

**Re: New Groundwater Monitoring Wells (MW19-01 & MW19-02) Sampling Results**

Ministry staff compared the sampling results for leachate indicator parameters from the new shallow groundwater monitoring wells (MW19-01 and MW19-02) to applicable water quality standards (see attached Table 1). To date, all sampling results for leachate indicator parameters from the new shallow groundwater monitoring wells meet applicable water quality standards. However, the results show some variability and the sample collected from well MW19-02 on December 19, 2019, and reported in the January 15, 2020, status report, indicated a potential influence of leachate in the groundwater. The ministry requested that the Named Parties examine the leachate collection system and resample the well. The Named Parties resampled well MW19-02 on January 21, 2020, and the sampling results reflected improved groundwater quality.

The Named Parties also examined the leachate collection system and found that the leachate valve on the pipe that conveys leachate to the leachate storage tanks was partially closed and this may have caused very low leachate volumes to enter the leachate storage tanks from late 2019 to early 2020. After the valve was fully opened in late January, the accumulated leachate that was contained in the lined landfill flowed through the pipe and entered the leachate storage tanks resulting in the large leachate volumes reported in the January 30 and February 15, 2020, status reports.

Presently there is no evidence of impact or risk to the environment. However, the ministry, together with the Named Parties and their Qualified Professionals, will continue to investigate and collect an adequate dataset to better understand these results. Currently, the following efforts are being made to generate this dataset:

- Ongoing monitoring of leachate volume and sampling of groundwater by the Named Parties, and,
- Ministry staff collected an additional sample from the new shallow groundwater monitoring well MW19-02 on February 21, 2020.

**Table 1: Leachate Indicator Parameters as Measured at Water Monitoring Sites (compared to Water Quality Standards)**

Table 1 shows how the most recent receiving environment sampling results for leachate indicator parameters compare to applicable standards (surface water data is compared to the most sensitive of BC’s approved and working water quality guidelines, and groundwater data is compared to applicable CSR standards)

Parameter	Surface Water and Groundwater Monitoring Sites <sup>5</sup>						
	Surface Water		CSR Standards <sup>7</sup>	Groundwater			
	BC Water Quality Guidelines <sup>6</sup>	SW-1		MW19-01		MW19-02	
		2019-12-19		2019-12-19	2019-12-19	2020-01-21	2019-12-19
<i>General Parameters</i>							
Alkalinity, Total as CaCO <sub>3</sub> (mg/L)	N/A	87.1	N/A	83.3	154	161	109
pH	N/A	7.79	N/A	7.63	7.96	7.74	7.69
Total Dissolved Solids (mg/L)	N/A	205	N/A	162	274	593	286
<i>Anions</i>							
Chloride (mg/L)	250 <sup>AO</sup>	8.23	250 <sup>AO</sup>	4.57	9.97	25.5	5.68
Nitrite (as N) (mg/L)	0.30 <sup>CI</sup>	<0.010	0.6-2 <sup>CI</sup>	<0.010	<0.010	<0.010	<0.010
Sulphate (mg/L)	309 <sup>H</sup>	73.7	500	38.9	53.8	263	109
Total Hardness as CaCO <sub>3</sub> (mg/L)	N/A	143	N/A	54.7	70.7	321	189
<i>Dissolved Metals</i>							
Calcium, dissolved (mg/L)	< 4 to 8 <sup>S</sup>	46.2	N/A	18.2	23.1	108	63.7
Chromium, dissolved (mg/L)	N/A	<0.00050	0.010	<0.00050	<0.00050	<0.00050	<0.00050
Copper, dissolved (mg/L)	0.00180 <sup>CAL</sup>	0.00092	0.030 – 0.090 <sup>H</sup>	<0.00040	0.00061	0.00067	0.00063
Lead, dissolved (mg/L)	N/A	<0.00020	0.010	<0.00020	<0.00020	<0.00020	<0.00020
Magnesium, dissolved (mg/L)	N/A	6.68	N/A	2.26	3.15	12.8	7.31
Manganese, dissolved (mg/L)	N/A	0.00083	1.5	0.0337	0.0121	0.274	0.0297
Potassium, dissolved (mg/L)	N/A	0.53	N/A	0.82	1.58	1.52	0.72
Sodium, dissolved (mg/L)	N/A	7.05	200	31.8	60.2	54.9	10.6

**Table 1 (continued): Leachate Indicator Parameters as Measured at Water Monitoring Sites (compared to Water Quality Standards)**

Parameter <sup>2</sup>	Surface Water and Groundwater Monitoring Sites <sup>5</sup>						
	Surface Water		CSR Standards <sup>7</sup>	Groundwater			
	BC Water Quality Guidelines <sup>6</sup>	SW-1		MW19-01		MW19-02	
		2019-12-19		2019-12-19	2020-01-21	2019-12-19	2020-01-21
<i>Total Metals</i>							
Calcium, total (mg/L)	N/A	47.9	N/A	29.6	NI	112	NI
Chromium, total (mg/L)	N/A	<0.00050	N/A	0.0116	NI	0.00716	NI
Copper, total (mg/L)	N/A	0.00122	N/A	0.0155	NI	0.00269	NI
Iron, total (mg/L)	1; 0.3 <sup>AO</sup>	0.079	N/A	8.19	NI	1.45	NI
Lead, total (mg/L)	0.01 <sup>H</sup>	<0.00020	N/A	0.00759	NI	0.00075	NI
Magnesium, total (mg/L)	N/A	7.26	N/A	6.54	NI	14.6	NI
Manganese, total (mg/L)	0.05 <sup>AO</sup>	0.00473	N/A	0.232	NI	0.309	NI
Phosphorus, total (mg/L)	0.01	<0.050	N/A	0.325	NI	0.074	NI
Potassium, total (mg/L)	N/A	0.51	N/A	<0.00050	NI	0.00088	NI
Sodium, total (mg/L)	N/A	7.43	N/A	0.162	NI	0.436	NI
Non-leachate parameters (additional)							
Aluminum, total (mg/L)	0.2	0.0627	N/A	9.16	NI	1.7	NI
Arsenic, total (mg/L)	0.005	<0.00050	N/A	0.00222	NI	0.00059	NI
Boron, total (mg/L)	1.2	0.0145	N/A	0.000051	NI	0.000052	NI
Cobalt, total (mg/L)	0.110	<0.00010	N/A	0.00471	NI	0.00172	NI
Mercury, total (mg/L)	0.00002	NI	N/A	NI	NI	NI	NI
Molybdenum, total (mg/L)	0.25	0.00065	N/A	0.00521	NI	0.00408	NI
Nickel, total (mg/L)	0.103 <sup>H</sup>	0.00044	N/A	0.00843	NI	0.00332	NI
Selenium, total (mg/L)	0.002	<0.00050	N/A	<0.00050	NI	0.00088	NI
Silver, total (mg/L)	0.003 <sup>H</sup>	<0.000050	N/A	<0.000050	NI	<0.000050	NI
Zinc, total (mg/L)	0.048 <sup>H</sup>	<0.0040	N/A	0.0237	NI	0.0055	NI

**Notes:**

- Analytical results in excess of Water Quality Guideline
- Analytical result meets Water Quality Guideline
- No Water Quality Guideline or guideline not applicable

AO: Aesthetic Objective; standard to protect against taste and odour concerns  
CAL: Calculated; standard was calculated using the most stringent data available  
Cl: Chloride dependent guideline  
H: Hardness dependent guideline.  
S: Sensitivity to acid input dependent (4 to 8 is for moderately sensitive)  
N/A: Not Applicable  
ND: Not Detected  
NS: Not Specified  
NI: Not Indicated/Not Sampled

5: Sampling results as reported in the Islander Engineering Field Review Report, January 15, 2020 and January 29, 2020 (re-sampling report) by Mike Achtem, P.Eng. Sites MW19-01 and MW19-02 are shallow wells located on the property close to the landfill. Site SW-1 is the surface water site at the property boundary.

6: Standards for Surface Water Monitoring Site: Guideline shown is the most stringent of the British Columbia Approved and Working Water Quality Guidelines: Aquatic Life; Source Drinking Water Quality Guidelines

7: Standards for Groundwater Monitoring Sites: Contaminated Sites Regulation, Generic Numerical Water Standards for Aquatic Life and Drinking Water