



MONTHLY REPORTING PERIOD - OCTOBER, 2019

1. SUMMARY

The list below provides a summary of the water quality information collected by BMID in October, 2019. Documentation and figures are provided on the following pages to support this submission.

Source	Total (US Gals)	Total (Mega Litres)
Mission Creek	77,604,592	293.73
Well 4	3,172,000	12.001
Well 5	0	0
Well 6 (Irrigation Only)	0	0
Scotty Creek (Irrigation Only)	0	0
Total	80,776,592	305.74

1. A portion of the BMID's transmission main west of the Mission Creek Intake and east of the tunnel is located on an unstable slope. Slope movement has been minimal throughout October, continuing the trend seen throughout the past 11 months. Monitoring showed a steady decline in groundwater levels in the winter and spring of 2019, but has since leveled out. The hillside is being monitored for movement and groundwater levels every month.
2. As a contingency plan for the unstable slope, BMID has 300m of flexible 900mm diameter High-density Polyethylene (HDPE) pipe on-site. The pipe has been fused into longer sections and is stored on location. Should a slope failure occur, the pipe can be assembled in a short period of time to restore significant water service;
3. Turbidity levels at the Distribution Intake peaked at 0.41 NTU on October 2nd, 3rd and 30th, 2019. Average turbidity for October was 0.37 NTU;
4. The highest monthly turbidity level recorded at the first customer (Booster #1) was 0.36 NTU on October 6th. Average monthly turbidity was 0.30 NTU for October;
5. BMID's Ultraviolet Treatment Facility treated 271,448 m³ of water, none of which was "Off-Spec". Average UV Transmissivity was 90.86%. The average inlet chlorine residual was 1.82 mg/L compared to an average of 1.58 mg/L for the outlet after UV treatment and after the BMID sodium hypochlorite top-up system;
6. BMID continued to drain Belgo Lake Reservoir throughout the month in order to repair a faulty gate used to regulate outflow from the reservoir. The faulty gate was replaced on October 23rd. As a result, Mission Creek had slightly elevated water levels originating from Belgo Lake Reservoir;
7. BMID's Scotty Creek source, used for irrigation in the north-end, was shut off for the year on September 1, 2019;
8. Well # 4 was used as the primary distribution source in the north-end of the system starting on September 1st. Well # 4 remained as the primary domestic water throughout October;
9. Well # 5 was shut-off for year on September 9th and will remain on stand-by until consumption rises in the spring of 2020;

10. Irrigation services were turned off in the first week of October. Well #6, which supplies irrigation water to the twinned north-end water system, was not used throughout October;
11. *E. Coli* levels at Mission Creek's Point-of-Diversion (creek intake prior to WTP) had normal counts throughout October with a peak (most probable number) count of 9.1 on October 2nd, 2019. At the Point-of-Diversion the average *E. Coli* count was 2.63 per sample based on the 9 samples taken throughout the last month. Of note, the method of analysis used for raw water analysis was recently changed from Membrane Filtration to Multiple Tube-Fermentation due to the high counts in previous samples;
12. *E. Coli* levels in the raw water at the distribution system intake down-stream of the WTP, prior to disinfection, had zero counts throughout October, 2019. The reduction in *E. Coli* levels is credited to the performance of the WTP and settling of particles in the water after the water treatment plant;
13. No *E. Coli* or *Total Coliforms* were found in treated water in the distribution system through third-party analysis;
14. BMID's field analysed chlorine residuals and temperatures were misplaced for the second half of the month during routine Presence/Absence sampling. However, all samples were properly incubated, and all were found to be absent of bacteria;
15. The WTP ran throughout October 2019 as water quality conditions in Mission Creek required chemical treatment to reduce turbidity and colour levels of raw water.

1.0 FLOWS - OCTOBER, 2019

Maximum Daily Flow was on October 5, 2019 at 3,964,135 US gallons (15.00 ML)

Minimum Daily Flow was on October 31, 2019 at 2,003,581 US gallons (7.58 ML)

Mission Creek provided 96% of domestic flow throughout October.

Figure 1.1 - Domestic Water System Flow

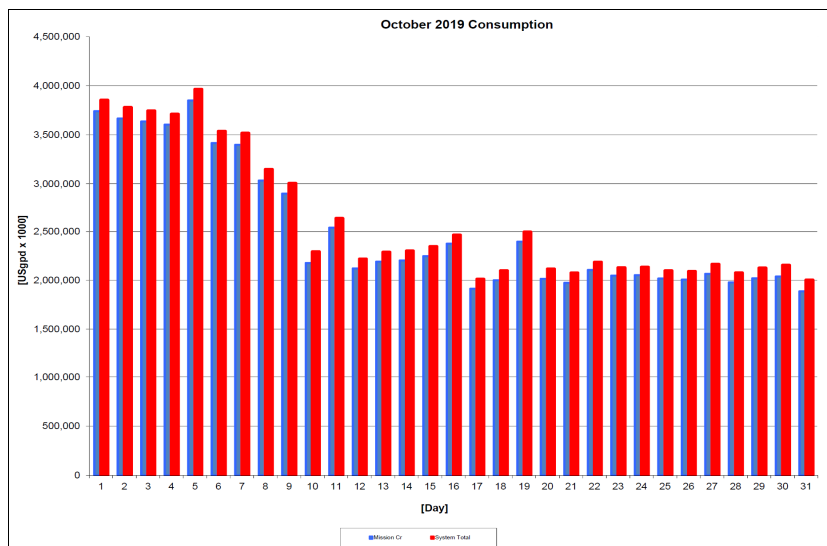


Table 1.2 - October 2019 - Daily Consumption Report

Year	Mission Cr	Well #4	Well #5	System Total	System Total
2019	Usgpd	Usgpd	Usgpd	Usgpd	ML/Day
1-Oct	3,739,729	114,000	0.0	3,853,729	14.59
2-Oct	3,665,257	114,000	0.0	3,779,257	14.30
3-Oct	3,635,735	108,000	0.0	3,743,735	14.17
4-Oct	3,602,453	108,000	0.0	3,710,453	14.04
5-Oct	3,849,135	115,000	0.0	3,964,135	15.00
6-Oct	3,415,759	120,000	0.0	3,535,759	13.38
7-Oct	3,396,762	120,000	0.0	3,516,762	13.31
8-Oct	3,032,186	115,000	0.0	3,147,186	11.91
9-Oct	2,889,447	116,000	0.0	3,005,447	11.38
10-Oct	2,177,381	116,000	0.0	2,293,381	8.68
11-Oct	2,539,747	96,000	0.0	2,635,747	9.98
12-Oct	2,121,356	98,000	0.0	2,219,356	8.40
13-Oct	2,191,152	98,000	0.0	2,289,152	8.66
14-Oct	2,203,750	98,000	0.0	2,301,750	8.71
15-Oct	2,248,416	98,000	0.0	2,346,416	8.88
16-Oct	2,375,305	89,000	0.0	2,464,305	9.33
17-Oct	1,913,217	99,000	0.0	2,012,217	7.62
18-Oct	2,000,309	99,000	0.0	2,099,309	7.95
19-Oct	2,395,979	100,000	0.0	2,495,979	9.45
20-Oct	2,014,678	102,000	0.0	2,116,678	8.01
21-Oct	1,973,688	102,000	0.0	2,075,688	7.86
22-Oct	2,106,030	81,000	0.0	2,187,030	8.28
23-Oct	2,048,296	82,000	0.0	2,130,296	8.06
24-Oct	2,052,645	82,000	0.0	2,134,645	8.08
25-Oct	2,018,503	80,000	0.0	2,098,503	7.94
26-Oct	2,007,731	84,000	0.0	2,091,731	7.92
27-Oct	2,066,131	99,000	0.0	2,165,131	8.20
28-Oct	1,978,080	99,000	0.0	2,077,080	7.86
29-Oct	2,020,773	106,000	0.0	2,126,773	8.05
30-Oct	2,038,381	117,000	0.0	2,155,381	8.16
31-Oct	1,886,581	117,000	0.0	2,003,581	7.58
Totals Usgpd	77,604,592	3,172,000	0	80,776,592	305.74
Totals ML	293.73	12.01	0.00		
Avg's	2,523,934	9.55		2,625,767	9.94
Max	3,849,135	14.57		3,964,135	15.00
Min	1,913,217	7.24		2,012,217	7.62

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 WTP lowers colour, turbidity and particle counts in the raw water. The *E.Coli* readings are consistent with the reduction in those other parameters. The *E.Coli* readings confirm the WTP's effectiveness in reducing raw water quality risks with coagulation, flocculation, and sedimentation process followed by settling times across Stevens and Hadden Reservoirs.

Figure 2.1 - Raw Water *E.Coli* Readings (CARO Lab results) September-October 2019

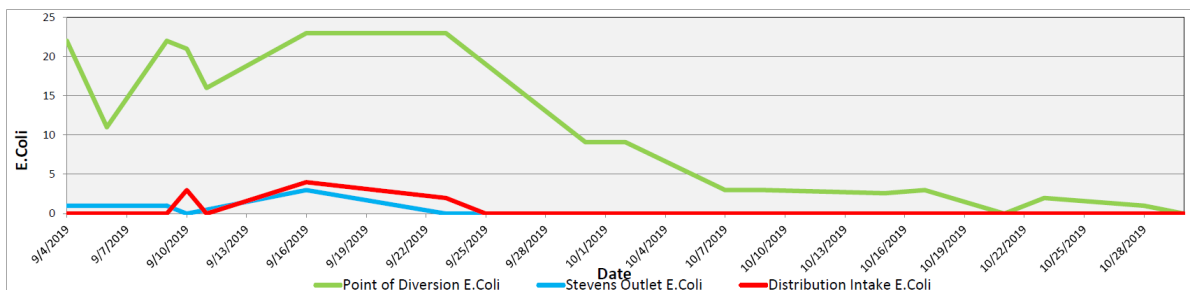


Table 2.1 - *E.Coli* Readings (CARO Labs)

Date	Point of Diversion E.Coli	Stevens Outlet E.Coli	Distribution Intake E.Coli
4-Sep-19	22	1	0
6-Sep-19	11	0	0
9-Sep-19	22	1	0
10-Sep-19	21	0	3
11-Sep-19	16	0	0
16-Sep-19	23	3	4
23-Sep-19	23	0	2
25-Sep-19			0
30-Sep-19	9.1	0	0
2-Oct-19	9.1		0
7-Oct-19	<3	0	0
9-Oct-19	<3		0
15-Oct-19	2.6	0	0
17-Oct-19	3		0
21-Oct-19	0	0	0
23-Oct-19	2		0
28-Oct-19	1	0	0
30-Oct-19	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

Through October, 2019, turbidity for the Mission Creek source was measured at Booster Station No. 1 on Gallagher’s Road, which is the approximate location of the first-customer. The highest turbidity recorded at this location was 0.36 NTU on October 6th. The average turbidity for the month was 0.30 NTU during October.

The distribution intake is where the water leaves Hadden Reservoir.

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

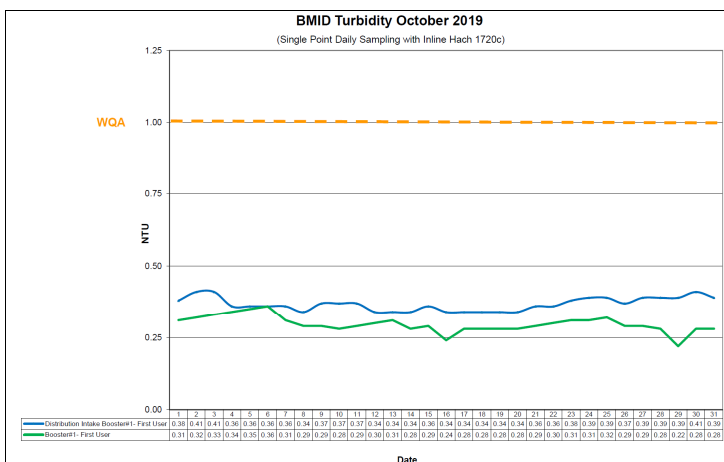


Table 3.1 - Daily Monitoring Record – Turbidity at Distribution Intake & Bst Stn 1

Turbidity Point Sampling for October 2019		
Date	Distribution Intake	Booster#1- First User
	Daily Average [NTU]	Daily Average [NTU]
1	0.38	0.31
2	0.41	0.32
3	0.41	0.33
4	0.36	0.34
5	0.36	0.35
6	0.36	0.36
7	0.36	0.31
8	0.34	0.29
9	0.37	0.29
10	0.37	0.28
11	0.37	0.29
12	0.34	0.30
13	0.34	0.31
14	0.34	0.28
15	0.36	0.29
16	0.34	0.24
17	0.34	0.28
18	0.34	0.28
19	0.34	0.28
20	0.34	0.28
21	0.36	0.29
22	0.36	0.30
23	0.38	0.31
24	0.39	0.31
25	0.39	0.32
26	0.37	0.29
27	0.39	0.29
28	0.39	0.28
29	0.39	0.22
30	0.41	0.28
31	0.39	0.28
Average	0.37	0.30

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 October, 2019.

Figure 4.1 - CT Trending – BMID Mission Creek Source – October 2019

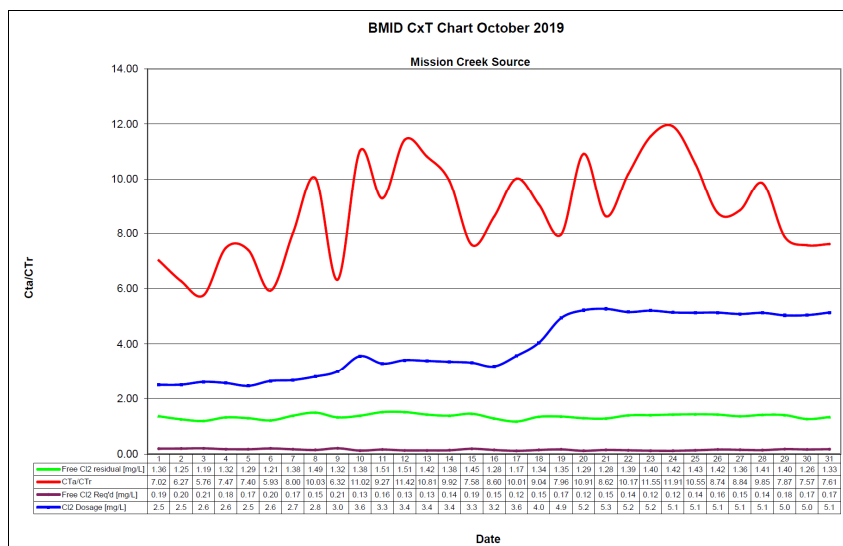


Table 4.2 - CT Table – Mission Creek Source

BMID October 2019 Mission Creek Source													
DATE	pH	TEMP	PEAK	Free Cl ₂	CT	CT	CTa/CTr	Free Cl ₂	Cl ₂	VOLUME	TIME	FLOW	CL ₂ DOSAGE
	(Average)	(Present)	FLOW	residual	achieved	req'd		Req'd	Dosage	TOTAL	[mins]	Daily Average	Average
October		[°C]	[Usgpm]	[mg/L]				[mg/L]	[mg/L]	[USgal]		[USGPM]	[PPD]
1	7.27	11.5	4365	1.36	825.5	117.6	7.02	0.19	2.5	2649600	607	2592	78
2	7.28	11.4	4501	1.25	735.8	117.4	6.27	0.20	2.5	2649600	589	2558	77
3	7.25	11.7	4851	1.19	650.0	112.8	5.76	0.21	2.6	2649600	546	2519	79
4	7.23	11.3	4003	1.32	873.7	117.0	7.47	0.18	2.6	2649600	662	2504	77
5	7.25	11.5	3991	1.29	856.4	115.8	7.40	0.17	2.5	2649600	664	2675	79
6	7.26	11.1	4569	1.21	701.7	118.4	5.93	0.20	2.6	2649600	580	2379	75
7	7.27	11.4	3849	1.38	950.0	118.7	8.00	0.17	2.7	2649600	688	2362	76
8	7.27	10.3	3038	1.49	1299.5	129.6	10.03	0.15	2.8	2649600	872	2109	71
9	7.28	10.3	4333	1.32	807.2	127.7	6.32	0.21	3.0	2649600	611	2011	72
10	7.29	11.1	2718	1.38	1345.3	122.1	11.02	0.13	3.6	2649600	975	1508	64
11	7.25	10.3	3348	1.51	1195.0	128.9	9.27	0.16	3.3	2649600	791	1772	70
12	7.30	9.3	2489	1.51	1607.4	140.7	11.42	0.13	3.4	2649600	1065	1472	60
13	7.31	9.8	2575	1.42	1461.1	135.1	10.81	0.13	3.4	2649600	1029	1518	62
14	7.32	9.0	2581	1.38	1416.7	142.8	9.92	0.14	3.4	2649600	1027	1542	62
15	7.33	9.6	3659	1.45	1050.0	138.5	7.58	0.19	3.3	2649600	724	1558	62
16	7.35	9.7	2900	1.28	1169.5	136.0	8.60	0.15	3.2	2649600	914	1653	63
17	7.30	9.3	2288	1.17	1354.9	135.4	10.01	0.12	3.6	2649600	1158	1326	57
18	7.32	9.5	2859	1.34	1241.9	137.3	9.04	0.15	4.0	2649600	927	1394	68
19	7.34	9.1	3156	1.35	1133.4	142.4	7.96	0.17	4.9	2649600	840	1662	99
20	7.35	9.1	2208	1.29	1548.0	141.9	10.91	0.12	5.2	2649600	1200	1403	88
21	7.36	8.8	2709	1.28	1251.9	145.3	8.62	0.15	5.3	2649600	978	1369	87
22	7.36	8.9	2479	1.39	1485.7	146.0	10.17	0.14	5.2	2649600	1069	1464	91
23	7.37	8.7	2159	1.40	1718.1	148.8	11.55	0.12	5.2	2649600	1227	1423	89
24	7.37	9.4	2224	1.42	1691.7	142.0	11.91	0.12	5.1	2649600	1191	1428	88
25	7.38	8.6	2381	1.43	1591.3	150.9	10.55	0.14	5.1	2649600	1113	1405	87
26	7.38	8.9	2917	1.42	1289.8	147.6	8.74	0.16	5.1	2649600	908	1394	86
27	7.39	8.9	2771	1.36	1300.4	149.2	8.84	0.15	5.1	2649600	956	1441	88
28	7.39	7.8	2376	1.41	1572.4	159.7	9.85	0.14	5.1	2649600	1115	1374	85
29	7.40	7.2	2824	1.40	1313.5	166.9	7.87	0.18	5.0	2649600	938	1408	85
30	7.41	6.9	2620	1.26	1274.2	168.4	7.57	0.17	5.0	2649600	1011	1413	86
31	7.43	6.9	2708	1.33	1301.3	171.0	7.61	0.17	5.1	2649600	978	1312	81
Averages	7.32	9.59	3111	1.35	1226.24	137.73	8.84	0.16	3.92				

5.0 ULTRAVIOLET DISINFECTION

Total Water Treated: 271,448 m³ 100.000 %
 On-Spec Water: 271,448 m³ 100.000 %
 Off-Spec Water: 0 m³ 0.000%

Average monthly chlorine residual before UV Treatment was 1.82 mg/L
 The average monthly chlorine residual after UV treatment and re-chlorination was 1.58 mg/L.

Figure 5.1 - UV Disinfection – BMID Mission Creek Source – October 2019

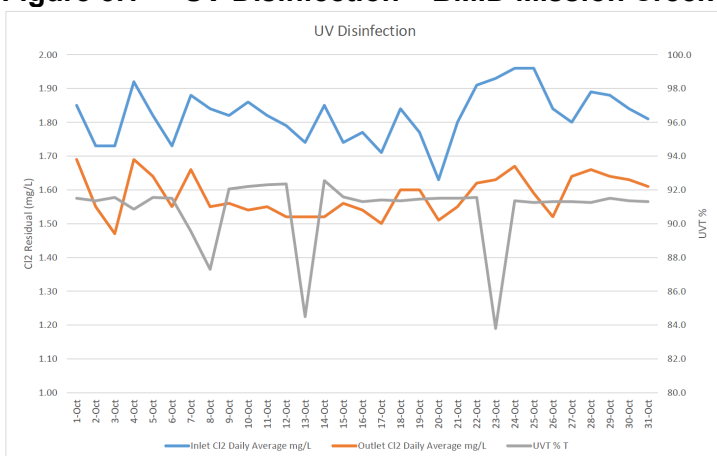


Table 5.2 - UV Disinfection Table – Mission Creek Source

Date	Inlet Cl2	Outlet Cl2	UVT	In Spec Water	Off Spec	Off Spec %
	Daily	Daily		Volume	Water	of Water
	mg/L	mg/L	% T	Cubic Meters	Cubic Meters	Percentage
1-Oct	1.85	1.69	91.5	12,254	0	0.00%
2-Oct	1.73	1.55	91.4	10,897	0	0.00%
3-Oct	1.73	1.47	91.6	10,850	0	0.00%
4-Oct	1.92	1.69	90.9	10,859	0	0.00%
5-Oct	1.82	1.64	91.6	10,965	0	0.00%
6-Oct	1.73	1.55	91.5	10,970	0	0.00%
7-Oct	1.88	1.66	89.5	10,509	0	0.00%
8-Oct	1.84	1.55	87.3	10,517	0	0.00%
9-Oct	1.82	1.56	92.1	10,088	0	0.00%
10-Oct	1.86	1.54	92.2	10,093	0	0.00%
11-Oct	1.82	1.55	92.3	9,654	0	0.00%
12-Oct	1.79	1.52	92.4	9,657	0	0.00%
13-Oct	1.74	1.52	84.5	8,274	0	0.00%
14-Oct	1.85	1.52	92.6	10,029	0	0.00%
15-Oct	1.74	1.56	91.6	8,130	0	0.00%
16-Oct	1.77	1.54	91.3	9,018	0	0.00%
17-Oct	1.71	1.50	91.4	7,245	0	0.00%
18-Oct	1.84	1.60	91.4	7,631	0	0.00%
19-Oct	1.77	1.60	91.5	9,073	0	0.00%
20-Oct	1.63	1.51	91.5	7,636	0	0.00%
21-Oct	1.80	1.55	91.5	7,493	0	0.00%
22-Oct	1.91	1.62	91.6	7,996	0	0.00%
23-Oct	1.93	1.63	83.8	7,780	0	0.00%
24-Oct	1.96	1.67	91.4	7,789	0	0.00%
25-Oct	1.96	1.59	91.3	7,681	0	0.00%
26-Oct	1.84	1.52	91.3	7,593	0	0.00%
27-Oct	1.80	1.64	91.3	7,859	0	0.00%
28-Oct	1.89	1.66	91.3	7,516	0	0.00%
29-Oct	1.88	1.64	91.5	7,670	0	0.00%
30-Oct	1.84	1.63	91.4	7,724	0	0.00%
31-Oct	1.81	1.61	91.3	7,184	0	0.00%
Average	1.82	1.58	90.86	271,448.00	0	0.000%

6.0 WATER DISTRIBUTION SAMPLING (TREATED)

Third Party Analysis (CARO Analytical Services)

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

Table 6.1 - CARO Independent Lab Testing – Total Coliforms – E.Coli

Date	2921 Belgo Rd		Booster 1		Elison Blow-Off		Elison School		3976 Highway 97		Prospect Reservoir		Tower Reservoir		Well #4		Kirschner Res		Pearson School	
	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	Coliforms	E.coli
3-Sep-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	0	0	0	0
9-Sep-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6-Sep-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-Sep-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7-Oct-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15-Oct-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21-Oct-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-Oct-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 6.3 – Disinfection By-Products - THM and HAA Results

7-Oct-19		
Location	THM	HAA
Kirschner Reservoir		0.0896
2921 Belgo Rd	0.0962	
Pearson School	0.0814	0.0636
3976 Highway 97	0.0819	

In-House Analysis (BMID Staff)

- Presence/Absence samples taken on a three-week cycle at seven sites around the BMID service area.
- All 9 samples were found to be absent of both Total Coliforms and *E. Coli*.

Table 6.4 - BMID In-house Testing – Presence Absence

Location	10/7/2019				10/15/2019				10/21/2019				10/28/2019			
	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.
Sylvania Cres									NA	NA	-	X				
170 Kneller Rd									NA	NA	-	X				
2105 Morrison	0.63	16.2	-	X									NA	NA	-	X
Staymen Rd	0.39	15.6	-	X									NA	NA	-	X
260 Campion Rd					0.30	14.4	-	X								
Fenwick Rd					0.06	10.2	-	X								
Solly Ct									NA	NA	-	X				

- 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) = 9
- Total tests sampled by BMID and tested by Caro Labs = 40
- Total tests sampled in BMID treated distribution system = 49 (Zero Positive Samples)