2019 Annual Report

1.0 - Operator Certification

BMID is administered by Robert Hrasko and has EOCP classified facilities as Water Distribution (WD) level IV and Water Treatment (WT) level IV.

As required, BMID is undertaking an informal program to have level IV operators for both the Water Distribution System and the Water Treatment Plant as required by EOCP facility classifications. Currently, Scott Findlay and Bryan Vig and Jeff Clark are Level IV Water Distribution certified operators. In addition, Chase Elliott and Shayne Ermel are currently level III Water Treatment Plant operators and are both working towards their level IV certification.

Table 1.1 – BMID Operator Certification

BMID's certified operators are as follows (End of 2019):

Name	WD Level	WT Level	Chlorine Handling
Scott Findlay	IV	I	Yes
Bryan Vig	IV	I	Yes
Chase Elliott	II	III	Yes
Timothy Bauer	II	-	Yes
Geoffrey Caldwell	II	-	Yes
Jeff Clark	IV	I	Yes
Kurt Kover	II	-	Yes
Shayne Ermel	I	III	Yes
Keifer Baranec	II		Yes
Scott Alexander	I	-	Yes

2.0 - Cross-Connection Control Program

Working in partnership with the City of Kelowna, BMID staff help to ensure that all backflow prevention assemblies installed within our service area are tested annually by an approved tester to limit any potential hazards from entering the distribution system from commercial, industrial and institutional customers. As the program is run out of the City of Kelowna's offices using their Backflow Prevention Monitoring Software, BMID is in contact with the City when a backflow assembly is past-due for testing or when an assembly fails a test. At this point BMID contacts the customer to ensure compliance with the program.

BMID staff are in regular contact with City of Kelowna staff to confirm that all backflow assemblies installed in BMID's service area are tested and functioning. BMID works to maintain 100% compliance within our Cross-Connection program. In addition, new and renovated facilities are inspected by the building and inspection departments at the City of Kelowna to ensure that all backflow prevention assemblies are installed as required. With the exception of new and renovated facilities, BMID's cross-connection control program continues to run in the same manner in 2019 as in previous years. There are 791 backflow assemblies currently found in the BMID system including 16 new installations in 2019. In total, there are 258 individual customers with a backflow prevention assembly located in 358 individual facilities.

3.0 - Water Monitoring Plan

BMID's 2019 water monitoring plan has only minor changes from the Monitoring Plan implemented in 2013. Changes to the Monitoring Plan are as follows:

1. One new sample site was installed at Esquire Reservoir, however this site is only utilized periodically to help isolate potential water quality issues;
2. For all of 2019, sampling only took place at Well No. 4 during the winter when the well provided water for domestic consumption;
3. Sampling took place at Well No. 5 during the spring/summer when the well provided domestic water for the north-end of the system;
4. The newly installed Well #6, used for irrigation in the north-end, is sampled on a monthly basis while in use. The source sampled for both bacteria as well as nitrate levels.
5. Both THM and HAA sampling in the distribution system were taken at the Pearson Rd sample station. For 2019, HAA testing also took place at Kirschner Reservoir, while additional THM samples were taken at 2927 Belgo Rd sample station and 3976 Highway 97 sample station.
6. As in previous years, full parameters were carried out on all raw water sources and in BMID's high elevation drinking water reservoirs. Samples were also collected at the intakes of BMID's drinking water sources. Booster No.1 (first customer) of the primary Mission Creek source was sampled in both June and January. Well water is used as a supplemental drinking water source in the north-end for both domestic use and irrigation use. Well 4, used as the low flow winter source, was sampled in December previously and will now take place in January 2020. Well 5, used as the high-flow summer source, was sampled in June 2019;
7. Weekly raw water samples at the Scotty Creek Intake are no longer being taken as the source is used only for irrigation. All domestic connections in the Scotty Creek subdivision and the north-end of BMID's distribution system are fed off of a combination of Mission Creek system water with supplemented supply well water after the water mains were twinned and separated for domestic and irrigation use in previous years;
8. Weekly raw water samples and comprehensive samples did not take place at the newly commissioned Well 6 as this well is only used as a source for irrigation water. However Well 6 was tested during the months of operation for both bacteria and nitrate levels;

Table 3.1 – BMID Water Sampling Summary

Watershed & Sources	Biological	Chemical	Full Parameters	Special Testing	Frequency	Sample By
Graystoke Reservoir			X		Annual	LARRATT
Fishhawk Reservoir			X		Annual	LARRATT
Loch Long			X		Annual	LARRATT
Belgo Reservoir			X		Annual	LARRATT
James Lake Reservoir			X		Annual	LARRATT
Mission (Crescent) Lake				X	Varies	BMID
St. Margaret's Lake				X	Varies	BMID
Mission Creek Intake			X		Semi-annual	CARO
Scotty Creek Intake				X	Varies	BMID
Cornish Well				X	Varies	BMID
Well No. 4			X		Annual	CARO
Well No. 5			X		Annual	CARO
Well No. 6				X	Varies	CARO
Raw Water Microbiological Monitoring						
Scotty Creek Intake					Varies	BMID
WTP Intake					Bi-Weekly	CARO-BMID
Stevens – Outlet					Weekly	CARO-BMID
Hadden Outlet (at Screens)					Bi-Weekly	CARO-BMID
Distribution System Monitoring						
Booster No. 1	X		X		Weekly	CARO
Screen Works	X	X			Weekly	CARO
2921 Belgo	X	X		X	Weekly	CARO
Ellison Blow-Off	X				Weekly	CARO
Pearson Rd	X	X		X	Weekly	CARO
3976 Hwy 97	X				Weekly	CARO
Prospect Reservoir	X				Weekly	CARO
Tower's Ranch Reservoir	X				Weekly	CARO
Kirschner Reservoir	X	X		X	Weekly	CARO
Ellison School	X				Weekly	CARO
Well 4	X		X		Weekly	CARO
Well 5	X		X		Weekly	CARO
Well 6	X			X	Monthly	CARO
7 Sites through WD System on a 3 week rotation		Sampled for Presence Absence			Rotation	BMID
On-Line Monitoring						
Point of Diversion (Mission Creek Intake)	On-line turbidity meter					
Water Treatment Plant	Parameters of turbidity, water consumption and particle charge (streaming current monitor) are all operating on-line at WTP					
Distribution Intake (Hadden Outlet at Screens)	On-line residual chlorine downstream of dosing location, pH and turbidity					
Surge Tower	On-line residual chlorine					
Booster Station No.1	On-line residual chlorine, pH, and turbidity					
BMID UV Reactor	On-line upstream/downstream chlorine, UV transmissivity, turbidity and pressure					
Towers Reservoir	On-line residual chlorine					
Kirschner Reservoir	On-line residual chlorine					
Prospect Reservoir	On-line residual chlorine					
PRV No. 24	On-line residual chlorine					

Table 3.1 – BMID Water Sampling Summary (continued)

Biological Parameters						
Weekly Tests by CARO	Free Chlorine Residual (field) (mg/L)	Temperature (field) (degrees C)	Total Coliforms Colonies/100ml	E.Coli colonies/ 100ml		
Chemical Parameters						
Weekly Tests by CARO	Turbidity (NTU)	Colour (TCU)	pH (pH units)	Alkalinity (mg/L Caco3)	Free Chlorine Residual (field) (mg/L)	Temperature (field) (degrees C)
Monthly Tests By CARO	Disinfection Byproducts	Trihalomethanes	Haloacetic Acids			
Special Water Quality Parameters						
Mission Creek Source	UV Trans					
Mission Creek Source	TOC					
Screen Works	TOC					
Stevens Reservoir	Metals					
Full Parameters						
Carried out at Booster No. 1 on all raw water sources for consumption and on watershed drinking water reservoirs						
Parameter	Units					
Alkalinity (total)	mg/L as CaCO3					
Calcium (total)	mg/L					
Colour (true)	Colour units					
Conductivity	Umhos/cm					
Hardness	mg/L as CaCO3					
Iron (total)	mg/L					
Magnesium (total	mg/L					
Manganese (total)	mg/L					
Nitrate & Nitrite	mg/L as N					
pH	pH units					
Potassium (total)	mg/L					
Sodium (total)	mg/L					
Sulfate	mg/L					
Total Dissolved Solids	mg/L					
Turbidity	NTU					
Ortho Phosphate	mg/L as P					
Dissolved Phosphorus	mg/L as P					
Total Phosphorus	mg/L as P					
Total Organic Carbon	mg/L					
Total Coliform	MPN/100ml					
E.Colil Coliform	MPN/100ml					
UV Transmissivity @ 254u	%/cm					
Ammonia	mg/L as N					
Total Kjeldahl Nitrogen	mg/L as N					
Chloride	mg/L					
Fluoride	mg/L					
Cyanide	mg/L					
Aluminum	mg/L					
Antimony	mg/L					
Arsenic	mg/L					
Barium	mg/L					
Boron	mg/L					
Cadmium	mg/L					
Calcium	mg/L					
Chromium	mg/L					
Cobalt	mg/L					
Copper	mg/L					
Lead	mg/L					
Mercury	mg/L					
Molybdenum	mg/L					
Nickel	mg/L					
Selenium	mg/L					
Uranium	mg/L					
Zinc	mg/L					
Total Coliforms	CFU/100 Ml					
E.Coli Coliforms	CFU/100 Ml					

3.2 – BMID Water Sampling Summary (continued)

BMID staff take weekly samples from 10 locations in the distribution system. For 2019, 542 samples were collected and taken to CARO Analytical for testing. Of the 542 samples collected all came back negative for *E.*Coli representing 100% of the total samples taken. Of the 542 samples taken for Total Coliforms, 548 came back as negative for Total Coliforms representing 99.26% of samples. Of the 4 samples that came back as positive for Total Coliforms all samples were located at the Ellison School dedicated sample station and all took place during a one month period during July and August. All subsequent samples at this location came back as negative for Total Coliforms and all samples in neighboring areas were also negative for all samples.

In addition to the testing conducted by CARO, BMID staff also sampled for Presence/Absence (PA) of bacteria and incubated the samples in-house. These samples took place throughout the distribution system at 7 locations. In total 122 PA samples were collected and incubated with 98.36% of the samples coming back as negative for bacteria.

BMID staff also collected raw-water samples from three locations between Mission Creek and the point of chlorination. Samples at the Point of Diversion Intake (WTP intake or Stevens Pond intake depending on time of the year) and the Distribution Intake at Hadden Pond Outlet (just prior to chlorination) are taken twice weekly, whereas samples at Stevens Outlet are only taken once per week. There is a substantive reduction in the number of *E.Coli* colonies present between the Mission Creek Intake and the Distribution Intake demonstrates the effective settling of particles as the water moves through Stevens Reservoir and Hadden Reservoir. Only *E.Coli* results for these samples are as follows:

Location	**Average *E.Colli* counts per sample**	**Max *E.Coli* count**
Creek Intake	17.2	590
Stevens Outlet	0.7	5
Hadden Outlet	0.7	7

4.0 - Annual Consumption Data

CONSUMPTION: Total annual consumption was 11,377.78 ML which was slightly below the ten-year average of 12,034 ML. The average daily flow for 2019 was 31.17 ML/day. The maximum daily flow was on August 6, 2019 when 115.09 ML of water was consumed.

WATERSHED: Graystoke, Fishhawk and Loch Long Reservoirs are normally used to keep water quality as high as possible through the summer months. BMID did not utilize water from the high elevation storage reservoirs until late-August, almost a month later than usual. Belgo Reservoir is utilized in early summer when the Water Treatment Plant is running because of the high levels of colour found in the water source. Belgo Reservoir was drained in 2019 to facilitate repairs on the release gate. Water from James Lake Reservoir is only used as an irrigation source for the Scotty Creek area of the distribution network in BMID's north-end.

The reservoir levels at 2019 year-end are summarized below. At year end 50% of storage remained in place.

Table 4.1 – Watershed Reservoir Data

Reservoir	Capacity (ML)	Volume at Yr End (ML)	% Full
Belgo Reservoir	6,785	0	0%
Graystoke Reservoir	5,104	4375	85.7%
Fishhawk Reservoir	2,107	1,948	92.5%
Loch Long Reservoir	625	447	71.5%
James Lake Reservoir	1,378	1,233	98.5%
TOTAL	**15,999**	**8,003**	**50.02%**

Graph 4.2 – Monthly Consumption

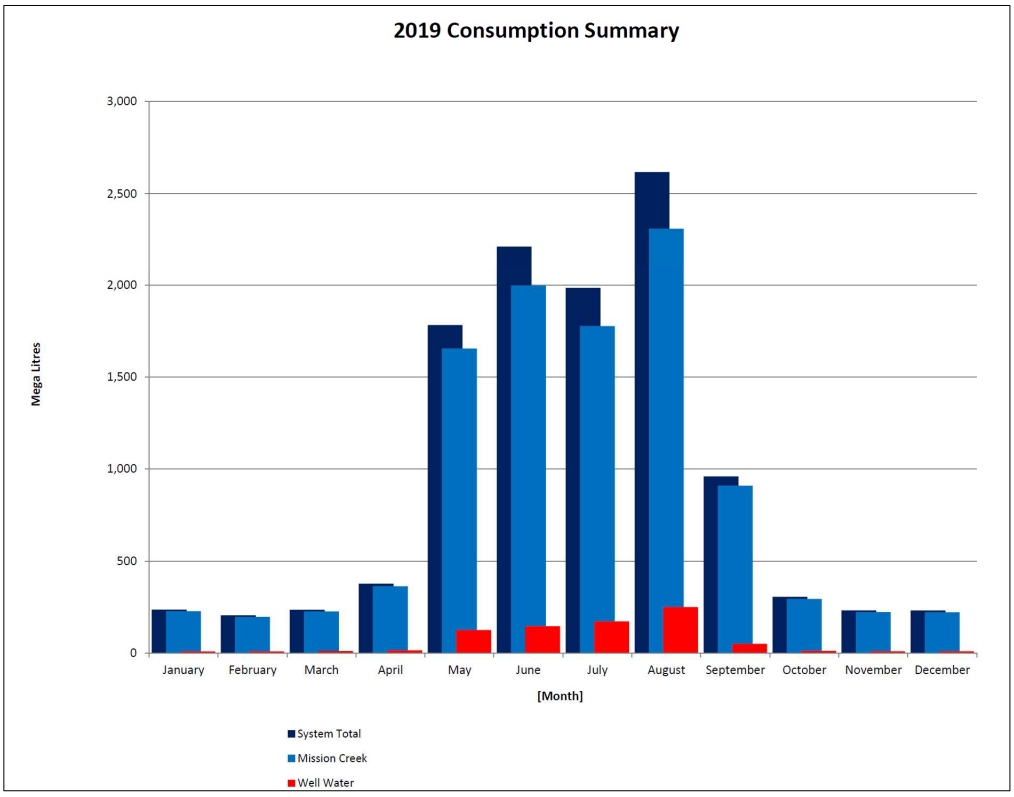


Table 4.3 – Monthly Consumption

BLACK MOUNTAIN IRRIGATION DISTRICT									
MONTHLY CONSUMPTION TOTALS AND YEAR END SUMMARY									
Year	Mission Creek	Well #4	Well #5	Well #6	Scotty Creek	NE Production	Well Water	Surface Water	System Total
2019	Mega Litres	Mega Litres	Mega Litres	Mega Litres	Mega Litres	Mega Litres	Mega Litres	Mega Litres	Mega Litres
January	227.47	8.02	0.25	0.00	0.00	8.27	8.27	227.47	235.74
February	195.92	8.88	0.00	0.00	0.00	8.88	8.88	195.92	204.80
March	225.25	9.95	0.00	0.25	0.00	10.20	10.20	225.25	235.45
April	362.68	10.83	3.05	0.62	0.00	14.50	14.50	362.68	377.18
May	1,654.56	0.00	101.65	24.05	1.95	127.65	125.70	1,656.51	1,782.21
June	1,997.41	0.00	90.93	55.13	69.83	215.89	146.06	2,067.24	2,213.30
July	1,776.49	0.00	116.95	55.02	35.90	207.87	171.96	1,812.39	1,984.35
August	2,310.39	0.00	162.41	87.64	56.56	306.61	250.05	2,366.95	2,617.00
September	909.84	20.62	29.34	0.00	0.00	49.96	49.96	909.84	959.80
October	293.73	12.01	0.00	0.00	0.00	12.01	12.01	293.73	305.74
November	222.27	9.08	0.00	0.00	0.00	9.08	9.08	222.27	231.35
December	221.18	9.67	0.00	0.00	0.00	9.67	9.67	221.18	230.85
Total	10,397.20	89.05	504.58	222.72	164.23	980.58	816.35	10561.43	11,377.78
% of Total	91.38%	0.78%	4.43%	1.96%	1.44%	8.62%	7.17%	92.83%	100.00%

5.0 – Completed and Ongoing Water Infrastructure Projects

- A sodium hypochlorite injection system was installed in BMID's UV facility to aid in toping up the free available chlorine residual after UV treatment.
- BMID staff continue the process of winterizing as many aspects of the Water Treatment Plant as possible to ensure that the facility can remain on stand-by throughout the winter.
- Due to a slope failure along BMID's primary transmission water main east of the existing tunnel, BMID is investigating the possibility of extending the existing rock tunnel to bypass the unstable slope, thereby eliminate the possibility of a slope failure cutting off BMID's Mission Creek water supply.
- Due to the potential safety concerns with chlorine gas at the Scotty Creek intake, which has a nearby subdivision, BMID is removing the gas chlorination system and installing a hypochlorite system to disinfect the irrigation water from Scotty Creek.

6.0 - WTP OPERATIONS

The Black Mountain Irrigation District's Class IV Water Treatment Plant performed very well throughout the extended 2019 treatment season. Improved water quality was achieved in all measurements by the treatment process, especially in the reduction of colour, turbidity, total organic carbon levels, and disinfection byproducts (Trihalomethanes and Haloacetic acids). The WTP remained in use into December due to high turbidity in Mission Creek late into the season, and from draining Belgo Reservoir to allow for scheduled repair work, leading to prolonged high colour levels in the creek.

Occurrences of turbidity spikes during freshet in Mission Creek were common, as in the past. However, the 2019 season did not encounter the same significant flooding and high-turbidity events that Mission Creek experienced during the 2017 and 2018 seasons. Peak raw water turbidity at the Grit Pond was measured at 20.6 NTU (Nephelometric Turbidity Units) on April 20, 2019 prior to entering the treatment process - this number was taken at the Grit Pond after the water settled out for a time lowering the turbidity.

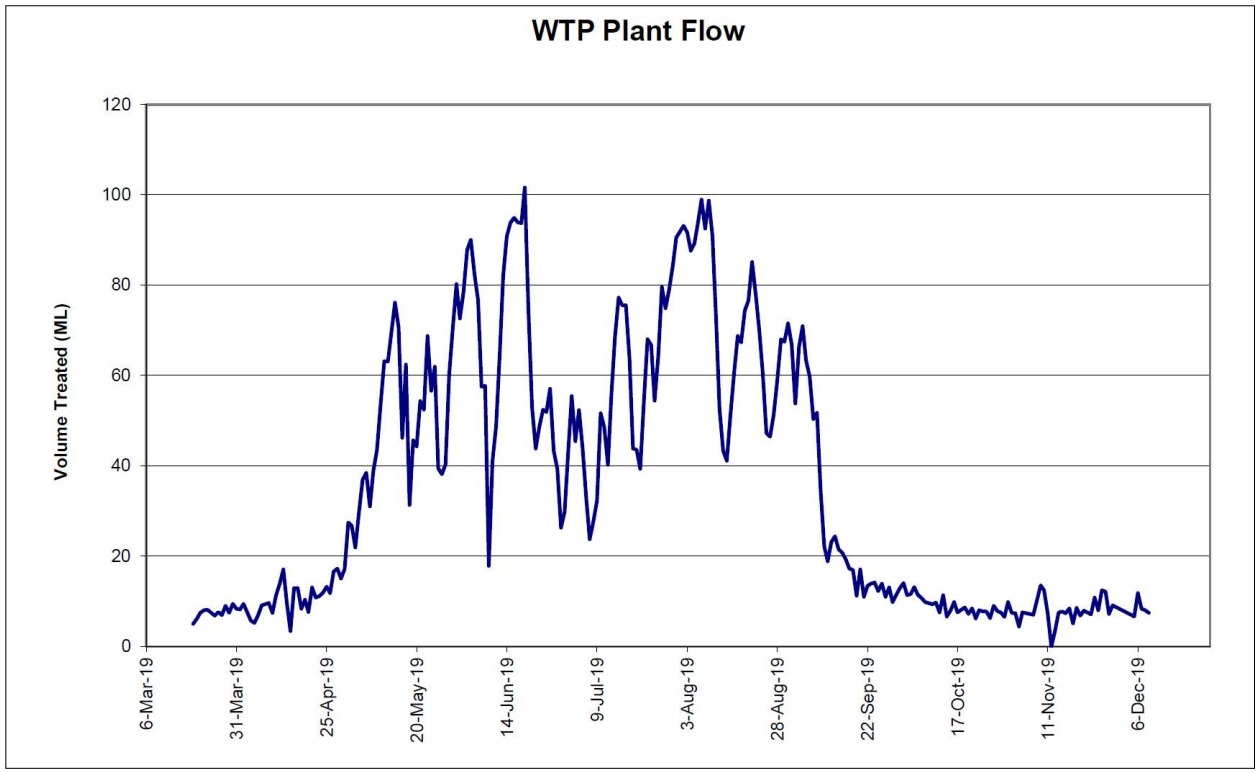
The Water Treatment Plant was able to maintain turbidity levels below 1.0 NTU at the point of disinfection for the entire 261 days in which the WTP was in operation. Peak turbidity as measured at Booster 1 (the first customer) was 0.64 on April 5.

In addition, the recorded highest turbidity at the Distribution intake, Hadden Pond, was 0.63 NTU on May 31, 2019, with the data obtained through a single point grab sample.

6.1 - PLANT FLOW

For the Mission Creek source, peak daily consumption in June reached over 101.09 ML (26,718,321 US gallons) and peak demand was recorded at 1,238 L/s. Peak daily flow was reached on June 7, 2019 as 101.6 ML were produced at the Water Treatment Plant. This year, 9,254 ML were treated compared to an average of 8,783 ML over the past five years. In 2019, the Water Treatment Plant was open for 261 days, up from the 227 days during the 2018 season. The Water Treatment Plant was started on March 18, 2019 and turned off on December 9, 2019 when the raw water quality had improved enough to no longer require chemical treatment.

Graph 6.2 – WTP Plant Flow



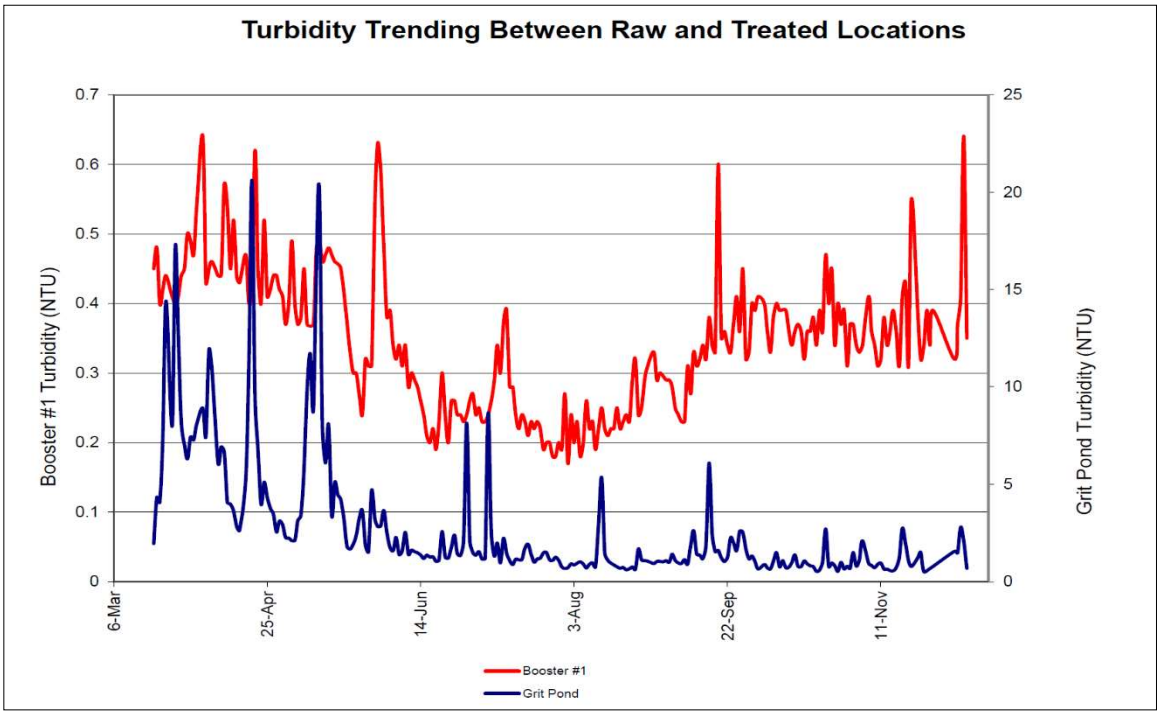
Daily plant flow ML for 2019 combined total for both trains

6.3 – TURBIDITY RESULTS

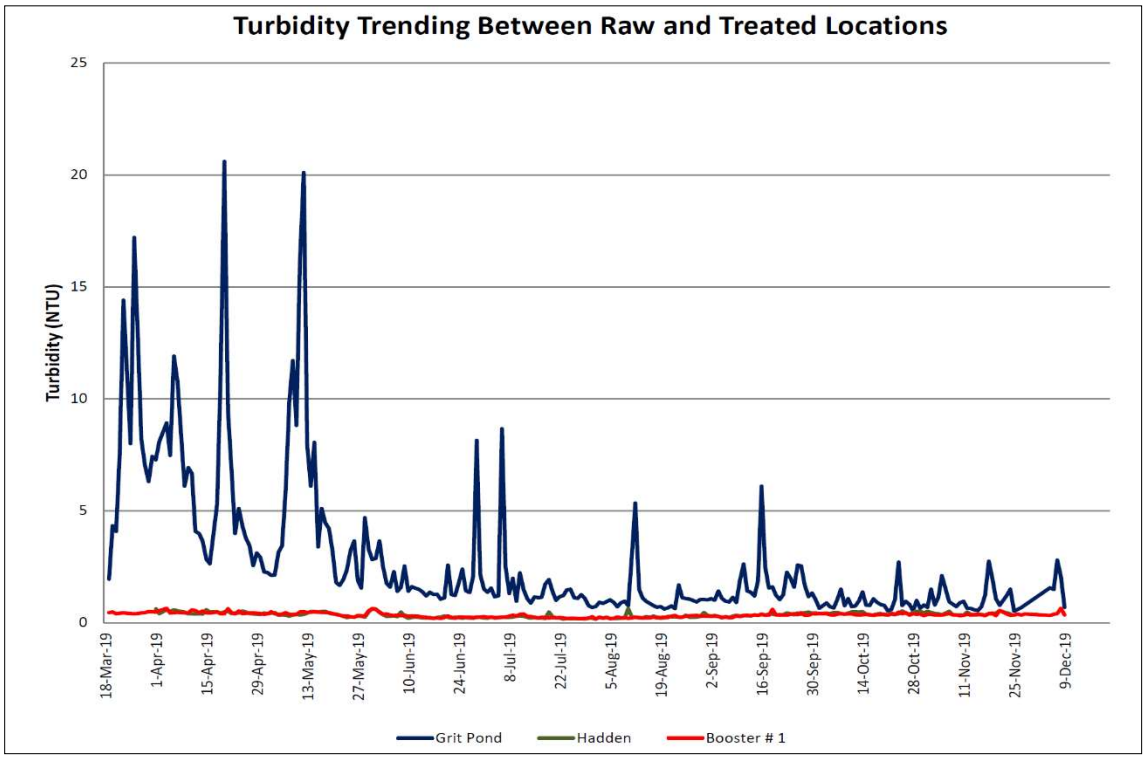
As set by the Canadian Drinking Water Guidelines, Black Mountain's system turbidity is to be less than 1.0 NTU at its first customer (Booster 1). Throughout the treatment season, the Water Treatment Plant was able to maintain acceptable turbidity below this guideline of 1.0 NTU at Booster #1. Turbidity at the first customer peaked at 0.64 NTU on April 5, 2019. Due to the relatively mild freshet, raw water turbidity at the Grit Pond peaked at 20.6 NTU on April 20, 2019. This is a significant reduction in raw water turbidity compared to the 2017 and 2018 treatment seasons.

Average turbidity levels over the treatment period at locations in the water supply system are as follows:

Location	Lab (NTU)	On-line (NTU)
Raw Grit Pond	2.70	-
Stevens Intake	0.34	-
Stevens Outlet	0.33	-
Hadden Outlet	0.34	-
Screen Works	0.34	0.37
Booster Stn No. 1	0.34	0.31



Graph 6.3 – WTP Turbidity Results



Daily turbidity (NTU) results between raw water (Grit Pond) and treated water (Steven's Intake and Booster 1)