



MONTHLY REPORTING PERIOD - JULY, 2019

1. SUMMARY

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

Source	Total (US Gals)	Total (Mega Litres)
Mission Creek	469,349,114	1,776.49
Well 4	0	0
Well 5	30,897,550	116.95
Well 6 (Irrigation Only)	14,535,011	55.02
Scotty Creek (Irrigation Only)	9,486,000	35.90
Total	524,267,675	1,984.35

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 July, 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 movement and groundwater levels every month.
2. BMID has 300m of flexible 900mm diameter High-density Polyethylene (HDPE) pipe on-site. As a contingency plan, the pipe has been fused into longer sections and is stored on location where it can be assembled in a fairly short period of time, should a slope failure occur;
3. Turbidity levels at the Distribution Intake peaked at 0.35 NTU on July 21, 2019. Average turbidity for July was 0.27 NTU;
4. The highest monthly turbidity level recorded at the first customer (Booster #1) was 0.29 NTU on July 06. Average monthly turbidity was 0.23 NTU for July;
5. BMID's Ultraviolet Treatment Facility treated 1,740,570.7m³ of water, with only 0.049% being "Off-Spec". Average UV Transmissivity was 92.35%. The average inlet chlorine residual was 1.37 mg/L compared to an average of 1.40 mg/L for the outlet after UV treatment (from BMID sodium hypochlorite top up system);
6. Mission Creek had average natural flows for early summer during July. Above average rainfall occurred in the watershed in early July mitigating the low that average natural flows recorded during June of 2019;
7. BMID's Scotty Creek source, used for irrigation in the north-end, was used as a supplementary source throughout July 2019;
8. Well # 5 was the primary source of domestic water for the north-end for all of July;
9. Well #6 which supplies irrigation water to the twinned north-end of the system, was used consistently throughout July to supplement flows from Well 5 and Mission Creek;
10. *E.Coli* levels at Mission Creek's Point of Diversion (creek intake prior to WTP) had average counts throughout July with a peak count of 63 on July 8, 2019. The Point of

Diversion had an average *E. Coli* count of 24.4 CFU/100ml per sample based on the 8 samples taken throughout the last month;

11. *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 July, 2019 with a peak counts of 3 *E-Coli* on July 2. Average *E. Coli* counts for the month was less than 1.0 (0.77) CFU/100ml based of the 9 samples taken;
12. No *E. Coli* or were found in treated water in the distribution system through third-party analysis;
13. Two samples collected at the Ellison School sample site were found to have positive counts for Total Coliforms. The July 8 sample had 6 CFU/100ml and the July 12 sample had a count of 1 CFU/100ml. No positive *E. Coli* counts were found in the water distribution system;
14. Once the positive samples were identified, the water mains in the affected area were thoroughly flushed and the chlorination dose was increased at Well 5 which is the primary domestic water source for the area. Subsequent testing had zero counts on all samples throughout the remainder of the month;
15. The WTP ran throughout July, 2019 as water quality conditions in Mission Creek required chemical treatment to reduce turbidity and colour levels associated with raw water quality in the early summer.

1.0 FLOWS - JULY, 2019

Maximum Daily Flow was on July 30, 2019 at 26,036,637 US gallons (98.55 ML)

Minimum Daily Flow was on July 6, 2019 at 8,204,579 US gallons (31.05 ML)

Mission Creek provided 90% of domestic flow throughout July.

Figure 1.1 - Domestic Water System Flow

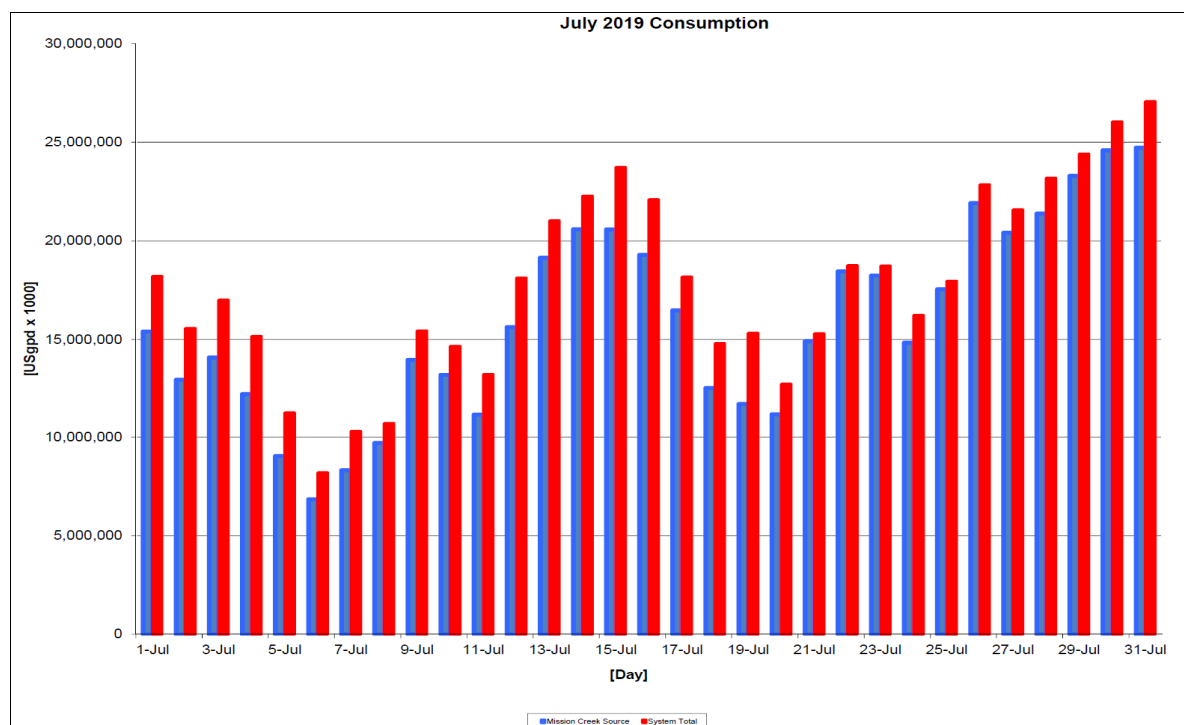


Table 1.2 - July 2019 - Daily Consumption Report

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-Jul	15,402,981	0	1,382,480	872,048	550,000	18,207,509	68.92
2-Jul	12,911,095	0	1,447,068	985,968	226,000	15,570,131	58.93
3-Jul	14,090,514	0	1,612,145	1,076,976	221,000	17,000,635	64.35
4-Jul	12,178,623	0	1,583,546	1,097,560	304,000	15,163,729	57.39
5-Jul	9,043,227	0	1,147,981	994,117	56,000	11,241,325	42.55
6-Jul	6,842,656	0	1,286,320	68,603	7,000	8,204,579	31.05
7-Jul	8,318,851	0	1,286,320	679,879	11,000	10,296,050	38.97
8-Jul	9,702,507	0	915,556	7,352	69,000	10,694,415	40.48
9-Jul	13,967,042	0	987,488	0	488,000	15,442,530	58.45
10-Jul	13,161,928	0	908,593	0	594,000	14,664,521	55.51
11-Jul	11,140,878	0	1,611,217	4,778	424,000	13,180,873	49.89
12-Jul	15,630,905	0	1,386,080	1,105,306	0	18,122,291	68.59
13-Jul	19,137,807	0	1,053,616	822,240	6,000	21,019,663	79.56
14-Jul	20,588,203	0	146,872	1,131,848	406,000	22,272,923	84.30
15-Jul	20,577,199	0	1,294,624	1,002,324	856,000	23,730,147	89.82
16-Jul	19,288,971	0	1,122,640	1,040,750	634,000	22,086,361	83.60
17-Jul	16,476,678	0	1,458,400	115,614	126,000	18,176,692	68.80
18-Jul	12,492,887	0	1,335,682	968,496	0	14,797,065	56.01
19-Jul	11,678,297	0	1,880,446	1,766,684	0	15,325,427	58.01
20-Jul	11,153,137	0	743,640	793,860	0	12,690,637	48.03
21-Jul	14,907,462	0	389,061	0	0	15,296,523	57.90
22-Jul	18,456,105	0	295,775	0	0	18,751,880	70.98
23-Jul	18,234,277	0	496,976	0	0	18,731,253	70.90
24-Jul	14,841,658	0	1,359,865	0	24,000	16,225,523	61.41
25-Jul	17,545,924	0	413,095	0	0	17,959,019	67.97
26-Jul	21,909,936	0	560,880	0	376,000	22,846,816	86.48
27-Jul	20,406,480	0	689,081	0	485,000	21,580,561	81.68
28-Jul	21,378,648	0	920,615	0	887,000	23,186,263	87.76
29-Jul	23,288,785	0	492,304	0	628,000	24,409,089	92.39
30-Jul	24,595,453	0	689,184	0	752,000	26,036,637	98.55
31-Jul	24,717,824	0	999,048	608	1,356,000	27,073,480	102.47
Totals Usgpd	469,349,114	0	30,897,550	14,535,011	9,486,000	524,267,675	1984.35
Totals ML	1,776.49	0.00	116.95	55.02	35.90		
Avg's	15,644,970	59.22				17,430,369	65.97
Max	24,595,453	93.09				26,036,637	98.55
Min	6,842,656	25.90				8,204,579	31.05

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) June-July 2018/2019

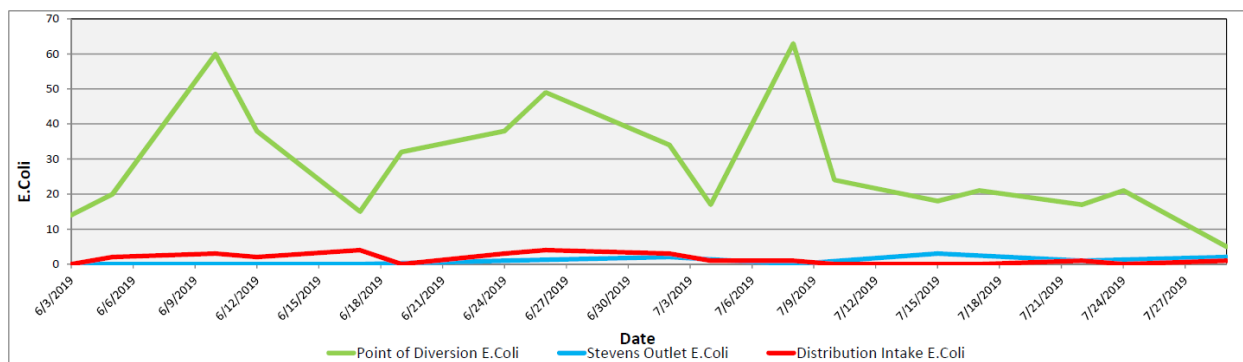


Table 2.1 - *E. Coli* Readings (CARO Labs)

Date	Point of Diversion E. Coli	Stevens Outlet E. Coli	Distribution Intake E. Coli
3-Jun-19	14	0	0
5-Jun-19	20	0	2
10-Jun-19	60	0	3
12-Jun-19	38	0	2
17-Jun-19	15	0	4
19-Jun-19	32	0	0
24-Jun-19	38	1	3
26-Jun-19	49	0	4
2-Jul-19	34	2	3
4-Jul-19	17	0	1
8-Jul-19	63	0	1
10-Jul-19	24	0	0
15-Jul-19	18	3	0
17-Jul-19	21	0	0
22-Jul-19	17	1	1
24-Jul-19	21	0	0
29-Jul-19	5	2	1

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 July, 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 0.29 NTU on July 6. The average turbidity for the month was 0.23 NTU during July.

The distribution intake is where the water leaves Hadden Reservoir.

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

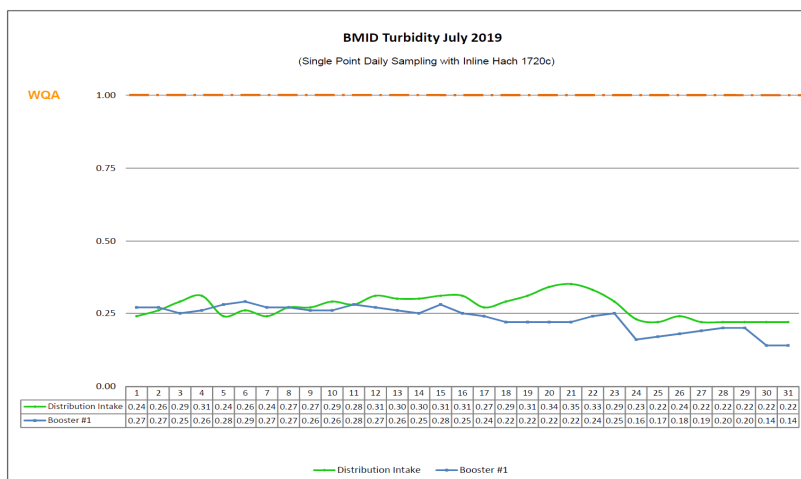


Table 3.1 - Daily Monitoring Record – Turbidity at Distribution Intake & Bst Stn 1

Turbidity Point Sampling for June 2019		
Date	Distribution Intake Daily Average [NTU]	Booster#1- First User Daily Average [NTU]
1	0.24	0.27
2	0.26	0.27
3	0.29	0.25
4	0.31	0.26
5	0.24	0.28
6	0.26	0.29
7	0.24	0.27
8	0.27	0.27
9	0.27	0.26
10	0.29	0.26
11	0.28	0.28
12	0.31	0.27
13	0.30	0.26
14	0.30	0.25
15	0.31	0.28
16	0.31	0.25
17	0.27	0.24
18	0.29	0.22
19	0.31	0.22
20	0.34	0.22
21	0.35	0.22
22	0.33	0.24
23	0.29	0.25
24	0.23	0.16
25	0.22	0.17
26	0.24	0.18
27	0.22	0.19
28	0.22	0.20
29	0.22	0.20
30	0.22	0.14
31	0.22	0.14
AVG	0.27	0.23

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 July, 2019.

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

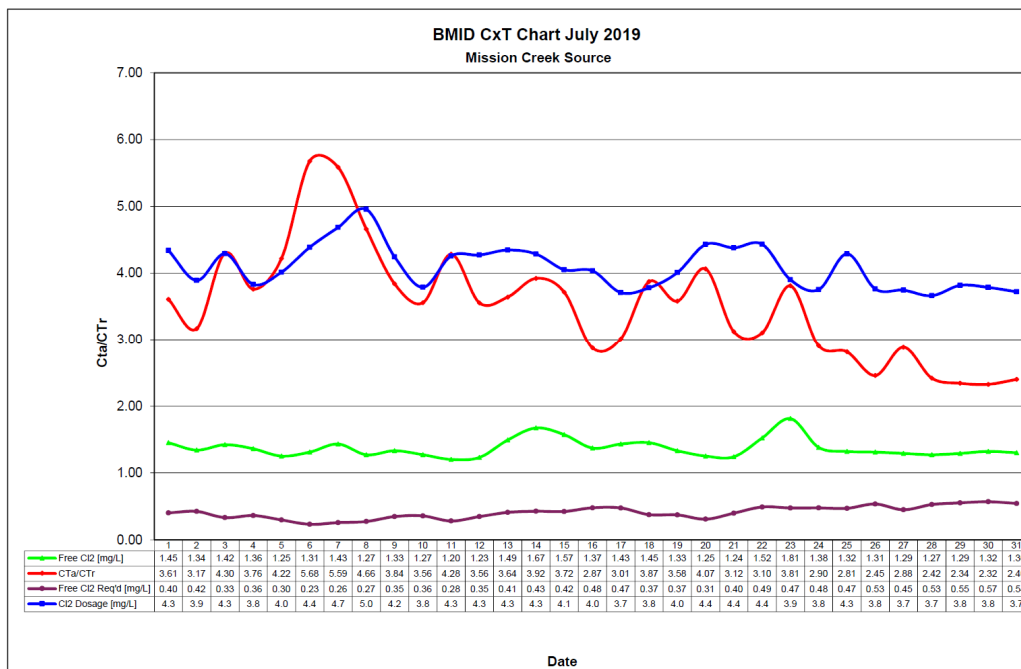


Table 4.2 - CT Table – Mission Creek Source

DATE	BMID July 2019												
	Mission Creek Source												
	pH	TEMP	PEAK	Free Cl ₂	CT	CT	CTa/CTr	Free Cl ₂	Cl ₂	VOLUME	TIME	FLOW	CL ₂ DOSAGE
	(Average)	(Present)	FLOW		achieved	req'd		Req'd	Dosage	TOTAL		Daily Average	Average
July		[°C]	[Usgpm]	[mg/L]				[mg/L]	[mg/L]	[USgal]	[mins]	[USGPM]	[PPD]
1	7.08	16.1	13245	1.45	290.1	80.4	3.61	0.40	4.3	2649600	200	7465.7	389.48
2	7.05	16.6	14774	1.34	240.3	75.8	3.17	0.42	3.9	2649600	179	7122.5	333.09
3	7.03	16.5	11448	1.42	328.7	76.5	4.30	0.33	4.3	2649600	231	6999.5	361.02
4	7.01	17.1	13249	1.36	272.0	72.3	3.76	0.36	3.8	2649600	200	6874.3	316.54
5	7.02	16.6	10576	1.25	313.2	74.2	4.22	0.30	4.0	2649600	251	5174.9	249.73
6	7.04	16.3	7951	1.31	436.5	76.9	5.68	0.23	4.4	2649600	333	3851.9	203.14
7	7.03	17.0	9173	1.43	413.1	73.9	5.59	0.26	4.7	2649600	289	4323.4	243.4
8	7.08	17.1	9821	1.27	342.6	73.5	4.66	0.27	5.0	2649600	270	4507.5	268.46
9	7.09	17.8	12961	1.33	271.9	70.8	3.84	0.35	4.2	2649600	204	6916.3	352.81
10	7.07	18.1	13842	1.27	243.1	68.3	3.56	0.36	3.8	2649600	191	7336.4	334.08
11	7.09	17.7	10574	1.20	300.7	70.2	4.28	0.28	4.3	2649600	251	5687.9	291.06
12	7.08	18.1	13427	1.23	242.7	68.3	3.56	0.35	4.3	2649600	197	7484.8	384.31
13	7.04	18.6	16219	1.49	243.4	66.8	3.64	0.41	4.3	2649600	163	9191.9	480.17
14	7.01	18.6	16788	1.67	263.6	67.2	3.92	0.43	4.3	2649600	158	10169.9	524.01
15	7.05	18.1	15993	1.57	260.1	70.0	3.72	0.42	4.1	2649600	166	10324.8	502.9
16	7.10	17.9	17850	1.37	203.4	70.9	2.87	0.48	4.0	2649600	148	9694.5	470.25
17	7.14	18.7	18363	1.43	206.3	68.5	3.01	0.47	3.7	2649600	144	9339.4	416.33
18	7.20	18.3	13741	1.45	279.6	72.2	3.87	0.37	3.8	2649600	193	6931.5	314.93
19	7.25	17.3	12643	1.33	278.7	77.8	3.58	0.37	4.0	2649600	210	6351.1	305.92
20	7.23	17.4	10722	1.25	308.9	76.0	4.07	0.31	4.4	2649600	247	5708.4	303.89
21	7.21	17.3	13870	1.24	236.9	75.9	3.12	0.40	4.4	2649600	191	7290.2	383.77
22	7.22	17.4	16641	1.52	242.0	78.0	3.10	0.49	4.4	2649600	159	8875.8	472.89
23	7.15	17.7	16483	1.81	291.0	76.4	3.81	0.47	3.9	2649600	161	9698.8	454.86
24	7.19	17.8	17041	1.38	214.6	73.9	2.90	0.48	3.8	2649600	155	7982.5	360.14
25	7.22	17.2	16079	1.32	217.5	77.4	2.81	0.47	4.3	2649600	165	8240.3	424.89
26	7.24	17.8	18928	1.31	183.4	74.7	2.45	0.53	3.8	2649600	140	10918.8	493.9
27	7.21	18.1	16446	1.29	207.8	72.2	2.88	0.45	3.7	2649600	161	10393.2	467.85
28	7.23	17.8	18803	1.27	179.0	74.1	2.42	0.53	3.7	2649600	141	10772.7	474.22
29	7.26	18.0	19736	1.29	173.2	74.1	2.34	0.55	3.8	2649600	134	11384.8	522.28
30	7.24	18.6	21281	1.32	164.3	70.8	2.32	0.57	3.8	2649600	125	12332.6	561.29
31	7.24	18.7	20502	1.30	168.0	70.1	2.40	0.54	3.7	2649600	129	12292.2	549.87
Averages	7.13	17.62258	14812	1.37	258.595	73.2	3.53	0.4078	4.093				

5.0 ULTRAVIOLET DISINFECTION

Total Water Treated: 1,740,570.7 m 100.000 %
On-Spec Water: 1,739,726.7 m³ 99.951 %
Off-Spec Water: 844.0 m³ 0.049%

Average monthly chlorine residual before UV Treatment was 1.37 mg/L compared to 1.40 mg/L after UV disinfection and re-chlorination.

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

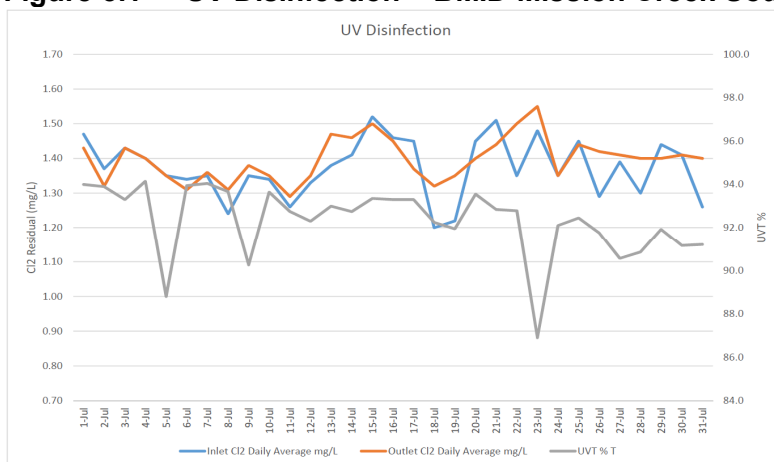


Table 5.2 - UV Disinfection Table – Mission Creek Source

	Inlet Cl2 Daily	Outlet Cl2 Daily	UVT		In Spec Water Volume	Off Spec Water Volume	Off Spec % of Water Volume
Date	mg/L	mg/L	% T		Cubic Meters	Cubic Meters	Percentage
1-Jul	1.47	1.43	94.0		51,650.40	0	0.00%
2-Jul	1.37	1.32	93.9		51,652.60	0	0.00%
3-Jul	1.43	1.43	93.3		46,390.20	0	0.00%
4-Jul	1.40	1.40	94.2		46,391.80	0	0.00%
5-Jul	1.35	1.35	88.8		40,152.60	0	0.00%
6-Jul	1.34	1.31	94.0		29,791.50	0	0.00%
7-Jul	1.35	1.36	94.1		26,805.10	0	0.00%
8-Jul	1.24	1.31	93.7		31,897.50	0	0.00%
9-Jul	1.35	1.38	90.3		45,521.10	0	0.00%
10-Jul	1.34	1.35	93.7		45,523.00	0	0.00%
11-Jul	1.26	1.29	92.8		43,524.10	0	0.00%
12-Jul	1.33	1.35	92.3		50,857.90	0	0.00%
13-Jul	1.38	1.47	93.0		63,850.40	0	0.00%
14-Jul	1.41	1.46	92.8		70,337.20	0	0.00%
15-Jul	1.52	1.50	93.4		70,339.70	0	0.00%
16-Jul	1.46	1.45	93.3		68,008.60	0	0.00%
17-Jul	1.45	1.37	93.3		64,404.80	0	0.00%
18-Jul	1.20	1.32	92.3		56,078.40	0	0.00%
19-Jul	1.22	1.35	92.0		40,517.30	0	0.00%
20-Jul	1.45	1.40	93.6		38,395.00	0	0.00%
21-Jul	1.51	1.44	92.9		48,733.90	0	0.00%
22-Jul	1.35	1.50	92.8		61,727.70	0	0.00%
23-Jul	1.48	1.55	86.9		61,991.60	0	0.00%
24-Jul	1.35	1.35	92.1		61,993.80	299.2	0.48%
25-Jul	1.45	1.44	92.5		59,633.10	299.2	0.50%
26-Jul	1.29	1.42	91.8		73,167.10	165	0.23%
27-Jul	1.39	1.41	90.6		73,169.50	86.6	0.12%
28-Jul	1.30	1.40	90.9		70,902.40	0	0.00%
29-Jul	1.44	1.40	91.9		78,443.50	0	0.00%
30-Jul	1.41	1.41	91.2		83,936.10	0	0.00%
31-Jul	1.26	1.40	91.2		83,938.80	0	0.00%
Average	1.37	1.40	92.35	Total	1,739,726.70	850	0.049%

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
- 49 samples were found to be absent of Coliforms.
- 51 samples were found to be absent of *E. Coli*.
- July 8 and 12 had positive Coliform counts at the Ellison School location
 - Chlorination dosage at Well 5 was increased after positive Coliform counts were identified

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
3-Jun-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	0	0	0	0
10-Jun-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	0	0	0	0
17-Jun-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	0	0	0	0
24-Jun-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	0	0	0	0
2-Jul-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	0	0	0	0
8-Jul-19	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	-	-	0	0	0	0
12-Jul-19	-	-	-	-	-	-	1	0	-	-	-	-	-	-	0	0	-	-	-	-	-	-
15-Jul-19	0	0	0	0	0	0	-	-	0	0	0	0	0	0	0	0	-	-	0	0	0	0
22-Jul-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	0	0	0	0
31-Jul-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	0	0	0	0

Table 6.2 – Disinfection By-Products - THM and HAA Results

12-Jun-19		
Location	THM	HAA
Kirschner Reservoir		0.0498
2921 Belgo Rd	0.0398	
Pearson School	0.0426	0.0396
3976 Highway 97	0.0583	

In-House Analysis (BMID Staff)

- Presence/Absence samples taken on a three week cycle at seven sites around the BMID service area.
- All 12 samples were found to be absent of both Total Coliforms and *E. Coli*.

Table 6.3 - BMID In-house Testing – Presence Absence

Location	7/2/2019				7/8/2019				7/15/2019				7/22/2019				7/29/2019			
	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.
Sylvania Cres					0.72	21.1	X	-									0.92	21.6	X	-
170 Kneller Rd					0.76	21.3	X	-									1.08	22.6	X	-
2105 Morrison									1.32	19.4	X	-								
Staymen Rd									1.13	18.9	X	-								
260 Campion Rd	0.39	20.2	X	-									0.43	21.4	X	-				
Fenwick Rd	0.41	20.8	X	-									0.46	21.4	X	-				
Solly Ct					0.96	18.3	-	X									1.2	21.6	-	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) = 12
- Total tests sampled by BMID and tested by Caro Labs = 51
- Total tests sampled in BMID treated distribution system = 63 (Two positive Samples)