



MONTHLY REPORTING PERIOD - APRIL, 2023

SUMMARY

This document provides a summary of the water quality information collected by BMID in April 2023. Documentation and figures are provided on the following pages to support this submission.

WATER SUPPLY & USAGE SUMMARY

1. Water usage data for April is as follows:

Source	Total (US Gals)	Total (Mega Litres)
Mission Creek	89,805,800	339.91
Well 4	3,630,488	13.74
Well 5	3,457,536	13.09
Well 6 (Irrigation Only)	0	0
Scotty Creek (Irrigation Only)	0	0
Total	96,893,824	366.74

2. BMID's control gates on the high-elevation reservoirs are closed for the spring. The gates will remain closed until summer of 2023;
3. BMID's Scotty Creek source supplying irrigation water to the north-end of the service area, provided water from May 27th, 2022 to September 9th 2022 when irrigation demands in the north-end reduced from peak flows experienced earlier in summer. The Scotty Creek source will resume service in the summer of 2023;
4. Well #4, used as a primary source for domestic water in the north-end of the distribution system, was in operation throughout the month of April;
5. 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, resumed operation on April 19th as flows in the north end increased;
6. Well #6, which supplies water to the north-end irrigation distribution system, ran from May 26 to September 25, 2022. Well #6 will remain in stand-by mode until irrigation demands increase in the spring/summer of 2023;
7. 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 is not moving;

WATER QUALITY SUMMARY

1. The WTP ran throughout most of April starting on the 5th as the initial stages of spring freshet began to increase both turbidity and colour in the raw water. The WTP will remain in use until the late-fall/early-winter;
2. Raw water turbidity levels in Mission Creek peaked at 57.01 NTU (average daily turbidity) on April 29th. Average daily raw water turbidity for April was 9.67 NTU at the Mission Creek intake;
3. The highest turbidity level at the Distribution Intake (end of Hadden Reservoir) was 0.82 NTU on April 5th, 2023. Average settled water turbidity for April was 0.66 NTU at the Distribution Intake at the lower end of Hadden Reservoir;
4. Turbidity entering the distribution system at the Screen Works averaged below 1.00 NTU throughout April. However, the highest turbidity level at the first customer (Booster #1) was 1.09 NTU on April 28th. The increase in turbidity is a result of increased system flows stirring up sediment already present in the water main. However, the increased turbidity was after disinfection took place downstream of the chlorination and UV facilities. Average monthly turbidity at the first customer was 0.56 NTU;
5. The highest turbidity daily average at the UV plant was 1.08 NTU on April 29th. Increased flows caused an internal stirring of sediment in the mains leading to higher turbidity at the UV Plant for short durations. Average monthly turbidity at the UV plant was 0.56 NTU throughout April;
6. BMID's Ultraviolet Treatment Facility treated 339,926.2 m³ of water, none of which was "Off-Spec" (0.00%);
7. Regarding microbiological readings, the Mission Creek upper and mid-elevation watershed was frozen over throughout the month of April resulting in a greater groundwater influence on the raw water quality. However, as rising temperatures melt the lower portions of the watershed, Mission Creek will have greater variability in microbiological conditions as surface water runoff begins to affect creek conditions;
8. *E.Coli* levels at Mission Creek's Point-of-Diversion (creek intake prior to WTP) had average counts for April. The April 20th sample had the peak monthly count of 53 coliforms. The average monthly *E.Coli* was 15.75, based on 4 samples;
9. *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 due to the settling of particles as water passes through the BMID Water Treatment Plant, Stevens Reservoir and Hadden Reservoir;
10. 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 April;
11. Disinfection By-Product testing occurred on April 3rd 2023. Both THM and HAA results were well below MAC limits;

1.0 FLOWS - APRIL, 2023

The Maximum Daily Flow was on April 30th, at 7,804,005 US gallons (29.54 ML)

The Minimum Daily Flow was on April 3rd, at 2,134,166 US gallons (8.08 ML)

Mission Creek provided just over 93% of domestic flow supplied in April.

Figure 1.1 - Domestic Water System Flow

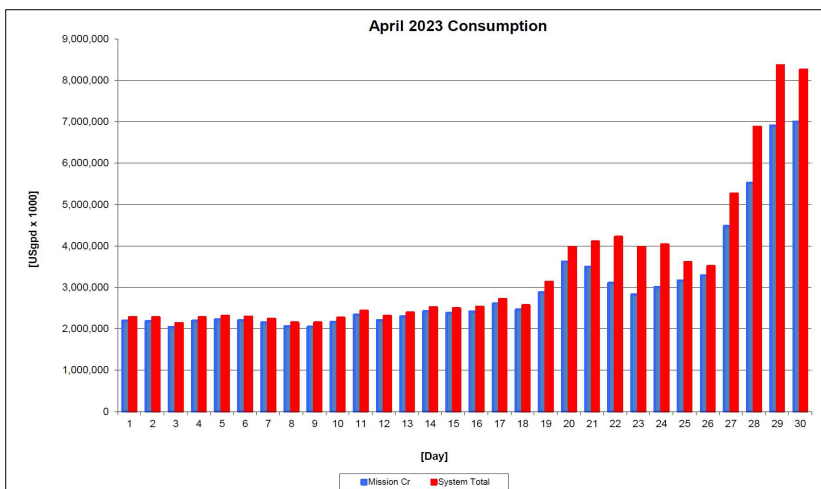


Table 1.2 - April 2023 - Daily Consumption Report

Year	Mission Cr	Well #4	Well #5	System Total	System Total
2023	Usgpd	Usgpd	Usgpd	Usgpd	ML/Day
1-Apr	2,194,107	86,384	0	2,280,491	8.63
2-Apr	2,179,023	94,309	0	2,273,331	8.60
3-Apr	2,039,857	94,309	0	2,134,166	8.08
4-Apr	2,190,144	85,855	0	2,276,000	8.61
5-Apr	2,223,800	87,969	0	2,311,769	8.75
6-Apr	2,201,134	87,969	0	2,289,103	8.66
7-Apr	2,148,775	90,082	0	2,238,857	8.47
8-Apr	2,052,590	94,837	0	2,147,427	8.13
9-Apr	2,045,959	99,328	0	2,145,287	8.12
10-Apr	2,163,489	99,328	0	2,262,817	8.56
11-Apr	2,334,012	100,913	0	2,434,925	9.22
12-Apr	2,205,176	100,913	0	2,306,089	8.73
13-Apr	2,291,243	98,800	0	2,390,043	9.05
14-Apr	2,419,604	96,158	0	2,515,762	9.52
15-Apr	2,378,314	111,216	0	2,489,530	9.42
16-Apr	2,415,721	113,065	0	2,528,786	9.57
17-Apr	2,603,441	113,065	0	2,716,506	10.28
18-Apr	2,460,313	104,875	0	2,565,189	9.71
19-Apr	2,877,467	102,234	73,545	3,053,246	11.56
20-Apr	3,616,620	101,970	120,752	3,839,342	14.53
21-Apr	3,491,324	101,970	271,012	3,864,305	14.63
22-Apr	3,104,180	137,897	497,908	3,739,984	14.16
23-Apr	2,823,999	137,897	433,212	3,395,108	12.85
24-Apr	2,999,224	124,952	148,384	3,272,561	12.39
25-Apr	3,163,301	120,726	48,554	3,332,581	12.61
26-Apr	3,284,609	130,764	40,550	3,455,923	13.08
27-Apr	4,475,813	160,351	293,176	4,929,340	18.66
28-Apr	5,522,225	185,712	574,913	6,282,850	23.78
29-Apr	6,903,792	255,188	459,524	7,618,504	28.84
30-Apr	6,996,543	311,456	496,006	7,804,005	29.54
Totals Usgpd	89,805,800	3,630,488	3,457,536	96,893,824	366.74
Totals ML	339.91	13.74	13.09		
Avg's	2,993,527	11.33		3,229,794	12.22
Max	6,996,543	26.48		7,804,005	29.54
Min	2,039,857	7.72		2,134,166	8.08

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 upper watershed is frozen over with snow cover and no overland flow to the creeks in the watershed. However, the lower elevations of the watershed have begun to melt resulting in increased E.Coli levels compared to previous months. Moreover, The *E.Coli* readings confirm the WTP’s effectiveness in reducing raw water quality risks with coagulation, flocculation, and sedimentation processes followed by settling times across Stevens and Hadden Reservoirs.

Figure 2.1 - Raw Water *E.Coli* Readings (CARO Lab results) March 2023 - April 2023

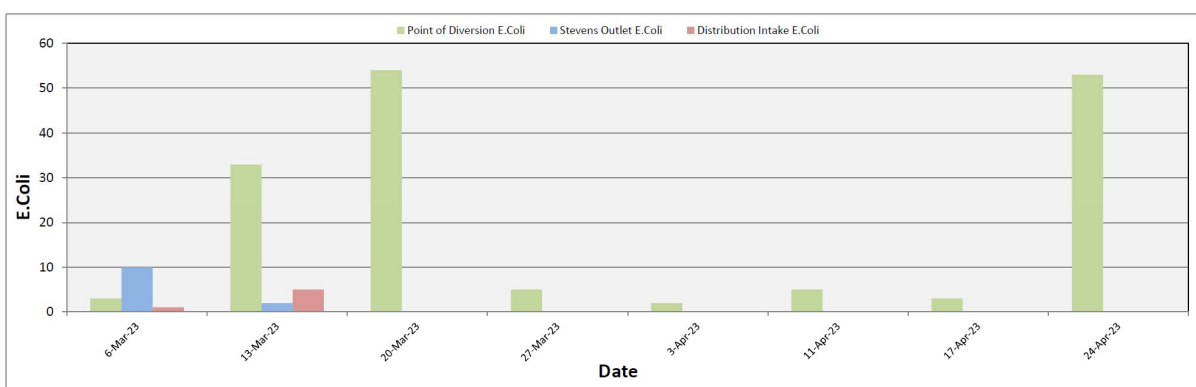


Table 2.1 - *E.Coli* Readings (CARO Labs)

Date	Point of Diversion E.Coli	Stevens Outlet E.Coli	Distribution Intake E.Coli
6-Mar-23	3	10	1
13-Mar-23	33	2	5
20-Mar-23	54	0	0
27-Mar-23	5	0	0
3-Apr-23	2	0	0
11-Apr-23	5	0	0
17-Apr-23	3	0	0
24-Apr-23	53	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 April 2023, 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 1.09 NTU on April 28th, 2023. The lowest turbidity level was 0.35 NTU and the average turbidity was 0.56 NTU.

The distribution intake is where the water leaves Hadden Reservoir and enters a closed conduit. 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 (Mission Creek Raw - Distribution Intake - Booster Station 1 and UV Plant)

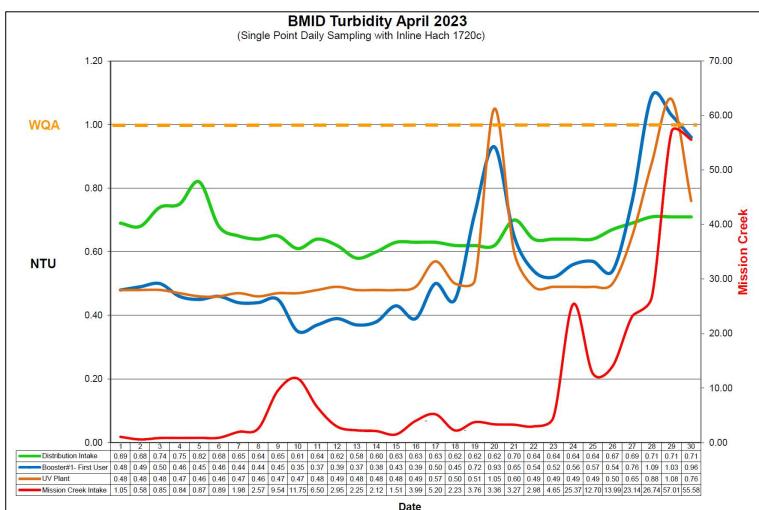


Table 3.1 - Daily Monitoring Record – Turbidity at On-Line Turbidity Analysers

Turbidity Point Sampling for April 2023				
Date	Mission Creek Intake	Distribution Intake	Booster#1- First User	UV Plant
	Daily Average [NTU]	Daily Average NTU	Daily Average NTU	Daily Average [NTU]
1	1.05	0.69	0.48	0.48
2	0.58	0.68	0.49	0.48
3	0.85	0.74	0.50	0.48
4	0.84	0.75	0.46	0.47
5	0.87	0.82	0.45	0.46
6	0.89	0.68	0.46	0.46
7	1.98	0.65	0.44	0.47
8	2.57	0.64	0.44	0.46
9	9.54	0.65	0.45	0.47
10	11.75	0.61	0.35	0.47
11	6.50	0.64	0.37	0.48
12	2.95	0.62	0.39	0.49
13	2.25	0.58	0.37	0.48
14	2.12	0.60	0.38	0.48
15	1.51	0.63	0.43	0.48
16	3.99	0.63	0.39	0.49
17	5.20	0.63	0.50	0.57
18	2.23	0.62	0.45	0.50
19	3.76	0.62	0.72	0.51
20	3.36	0.62	0.93	1.05
21	3.27	0.70	0.65	0.60
22	2.98	0.64	0.54	0.49
23	4.65	0.64	0.52	0.49
24	25.37	0.64	0.56	0.49
25	12.70	0.64	0.57	0.49
26	13.99	0.67	0.54	0.50
27	23.14	0.69	0.76	0.65
28	26.74	0.71	1.09	0.88
29	57.01	0.71	1.03	1.08
30	55.58	0.71	0.96	0.76
AVG	9.67	0.66	0.56	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, 2023.

Figure 4.1 - CT Trending – BMID Mission Creek Source – April 2023

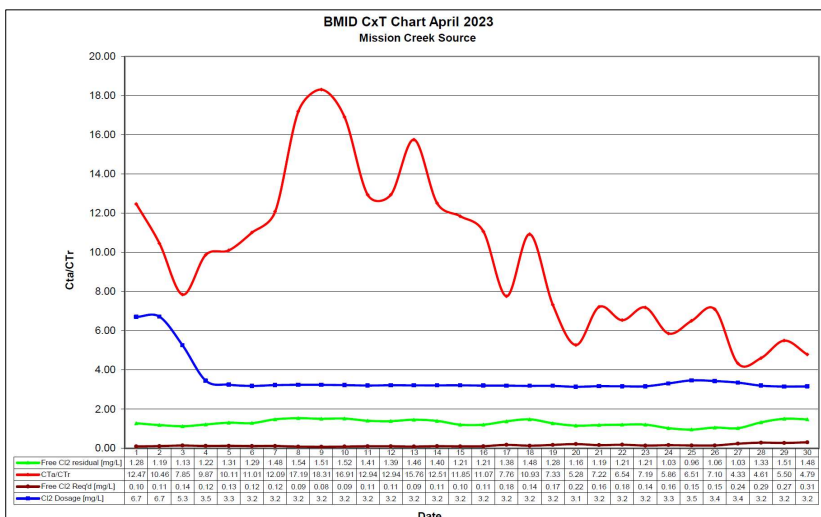


Table 4.2 - CT Table – Mission Creek Source

BMID April 2023 Mission Creek Source													
DATE	pH (Average)	TEMP (Present) [°C]	PEAK FLOW [Usgpm]	Free Cl ₂ residual [mg/L]	CT achieved	CT req'd	CTa/CTr	Free Cl ₂ Req'd [mg/L]	Cl ₂ Dosage [mg/L]	VOLUME TOTAL [USgal]	TIME [mins]	FLOW Daily Average [USGPM]	CL ₂ DOSAGE Average [PPD]
1	8.04	13.1	1,989	1.28	1704.9	136.7	12.47	0.10	6.7	2649600	1332	1,549	125
2	8.04	12.6	2,152	1.19	1464.8	140.0	10.46	0.11	6.7	2649600	1231	1,541	124
3	7.92	10.7	2,507	1.13	1194.4	152.2	7.85	0.14	5.3	2649600	1057	1,440	91
4	7.82	9.3	1,997	1.22	1618.6	164.0	9.87	0.12	3.5	2649600	1327	1,541	64
5	7.81	9.2	2,065	1.31	1680.6	166.3	10.11	0.13	3.3	2649600	1283	1,562	61
6	7.82	10.4	2,026	1.29	1687.3	153.2	11.01	0.12	3.2	2649600	1308	1,553	60
7	7.82	10.5	2,089	1.48	1877.1	155.3	12.09	0.12	3.2	2649600	1268	1,516	59
8	7.82	14.8	2,047	1.54	1993.3	116.0	17.19	0.09	3.2	2649600	1294	1,444	56
9	7.82	15.4	1,970	1.51	2030.7	110.9	18.31	0.08	3.2	2649600	1345	1,441	56
10	7.82	14.9	2,072	1.52	1943.3	114.9	16.91	0.09	3.2	2649600	1278	1,525	59
11	7.82	14.7	2,505	1.41	1491.3	115.2	12.94	0.11	3.2	2649600	1058	1,648	64
12	7.77	14.0	2,398	1.39	1535.7	118.6	12.94	0.11	3.2	2649600	1105	1,553	60
13	7.67	14.8	2,248	1.46	1720.5	109.2	15.76	0.09	3.2	2649600	1178	1,618	63
14	7.67	13.5	2,496	1.40	1485.9	118.7	12.51	0.11	3.2	2649600	1061	1,705	66
15	7.67	13.5	2,329	1.21	1376.4	116.2	11.85	0.10	3.2	2649600	1138	1,676	65
16	7.67	13.2	2,443	1.21	1312.6	118.6	11.07	0.11	3.2	2649600	1085	1,707	66
17	7.66	12.5	3,722	1.38	982.5	126.6	7.76	0.18	3.2	2649600	712	1,835	71
18	7.70	12.4	2,747	1.48	1427.6	130.6	10.93	0.14	3.2	2649600	965	1,743	67
19	7.79	11.1	3,208	1.28	1057.2	144.3	7.33	0.17	3.2	2649600	826	2,023	78
20	7.79	13.9	4,976	1.16	617.6	117.1	5.28	0.22	3.1	2649600	532	2,567	97
21	7.75	13.4	3,641	1.19	866.1	120.0	7.22	0.16	3.2	2649600	728	2,457	94
22	7.75	13.0	3,963	1.21	809.1	123.7	6.54	0.18	3.2	2649600	669	2,202	84
23	7.75	13.4	3,156	1.21	864.8	120.3	7.19	0.14	3.2	2649600	840	2,007	76
24	7.75	13.4	3,695	1.03	688.4	117.4	5.86	0.16	3.3	2649600	717	2,110	84
25	7.75	15.1	3,783	0.96	672.3	103.3	6.51	0.15	3.5	2649600	700	2,240	93
26	7.75	13.7	3,424	1.06	820.3	115.5	7.10	0.15	3.4	2649600	774	2,338	97
27	7.75	13.2	5,289	1.03	516.0	119.1	4.33	0.24	3.4	2649600	501	3,161	127
28	7.74	14.2	6,650	1.33	529.9	115.0	4.61	0.29	3.2	2649600	398	3,923	151
29	7.69	15.5	6,912	1.51	578.8	105.3	5.50	0.27	3.2	2649600	383	4,891	185
30	7.65	15.6	7,966	1.48	492.2	102.8	4.79	0.31	3.2	2649600	333	4,944	188
Averages	7.78	13.2	3282	1.30	1234.68	125.6	9.81	0.151	3.5372		948	2,115	87.63

5.0 ULTRAVIOLET DISINFECTION

Total Water Treated: 339,926.2 m³ 100.00%
 On-Spec Water: 339,926.2 m³ 100.00%
 Off-Spec Water: 0.0 m³ 0.00%

Average monthly chlorine residual before UV Treatment was 1.28 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 – April 2023

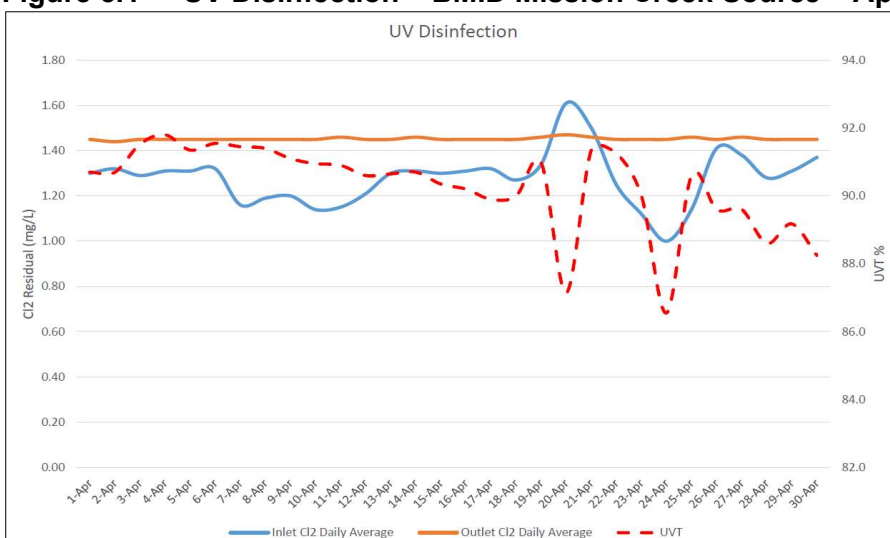


Table 5.2 - UV Disinfection Table – Mission Creek Source

	Inlet Cl2 Daily	Outlet Cl2 Daily	UVT	Turbidity		In Spec Water Volume	Off Spec Water	Off Spec % of Water
Date	mg/L	mg/L	% T	NTU		Cubic Meters	Cubic Meters	Percentage
1-Apr	1.30	1.45	90.7	0.55		8305.6	0	0.00%
2-Apr	1.32	1.44	90.7	0.53		8248.5	0	0.00%
3-Apr	1.29	1.45	91.5	0.48		7721.7	0	0.00%
4-Apr	1.31	1.45	91.8	0.57		8290.6	0	0.00%
5-Apr	1.31	1.45	91.4	0.48		8418.0	0	0.00%
6-Apr	1.32	1.45	91.6	0.49		8332.2	0	0.00%
7-Apr	1.16	1.45	91.5	0.50		8134.0	0	0.00%
8-Apr	1.19	1.45	91.4	0.48		7769.9	0	0.00%
9-Apr	1.20	1.45	91.1	0.49		7744.8	0	0.00%
10-Apr	1.14	1.45	91.0	0.50		8189.7	0	0.00%
11-Apr	1.15	1.46	90.9	0.56		8835.2	0	0.00%
12-Apr	1.21	1.45	90.6	0.53		8347.5	0	0.00%
13-Apr	1.30	1.45	90.7	0.96		8673.3	0	0.00%
14-Apr	1.31	1.46	90.7	0.51		9159.2	0	0.00%
15-Apr	1.30	1.45	90.4	0.59		9002.9	0	0.00%
16-Apr	1.31	1.45	90.2	0.85		9144.5	0	0.00%
17-Apr	1.32	1.45	89.9	0.88		9855.1	0	0.00%
18-Apr	1.27	1.45	90.0	0.59		9313.3	0	0.00%
19-Apr	1.34	1.46	91.0	0.51		10892.4	0	0.00%
20-Apr	1.61	1.47	87.2	1.05		13690.4	0	0.00%
21-Apr	1.50	1.46	91.4	0.98		13216.1	0	0.00%
22-Apr	1.25	1.45	91.3	0.54		11750.6	0	0.00%
23-Apr	1.12	1.45	90.0	2.37		10690.0	0	0.00%
24-Apr	1.00	1.45	86.6	5.61		11353.3	0	0.00%
25-Apr	1.14	1.46	90.6	0.54		11974.4	0	0.00%
26-Apr	1.41	1.45	89.6	1.54		12433.6	0	0.00%
27-Apr	1.38	1.46	89.6	1.22		16942.8	0	0.00%
28-Apr	1.28	1.45	88.6	2.16		20903.9	0	0.00%
29-Apr	1.31	1.45	89.2	1.08		26109.1	0	0.00%
30-Apr	1.37	1.45	88.3	1.51		26483.6	0	0.00%
Average	1.28	1.45	90.3		Total	339926.2	0	0.00%

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
- 24 samples were found to be absent of Coliforms.
- 24 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
6-Mar-23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13-Mar-23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20-Mar-23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-Mar-23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Apr-23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11-Apr-23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17-Apr-23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24-Apr-23	0	0	0	0	0	0	0	0	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

Location	4/4/2023				4/11/2023				4/17/2023				4/26/2023			
	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.
Sylvania Cres					0.72	18.2	-	X								
170 Kneller Rd					0.84	15.8	-	X								
2105 Morrison	0.79	11.2	-	X									0.68	12.8	-	X
Staymen Rd	0.96	9.4	-	X									0.78	12.4	-	X
260 Campion Rd									0.67	10.0	-	X				
Fenwick Rd									0.85	12.2	-	X				
Solly Ct					0.89	20.6	-	X								

Table 6.3 - BMID Disinfection By-product Testing – THM and HAA

3-Apr-23		
Location	THM (mg/L)	HAA (mg/L)
UV Plant	0.0559	0.0520
Pearson School	0.0669	0.0672

- Both THM and HAA results are within the limits as set out in the Guidelines for Canadian Drinking Water Quality

- 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 24
- Total tests sampled in BMID treated distribution system = 33
- 0 Positive *E. Coli* and Total Coliform Samples