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BMID FILE: 486

MONTHLY REPORTING PERIOD - FEBRUARY, 2022

1. SUMMARY

The list below provides a summary of the water quantity information collected by BMID in February 2022. Documentation and figures are provided on the following pages to support this submission.

Source	Total (US Gals)	Total (Mega Litres)
Mission Creek	59,719,938	226.04
Well 4	1,837,000	6.95
Well 5	0	0
Scotty Creek (Irrigation Only)	0	0
Total	61,556,938	232.99

1. A large fire in a commercial warehouse occurred on February 15. Flows increased from 75 L/s to 345 L/s as fire crews fought the blaze. The result was a slight rise in system turbidity and a lowering of disinfection contact time during the firefighting efforts;
2. 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 continues to be monitored. It is currently stable and not moving.
3. The Water Treatment Plant began the month on stand-by mode as raw water quality in Mission Creek had improved enough to eliminate the necessity of chemical treatment upstream of the disinfection facilities. The WTP resumed operation on February 8th and was operated variably, either in operation or in by-pass, depending on raw water quality for the remained of February;
4. Raw water turbidity levels in Mission Creek peaked at 2.54 NTU (average daily turbidity) on February 11 and 20. Average daily raw water turbidity for February was 1.63 NTU at the Mission Creek intake;
5. Turbidity levels at the Distribution Intake (end of Hadden Reservoir) high reading was 0.44 NTU on February 17, 2022. Average clarified water turbidity for February was 0.37 NTU at the Distribution Intake at the lower end of Hadden Reservoir. Colder water temperatures make chemical treatment more challenging;
6. The highest recorded monthly turbidity level at the first customer (Booster #1) was 0.71 NTU on February 15, during a large warehouse fire that effected flows in the distribution system. Average monthly turbidity at the first customer was 0.41 NTU for February;
7. BMID's Ultraviolet Treatment Facility treated 226,064 m^3 of water, none of which was "Off-Spec" (0.00%). Average UV Transmissivity was 85%. UVT % at the UV plant had highly variable numbers on one of the on-line analysers. This was an instrumentation issue with the analyser, and at all times disinfection remained acceptable. The average inlet chlorine residual level at the UV site was 1.09 mg/L. With the cold temperatures, minimum chlorine addition was required. The average outgoing chlorine was 1.45 mg/L after the sodium hypochlorite top-up system;

8. BMID's Scotty Creek source, used for irrigation in the north-end, ran from May 25, 2021 until it was placed in bypass mode on August 21. The Scotty Creek source will remain in bypass mode until irrigation begins again in the late spring of 2022;
9. Well #4 resumed operations as a source for domestic water in the north-end of the distribution system on August 24, 2021 and will remain in operation until the spring of 2022 when Well #5 will be needed to meet demand;
10. Well #5, used as the primary domestic water source in the north-end of the system for both irrigation and domestic consumption during the summer months, was placed in stand-by mode on September 1, 2021;
11. Well #6, which supplies irrigation water to the twinned north-end water distribution systems, was placed in standby on August 21, 2021. This is a result of reduced irrigation demand in the north-end of the distribution system from the peak flows experienced in early summer. Well #6 will resume operations in 2022;
12. *E.Coli* levels at Mission Creek's Point-of-Diversion (creek intake prior to WTP) had low counts for late winter with a peak count of 1 on February 7 and 22, 2022. The average creek *E.Coli* count was 0.5 for February based on 4 samples;
13. *E.Coli* levels in the raw water at the water distribution system intake at the east end of Hadden Reservoir, immediately prior to disinfection, had zero counts on all 4 samples. reduction in *E.Coli* levels is credited to the clarification process and the further settling of particles in the water in Stevens and Hadden Reservoirs;
14. No *E.Coli* or *Total Coliforms* were found in treated water in the distribution system through third-party analysis. In addition, zero positive samples were detected by BMID's in-house presence/absence testing throughout February;

1.0 FLOWS - FEBRUARY, 2022

The Maximum Daily Flow was on February 23, at 2,918,922 US gallons (11.05 ML)

The Minimum Daily Flow was on February 19, at 1,753,470 US gallons (6.64 ML)

Mission Creek provided 97% of domestic and irrigation flow throughout February.

Figure 1.1 - Domestic Water System Flow

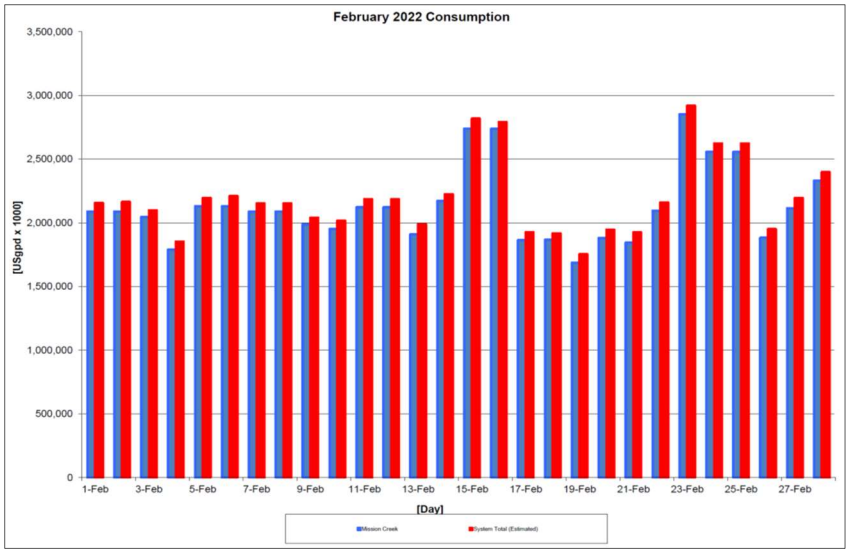


Table 1.2 - February 2022 - Daily Consumption Report

Year	Mission Creek	Well #4	Well #5	Well #6	System Total	System Total
2022	Usgpd	Usgpd	Usgpd	Usgpd	Usgpd	ML/Day
1-Feb	2,088,940	66,000	0	0	2,154,940	8.16
2-Feb	2,088,993	75,000	0	0	2,163,993	8.19
3-Feb	2,045,510	53,000	0	0	2,098,510	7.94
4-Feb	1,790,716	62,000	0	0	1,852,716	7.01
5-Feb	2,128,936	66,000	0	0	2,194,936	8.31
6-Feb	2,128,989	80,000	0	0	2,208,989	8.36
7-Feb	2,088,887	63,000	0	0	2,151,887	8.14
8-Feb	2,088,914	63,000	0	0	2,151,914	8.14
9-Feb	1,988,608	51,000	0	0	2,039,608	7.72
10-Feb	1,952,442	64,000	0	0	2,016,442	7.63
11-Feb	2,121,328	64,000	0	0	2,185,328	8.27
12-Feb	2,121,380	63,000	0	0	2,184,380	8.27
13-Feb	1,909,250	78,000	0	0	1,987,250	7.52
14-Feb	2,171,679	53,000	0	0	2,224,679	8.42
15-Feb	2,737,747	80,000	0	0	2,817,747	10.67
16-Feb	2,737,773	53,000	0	0	2,790,773	10.56
17-Feb	1,863,866	62,000	0	0	1,925,866	7.29
18-Feb	1,866,032	51,000	0	0	1,917,032	7.26
19-Feb	1,685,470	68,000	0	0	1,753,470	6.64
20-Feb	1,880,746	65,000	0	0	1,945,746	7.36
21-Feb	1,844,951	80,000	0	0	1,924,951	7.29
22-Feb	2,094,990	64,000	0	0	2,158,990	8.17
23-Feb	2,851,922	67,000	0	0	2,918,922	11.05
24-Feb	2,556,683	66,000	0	0	2,622,683	9.93
25-Feb	2,556,736	66,000	0	0	2,622,736	9.93
26-Feb	1,882,516	67,000	0	0	1,949,516	7.38
27-Feb	2,115,146	81,000	0	0	2,196,146	8.31
28-Feb	2,330,790	66,000	0	0	2,396,790	9.07
Totals Usgpd	59,719,938	1,837,000	0	0	61,556,938	232.99
Totals ML	226.04	6.95	0.00	0.00	233	
Avg's	2,132,855	8.07			2,198,462	8.32
Max	2,851,922	10.79			2,918,922	11.05
Min	1,685,470	6.38			1,753,470	6.64

2.0 RAW WATER QUALITY - BACTERIOLOGICAL MONITORING

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

Samples were taken at the Distribution Intake's Point of Disinfection and at the Mission Creek raw water Point of Diversion and 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) January 2022 - February 2022

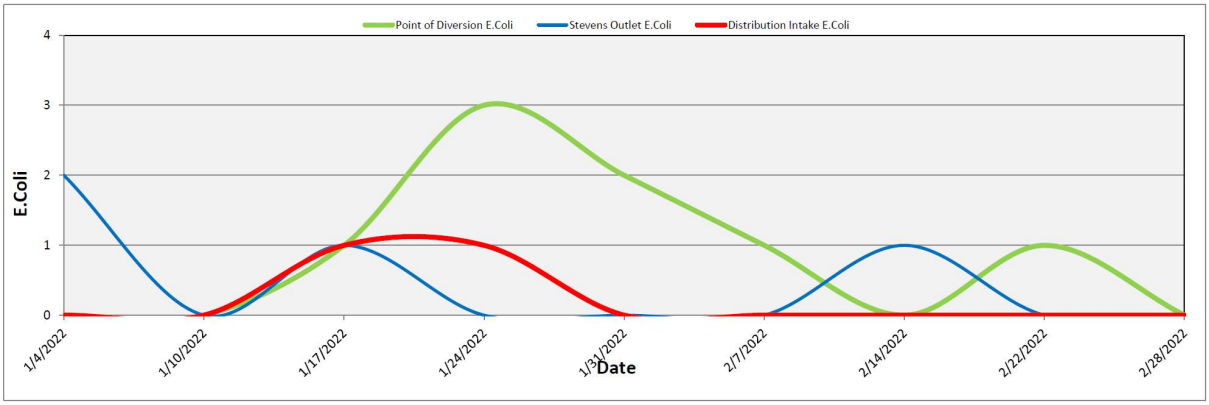


Table 2.1 - *E.Coli* Readings (CARO Labs)

Date	Point of Diversion E.Coli	Stevens Outlet E.Coli	Distribution Intake E.Coli
4-Jan-22	0	2	0
10-Jan-22	0	0	0
17-Jan-22	1	1	1
24-Jan-22	3	0	1
31-Jan-22	2	0	0
7-Feb-22	1	0	0
14-Feb-22	0	1	0
22-Feb-22	1	0	0
28-Feb-22	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 m^3 1st upper balancing reservoir (Stevens Res.)
Hadden Outlet (Raw) - Sampling point after exiting 75,000 m^3 2nd lower balancing reservoir (Hadden Res.)
(*Hadden Outlet = Distribution Intake - Point of Disinfection*)

3.0 RAW AND TREATED WATER TURBIDITY

Through February 2022, 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 0.71 NTU on February 15, 2022.

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

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

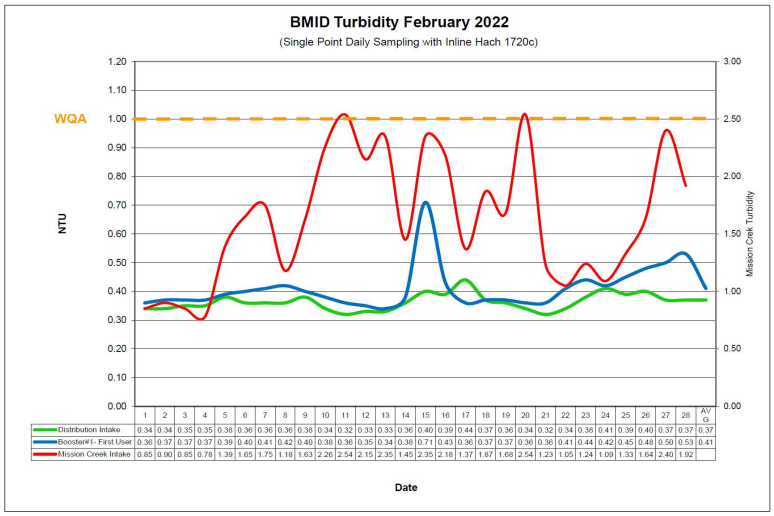


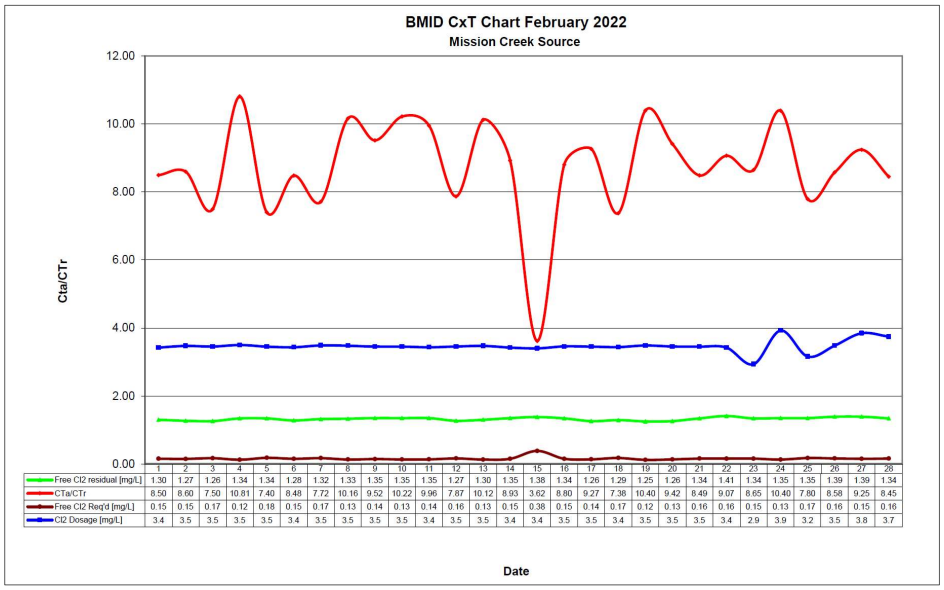
Table 3.1 - Daily Monitoring Record – Turbidity at Distribution Intake & Bst Stn 1

Turbidity Point Sampling for February 2022			
Date	Mission Creek Intake	Distribution Intake	Booster#1- First User
	Daily Average [NTU]	Daily Average NTU	Daily Average NTU
1	0.85	0.34	0.36
2	0.90	0.34	0.37
3	0.85	0.35	0.37
4	0.78	0.35	0.37
5	1.39	0.38	0.39
6	1.65	0.36	0.40
7	1.75	0.36	0.41
8	1.18	0.36	0.42
9	1.63	0.38	0.40
10	2.26	0.34	0.38
11	2.54	0.32	0.36
12	2.15	0.33	0.35
13	2.35	0.33	0.34
14	1.45	0.36	0.38
15	2.35	0.40	0.71
16	2.18	0.39	0.43
17	1.37	0.44	0.36
18	1.87	0.37	0.37
19	1.68	0.36	0.37
20	2.54	0.34	0.36
21	1.23	0.32	0.36
22	1.05	0.34	0.41
23	1.24	0.38	0.44
24	1.09	0.41	0.42
25	1.33	0.39	0.45
26	1.64	0.40	0.48
27	2.40	0.37	0.50
28	1.92	0.37	0.53
AVG	1.63	0.37	0.41

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 February, 2022. There is a noticeable drop in CTa/CTr on February 15 as high peak flows for that day for fire-fighting purposes dropped the calculated contact time.

Figure 4.1 - CT Trending – BMID Mission Creek Source – February 2022



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Free Cl2 residual [mg/L]	1.30	1.27	1.26	1.34	1.34	1.28	1.32	1.33	1.35	1.35	1.35	1.27	1.30	1.35	1.38	1.34	1.26	1.29	1.25	1.26	1.34	1.41	1.34	1.35	1.35	1.39	1.39	1.34
CTa/CTr	8.50	8.60	7.50	10.81	7.40	8.48	7.72	10.16	9.52	10.22	9.96	7.87	10.12	8.93	3.62	8.80	9.27	7.38	10.40	9.42	8.49	9.07	8.65	10.40	7.80	8.58	9.25	8.45
Free Cl2 Req'd [mg/L]	0.15	0.15	0.17	0.12	0.18	0.15	0.17	0.13	0.14	0.13	0.14	0.16	0.13	0.15	0.38	0.15	0.14	0.17	0.12	0.13	0.16	0.16	0.15	0.13	0.17	0.16	0.15	0.16
Cl2 Dosage [mg/L]	3.4	3.5	3.5	3.5	3.5	3.4	3.5	3.5	3.5	3.5	3.4	3.5	3.5	3.4	3.4	3.5	3.5	3.4	3.5	3.5	3.5	3.4	2.9	3.9	3.2	3.5	3.8	3.7

Table 4.2 - CT Table – Mission Creek Source

	BMID February 2022												
	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
February		[°C]	[Usgpm]	[mg/L]				[mg/L]	[mg/L]	[USgal]	[mins]	US Gallons	[PPD]
1	7.24	5.8	2363	1.30	1457.5	171.5	8.50	0.15	3.4	2649600	1121	1476	61
2	7.26	4.3	2048	1.27	1643.2	191.1	8.60	0.15	3.5	2649600	1294	1251	52
3	7.26	5.1	2466	1.26	1353.6	180.5	7.50	0.17	3.5	2649600	1074	1441	60
4	7.26	5.9	1905	1.34	1863.6	172.4	10.81	0.12	3.5	2649600	1391	1259	53
5	7.26	5.6	2725	1.34	1303.1	176.0	7.40	0.18	3.5	2649600	972	1499	62
6	7.26	5.8	2319	1.28	1462.5	172.4	8.48	0.15	3.4	2649600	1143	1471	61
7	7.26	5.3	2528	1.32	1383.4	179.3	7.72	0.17	3.5	2649600	1048	1472	62
8	7.26	5.4	1945	1.33	1812.0	178.3	10.16	0.13	3.5	2649600	1362	1268	53
9	7.06	6.4	2430	1.35	1472.1	154.6	9.52	0.14	3.5	2649600	1090	1398	58
10	6.93	5.6	2251	1.35	1589.2	155.5	10.22	0.13	3.5	2649600	1177	1379	57
11	6.95	5.3	2246	1.35	1592.6	160.0	9.96	0.14	3.4	2649600	1180	1493	62
12	6.94	5.3	2707	1.27	1243.0	157.9	7.87	0.16	3.5	2649600	979	1341	56
13	6.95	5.8	2214	1.30	1555.6	153.7	10.12	0.13	3.5	2649600	1197	1344	56
14	7.17	5.9	2401	1.35	1489.6	166.9	8.93	0.15	3.4	2649600	1103	1531	63
15	7.43	6.3	5638	1.38	648.5	179.2	3.62	0.38	3.4	2649600	470	1923	79
16	7.45	5.9	2183	1.34	1626.7	184.8	8.80	0.15	3.5	2649600	1214	1408	59
17	7.43	6.3	2037	1.26	1639.1	176.8	9.27	0.14	3.5	2649600	1301	1314	55
18	7.46	6.4	2601	1.29	1314.1	178.1	7.38	0.17	3.4	2649600	1019	1314	54
19	7.45	6.9	1867	1.25	1773.8	170.6	10.40	0.12	3.5	2649600	1419	1187	50
20	7.45	7.2	2119	1.26	1575.4	167.3	9.42	0.13	3.5	2649600	1250	1322	55
21	7.45	5.5	2202	1.34	1612.7	190.0	8.49	0.16	3.5	2649600	1203	1300	54
22	7.44	4.2	1973	1.41	1893.2	208.7	9.07	0.16	3.4	2649600	1343	1476	61
23	7.44	4.3	1996	1.34	1779.2	205.7	8.65	0.15	2.9	2649600	1328	1474	52
24	7.43	4.6	1712	1.35	2089.5	201.0	10.40	0.13	3.9	2649600	1548	1251	59
25	7.43	4.2	2221	1.35	1610.8	206.6	7.80	0.17	3.2	2649600	1193	1433	54
26	7.42	4.2	2076	1.39	1773.7	206.8	8.58	0.16	3.5	2649600	1276	1312	55
27	7.42	5.5	2108	1.39	1747.0	189.0	9.25	0.15	3.8	2649600	1257	1328	61
28	7.41	5.6	2259	1.34	1571.9	186.0	8.45	0.16	3.7	2649600	1173	1488	67
Averages	7.29	5.5	2341	1.33	1567.0	179.3	8.76	0.16	3.5		1183	1398	58

5.0 ULTRAVIOLET DISINFECTION

Total Water Treated:	226,064 m^3	100.00%
On-Spec Water:	226,064 m^3	100.00%
Off-Spec Water:	0 m^3	0.000%

Average monthly chlorine residual before UV Treatment was 1.14 mg/L
The average monthly chlorine residual after UV treatment and re-chlorination was 1.45 mg/L.

Figure 5.1 - UV Disinfection – BMID Mission Creek Source – February 2022

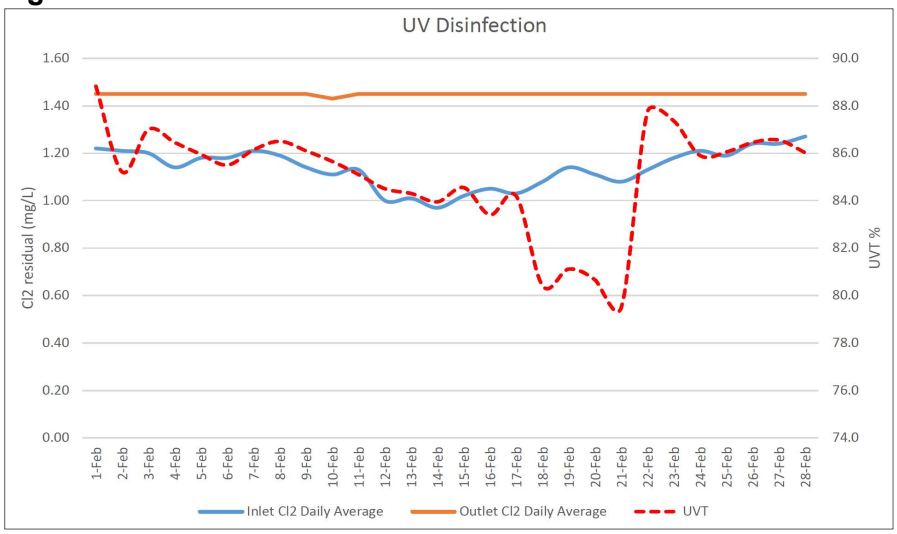


Table 5.2 - UV Disinfection Table – Mission Creek Source

	Inlet Cl2 Daily Average	Outlet Cl2 Daily Average		UVT		In Spec Water Volume	Off Spec Water	Off Spec % of Water
Date	mg/L	mg/L		% T		Cubic Meters	Cubic Meters	Percentage
1-Feb	1.22	1.45		88.8		7907.5	0	0.00%
2-Feb	1.21	1.45		85.2		7907.7	0	0.00%
3-Feb	1.20	1.45		87.0		7743.1	0	0.00%
4-Feb	1.14	1.45		86.5		6778.6	0	0.00%
5-Feb	1.18	1.45		86.0		8058.9	0	0.00%
6-Feb	1.18	1.45		85.5		8059.1	0	0.00%
7-Feb	1.21	1.45		86.1		7907.3	0	0.00%
8-Feb	1.19	1.45		86.5		7907.4	0	0.00%
9-Feb	1.14	1.45		86.1		7527.7	0	0.00%
10-Feb	1.11	1.43		85.7		7390.8	0	0.00%
11-Feb	1.13	1.45		85.1		8030.1	0	0.00%
12-Feb	1.00	1.45		84.5		8030.3	0	0.00%
13-Feb	1.01	1.45		84.3		7227.3	0	0.00%
14-Feb	0.97	1.45		84.0		8220.7	0	0.00%
15-Feb	1.02	1.45		84.6		10363.5	0	0.00%
16-Feb	1.05	1.45		83.4		10363.6	0	0.00%
17-Feb	1.03	1.45		84.2		7055.5	0	0.00%
18-Feb	1.08	1.45		80.4		7063.7	0	0.00%
19-Feb	1.14	1.45		81.1		6380.2	0	0.00%
20-Feb	1.11	1.45		80.7		7119.4	0	0.00%
21-Feb	1.08	1.45		79.5		6983.9	0	0.00%
22-Feb	1.13	1.45		87.8		7930.4	0	0.00%
23-Feb	1.18	1.45		87.4		10795.7	0	0.00%
24-Feb	1.21	1.45		85.9		9678.1	0	0.00%
25-Feb	1.19	1.45		86.1		9678.3	0	0.00%
26-Feb	1.24	1.45		86.5		7126.1	0	0.00%
27-Feb	1.24	1.45		86.6		8006.7	0	0.00%
28-Feb	1.27	1.45		86.0		8823	0	0.00%
Average	1.14	1.45		85.0	Total	226064.6	0	0.0000%

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
- 25 samples were found to be absent of Coliforms.
- 25 samples were found to be absent of *E.Coli*.

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

	2921 Belgo Rd		Booster 1		Ellison Blow-Off		Ellison School		3976 Highway 97		Prospect Reservoir		Tower Reservoir		Well #4		Kirschner Res		Pearson School	
Date	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
4-Jan-22			0	0	0	0	0	0	0	0			0	0	0	0				
10-Jan-21	0	0	0	0							0	0			0	0	0	0	0	0
17-Jan-22			0	0	0	0	0	0	0	0			0	0	0	0				
25-Jan-22	0	0	0	0							0	0			0	0	0	0	0	0
31-Jan-22			0	0	0	0	0	0	0	0			0	0	0	0				
7-Feb-22	0	0	0	0							0	0			0	0	0	0	0	0
14-Feb-22			0	0	0	0	0	0	0	0			0	0	0	0				
16-Feb-22													0	0						
22-Feb-22	0	0	0	0							0	0			0	0	0	0	0	0
28-Feb-22			0	0	0	0	0	0	0	0			0	0	0	0				

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 6.2 - BMID In-house Testing – Presence Absence

	2/7/2022				2/14/2022				2/22/2022				2/28/2022			
Location	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.
Sylvania Cres									0.76	8.2	-	X				
170 Kneller Rd									0.83	8.4	-	X				
2105 Morrison					0.59	6.2	-	X								
Staymen Rd					0.48	5.2	-	X								
260 Campion Rd	0.61	9.4	-	X									0.64	9.4	-	X
Fenwick Rd	0.70	10.0	-	X									0.55	10.4	-	X
Solly Ct									0.88	8.8	-	X				

- BMID Population = 28,000

RECOMMENDED TESTS

- Recommended number of samples per month = 28

  (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 25
- Total tests sampled in BMID treated distribution system = 34