0841	0.136	0.245	0.25	0.103	0.132	0.114	0.245	0.256	0.0753	0.124	0.105
Lead (Pb)-Total	mg/L	0.003	-	0.01	0.000237	0.0000564	0.0000687	0.000251	0.000294	0.000105	0.0000867	0.0000743	0.000216	0.000179	0.0000482	0.0000625	0.0000714
Lithium (Li)-Total	mg/L	0.014	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Magnesium (Mg)-Total	mg/L	-	-	-	1.19	1	0.887	1.19	1.17	1.02	1.06	0.94	1.11	1.11	1.02	0.953	0.947
Manganese (Mn)-Total	mg/L	0.768	0.05	-	0.0265	0.00509	0.00625	0.0142	0.0156	0.0129	0.00759	0.00586	0.0128	0.0121	0.00416	0.00495	0.00521
Mercury (Hg)-Total	mg/L	0.00001	-	0.001	-	-	<0.000050	-	-	-	<0.000050	<0.000050	-	-	-	<0.000050	-
Molybdenum (Mo)-Total	mg/L	1	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000051
Nickel (Ni)-Total	mg/L	0.025	-	-	0.000753	0.000211	0.000281	0.000392	0.000397	0.000225	0.000297	0.000239	0.000394	0.000391	0.000224	0.000258	0.000275
Potassium (K)-Total	mg/L	373	-	-	0.282	0.198	0.185	0.252	0.247	0.195	0.206	0.185	0.252	0.253	0.201	0.198	0.203
Selenium (Se)-Total	mg/L	0.001	-	0.05	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040
Silicon (Si)-Total	mg/L	-	-	-	3.85	3.13	3.49	3.28	3.32	3.32	3.55	3.7	3.37	3.38	3.3	3.79	3.8
Silver (Ag)-Total	mg/L	0.00005	-	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Sodium (Na)-Total	mg/L	-	200	-	2.97	2.68	2.26	3.24	3.18	2.58	2.83	2.63	3.01	2.94	2.47	2.43	2.54
Strontium (Sr)-Total	mg/L	-	-	-	0.0194	0.0153	0.0149	0.0191	0.0182	0.0159	0.0167	0.017	0.018	0.0181	0.0156	0.0157	0.0162
Thallium (Tl)-Total	mg/L	0.0008	-	-	0.0000044	0.0000036	<0.0000020	0.0000039	0.0000034	0.0000055	<0.0000020	<0.0000020	0.0000032	0.000003	0.0000034	<0.0000020	<0.0000020
Tin (Sn)-Total	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Uranium (U)-Total	mg/L	0.0085	-	0.02	0.0000166	0.0000061	0.0000101	0.00001	0.0000109	0.000008	0.0000076	0.0000073	0.0000102	0.0000101	0.0000072	0.0000066	0.000007
Vanadium (V)-Total	mg/L	0.006	-	-	0.00157	0.00038	0.00047	0.00075	0.00076	0.0005	0.00056	0.00044	0.00078	0.00083	0.00041	0.00045	0.00046
Zinc (Zn)-Total	mg/L	0.0075	5	-	0.0018	0.00073	0.00077	0.00224	0.00335	0.00172	0.0013	0.00115	0.00139	0.00144	0.00099	0.0012	0.00183
Dissolved Metals																	
Aluminum (Al)-Dissolved	mg/L	0.1	0.1	-	0.0666	**0.107**	0.0617	0.068	0.0619	0.0607	0.0593	0.0527	0.0764	0.0753	0.0579	0.0596	0.0604
Antimony (Sb)-Dissolved	mg/L	-	-	0.006	<0.000020	<0.000020	<0.000020	0.000021	0.000023	0.00002	<0.000020	<0.000020	0.000026	0.000023	0.00002	<0.000020	<0.000020
Arsenic (As)-Dissolved	mg/L	0.005	-	0.01	0.000069	0.000069	0.000061	0.000092	0.000081	0.000057	0.000061	0.000056	0.000082	0.000081	0.000065	0.000072	0.000071
Barium (Ba)-Dissolved	mg/L	1	-	1	0.00268	0.00298	0.00241	0.0028	0.00285	0.00247	0.00231	0.00235	0.00288	0.00291	0.00238	0.0025	0.00235
Beryllium (Be)-Dissolved	mg/L	0.00013	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Bismuth (Bi)-Dissolved	mg/L	-	-	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Boron (B)-Dissolved	mg/L	1.2	-	5	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cadmium (Cd)-Dissolved	mg/L	Calculated[C]	-	0.005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium (Ca)-Dissolved	mg/L	4	-	-	4.61	3.75	3.8	4.73	4.61	3.8	4.06	3.7	4.45	4.36	3.96	3.96	3.88
Chromium (Cr)-Dissolved	mg/L	0.001[A]	-	0.05	0.00011	0.00017	0.00014	0.00013	0.00013	0.00013	0.00013	0.00013	0.00021	0.00014	0.00013	0.00013	0.00012

Quarterly Summary Report #3
Water Quality Results (all sites)

Analyte	Units	Guideline			S-6 (EMS E306326)			S-7 (EMS E306327)					S-8 (EMS 1199906)				
		BCAWQG AL	GCDWQ AO	GCDWQ MAC	18-Jan-17	20-Feb-17	20-Mar-17	18-Jan-17		20-Feb-17	20-Mar-17	20-Mar-17	18-Jan-17		20-Feb-17	20-Mar-17	
Cobalt (Co)-Dissolved	mg/L	0.004	-	-	0.0000467	0.0000613	0.0000343	0.0000418	0.0000397	0.000032	0.0000329	0.0000337	0.0000526	0.0000496	0.0000313	0.0000324	0.0000332
Copper (Cu)-Dissolved	mg/L	Calculated[B]	1	-	0.000509	0.000562	0.00046	0.000544	0.000535	0.00048	0.000465	0.000455	0.000531	0.000568	0.000519	0.000468	0.000471
Iron (Fe)-Dissolved	mg/L	0.35	0.3	-	0.0448	0.0771	0.0352	0.047	0.0429	0.0339	0.0335	0.0339	0.0627	0.0593	0.0334	0.0347	0.0359
Lead (Pb)-Dissolved	mg/L	0.003	-	0.01	0.0000646	0.0000796	0.0000159	0.0000712	0.000107	0.0000161	0.0000178	0.0000181	0.000206	0.0000607	0.0000188	0.0000151	0.0000337
Lithium (Li)-Dissolved	mg/L	0.014	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Magnesium (Mg)-Dissolved	mg/L	-	-	-	1.05	0.885	0.82	1.27	1.17	0.973	0.858	1.01	1.06	1.08	0.928	0.892	0.937
Manganese (Mn)-Dissolved	mg/L	0.768	0.05	-	0.00699	0.00397	0.00241	0.00465	0.00426	0.00166	0.00183	0.00177	0.00551	0.00581	0.00179	0.00196	0.00202
Molybdenum (Mo)-Dissolved	mg/L	1	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel (Ni)-Dissolved	mg/L	0.025	-	-	0.000151	0.000181	0.000132	0.000154	0.000154	0.000131	0.000136	0.000124	0.000159	0.000159	0.000125	0.000137	0.000125
Potassium (K)-Dissolved	mg/L	373	-	-	0.224	0.187	0.158	0.247	0.237	0.174	0.172	0.171	0.235	0.238	0.174	0.172	0.171
Selenium (Se)-Dissolved	mg/L	0.001	-	0.05	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040	<0.000040
Silicon (Si)-Dissolved	mg/L	-	-	-	2.8	2.8	3.13	3.22	2.99	2.91	3.4	2.97	3.03	3.08	2.92	3.44	3.55
Silver (Ag)-Dissolved	mg/L	0.00005	-	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Sodium (Na)-Dissolved	mg/L	-	200	-	2.89	2.35	2.19	3.48	3.35	2.53	2.39	2.42	3.01	3	2.37	2.19	2.28
Strontium (Sr)-Dissolved	mg/L	-	-	-	0.0185	0.0149	0.0146	0.0184	0.0177	0.0155	0.0148	0.0138	0.0173	0.0177	0.0151	0.0161	0.015
Thallium (Tl)-Dissolved	mg/L	0.0008	-	-	0.0000023	0.0000039	<0.0000020	0.0000022	0.0000024	0.0000045	<0.0000020	<0.0000020	0.0000023	0.0000026	0.0000042	<0.0000020	<0.0000020
Tin (Sn)-Dissolved	mg/L	-	-	-	0.000014	0.000014	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Uranium (U)-Dissolved	mg/L	0.0085	-	0.02	0.0000058	0.0000087	0.0000054	0.000006	0.0000053	0.0000053	0.0000056	0.0000057	0.0000065	0.0000061	0.0000056	0.0000056	0.0000054
Vanadium (V)-Dissolved	mg/L	0.006	-	-	0.00022	0.00036	0.0002	0.00026	0.00025	0.00026	0.00025	0.00023	0.0003	0.0003	0.00025	0.00025	0.00024
Zinc (Zn)-Dissolved	mg/L	0.0075	5	-	0.00077	0.0009	0.00039	0.00115	0.00084	0.00138	0.00057	0.00064	0.00101	0.00097	0.00064	0.00051	0.00054
Hydrocarbons																	
EPH10-19	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
EPH19-32	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
LEPH	mg/L	0.05	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
HEPH	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
2-Bromobenzotrifluoride	%	-	-	-	83.3	100.2	100.6	97.2	85.4	110	108.6	109.4	98.7	90.4	105	118.1	98.1
Acenaphthene	mg/L	0.006	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000020	<0.000010	<0.000010	<0.000010
Acenaphthylene	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Acridine	mg/L	0.00005	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Anthracene	mg/L	0.0001	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benz(a)anthracene	mg/L	0.0001	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benzo(a)pyrene	mg/L	0.00001	-	0.00004	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Benzo(b)fluoranthene	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benzo(g,h,i)perylene	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Benzo(k)fluoranthene	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chrysene	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dibenz(a,h)anthracene	mg/L	-	-	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Fluoranthene	mg/L	0.0002	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.00001	0.000018	<0.000010	<0.000010	<0.000010
Fluorene	mg/L	0.012	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Indeno(1,2,3-c,d)pyrene	mg/L	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Naphthalene	mg/L	0.001	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Phenanthrene	mg/L	0.0003	-	-	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000023	0.000033	<0.000020	<0.000020	<0.000020
Pyrene	mg/L	0.00002	-	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000014	<0.000010	<0.000010	<0.000010
Quinoline	mg/L	0.0034	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Acridine d9	%	-	-	-	89.2	95	118.6	92.8	92.4	84.4	125.1	125.4	90.8	90.3	91.1	120.3	129.8
Chrysene d12	%	-	-	-	86.3	98.8	92.3	87.4	84.3	96.9	98.2	97.8	83.5	87.2	95.8	92.9	100.3
Naphthalene d8	%	-	-	-	92.8	98.2	78.1	95.5	92.7	88.7	83.6	80.6	93.9	95.2	90.9	77.2	79.8
Phenanthrene d10	%	-	-	-	100.5	89.6	108.2	101.5	100.9	93.8	114.7	113.1	99.9	103.7	96.7	109.1	115.2

BCAWQG/BCWWQG AL = BC Approved/Working Water Quality Guidelines for Freshwater Aquatic Life (MAY, 2015)

GCDWQ AO = Guidelines for Canadian Drinking Water Quality Aesthetic Objectives

GCDWQ MAC = Guidelines for Canadian Drinking Water Quality Maximum Acceptable Concentration

Result exceeds the acute BCAWQG/BCWWQG AL

Result exceeds the GCDWQ

Result exceeds both the BCAWQG AL and the GCDWQ

Notes:
Guideline values are provided by ALS Laboratories, using their online Webtrieve system.
A: The BCWWQG AL for chromium is 0.001 mg/L for Cr (III) and 0.0089 mg/L for Cr (VI).
B: The BCAWQG AL for copper in mg/L is calculated as follows: (0.094(hardness [mg/L CaCO3]) + 2)*1000
C: The BCAWQG AL for cadmium in mg/L is calculated as follows: e^(1.03*ln(hardness[mg/L $CaCO_3$])-5.274)*1000