From:	Bilawchuk, Maureen ENV:EX
To:	Bilawchuk, Maureen ENV:EX
Subject:	SPO MO1701-Status Update January 15, 2018
Date:	Tuesday, January 16, 2018 11:31:54 AM
Attachments:	CHH SUBMITTAL-2018 Ground Water Quality DATA-CLOSURE PLAN.pdf CHH SUBMITTAL-2018 Surface Water Quality DATA-CLOSURE PLAN.pdf COA-CHH DECEMBER 2017.pdf COA-CHH DECEMBER 2017.xlsx Jan 15, 2018 CHH Progress Report.pdf

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From: spomo1701@outlook.com [mailto:spomo1701@outlook.com]
Sent: Monday, January 15, 2018 10:23 PM
To: Environmental Compliance ENV:EX; marty@chholdings.ca
Subject: SPO MO1701-Status Update January 15, 2018

- ***Please find information regarding the Leachate reporting requirements for the Jan 15, 2018 reporting period as per SPILL PREVENTION ORDER : MO1701 Section 1d***

Total Leachate Collected= 13.72 m^3
Total Leachate Stored= 71.54 m^3
Total Leachate Transported= 0 m^3 (Leachate removal to a permitted facility is scheduled for this week.)

- ***Sampling was conducted December 27, 2017 as per Section 6biii of File 311372 August 11, 2017 letter. Tabulated Laboratory Results and COA's are attached.***

Sampling Summary-Samples were taken on December 27, 2017:

1. *SHA-SW1*
2. *SHA-SW2 (No Flow)*
3. *MW6*
4. *MW3*
5. *MW2*
6. *SHA-LE-1*
7. *SHA-LD-1 (Dry Conditions)*
8. *SB-1*
9. *SB-2*
10. *SB-3*

- ***Attached is the QP Progress Report for Jan 15, 2018 as per File 311372 August 11, 2017 letter.***

Thank you

Table GW1: Analytical Results for Nutrients in Groundwater

Sample Location	CSR Standards[1]		MW-6	MW-3S	MW-3D	MW-2	SB1	SB2	SB3
As-built Well Depths			47m	23m	46m	43m	4.01m	3.28m	3.53m
Sample ID			7121899-01	7121899-02	7121899-03	7121899-04	7121899-05	7121899-06	7121899-07
			MW6	MW3S	MW3D	MW2	SB1	SB2	SB3
Date Sampled	Aquatic Life	Drinking Water	2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27
Physical Tests									
Colour, True (TCU)	-	-	6.1	<5.0	6	5.3	<5.0	<5.0	<5.0
Conductivity (uS/cm)	-	-	1320	375	250	290	164	624	490
Hardness (as CaCO3) mg/L	-	-	560	138	95	117	65.3	237	210
pH (pH Units)	-	-	7.4	7.78	7.88	7.83	7.42	7.07	7.52
Total Suspended Solids mg/L			9	12	11	25.1	93.2	108	506
Total Dissolved Solids mg/L	-	-	-	-	-	-	-	-	-
Turbidity (NTU)	-	-	10.7	9.19	6.1	19.7	83.2	107	303
Anions and Nutrients mg/L									
Alkalinity, Total (as CaCO3)	-	-	634	128	103	123	38.3	195	82.2
Chloride (Cl)	1500	250	39.2	6.64	2.24	4.53	1.88	39.6	4.43
Fluoride (F)	2 (H < 50)	1.5							
	3 (H ≥ 50)		0.22	0.12	0.12	0.11	<0.10	<0.10	<0.10
Nitrate (as N)	400	10	<0.010	0.012	0.011	<0.010	0.17	0.206	0.442
Nitrite (as N) [7] Cl <2 mg/L	0.2	3.2					<0.010		
Cl 2 - <4 mg/L	0.4				<0.010				
Cl 4 - <6 mg/L	0.6					<0.010			<0.010
Cl 6 - <8 mg/L	0.8			<0.010					
Cl 8 - <10 mg/L	1								
Cl ≥ 10 mg/L	2		<0.010					<0.010	
Sulfate (SO4)	1000	500	86.7	36.6	21.5	17.1	33.4	63.4	136

Notes: Refer to Table Endnotes (attached)

Table GW2: Analytical Results for Total Metals in Groundwater

Sample Location	CSR Standards[1]		MW-6	MW-3S	MW-3D	MW-2	SB1	SB2	SB3
As-built Well Depths			47m	23m	46m	43m	4.01m	3.28m	3.53m
Sample ID			7121899-01	7121899-02	7121899-03	7121899-04	7121899-05	7121899-06	7121899-07
			MW6	MW3S	MW3D	MW2	SB1	SB2	SB3
Date Sampled	Aquatic Life	Drinking Water	2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27
Physical Tests mg/L									
Hardness (as CaCO3)	-	-	560	138	95	117	65.3	237	210
Total Metals mg/L									
Aluminum (Al)-Total	-	-	0.312	0.127	0.0841	0.842	4.5	5.49	16.4
Antimony (Sb)-Total	-	-	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00034
Arsenic (As)-Total	-	-	0.00426	0.00099	0.00126	0.00197	0.00063	0.00072	0.00243
Barium (Ba)-Total	-	-	0.0885	0.0328	0.0205	0.0339	0.0259	0.0329	0.0636
Beryllium (Be)-Total	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00016	0.0003
Bismuth (Bi)- Total	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Boron (B)-Total	-	-	0.0861	0.025	0.027	0.0266	0.0082	0.0295	0.021
Cadmium (Cd)-Total	-	-	0.000121	0.000171	0.000094	0.00004	0.000027	0.000019	0.000067
Calcium (Ca)-Total	-	-	192	50.7	33.3	41.9	27.9	91.5	87.2
Chromium (Cr)-Total	-	-	0.00072	<0.00050	<0.00050	0.00113	0.00541	0.00589	0.0342
Cobalt (Co)-Total	-	-	0.00258	0.001	0.00039	0.00093	0.00472	0.00434	0.0186
Copper (Cu)-Total	-	-	0.00321	0.00053	<0.00040	0.00113	0.0131	0.017	0.0555
Iron (Fe)-Total	-	-	1.95	0.151	0.135	1.52	5.26	6.6	21.1
Lead (Pb)-Total	-	-	0.00096	<0.00020	<0.00020	0.00037	0.005	0.00177	0.00902
Lithium (Li)-Total	-	-	0.0127	0.00027	0.00016	0.00027	0.00159	0.00206	0.0074
Magnesium (Mg)-Total	-	-	37.1	7.34	5.47	7.6	3.62	13.2	16.8
Manganese (Mn)-Total	-	-	2.23	0.395	0.279	0.494	0.147	0.264	0.401
Mercury (Hg)-Total	-	-	<0.000010	<0.000010	<0.000010	<0.000010	0.000016	<0.000010	0.000022
Molybdenum (Mo)-Total	-	-	0.00101	0.00592	0.00632	0.00407	0.00051	0.00095	0.00102
Nickel (Ni)-Total	-	-	0.00536	0.00166	0.00146	0.00164	0.00544	0.00578	0.0282
Phosphorus(P)-Total	-	-	<0.050	0.073	0.084	0.21	0.112	0.183	0.475
Potassium (K)-Total	-	-	4.38	1.04	0.68	0.81	0.62	2.51	1.92
Selenium (Se)-Total	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00081
Silicon (Si)-Total	-	-	12.3	6.7	6.4	8	8.2	14.8	29.1
Silver (Ag)-Total	-	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000057
Sodium (Na)-Total	-	-	73.6	14.7	11.5	9.67	2.81	30	9.26
Strontium (Sr)-Total	-	-	0.619	0.239	0.193	0.171	0.067	0.285	0.182
Sulfur (S)-Total	-	-	28.5	14.3	7.5	7	12.7	22.4	53.4
Tellurium (Te)-Total	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Thallium (Tl)-Total	-	-	0.000054	0.000024	<0.000020	<0.000020	<0.000020	<0.000020	0.000045
Thorium (Th)-Total	-	-	<0.00010	0.00015	0.0002	0.00011	<0.00010	0.00018	0.00059
Tin (Sn)-Total	-	-	0.00094	<0.00020	<0.00020	<0.00020	0.00033	0.00041	0.00098
Titanium (Ti)-Total	-	-	0.0219	<0.0050	<0.0050	0.0539	0.228	0.304	0.825
Uranium (U)-Total	-	-	0.00827	0.00113	0.000688	0.000899	0.000306	0.00155	0.0016
Vanadium (V)-Total	-	-	0.0011	<0.0010	<0.0010	0.004	0.0135	0.014	0.0493
Zinc (Zn)-Total	-	-	0.0072	<0.0040	<0.0040	<0.0040	0.0147	0.0155	0.0521
Zirconium (Zr)-Total	-	-	0.00024	0.00024	0.0002	0.00021	0.00024	0.00025	0.00047

Notes: Refer to Table Endnotes (attached)

Table GW3: Analytical Results for Dissolved Metals in Groundwater

Sample Location	CSR Standards[1]		MW-6	MW-3S	MW-3D	MW-2	SB1	SB2	SB3
As-built Well Depths			47m	23m	46m	43m	4.01m	3.28m	3.53m
Sample ID			7121899-01	7121899-02	7121899-03	7121899-04	7121899-05	7121899-06	7121899-07
			MW6	MW3S	MW3D	MW2	SB1	SB2	SB3
Date Sampled	Aquatic Life	Drinking Water	2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27
Physical Tests mg/L									
Hardness (as CaCO3)	-	-	560	138	95	117	65.3	237	210
Dissolved Metals mg/L									
Aluminum (Al)-Dissolved	-	9.5	<0.0050	<0.0050	<0.0050	<0.0050	0.0054	<0.0050	<0.0050
Antimony (Sb)-Dissolved	0.2	0.006	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Arsenic (As)-Dissolved	0.05	0.01	0.00371	0.00086	0.00127	0.0018	<0.00050	<0.00050	<0.00050
Barium (Ba)-Dissolved	10	1	0.0771	0.0254	0.0181	0.0274	<0.0050	0.0083	<0.0050
Beryllium (Be)-Dissolved	0.053	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)- Dissolved	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Boron (B)-Dissolved	50	5	0.071	0.0188	0.0198	0.0185	<0.0050	0.0202	0.0118
Cadmium (Cd)-Dissolved	0.0001 (H< 30)	0.005							
	0.0003 (H=30 -<90						<0.000010		
	0.0005 (H=90-<150			<0.000010	<0.000010	<0.000010			
	0.0006 (H=150-<210)		<0.000010					<0.000010	<0.000010
Calcium (Ca)-Dissolved	-	-	169	44.4	30	36.2	23.1	77.8	69.8
Chromium (Cr)-Dissolved	0.01	0.05	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Colbalt (Co)-Dissolved	0.04	-	0.00205	0.00077	0.0003	0.00034	<0.00010	<0.00010	0.00013
Copper (Cu)-Dissolved	0.02 (H<50)	1							
	0.03 (H=50-<75)						0.00041		
	0.04 (H=75-<100)				<0.00040				
	0.05 (H=100-<125)					<0.00040			
	0.06 (H=125-<150)			0.00054					
	0.07 (H=150-<175)								
	0.08 (H=175-<200)								
	0.09 (H>200)		<0.00040					0.00068	0.00076
Iron (Fe)-Dissolved	-	6.5	1.46	0.04	0.08	0.217	<0.010	<0.010	<0.010
Lead (Pb)-Dissolved	0.04 (H<50)	0.01							
	0.05 (H=50-<100)				<0.00020		<0.00020		
	0.06 (H=100-<200)			<0.00020		<0.00020			
	0.11 (H=200-<300)							<0.00020	<0.00020
	0.16 (H>300)		<0.00020						
Lithium (Li)-Dissolved	-	-	0.0113	<0.00010	<0.00010	<0.00010	<0.00010	0.00011	0.00013
Magnesium (Mg)-Dissolved	-	100	33.5	6.42	4.84	6.46	1.82	10.2	8.64
Manganese (Mn)-Dissolved	-	0.55	2.02	0.36	0.255	0.439	0.00035	0.00261	0.00092
Mercury (Hg)-Dissolved	0.001	0.001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Molybdenum (Mo)-Dissolved	10	0.25	0.00066	0.0054	0.0058	0.00367	0.00037	0.00067	0.00073
Nickel (Ni)-Dissolved	0.25 (H<60)	-							
	0.65 (H=60-<120)				0.00109	0.00077	0.0006		
	1.1 (H=120-<180)			0.00133					
	1.5 (H>=180)		0.00359					0.00055	0.00066
Phosphorus(P)-Dissolved	-	-	<0.050	0.053	0.088	0.123	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	-	-	3.9	0.93	0.62	0.7	0.24	1.55	0.61
Selenium (Se)-Dissolved	0.01	0.01	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00055
Silicon (Si)-Dissolved	-	-	11.2	6.1	5.9	6.3	1.8	5.7	4.8
Silver (Ag)-Dissolved	0.0005 (H<=100)	-			<0.000050		<0.000050		
	0.015 (H>100)		<0.000050	<0.000050		<0.000050		<0.000050	<0.000050
Sodium (Na)-Dissolved	-	200	65.4	12.6	9.97	8.3	1.98	26.1	6.98
Strontium (Sr)-Dissolved	-	-	0.56	0.222	0.179	0.156	0.0529	0.25	0.133
Sulfur (S)-Dissolved	-	-	25.2	13.7	6.5	6	11.4	19.8	47.6
Tellurium (Te)-Dissolved	-	-	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Thallium (Tl)-Dissolved	0.003	-	<0.000020	0.000023	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Thorium (Th)-Dissolved	-	-	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	-	-	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Titanium (Ti)-Dissolved	1	-	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Uranium (U)-Dissolved	3	0.02	0.00703	0.000949	0.000543	0.000732	0.000092	0.00112	0.0008
Vanadium (V)-Dissolved	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn)-Dissolved	0.075 (H<90)	5					<0.0040		
	0.150 (H=90-<100)				<0.0040				
	0.900 (H=100-<200)			<0.0040		<0.0040			
	1.650 (H=200-<300)							<0.0040	<0.0040
	2.4 (H=300-<400)		<0.0040						
Zirconium (Zr)-Dissolved	-	-	0.00019	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

Notes: Refer to Table Endnotes (attached)

Table GW4: Analytical Results for Hydrocarbons and PAHs in Groundwater

Sample Location	CSR Standards[1]		MW-6	MW-3S	MW-3D	MW-2	SB1	SB2	SB3
As-built Well Depths			47m	23m	46m	43m	4.01m	3.28m	3.53m
Sample ID			7121899-01	7121899-02	7121899-03	7121899-04	7121899-05	7121899-06	7121899-07
			MW6	MW3S	MW3D	MW2	SB1	SB2	SB3
Date Sampled	Aquatic Life	Drinking Water	2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27
Hydrocarbons ug/L									
EPH10-19	5000	5000	<250	<250	<250	<250	<250	<250	<250
EPH10-19 (SG)	5000	5000							
EPH19-32	-	-	<250	<250	<250	<250	<250	<250	<250
EPH19-32 (SG)	-	-							
LEPH	500	-	<250	<250	<250	<250	<250	<250	<250
HEPH	-	-	<250	<250	<250	<250	<250	<250	<250
Polycyclic Aromatic Hydrocarbons ug/L									
Acenaphthene	60	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Acenaphthylene	-	-	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200
Acridine	0.5	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Anthracene	1	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benz(a)anthracene	1	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(a)pyrene	0.1	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.018
Benzo(b)fluoranthene	-	-	-	-	-	-	-	-	-
Benzo(b+j)fluoranthene	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzo(g,h,i)perylene	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzo(k)fluoranthene	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
2-Chloronaphthalene			<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Chrysene	1	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dibenz(a,h)anthracene	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Fluoranthene	2	-	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Fluorene	120	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Indeno(1,2,3-c,d)pyrene	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
1-Methylnaphthalene			<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
2-Methylnaphthalene			<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Naphthalene	10	-	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200
Phenanthrene	3	-	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Pyrene	0.2	-	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Quinoline	34	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050

Notes: Refer to Table Endnotes (attached)

Analytical Table Footnotes: Analytical Results for Groundwater

All concentrations in mg/L, except pH or as indicated.

"<" less than the laboratory detection limit indicated.

"-" means not analyzed or no standard or guideline applies.

* RPDs are not normally calculated where one or more concentrations are less than five times MDL.

(1) A compendium of CSR Schedules 6 and 10 guidelines with respect to Drinking Water (DW) and Freshwater Aquatic Life (AW).

(2) Standard is dissolved Chloride-dependent.

BOLD, UNDERLINE	Laboratory Detection Limit exceeds one or more applicable Standard
BLUE SHADING	Concentration greater than CSR Aquatic Life (AW) Standard
BOLD, BEIGE TEXT	Concentration greater than CSR Drinking Water (DW) Standard

Table 1: Analytical Results for Nutrients in Surface Water			SHA-LE-1	SHA-LE-1	RPD	SHA-SW-1	FIELD BLANK
Laboratory ID			7121899-08	7121899-09		7121899-10	7121899-11
Sample ID	**BC DRINKING WATER QUALITY GUIDELINES**	**BC FRESHWATER AQUATIC LIFE WATER QUALITY GUIDELINES**	LE-1	LE-1		SW1	FB
Date Sampled/Time			2017-12-27	2017-12-27		2017-12-27	2017-12-27
Physical Tests							
Colour, True (Colour Units)	**15 TCU**	**15** [1] units absolute, or 5 units above background (30-day average)	<5.0	<5.0	*	<5.0	<5.0
Total Dissolved Solids (mg/L)	-	-	-	-	-	-	-
Total Suspended Solids (mg/L)	-	**25 mg/L above background (24-hr during**	<7.1	17.5	*	<4.0	<5.0
pH	**7-10.5**	**6.5-9**	7.38	7.37	0.14%	7.7	5.97
Conductivity (uS/cm)	-	-	11100	11000	0.90%	449	<2.0
Hardness (as CaCO3)	-	-	2700	2670	1.12%	180	<0.500
Turbidity (NTU)	**Δ1 NTU**	**8 NTU above background (24-hr during clear flow**	1.3	0.78	50.00%	0.63	0.21
	5 NTU at any time when background is 8 - 50 NTU during high flows or in turbid waters	**Change from background of 5 NTU at any time when background is 8 - 50 NTU during high flows or in turbid waters**					
Anions and Nutrients mg/L							
Alkalinity Total (as CaCO3)	**<10 high sensitivity to acid inputs**	**10-20**	83.7	73.4	13.11%	100	<1.0
Acid Sensitivity	**moderate sensitivity to acid inputs**	**>20 low sensitivity to acid inputs**	Low	Low		Low	-
Chloride (Cl)	**250 mg/L**	**600 mg/L (instant max), 150 mg/L (30-day average)**	**2610**	**2610**	0.00%	15.8	0.29
Fluoride (F)	**1.5 mg/L (instant max) 1.0 mg/L (30-day average)**	**0.4 (Hardness <10mg/L)**	<1.00	<1.00	*	<0.10	<0.10
		Hardness-Dependent AW (Hardness is >10mg/L) [3]	**0.29**	**0.29**		**0.30**	**0.20**
Nitrate (as N)	**45 mg/L**	**32.8 mg/L (instant maximum) 3.0 mg/L (30-day average)**	1.13	0.98	14.22%	0.491	<0.010
Nitrite (as N) [2]	**3 mg/L**	**Cl > 10 mg/L 0.6 mg/L (MAX), 0.2 mg/L (30-day average)**	<0.100	<0.100	*	<0.010	<0.010
Sulfate (SO4) H 0-30 mg/L	**500 mg/L**	**128 mg/L 30-day average)**					<1.0
H 31 - 75 mg/L		**218 mg/L (30-day average)**					
H 76 - 180 mg/L		**309 mg/L (30-day average)**				88.5	
H 181 - 250 mg/L		**429 mg/L (30-day average)**					
H > 250 mg/L		**TBD**	**1390**	**1390**	0.00%		

Notes: Refer to Table Endnotes (attached)

Table 2: Analytical Results for Total Metals in Surface Water			SHA-LE-1	SHA-LE-1	RPD	SHA-SW-1	FIELD BLANK
Laboratory ID	**BC DRINKING WATER QUALITY GUIDELINES**	**BC FRESHWATER AQUATIC LIFE WATER QUALITY GUIDELINES**	7121899-08	7121899-09		7121899-10	7121899-11
Sample ID			LE-1	LE-1		SW1	FB
Date Sampled/Time			2017-12-27	2017-12-27		2017-12-27	2017-12-27
Physical Tests							
Hardness (as CaCO3) (mg/L)	-	-	2700	2670	1.12%	180	<0.500
pH	**7-10.5**	**6.5-9**	7.38	7.37	0.14%	7.7	5.97
Total Metals (mg/L)							
Aluminum (Al)-Total	**0.2**	-	0.101	0.0597	51.40%	0.0086	0.0064
Antimony (Sb)-Total	-	-	<0.00020	<0.00020	*	<0.00020	<0.00020
Arsenic (As)-Total	**0.01**	**0.005**	<0.00050	<0.00050	*	<0.00050	<0.00050
Barium (Ba)-Total	-	-	0.0594	0.0594	0.00%	0.0108	<0.0050
Beryllium (Be)-Total	-	-	<0.00010	<0.00010	*	<0.00010	<0.00010
Bismuth, total	-	-	<0.00010	<0.00010	*	<0.00010	<0.00010
Boron (B)-Total	**5**	**1.2**	0.288	0.304	5.41%	0.0255	<0.0050
Cadmium (Cd)-Total	-	-	0.000635	0.00063	0.79%	<0.000010	<0.000010
Calcium (Ca)-Total	-	-	881	876	0.57%	71	<0.20
Chromium (Cr)-Total Chromium	-	-	<0.00050	<0.00050	*	<0.00050	<0.00050
Chromium (Cr(III))	-	-	-	-		<0.00100	-
Chromium (Cr(VI))	-	-	-	-		<0.0010	-
Cobalt (Co)-Total	-	**0.110 (Short Term), 0.004 (Long Term Average)**	**0.00767**	**0.00777**	1.30%	<0.00010	<0.00010
Copper (Cu)-Total	**0.5**	**Hardness-Dependent**[7]	0.00345	0.00332	3.84%	0.00117	<0.00040
		Hardness-Dependent BCAWQG to protect AW [3] (instant max)	0.2558	0.2530		0.0189	-
		Hardness-Dependent BCAWQG to protect AW [3] (30-d average)	0.1080	0.1068		0.0072	-
Iron (Fe)-Total	-	**1**	0.094	0.046	*	<0.010	<0.010
Lead (Pb)-Total	**0.01**	**Hardness-Dependent**[3]	<0.00020	<0.00020	*	<0.00020	<0.00020
		Hardness-Dependent BCAWQG to protect AW [3] (instant max)	5.4207	5.3442		0.1725	-
		Hardness-Dependent BCAWQG to protect AW [3] (30-d average)	0.2148	0.2118		0.0100	-
Lithium (Li)-Total	-	-	0.00045	0.0005	*	0.00027	<0.00010
Magnesium (Mg)-Total	-	-	244	251	2.83%	9.42	<0.010
Manganese (Mn)-Total	-	**Hardness Dependent** [3]	**29.4**	**30**	2.02%	0.00634	0.00023
		Hardness-Dependent BCAWQG to protect AW [3] (instant max)	30.3	30.0		2.5	-
		Hardness-Dependent BCAWQG to protect AW [3] (30-d average)	12.5	12.4		1.4	-
Mercury (Hg)-Total	**0.001**	**0.00002**	<0.000010	<0.000010	*	<0.000010	<0.000010
Molybdenum (Mo)-Total	**0.25**	**≤1 (instant max) 2 (30-d average)**	0.00136	0.00139	2.18%	0.00081	<0.00010
Nickel (Ni)-Total	-	0.025 (Hardness-Dependent [3] BCAWWQG to protect AW H<60mg/L)	0.00747	0.00745	0.27%	0.00046	<0.00040
		Calculated Hardness-Dependent [3] BCAWWQG to protect AW 60≤Hs≤180 mg/L CaCO3	1.169	1.159		0.149	-
Phosphorus(P)-Total	-	-	<0.050	<0.050	*	<0.050	<0.050
Potassium (K)-Total	-	-	20.9	21.4	2.36%	0.89	<0.10
Selenium (Se)-Total	**0.01**	**0.002**	<0.00050	<0.00050	*	<0.00050	<0.00050
Silicon (Si)-Total	-	-	6.3	6.5	3.13%	5	<1.0
Silver (Ag)-Total	-	**HARDNESS <100mg/L 0.0001 (SHORT TERM), 0.00005 (LONG TERM), HARDNESS >100mg/L 0.003 (SHORT TERM), 0.0015 (LONG TERM)**	<0.000050	<0.000050	*	<0.000050	<0.000050
Sodium (Na)-Total	-	-	1560	1580	1.27%	12.9	0.22
Strontium (Sr)-Total	-	-	4.32	4.36	0.92%	0.185	<0.0010
Sulfur (S)-Total	-	-	640	655	2.32%	35.7	<3.0
Tellurium (Te)-Total	-	-	<0.00050	<0.00050	*	<0.00050	<0.00050
Thallium (Tl)-Total	-	-	0.00004	0.000038	*	<0.000020	<0.000020
Thorium (Th)-Total	-	-	<0.00010	<0.00010	*	<0.00010	<0.00010
Tin (Sn)-Total	-	-	<0.00020	<0.00020	*	<0.00020	<0.00020
Titanium (Ti)-Total	-	-	<0.0050	<0.0050	*	<0.0050	<0.0050
Uranium (U)-Total	-	-	0.000578	0.000565	2.27%	0.00102	<0.000020
Vanadium (V)-Total	-	-	<0.0010	<0.0010	*	0.0011	<0.0010
Zinc (Zn)-Total	**5.0**	**Hardness >90 mg/L**	0.0146	0.0145	*	<0.0040	<0.0040
		Hardness-Dependent BCAWQG to protect AW [3](instant max)	1.991	1.968		0.101	-
		Hardness-Dependent BCAWQG to protect AW [3] (30-d average)	1.965	1.943		0.075	-
Zirconium (Zr)-Total	-	-	<0.00010	<0.00010	*	<0.00010	<0.00010

Table 3: Analytical Results for Dissolved Metals in Surface Water			SHA-LE-1	SHA-LE-1	RPD	SHA-SW-1	FIELD BLANK
Laboratory ID	**BC DRINKING WATER QUALITY GUIDELINES**	**BC FRESHWATER AQUATIC LIFE WATER QUALITY GUIDELINES**	7121899-08	7121899-09		7121899-10	7121899-11
Sample ID			LE-1	LE-1		SW1	FB
Date Sampled/Time			2017-12-27	2017-12-27		2017-12-27	2017-12-27
Physical Tests							
Hardness (as CaCO3) (mg/L)	-	-	2700	2670	1.12%	180	<0.500
pH	**7-10.5**	**6.5-9**	7.38	7.37	0.14%	7.7	5.97
Dissolved Metals (mg/L)							
Aluminum (Al)-Dissolved	-	**0.05 (30-day average where median pH > 6.5) 0.1 (maximum where instantaneous pH > 6.5) "**" indicates pH-dependent maximum where instant pH ≤ 6.5**	0.0138	0.0116	*	<0.0050	<0.0050
		pH/Hardness Dependent BCAWQG to protect AW [4] (instant max)	0.327	0.321		0.598	0.046
		pH/Hardness Dependent BCAWQG to protect AW [4] (30-d Mean)	0.347	0.338		0.833	0.020
Antimony (Sb)-Dissolved	-	-	<0.00020	<0.00020	*	<0.00020	<0.00020
Arsenic (As)-Dissolved	-	-	<0.00050	<0.00050	*	<0.00050	<0.00050
Barium (Ba)-Dissolved	-	-	0.0501	0.0496	1.00%	0.0092	<0.0050
Beryllium (Be)-Dissolved	-	-	<0.00010	<0.00010	*	<0.00010	<0.00010
Bismuth (Bi)-Dissolved	-	-	<0.00010	<0.00010	*	<0.00010	<0.00010
Boron (B)-Dissolved	-	-	0.233	0.234	0.43%	0.0181	<0.0050
Cadmium (Cd)-Dissolved	-	**Hardness-Dependent**[3]	0.000539	0.000515	4.55%	<0.000010	<0.000010
	-	Calculated Hardness-Dependent [3] BCAWQG to protect AW (short-term max) e[1.03 * ln(Hss) - 5.274] ug/L H<455mg/L	Hardness exceeds 455mg/L	Hardness exceeds 455mg/L		0.00108	-
	-	Calculated Hardness-Dependent BCAWQG to protect AW [3] (long-term max) e[0.736 * ln(Hss) - 4.943] ug/L H<285mg/L	Hardness exceeds 285mg/L	Hardness exceeds 285mg/L		0.00033	-
Calcium (Ca)-Dissolved	-	**up to 4, highly sensitive to acid inputs 4 to 8, moderately sensitive over 8 low sensitivity**	744 Low	731 Low	1.76%	58.9 Low	<0.20 -
Chromium (Cr)-Dissolved	-	-	<0.00050	<0.00050	*	<0.00050	<0.00050
Cobalt (Co)-Dissolved	-	-	0.00637	0.00633	0.63%	<0.00010	<0.00010
Copper (Cu)-Dissolved	-	-	0.0029	0.00271	6.77%	0.00086	<0.00040
Iron (Fe)-Dissolved	-	**0.35**	0.012	<0.010	*	<0.010	<0.010
Lead (Pb)-Dissolved	-	-	<0.00020	<0.00020	*	<0.00020	<0.00020
Lithium, dissolved	-		0.00032	0.00039	*	0.00015	<0.00010
Magnesium (Mg)-Dissolved	-	-	204	204	0.00%	8.03	<0.010
Manganese (Mn)-Dissolved	-	-	24.8	24.7	0.40%	0.00616	<0.00020
Mercury (Hg)-Dissolved	-	-	<0.000010	<0.000010	*	<0.000010	<0.000010
Molybdenum (Mo)-Dissolved	-	-	0.00111	0.00115	3.54%	0.0007	<0.00010
Nickel (Ni)-Dissolved	-		0.00609	0.00608	0.16%	<0.00040	<0.00040
Phosphorus (P)-Dissolved	-		<0.050	<0.050	*	<0.050	<0.050
Potassium (K)-Dissolved	-	-	17.7	18	1.68%	0.77	<0.10
Selenium (Se)-Dissolved	-	-	<0.00050	<0.00050	*	<0.00050	<0.00050
Silicon (Si)-Dissolved	-		5.6	5.6	0.00%	4.4	<1.0
Silver (Ag)-Dissolved	-		<0.000050	<0.000050	*	<0.000050	<0.000050
Sodium (Na)-Dissolved	-	-	1310	1300	0.77%	10.5	<0.10
Strontium (Sr)-dissolved	-	-	3.66	3.65	0.27%	0.16	<0.0010
Sulfur (S)-Dissolved	-	-	538	536	0.37%	29.3	<3.0
Tellurium (Te)-Dissolved	-	-	<0.00050	<0.00050	*	<0.00050	<0.00050
Thallium (Ti)-Dissolved	-	-	0.000039	0.000036	*	<0.000020	<0.000020
Thorium (Th)-Dissolved	-	-	<0.00010	<0.00010	*	<0.00010	<0.00010
Tin (Sn)-Dissolved	-	-	<0.00020	<0.00020	*	<0.00020	<0.00020
Titanium (Ti)-Dissolved	-	-	<0.0050	<0.0050	*	<0.0050	<0.0050
Uranium (U)-Dissolved	-	-	0.000484	0.000463	4.44%	0.000825	<0.000020
Vanadium (V)-Dissolved	-	-	<0.0010	<0.0010	*	<0.0010	<0.0010
Zinc (Zn)-Dissolved	-	-	0.0131	0.0122	*	<0.0040	<0.0040
Zirconium (Zr)-Dissolved	-		<0.00010	<0.00010	*	<0.00010	<0.00010

Notes: Refer to Table Endnotes (attached)

Table 4: Analytical Results for Hydrocarbons and PAHs in			SHA-LE-1	SHA-LE-1		SHA-SW-1	FIELD BLANK
Laboratory ID	BC DRINKING	BC FRESHWATER AQUATIC LIFE WATER QUALITY GUIDELINES	7121899-08	7121899-09	RPD	7121899-10	7121899-11
Sample ID			LE-1	LE-1		SW1	FB
Date Sampled/ Time			2017-12-27	2017-12-27		2017-12-27	2017-12-27
Hydrocarbons ug/L							
LEPH	-	-	<250	<250	*	<250	<250
HEPH	-	-	<250	<250	*	<250	<250
Polycyclic Aromatic							
Acenaphthene	-	**6 (LONG TERM)**	<0.050	<0.050	*	<0.050	<0.050
Acenaphthylene	-	-	<0.200	<0.200	*	<0.200	<0.200
Acridine	-	**3 (LONG TERM), 0.05 (PHOTOTOXIC)**	<0.050	<0.050	*	<0.050	<0.050
Anthracene	-	**4 (LONG TERM), 0.1 (PHOTOTOXIC)**	<0.010	<0.010	*	<0.010	<0.010
Benz(a)anthracene	**0.01**	**0.1 (LONG TERM), 0.1 (PHOTOTOXIC)**	<0.010	<0.010	*	<0.010	<0.010
Benzo(a)pyrene	-	**0.01 (LONG TERM)**	<0.010	<0.010	*	<0.010	<0.010
Benzo(b)fluoranthene	-	-			*		
Benzo(b+j)fluoranthene	-	-	<0.050	<0.050	*	<0.050	<0.050
Benzo(g,h,i)perylene	-	-	<0.050	<0.050	*	<0.050	<0.050
Benzo(k)fluoranthene	-	-	<0.050	<0.050	*	<0.050	<0.050
2-Chloronaphthalene			<0.100	<0.100	*	<0.100	<0.100
Chrysene	-	-	<0.050	<0.050	*	<0.050	<0.050
Dibenz(a,h)anthracene	-	-	<0.010	<0.010	*	<0.010	<0.010
Fluoranthene	-	**4 (LONG TERM), 0.2 (PHOTOTOXIC)**	<0.030	<0.030	*	<0.030	<0.030
Fluorene	-	**12 (LONG TERM)**	<0.050	<0.050	*	<0.050	<0.050
Indeno(1,2,3-c,d)pyrene	-	-	<0.050	<0.050	*	<0.050	<0.050
1-Methylnaphthalene			<0.100	<0.100	*	<0.100	<0.100
2-Methylnaphthalene			<0.100	<0.100	*	<0.100	<0.100
Naphthalene	-	**1 (LONG TERM)**	<0.200	<0.200	*	<0.200	<0.200
Phenanthrene	-	**0.3 (LONG TERM)**	<0.100	<0.100	*	<0.100	<0.100
Pyrene	-	**0.02 (PHOTOTOXIC)**	<0.020	<0.020	*	<0.020	<0.020
Quinoline	-	-	<0.050	<0.050	*	<0.050	<0.050

Notes: Refer to Table Endnotes (attached)

Analytical Table Footnotes: Analytical Results for Surface Water

All concentrations in mg/L, except pH or as indicated.

"<" less than the laboratory detection limit indicated.

"-" means not analyzed or no standard or guideline applies.

* RPDs are not normally calculated where one or more concentrations are less than five times RDL.

(1) Guideline of 15 mg/L Pt for Drinking Water. Once background levels are established, colour should also not exceed 5 mg/L above background, to protect for Aquatic Life. This is considered a clearwater system (background less than 20 mg/L Pt.)

(2) Nitrite BCAWWQG Guideline is Chloride dependent

(3) Standard is calculated based on the hardness dependent BCAWWQG formula, and has been calculated and shown for each individual result

(4) pH-dependent maximum where instant pH < 6.5

BOLD, UNDERLINE	Laboratory Detection Limit exceeds one or more applicable Standard
BOLD, BLUE SHADING	Concentration greater than BCAWWQG Guideline
BOLD, BEIGE SHADING	Concentration greater than BCAWWQG Chronic Guideline
BOLD, GREEN SHADING	Concentration greater than BC Ministry of Environment Drinking Water Sources
RED FONT	Concentration less than laboratory detection limit (Formula 0.5MRL utilized for statistical analysis)

CARO Analytical Services
FINAL Analytical Testing Report
Work Order: 7121899
Report Date: 2018-01-05 13:08:39

Client Allterra Construction
Attention Rahim Gaidhar
Project P17-932
Project Info [none]

Note: This is not the original data. Please refer to PDF / Hardcopy report.

LAB ID				7121899-01	7121899-02	7121899-03	7121899-04	7121899-05	7121899-06	7121899-07	7121899-08	7121899-09	7121899-10	7121899-11
CLIENT ID				MW6	MW3S	MW3D	MW2	SB1	SB2	SB3	LE-1	LE-1	SW1	FB
DATE SAMPLED				2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27
DATE RECEIVED				2017-12-28	2017-12-28	2017-12-28	2017-12-28	2017-12-28	2017-12-28	2017-12-28	2017-12-28	2017-12-28	2017-12-28	2017-12-28
MATRIX				Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water
General Method	**Analyte**	**Units**	**RL**											
Anions	Chloride	mg/L	0.1	39.2	6.64	2.24	4.53	1.88	39.6	4.43	2610	2610	15.8	0.29
Anions	Fluoride	mg/L	0.1	0.22	0.12	0.12	0.11	<0.10	<0.10	<0.10	<1.00	<1.00	<0.10	<0.10
Anions	Nitrate (as N)	mg/L	0.01	<0.010	0.012	0.011	<0.010	0.17	0.206	0.442	1.13	0.98	0.491	<0.010
Anions	Nitrite (as N)	mg/L	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.100	<0.100	<0.010	<0.010
Anions	Sulfate	mg/L	1	86.7	36.6	21.5	17.1	33.4	63.4	136	1390	1390	88.5	<1.0
General Parameters	Colour, True	CU	5	6.1	<5.0	6	5.3	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
General Parameters	Alkalinity, Total (as CaCO3)	mg/L	1	634	128	103	123	38.3	195	82.2	83.7	73.4	100	<1.0
General Parameters	Alkalinity, Phenolphthalein (as Ca	mg/L	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
General Parameters	Alkalinity, Bicarbonate (as CaCO3)	mg/L	1	634	128	103	123	38.3	195	82.2	83.7	73.4	100	<1.0
General Parameters	Alkalinity, Carbonate (as CaCO3)	mg/L	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
General Parameters	Alkalinity, Hydroxide (as CaCO3)	mg/L	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
General Parameters	Chromium, Hexavalent	mg/L	0.001										<0.0010	
General Parameters	Solids, Total Suspended	mg/L	10	9	12	11	25.1	93.2	108	506	<7.1	17.5	<4.0	<5.0
General Parameters	Turbidity	NTU	0.1	10.7	9.19	6.1	19.7	83.2	107	303	1.3	0.78	0.63	0.21
General Parameters	pH	pH units	0.1	7.4	7.78	7.88	7.83	7.42	7.07	7.52	7.38	7.37	7.7	5.97
General Parameters	Conductivity (EC)	uS/cm	2	1320	375	250	290	164	624	490	11100	11000	449	<2.0
Calculated Parameters	Chromium, Trivalent	mg/L	0.001										<0.00100	
Calculated Parameters	Hardness, Total (as CaCO3)	mg/L	0.5	560	138	95	117	65.3	237	210	2700	2670	180	<0.500
Dissolved Metals	Aluminum, dissolved	mg/L	0.005	<0.0050	<0.0050	<0.0050	<0.0050	0.0054	<0.0050	<0.0050	0.0138	0.0116	<0.0050	<0.0050
Dissolved Metals	Antimony, dissolved	mg/L	0.0002	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Metals	Arsenic, dissolved	mg/L	0.0005	0.00371	0.00086	0.00127	0.0018	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Metals	Barium, dissolved	mg/L	0.005	0.0771	0.0254	0.0181	0.0274	<0.0050	0.0083	<0.0050	0.0501	0.0496	0.0092	<0.0050
Dissolved Metals	Beryllium, dissolved	mg/L	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Metals	Bismuth, dissolved	mg/L	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Metals	Boron, dissolved	mg/L	0.005	0.071	0.0188	0.0198	0.0185	<0.0050	0.0202	0.0118	0.233	0.234	0.0181	<0.0050
Dissolved Metals	Cadmium, dissolved	mg/L	1E-05	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000539	0.000515	<0.000010	<0.000010
Dissolved Metals	Calcium, dissolved	mg/L	0.2	169	44.4	30	36.2	23.1	77.8	69.8	744	731	58.9	<0.20
Dissolved Metals	Chromium, dissolved	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Metals	Cobalt, dissolved	mg/L	0.0001	0.00205	0.00077	0.0003	0.00034	<0.00010	<0.00010	0.00013	0.00637	0.00633	<0.00010	<0.00010
Dissolved Metals	Copper, dissolved	mg/L	0.0004	<0.00040	0.00054	<0.00040	<0.00040	0.00041	0.00068	0.00076	0.0029	0.00271	0.00086	<0.00040
Dissolved Metals	Iron, dissolved	mg/L	0.01	1.46	0.04	0.08	0.217	<0.010	<0.010	<0.010	0.012	<0.010	<0.010	<0.010
Dissolved Metals	Lead, dissolved	mg/L	0.0002	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Metals	Lithium, dissolved	mg/L	0.0001	0.0113	<0.00010	<0.00010	<0.00010	<0.00010	0.00011	0.00013	0.00032	0.00039	0.00015	<0.00010
Dissolved Metals	Magnesium, dissolved	mg/L	0.01	33.5	6.42	4.84	6.46	1.82	10.2	8.64	204	204	8.03	<0.010

LAB ID				7121899-01	7121899-02	7121899-03	7121899-04	7121899-05	7121899-06	7121899-07	7121899-08	7121899-09	7121899-10	7121899-11
CLIENT ID				MW6	MW3S	MW3D	MW2	SB1	SB2	SB3	LE-1	LE-1	SW1	FB
DATE SAMPLED				2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27
DATE RECEIVED				2017-12-28	2017-12-28	2017-12-28	2017-12-28	2017-12-28	2017-12-28	2017-12-28	2017-12-28	2017-12-28	2017-12-28	2017-12-28
MATRIX				Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water
General Method	**Analyte**	**Units**	**RL**											
Dissolved Metals	Manganese, dissolved	mg/L	0.0002	2.02	0.36	0.255	0.439	0.00035	0.00261	0.00092	24.8	24.7	0.00616	<0.00020
Dissolved Metals	Mercury, dissolved	mg/L	1E-05	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Dissolved Metals	Molybdenum, dissolved	mg/L	0.0001	0.00066	0.0054	0.0058	0.00367	0.00037	0.00067	0.00073	0.00111	0.00115	0.0007	<0.00010
Dissolved Metals	Nickel, dissolved	mg/L	0.0004	0.00359	0.00133	0.00109	0.00077	0.0006	0.00055	0.00066	0.00609	0.00608	<0.00040	<0.00040
Dissolved Metals	Phosphorus, dissolved	mg/L	0.05	<0.050	0.053	0.088	0.123	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Dissolved Metals	Potassium, dissolved	mg/L	0.1	3.9	0.93	0.62	0.7	0.24	1.55	0.61	17.7	18	0.77	<0.10
Dissolved Metals	Selenium, dissolved	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00055	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Metals	Silicon, dissolved	mg/L	1	11.2	6.1	5.9	6.3	1.8	5.7	4.8	5.6	5.6	4.4	<1.0
Dissolved Metals	Silver, dissolved	mg/L	5E-05	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Dissolved Metals	Sodium, dissolved	mg/L	0.1	65.4	12.6	9.97	8.3	1.98	26.1	6.98	1310	1300	10.5	<0.10
Dissolved Metals	Strontium, dissolved	mg/L	0.001	0.56	0.222	0.179	0.156	0.0529	0.25	0.133	3.66	3.65	0.16	<0.0010
Dissolved Metals	Sulfur, dissolved	mg/L	3	25.2	13.7	6.5	6	11.4	19.8	47.6	538	536	29.3	<3.0
Dissolved Metals	Tellurium, dissolved	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Metals	Thallium, dissolved	mg/L	2E-05	<0.000020	0.000023	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.000039	0.000036	<0.000020	<0.000020
Dissolved Metals	Thorium, dissolved	mg/L	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Dissolved Metals	Tin, dissolved	mg/L	0.0002	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Metals	Titanium, dissolved	mg/L	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Dissolved Metals	Tungsten, dissolved	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Dissolved Metals	Uranium, dissolved	mg/L	2E-05	0.00703	0.000949	0.000543	0.000732	0.000092	0.00112	0.0008	0.000484	0.000463	0.000825	<0.000020
Dissolved Metals	Vanadium, dissolved	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Dissolved Metals	Zinc, dissolved	mg/L	0.004	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	0.0131	0.0122	<0.0040	<0.0040
Dissolved Metals	Zirconium, dissolved	mg/L	0.0001	0.00019	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Total Metals	Aluminum, total	mg/L	0.005	0.312	0.127	0.0841	0.842	4.5	5.49	16.4	0.101	0.0597	0.0086	0.0064
Total Metals	Antimony, total	mg/L	0.0002	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00034	<0.00020	<0.00020	<0.00020	<0.00020
Total Metals	Arsenic, total	mg/L	0.0005	0.00426	0.00099	0.00126	0.00197	0.00063	0.00072	0.00243	<0.00050	<0.00050	<0.00050	<0.00050
Total Metals	Barium, total	mg/L	0.005	0.0885	0.0328	0.0205	0.0339	0.0259	0.0329	0.0636	0.0594	0.0594	0.0108	<0.0050
Total Metals	Beryllium, total	mg/L	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00016	0.0003	<0.00010	<0.00010	<0.00010	<0.00010
Total Metals	Bismuth, total	mg/L	0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Total Metals	Boron, total	mg/L	0.005	0.0861	0.025	0.027	0.0266	0.0082	0.0295	0.021	0.288	0.304	0.0255	<0.0050
Total Metals	Cadmium, total	mg/L	1E-05	0.000121	0.000171	0.000094	0.00004	0.000027	0.000019	0.000067	0.000635	0.00063	<0.000010	<0.000010
Total Metals	Calcium, total	mg/L	0.2	192	50.7	33.3	41.9	27.9	91.5	87.2	881	876	71	<0.20
Total Metals	Chromium, total	mg/L	0.0005	0.00072	<0.00050	<0.00050	0.00113	0.00541	0.00589	0.0342	<0.00050	<0.00050	<0.00050	<0.00050
Total Metals	Cobalt, total	mg/L	0.0001	0.00258	0.001	0.00039	0.00093	0.00472	0.00434	0.0186	0.00767	0.00777	<0.00010	<0.00010
Total Metals	Copper, total	mg/L	0.0004	0.00321	0.00053	<0.00040	0.00113	0.0131	0.017	0.0555	0.00345	0.00332	0.00117	<0.00040
Total Metals	Iron, total	mg/L	0.01	1.95	0.151	0.135	1.52	5.26	6.6	21.1	0.094	0.046	<0.010	<0.010
Total Metals	Lead, total	mg/L	0.0002	0.00096	<0.00020	<0.00020	0.00037	0.005	0.00177	0.00902	<0.00020	<0.00020	<0.00020	<0.00020
Total Metals	Lithium, total	mg/L	0.0001	0.0127	0.00027	0.00016	0.00027	0.00159	0.00206	0.0074	0.00045	0.0005	0.00027	<0.00010
Total Metals	Magnesium, total	mg/L	0.01	37.1	7.34	5.47	7.6	3.62	13.2	16.8	244	251	9.42	<0.010
Total Metals	Manganese, total	mg/L	0.0002	2.23	0.395	0.279	0.494	0.147	0.264	0.401	29.4	30	0.00634	0.00023
Total Metals	Mercury, total	mg/L	1E-05	<0.000010	<0.000010	<0.000010	<0.000010	0.000016	<0.000010	0.000022	<0.000010	<0.000010	<0.000010	<0.000010
Total Metals	Molybdenum, total	mg/L	0.0001	0.00101	0.00592	0.00632	0.00407	0.00051	0.00095	0.00102	0.00136	0.00139	0.00081	<0.00010

LAB ID				7121899-01	7121899-02	7121899-03	7121899-04	7121899-05	7121899-06	7121899-07	7121899-08	7121899-09	7121899-10	7121899-11
CLIENT ID				MW6	MW3S	MW3D	MW2	SB1	SB2	SB3	LE-1	LE-1	SW1	FB
DATE SAMPLED				2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27
DATE RECEIVED				2017-12-28	2017-12-28	2017-12-28	2017-12-28	2017-12-28	2017-12-28	2017-12-28	2017-12-28	2017-12-28	2017-12-28	2017-12-28
MATRIX				Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water
General Method	**Analyte**	**Units**	**RL**											
Total Metals	Nickel, total	mg/L	0.0004	0.00536	0.00166	0.00146	0.00164	0.00544	0.00578	0.0282	0.00747	0.00745	0.00046	<0.00040
Total Metals	Phosphorus, total	mg/L	0.05	<0.050	0.073	0.084	0.21	0.112	0.183	0.475	<0.050	<0.050	<0.050	<0.050
Total Metals	Potassium, total	mg/L	0.1	4.38	1.04	0.68	0.81	0.62	2.51	1.92	20.9	21.4	0.89	<0.10
Total Metals	Selenium, total	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00081	<0.00050	<0.00050	<0.00050	<0.00050
Total Metals	Silicon, total	mg/L	1	12.3	6.7	6.4	8	8.2	14.8	29.1	6.3	6.5	5	<1.0
Total Metals	Silver, total	mg/L	5E-05	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000057	<0.000050	<0.000050	<0.000050	<0.000050
Total Metals	Sodium, total	mg/L	0.1	73.6	14.7	11.5	9.67	2.81	30	9.26	1560	1580	12.9	0.22
Total Metals	Strontium, total	mg/L	0.001	0.619	0.239	0.193	0.171	0.067	0.285	0.182	4.32	4.36	0.185	<0.0010
Total Metals	Sulfur, total	mg/L	3	28.5	14.3	7.5	7	12.7	22.4	53.4	640	655	35.7	<3.0
Total Metals	Tellurium, total	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Total Metals	Thallium, total	mg/L	2E-05	0.000054	0.000024	<0.000020	<0.000020	<0.000020	<0.000020	0.000045	0.00004	0.000038	<0.000020	<0.000020
Total Metals	Thorium, total	mg/L	0.0001	<0.00010	0.00015	0.0002	0.00011	<0.00010	0.00018	0.00059	<0.00010	<0.00010	<0.00010	<0.00010
Total Metals	Tin, total	mg/L	0.0002	0.00094	<0.00020	<0.00020	<0.00020	0.00033	0.00041	0.00098	<0.00020	<0.00020	<0.00020	<0.00020
Total Metals	Titanium, total	mg/L	0.005	0.0219	<0.0050	<0.0050	0.0539	0.228	0.304	0.825	<0.0050	<0.0050	<0.0050	<0.0050
Total Metals	Tungsten, total	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Metals	Uranium, total	mg/L	2E-05	0.00827	0.00113	0.000688	0.000899	0.000306	0.00155	0.0016	0.000578	0.000565	0.00102	<0.000020
Total Metals	Vanadium, total	mg/L	0.001	0.0011	<0.0010	<0.0010	0.004	0.0135	0.014	0.0493	<0.0010	<0.0010	0.0011	<0.0010
Total Metals	Zinc, total	mg/L	0.004	0.0072	<0.0040	<0.0040	<0.0040	0.0147	0.0155	0.0521	0.0146	0.0145	<0.0040	<0.0040
Total Metals	Zirconium, total	mg/L	0.0001	0.00024	0.00024	0.0002	0.00021	0.00024	0.00025	0.00047	<0.00010	<0.00010	<0.00010	<0.00010
BCMOE Aggregate Hydrocarbons	EPHw10-19	ug/L	250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250
BCMOE Aggregate Hydrocarbons	EPHw19-32	ug/L	250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250
BCMOE Aggregate Hydrocarbons	LEPHw	ug/L	250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250
BCMOE Aggregate Hydrocarbons	HEPHw	ug/L	250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250	<250
Polycyclic Aromatic Hydrocarbons (PAH)	Acenaphthene	ug/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
Polycyclic Aromatic Hydrocarbons (PAH)	Acenaphthylene	ug/L	0.2	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200
Polycyclic Aromatic Hydrocarbons (PAH)	Acridine	ug/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
Polycyclic Aromatic Hydrocarbons (PAH)	Anthracene	ug/L	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Polycyclic Aromatic Hydrocarbons (PAH)	Benz(a)anthracene	ug/L	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Polycyclic Aromatic Hydrocarbons (PAH)	Benzo(a)pyrene	ug/L	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.018	<0.010	<0.010	<0.010	<0.010
Polycyclic Aromatic Hydrocarbons (PAH)	Benzo(b+j)fluoranthene	ug/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
Polycyclic Aromatic Hydrocarbons (PAH)	Benzo(g,h,i)perylene	ug/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
Polycyclic Aromatic Hydrocarbons (PAH)	Benzo(k)fluoranthene	ug/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
Polycyclic Aromatic Hydrocarbons (PAH)	2-Chloronaphthalene	ug/L	0.1	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Polycyclic Aromatic Hydrocarbons (PAH)	Chrysene	ug/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
Polycyclic Aromatic Hydrocarbons (PAH)	Dibenz(a,h)anthracene	ug/L	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Polycyclic Aromatic Hydrocarbons (PAH)	Fluoranthene	ug/L	0.03	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Polycyclic Aromatic Hydrocarbons (PAH)	Fluorene	ug/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
Polycyclic Aromatic Hydrocarbons (PAH)	Indeno(1,2,3-cd)pyrene	ug/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
Polycyclic Aromatic Hydrocarbons (PAH)	1-Methylnaphthalene	ug/L	0.1	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Polycyclic Aromatic Hydrocarbons (PAH)	2-Methylnaphthalene	ug/L	0.1	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Polycyclic Aromatic Hydrocarbons (PAH)	Naphthalene	ug/L	0.2	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200

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CLIENT ID				MW6	MW3S	MW3D	MW2	SB1	SB2	SB3	LE-1	LE-1	SW1	FB
DATE SAMPLED				2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27	2017-12-27
DATE RECEIVED				2017-12-28	2017-12-28	2017-12-28	2017-12-28	2017-12-28	2017-12-28	2017-12-28	2017-12-28	2017-12-28	2017-12-28	2017-12-28
MATRIX				Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water
General Method	**Analyte**	**Units**	**RL**											
Polycyclic Aromatic Hydrocarbons (PAH)	Phenanthrene	ug/L	0.1	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Polycyclic Aromatic Hydrocarbons (PAH)	Pyrene	ug/L	0.02	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Polycyclic Aromatic Hydrocarbons (PAH)	Quinoline	ug/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

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FIELD REVIEW REPORT		DATE: Jan 14 2018	ISLANDER PROJECT No.: 2087
REPORT No: 12	STAGE OF CONSTRUCTION: Landfill Closure	WEATHER: Sunny 9 deg	PAGE: 1 of 3
PROJECT:	Cobble Hill Landfill 2017 Minor Construction Works		
TO:	CHH	ATTENTION:	Marty Block
CC:			

The field review included the inspection of the following items included in the detailed summary of works section of the *Cobble Hill Landfill — 2017 Minor Construction Works, Detailed Construction Plan (Sperling Hansen Associates, September 13, 2017)*:

- ***PEA***
  - *Liner appears to be in good condition. Based upon visual inspections, the liner appears to be in good condition.*

- ***Leachate and Leak Detention facility***
  - Total leachate collected:= 13.72 m^3
  - Total leachate stored = 71.54 m^3
  - Total leachate transported = 0 m^3
  - Leachate scheduled to be transported to a registered facility next week

- ***Soil Management Area (SMA)***
  - All works are in good condition and no noticeable changes since the date of our last inspection

- ***Contact Water Containment Pond***
  - All works are in good condition and no noticeable changes since the date of our last inspection

- ***cut-off ditch upland of PEA***
  - All works are in good condition, ditch still performing well.

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PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
M.J. ACHTEM
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Mike Achtem, P.Eng

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SMA - liner – looking south

SMA – looking north

Contact water containment Pond

Pipe trenching and Leachate and Leak Detention facility

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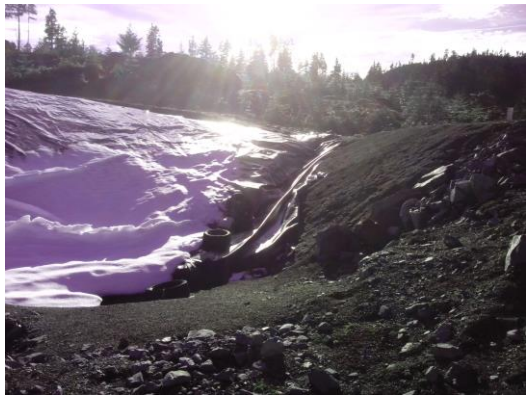
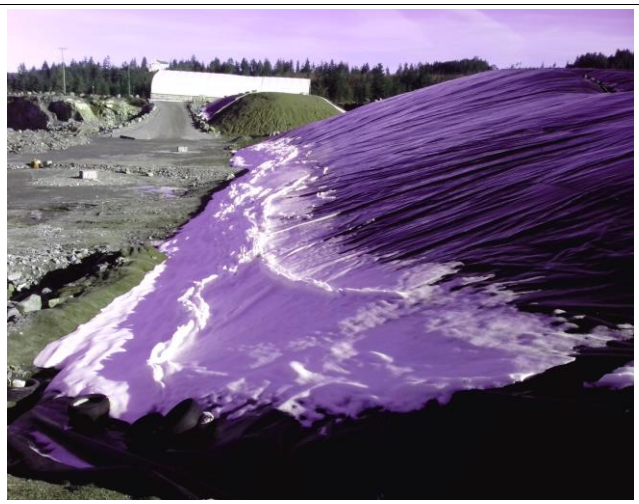


PEA – liner near NW corner

PEA– NE corner

Cut-off ditch upland of PEA



PEA north face