REGIONAL DISTRICT NORTH OKANAGAN

Greater Vernon Water (GVW) Water Quality Report for November 2020

The following is the water quality summary for the Greater Vernon Water (GVW) utility.

On October 24th, Kalamalka Intake was shut off due to high algae counts and remained off until November 26th.

On November 16th, the DCWTP UV Plant was bypassed to permanently fix a leak in the pipe that carries water from the Duteau Creek Ultraviolet (UV) Disinfection facility to customers.

The leak was discovered in the fall of 2019 and a temporary fix allowed for the treatment plant to continue running. This spring, the plan to repair the leak was postponed due to snow and waiting for a mechanical part; therefore, the permanent fix was postponed until irrigation season was completed.

The UV portion of water treatment was temporarily bypassed to allow for repairs. While water was not be treated with UV, the water was treated with the clarification process (Diffused Air Floatation or DAF) and chlorine by the Duteau Creek Water Treatment Plant. This is the same treatment process that was in place for years until the UV Facility was turned on in February 2019.

1. Sources

GVW has two sources that are used for potable water. The two sources are Duteau Creek and Kalamalka Lake. Raw (untreated) water samples are taken at the intakes of Duteau Creek and Kalamalka Lake once a week. Tables 1 and 2 summarize the results for bacteria and turbidity.

Table 1 Duteau Creek Intake – Headgates

Parameter	Laboratory		# of Samples	# of Deviations	Min	Max	Average
E.coli[2]	Caro	MPN/100 mL	4	-----	2	6	3
E.coli[2]	GVW	MPN/100 mL	4	-----	<1	3.1	1.8
Total Coliform	Caro	MPN/100 mL	4	-----	74	404	215
Total Coliform	GVW	MPN/100 mL	4	-----	45.3	200.5	121.2
Turbidity	GVW Grab Sample	NTU	4	-----	1.39	1.54	1.47
Turbidity	SCADA[1] Hourly Average	NTU	30 Days	-----	0.92	1.72	1.12

[1]SCADA: Supervisory Control and Data Acquisition.
[2]Drinking Water Treatment Objectives_ BC (Sec 4.3): Determine number of raw water samples with E. coli >20 CFU. The number of E. coli in raw water does not exceed 20/100 mL in at least 90% of the weekly samples from the previous six months.

Table 2 North Kalamalka Intake

Parameter	Laboratory		# of Samples	# of Deviations	Min	Max	Average
E.coli[3]	Caro	MPN/100 mL	4	-----	3	15	8
E.coli[3]	GVW	MPN/100 mL	4	-----	4.2	13.7	9.5
Total Coliform	Caro	MPN/100 mL	4	-----	11	29	20
Total Coliform	GVW	MPN/100 mL	4	-----	16.4	32.4	22.2
Turbidity[2]	GVW Grab Sample	NTU	4	-----	0.60	0.73	0.68
Turbidity[2]	SCADA[1] Hourly Average	NTU	5 Days	-----	0.51	0.97	0.64

[1]SCADA: Supervisory Control and Data Acquisition.
[2]Operation Guideline: As outlined in Deviation Response Plan, turbidity < 3 NTU.
[3]Drinking Water Treatment Objectives_ BC (Sec 4.3): Determine number of raw water samples with E. coli >20 CFU. The number of E. coli in raw water does not exceed 20/100 mL in at least 90% of the weekly samples from the previous six months.
[4]Kalamalka Lake intake was turned off on October 24th due to high algae counts. The intake remains on to provide source water for sampling and to the pilot plant. The MHWTP was brough back online on November 26th.

2. Agriculture/ Irrigation Sources

The Agriculture irrigation supply was turned off September 15, 2020. The sources used for irrigation supply include Duteau Creek, King Edward/Deer Creek, Goose Lake, Well #3 and Well #2 located on Coldstream Ranch.

The majority of the Duteau Creek water (approx. 85%) is treated but the other sources are separated from the potable system and are not chlorinated.

Irrigation water used after September 15 mainly comes from Wells 2 and 3 along with King Edward. This water is mainly used for livestock watering.

Table 2 Monthly Flows for Irrigation Sources

Irrigation Sources	DCWTP	Well 3	Well 2	King Edward
Min (ML/Day)	0.00	0.00	0.00	0.00
Max (ML/Day)	0.00	0.00	0.40	0.20
Average (ML/Day)	0.00	0.00	0.29	0.14
Monthly Total (ML)	0.00	0.00	8.61	4.33

3. Treatment Plants

GVW has two treatment plants: Duteau Creek Water Treatment Plant (DCWTP) and Mission Hill Water Treatment Plant (MHWTP). At the DCWTP water is first treated with a coagulant and mixed to create a floc, next clarification is achieved by Dissolved Air Floatation (DAF). Chlorine is added after treatment to ensure contact time for the removal of viruses, followed by Ultra-violet (UV) disinfection, and finally chlorine is added before entering the distribution system for residual. MHWTP uses a dual disinfection process of UV and chlorine.

Tables 4 and 6 summarize results for chlorine, bacterial, turbidity, UV Transmittance (UVT) and UV Dosage (UVD). Table 5 summarizes the DCWTP contact time (CT) 4-log inactivation of Viruses.

Table 4 Duteau Creek Water Treatment Plant Reservoir

Parameter	Laboratory		# of Samples	# of Deviations	Min	Max	Average
Free Chlorine[2]	SCADA[1] Daily Average	mg/L	30 Days	-----	1.89	2.12	1.95
E.coli	Caro	CFU/100 mL	4	-----	<1	<1	<1
E.coli	GVW	MPN/100 mL	4	-----	A	A	A
Total Coliform	Caro	CFU/100 mL	4	-----	<1	<1	<1
Total Coliform	GVW	MPN/100 mL	4	-----	A	A	A
Turbidity[2]	SCADA[1] Daily Average	NTU	30 Days	-----	0.25	0.33	0.29
UVT (unfiltered)	GVW	%	13	-----	87.7	89.8	88.4
Pre UVT[3]	SCADA[1]	%	19 Days[4]	-----	87.43	91.10	90.23

[1]SCADA: Supervisory Control and Data Acquisition.
[2]GVW WQ Deviation Response Plan – Free Chlorine >0.20 mg/L Turbidity < 1.0 NTU.
[3]The UV Plant is now operational. UVT is monitored pre-UV treatment which is used to determine UV dosage.
[4]The UV Plant was bypassed from November 16 to November 26 to fix a leak. The UVT analyzer was offline during this time.

This month, 0 m^3 off-spec water occurred at DCWTP.

Table 5 DCWTP – Contact Time (CT) 4-log inactivation of Viruses

Parameter	Days Monitored	Days 4-log inactivation ACHIEVED	Days 4-log inactivation NOT ACHIEVED
> 4-log Removal of Viruses[1]	30[2]	30	0

[1]99.99%, 4-log inactivation of Viruses; CT is logged by the minute on SCADA as of February 2019.
[2]During the days the UV plant was being bypassed, the chlorine analyzer used for free residual to determine CT removal was offline. There was a 2.0mg/L residual through the reservoir, therefore 4-Log virus removal was easily met during this time.

Table 6 DCWTP – Contact Time (CT) 4-log Virus Removal

Parameter	Days Monitored	Min	Max	Average
log Removal of Viruses	19[1]	23.47	78.34	39.90

[1]The UV plant was was being bypassed for 10 days to fix a leak. The chlorine analyzer used for free residual to determine CT removal was offline. There was a 2.0mg/L residual through the reservoir, therefore 4-Log virus removal was easily met during this time.

Table 7 Mission Hill Water Treatment Plant

Parameter	Laboratory		# of Samples	# of Deviations	Min	Max	Average
Free Chlorine (483 Pressure Zone)	SCADA[1] Daily Average	mg/L	5 Days	-----	2.10	2.76	2.23
Free Chlorine (550 Pressure Zone)	SCADA[1] Daily Average	mg/L	5 Days	-----	1.96	2.17	2.12
Turbidity[2]	SCADA[1] Daily Average	NTU	5 Days	-----	0.51	0.97	.64
Pre UVT	SCADA[1]	%	5 Days	-----	89.97	90.43	90.22

[1]SCADA: Supervisory Control and Data Acquisition.
[2]GVW WQ Deviation Response Plan – Free Chlorine >0.20 mg/L Turbidity < 3.0 NTU.
Note: MHWTP was off until Thursday November 26th, therefore bacterial samples were not taken in November.

This month, 0 m^3 off-spec water occurred at MHWTP.

4. Distribution

GVW has two distribution systems that interconnect: Duteau System supplied by Duteau Creek and Kalamalka System supplied by Kalamalka Lake. GVW has approximately 22,350 service connections.

Table 7 summarizes the daily flow for each distribution system. The Duteau and Kalamalka systems have many locations where they can be interconnected. This means there are areas where there is a blend of water quality and can be identified by the conductivity of the water.

Table 8 Monthly Usage for GVW Distribution Systems

Distribution Systems	DCWTP	MHWTP
Min (ML/Day)	8.20	0.00
Max (ML/Day)	24.40	11.28
Average (ML/Day)	18.89	1.38
Monthly Total (ML)	566.84	41.28

The GVW distribution system contains six sampling sites (Table 8) that frequently have free chlorine < 0.2 mg/L due to the sample sites being located at the end of the distribution line (Tables 9 and 10). Measures are currently in place to mitigate this issue including regular monitoring and flushing. The three sites at Boss Creek represent a localized area.

Table 9 Low Chlorine Sites and Mitigation Measures

Frequent Low Free Chlorine Sites	Mitigation Measures
O'Keefe Ranch SS	On a localized Water Quality Advisory, regular monitoring and flushing
9007 Aberdeen Rd SS	Regular monitoring and flushing
Noble Canyon B/O	Regular monitoring and flushing
Boss Creek PH 1 (Lower) Return/Inlet	Regular monitoring
Boss Creek PH 2 (Upper) Discharge/Outlet	Regular monitoring
Boss Creek PH 2 (Upper) return/inlet	Regular monitoring

Tables 9 and 10 summarize results for chorine, bacterial, and turbidity for each distribution system. These systems are monitored by handheld instruments weekly.

Table 10 Duteau Distribution

Parameter	Laboratory		# of Samples	# of Deviations	Min	Max	Average
Free Chlorine[1]	GVW grab sample	mg/L	134	**20[2]**	0.00	2.20	1.05
Total Chlorine	GVW grab sample	mg/L	134	-----	0.02	2.20	1.23
E.coli	Caro	CFU/100 mL	67	-----	<1	<1	<1
E.coli	GVW	MPN/100 mL	62	-----	A	A	A
Total Coliform	Caro	CFU/100 mL	67	-----	<1	<1	<1
Total Coliform	GVW	MPN/100 mL	62	-----	A	A	A
Turbidity[1]	GVW grab sample	NTU	131	**7[3]**	0.18	3.12	0.60

[1]Operation Guidelines: Free Chlorine >0.20 mg/L or <2.20 mg/L, Turbidity < 1 NTU.
[2]Twelve samples had free chlorine < 0.20 mg/L at sites commonly known for low free chlorine, see paragraph above, these include: 9007 Aberdeen Rd SS, Boss Creek PH 1 Return, Boss Creek PH 2 Discharge, Boss Creek PH 2 Return, Cosens Bay Rd SS, and O'Keefe Ranch SS. Twelve samples had <0.20 mg/L that are not commonly know for low free chlorine: Springfield SS, Goflview SS, Kidston SS, Coldstream Creek Road SS, 1101 Galliano Road B/O and 6198 Brookeside. All bacterial results for these sites were non-detect.
[3]Seven samples had turbidity >1 NTU:Lavington SS, Pine SS, Bessette SS, Upland SS, 4404 25 St SS and 1101 Galliano Road B/O.

5. Customer Calls and Notifications

Customer calls within the GVW Service area are tracked and recorded. As of September, customer calls will include water quality inquiries, therefore the number of calls will increase. There were a total of 7 customer calls in November.

NUMBER OF CALLS	TYPE OF CALL	ISSUE	INVESTIGATION	COMMENTS
3	inquiries	-----	-----	-----
2	water quality	dirty water	na	Flow testing stirred up the area. Operations have been flushing and monitoring
1	water shut off	complaint	na	Due to work, water had to be shut off
1	water quality	murky water	na	water source change can cause air in the pipes

6. Operational or Maintenance Activity

The annual water main flushing program began in May and continued through October. As of November 12th, flushing has been concluded for the year. There were 7 water main break in the GVW system in November.