



MONTHLY REPORTING PERIOD - SEPTEMBER, 2019

1. SUMMARY

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

Source	Total (US Gals)	Total (Mega Litres)
Mission Creek	240,380,583	909.84
Well 4	5,446,788	20.62
Well 5	7,752,596	29.34
Well 6 (Irrigation Only)	0	0
Scotty Creek (Irrigation Only)	0	0
Total	253,579,967	959.80

1. A portion of the BMID's transmission main west of the Mission Creek Intake and east of the tunnel is located on silty slope that over the past two years, has been unstable. Slope movement has been minimal throughout September, continuing the trend seen in the previous months. Groundwater monitoring is showing a steady decline in groundwater levels since the fall of 2018. The hillside is being monitored for surface 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 0.60 NTU on September 21, 2019. Average turbidity for September was 0.36 NTU;
4. The highest monthly turbidity level recorded at the first customer (Booster #1) was 0.35 NTU on September 20. Average monthly turbidity was 0.27 NTU for September;
5. BMID's Ultraviolet Treatment Facility treated 829,848m³ of water, with only 0.112% being "Off-Spec". Average UV Transmissivity was 90.44%. The average inlet chlorine residual was 1.56 mg/L compared to an average of 1.52 mg/L for the outlet after UV treatment (from BMID sodium hypochlorite top-up system);
6. Mission Creek had average natural flows for late summer during September. BMID drained Belgo Lake Reservoir throughout the month in order to repair a faulty gate used to regulate releases from the reservoir. 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 will remained as the primary domestic water throughout September;

9. Well # 5 was the primary source of irrigation water for the north-end between September 1st and September 9th after which the well was turned off for the year. Well #5 was also used in conjunction with Well # 4 to supply domestic water to the north-end;
10. Well #6, which supplies irrigation water to the twinned north-end of the system, was not used throughout September;
11. *E.Coli* levels at Mission Creek's Point of Diversion (creek intake prior to WTP) had normal counts throughout September with a peak (most probable number) count of 23 on September 16 and 23, 2019. The Point of Diversion had an average *E.Coli* count of 18.4 per sample based on the 8 samples taken throughout the last month. Of note, the method of analysis used on for this location was 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 low counts throughout most of September, 2019 with a peak counts of 4 *E-Coli* on September 16. Average *E.Coli* counts for the month was less than 1 CFU/100ml based of the 9 samples taken. 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* or were found in treated water in the distribution system through third-party analysis;
14. The WTP ran throughout September 2019 as water quality conditions in Mission Creek required chemical treatment to reduce turbidity and colour levels associated with raw water quality in the late summer.

1.0 FLOWS - SEPTEMBER, 2019

Maximum Daily Flow was on September 3, 2019 at 20,860,402 US gallons (78.96 ML)

Minimum Daily Flow was on September 29, 2019 at 3,622,875 US gallons (13.71 ML)

Mission Creek provided 95% of domestic flow throughout September.

Figure 1.1 - Domestic Water System Flow

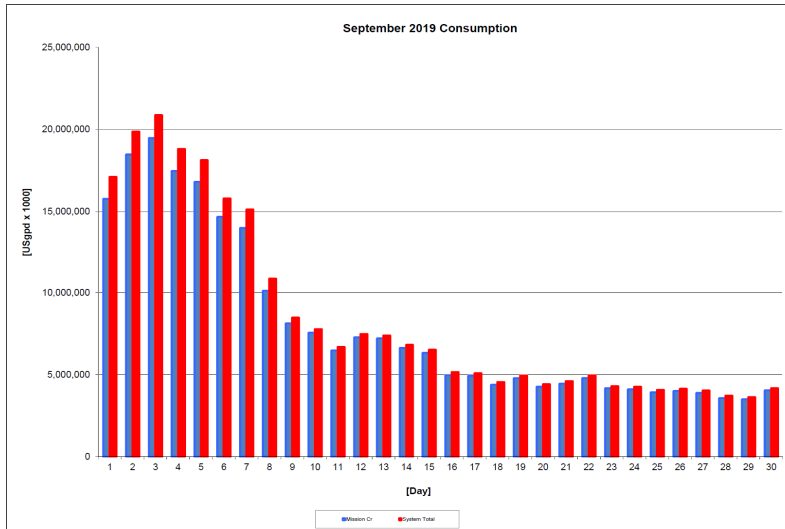


Table 1.2 - September 2019 - Daily Consumption Report

Year	Mission Cr	Well #4	Well #5	Well #6	Scotty Crk	System Total	System Total
2019	Usgpd	Usgpd	Usgpd	Usgpd	Usgpd	Usgpd	ML/Day
1-Sep	15,779,340	324,000	998,844.0	0.0	0.0	17,102,184	64.73
2-Sep	18,479,250	382,000	998,733.0	0.0	0.0	19,859,983	75.17
3-Sep	19,478,971	382,000	999,431.0	0.0	0.0	20,860,402	78.96
4-Sep	17,476,582	330,000	998,990.0	0.0	0.0	18,805,572	71.18
5-Sep	16,809,660	314,000	998,716.0	0.0	0.0	18,122,376	68.59
6-Sep	14,690,335	104,652	999,758.0	0.0	0.0	15,794,745	59.78
7-Sep	14,015,462	107,568	999,273.0	0.0	0.0	15,122,303	57.24
8-Sep	10,131,806	107,568	618,033.0	0.0	0.0	10,857,407	41.10
9-Sep	8,134,913	196,000	140,818.0	0.0	0.0	8,471,731	32.07
10-Sep	7,573,657	200,000	0.0	0.0	0.0	7,773,657	29.42
11-Sep	6,483,047	200,000	0.0	0.0	0.0	6,683,047	25.30
12-Sep	7,292,283	182,000	0.0	0.0	0.0	7,474,283	28.29
13-Sep	7,216,796	166,000	0.0	0.0	0.0	7,382,796	27.94
14-Sep	6,635,504	181,000	0.0	0.0	0.0	6,816,504	25.80
15-Sep	6,337,191	178,000	0.0	0.0	0.0	6,515,191	24.66
16-Sep	4,975,348	178,000	0.0	0.0	0.0	5,153,348	19.51
17-Sep	4,937,917	145,000	0.0	0.0	0.0	5,082,917	19.24
18-Sep	4,394,705	151,000	0.0	0.0	0.0	4,545,705	17.21
19-Sep	4,789,824	151,000	0.0	0.0	0.0	4,940,824	18.70
20-Sep	4,268,511	144,000	0.0	0.0	0.0	4,412,511	16.70
21-Sep	4,457,372	140,000	0.0	0.0	0.0	4,597,372	17.40
22-Sep	4,796,280	156,000	0.0	0.0	0.0	4,952,280	18.74
23-Sep	4,174,395	116,000	0.0	0.0	0.0	4,290,395	16.24
24-Sep	4,112,844	140,000	0.0	0.0	0.0	4,252,844	16.10
25-Sep	3,921,188	140,000	0.0	0.0	0.0	4,061,188	15.37
26-Sep	4,005,050	123,000	0.0	0.0	0.0	4,128,050	15.62
27-Sep	3,890,700	134,000	0.0	0.0	0.0	4,024,700	15.23
28-Sep	3,573,755	134,000	0.0	0.0	0.0	3,707,755	14.03
29-Sep	3,502,875	120,000	0.0	0.0	0.0	3,622,875	13.71
30-Sep	4,045,022	120,000	0.0	0.0	0.0	4,165,022	15.76
Totals Usgpd	240,380,583	5,446,788	7,752,596	0	0	253,579,967	959.80
Totals ML	909.84	20.62	29.34	0.00	0.00		
Avg's	8,012,686	30.33				8,452,666	31.99
Max	19,478,971	73.73				20,860,402	78.96
Min	3,502,875	13.26				3,622,875	13.71

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) August-September 2019

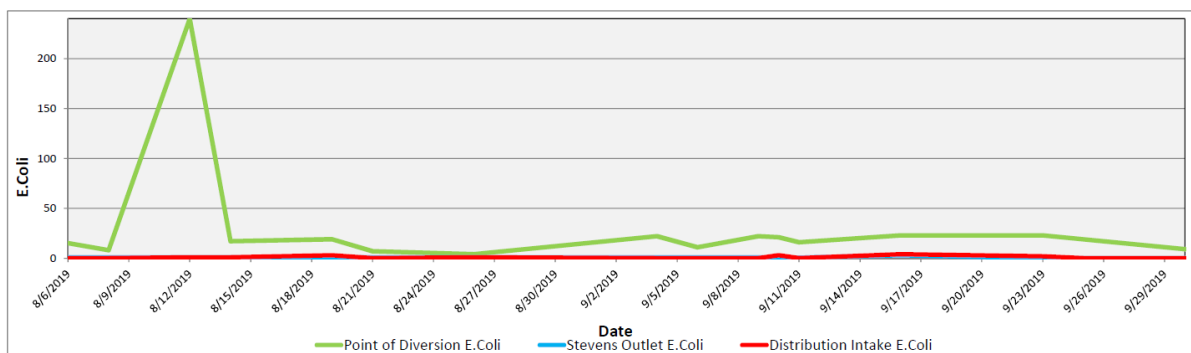


Table 2.1 - *E. Coli* Readings (CARO Labs)

Date	Point of Diversion E. Coli	Stevens Outlet E. Coli	Distribution Intake E. Coli
6-Aug-19	15	1	0
8-Aug-19	8	1	0
12-Aug-19	240	1	1
14-Aug-19	17	1	1
19-Aug-19	19	1	3
21-Aug-19	7	1	0
26-Aug-19	4	1	1
4-Sep-19	22	1	0
6-Sep-19	11	1	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	9.1	0	0
30-Sep-19	9.1	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 September, 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 0.35 NTU on September 20. The average turbidity for the month was 0.27 NTU during September.

The distribution intake is where the water leaves Hadden Reservoir.

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

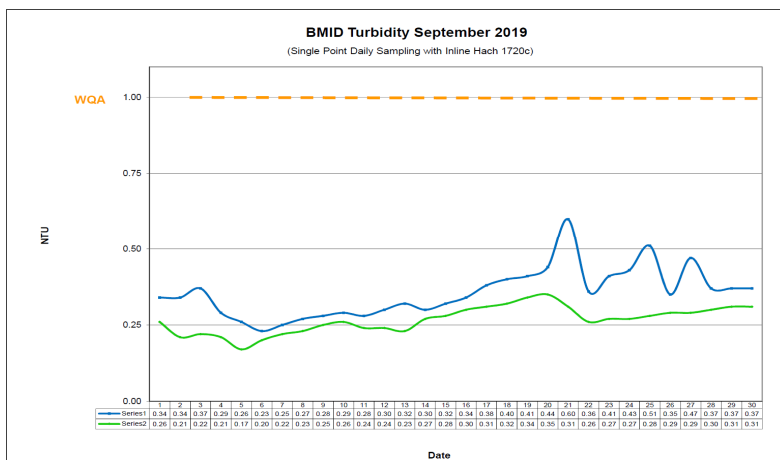


Table 3.1 - Daily Monitoring Record – Turbidity at Distribution Intake & Bst Stn 1

Turbidity Point Sampling for September 2019		
Date	Distribution Intake Daily Average [NTU]	Booster#1- First User Daily Average [NTU]
1	0.34	0.26
2	0.34	0.21
3	0.37	0.22
4	0.29	0.21
5	0.26	0.17
6	0.23	0.20
7	0.25	0.22
8	0.27	0.23
9	0.28	0.25
10	0.29	0.26
11	0.28	0.24
12	0.30	0.24
13	0.32	0.23
14	0.30	0.27
15	0.32	0.28
16	0.34	0.30
17	0.38	0.31
18	0.40	0.32
19	0.41	0.34
20	0.44	0.35
21	0.60	0.31
22	0.36	0.26
23	0.41	0.27
24	0.43	0.27
25	0.51	0.28
26	0.35	0.29
27	0.47	0.29
28	0.37	0.30
29	0.37	0.31
30	0.37	0.31
Average	0.36	0.27

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 September, 2019.

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

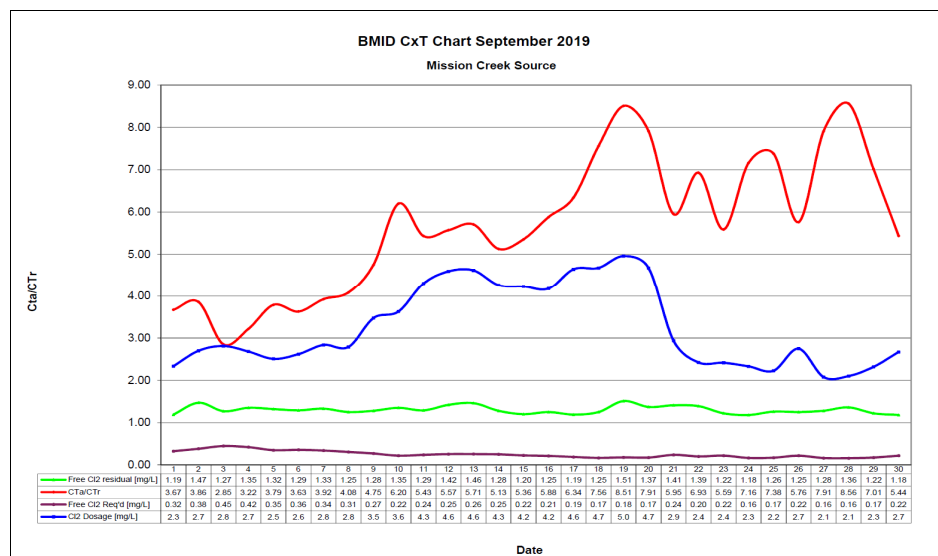


Table 4.2 - CT Table – Mission Creek Source

BMID September 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
September	(Average)	(Present)	FLOW	residual	achieved	req'd		Req'd	Dosage	TOTAL	[mins]	Daily Average	Average
		[°C]	[USgpm]	[mg/L]				[mg/L]	[mg/L]	[USgal]		[USGPM]	[PPD]
1	7.25	20.2	13725	1.19	229.7	62.6	3.67	0.32	2.3	2649600	193	18474	518
2	7.25	19.9	15310	1.47	254.4	66.0	3.86	0.38	2.7	2649600	173	18333	594
3	7.25	18.9	17068	1.27	197.2	69.2	2.85	0.45	2.8	2649600	155	19348	654
4	7.24	18.9	15985	1.35	223.8	69.5	3.22	0.42	2.7	2649600	166	19479	628
5	7.26	19.4	13691	1.32	255.5	67.4	3.79	0.35	2.5	2649600	194	17477	527
6	7.22	19.2	14028	1.29	243.7	67.1	3.63	0.36	2.6	2649600	189	16810	529
7	7.25	18.8	12810	1.33	275.1	70.1	3.92	0.34	2.8	2649600	207	14690	501
8	7.26	18.8	11631	1.25	284.8	69.7	4.08	0.31	2.8	2649600	228	14015	470
9	7.23	18.0	9756	1.28	347.6	73.2	4.75	0.27	3.5	2649600	272	10132	423
10	7.26	17.9	7684	1.35	465.5	75.1	6.20	0.22	3.6	2649600	345	8135	355
11	7.26	17.6	8260	1.29	413.8	76.1	5.43	0.24	4.3	2649600	321	7574	392
12	7.29	17.3	8467	1.42	444.4	79.7	5.57	0.25	4.6	2649600	313	7259	401
13	7.32	17.2	8318	1.46	465.1	81.5	5.71	0.26	4.6	2649600	319	7292	405
14	7.33	17.0	8127	1.28	417.3	81.4	5.13	0.25	4.3	2649600	326	7217	370
15	7.31	16.7	7269	1.20	437.4	81.7	5.36	0.22	4.2	2649600	365	6636	337
16	7.33	16.2	6572	1.25	504.0	85.7	5.88	0.21	4.2	2649600	403	6337	318
17	7.34	15.9	5703	1.19	552.9	87.2	6.34	0.19	4.6	2649600	465	4975	278
18	7.30	16.1	5134	1.25	645.1	85.3	7.56	0.17	4.7	2649600	516	4938	278
19	7.31	16.1	5337	1.51	749.7	88.1	8.51	0.18	5.0	2649600	496	4750	283
20	7.34	16.1	5226	1.37	694.6	87.8	7.91	0.17	4.7	2649600	507	4790	269
21	7.33	15.1	6664	1.41	560.6	94.2	5.95	0.24	2.9	2649600	398	4437	157
22	7.33	15.2	5695	1.39	646.7	93.3	6.93	0.20	2.4	2649600	465	4775	139
23	7.33	14.9	6189	1.22	522.3	93.4	5.59	0.22	2.4	2649600	428	4796	139
24	7.31	14.4	4570	1.18	684.1	95.5	7.16	0.16	2.3	2649600	580	4174	117
25	7.32	14.0	4544	1.26	734.7	99.6	7.38	0.17	2.2	2649600	583	4113	110
26	7.35	14.0	5715	1.25	579.5	100.6	5.76	0.22	2.7	2649600	464	3976	131
27	7.33	13.3	4078	1.28	831.7	105.2	7.91	0.16	2.1	2649600	650	4005	100
28	7.32	13.0	3899	1.36	924.2	107.9	8.56	0.16	2.1	2649600	680	3891	98
29	7.29	12.6	4269	1.22	757.2	108.0	7.01	0.17	2.3	2649600	621	3574	100
30	7.27	12.1	5205	1.18	600.7	110.4	5.44	0.22	2.7	2649600	509	4029	129
Averages	7.29	16.49	8364	1.30	498.1	84.4	5.70	0.25	3.26				

5.0 ULTRAVIOLET DISINFECTION

Total Water Treated: 829,848 m³ 100.000 %
On-Spec Water: 828,922.6 m³ 99.888 %
Off-Spec Water: 925.4 m³ 0.112%

Average monthly chlorine residual before UV Treatment was 1.56 mg/L compared to 1.52 mg/L after UV disinfection and re-chlorination.

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

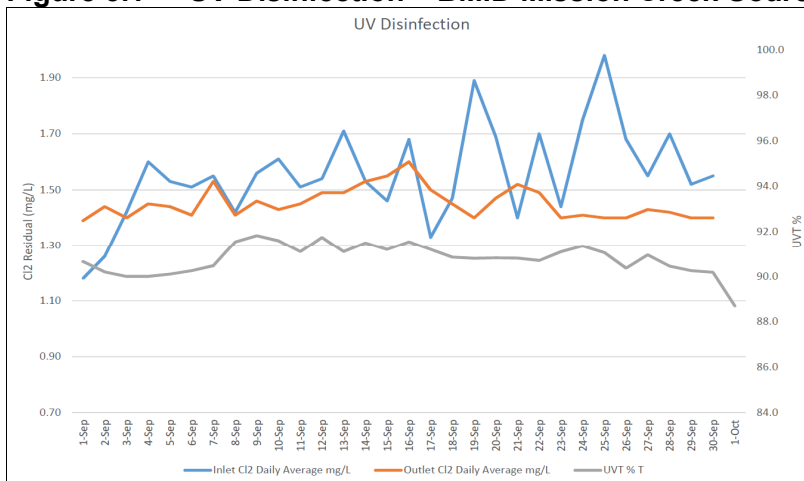


Table 5.2 - UV Disinfection Table – Mission Creek Source

Date	Inlet Cl2 Daily mg/L	Outlet Cl2 Daily mg/L	UVT % T		In Spec Water Volume Cubic Meters	Off Spec Water Cubic Meters	Off Spec % of Water Percentage
1-Sep	1.18	1.40	87.1		60,508	0	0.00%
2-Sep	1.26	1.40	89.4		62,369	0	0.00%
3-Sep	1.42	1.41	88.7		64,421	463	0.00%
4-Sep	1.60	1.51	88.5		64,423	463	0.00%
5-Sep	1.53	1.47	88.5		58,946	0	0.00%
6-Sep	1.51	1.46	89.1		54,338	0	0.00%
7-Sep	1.55	1.50	89.3		48,064	0	0.00%
8-Sep	1.42	1.40	88.3		46,586	0	0.00%
9-Sep	1.56	1.51	89.4		31,772	0	0.00%
10-Sep	1.61	1.57	89.6		25,658	0	0.14%
11-Sep	1.51	1.47	90.0		23,702	0	0.14%
12-Sep	1.54	1.61	90.3		22,723	0	0.85%
13-Sep	1.71	1.73	90.7		22,724	0	0.86%
14-Sep	1.53	1.52	90.1		22,391	0	0.00%
15-Sep	1.46	1.49	90.4		19,848	0	1.68%
16-Sep	1.68	1.60	90.4		19,565	0	1.40%
17-Sep	1.33	1.50	90.5		14,829	0	0.00%
18-Sep	1.47	1.50	91.2		14,207	0	0.00%
19-Sep	1.89	1.72	90.3		14,173	0	0.00%
20-Sep	1.69	1.56	91.8		14,174	0	0.00%
21-Sep	1.40	1.49	90.2		13,453	0	0.01%
22-Sep	1.70	1.60	91.8		14,240	0	0.01%
23-Sep	1.44	1.50	92.7		14,240	0	0.00%
24-Sep	1.75	1.51	92.4		12,291	0	0.00%
25-Sep	1.98	1.61	92.4		12,291	0	0.00%
26-Sep	1.68	1.53	92.5		11,308	0	0.00%
27-Sep	1.55	1.50	92.5		11,611	0	0.00%
28-Sep	1.70	1.54	91.3		11,611	0	0.00%
29-Sep	1.52	1.51	92.5		10,209	0	0.00%
30-Sep	1.55	1.51	92.0		12,249	0	0.00%
Average	1.56	1.52	90.44	Total	828,922.60	925.4	0.112%

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 #5		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	Coliforms	E. coli
6-Aug-19	0	0	0	0	0	0	40	0	0	0	0	0	0	0	0	0	-	-	0	0	0	0
12-Aug-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	0	0	0	0
19-Aug-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	0	0	0	0
26-Aug-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	0	0	0	0
3-Sep-19	0	0	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	0
6-Sep-19	0	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	0

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

3-Sep-19		
Location	THM	HAA
Kirschner Reservoir		0.0745
2921 Belgo Rd	0.0857	
Pearson School	0.0844	0.053
3976 Highway 97	0.0886	

In-House Analysis (BMID Staff)

- Presence/Absence samples taken on a three week cycle at seven sites around the BMID service area.
- All 10 samples were found to be absent of both Total Coliforms and *E. Coli*.

Table 6.4 - BMID In-house Testing – Presence Absence

Location	9/4/2019				9/9/2019				9/16/2019				9/23/2019				9/30/2019			
	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.
Sylvania Cres					0.74	19.8	-	X									0.70	17.6	-	X
170 Kneller Rd					0.74	21.4	-	X									0.70	16.6	-	X
2105 Morrison Staymen Rd									0.51	20.6	-	X								
260 Campion Rd	0.20	21.4	-	X					0.46	19.0	-	X								
Fenwick Rd	0.57	24.0	-	X									0.21	17.4	-	X				
Solly Ct					0.79	19.6	-	X					0.36	21.4	-	X				
																	0.77	15.2	-	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) = 12
- Total tests sampled by BMID and tested by Caro Labs = 40
- Total tests sampled in BMID treated distribution system = 52 (Zero Positive Samples)