



MONTHLY REPORTING PERIOD - NOVEMBER, 2019

1. SUMMARY

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

Source	Total (US Gals)	Total (Mega Litres)
Mission Creek	58,724,402	222.27
Well 4	2,399,000	9.08
Well 5	0	0
Well 6 (Irrigation Only)	0	0
Scotty Creek (Irrigation Only)	0	0
Total	61,123,402	231.35

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 November, continuing the trend seen throughout the past year. 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. Average daily turbidity levels at Mission Creek raw water intake, prior to any treatment, peaked at 2.61 NTU on November 18. The daily average turbidity at this location was 0.92 NTU for November;
4. Turbidity levels at the Distribution Intake peaked at 0.46 NTU on November 25, 2019. Average turbidity for November was 0.38 NTU;
5. The highest monthly turbidity level recorded at the first customer (Booster #1) was 0.34 NTU on November 6 and 7. Average monthly turbidity was 0.25 NTU for November;
6. BMID's Ultraviolet Treatment Facility treated 229,999 m³ of water, none of which was "Off-Spec". Average UV Transmissivity was 91.07%. The average inlet chlorine residual was 1.71 mg/L compared to an average of 1.56 mg/L for the outlet after UV treatment and after the BMID sodium hypochlorite top-up system;
7. BMID's Scotty Creek source, used for irrigation in the north-end, was shut off for the year in September, 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 November;
9. Well # 5 was shut-off for year in September and will remain on stand-by until consumption rises in the spring of 2020;

10. Well #6, which supplies irrigation water to the twinned north-end water system, was not used throughout November;
11. *E.Coli* levels at Mission Creek's Point-of-Diversion (creek intake prior to WTP) had low counts throughout November with a peak (most probable number) count of 3.1 on November 20, 2019. At the Point-of-Diversion the average *E.Coli* count was 1.01 per sample based on the 7 samples taken throughout the month;
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 November, 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. In addition, no positive samples were detected by BMID's in-house presence/absence testing;
14. The WTP ran throughout November 2019 as water quality conditions in Mission Creek required chemical treatment to reduce turbidity and colour levels of raw water.

1.0 FLOWS - NOVEMBER, 2019

Maximum Daily Flow was on November 26, 2019 at 2,229,756 US gallons (8.44 ML)

Minimum Daily Flow was on November 23, 2019 at 1,868,124 US gallons (7.07 ML)

Mission Creek provided 96% of domestic flow throughout November.

Figure 1.1 - Domestic Water System Flow

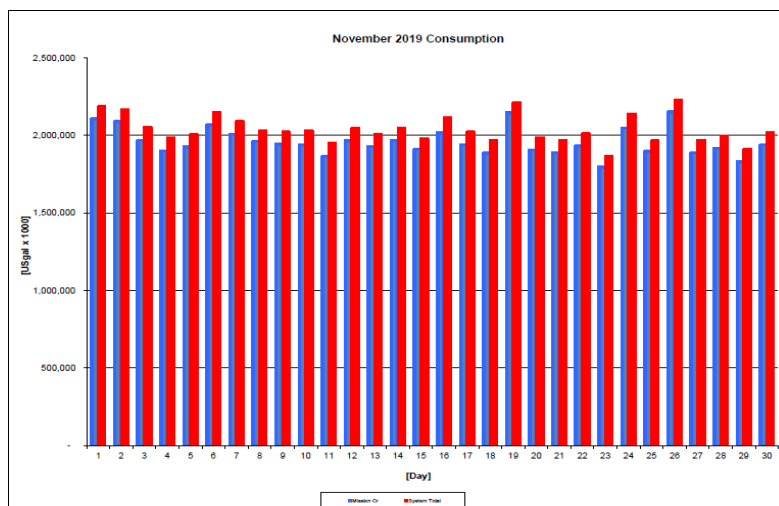


Table 1.2 - November 2019 - Daily Consumption Report

Year	Mission Cr	Well #4	Well #5	System Total	System Total
2019	Usgpd	Usgpd	Usgpd	Usgpd	ML/Day
1-Nov	2,105,221	81,000	-	2,186,221	8.27
2-Nov	2,089,281	78,000	-	2,167,281	8.20
3-Nov	1,967,312	85,000	-	2,052,312	7.77
4-Nov	1,898,865	84,000	-	1,982,865	7.51
5-Nov	1,926,369	78,000	-	2,004,369	7.59
6-Nov	2,067,516	81,000	-	2,148,516	8.13
7-Nov	2,007,788	82,000	-	2,089,788	7.91
8-Nov	1,962,435	66,000	-	2,028,435	7.68
9-Nov	1,943,540	79,000	-	2,022,540	7.66
10-Nov	1,940,014	90,000	-	2,030,014	7.68
11-Nov	1,861,600	90,000	-	1,951,600	7.39
12-Nov	1,964,785	82,000	-	2,046,785	7.75
13-Nov	1,928,949	80,000	-	2,008,949	7.60
14-Nov	1,967,720	81,000	-	2,048,720	7.75
15-Nov	1,912,362	66,000	-	1,978,362	7.49
16-Nov	2,016,222	96,000	-	2,112,222	7.99
17-Nov	1,939,365	83,000	-	2,022,365	7.65
18-Nov	1,885,703	80,000	-	1,965,703	7.44
19-Nov	2,145,976	66,000	-	2,211,976	8.37
20-Nov	1,906,164	80,000	-	1,986,164	7.52
21-Nov	1,889,380	79,000	-	1,968,380	7.45
22-Nov	1,930,957	79,000	-	2,009,957	7.61
23-Nov	1,796,124	72,000	-	1,868,124	7.07
24-Nov	2,047,825	92,000	-	2,139,825	8.10
25-Nov	1,898,266	67,000	-	1,965,266	7.44
26-Nov	2,150,756	79,000	-	2,229,756	8.44
27-Nov	1,889,395	80,000	-	1,969,395	7.45
28-Nov	1,916,821	80,000	-	1,996,821	7.56
29-Nov	1,828,834	82,000	-	1,910,834	7.23
30-Nov	1,938,857	81,000	-	2,019,857	7.65
Totals Usgpd	58,724,402	2,399,000	-	61,123,402	231.35
Totals ML	222.27	9.08	0.00		
Avg's	1957480.1	7.41		2037446.7	7.71
Max	2150756.0	8.14		2229756.0	8.44
Min	1796124.0	6.80		1868124.0	7.07

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) October-November 2019

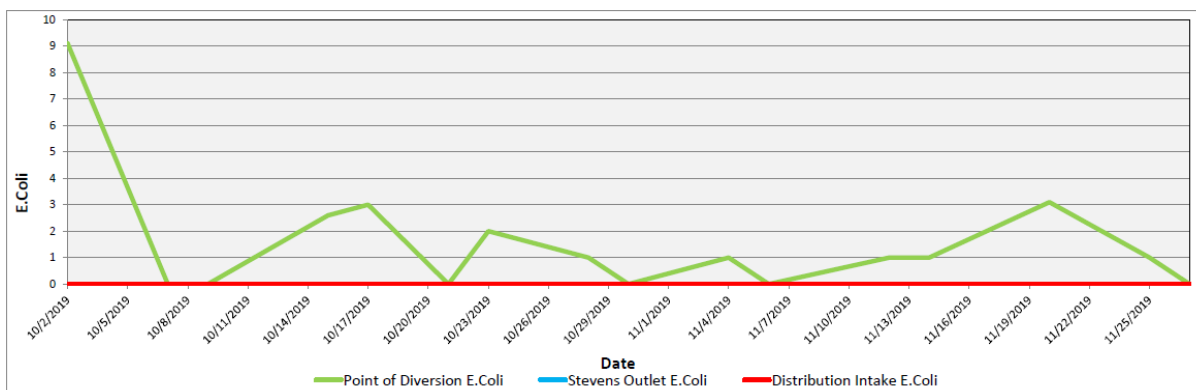


Table 2.1 - *E.Coli* Readings (CARO Labs)

Date	Point of Diversion E.Coli	Stevens Outlet E.Coli	Distribution Intake E.Coli
2-Oct-19	9.1	0	0
7-Oct-19	<3	0	0
9-Oct-19	<3	0	0
15-Oct-19	2.6	0	0
17-Oct-19	3	0	0
21-Oct-19	0	0	0
23-Oct-19	2	0	0
28-Oct-19	1	0	0
30-Oct-19	0	0	0
4-Nov-19	1	0	0
6-Nov-19	0	0	0
12-Nov-19	1	0	0
14-Nov-19	1	0	0
20-Nov-19	3.1	0	0
25-Nov-19	1	0	0
27-Nov-19	0	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 November, 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 level recorded at this location was 0.34 NTU on November 6 and 7. The average turbidity for the month was 0.25 NTU during November.

Mission Creek intake is the raw water turbidity reading taken directly from the creek prior to any form of treatment. 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)

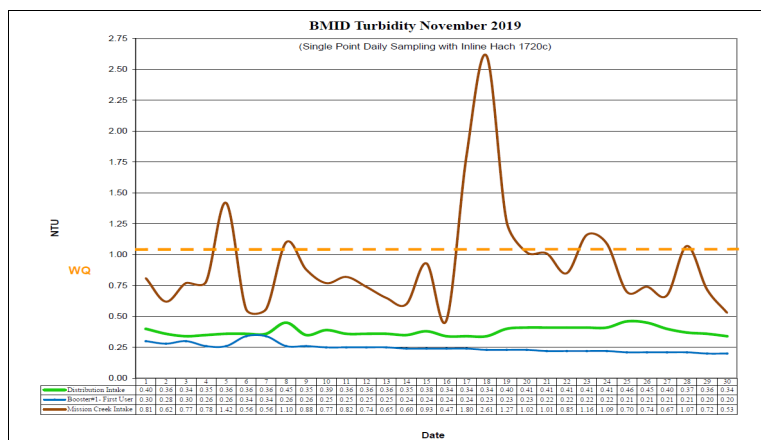


Table 3.1 - Daily Monitoring Record – Turbidity at Distribution Intake & Bst Stn 1

Turbidity Point Sampling for November 2019			
Date	Mission Creek Intake	Distribution Intake	Booster#1- First User
	Daily Average [NTU]	Daily Average [NTU]	Daily Average [NTU]
1	0.81	0.40	0.30
2	0.62	0.36	0.28
3	0.77	0.34	0.30
4	0.78	0.35	0.26
5	1.42	0.36	0.26
6	0.56	0.36	0.34
7	0.56	0.36	0.34
8	1.10	0.45	0.26
9	0.88	0.35	0.26
10	0.77	0.39	0.25
11	0.82	0.36	0.25
12	0.74	0.36	0.25
13	0.65	0.36	0.25
14	0.60	0.35	0.24
15	0.93	0.38	0.24
16	0.47	0.34	0.24
17	1.80	0.34	0.24
18	2.61	0.34	0.23
19	1.27	0.40	0.23
20	1.02	0.41	0.23
21	1.01	0.41	0.22
22	0.85	0.41	0.22
23	1.16	0.41	0.22
24	1.09	0.41	0.22
25	0.70	0.46	0.21
26	0.74	0.45	0.21
27	0.67	0.40	0.21
28	1.07	0.37	0.21
29	0.72	0.36	0.20
30	0.53	0.34	0.20
AVG	0.92	0.38	0.25

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 November, 2019.

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

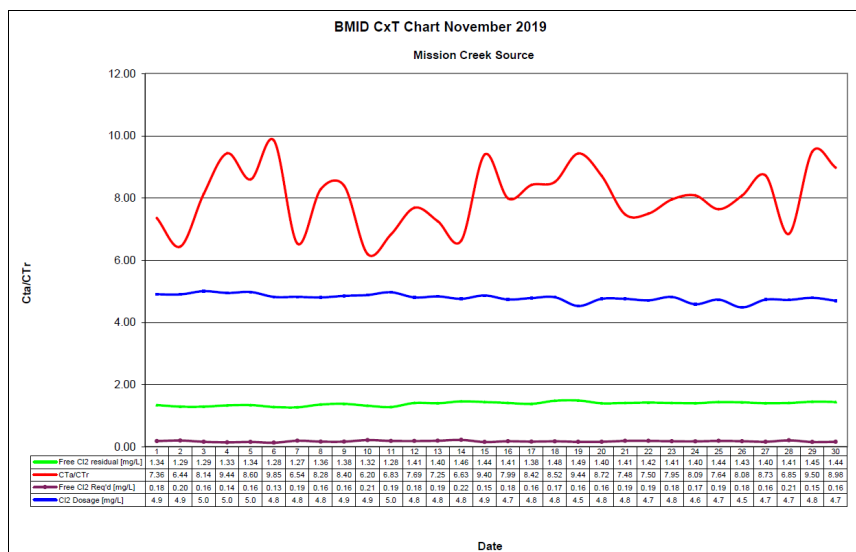


Table 4.2 - CT Table – Mission Creek Source

BMID November 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		Daily Average	Average
November		[°C]	[Usgpm]	[mg/L]				[mg/L]	[mg/L]	[USgal]	[mins]	[USGPM]	[PPD]
1	7.43	6.7	2781	1.34	1276.7	173.6	7.36	0.18	4.9	2649600	953	1463	86.3
2	7.45	7.8	3295	1.29	1037.3	161.0	6.44	0.20	4.9	2649600	804	1453	85.6
3	7.42	7.6	2601	1.29	1314.1	161.5	8.14	0.16	5.0	2649600	1019	1348	81.1
4	7.46	8.4	2396	1.33	1470.8	155.8	9.44	0.14	5.0	2649600	1106	1363	81.1
5	7.42	7.4	2506	1.34	1416.8	164.7	8.60	0.16	5.0	2649600	1057	1322	79.1
6	7.44	8.4	2239	1.28	1514.7	153.7	9.85	0.13	4.8	2649600	1183	1429	82.8
7	7.45	8.1	3269	1.27	1029.4	157.4	6.54	0.19	4.8	2649600	811	1403	81.3
8	7.44	7.6	2652	1.36	1358.8	164.0	8.28	0.16	4.8	2649600	999	1394	80.5
9	7.43	6.0	2380	1.38	1536.3	183.0	8.40	0.16	4.9	2649600	1113	1349	78.7
10	7.44	6.2	3135	1.32	1115.6	179.9	6.20	0.21	4.9	2649600	845	1328	77.9
11	7.45	5.1	2559	1.28	1325.3	194.0	6.83	0.19	5.0	2649600	1035	1284	76.7
12	7.46	5.5	2529	1.41	1477.2	192.1	7.69	0.18	4.8	2649600	1048	1379	79.6
13	7.47	6.2	2787	1.40	1331.0	183.5	7.25	0.19	4.8	2649600	951	1326	77.1
14	7.46	6.3	3193	1.46	1211.5	182.7	6.63	0.22	4.8	2649600	830	1388	79.4
15	7.45	7.2	2378	1.44	1604.5	170.7	9.40	0.15	4.9	2649600	1114	1310	76.6
16	7.44	6.6	2645	1.41	1412.5	176.7	7.99	0.18	4.7	2649600	1002	1398	79.6
17	7.42	6.8	2517	1.38	1452.7	172.5	8.42	0.16	4.8	2649600	1053	1362	78.3
18	7.44	7.4	2733	1.48	1434.8	168.4	8.52	0.17	4.8	2649600	969	1306	75.5
19	7.46	7.9	2551	1.49	1547.6	164.0	9.44	0.16	4.5	2649600	1039	1516	82.5
20	7.48	7.3	2494	1.40	1487.3	170.6	8.72	0.16	4.8	2649600	1062	1317	75.3
21	7.47	5.4	2573	1.41	1452.0	194.2	7.48	0.19	4.8	2649600	1030	1296	74.1
22	7.48	5.2	2536	1.42	1483.6	197.8	7.50	0.19	4.7	2649600	1045	1335	75.6
23	7.48	5.2	2377	1.41	1571.7	197.6	7.95	0.18	4.8	2649600	1115	1259	72.9
24	7.48	6.3	2508	1.40	1479.0	182.9	8.09	0.17	4.6	2649600	1056	1421	78.3
25	7.49	6.2	2690	1.44	1418.4	185.6	7.64	0.19	4.7	2649600	985	1317	74.9
26	7.49	6.1	2511	1.43	1508.9	186.7	8.08	0.18	4.5	2649600	1055	1502	80.9
27	7.49	7.3	2482	1.40	1494.5	171.2	8.73	0.16	4.7	2649600	1068	1318	75.0
28	7.49	7.1	3138	1.41	1190.5	173.8	6.85	0.21	4.7	2649600	844	1323	75.1
29	7.50	7.5	2374	1.45	1618.3	170.4	9.50	0.15	4.8	2649600	1116	1277	73.5
30	7.50	6.5	2329	1.44	1638.2	182.4	8.98	0.16	4.7	2649600	1138	1346	76.0
Averages	7.46	6.78	2638.6	1.39	1407.01	175.8	8.03	0.17	4.79			1361	78.4

5.0 ULTRAVIOLET DISINFECTION

Total Water Treated:	229,999 m ³	100.000 %
On-Spec Water:	229,999 m ³	100.000 %
Off-Spec Water:	0 m ³	0.000%

Average monthly chlorine residual before UV Treatment was 1.71 mg/L
The average monthly chlorine residual after UV treatment and re-chlorination was 1.56 mg/L.

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

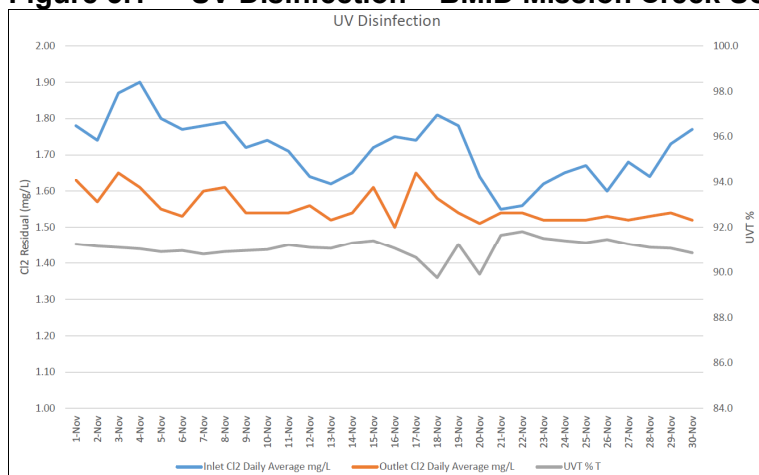


Table 5.2 - UV Disinfection Table – Mission Creek Source

Date	Inlet Cl2 Daily	Outlet Cl2 Daily	UVT % T	In Spec Water Cubic Meters	Off Spec Water Cubic Meters	Off Spec % of Water Percentage
	mg/L	mg/L				
1-Nov	1.78	1.63	91.3	13,074	0	0.00%
2-Nov	1.74	1.57	91.2	7,906	0	0.00%
3-Nov	1.87	1.65	91.1	7,453	0	0.00%
4-Nov	1.90	1.61	91.0	9,152	0	0.00%
5-Nov	1.80	1.55	90.9	7,336	0	0.00%
6-Nov	1.77	1.53	91.0	7,847	0	0.00%
7-Nov	1.78	1.60	90.8	7,608	0	0.00%
8-Nov	1.79	1.61	90.9	7,419	0	0.00%
9-Nov	1.72	1.54	91.0	7,354	0	0.00%
10-Nov	1.74	1.54	91.0	7,387	0	0.00%
11-Nov	1.71	1.54	91.2	7,053	0	0.00%
12-Nov	1.64	1.56	91.1	7,424	0	0.00%
13-Nov	1.62	1.52	91.1	7,358	0	0.00%
14-Nov	1.65	1.54	91.3	7,470	0	0.00%
15-Nov	1.72	1.61	91.4	7,250	0	0.00%
16-Nov	1.75	1.50	91.1	7,674	0	0.00%
17-Nov	1.74	1.65	90.7	7,326	0	0.00%
18-Nov	1.81	1.58	89.8	7,193	0	0.00%
19-Nov	1.78	1.54	91.2	8,102	0	0.00%
20-Nov	1.64	1.51	89.9	7,234	0	0.00%
21-Nov	1.55	1.54	91.7	7,193	0	0.00%
22-Nov	1.56	1.54	91.8	7,362	0	0.00%
23-Nov	1.62	1.52	91.5	6,828	0	0.00%
24-Nov	1.65	1.52	91.4	7,775	0	0.00%
25-Nov	1.67	1.52	91.3	7,228	0	0.00%
26-Nov	1.60	1.53	91.5	8,157	0	0.00%
27-Nov	1.68	1.52	91.3	7,162	0	0.00%
28-Nov	1.64	1.53	91.1	7,325	0	0.00%
29-Nov	1.73	1.54	91.1	6,968	0	0.00%
30-Nov	1.77	1.52	90.9	7,382	0	0.00%
Average	1.71	1.56	91.07	Total 229,999	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
- 50 samples were found to be absent of Coliforms.
- 50 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	
7-Oct-19	0	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	0
21-Oct-19	0	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	0
4-Nov-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12-Nov-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18-Nov-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20-Nov-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-Nov-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

4-Nov-19		
Location	THM	HAA
Kirschner Reservoir		0.0447
2921 Belgo Rd	0.1200	
Pearson School	0.0917	0.0612
3976 Highway 97	0.0988	

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	11/4/2019				11/12/2019				11/18/2019				11/25/2019			
	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.
Sylvania Cres									0.80	12.0	-	X				
170 Kneller Rd									0.86	10.6	-	X				
2105 Morrison					0.51	12.4	-	X								
Staymen Rd					0.68	11.4	-	X								
260 Campion Rd	0.63	14.8	-	X									0.65	8.8	-	X
Fenwick Rd	0.37	14.8	-	X									0.40	11.2	-	X
Solly Ct									1.01	10.6	-	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) = 9
- Total tests sampled by BMID and tested by Caro Labs = 50
- Total tests sampled in BMID treated distribution system = 59 (Zero Positive Samples)