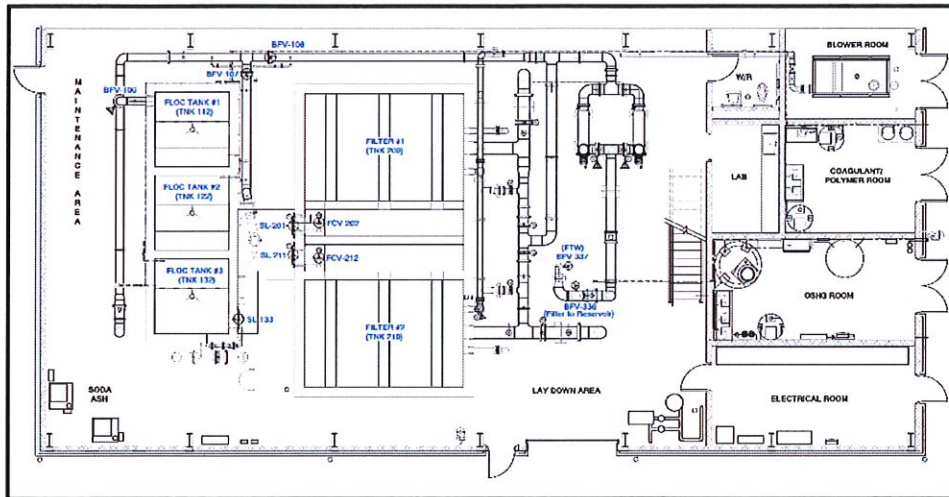




# TOWN OF LAKE COWICHAN WATER TREATMENT PLANT



## September 2020 Operations Performance Report



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## Permit to Operate

Operated water treatment plant under Operate Permit dated September 21, 2020. All WTP systems turned on under guidance of Stantec engineer on September 29, 2020.

## Certified Operators

The Vancouver Island Health Authority Operational Permit requires that the Town of Cowichan have a certified operator to match or exceed the Water Treatment Plant Certification, which is a level III plant. The Town of Cowichan has three certified operators on staff which agreements in place to call upon additional resources as required.

Operator	Title	Staff/Contractor	Certification
Mike Hewitt	Chief Water Operator	Staff (Public Works)	WT4, WD2
David Campbell	Water Operator	Staff (Public Works)	WT2, WD2, WWT1, WWC2
Terry McMahon	Water Operator	Staff (Public Works)	WT1, WD1
Scott Jameson	Professional Operator	Contractor (C2EP)	WT4
Joe Woolls	Professional Operator	Contractor (IFC Water)	WT1, WD3

## Notable Events

**Wednesday, September 2** – Telus installed phone line at WTP.

**Friday, September 4** – Second monthly report forwarded to Public Health Engineer, Murray Sexton, and local Environmental Health Officer, Heather Hutton, for review toward Operating Permit issuance.

**Thursday, September 10** – Water System Emergency Response and Contingency Plan forwarded to Heather Hutton for review toward Operating Permit issuance.

**Thursday, September 10** – First draft of Operating Permit received for review by Town of Lake Cowichan. Feedback returned noted that the focus of the operating permit is on treated water turbidity and not raw water turbidity was positive as we have control over the former, but not the latter. Additional routine testing for aluminum, total nitrogen, phosphorous, microcystin-LR, trihalomethanes (THM) and haloacetic acid (HAA) were agreed as reasonable. We confirmed daily verification checks of chlorine, turbidity and pH by the on-site operator.

**Wednesday, September 16** – Reactivated chlorine gas system at raw water pump station to use up remaining two full and one partially full gas cylinders. Chlorine residuals coming into the WTP were monitored to determine reduction in post-filtration chlorination would be required to maintain targeted residual leaving reservoir.



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**Friday, September 18** – Second draft of operating permit received and reviewed.

**Monday, September 21** – Final version based on second draft issued to Town of Lake Cowichan. Stantec notified. Arrangements made for their civil designer, Nicolas Tardy, to return to site on Tuesday, September 29 to turn on the flocculation and associated chemical systems (polyaluminum chloride with polymer) and pH control system using soda ash. Chief Operator, Mike Hewitt, will be with Nicolas during the final commissioning stages for a complete handover of the facility.

**Monday, September 21** – Frequency of comm loss alarms from raw water station increasing. Site visit investigation concludes that encroaching vegetation around transmitting antennae may be source of problem.

**Wednesday, September 22** – Contractor removes vegetation may along west side of raw water station. Frequency of raw water pump comm loss alarms reduced but not eliminated.

**Friday, September 25** – Contractor removed vegetation around River Road Booster station. Raw Water Pump Station COMM LOSS alarms still present. Raw Water Pump #1 placed on MANUAL/STOP due to potential problem of pump shutting down due to COMM LOSS and as a result of no one-way clutch, that while it is draining and the shaft moving in reverse direction, the communication resumes and the pump starts. This could result in the motor burning out or pump shaft shear.

**Monday, September 28** – Decision to call Shaw in to install an internet connection at the Raw Water Pump Station made so that communications between locations is wired instead of aerial radio. Shaw to first visit site to assess requirements. Date TBD.

**Tuesday, September 29** – Nicolas Tardy (Stantec) onsite to turn on the flocculation system and pH control. System ran with addition of both coagulant and polymer resulted in short filter run. Decision made to not run polymer until the rainy season so that it has something to bind to. All systems running by 18:30.

## Performance Standards

The Operating Permit for the Town of Lake Cowichan Water System dated September 21, 2020 stipulates the following performance requirements:

PARAMETER	GUIDELINE
Turbidity	≤ 0.3 NTU in ≥ 95% of samples
	Never to exceed 1 NTU
<i>Giardia</i> and <i>Cryptosporidium</i>	2.5-Log (99.7%) removal coagulation, flocculation and filtration
	1-Log (90%) inactivation via UV



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Viruses	1-Log (90%) removal coagulation, flocculation and filtration 3-Log (99.9%) inactivation via UV
Free Available Chlorine	Sufficient for CT <sub>CALC</sub> and not to exceed 4.0 mg/L
Trihalomethane (THM)	≤ 0.100 mg/L
Haloacetic Acid (HAA)	≤ 0.080 mg/L
Total Aluminum	≤ 0.1 mg/L
pH	Be between 7.0 and 10.5
Microcystin-LR	≤ 1.5 µg/L

Please note that as the Operating Permit was issued near the end of the month, that tests requiring third-party accredited laboratory testing were not conducted during the month of September. For clarity, these tests included: THM, HAA, Total Aluminum, and Microcystin-LR. Arrangements are being made for these tests to be conducted during the month of October by MB Labs in Sidney, B.C.

## Chlorine Contact Time Calculations

**Step 1: Calculate Theoretical Detention Time (TDT = V / Q)**

5,400 m<sup>3</sup> and peak flow of 62 L/s for a total retention time of 24.2 hours

**Step 2: Calculate Actual Detention Time (T = TDT x BF)**

*Table 1 - Baffling Factors*

Baffling Condition	Baffling Factor	Baffling Description
Unbaffled (mixed flow)	0.1	None, agitated basin, very low length-to-width ratio, high inlet and outlet flow velocities
Poor	0.3	Single or multiple unbaffled inlets and outlets, no intra basin baffles
Average	0.5	Baffled inlet or outlet with some intra basin baffles
Superior	0.7	Perforated inlet baffle, serpentine or perforated intra basin baffles, outlet weir or perforated launders
Perfect (plug flow)	1.0	Very high length-to-width ratio (pipeline flow), perforated inlet, outlet, and intrabasin baffles

24.2 hours X 0.3 = 7.26 hours (435.6 minutes)

**Step 3: Calculate CT<sub>CALC</sub>**

CT<sub>CALC</sub> = C x T



$CT_{CALC} = 0.81 \text{ mg/L} \times 435.6 \text{ minutes}$

$CT_{CALC} = 352.8 \text{ minutes} \bullet \text{ mg/L}$

Step 4: Calculate *Giardia lamblia* log inactivation

Table 2 - 3-log inactivation of *Giardia lamblia* (designated as  $CT_{99.9}$ )

Chlorine Conc. (mg/L)	Temperature 15°C						
	pH						
	≤ 6.0	6.5	7.0	7.5	8.0	8.5	9.0
≤ 0.4	49	59	70	83	99	118	140
0.6	50	60	72	86	102	122	146
0.8	52	61	73	88	105	126	151
1.0	53	63	75	90	108	130	156

Conclusion: Our retention time of 352.8 minutes • mg/L is 4.8-fold that as required for 3-Log removal of *Giardia lamblia* as per Table 2 above.

Step 5: Calculate virus inactivation

Table 3 - 4-log inactivation of viruses (designated as  $CT_{99.99}$ )

Temperature (°C)	pH	
	6-9	10
0.5	12	90
5	8	60
10	6	45
15	4	30
20	3	22
25	2	15

Conclusion: Our retention time of 352.8 minutes • mg/L is 88-fold that as required for 4-Log virus removal as per Table 3 above.

UV Dose Log Inactivation Credits

Table 4 - UV Dose Log Inactivation Values for *Cryptosporidium*, *Giardia*, and Viruses

Log	UV dose (mJ/cm <sup>2</sup> )
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Inactivation	<i>Cryptosporidium</i>	<i>Giardia</i>	Viruses*
0.5	1.6	1.5	39
1.0	2.5	2.1	58
1.5	3.9	3.0	79
2.0	5.8	5.2	100
2.5	8.5	7.7	121
3.0	12	11	143
3.5	15	15	163
4.0	22	22	186

\* Based on adenovirus inactivation.

Table 5 - Lake Cowichan Daily UV Dosages

UV Dosage	mJ/cm <sup>2</sup>
Minimum	54.06
Average	80.23
Maximum	107.12

Conclusion: Our minimum UV dosage as shown in Table 5 exceeds that required by the Operating Permit for inactivation of *Cryptosporidium* and applies additional credits for *Giardia* and viruses.

## Water Quality Results

### Highlights

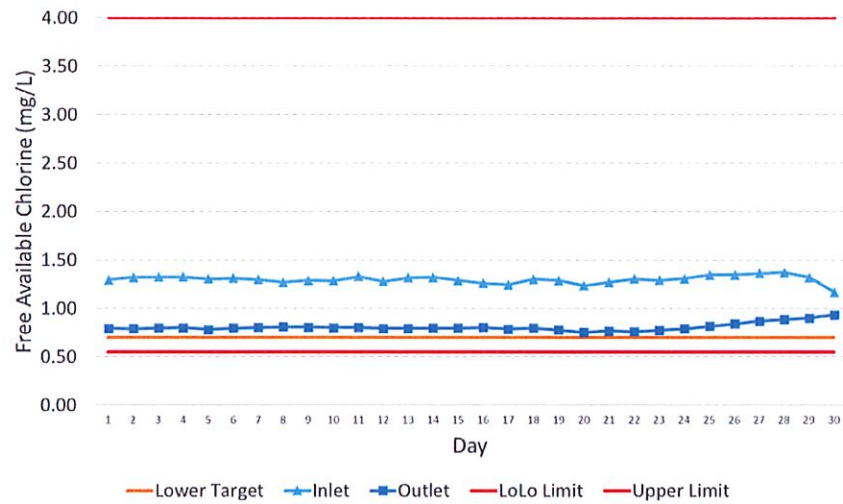
- Heavy rains beginning on September 22 resulting in increasing lake turbidity from 0.39 NTU to a peak of 0.61 NTU on September 26.
- Recording of a pH 6.95 at the reservoir outlet recorded September 23, 2020. Likely a result of the heavy rains during this period. Typical clean rainwater has a pH of 5.6. The Lake Cowichan WTP pH control system using soda ash was not turned on until Stantec engineer arrived on September 29.
- Once the flocculation system and associated chemicals were turned on the following changes occurred:
  - Filter effluent turbidity declined over 75%
  - UV Transmittance increased 2%
  - Chlorine demand dropped



Individual Parameter Charts

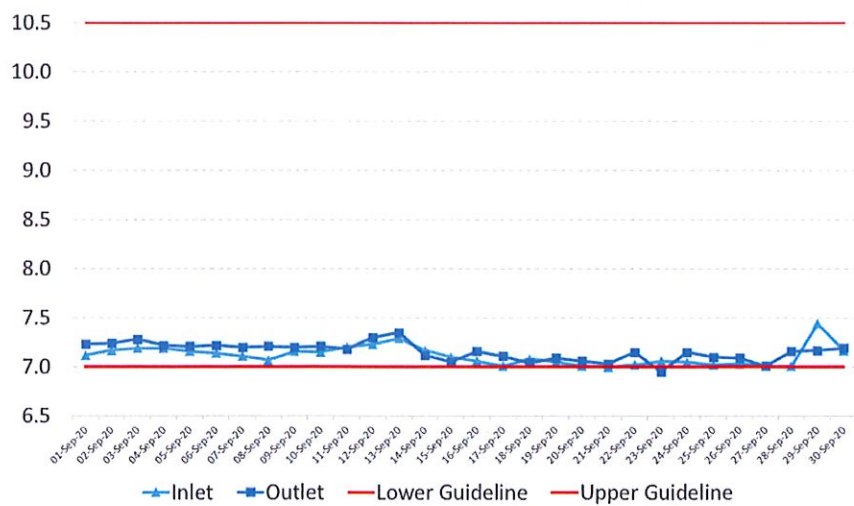
### Free Available Chlorine (Sep 2020)

Source: SCADA Daily Averages



### pH (Sep 2020)

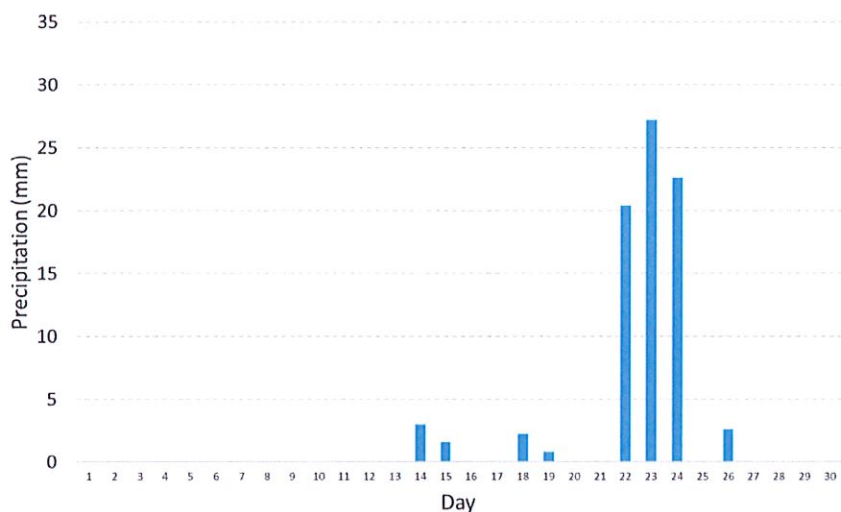
Source: Operator Testing





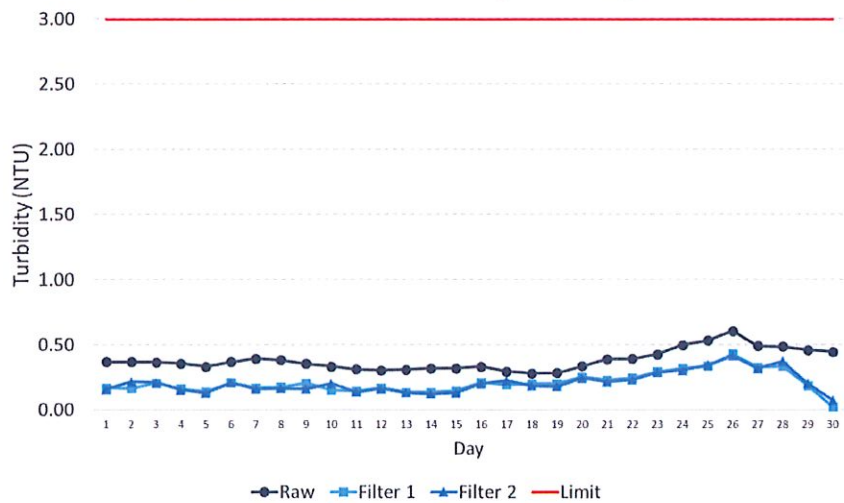
### Total Precipitation (Sep 2020)

Source: Environment Canada - North Cowichan Station



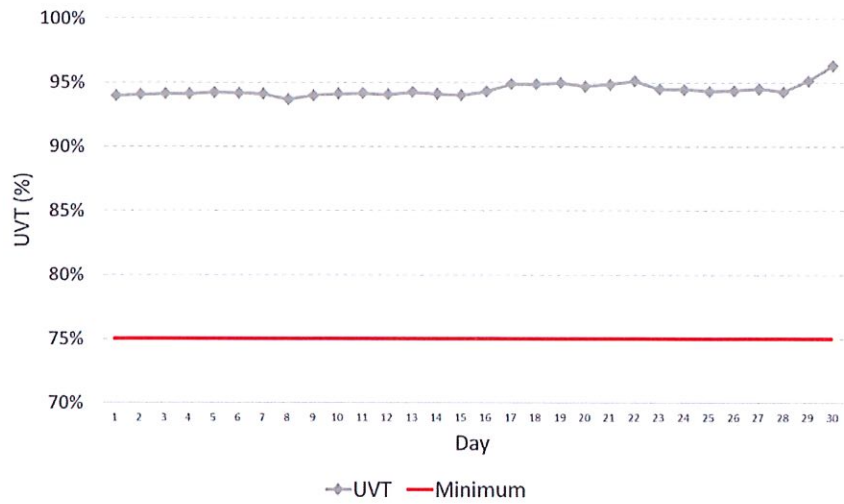
### Turbidity (Sep 2020)

Source: SCADA Daily Averages





### UV Transmittance (Sep 2020) Source: SCADA Daily Averages



### UV Dosage (Sep 2020) Source: SCADA Daily Averages

