

# 2019 Annual Wastewater Treatment Plant Report

Resort Municipality of Whistler Wastewater Treatment Plant

Operational Certificate ME- 01452



WHISTLER

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## INTRODUCTION

Per section 3.6 Reporting of the Operation Certificate ME-01452 for the Resort Municipality of Whistler's (RMOW) Waste Water Treatment Plant (WWTP), the intent of this document is to report discharge and receiving environment data for the operating period. The report includes trend analysis data and interpretation from the receiving environment for the reported operating year and in comparison to previous years, in regards to the potential impact to the receiving environment. The report will also outline the past years achievement in regards to source control, water conservation programs, and environmental impact programs.

## MONITORING AND REPORTING REQUIREMENTS

Per section 3.0 of the operational certificate, monitoring samples are collected for the WWTP to monitor discharge, receiving environment outfall, and trucked waste.

*Table 1 Discharge Monitoring Sampling Parameters*

Parameter	Unit of measure	Sample type	Frequency
<b>Chlorine residual *</b>	mg/L	Daily	Grab
<b>TSS</b>	mg/L	5 time per week	Composite
<b>Orthophosphate (as phosphorus)</b>	mg/L	5 times per week	Composite
<b>CBOD<sub>5</sub>**</b>	mg/L	2 times per week	Composite
<b>Fecal Coliform*</b>	MPN/100mL	2 times per week	Grab
<b>Total phosphorus</b>	mg/L	Weekly	Composite
<b>Iron</b>	mg/L	Monthly	Composite
<b>Fish Bioassay (rainbow trout) 96 hour LC, %</b>	% survival rate	2 times per year	Grab
<b>Effluent volume discharge</b>	m <sup>3</sup> /day	1 per day over a 24 period	Flow monitor

\*if chlorine is used between May 15 and September 15 only

\*\*COD may be used in place of CBOD<sub>5</sub> if CBOD<sub>5</sub> is examined with every 5<sup>th</sup> sample

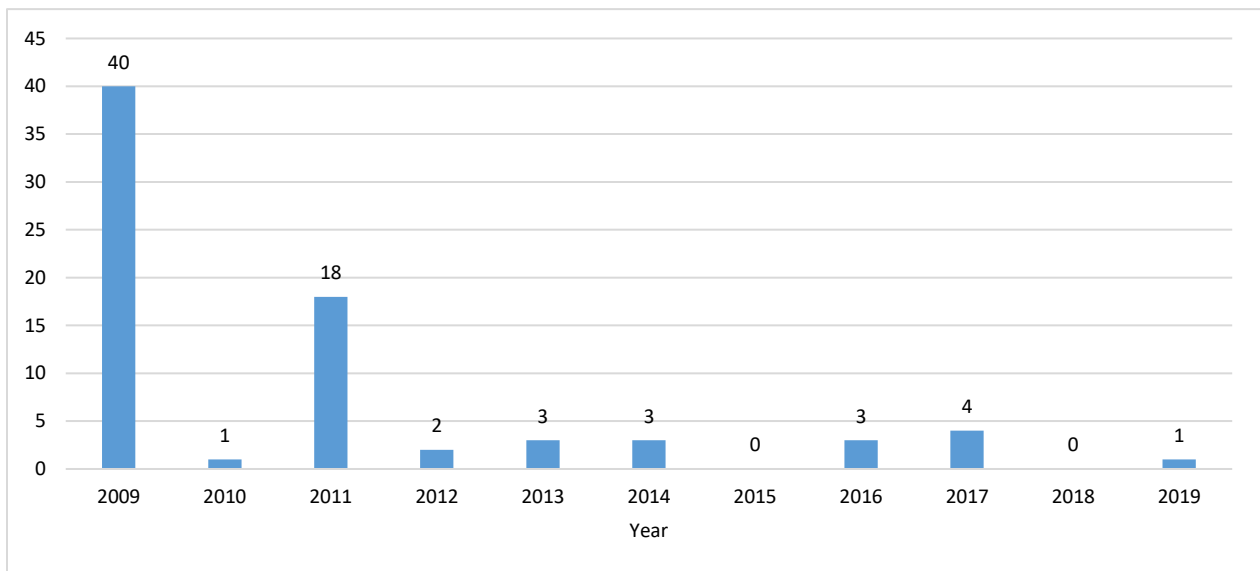
Table 2 Receiving Environment Monitoring Sampling Parameters

Parameter	Unit of measure	Sample type	Frequency
<b>pH</b>	-	Grab	3 times per year; winter low flow, spring freshet & fall flow
<b>Conductivity</b>	µmho/cm	Grab	3 times per year; winter low flow, spring freshet & fall flow
<b>Turbidity</b>	TU	Grab	3 times per year; winter low flow, spring freshet & fall flow
<b>Orthophosphate (as phosphorus)</b>	mg/L	Grab	3 times per year; winter low flow, spring freshet & fall flow
<b>Nitrate nitrogen</b>	mg/L	Grab	3 times per year; winter low flow, spring freshet & fall flow
<b>Nitrite nitrogen</b>	mg/L	Grab	3 times per year; winter low flow, spring freshet & fall flow
<b>Ammonia nitrogen</b>	mg/L	Grab	3 times per year; winter low flow, spring freshet & fall flow

## Permit Excursions

The WWTP tracks and monitors the number of permit exceedances that occur during the reporting period (Figure 1). For the report period, one (1) permit excursion was recorded per section 1.1.3 Nutrient loading for the discharge from May 15 – September 15 inclusive of Orthophosphate (as phosphorus) 36.6 kg/month maximum. This excursion is discussed further below. The Notice of Non-Compliance is attached in Appendix A.

Figure 1 Quantity of Permit Excursions per year 2009-2019



## Outfall Inspection

The final effluent outfall was inspected by Cascade Environmental Resource Group in 2018. The recommendation from this inspection was to “...cut back shrub vegetation growing on top of the berm around the outfall location” (Cascade, 2018). This has been completed and is part of a preventative maintenance program. The WWTP Operational permit requires that the effluent outfall be inspected once every 5 years. The next outfall inspection will be in 2023.

## Website

Quarterly and Annual monitoring data is posted to the Resort Municipality of Whistler’s website <https://www.whistler.ca/services/water-and-wastewater/wastewater-treatment-plant>.

## Facility Staffing

The RMOW WWTP facility staff qualifications met EOCB requirements (Table 2) for the report period.

Table 3 Facility Staff certification list

Name	Position	Certification
<b>Chris Wike</b>	Utilities Manager (Acting)	
<b>Wayne Dennien</b>	Utilities Superintendent (Acting)	
<b>Jenny James</b>	Chief Utilities Operator	
<b>Elizabeth Toole</b>	Operator 4	EOCP Level IV Municipal Wastewater Treatment
<b>Hamish (Ty) MacFayden</b>	Operator 3	EOCP Level III Municipal Wastewater Treatment
<b>Paul Kozin</b>	Operator 2	EOCP Level II Municipal Wastewater Treatment
<b>Ahren Snikvalds</b>	Operator 1	EOCP Level I Municipal Wastewater Treatment
<b>Kyle Quesnel</b>	Operator 1	EOCP Level I Municipal Wastewater Treatment
<b>Ian McKeachie</b>	Operator 1	EOCP Small Water and Wastewater Systems
<b>Trent Skatch</b>	Temporary Operator	EOCP Level I Municipal Wastewater Collection
<b>Neil Kearns</b>	Lab Technician	EOCP Level II Municipal Wastewater Treatment
<b>Bruce Eckersley</b>	Millwright	Red Seal Certified Millwright

## Other Achievements

During the report period, no volume of effluent bypassed the WWTP as the raw sewage bypass line had been removed in 2010. Further to this, the operation had no emergency shut downs and zero (0) trucks were turned away due to hazardous waste.

In 2018, the Once-Through Water Use Bylaw No. 2198 was adopted. This will have a positive impact on the WWTP operations by reducing the volume of effluent that is sent to the WWTP by reducing liquid waste entering the sanitary collection system created by One-Through Cooling Systems.

The effluent treated by the WWTP is used to produce heat for the RMOW's District Energy System. This system provides radiant heat through its system to the residents and businesses of Cheakamus Crossing neighbourhood of the RMOW.

Once bio-solids produced at the WWTP are thickened and dewatered, the material is transported by truck to a municipally owned composter facility and composted into a soil amendment.

# DISCHARGE DISCUSSION AND ANALYSIS

## Discharge Volume

The dry season is defined as May 15<sup>th</sup> to September 15<sup>th</sup> inclusively, and the wet season is defined as January 1<sup>st</sup> to May 14<sup>th</sup> and September 16<sup>th</sup> to December 31<sup>st</sup>. The effluent discharge volume was below the maximum allowable discharge volume during all of the dry (16,000 m<sup>3</sup>/day) and wet seasons (25,000 m<sup>3</sup>/day) (Figure 2). The average discharge volume was 9,436 m<sup>3</sup>/day during the dry season and 10,276 m<sup>3</sup>/day during the wet season.

Figure 2 Whistler Wastewater Treatment Plant Daily Effluent Discharge Volume (m<sup>3</sup>/day) 2019

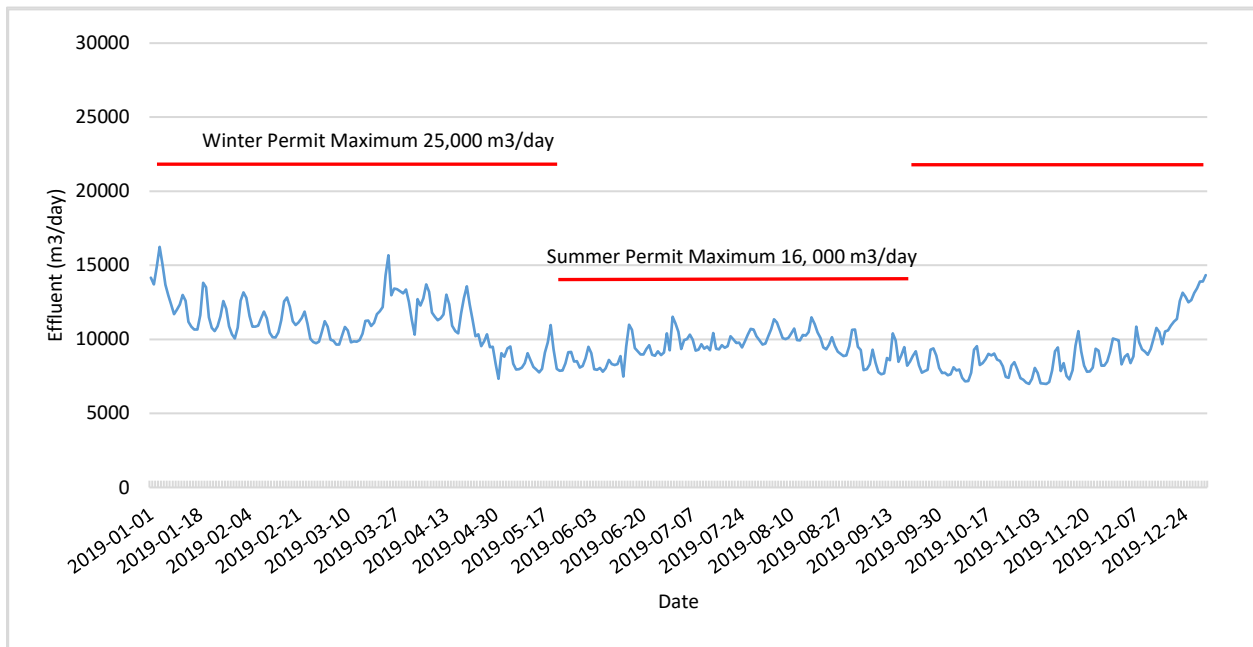


Table 4 Maximum daily discharge (m3) wet and dry values by year 2004-2019

Year	Max Discharge Dry	Max Discharge Wet	Month Max Discharge Dry	Month Max Discharge Wet
2004	10,160	14,681	August	January
2005	12,238	13,720	August	December
2005	11,402	17,174	July	January
2006	13,742	19,731	July	December
2007	13,991	24,247	August	March
2008	12,891	17,568	August	December
2009	11,623	17,859	June	April
2010	12,891	22,855	August	January
2011	12,153	19,472	July	January
2012	13,397	20,575	June	January
2013	12,525	19,351	June	March
2014	11,646	25,070	August	December
2015	11,447	25,019	August	February
2016	12,119	21,284	August	February
2017	11,670	19,852	July	March
2018	11,395	16,927	August	December
2019	11,535	15,670	June	March



## Orthophosphate as Phosphorous P04-P

Orthophosphate as Phosphorous P04-P concentrations did not exceed the permitted levels of 1.75 mg/L per day, shown in Figure 3.

As shown in Figure 4, for the period of July 15 to August 14 the total phosphorus discharged at the final effluent exceeded the permit allowance of 36.6 kg by 7.88 kg for a total sum of 44.48 kg. This environmental non-compliance was reported to the Ministry of Environment.

Figure 2 2019 Final effluent daily Phosphorus (PO4-P) concentrations

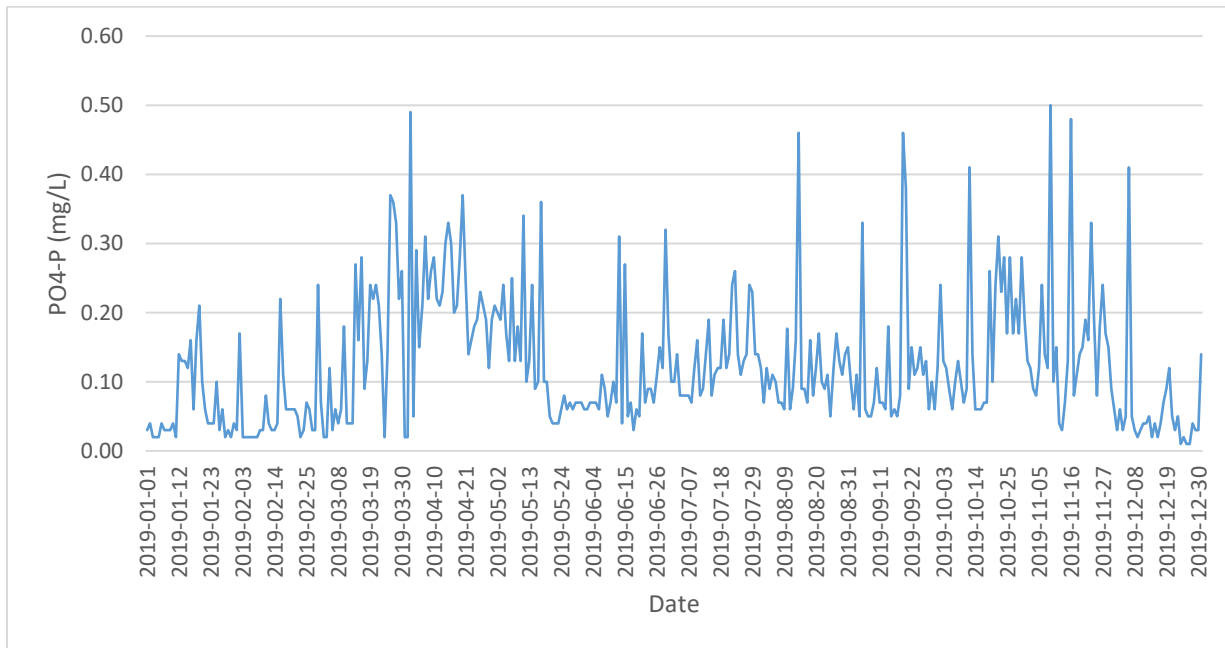
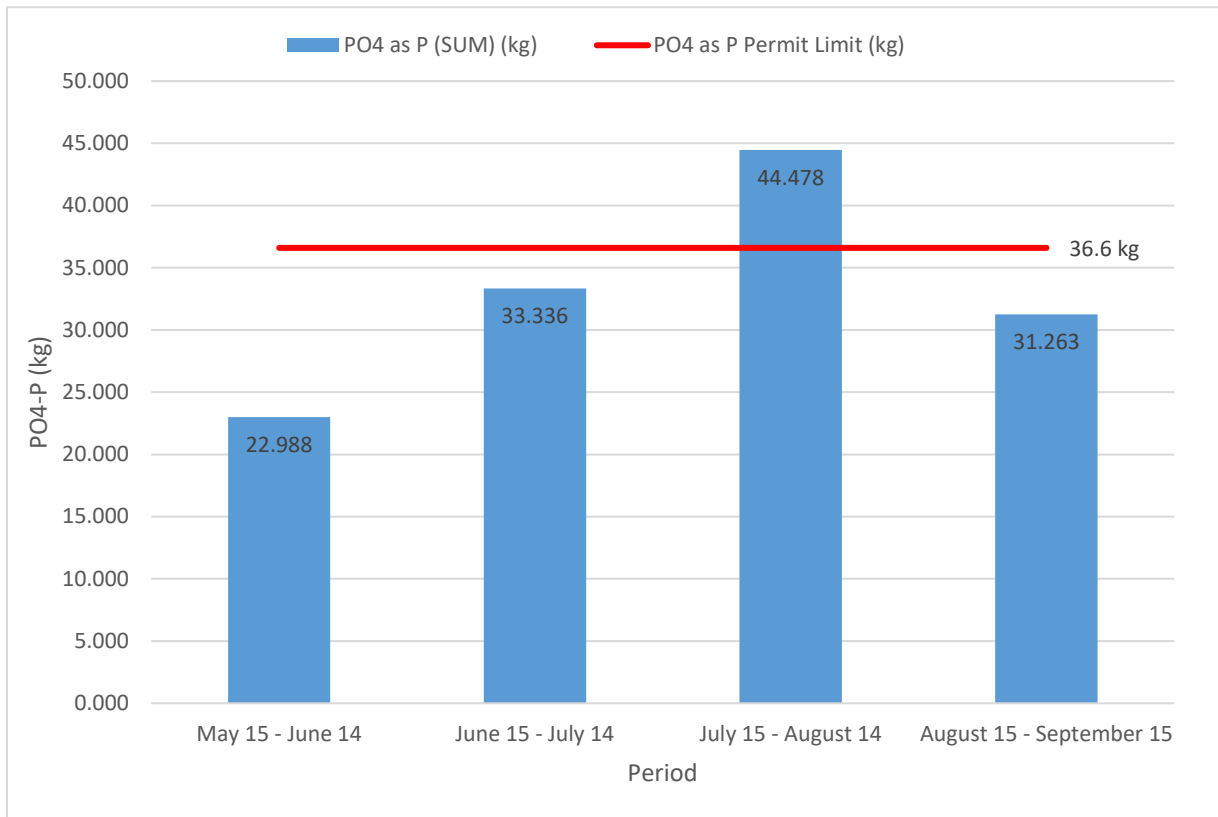


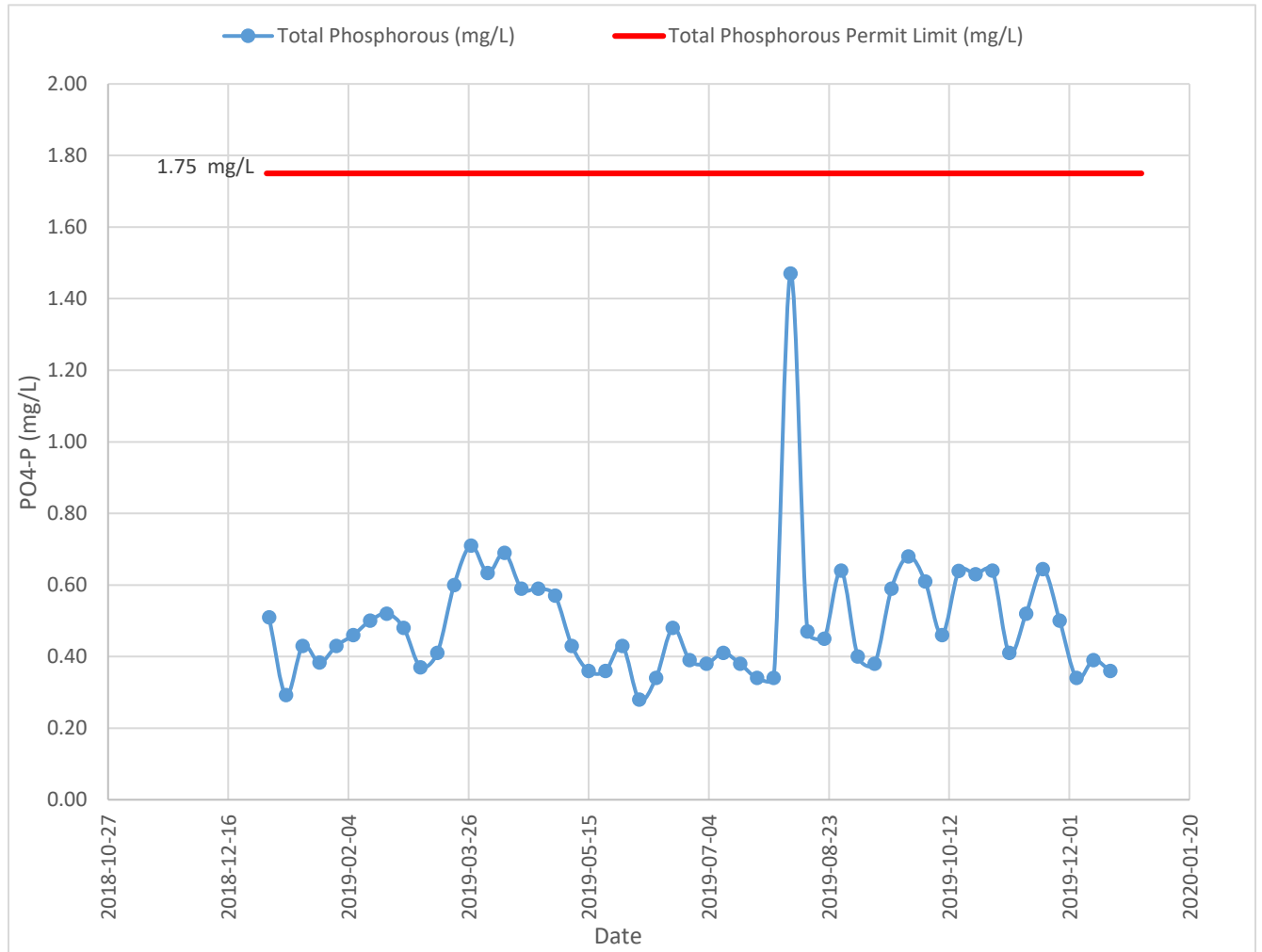
Figure 3 Final effluent total Phosphorus (PO4-P) discharge by month May 15 - September 15 2019



# Total Phosphorous – Laboratory Results

Weekly final effluent samples are submitted to a certified laboratory for total phosphorous concentration analysis.

Figure 4 2019 Final Effluent Weekly Phosphorous (PO4-P) Concentration Weekly Laboratory Data



# Total Suspended Solids

Total Suspended Solids concentrations did not exceed the permitted level of 40 mg/L per day for the report period, shown in Figure 6.

Figure 5 Total Suspended Solids (mg/L) 2019

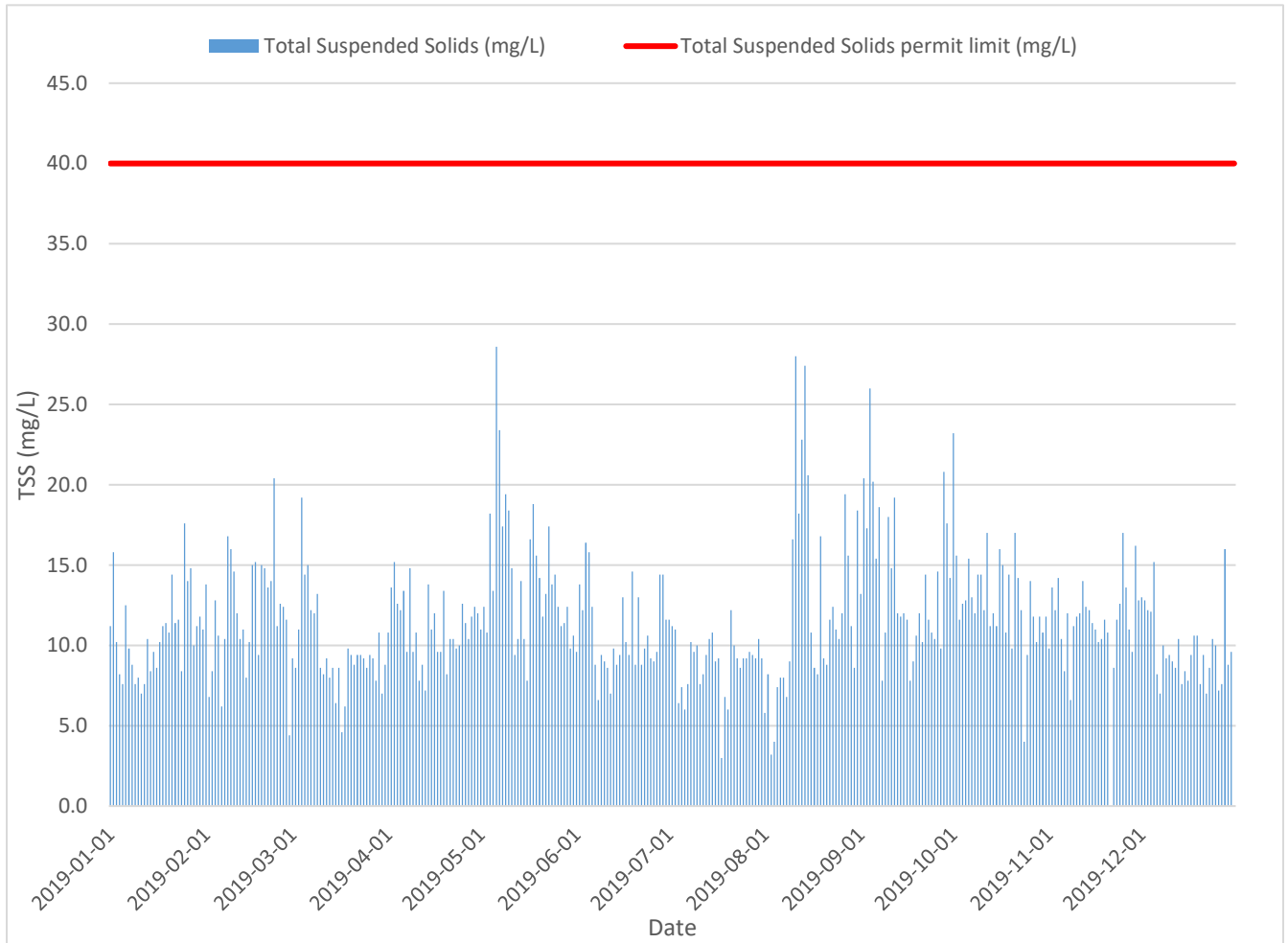
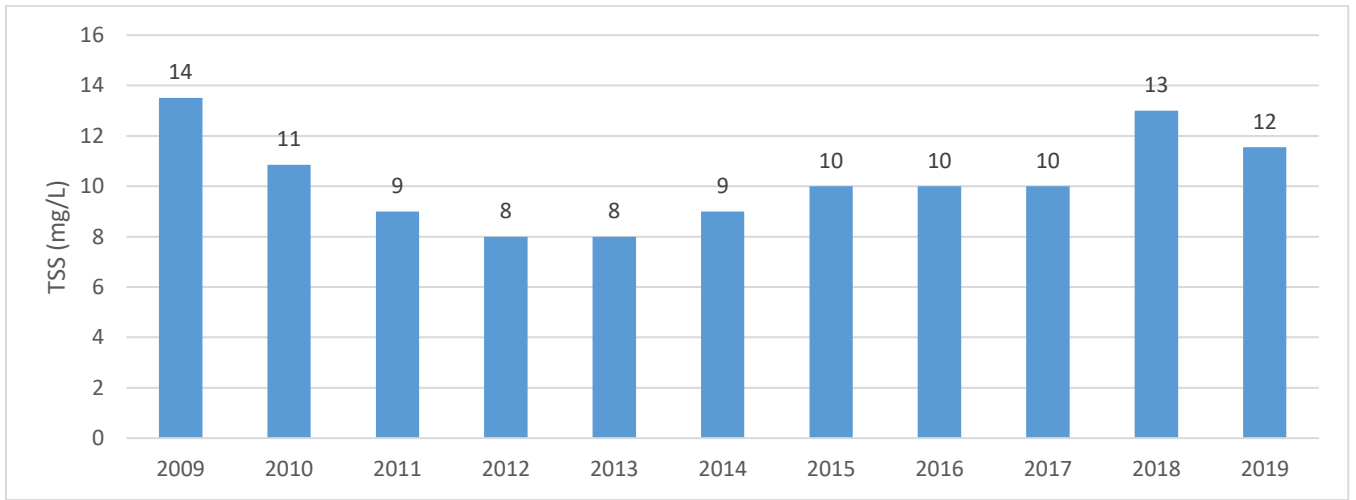


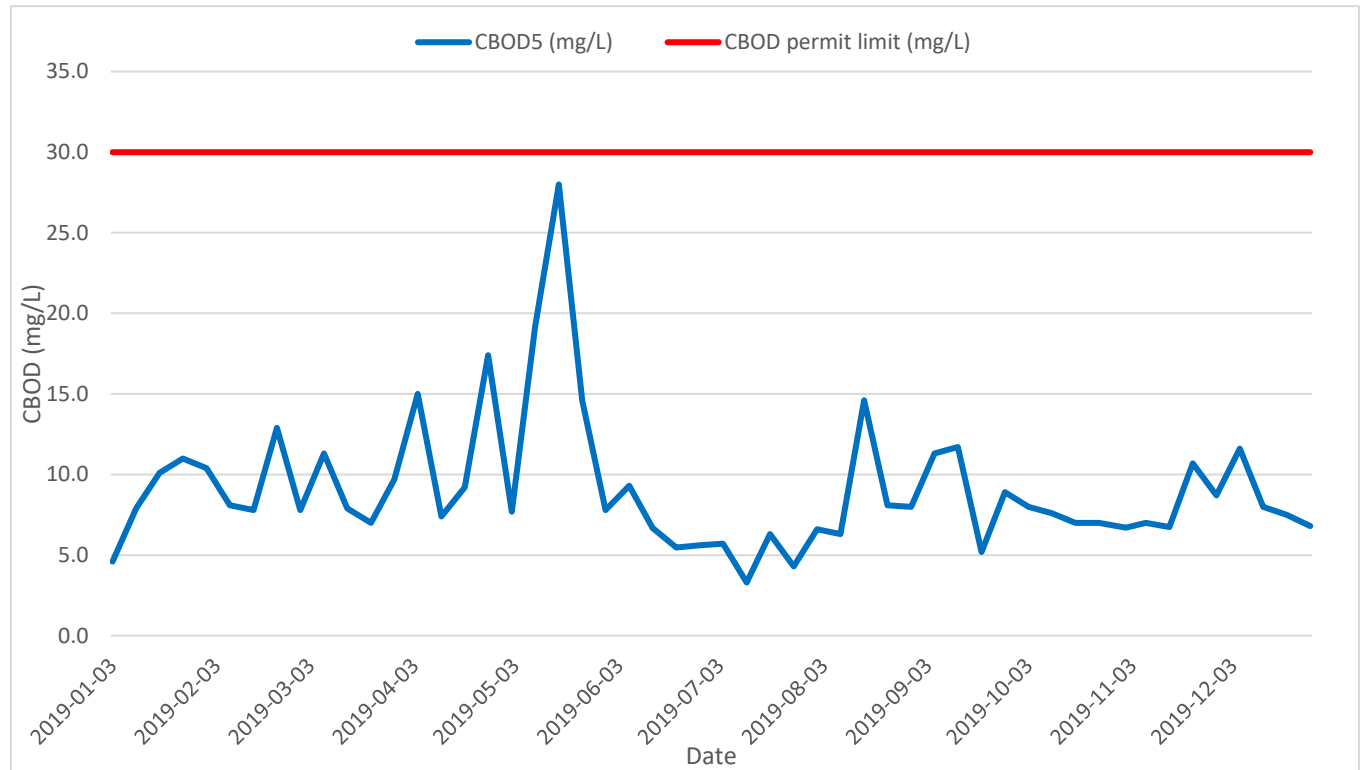
Figure 8 Annual Average Suspended Solids (mg/L) 2009 - 2019



## Carbonaceous Biochemical Oxygen Demand (BOD)

Carbonaceous BOD did not exceed the permitted level of 30 mg/L per day for the report period.

Figure 9 Weekly Carbonaceous BOD (mg/L) 2019

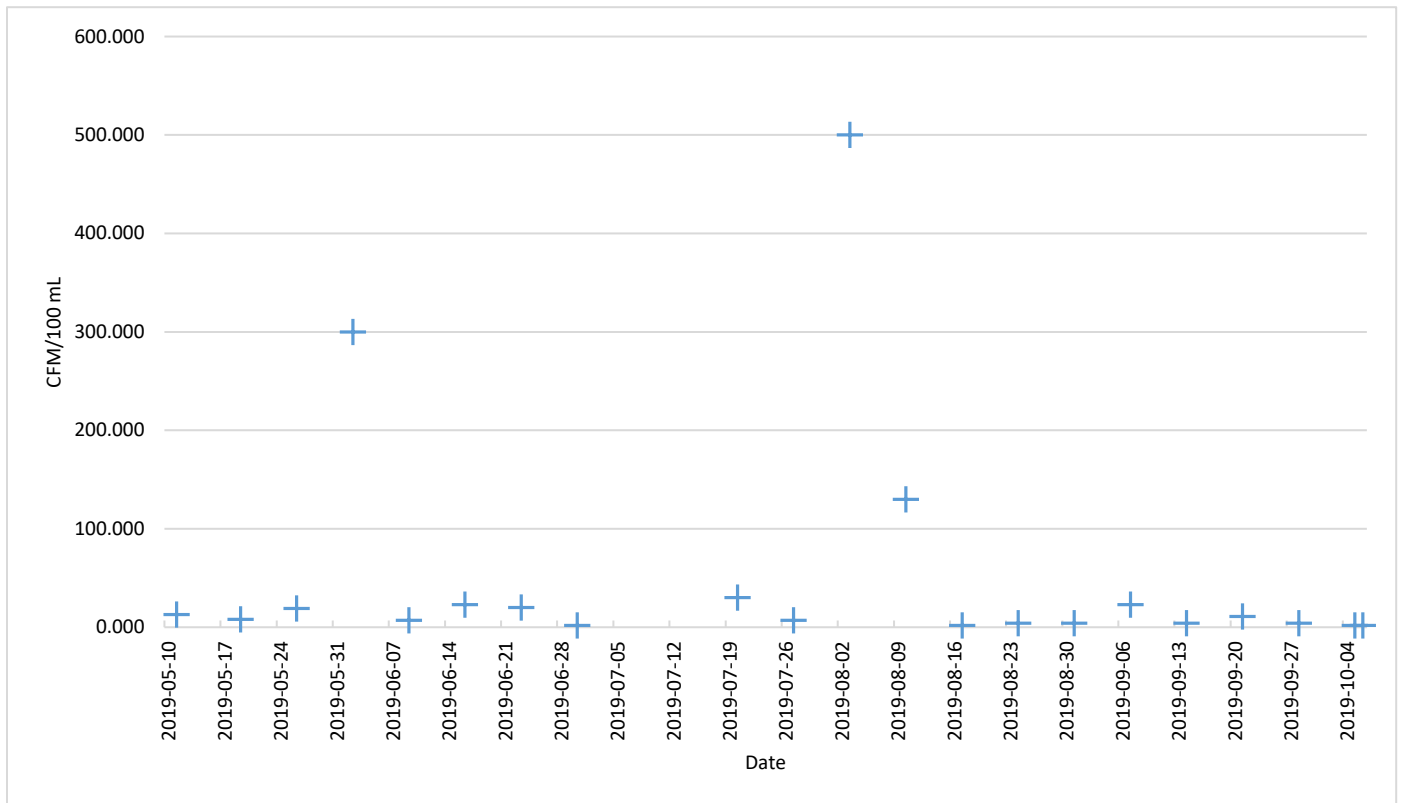


## Effluent Disinfection

The WWTP is required to disinfect the effluent using UV from May 15<sup>th</sup> to October 15<sup>th</sup>. The WWTP is currently operating the UV system twelve months a year. Bi-weekly final effluent samples were submitted to a certified laboratory for fecal coliform analysis throughout the disinfection period in order to verify the effectiveness of the UV disinfection, data shown in Figure 8. The three elevated samples on March 31, August 2 and August 9 are outlier samples that had been taken before UV disinfection.

Note: results determined to be less than detection limit are shown on the graph as the laboratory detection limit of 2.0 cfu/ 100 mL.

Figure 10 Weekly Fecal Coliform (CFM/mL) 2019



## Effluent Toxicity

Two (2) LT50 and Two (2) LC50 toxicity tests were performed during the report period. The results are 100% of rainbow trout fry surviving in raw (100% concentration) effluent for 96 hours. See Appendix B for results.

## **RECEIVING ENVIRONMENT MONITORING**

The receiving environment (the Cheakamus River) is sampled once per month by WWTP staff, and the samples are submitted to a certified laboratory. Cascade Environmental completed an analysis of the Receiving Environment data for the reporting year and analysis can be found in Appendix D.

The operating certificate requires the RMOW monitor two sampling stations, with samples taken three times per year. The RMOW exceeds this requirement by sampling at three locations, every month of the year.

## **CONCLUSION**

This report fulfills the requirements for the Operational Certificated ME-01452. Any further inquiries can be directed to Chris Wike, Utilities Group Manager at (604) 935-8321 or cwike@whistler.ca.



# APPENDIX A - NON-COMPLIANCE NOTIFICATION



MINISTRY OF ENVIRONMENT  
REGIONAL OPERATIONS BRANCH

NON-COMPLIANCE REPORTING MAILBOX  
NOTIFICATION TEMPLATE

**To:** [EnvironmentalNonCompliance@gov.bc.ca](mailto:EnvironmentalNonCompliance@gov.bc.ca)  
**Subject:** 2019-08-14 Authorization #ME-01452 Final Effluent PO4-P Non-compliance

**Attention:** *Non-compliance Report for Authorization # ME-01452 Final Effluent Orthophosphate (phosphorus) PO4-P Non-compliance*

**Date of Non-compliance:** 2019-07-15 00:00 / 2019-08-14 00:00

**Location of Non-compliance:** 50.08448, -123.041263

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**Nature of Non-compliance:** The maximum nutrient loading of Orthophosphate (phosphorus) PO4-P for the discharge from May 15 to September 15 inclusive shall be 36.6kg/month maximum. For the period of July 15<sup>th</sup> to August 14<sup>th</sup> 2019, this monthly limit was exceeded. The final effluent was found to have a total sum of 44.48 kg for the previous 30 day period.

**Initial Response/Actions taken:** On July 30<sup>th</sup>, notification was received from staff regarding higher than expected PO4-P levels in daily sampling. Action was taken to turn on Alum dosing to assist the reduction of Orthophosphate (phosphorus) PO4-P in the effluent.

**Monitoring conducted:** Continuous PO4-P monitoring in both the bio reactor and the final effluent will continue as usual. This consists of daily PO4-P testing on the 24 hour bio reactor and final effluent composites.

**Future action items:** The Utilities Group Manager is analyzing environmental conditions' and influent data to determine the reason for increased PO4-P effluent levels. This data analysis looks to produce recommendations that will address higher than expected PO4-P levels in the final effluent.

**Contact information:** For additional information, please contact Francis Morrell at 604-935-8203, or via email at [fmorrell@whistler.ca](mailto:fmorrell@whistler.ca).

# APPENDIX B – ACUTE LETHALITY TEST RESULTS



## SAMPLE INFORMATION

Sample ID	Dates		Rainbow trout test initiation	Receipt temperature
	Collected	Received		
YVS108FE	28-Mar-19 at 0900h	28-Mar-19 at 1308h	29-Mar-19 at 1800h	12.1°C

## TESTS

- Rainbow trout 96-h LT50 test (median lethal time)

## RESULTS

### Toxicity test results

Sample ID	LT50 (hours)
YVS108FE	>96

LT = Lethal Time

## QA/QC

QA/QC summary	Rainbow trout
Reference toxicant LC50 (95% CL)	52.5 (37.6 – 73.2) µg/L Zn <sup>1</sup>
Reference toxicant historical mean (2 SD range)	125.7 (38.5 – 410.8) µg/L Zn
Reference toxicant CV	65%
Organism health history	Acceptable
Protocol deviations	None
Water quality range deviations	None
Control performance	Acceptable
Test performance	Valid

<sup>1</sup> Test Date: March 19, 2019 | LC = Lethal Concentration, CL = Confidence Limits, SD = Standard Deviation, CV = Coefficient of Variation

### SAMPLE INFORMATION

Sample ID	Dates			Receipt temperature
	Collected	Received	Rainbow trout test initiation	
YVS108FE	29-Aug-19 at 0900h	29-Aug-19 at 1321h	30-Aug-19 at 1130h	19.5°C

### TESTS

- Rainbow trout 96-h LT50 test (median lethal time)

### RESULTS

#### Toxicity test results

Sample ID	LT50 (hours)
YVS108FE	>96

LT = Lethal Time

### QA/QC

QA/QC summary	Rainbow trout
Reference toxicant LC50 (95% CL)	66.2 (49.1 – 89.0) µg/L Zn <sup>1</sup>
Reference toxicant historical mean (2 SD range)	95.1 (36.3 – 249.0) µg/L Zn
Reference toxicant CV	51%
Organism health history	Acceptable
Protocol deviations	None
Water quality range deviations	None
Control performance	Acceptable
Test performance	Valid

<sup>1</sup> Test Date: August 22, 2019, LC = Lethal Concentration, CL = Confidence Limits, SD = Standard Deviation, CV = Coefficient of Variation

## SAMPLE INFORMATION

Sample ID	Dates			Receipt temperature
	Collected	Received	Rainbow trout test initiation	
YVS108FE	24-Oct-19 at 0900h	24-Oct-19 at 1244h	24-Oct-19 at 1830h	13.8°C

## TESTS

- Rainbow trout 96-h LC50 test

## RESULTS

### Toxicity test results

Sample ID	LC50 (% v/v)
YVS108FE	>100

LC = Lethal Concentration

## QA/QC

QA/QC summary	Rainbow trout
Reference toxicant LC50 (95% CL)	80.8 (63.8 – 125.1) µg/L Zn <sup>1</sup>
Reference toxicant historical mean (2 SD range)	80.8 (31.8 – 205.3) µg/L Zn
Reference toxicant CV	49%
Organism health history	Acceptable
Protocol deviations	None
Water quality range deviations	None
Control performance	Acceptable
Test performance	Valid

<sup>1</sup>Test Date: October 24, 2019, LC = Lethal Concentration, CL = Confidence Limits, SD = Standard Deviation, CV = Coefficient of Variation

## SAMPLE INFORMATION

Sample ID	Dates			Receipt temperature
	Collected	Received	Rainbow trout test initiation	
YVS108FE	05-Dec-19 at 0900h	05-Dec-19 at 1330h	05-Dec-19 at 1730h	10.8 – 11.0°C

## TESTS

- Rainbow trout 96-h LC50 test

## RESULTS

### Toxicity test results

Sample ID	LC50 (% v/v)
YVS108FE	>100

LC = Lethal Concentration

## QA/QC

QA/QC summary	Rainbow trout
Reference toxicant LC50 (95% CL)	61.6 (51.7 – 73.4) µg/L Zn <sup>1</sup>
Reference toxicant historical mean (2 SD range)	84.0 (36.5 – 193.4) µg/L Zn
Reference toxicant CV	44%
Organism health history	Acceptable
Protocol deviations	None
Water quality range deviations	None
Control performance	Acceptable
Test performance	Valid

<sup>1</sup>Test Date: December 02, 2019, LC = Lethal Concentration, CL = Confidence Limits, SD = Standard Deviation, CV = Coefficient of Variation

## APPENDIX C – WASTE WATER TREATMENT PLANT DATA

Date	Effluent (m3/day)	Total Suspended Solids (mg/L)	CBOD5 (mg/L)	Soluble PO4 as P (mg/L)	PO4 as P (kg/day)	Total Phosphorous (mg/L)	Fecal Coliform (cfu/100mL)
2019-01-01	14164	11.2		0.03	0.4		
2019-01-02	13705	15.8	10.1	0.04	0.5	0.51	
2019-01-03	14902	10.2		0.02	0.3		
2019-01-04	16243	8.2		0.02	0.3		
2019-01-05	15044	7.6		0.02	0.3		
2019-01-06	13688	12.5		0.04	0.5		
2019-01-07	12976	9.8		0.03	0.4		
2019-01-08	12351	8.8		0.03	0.4		
2019-01-09	11695	7.6	7.9	0.03	0.4	0.29	
2019-01-10	12005	8.0		0.04	0.5		
2019-01-11	12358	7.0		0.02	0.2		
2019-01-12	12996	7.6		0.14	1.8		
2019-01-13	12615	10.4		0.13	1.6		
2019-01-14	11175	8.4		0.13	1.5		
2019-01-15	10860	9.6		0.12	1.3		
2019-01-16	10668	8.6	4.6	0.16	1.7	0.43	
2019-01-17	10670	10.2		0.06	0.6		
2019-01-18	11632	11.2		0.16	1.9		
2019-01-19	13816	11.4		0.21	2.9		
2019-01-20	13514	10.8		0.10	1.4		
2019-01-21	11487	14.4		0.06	0.7		
2019-01-22	10779	11.4		0.04	0.4		
2019-01-23	10565	11.6	11.0	0.04	0.4	0.38	
2019-01-24	10885	8.4		0.04	0.4		
2019-01-25	11545	17.6		0.10	1.2		
2019-01-26	12584	14.0		0.03	0.4		
2019-01-27	12067	14.8		0.06	0.7		
2019-01-28	10883	10.0		0.02	0.2		
2019-01-29	10333	11.2		0.03	0.3		
2019-01-30	10049	11.8	10.4	0.02	0.2	0.43	
2019-01-31	10786	11.0		0.04	0.4		
2019-02-01	12617	13.8		0.03	0.4		
2019-02-02	13172	6.8		0.17	2.2		
2019-02-03	12794	8.4		0.02	0.3		
2019-02-04	11561	12.8		0.02	0.2		
2019-02-05	10852	10.6		0.02	0.2		

2019-02-06	10863	6.2	8.1	0.02	0.2	0.46
2019-02-07	10927	10.4		0.02	0.2	
2019-02-08	11424	16.8		0.02	0.2	
2019-02-09	11883	16.0		0.03	0.4	
2019-02-10	11425	14.6		0.03	0.3	
2019-02-11	10451	12.0		0.08	0.8	
2019-02-12	10135	10.4		0.04	0.41	
2019-02-13	10127	11.0	7.8	0.03	0.3	0.50
2019-02-14	10476	8.0		0.03	0.3	
2019-02-15	11284	10.2		0.04	0.5	
2019-02-16	12559	15.0		0.22	2.8	
2019-02-17	12825	15.2		0.11	1.4	
2019-02-18	12199	9.4		0.06	0.7	
2019-02-19	11235	15.0		0.06	0.7	
2019-02-20	10958	14.8	12.9	0.06	0.7	0.52
2019-02-21	11128	13.6		0.06	0.7	
2019-02-22	11443	14.0		0.05	0.6	
2019-02-23	11870	20.4		0.02	0.2	
2019-02-24	11049	11.2		0.03	0.3	
2019-02-25	10046	12.6		0.07	0.7	
2019-02-26	9826	12.4		0.06	0.6	
2019-02-27	9743	11.6	7.8	0.03	0.3	0.48
2019-02-28	9832	4.4		0.03	0.3	
2019-03-01	10522	9.2		0.24	2.5	
2019-03-02	11224	8.6		0.07	0.8	
2019-03-03	10859	11.0		0.02	0.2	
2019-03-04	9976	19.2		0.02	0.2	
2019-03-05	9897	14.4		0.12	1.2	
2019-03-06	9645	15.0	11.3	0.03	0.3	0.37
2019-03-07	9657	12.2		0.06	0.6	
2019-03-08	10255	12.0		0.04	0.4	
2019-03-09	10846	13.2		0.06	0.7	
2019-03-10	10604	8.6		0.18	1.9	
2019-03-11	9801	8.2		0.04	0.4	
2019-03-12	9863	9.2		0.04	0.4	
2019-03-13	9832	8.0	7.9	0.04	0.4	0.41
2019-03-14	9942	8.6		0.27	2.7	
2019-03-15	10384	6.4		0.16	1.7	
2019-03-16	11255	8.6		0.28	3.2	
2019-03-17	11279	4.6		0.09	1.0	
2019-03-18	10894	6.2		0.13	1.4	
2019-03-19	11120	9.8		0.24	2.7	

2019-03-20	11694	9.4	7.0	0.22	2.6	0.60
2019-03-21	11904	8.8		0.24	2.9	
2019-03-22	12166	9.4		0.21	2.6	
2019-03-23	14323	9.4		0.14	2.0	
2019-03-24	15670	9.2		0.02	0.3	
2019-03-25	12978	8.6		0.14	1.8	
2019-03-26	13430	9.4		0.37	5.0	
2019-03-27	13388	9.2	9.7	0.36	4.8	0.71
2019-03-28	13249	7.8		0.33	4.4	
2019-03-29	13098	10.8		0.22	2.9	
2019-03-30	13367	7.0		0.26	3.5	
2019-03-31	12519	8.8		0.02	0.3	
2019-04-01	11309	10.8		0.02	0.2	
2019-04-02	10310	13.6		0.49	5.1	
2019-04-03	12723	15.2	15.0	0.05	0.6	
2019-04-04	12292	12.6		0.29	3.6	
2019-04-05	12752	12.2		0.15	1.9	
2019-04-06	13714	13.4		0.21	2.9	
2019-04-07	13205	9.6		0.31	4.1	
2019-04-08	11810	14.8		0.22	2.6	
2019-04-09	11523	9.6		0.26	3.0	
2019-04-10	11295	10.8	7.4	0.28	3.2	0.63
2019-04-11	11426	7.8		0.22	2.5	
2019-04-12	11675	8.8		0.21	2.5	
2019-04-13	13026	7.2		0.23	3.0	
2019-04-14	12370	13.8		0.30	3.7	
2019-04-15	10919	11.0		0.33	3.6	
2019-04-16	10551	12.0		0.30	3.2	
2019-04-17	10412	9.6	9.2	0.20	2.1	0.69
2019-04-18	11739	9.6		0.21	2.5	
2019-04-19	12796	13.4		0.28	3.6	
2019-04-20	13579	8.2		0.37	5.0	
2019-04-21	12347	10.4		0.25	3.1	
2019-04-22	11319	10.4		0.14	1.6	
2019-04-23	10202	9.8		0.16	1.6	
2019-04-24	10349	10.0	17.4	0.18	1.9	0.59
2019-04-25	9541	12.6		0.19	1.8	
2019-04-26	9860	11.4		0.23	2.3	
2019-04-27	10337	10.4		0.21	2.2	
2019-04-28	9485	11.8		0.19	1.8	
2019-04-29	9491	12.4		0.12	1.1	
2019-04-30	8347	12.0		0.19	1.6	



2019-05-01	7326	11.0	7.7	0.21	1.5	0.59	240.000
2019-05-02	9059	12.4		0.20	1.8		23.000
2019-05-03	8831	10.8		0.19	1.7		
2019-05-04	9392	18.2		0.24	2.3		
2019-05-05	9514	13.4		0.17	1.6		
2019-05-06	8349	28.6		0.13	1.1		
2019-05-07	7969	23.4		0.25	2.0		
2019-05-08	7986	17.4	19.2	0.13	1.0	0.57	2.000
2019-05-09	8083	19.4		0.18	1.5		2.000
2019-05-10	8401	18.4		0.13	1.1		
2019-05-11	9066	14.8		0.34	3.1		
2019-05-12	8593	9.4		0.10	0.9		
2019-05-13	8145	10.4		0.13	1.1		
2019-05-14	7967	14.0		0.24	1.9		
2019-05-15	7762	10.4	28.0	0.09	0.7	0.43	7.000
2019-05-16	8011	7.8		0.10	0.8		4.000
2019-05-17	9104	16.6		0.36	3.3		
2019-05-18	9809	18.8		0.10	1.0		
2019-05-19	10958	15.6		0.10	1.1		
2019-05-20	9325	14.2		0.05	0.5		
2019-05-21	7996	11.8		0.04	0.3		
2019-05-22	7881	13.2	14.6	0.04	0.3	0.36	2.000
2019-05-23	7899	17.4		0.04	0.3		11.000
2019-05-24	8373	13.8		0.06	0.5		
2019-05-25	9138	14.4		0.08	0.7		
2019-05-26	9158	12.4		0.06	0.5		
2019-05-27	8501	11.2		0.07	0.6		
2019-05-28	8533	11.4		0.06	0.5		
2019-05-29	8102	12.4	7.8	0.07	0.6	0.36	8.000
2019-05-30	8196	9.8		0.07	0.6		4.000
2019-05-31	8724	10.6		0.07	0.6		
2019-06-01	9498	9.6		0.06	0.6		
2019-06-02	9063	13.8		0.06	0.5		
2019-06-03	7993	12.2		0.07	0.6		
2019-06-04	7941	16.4		0.07	0.6		
2019-06-05	8071	15.8	9.3	0.07	0.6	0.43	2400.000
2019-06-06	7808	12.4		0.06	0.5		23.000
2019-06-07	8046	8.8		0.11	0.9		
2019-06-08	8618	6.6		0.09	0.8		
2019-06-09	8325	9.4		0.05	0.4		
2019-06-10	8271	9.0		0.07	0.6		
2019-06-11	8321	8.6		0.10	0.8		

2019-06-12	8873	7.0	6.7	0.07	0.6	0.28	2.000
2019-06-13	7496	9.8		0.31	2.3		4.000
2019-06-14	9509	8.8		0.04	0.4		
2019-06-15	10987	9.4		0.27	3.0		
2019-06-16	10635	13.0		0.05	0.5		
2019-06-17	9419	10.2		0.07	0.7		
2019-06-18	9202	9.4		0.03	0.3		
2019-06-19	8968	14.6	5.5	0.06	0.5	0.34	9.000
2019-06-20	8979	8.8		0.05	0.4		4.000
2019-06-21	9347	13.0		0.17	1.6		
2019-06-22	9598	8.8		0.07	0.7		
2019-06-23	8953	9.8		0.09	0.8		
2019-06-24	8882	10.6		0.09	0.8		
2019-06-25	9204	9.2		0.07	0.6		
2019-06-26	8944	9.0	5.6	0.11	1.0	0.48	2.000
2019-06-27	9117	9.6		0.15	1.4		2.000
2019-06-28	10403	14.4		0.12	1.2		
2019-06-29	9261	14.4		0.32	3.0		
2019-06-30	11535	11.6		0.17	2.0		
2019-07-01	11068	11.6		0.10	1.1		
2019-07-02	10511	11.2		0.10	1.1		
2019-07-03	9355	11.0	5.7	0.14	1.3	0.39	4.000
2019-07-04	9949	6.4		0.08	0.8		130.000
2019-07-05	10006	7.4		0.08	0.8		
2019-07-06	10320	6.0		0.08	0.8		
2019-07-07	9967	7.6		0.08	0.8		
2019-07-08	9245	10.2		0.07	0.6		
2019-07-09	9292	9.6		0.12	1.1		
2019-07-10	9667	10.0	3.3	0.16	1.5	0.38	4.000
2019-07-11	9377	7.6		0.08	0.8		500.000
2019-07-12	9527	8.2		0.09	0.9		
2019-07-13	9254	9.4		0.14	1.3		
2019-07-14	10431	10.4		0.19	2.0		
2019-07-15	9373	10.8		0.08	0.7		
2019-07-16	9332	9.0		0.11	1.0		
2019-07-17	9606	9.2	6.3	0.12	1.2	0.41	27.000
2019-07-18	9422	3.0		0.12	1.1		7.000
2019-07-19	9532	6.8		0.19	1.8		
2019-07-20	10218	6.0		0.12	1.2		
2019-07-21	9999	12.2		0.14	1.4		
2019-07-22	9755	10.0		0.24	2.3		
2019-07-23	9768	9.2		0.26	2.5		

2019-07-24	9450	8.6	4.3	0.14	1.3	0.38	17.000
2019-07-25	9872	9.2		0.11	1.1		30.000
2019-07-26	10319	9.2		0.13	1.3		
2019-07-27	10704	9.6		0.14	1.5		
2019-07-28	10674	9.4		0.24	2.6		
2019-07-29	10211	9.2		0.23	2.3		
2019-07-30	9951	10.4		0.14	1.4		50.000
2019-07-31	9644	9.2	6.6	0.14	1.4	0.34	80.000
2019-08-01	9708	5.8		0.12	1.2		
2019-08-02	10201	8.2		0.07	0.7		
2019-08-03	10688	3.2		0.12	1.3		
2019-08-04	11347	4.0		0.09	1.0		
2019-08-05	11133	7.4		0.11	1.2		
2019-08-06	10628	8.0		0.10	1.1		
2019-08-07	10076	8.0	6.3	0.07	0.7	0.34	23.000
2019-08-08	10009	6.8		0.07	0.7		17.000
2019-08-09	10091	9.0		0.06	0.6		
2019-08-10	10404	16.6		0.18	1.8		
2019-08-11	10727	28.0		0.06	0.6		
2019-08-12	9941	18.2		0.09	0.9		
2019-08-13	9927	22.8		0.16	1.6		
2019-08-14	10299	27.4	14.6	0.46	4.7	1.47	2.000
2019-08-15	10256	20.6		0.09	0.9		2.000
2019-08-16	10498	10.8		0.09	0.9		
2019-08-17	11484	8.6		0.07	0.8		
2019-08-18	11036	8.2		0.16	1.8		
2019-08-19	10463	16.8		0.08	0.8		
2019-08-20	10093	9.2		0.12	1.2		
2019-08-21	9457	8.8	8.1	0.17	1.6	0.47	2400.000
2019-08-22	9332	11.6		0.10	0.9		20.000
2019-08-23	9652	12.4		0.09	0.9		
2019-08-24	10136	11.0		0.11	1.1		
2019-08-25	9560	10.4		0.05	0.5		
2019-08-26	9179	12.0		0.12	1.1		
2019-08-27	9011	19.4		0.17	1.5		
2019-08-28	8863	15.6	8.0	0.13	1.2	0.45	9.000
2019-08-29	8922	11.2		0.11	1.0		23.000
2019-08-30	9550	8.6		0.14	1.3		
2019-08-31	10633	18.4		0.15	1.6		
2019-09-01	10654	13.2		0.10	1.1		
2019-09-02	9486	20.4		0.06	0.6		
2019-09-03	9285	17.3		0.11	1.0		

2019-09-04	7914	26.0	11.3	0.05	0.4	0.64	17.000
2019-09-05	7984	20.2		0.33	2.6		7.000
2019-09-06	8314	15.4		0.06	0.5		
2019-09-07	9300	18.6		0.05	0.5		
2019-09-08	8448	7.8		0.05	0.4		
2019-09-09	7792	10.8		0.07	0.5		
2019-09-10	7645	18.0		0.12	0.9		
2019-09-11	7701	14.8	11.7	0.07	0.5	0.40	130.000
2019-09-12	8742	19.2		0.07	0.6		300.000
2019-09-13	8590	12.0		0.06	0.5		
2019-09-14	10410	11.8		0.18	1.9		
2019-09-15	9934	12.0		0.05	0.5		
2019-09-16	8471	11.6		0.06	0.5		
2019-09-17	8925	7.8		0.05	0.4		
2019-09-18	9480	9.0	5.2	0.08	0.8	0.38	23.000
2019-09-19	8232	10.6		0.46	3.8		19.000
2019-09-20	8511	12.0		0.38	3.2		
2019-09-21	8890	10.2		0.09	0.8		
2019-09-22	9188	14.4		0.15	1.4		
2019-09-23	8246	11.6		0.11	0.9		
2019-09-24	7749	10.8		0.12	0.9		
2019-09-25	7852	10.4	8.9	0.15	1.2	0.59	30.000
2019-09-26	7939	14.6		0.11	0.9		8.000
2019-09-27	9308	9.8		0.13	1.2		
2019-09-28	9388	20.8		0.06	0.6		
2019-09-29	8908	17.6		0.10	0.9		
2019-09-30	8061	14.2		0.06	0.5		
2019-10-01	7718	23.2		0.12	0.93		
2019-10-02	7741	15.6	8.0	0.24	1.86	0.68	2.000
2019-10-03	7571	11.6		0.13	0.98		13.000
2019-10-04	7634	12.6		0.12	0.92		
2019-10-05	8122	12.8		0.09	0.73		
2019-10-06	7907	15.4		0.06	0.47		
2019-10-07	7957	13.0		0.10	0.80		
2019-10-08	7394	12.0		0.13	0.96		
2019-10-09	7168	14.4	7.6	0.10	0.72	0.61	50.000
2019-10-10	7180	14.4		0.07	0.50		22.000
2019-10-11	7740	12.2		0.09	0.70		
2019-10-12	9297	17.0		0.41	3.81		
2019-10-13	9532	11.2		0.14	1.33		
2019-10-14	8255	12.0		0.06	0.50		
2019-10-15	8386	11.2		0.06	0.50		

2019-10-16	8664	16.0	7.0	0.06	0.52	0.46	30.000
2019-10-17	9029	15.0		0.07	0.63		30.000
2019-10-18	8914	10.8		0.07	0.62		
2019-10-19	9042	14.4		0.26	2.35		
2019-10-20	8632	9.8		0.10	0.86		
2019-10-21	8539	17.0		0.24	2.05		
2019-10-22	8177	14.2		0.31	2.53		
2019-10-23	7468	12.2	7.0	0.23	1.72	0.64	
2019-10-24	7402	4.0		0.28	2.07		
2019-10-25	8219	9.4		0.17	1.40		
2019-10-26	8450	14.0		0.28	2.37		
2019-10-27	7977	11.8		0.17	1.36		
2019-10-28	7375	10.2		0.22	1.62		
2019-10-29	7273	11.8		0.17	1.24		
2019-10-30	7079	10.8	6.7	0.28	1.98	0.63	10.000
2019-10-31	6997	11.8		0.19	1.33		60.000
2019-11-01	7337	9.8		0.13	0.95		
2019-11-02	8067	13.6		0.12	0.97		
2019-11-03	7718	12.2		0.09	0.69		
2019-11-04	7044	14.2		0.08	0.56		
2019-11-05	7018	10.4		0.12	0.84		
2019-11-06	6984	8.4	7.0	0.24	1.68	0.64	11.000
2019-11-07	7117	12.0		0.14	1.00		2.000
2019-11-08	7904	6.6		0.12	0.95		
2019-11-09	9201	11.2		0.50	4.60		
2019-11-10	9444	11.8		0.10	0.94		
2019-11-11	7863	12.0		0.15	1.18		
2019-11-12	8399	14.0		0.04	0.34		
2019-11-13	7527	12.4	6.8	0.03	0.23	0.41	2.000
2019-11-14	7282	12.2		0.07	0.51		11.000
2019-11-15	7927	11.4		0.13	1.03		
2019-11-16	9563	11.0		0.48	4.59		
2019-11-17	10549	10.2		0.08	0.84		
2019-11-18	9179	10.4		0.11	1.01		
2019-11-19	8229	11.6		0.14	1.15		
2019-11-20	7812	10.8	10.7	0.15	1.17	0.52	4.000
2019-11-21	7839	n/a		0.19	1.49		4.000
2019-11-22	8088	8.6		0.16	1.29		
2019-11-23	9364	11.6		0.33	3.09		
2019-11-24	9247	12.6		0.19	1.76		
2019-11-25	8229	17.0		0.08	0.66		
2019-11-26	8220	13.6		0.18	1.48		

2019-11-27	8494	11.0	8.7	0.24	2.04	0.64	8.000
2019-11-28	9144	9.6		0.17	1.55		50.000
2019-11-29	10057	16.2		0.15	1.51		
2019-11-30	9995	12.8		0.09	0.90		
2019-12-01	9923	13.0		0.06	0.6		
2019-12-02	8312	12.8		0.03	0.2		
2019-12-03	8820	12.2		0.06	0.5		
2019-12-04	8997	12.1	11.6	0.03	0.3	0.50	4.000
2019-12-05	8393	15.2		0.05	0.4		7.000
2019-12-06	8851	8.2		0.41	3.6		
2019-12-07	10853	7.0		0.05	0.5		
2019-12-08	9791	10.0		0.03	0.3		
2019-12-09	9329	9.2		0.02	0.2		
2019-12-10	9181	9.4		0.03	0.3		
2019-12-11	8959	9.0	8.0	0.04	0.4	0.34	
2019-12-12	9347	8.6		0.04	0.4		
2019-12-13	10047	10.4		0.05	0.5		
2019-12-14	10772	7.6		0.02	0.2		
2019-12-15	10497	8.4		0.04	0.4		
2019-12-16	9676	7.8		0.02	0.2		
2019-12-17	10531	9.4		0.04	0.4		
2019-12-18	10604	10.6	7.5	0.07	0.7	0.39	
2019-12-19	10914	10.6		0.09	1.0		
2019-12-20	11210	7.6		0.12	1.3		
2019-12-21	11373	9.4		0.05	0.6		
2019-12-22	12587	7.0		0.03	0.4		
2019-12-23	13149	8.6		0.05	0.7		
2019-12-24	12868	10.4		0.01	0.1		
2019-12-25	12497	10.0		0.02	0.2		
2019-12-26	12641	7.2		0.01	0.1		
2019-12-27	13119	7.6		0.01	0.1		
2019-12-28	13457	16.0		0.04	0.5	0.36	
2019-12-29	13907	8.8	6.8	0.03	0.4		
2019-12-30	13899	9.6		0.03	0.4		
2019-12-31	14333	8.8		0.14	2.0		

**APPENDIX D – RECEIVING ENVIRONMENT MONITORING**



**CASCADE ENVIRONMENTAL**  
RESOURCE GROUP LTD

**DATE:** June 10, 2020  
**TO:** Chelsey Roberts, Resort Municipality of Whistler  
**FROM:** Margot Webster, Cascade Environmental Resource Group Ltd.  
Candace Rose-Taylor, Cascade Environmental Resource Group Ltd.  
**RE:** 2019 Annual Wastewater Treatment Plant Report: Receiving Environment  
Monitoring  
**FILE #:** 013-34-07

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## Introduction

The Resort Municipality of Whistler (RMOW) retained Cascade Environmental Resource Group Ltd. (Cascade) to assist in the data analysis of the Receiving Environment Monitoring section of the 2019 Annual Wastewater Treatment Plant Report. The Whistler Wastewater Treatment Plant (WWTP) is operated by the RMOW under the Operation Certificate ME-01452, which requires the RMOW to sample the WWTP discharge effluent and the receiving environment and summarize the sampling data in an annual report.

## Receiving Environment Monitoring

The receiving environment (the Cheakamus River) is sampled once per month by WWTP staff, and the samples are submitted to a certified laboratory. The operating certificate requires the RMOW to monitor two sampling stations, with a grab sample taken three times per year. The RMOW exceeds this requirement by sampling at three locations, every month of the year.

The monitored parameters are compared at three sampling locations: Upstream, Outfall and Downstream (see Map 1). The sample locations are as follows: the upstream sampling location is at the Bridge, approximately 100 metres upstream of the outfall; the outfall is also referred to as Station B; the downstream sampling location is also known as Camp, which is approximately 4 kilometres downstream of the outfall.

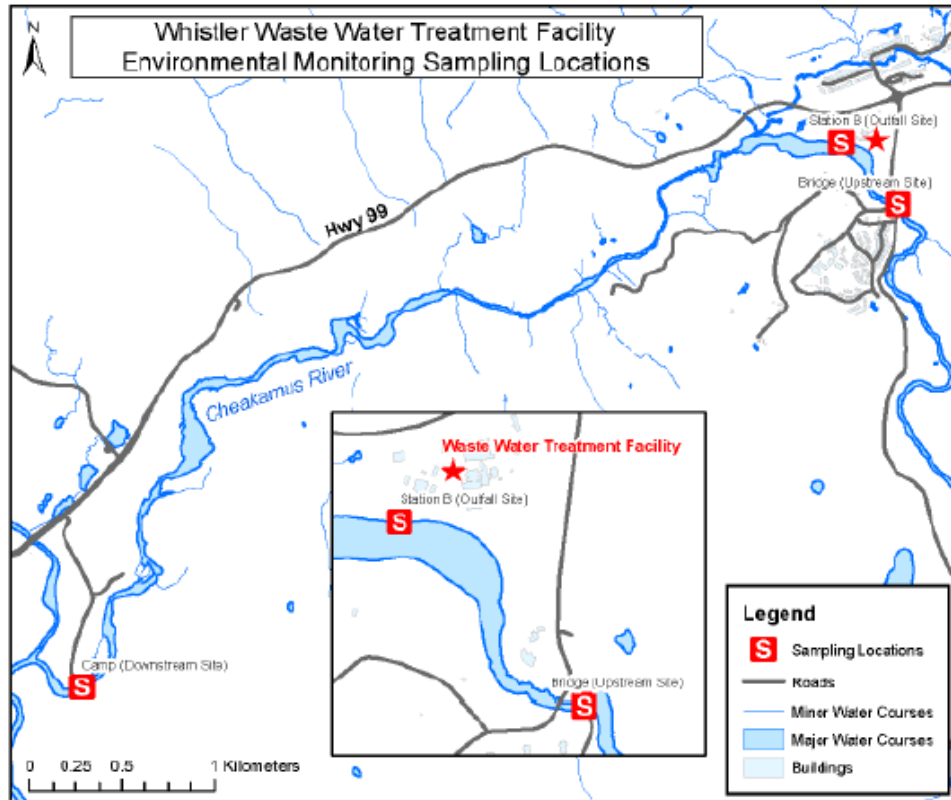
Results that fall below the laboratory detection limit are represented as equal to the laboratory detection limit. Sample parameters for the receiving environment monitoring include pH, conductivity, total suspended solids, turbidity, orthophosphate (as phosphorous), ammonia nitrogen, nitrate nitrogen and nitrite nitrogen. Sample results from 2019 and previous sampling years are presented and discussed below, along with the relevant government guidelines for parameters sampled.

[WWW.CERG.CA](http://WWW.CERG.CA)

WHISTLER: UNIT 3 - 1005 ALPHA LAKE ROAD WHISTLER BC CANADA V8E 0H5 TEL 604.938.1949  
SQUAMISH: UNIT 205 - 39480 QUEENS WAY SQUAMISH BC CANADA V8B 0Z5 TEL 604.815.0901



Map 1 Whistler Wastewater Treatment Plant Environmental Monitoring Sampling Locations



**Relevant Guidelines**

Receiving environment sampling results were compared to accepted water quality standards in order to determine compliance. Sample results were compared to the Canadian Council of Ministers of the Environment (CCME) - Water Quality Guidelines for the Protection of Aquatic Life and to the BC *Environmental Management Act* Contaminated Sites Regulation (CSR) - Schedule 3.2 – Generic Numerical Water Standards (Aquatic Life).

Some parameter guidelines do not have a finite limit but vary based on other parameters: the threshold for ammonia is dependent on pH and temperature at the time of the sample event, and the threshold of nitrite is dependent on chlorine concentrations.

**Table 1: SCR standards and CCME guidelines for the water quality parameters measured.**

Parameter	Unit	CCME Water Quality Guidelines for the Protection of Aquatic Life (Fresh Water - Long Term)	CSR Schedule 3.2 – Generic Numerical Water Standards (Aquatic Life)	BC Approved Water Quality Guidelines (to protect freshwater aquatic life)
Ammonia-N	mg/L	Varies with temperature and pH	1.3 (pH ≥ 8.5) 3.7 (pH 8.0 – 8.5) 11.3 (pH 7.5 – 8.0) 8.5 (pH 7.0 – 7.5) 8.4 (pH < 7.0)	
Conductivity		No guideline or standard for conductivity - typical range in Western Canadian surface waters is 4.8 to 84,600 µS/cm (NAQUADAT, 1985)		
Nitrate-N	mg/L	13	400	3.0 mg/L (30-d average concentration). 32.8 mg/L (maximum concentration).
Nitrite-N	mg/L	0.06	0.2 (Cl < 2mg/L) 0.4 (Cl 2 – 4mg/L) 0.6 (Cl 4 – 8mg/L) 0.8 (Cl 6 – 8mg/L) 1.0 (Cl 8 – 10mg/L) 2.0 (Cl > 10mg/L)	0.020 mg/L (30-d average concentration for low chloride water i.e. <2 mg/L). 0.060 mg/L (maximum concentration for low chloride water).
Nitrate + Nitrite	mg/L		400	
Ortho-Phosphate (as phosphorus)	µg/L	Varies with Trophic State Index: ultra-oligotrophic <4 oligotrophic 4-10 mesotrophic 10-20 meso-eutrophic 20-35 eutrophic 35-100 hyper-eutrophic > 100		
pH		6.5-9.0		



Parameter	Unit	CCME Water Quality Guidelines for the Protection of Aquatic Life (Fresh Water - Long Term)	CSR Schedule 3.2 – Generic Numerical Water Standards (Aquatic Life)	BC Approved Water Quality Guidelines (to protect freshwater aquatic life)
Turbidity	NTU	<p>- <b>Clear flow:</b> Maximum increase of 8 NTUs from background levels for a short-term exposure (e.g., 24-h period). Maximum average increase of 2 NTUs from background levels for a longer-term exposure (e.g., 30-d period).</p> <p>- <b>High flow or turbid waters:</b> Maximum increase of 8 NTUs from background levels at any one time when background levels are between 8 and 80 NTUs. Should not increase more than 10% of background levels when background is &gt; 80 NTUs.</p>		<p>- Change from background of 8 NTU at any one time for a duration of 24 h in all waters during clear flows or in clear waters.</p> <p>- Change from background of 2 NTU at any one time for a duration of 30 d in all waters during clear flows or in clear waters.</p> <p>- Change from background of 5 NTU at any time when background is 8 - 50 NTU during high flows or in turbid waters.</p> <p>- Change from background of 10% when background is &gt;50 NTU at any time during high flows or in turbid waters.</p>

**pH in Receiving Environment**

The CCME guidelines for the protection of aquatic life for pH are between 6.5 and 9.0. Results from the 2019 environmental monitoring are displayed in Figure 1 and show that no sample result from 2019 is outside of these guidelines (marked in red). The average monthly pH measurements for 2019 are 7.18 upstream of the outfall, 7.16 at the outfall and 7.19 downstream of the outfall.

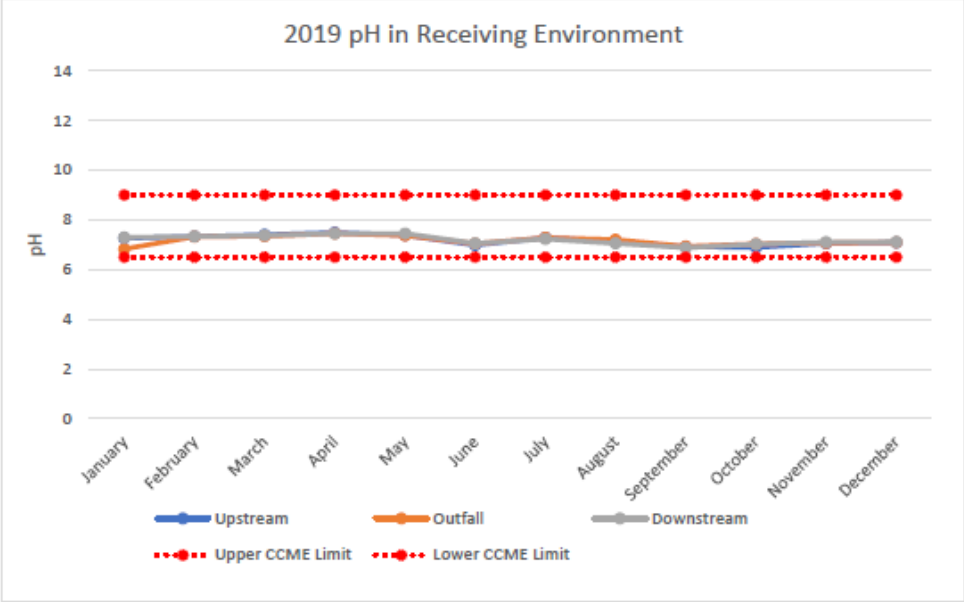


Figure 1: Whistler Wastewater Treatment Plant pH Monitoring in the Receiving Environment for 2019.



Figure 2 compares the pH sample results from the years 2016 to 2019 at the outfall location to the CCME guidelines in red. It appears that the pH has remained within the CCME guidelines for all sample years at the outfall. Only one recorded pH measurement from all sample locations has been marginally outside of the CCME guidelines: in October, 2017, the downstream sample at Camp was 6.1, however the recorded pH at the outfall during this sample event was 6.68 which is within guidelines.

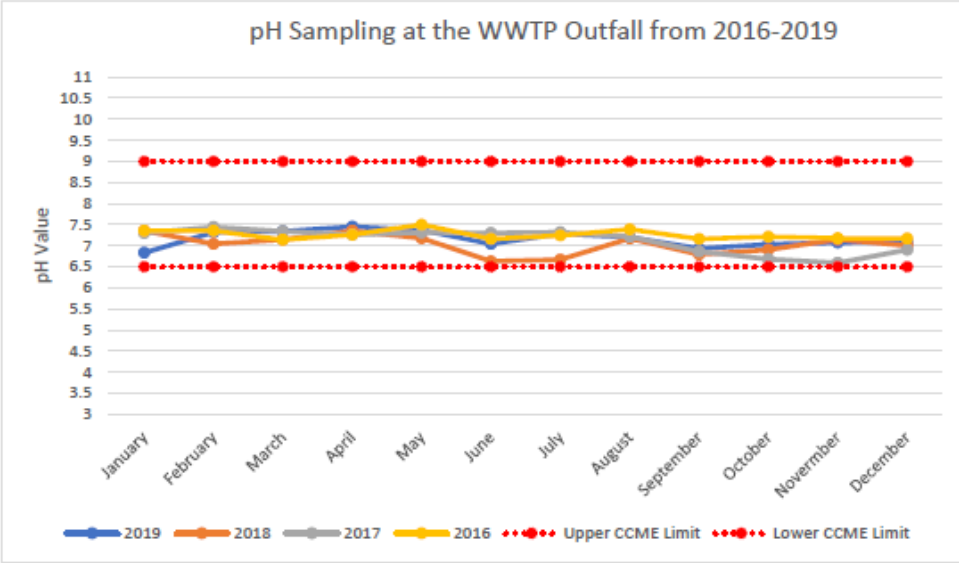


Figure 2: pH Sample Results from the Whistler WWTP Outfall, or Station B, on the Cheakamus River from 2016-2019.

### Conductivity in Receiving Environment

The water quality samples from the Cheakamus River receiving environment demonstrated an electrical conductivity range of 29.1 to 102  $\mu\text{S}/\text{cm}$  for the year 2019 at all sample locations. This is in alignment with the years 2016 to 2018 which resulted in conductivity measurements with an overall range of 28.7 to 121  $\mu\text{S}/\text{cm}$  at all sample locations (Figure 3). Conductivity typically ranges from 4.8 to 84,600  $\mu\text{S}/\text{cm}$  in Western Canada surface waters (NAQUADAT, 1985).

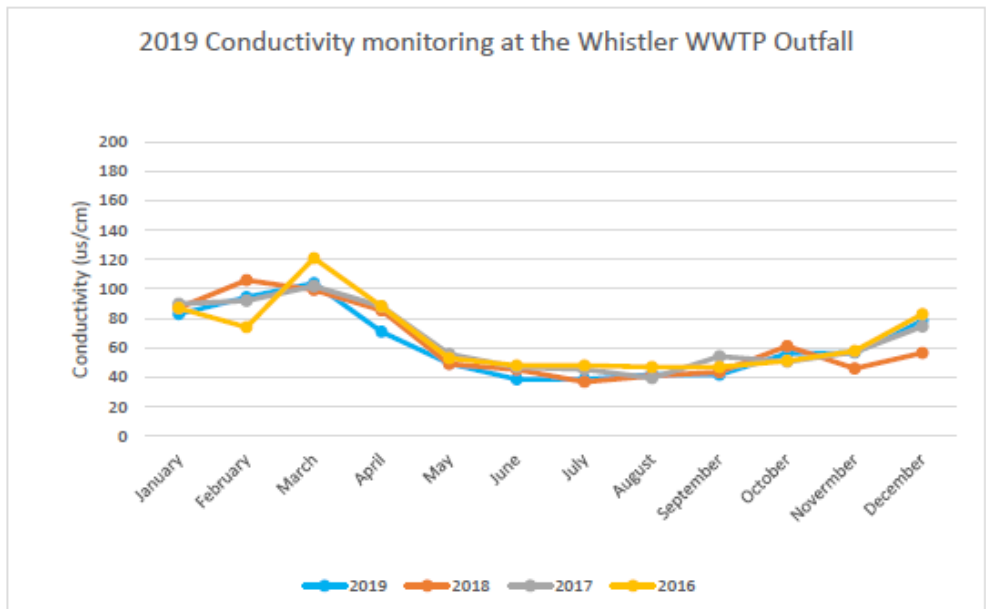


Figure 3: Conductivity Sample Results from the Whistler WWTP Outfall, or Station B, on the Cheakamus River from 2016-2019.

**Turbidity in Receiving Environment**

The CCME Guidelines and CSR Standards for turbidity both allow for a short-term maximum increase of 8 NTU from background levels in clear waters. As the background/upstream turbidity levels range from 0.3 to 3.21 NTU in the year 2019, it is assumed that the Cheakamus River is in the category of clear flowing waters. Figure 4 displays the results for turbidity samples in the receiving environment for the year 2019 with the Guideline/Standard amount in red. There is no sample event for the year 2019 that exceeds the CCME Guidelines or CSR Standards for turbidity.

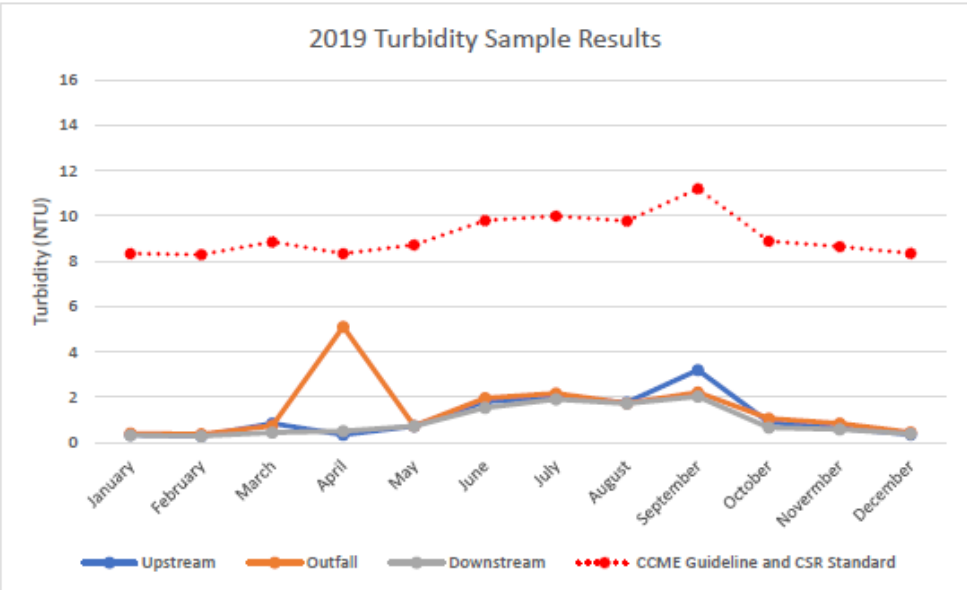


Figure 4: 2019 Turbidity Sample Results of the Whistler WWTP Receiving Environment.

Figure 5 depicts the results of turbidity samples from the years 2016 to 2019 at the Whistler WWTP Outfall sample location. There is no sample event that has been over the CCME Guideline or CSR Standards amount for turbidity in clear flowing water.

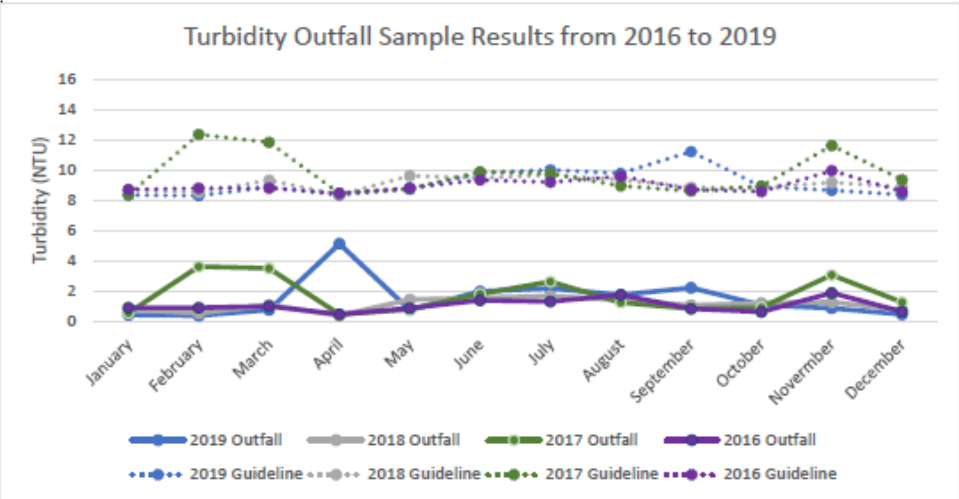


Figure 5: Turbidity Results at the Whistler WWTP Outfall from 2016 to 2019 and Guidelines.



### Orthophosphate in Receiving Environment

The guideline set by CCME for orthophosphate (as phosphorous) varies with Trophic State Index (TSI) of the receiving environment. As the Cheakamus River is oligotrophic, a range of 0.004 mg/L to 0.01 mg/L is within the CCME Guideline levels. The CCME Guidelines for phosphorus were exceeded at the outfall sample location in March 2019, however the daily orthophosphate discharge concentrations for this time period comply with the WWTP Operation Certificate, and the downstream receiving sample complied with the CCME Guidelines.

In October 2019, the guideline levels were exceeded at all three receiving environment sample locations. As the upstream sample also exceeded the guidelines, the higher phosphorus levels are not expected to have resulted from the WWTP effluent (Figure 6). The WWTP effluent phosphorus levels for October 2019 are within the normal range of effluent phosphorus levels for this facility in 2019, and all effluent phosphorus results are below the 1.75 mg/L allowed under the Operation Certificate. The CCME guideline phosphorus levels were also exceeded at all three receiving environment sample locations in October 2018 (Figure 7). This increase in phosphorus levels in consecutive Octobers may be due to autumn rain events flushing nutrients into the Cheakamus River.

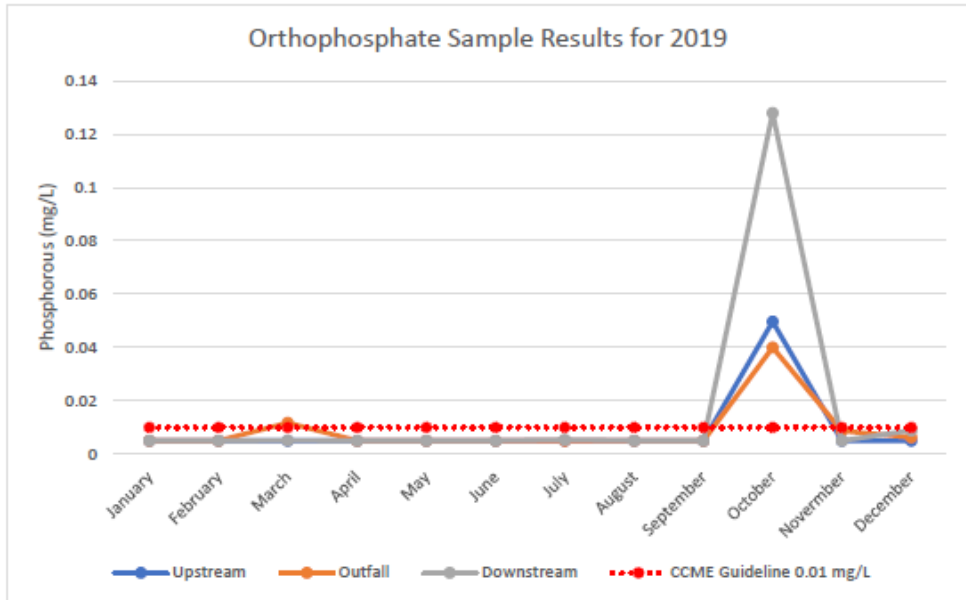


Figure 6: Orthophosphate Sample Results for the year 2019.

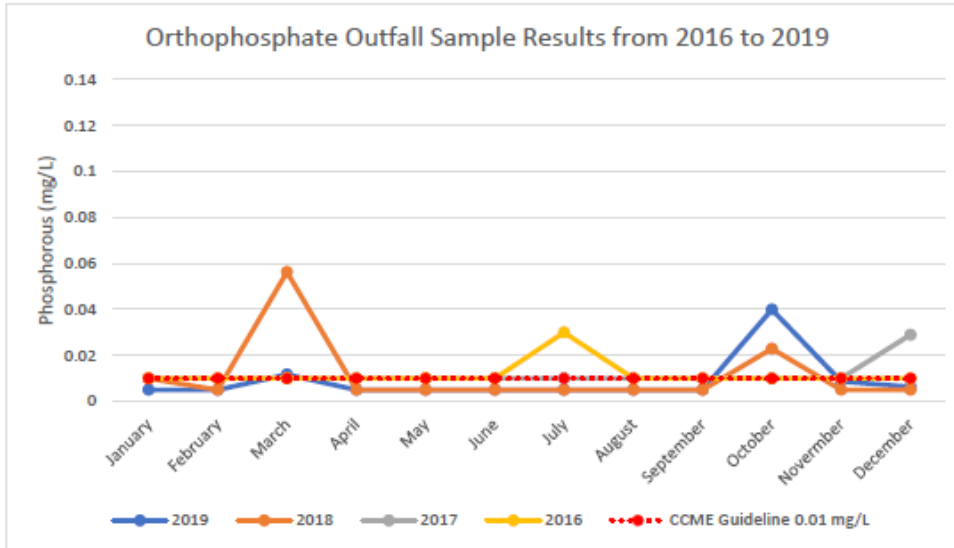


Figure 7: Orthophosphate Sample Results from the Outfall Location between 2016 to 2019.

**Nitrate in Receiving Environment**

Figure 8 displays the nitrate sample results from all three sample locations in 2019 and Figure 9 displays the outfall nitrate sample results between 2016 and 2019. All sample results comply with the CCME Guidelines, the CSR Standards and the BC Approved Water Quality Guidelines. Only the CCME Guideline is show in the graph as this is the most stringent daily maximum of the applicable standards and guidelines.

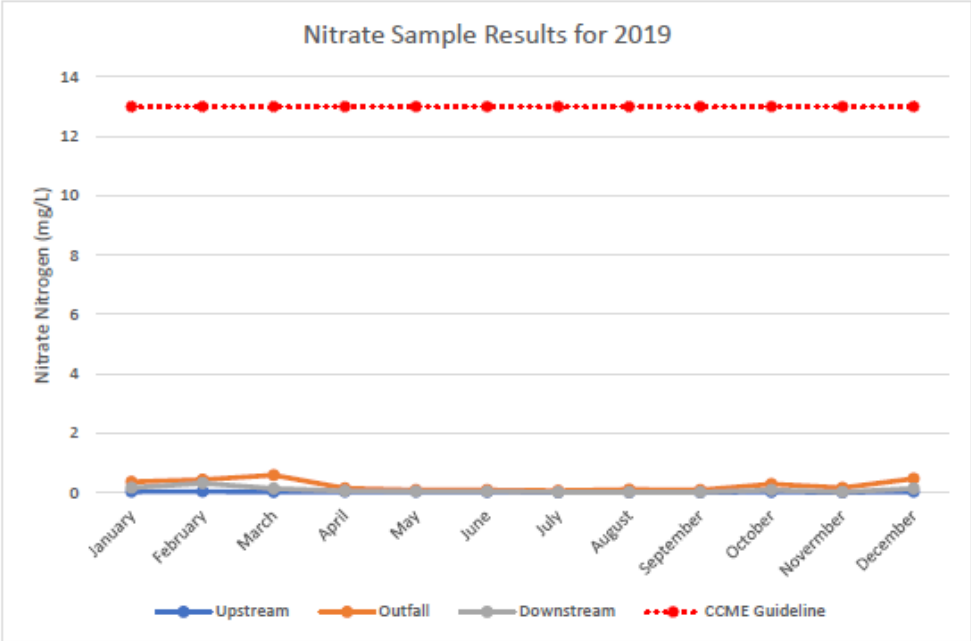


Figure 8: Nitrate Sample Results for 2019.

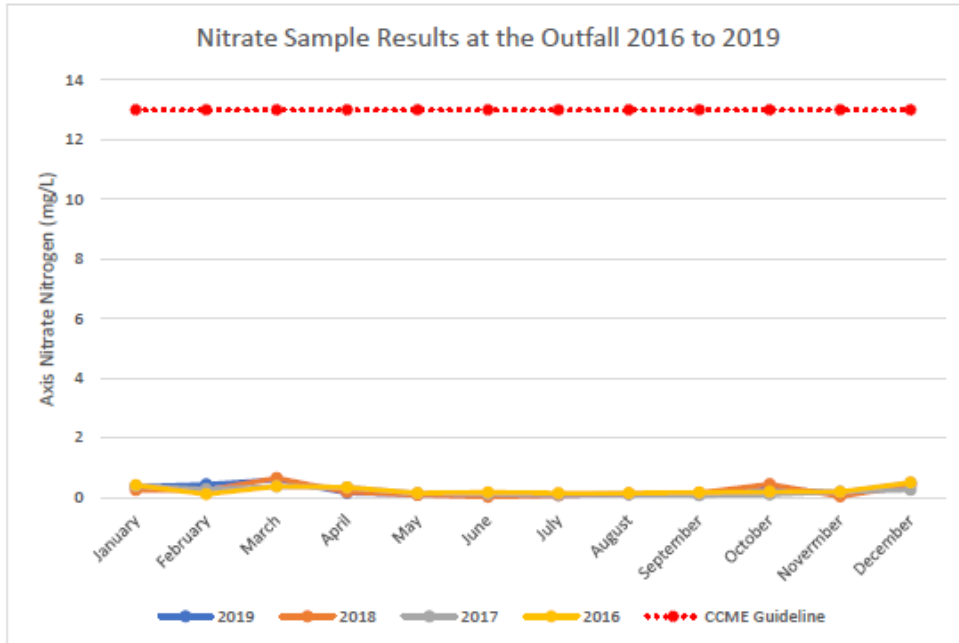


Figure 9: Nitrate Sample Results at the Outfall Sample Location between 2016 and 2019.

**Nitrite in Receiving Environment**

The CCME Guideline for nitrites is 0.06 mg/L; the CSR Standard and BC Approved Water Quality Guideline for Nitrite Nitrogen varies according to chlorine levels at the time of sampling (Table 1). Based on previous sampling events (Cascade, 2019), it was determined that chloride levels in the Cheakamus River ranged from 0.18 to 0.29 mg/L in 2019, which is in the category of low chlorine, or below 2 mg/L. Chloride sampling was conducted approximately 1 km upstream of the outfall (Cascade, 2019). As the Whistler WWTP does not use chlorine for treatment, it is assumed that the upstream chlorine concentrations are representative of the local area of the Cheakamus River. It is recommended that all three sample sites on the Cheakamus River are also sampled for chlorine during the monthly sampling events in order to demonstrate compliance with the CSR Standards for nitrites.

Figure 10 displays the nitrite sample results for the year 2019, and Figure 11 displays the nitrite sample results at the outfall location from the years 2016 to 2019. The CCME Guideline for nitrite and the BC Approved Water Quality Guidelines maximum daily nitrite concentration was marginally exceeded in February 2017, 2018, and 2019. It is expected that the low flows typically seen in the early months of the year contribute to the relative increase in contribution of nitrite by the WWTP to the Cheakamus River. However, the downstream Cheakamus River samples all comply with the Guideline nitrite amount, and all samples comply with the CSR Standards for nitrites.

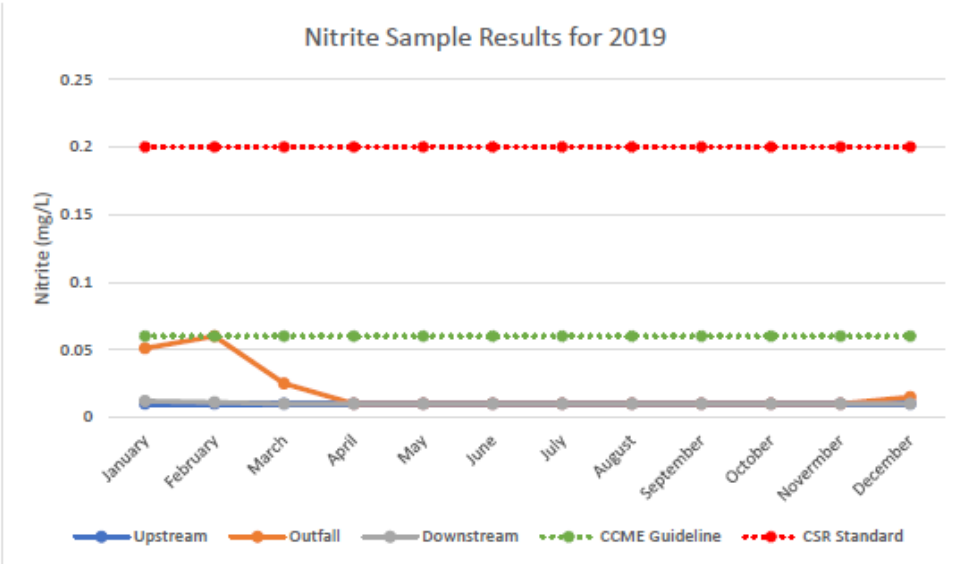


Figure 10: Nitrite Sample Results for 2019.

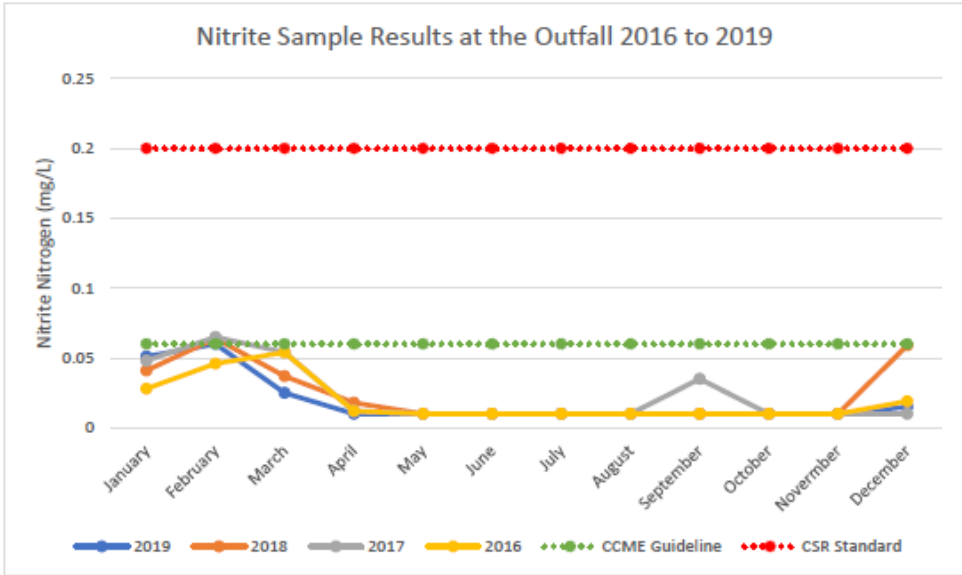


Figure 11: Nitrite Sample Results at the Outfall between 2016 to 2019.

**Ammonia in Receiving Environment**

The CCME Guidelines for ammonia vary according to the temperature and pH of the waterbody at the time of sampling. It is recommended that temperature readings of the Cheakamus River are taken at the time of sampling at all three sample sites in order to demonstrate compliance with the CCME Guidelines for ammonia nitrogen.

The CSR Standards for ammonia also vary according to pH. Figure 12 displays the ammonia sample results for the year 2019; the sample results from all three sampling locations are all well within the CSR Standards.

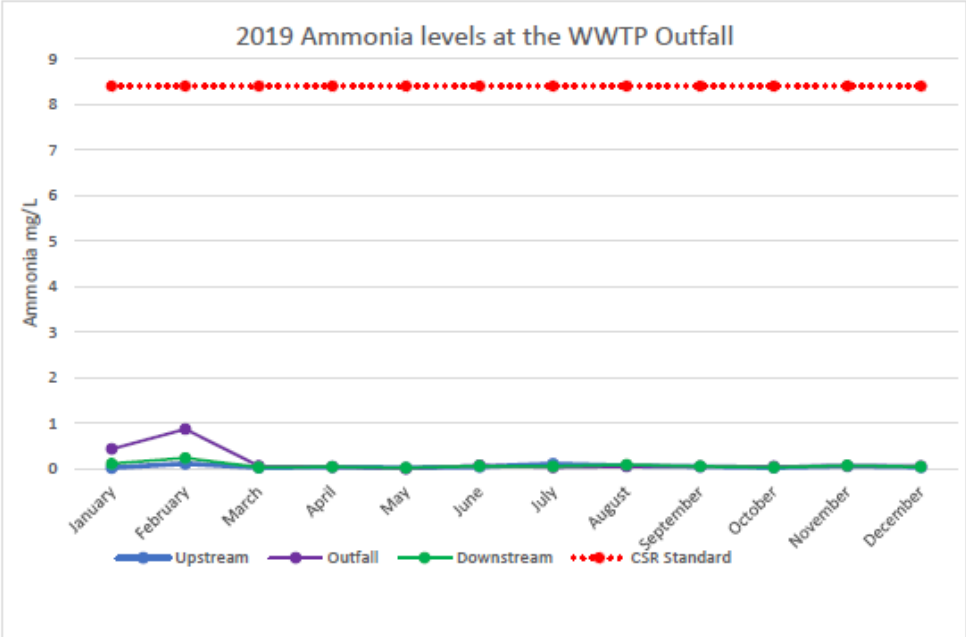


Figure 12: 2019 Ammonia levels at the Whistler Wastewater Treatment Plant Outfall along the Cheakamus River.

## Conclusions

The samples taken by the RMOW from the Cheakamus River receiving environment in 2019 all comply with the applicable CSR Standards. The CCME Guideline for orthophosphate was exceeded in October 2018 and 2019 at all sample locations, including the sample site upstream of the WWTP, implying that high orthophosphate levels in these samples are from a source independent of the WWTP. It is suspected that these exceedances are caused by rain events typically seen at this time of year mobilizing orthophosphate into the Cheakamus River.

The CCME Guideline for nitrite and the BC Approved Water Quality Guidelines maximum daily nitrite concentration was marginally exceeded in February 2017, 2018, and 2019. It is expected that the low flows typically seen in the early months of the year contribute to the relative increase in contribution of nitrite by the WWTP to the Cheakamus River. However, the downstream Cheakamus River samples all comply with the CCME Guideline for nitrite, and all samples comply with the CSR Standards for nitrite.

No guidelines or standards are currently available for conductivity. However, all samples taken from the Cheakamus River receiving environment are well within typical ranges for Western Canadian surface waters (NAQUADAT, 1985).

Should you have any questions regarding this report or would like further information, please do not hesitate to contact the Cascade Whistler office.

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