



MONTHLY REPORTING PERIOD - DECEMBER, 2018

1. SUMMARY

The list below provides a summary of the water quality information collected by BMID in December, 2018. Documentation and figures are provided on the following pages to support this submission.

Source	Total (US Gals)	Total (Mega Litres)
Mission Creek	55,488,631	210.02
Well 4	2,219,000	8.40
Well 5	0	0
Well 6 (Irrigation Only)	0	0
Scotty Creek (Irrigation Only)	0	0
Total	57,707,631	218.42

1. The hillside portion of BMID's transmission main west of the Distribution Intake and east of the tunnel has stabilized after a leak was detected and repaired. Groundwater monitoring has shown a sharp decrease in groundwater levels after the repairs, however, the hillside continues to move very slowly and continues to be monitored;
2. Turbidity levels at the Distribution Intake peaked at 0.51 NTU on December 20. Average turbidity for December was 0.44 NTU;
3. The highest monthly turbidity level recorded at the first customer (Booster #1) was 0.44 NTU on December 20 and 27, 2018. Average monthly turbidity was 0.37 NTU for December;
4. Mission Creek had average flows for December as the upper watershed runoff was reduced due to freezing conditions, however the lower watershed had increased turbidity resulting from above normal temperatures for December;
5. BMID's Scotty Creek source, used for irrigation in the north-end, was closed for the year on August 24;
6. Well # 4 is currently the primary source of water for the north-end. Well #5 was placed on stand-by until spring;
7. Well #6 supplies irrigation water and fire flows in the north-end of the system was placed on stand-by until spring;
8. *E.Coli* levels at Mission Creek's Point of Diversion averaged 1.5 counts per sample. The highest raw water *E.Coli* count was 4 on December 3, 2018;
9. *E.Coli* levels at the distribution system intake, down-stream of the WTP, prior to disinfection, had zero counts on all samples throughout December, 2018;
10. No *E.Coli* or *Total Coliforms* were found in treated water in the distribution system through third-party analysis. In addition, no positive bacteria tests were found from the in-house presence-absence tests during routine testing;
11. The WTP remained in use periodically throughout December as high colour and increased turbidity in Mission Creek required treatment during this time. The WTP remains on stand-by mode until required;

1.0 FLOWS - DECEMBER, 2018

Maximum Daily Flow was on December 3, 2018 at 2,159,006 US gallons (8.17 ML)

Minimum Daily Flow was on December 19, 2018 at 1,593,283 US gallons (6.03 ML)

Mission Creek provided 96% of domestic flow throughout December.

Figure 1.1 - Domestic Water System Flow

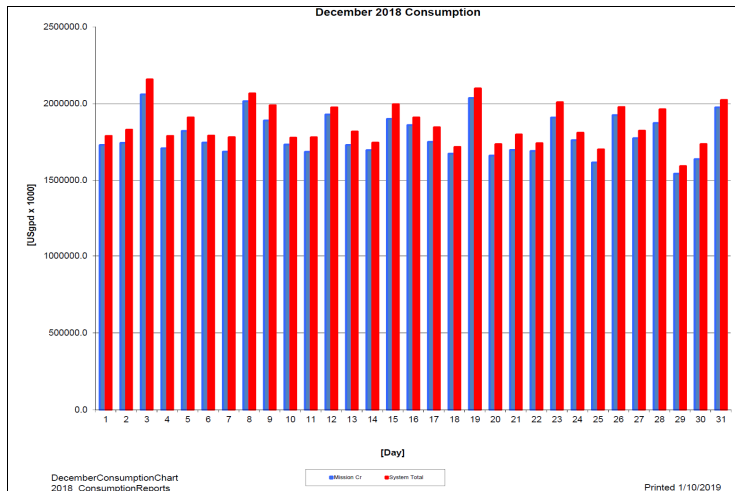


Table 1.2 - December, 2018 Daily Consumption Report

Year	Mission Cr	Well #4	Well #5	System Total	System Total
2018	Usgpd	Usgpd	Usgpd	Usgpd	ML/Day
1-Dec	1731010.0	59000.0	0.0	1790010.0	6.78
2-Dec	1744577.0	86000.0	0.0	1830577.0	6.93
3-Dec	2061006.0	98000.0	0.0	2159006.0	8.17
4-Dec	1708905.0	81000.0	0.0	1789905.0	6.77
5-Dec	1822432.0	88000.0	0.0	1910432.0	7.23
6-Dec	1746308.0	46000.0	0.0	1792308.0	6.78
7-Dec	1687027.0	95000.0	0.0	1782027.0	6.74
8-Dec	2017140.0	50000.0	0.0	2067140.0	7.82
9-Dec	1891096.0	99000.0	0.0	1990096.0	7.53
10-Dec	1733245.0	45000.0	0.0	1778245.0	6.73
11-Dec	1686439.0	95000.0	0.0	1781439.0	6.74
12-Dec	1929744.0	47000.0	0.0	1976744.0	7.48
13-Dec	1730921.0	88000.0	0.0	1818921.0	6.88
14-Dec	1697721.0	49000.0	0.0	1746721.0	6.61
15-Dec	1901348.0	96000.0	0.0	1997348.0	7.56
16-Dec	1860626.0	50000.0	0.0	1910626.0	7.23
17-Dec	1751239.0	95000.0	0.0	1846239.0	6.99
18-Dec	1674536.0	43000.0	0.0	1717536.0	6.50
19-Dec	2037051.0	63000.0	0.0	2100051.0	7.95
20-Dec	1662148.0	74000.0	0.0	1736148.0	6.57
21-Dec	1698377.0	101000.0	0.0	1799377.0	6.81
22-Dec	1692141.0	50000.0	0.0	1742141.0	6.59
23-Dec	1910115.0	100000.0	0.0	2010115.0	7.61
24-Dec	1762241.0	49000.0	0.0	1811241.0	6.86
25-Dec	1616950.0	85000.0	0.0	1701950.0	6.44
26-Dec	1925810.0	53000.0	0.0	1978810.0	7.49
27-Dec	1774935.0	49000.0	0.0	1823935.0	6.90
28-Dec	1874596.0	89000.0	0.0	1963596.0	7.43
29-Dec	1543283.0	50000.0	0.0	1593283.0	6.03
30-Dec	1638815.0	98000.0	0.0	1736815.0	6.57
31-Dec	1976849.0	48000.0	0.0	2024849.0	7.66
Totals Usgpd	55488631.00	2219000.00	0.00	57707631.00	218.42
Totals ML	210.02	8.40	0.00		
Avg's	1783726.07	6.75		1856092.73	7.03
Max	2061006.00	7.80		2159006.00	8.17
Min	1543283.00	5.84		1593283.00	6.03

2.0 RAW WATER QUALITY - BACTERIOLOGICAL MONITORING

Raw water samples were taken at three points at BMID settling ponds before chlorination

Samples were taken twice per week at the Distribution Intake's Point of Disinfection and at the Mission Creek raw water Point of Diversion; one sample is taken per week at Stevens Pond outlet (point halfway between WTP Outlet and Distribution Intake).

Samples from the previous month are also provided to show a two-month trend

The E.Coli readings clearly show the effectiveness in risk reduction from the Water Treatment Plant and extended settling times in Stevens and Hadden Reservoirs.

Figure 2.1 - Raw Water *E.Coli* Readings (CARO Lab results) November-December 2018

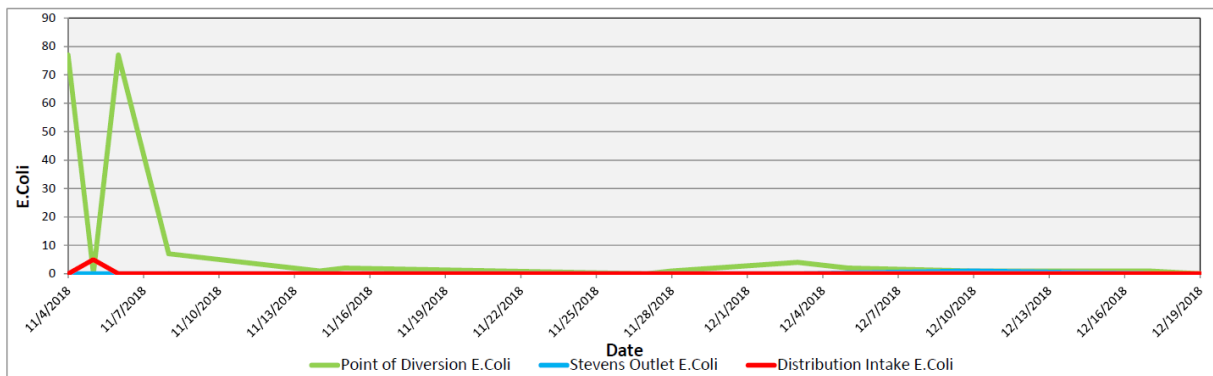


Table 2.1 - E.Coli Readings (CARO Labs)

Date	Point of Diversion E.Coli	Stevens Outlet E.Coli	Distribution Intake E.Coli
4-Nov-18	77	0	0
5-Nov-18	0		5
6-Nov-18	77	0	0
8-Nov-18	7	0	0
14-Nov-18	1		0
15-Nov-18	2	0	0
27-Nov-18	0	0	0
28-Nov-18	1		0
3-Dec-18	4	0	0
5-Dec-18	2		0
10-Dec-18	1	1	0
12-Dec-18	1		0
17-Dec-18	1	0	0
19-Dec-18	0		0

Stevens or WTP Intake (Raw) - Sampling of raw water at intake from Mission Creek

Stevens Outlet (Raw) - Sampling point after exiting 142,000 m³ 1st upper balancing reservoir (Stevens Res.)

Hadden Outlet (Raw) - Sampling point after exiting 75,000 m³ 2nd lower balancing reservoir (Hadden Res.)
(Hadden Outlet = Distribution Intake - Point of Disinfection)

3.0 RAW AND TREATED WATER TURBIDITY

Turbidity for the Mission Creek source was measured at Booster Station No. 1 on Gallagher's Road, the first-customer, through December 2018. The highest turbidity recorded at this location was 0.44 NTU on December 20 and 27. The average turbidity for the month was 0.37 NTU during December.

Figure 3.1 – Daily Turbidity Readings (Distribution Intake and Booster Station 1)

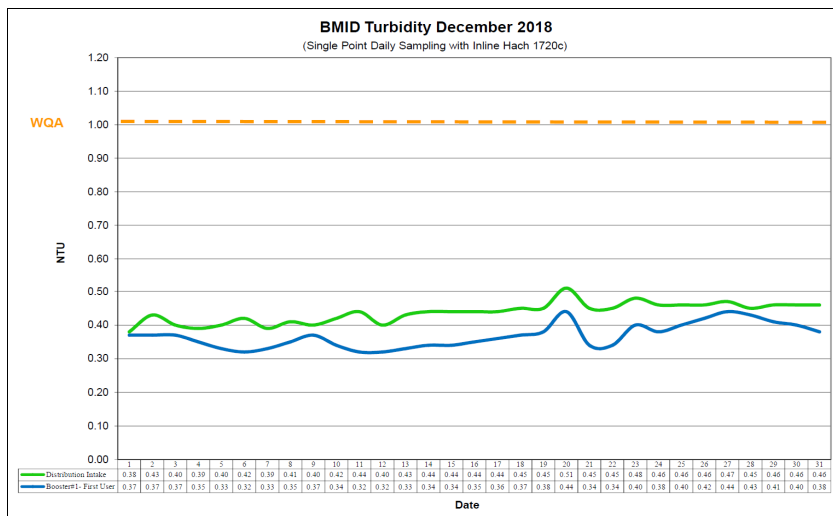


Table 3.1 - Daily Monitoring Record – Turbidity at Distribution Intake & Bst Stn 1

Turbidity Point Sampling for December 2018		
Date	Distribution Intake	Booster#1- First User
	Daily Average NTU	Daily Average NTU
1	0.38	0.37
2	0.43	0.37
3	0.40	0.37
4	0.39	0.35
5	0.40	0.33
6	0.42	0.32
7	0.39	0.33
8	0.41	0.35
9	0.40	0.37
10	0.42	0.34
11	0.44	0.32
12	0.40	0.32
13	0.43	0.33
14	0.44	0.34
15	0.44	0.34
16	0.44	0.35
17	0.44	0.36
18	0.45	0.37
19	0.45	0.38
20	0.51	0.44
21	0.45	0.34
22	0.45	0.34
23	0.48	0.40
24	0.46	0.38
25	0.46	0.40
26	0.46	0.42
27	0.47	0.44
28	0.45	0.43
29	0.46	0.41
30	0.46	0.40
31	0.46	0.38
AVG	0.44	0.37

4.0 CHLORINE CONTACT TIME

Temperature, pH, current flow and chlorine residual levels are recorded to determine the CT levels that are required to provide 3 log inactivation of *Giardia*. Chlorine Contact times exceeded the CT levels required to provide 3 log (99.9%) inactivation of *Giardia Lamblia* throughout the month of December, 2018.

Figure 4.1 - CT Trending – BMID Mission Creek Source – December 2018

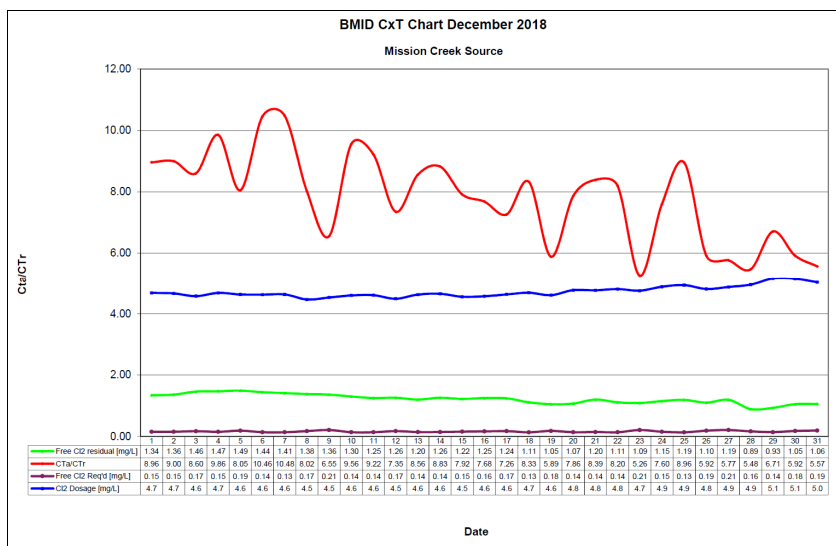


Table 4.2 - CT Table – Mission Creek Source

BMID December 2018 Mission Creek Source													
DATE	pH	TEMP	PEAK	Free Cl2	CT	CT	CTa/Ctr	Free Cl2	Cl2	VOLUME	TIME	FLOW	CL2 DOSAGE
	(highest)	Booster #1	FLOW	residual	achieved	req'd		Req'd	Dosage	TOTAL		AVERAGE	AVERAGE
December		[°C]	[USgpm]	[mg/L]				[mg/L]	[mg/L]	[USgal]	[mins]	[USGPM]	[PPD]
1	7.49	4.3	1891	1.34	1877.6	209.5	8.96	0.15	4.7	2649600	1401	1192	67
2	7.48	4.6	1955	1.36	1843.2	204.9	9.00	0.15	4.7	2649600	1355	1236	69
3	7.46	4.6	2187	1.46	1768.8	205.6	8.60	0.17	4.6	2649600	1212	1406	77
4	7.47	4.4	1887	1.47	2064.1	209.4	9.86	0.15	4.7	2649600	1404	1201	68
5	7.49	4.3	2304	1.49	1713.5	212.8	8.05	0.19	4.6	2649600	1150	1256	70
6	7.50	4.1	1693	1.44	2253.6	215.5	10.46	0.14	4.6	2649600	1565	1209	67
7	7.50	4.1	1660	1.41	2250.6	214.8	10.48	0.13	4.6	2649600	1596	1173	65
8	7.51	4.2	2137	1.38	1711.0	213.4	8.02	0.17	4.5	2649600	1240	1418	76
9	7.52	4.3	2591	1.36	1390.8	212.2	6.55	0.21	4.5	2649600	1023	1302	71
10	7.52	4.4	1722	1.30	2000.3	209.3	9.56	0.14	4.6	2649600	1539	1198	66
11	7.53	4.4	1721	1.25	1924.5	208.8	9.22	0.14	4.6	2649600	1540	1174	65
12	7.54	4.5	2179	1.26	1532.1	208.4	7.35	0.17	4.5	2649600	1216	1347	73
13	7.55	4.4	1777	1.20	1789.3	209.0	8.56	0.14	4.6	2649600	1491	1191	66
14	7.56	4.4	1790	1.26	1865.1	211.3	8.83	0.14	4.6	2649600	1480	1180	66
15	7.58	4.4	1928	1.22	1676.6	211.8	7.92	0.15	4.5	2649600	1374	1333	73
16	7.59	4.3	2007	1.25	1650.2	214.8	7.68	0.16	4.6	2649600	1320	1301	71
17	7.60	4.2	2086	1.24	1575.0	216.8	7.26	0.17	4.6	2649600	1270	1204	67
18	7.62	4.2	1644	1.11	1789.0	214.8	8.33	0.13	4.7	2649600	1612	1163	65
19	7.62	4.1	2204	1.05	1262.3	214.5	5.89	0.18	4.6	2649600	1202	1414	78
20	7.59	4.2	1706	1.07	1661.8	211.3	7.86	0.14	4.8	2649600	1553	1147	66
21	7.60	4.0	1732	1.20	1835.8	218.8	8.39	0.14	4.8	2649600	1530	1176	67
22	7.59	4.4	1712	1.11	1717.9	209.6	8.20	0.14	4.8	2649600	1548	1175	68
23	7.60	4.2	2580	1.09	1119.4	212.7	5.26	0.21	4.7	2649600	1027	1345	77
24	7.61	4.0	1838	1.15	1657.8	218.1	7.60	0.15	4.9	2649600	1442	1215	71
25	7.62	4.1	1611	1.19	1957.2	218.5	8.96	0.13	4.9	2649600	1645	1119	66
26	7.64	4.0	2249	1.10	1295.9	219.0	5.92	0.19	4.8	2649600	1178	1339	77
27	7.65	3.8	2424	1.19	1300.8	225.5	5.77	0.21	4.9	2649600	1093	1232	72
28	7.67	3.7	1967	0.89	1198.9	218.9	5.48	0.16	4.9	2649600	1347	1304	78
29	7.64	3.5	1661	0.93	1483.5	221.1	6.71	0.14	5.1	2649600	1595	1073	66
30	7.64	3.6	2101	1.05	1324.2	223.6	5.92	0.18	5.1	2649600	1261	1140	70
31	7.64	3.7	2267	1.06	1238.9	222.4	5.57	0.19	5.0	2649600	1169	1374	83
Averages	7.57	4.17	1974.55	1.22	1668.69	214.10	7.81	0.16	4.72				

5.0 WATER DISTRIBUTION SAMPLING (TREATED)

Third Party Analysis (CARO Analytical Services)

- Samples taken once per week at ten locations around the BMID service area
- 27 samples were found to be absent of Coliforms.
- 27 samples were found to be absent of *E. Coli*.

Table 5.1 - CARO Independent Lab Testing – Total Coliforms – E.Coli

Date	2921 Belgo Rd		Booster 1		Ellison Blow-Off		Ellison School		3976 Highway 97		Prospect Reservoir		Tower Reservoir		Well #4		Kirschner Res	
	Coliforms	E.coli	Coliforms	E.coli	Coliforms	E.coli	Coliforms	E.coli	Coliforms	E.coli	Coliforms	E.coli	Coliforms	E.coli	Coliforms	E.coli	Coliforms	E.coli
5-Nov-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6-Nov-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8-Nov-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15-Nov-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-Nov-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Dec-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10-Dec-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17-Dec-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 5.2 –THM and HAA Results

Date	THM Result mg/L	HAA Result mg/L
19-Nov-18	0.132	0.0852
12-Dec-18	0.0974	0.037

In-House Analysis (BMID Staff)

- Presence/Absence samples taken on a three week cycle at ten sites around the BMID service area.
- All samples were found to be absent of both Total Coliforms and *E. Coli*.

Table 5.3 - BMID In-house Testing – Presence Absence

Location	12/3/2018				12/10/2018				12/17/2018										
	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.							
Sylvania Cres	0.91	8.0	-	X	0.47	7.8	-	X	0.82	6.4	-	X							
170 Kneller Rd	0.48	9.4	-	X															
2105 Morrison				0.62	8.4	-	X												
Pearson School									0.43	8.2	-	X							
Staymen Rd																			
PRV #10											0.81	6.4	-	X					
260 Campion Rd					0.15	7.6	-	X											
Fenwick Rd																			
Solly Ct																			

- BMID Population = 25,000

RECOMMENDED TESTS

- Recommended number of samples per month = 25
(as per Guide for Canadian Drinking Water Quality)

ACTUAL TESTS

- Total tests by BMID staff (presence/absence) = 8
- Total tests sampled by BMID and tested by Caro Labs = 27
- Total tests sampled in BMID treated distribution system = 35 (Zero Positive Samples)