



MONTHLY REPORTING PERIOD - APRIL, 2020

1. SUMMARY

The list below provides a summary of the water quality information collected by BMID in April, 2020. Documentation and figures are provided on the following pages to support this submission.

Source	Total (US Gals)	Total (Mega Litres)
Mission Creek	135,726,233	513.72
Well 4	2,595,000	9.82
Well 5	11,022,608	41.72
Well 6 (Irrigation Only)	0	0
Scotty Creek (Irrigation Only)	0	0
Total	149,344,767	565.27

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 over the past 12 months. Monitoring showed a slight increase in the groundwater levels but this is to be expected as the snow accumulation continued to melt. The hillside is being monitored for surface movement on a monthly basis and groundwater levels as required.
2. The Water Treatment Plant resumed full-time operations on April 9, 2020 as a result of high turbidity in Mission Creek. It is expected that the WTP will continue to run until raw water quality improves in late fall or early winter;
3. Raw water turbidity levels in Mission Creek peaked at 22.45 NTU on April 24, 2020. Turbidity levels at the Distribution Intake (end of Hadden Reservoir) peaked at 0.68 NTU on April 9 and 10, 2020. Average turbidity for April was 0.62 NTU at the Distribution Intake;
4. The highest recorded monthly turbidity level at the first customer (Booster #1) using single point analysis was 0.86 NTU on April 16. However, there were short durations when, BMID's on-line analysers peaked at over 1 NTU during the period of May 16 to May 20. This was caused by increased flows during peak hours stirring up the settled particles in the water main. Moreover, there were periods where the turbidity levels were well below 1 NTU throughout the event. Average monthly turbidity at the first customer was 0.56 NTU for April;
5. BMID's Ultraviolet Treatment Facility treated 490,402.6 m³ of water of which only 548.2 m³ was "Off-Spec". Average UV Transmissivity was 86.5%. The average inlet chlorine residual level at the UV site was 1.50 mg/L. The average outgoing chlorine was 1.57 mg/L after the sodium hypochlorite top-up system;
6. BMID's Scotty Creek source, used for irrigation in the north-end, was shut off for the year in September, 2019. BMID crews are undertaking a change in the disinfection system from chlorine gas to hypochlorite as a way to reduce any potential safety concerns associated with chlorine gas;
7. Well # 4 was used as the primary domestic water source in the north-end of the system starting on September 1, 2019. Well # 4 provided domestic water for early April until

- consumption increased later in the month. Well #4 was shut off for the season on April 22, 2020;
8. Well #5 resumed operation on April 14 as both irrigation and domestic consumption in the north-end of the system increased. Well #5 is expected to supply domestic water to the north-end until flows reduce later in the fall;
 9. Well #6, which supplies irrigation water to the dual north-end water distribution systems was not used throughout April;
 10. *E.Coli* levels at Mission Creek's Point-of-Diversion (creek intake prior to WTP) had low counts throughout April with a peak count of 7.4 on April 29, 2020. The average *E.Coli* count was 2.76 for April;
 11. *E.Coli* levels in the raw water at the water distribution system intake down-stream of the WTP, immediately prior to disinfection, had low counts on all samples. The peak *E.Coli* count for the month was 7.5 on April 22 with a monthly average of 1.16 per sample. The reduction in *E.Coli* levels is credited to the settling of particles in the water in Stevens and Hadden Reservoirs;
 12. No *E.Coli* or *Total Coliforms* were found in treated water in the distribution system through third-party analysis. In addition, no positive samples were detected by BMID's in-house presence/absence testing;
 13. Disinfection by-products (Haloacetic acids and Trihalomethanes) were both above the recommended levels throughout the month. This is likely due to the delayed start date of the WTP which was about a month later than previous years. The WTP has proven to be effective in lowering the True Colour levels in the treated water;

1.0 FLOWS - APRIL, 2020

The Maximum Daily Flow was on April 29, at 9,452,714 US gallons (37.78 ML)

The Minimum Daily Flow was on April 3, at 2,070,566 US gallons (7.84 ML)

Mission Creek provided 91% of domestic flow throughout April.

Figure 1.1 - Domestic Water System Flow

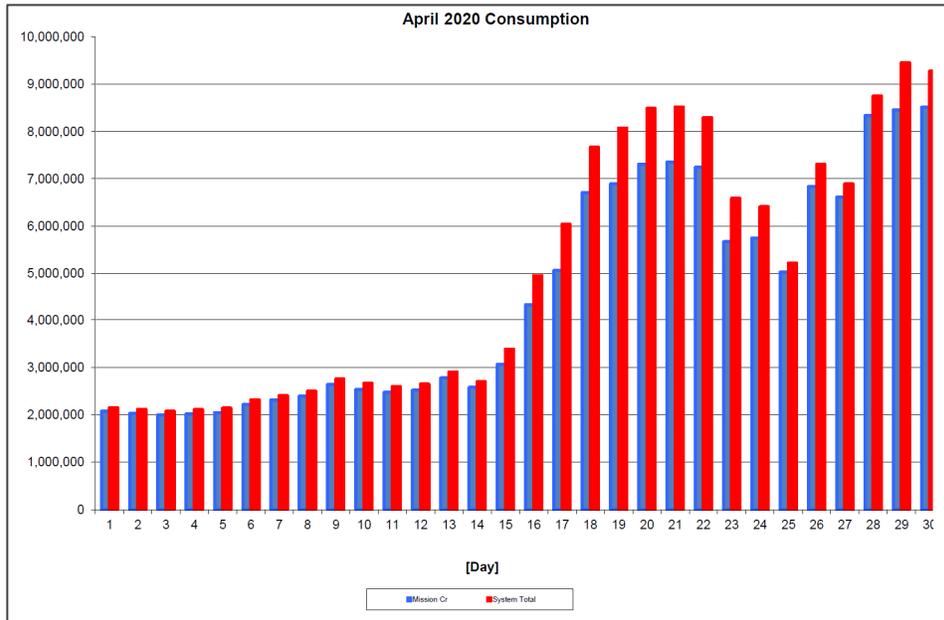


Table 1.2 - April 2020 - Daily Consumption Report

Year	Mission Cr	Well #4	Well #5	Well #6	Scotty Creek	System Total	System Total
2020	Usgpd	Usgpd	Usgpd	Usgpd	Usgpd	Usgpd	ML/Day
1-Apr	2,073,085	77,000	39	0	0	2,150,124	8.14
2-Apr	2,023,158	91,000	78	0	0	2,114,236	8.00
3-Apr	1,994,450	76,000	116	0	0	2,070,566	7.84
4-Apr	2,014,927	93,000	155	0	0	2,108,082	7.98
5-Apr	2,042,543	96,000	194	0	0	2,138,737	8.10
6-Apr	2,212,213	101,000	233	0	0	2,313,446	8.76
7-Apr	2,313,165	87,000	271	0	0	2,400,436	9.09
8-Apr	2,387,314	106,000	310	0	0	2,493,624	9.44
9-Apr	2,640,447	112,000	349	0	0	2,752,796	10.42
10-Apr	2,533,602	128,000	388	0	0	2,661,990	10.08
11-Apr	2,470,264	122,000	426	0	0	2,592,690	9.81
12-Apr	2,515,961	131,000	465	0	0	2,647,426	10.02
13-Apr	2,772,017	127,000	504	0	0	2,899,521	10.97
14-Apr	2,575,414	102,000	20,599	0	0	2,698,013	10.21
15-Apr	3,062,992	131,000	187,260	0	0	3,381,252	12.80
16-Apr	4,338,480	145,000	471,257	0	0	4,954,737	18.75
17-Apr	5,064,719	136,000	837,319	0	0	6,038,038	22.85
18-Apr	6,708,333	161,000	794,806	1	0	7,664,140	29.01
19-Apr	6,890,186	182,000	999,943	1	0	8,072,130	30.55
20-Apr	7,308,161	179,000	999,408	1	0	8,486,570	32.12
21-Apr	7,353,998	164,000	999,031	1	0	8,517,030	32.24
22-Apr	7,244,380	48,000	999,750	561	0	8,292,691	31.39
23-Apr	5,668,602	0	919,519	358	0	6,588,479	24.94
24-Apr	5,749,135	0	661,435	0	0	6,410,570	24.26
25-Apr	5,026,971	0	194,092	0	0	5,221,063	19.76
26-Apr	6,833,469	0	474,087	0	0	7,307,556	27.66
27-Apr	6,612,584	0	280,323	3	0	6,892,910	26.09
28-Apr	8,331,642	0	417,148	0	0	8,748,790	33.11
29-Apr	8,453,272	0	999,442	0	0	9,452,714	35.78
30-Apr	8,510,749	0	763,661	0	0	9,274,410	35.10
Totals Usgpd	135,726,233	2,595,000	11,022,608	926	0	149,344,767	565.27
Totals ML	513.72	9.82	41.72	0.00	0.00		
Avg's	4,524,208	17.12				4,978,159	18.84
Max	8,510,749	32.21				9,452,714	35.78
Min	1,994,450	7.55				2,070,566	7.84

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) March 2019 -April 2020

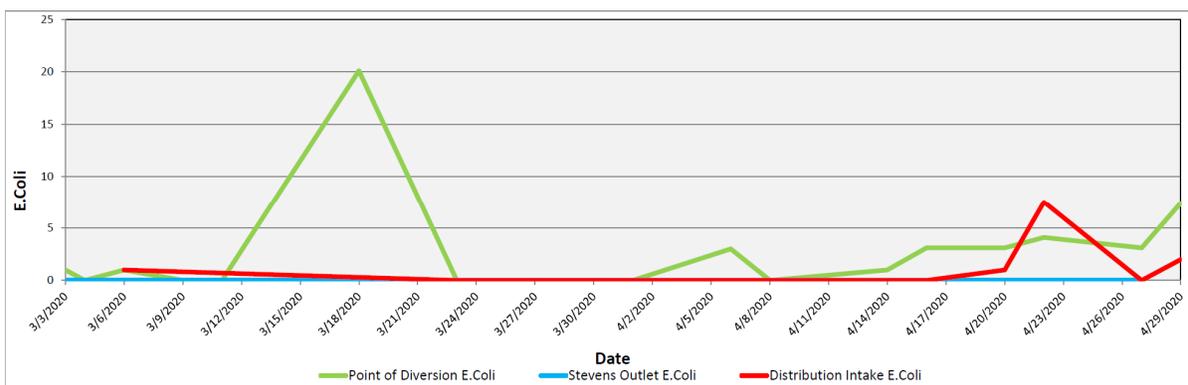


Table 2.1 - *E.Coli* Readings (CARO Labs)

Date	Point of Diversion E.Coli	Stevens Outlet E.Coli	Distribution Intake E.Coli
3-Mar-20	1	0	0
4-Mar-20	0	0	0
6-Mar-20	1	0	1
9-Mar-20	0	0	0
11-Mar-20	0	0	0
18-Mar-20	20.1	0	0
23-Mar-20	0	0	0
30-Mar-20	0	0	0
1-Apr-20	0	0	0
6-Apr-20	3	0	0
8-Apr-20	0	0	0
14-Apr-20	1	0	0
16-Apr-20	3.1	0	0
20-Apr-20	3.1	0	1
22-Apr-20	4.1	0	7.5
27-Apr-20	3.1	0	0
29-Apr-20	7.4	0	2

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 April 2020, 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 level recorded at this location was 0.86 NTU on April 16. However, this sample was analysed at the WTP lab and not on the on-line analyser at Booster 1 which had unstable readings from April 16 to April 20.

The distribution intake is where the water leaves Hadden Reservoir. Turbidity levels are greatly reduced through the settling process as Mission Creek water makes its way through the reservoirs.

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

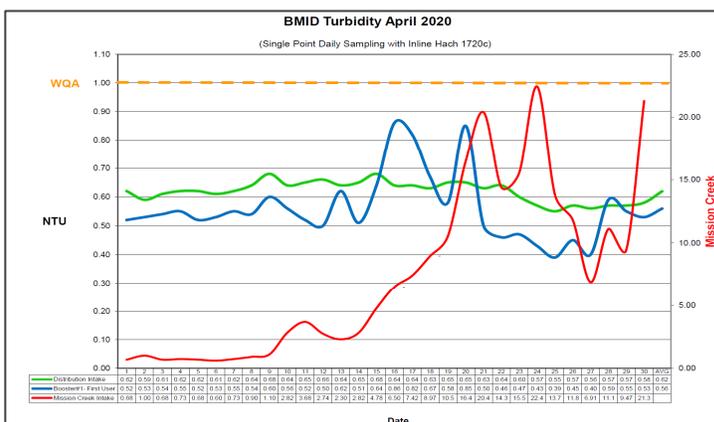


Table 3.1 - Daily Monitoring Record – Turbidity at Distribution Intake & Bst Stn 1

Turbidity Point Sampling for April 2020			
Date	Mission Creek Intake	Distribution Intake	Booster#1- First User
	Daily Average [NTU]	Daily Average NTU	Daily Average NTU
1	0.68	0.62	0.52
2	1.00	0.59	0.53
3	0.68	0.61	0.54
4	0.73	0.62	0.55
5	0.68	0.62	0.52
6	0.60	0.61	0.53
7	0.73	0.62	0.55
8	0.90	0.64	0.54
9	1.10	0.68	0.60
10	2.82	0.64	0.56
11	3.68	0.65	0.52
12	2.74	0.66	0.50
13	2.30	0.64	0.62
14	2.82	0.65	0.51
15	4.78	0.68	0.64
16	6.50	0.64	0.86
17	7.42	0.64	0.82
18	8.97	0.63	0.67
19	10.54	0.65	0.58
20	16.47	0.65	0.85
21	20.40	0.63	0.50
22	14.39	0.64	0.46
23	15.54	0.60	0.47
24	22.45	0.57	0.43
25	13.79	0.55	0.39
26	11.81	0.57	0.45
27	6.91	0.56	0.40
28	11.11	0.57	0.59
29	9.47	0.57	0.55
30	21.30	0.58	0.53
AVG	7.44	0.62	0.56

4.0 CHLORINE CONTACT TIME

Temperature, pH, peak 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 April, 2020. The following information applies only to the period where Mission Creek was the primary supply of domestic water.

Figure 4.1 - CT Trending – BMID Mission Creek Source – April 2020

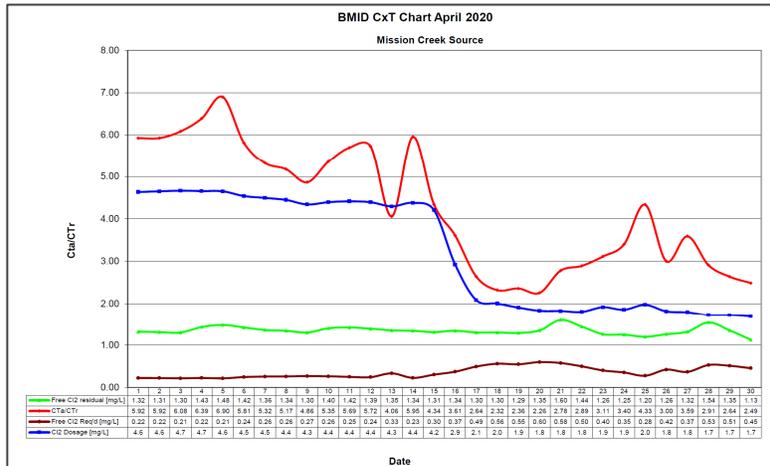


Table 4.2 - CT Table – Mission Creek Source

BMID April 2020 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		Daily Average	Average
April		[°C]	[Usgpm]	[mg/L]				[mg/L]	[mg/L]	[USgal]	[mins]	[USGPM]	[PPD]
1	7.73	3.6	2,473	1.32	1414.3	238.8	5.92	0.22	4.6	2649600	1071	1,437	80
2	7.74	3.7	2,465	1.31	1408.1	237.7	5.92	0.22	4.6	2649600	1075	1,406	79
3	7.75	4.0	2,427	1.30	1419.2	233.4	6.08	0.21	4.7	2649600	1092	1,387	78
4	7.76	4.0	2,497	1.43	1517.4	237.5	6.39	0.22	4.7	2649600	1061	1,404	79
5	7.77	4.2	2,406	1.48	1629.8	236.3	6.90	0.21	4.6	2649600	1101	1,413	79
6	7.78	4.1	2,729	1.42	1378.7	237.3	5.81	0.24	4.5	2649600	971	1,536	84
7	7.78	4.3	2,914	1.36	1236.6	232.5	5.32	0.26	4.5	2649600	909	1,608	87
8	7.79	4.4	2,971	1.34	1195.0	231.2	5.17	0.26	4.4	2649600	892	1,661	89
9	7.77	4.5	3,121	1.30	1103.6	227.0	4.86	0.27	4.3	2649600	849	1,836	96
10	7.76	4.7	3,073	1.40	1207.1	225.6	5.35	0.26	4.4	2649600	862	1,760	93
11	7.76	5.1	3,005	1.42	1252.1	219.9	5.69	0.25	4.4	2649600	882	1,717	91
12	7.77	5.1	2,926	1.39	1258.7	219.9	5.72	0.24	4.4	2649600	906	1,749	92
13	7.78	5.3	4,070	1.35	878.9	216.7	4.06	0.33	4.3	2649600	651	1,929	100
14	7.78	5.3	2,756	1.34	1288.3	216.5	5.95	0.23	4.4	2649600	961	1,788	94
15	7.79	5.6	3,774	1.31	919.7	212.0	4.34	0.30	4.2	2649600	702	2,131	108
16	7.80	5.8	4,675	1.34	759.5	210.5	3.61	0.37	2.9	2649600	567	3,022	106
17	7.79	6.0	6,332	1.30	544.0	206.0	2.64	0.49	2.1	2649600	418	3,521	88
18	7.77	6.5	7,511	1.30	458.6	197.6	2.32	0.56	2.0	2649600	353	4,675	113
19	7.75	7.1	7,707	1.29	443.5	188.0	2.36	0.55	1.9	2649600	344	4,791	110
20	7.74	7.8	8,820	1.35	405.6	179.7	2.26	0.60	1.8	2649600	300	5,092	112
21	7.72	7.8	8,330	1.60	508.9	183.1	2.78	0.58	1.8	2649600	318	5,115	112
22	7.70	8.0	7,479	1.44	510.2	176.5	2.89	0.50	1.8	2649600	354	5,023	109
23	7.69	8.4	6,348	1.26	521.7	167.6	3.11	0.40	1.9	2649600	417	3,929	91
24	7.67	8.5	5,663	1.25	561.5	165.1	3.40	0.35	1.9	2649600	468	3,996	89
25	7.65	8.8	4,597	1.20	691.7	159.6	4.33	0.28	2.0	2649600	576	3,488	83
26	7.64	8.8	6,943	1.26	480.8	160.2	3.00	0.42	1.8	2649600	382	4,747	104
27	7.62	9.0	6,167	1.32	567.1	158.0	3.59	0.37	1.8	2649600	430	4,596	99
28	7.60	9.1	8,795	1.54	463.9	159.5	2.91	0.53	1.7	2649600	301	5,780	120
29	7.56	9.0	8,740	1.35	409.3	155.2	2.64	0.51	1.7	2649600	303	5,870	122
30	7.50	9.1	8,197	1.13	365.3	146.9	2.49	0.45	1.7	2649600	323	5,917	120
Averages	7.72	6.3	4997	1.35	893.298	201.2	4.26	0.356	3.1999		661	3,144	96.76

5.0 ULTRAVIOLET DISINFECTION

Total Water Treated:	490,402.6 m ³	100.0%
On-Spec Water:	489,854.4 m ³	100.0%
Off-Spec Water:	548.2 m ³	0.112%

Average monthly chlorine residual before UV Treatment was 1.50 mg/L
 The average monthly chlorine residual after UV treatment and re-chlorination was 1.57 mg/L.

Figure 5.1 - UV Disinfection – BMID Mission Creek Source – April 2020

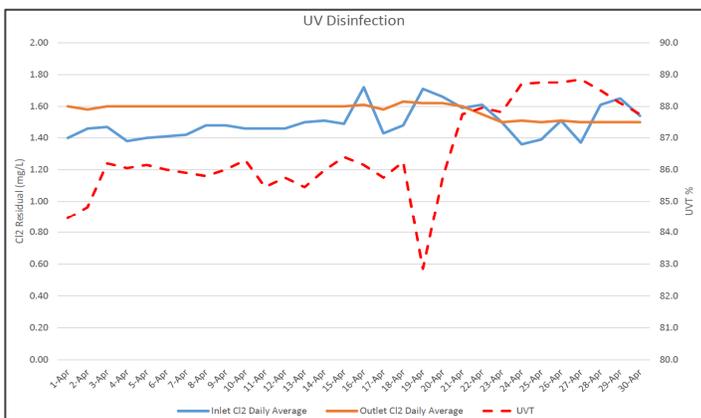


Table 5.2 - UV Disinfection Table – Mission Creek Source

	Inlet Cl2 Daily	Outlet Cl2 Daily	UVT	In Spec Water Volume	Off Spec Water	Off Spec % of Water	
Date	mg/L	mg/L	% T	Cubic Meters	Cubic Meters	Percentage	
1-Apr	1.40	1.60	84.5	7957.5	0	0.00%	
2-Apr	1.46	1.58	84.8	11490.4	489.8	4.26%	
3-Apr	1.47	1.60	86.2	9610.9	24.4	0.25%	
4-Apr	1.38	1.60	86.1	7755.8	0	0.00%	
5-Apr	1.40	1.60	86.2	7820.8	0	0.00%	
6-Apr	1.41	1.60	86.0	12739.8	0	0.00%	
7-Apr	1.42	1.60	85.9	12740.3	0	0.00%	
8-Apr	1.48	1.60	85.8	11140.3	0	0.00%	
9-Apr	1.48	1.60	86.0	10113.1	0	0.00%	
10-Apr	1.46	1.60	86.3	10113.3	0	0.00%	
11-Apr	1.46	1.60	85.5	9683.9	0	0.00%	
12-Apr	1.46	1.60	85.8	9606.0	0	0.00%	
13-Apr	1.50	1.60	85.5	10592.3	0	0.00%	
14-Apr	1.51	1.60	86.0	10592.6	0	0.00%	
15-Apr	1.49	1.60	86.4	11674.9	0	0.00%	
16-Apr	1.72	1.61	86.2	16523.2	0	0.00%	
17-Apr	1.43	1.58	85.8	16523.8	0	0.00%	
18-Apr	1.48	1.63	86.3	21966.0	0	0.00%	
19-Apr	1.71	1.62	82.9	22664.7	0	0.00%	
20-Apr	1.66	1.62	85.8	23940.4	0	0.00%	
21-Apr	1.59	1.60	87.8	24129.3	0	0.00%	
22-Apr	1.61	1.55	88.0	24130.1	0	0.00%	
23-Apr	1.50	1.50	87.8	23643.6	0	0.00%	
24-Apr	1.36	1.51	88.7	18170.8	0	0.00%	
25-Apr	1.39	1.50	88.8	17819.6	0	0.00%	
26-Apr	1.51	1.51	88.8	22197.8	0	0.00%	
27-Apr	1.37	1.50	88.9	22181.3	17	0.08%	
28-Apr	1.61	1.50	88.5	27114.3	17	0.06%	
29-Apr	1.65	1.50	88.1	27608.4	0	0.00%	
30-Apr	1.54	1.50	87.8	27609.2	0	0.00%	
Average	1.50	1.57	86.5	Total	489854.4	548.2	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
- 41 samples were found to be absent of Coliforms.
- 41 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		Ellison Blow Off		Ellison 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
3-Mar-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9-Mar-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16-Mar-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19-Mar-20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23-Mar-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-Mar-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6-Apr-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	0	0	0	0	0	0
14-Apr-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	0	0	0	0	0	0
20-Apr-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-Apr-20	0	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

April 06 - 2020		
Location	THM (mg/L)	HAA (mg/L)
Kirschner Reservoir		0.120
2921 Belgo Rd	0.1040	
Pearson School	0.1040	0.106
3976 Highway 97	0.1030	

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	4/6/2020				4/15/2020				4/20/2020				4/27/2020			
	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.
Sylvania Cres	0.99	10.4	-	X									1.03	15.0	-	X
170 Kneller Rd	1.00	10.6	-	X									0.87	13.6	-	X
2105 Morrison Staymen Rd									1.23	14.4	-	X				
260 Campion Rd					0.62	10.4	-	X	0.93	11.6	-	X				
Fenwick Rd					0.38	10.2	-	X								
Solly Ct	1.17	12.6	-	X									1.17	12.6	-	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) = 10
- Total tests sampled by BMID and tested by Caro Labs = 41
- Total tests sampled in BMID treated distribution system = 51 (Zero Positive Samples)