

2017 Annual Wastewater Treatment Plant Report

Resort Municipality of Whistler Wastewater Treatment Plant

Authorization Number ME- 01452



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1.0 BACKGROUND

Discharge Monitoring Frequency

Monitoring samples are collected at the WWTP and analyzed daily, bi-weekly, monthly, and semi-annually. Samples monitored at each given frequency are outlined below.

Daily

- Total Suspended Solids (TSS)
- Orthophosphate (PO₄-P)

Bi-Weekly

- Chemical Oxygen Demand (COD)
- Fecal Coliforms (from May 15 – September 15)

Weekly

- Five Day Carbonaceous Biochemical Oxygen Demand (cBOD₅)
- Total Phosphorous (TP)
- Total Kjeldahl Nitrogen (TKN)
- Nitrate + Nitrite (N+N)

Monthly

- Total Metals

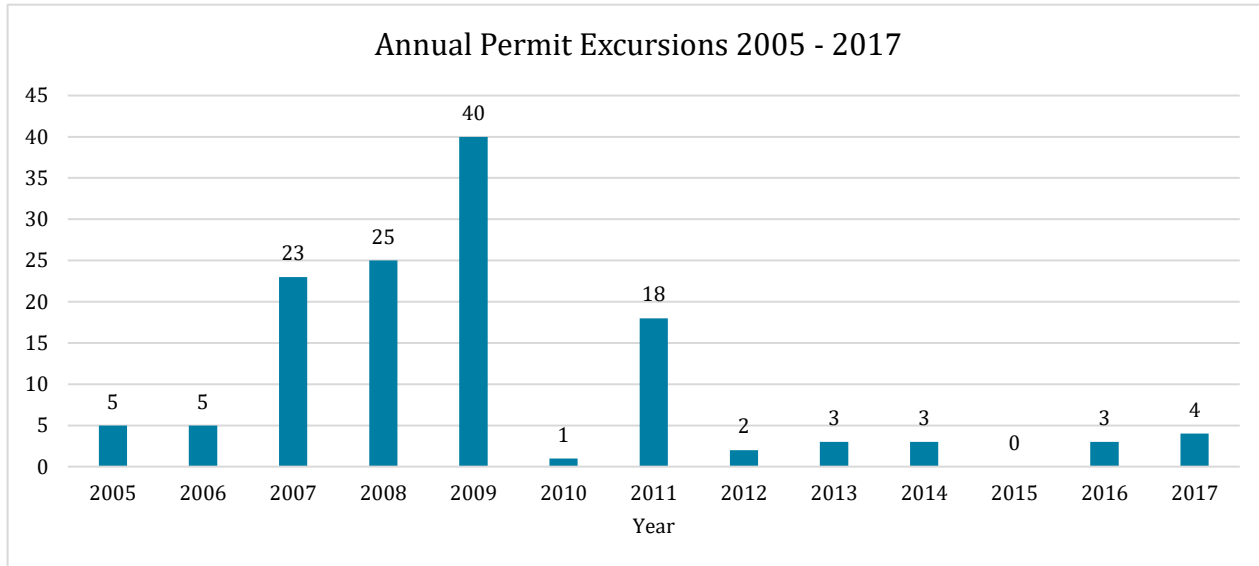
Semi-Annually

- Fish Bioassay 96 LT50 (Rainbow Trout)

Permit Excursions

The WWTP tracks and monitors the number of permit excursions that occur during the year (Fig. 1). In 2017, the WWTP had 4 permit excursions.

Figure 1 Number of permit excursions occurring by year since 2005



General Permit Requirements

Table 1 List of General Permit Requirements

General Requirement	Quantity
Volume of effluent that bypassed the WWTP*	0
Number of emergency shutdowns during the year	0
Number of trucks turned away due to hazardous waste	0
Number of achievements to report regarding source control and water conservation programs	0

*The raw sewage bypass line was removed in 2010

Outfall Inspection

The final effluent outfall was inspected by Cascade Environmental Resource Group in 2010. Effluent pipe inspection is planned for 2019.

Website

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

Facility Staffing

The Resort Municipality of Whistler Waste Water Treatment Plant facility staff qualifications meet and/or exceeded 2017 EOCP requirements (Table 2).

Table 2 Facility Staff certification list

Name	Position	Certification
Gillian Woodward, P.Eng	Utilities Manager	Professional Engineer
Trish Browning	Supervisor	Environmental Engineering Technologist EOCP Level I Municipal Wastewater Treatment
Doug Brereton	Operator 4	EOCP Level IV Municipal Wastewater Treatment
Elizabeth Toole	Operator 3	EOCP Level III Municipal Wastewater Treatment
Hamish (Ty) MacFayden	Operator 3	EOCP Level III Municipal Wastewater Treatment
Wendy Linton	Operator 2	EOCP Level II Municipal Wastewater Treatment
Kristy Koehle	Operator 1	EOCP Level I Municipal Wastewater Treatment
Paul Kozin	Operator 1	EOCP Level I Municipal Wastewater Treatment
Aaron Bose	Operator 1	EOCP Level I Municipal Wastewater Treatment
Neil Kearns	Lab Technician	EOCP Level II Municipal Wastewater Treatment
Bruce Eckersley	Millwright	Red Seal Certified Millwright

2.0 DISCHARGE DISCUSSION AND ANALYSIS

Discharge Volume

In 2017, the effluent discharge volume from the WWTP was below the maximum allowable discharge volume for the dry season of 16, 000 m³/day. The WWTP was also below the 25, 000 m³/day maximum allowable discharge volume for the wet season (Figure 2). The average discharge volume was 9,543 m³/day during the Dry Season from May 15 to September 15 inclusively and 11073 m³/day during the Wet Season which spans from January 1st to May 14th and September 16th to December 31st.

Figure 2 Whistler Wastewater Treatment Plant Daily Effluent Discharge Volume (mg/L) 2017

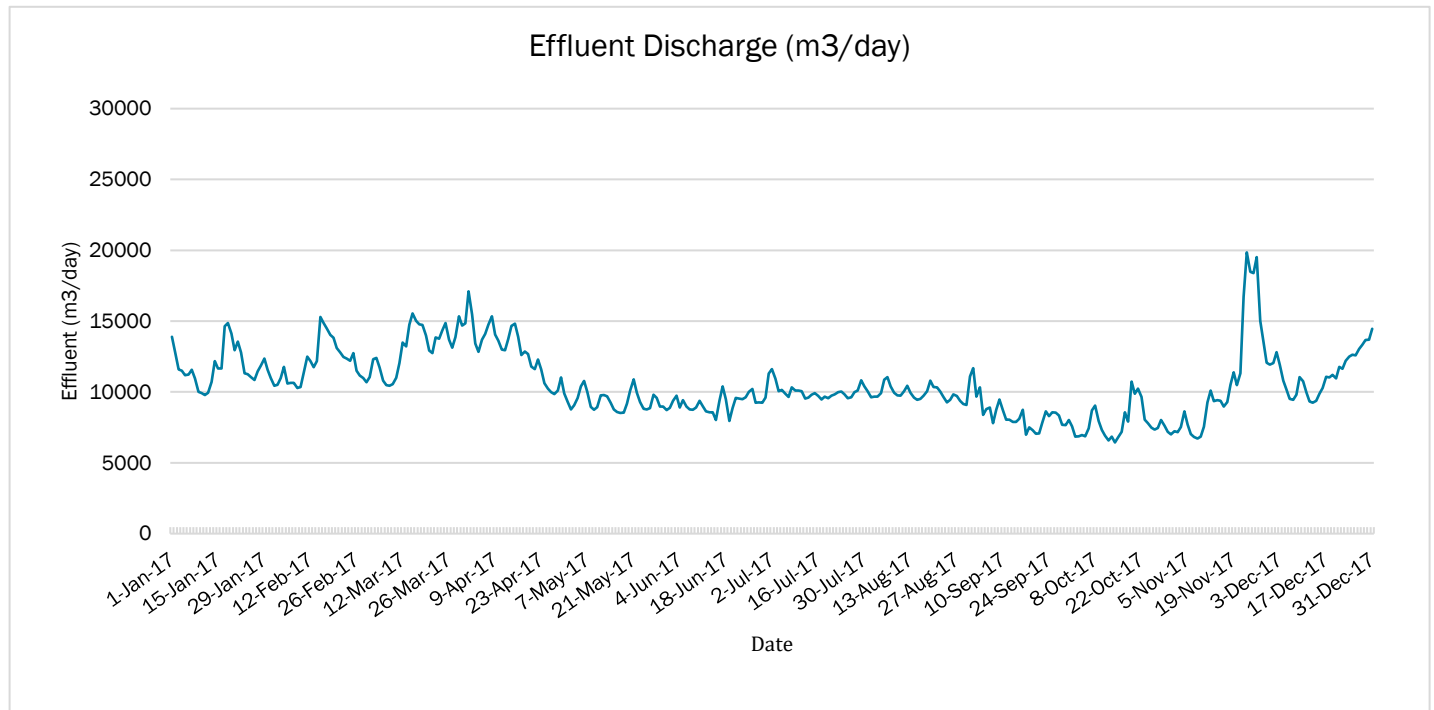


Figure 3 Maximum daily discharge (m3) wet and dry values by year 2004-2017

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

Orthophosphate as Phosphorous P04-P

The levels of Orthophosphate as Phosphorous P04-P are significantly reduced over past years because of two reasons. No exceedances of the 1.75 mg/L permit limit were observed. The equalization tank and the Aluminum Sulphate dosing were both automated during the summer 2017 period. No permit exceedances were observed.

Figure 4 Wastewater Treatment Facility daily orthophosphate discharge concentrations (mg/L) 2017

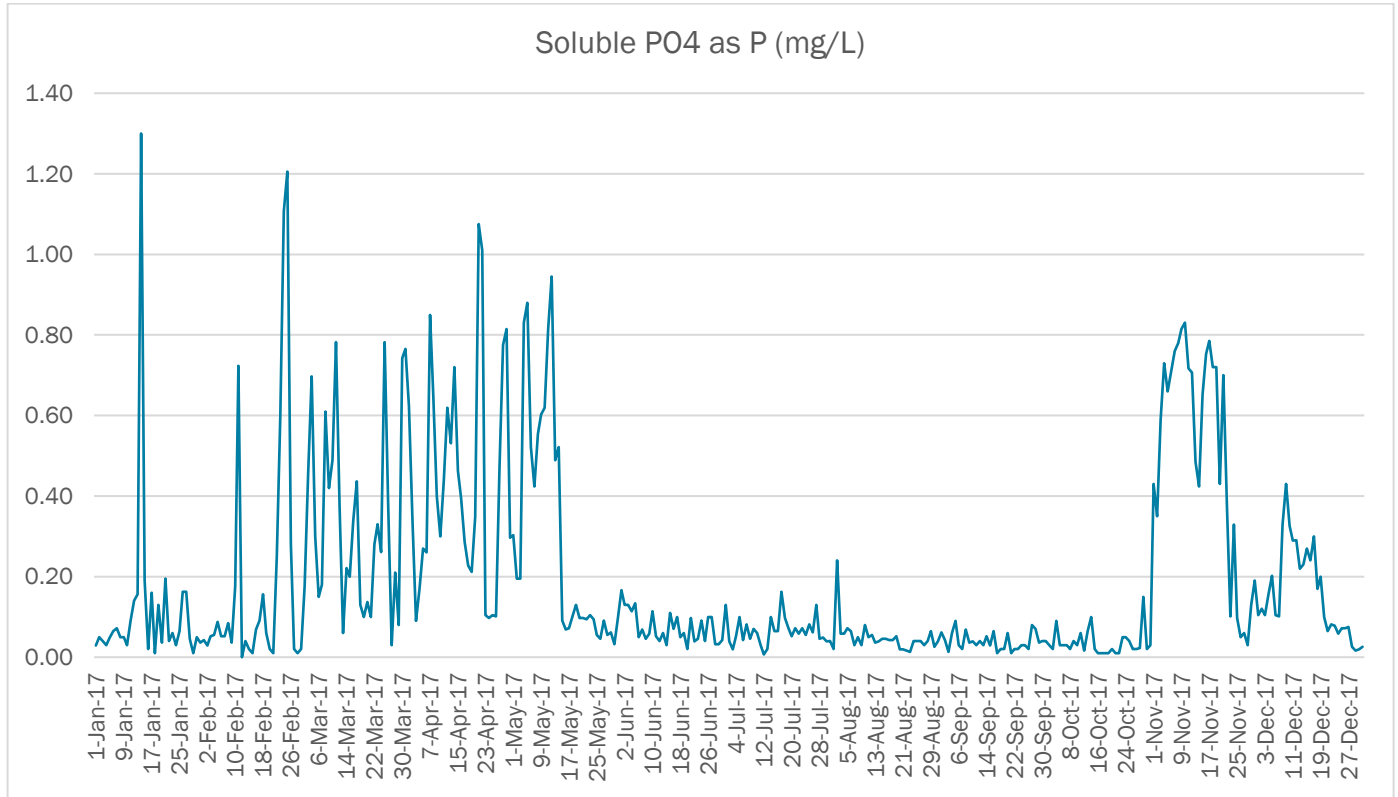
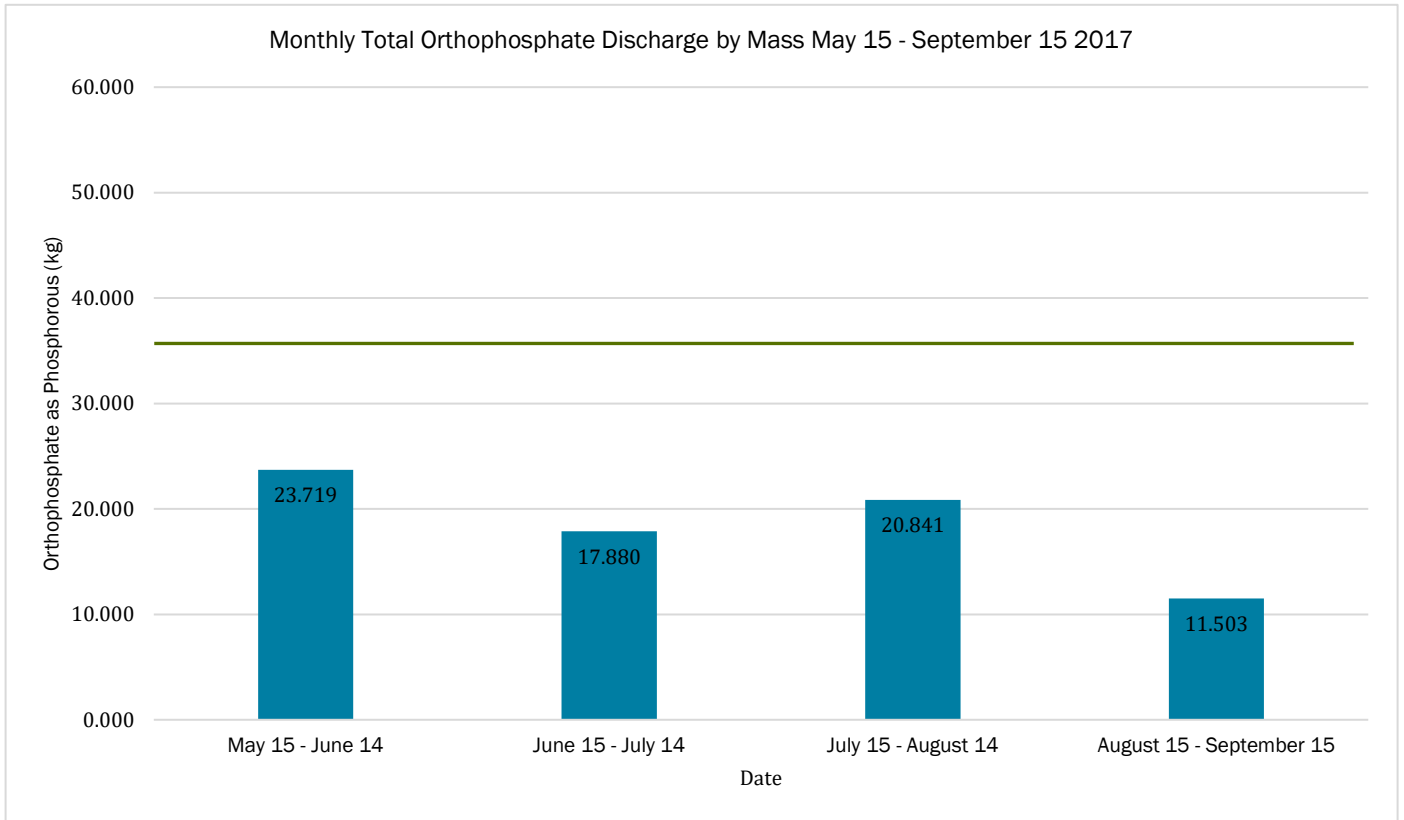


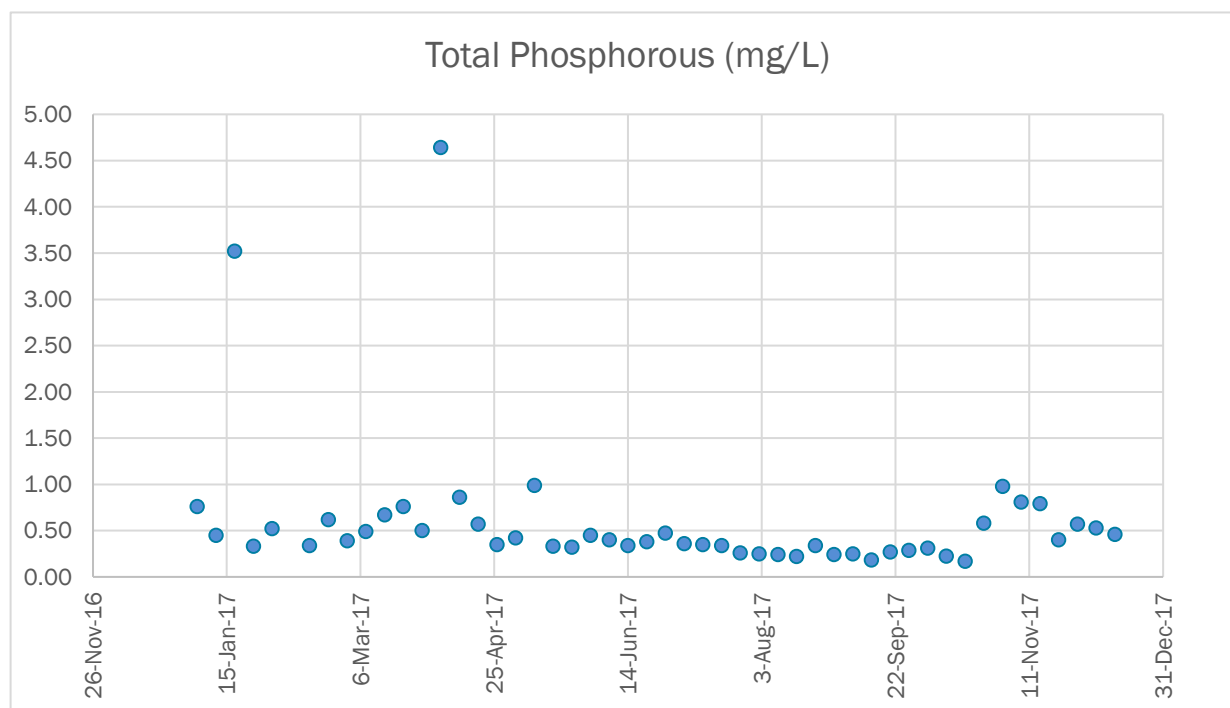
Figure 5 Wastewater Treatment Facility total orthophosphate discharge (kg) by month May 15 - September 15 2017



Total Phosphorous

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

Figure 6 Whistler Wastewater Treatment Plant Weekly Total Phosphorous in Effluent (mg/L) 2017



Total Suspended Solids

Total Suspended Solids concentrations exceeded allowable levels of 40 mg/L per day on 2 separate occasions in 2017.

The January 18th and 19th 2017 exceedance is characterized by the combination of poor settle-ability in the mixed liquor suspended solids, and high flows causing a sudden washout of solids over their weirs and into the final effluent. Aluminum Sulphate dosing was turned on to assist with settling in the secondary clarifiers, and a primary clarifier was put online as flow equalization.

On September 4th 2017 and exceedance was caused by overloaded solids in the secondary clarifier. Corrective action was taken by turning on Aluminum Sulphate dosing to aid with settling.

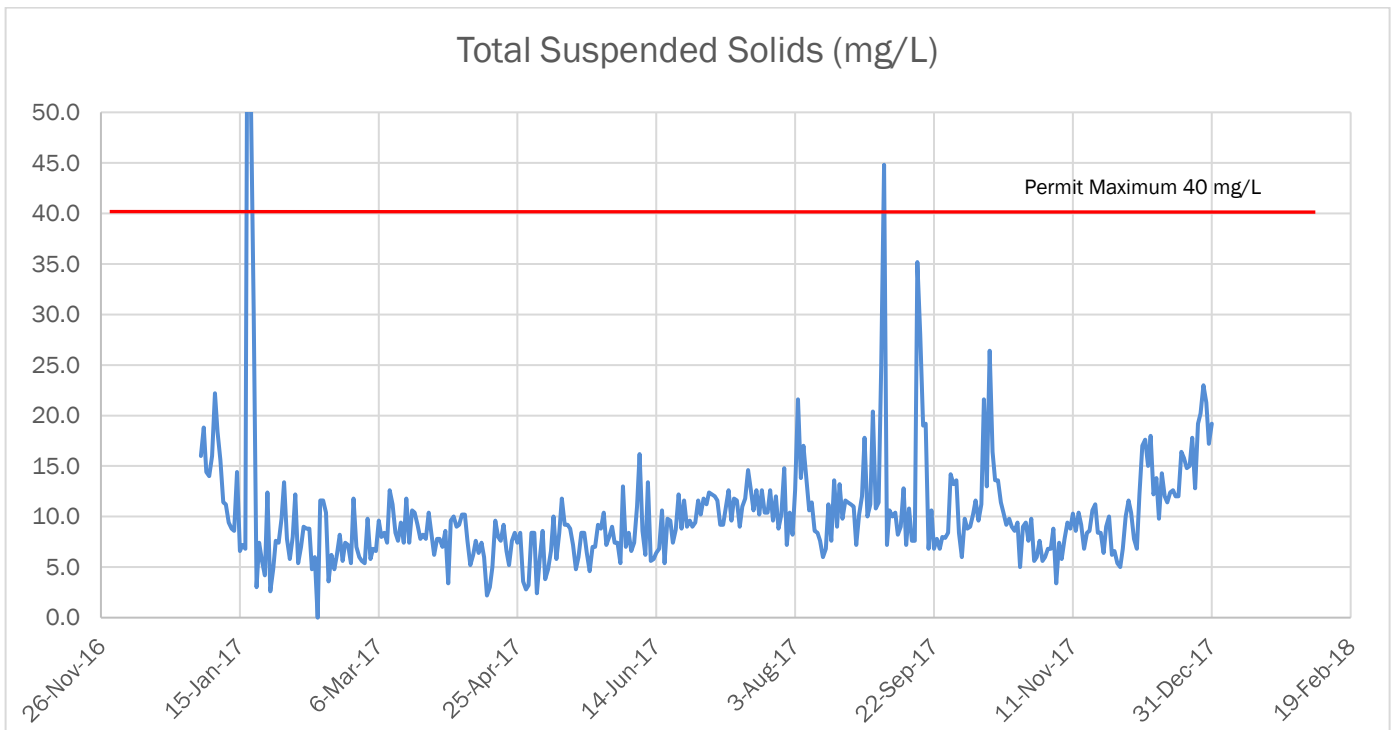
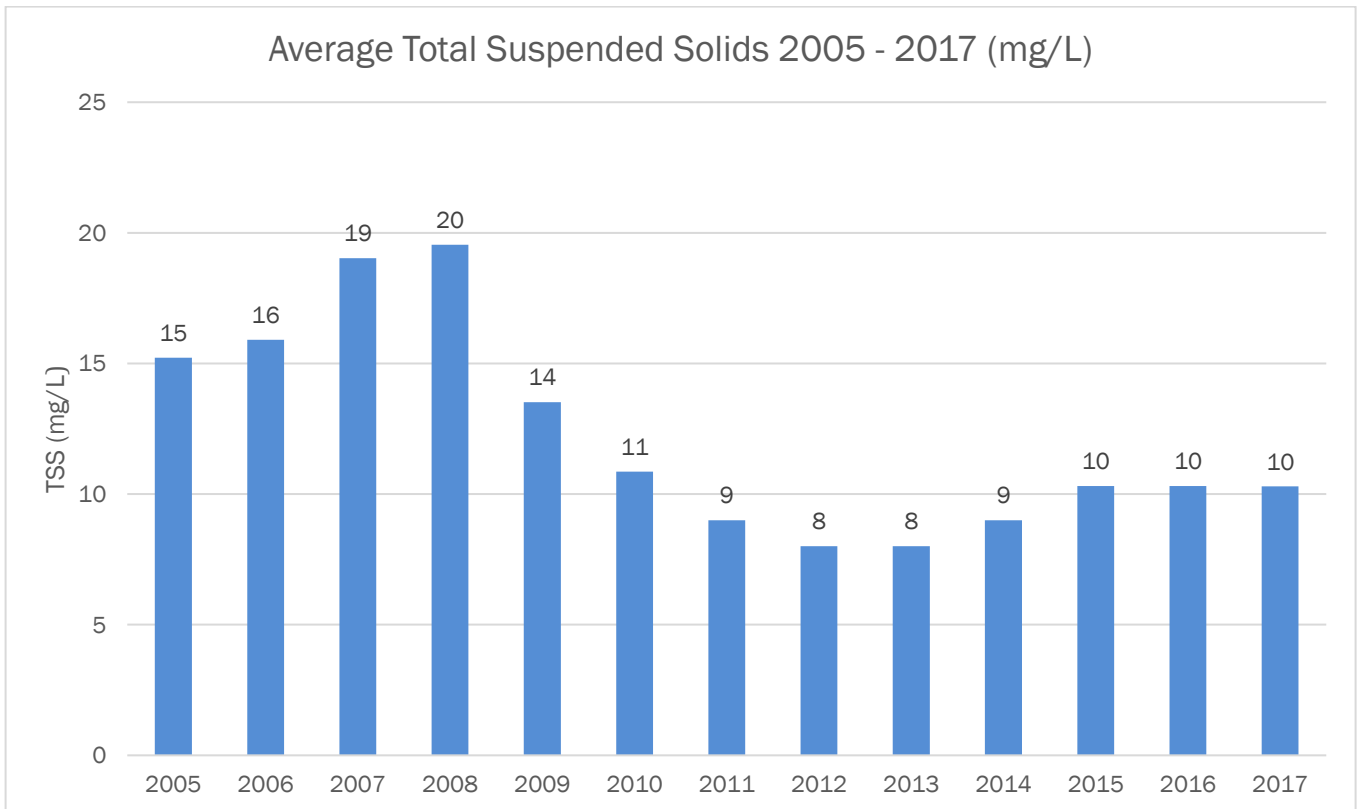


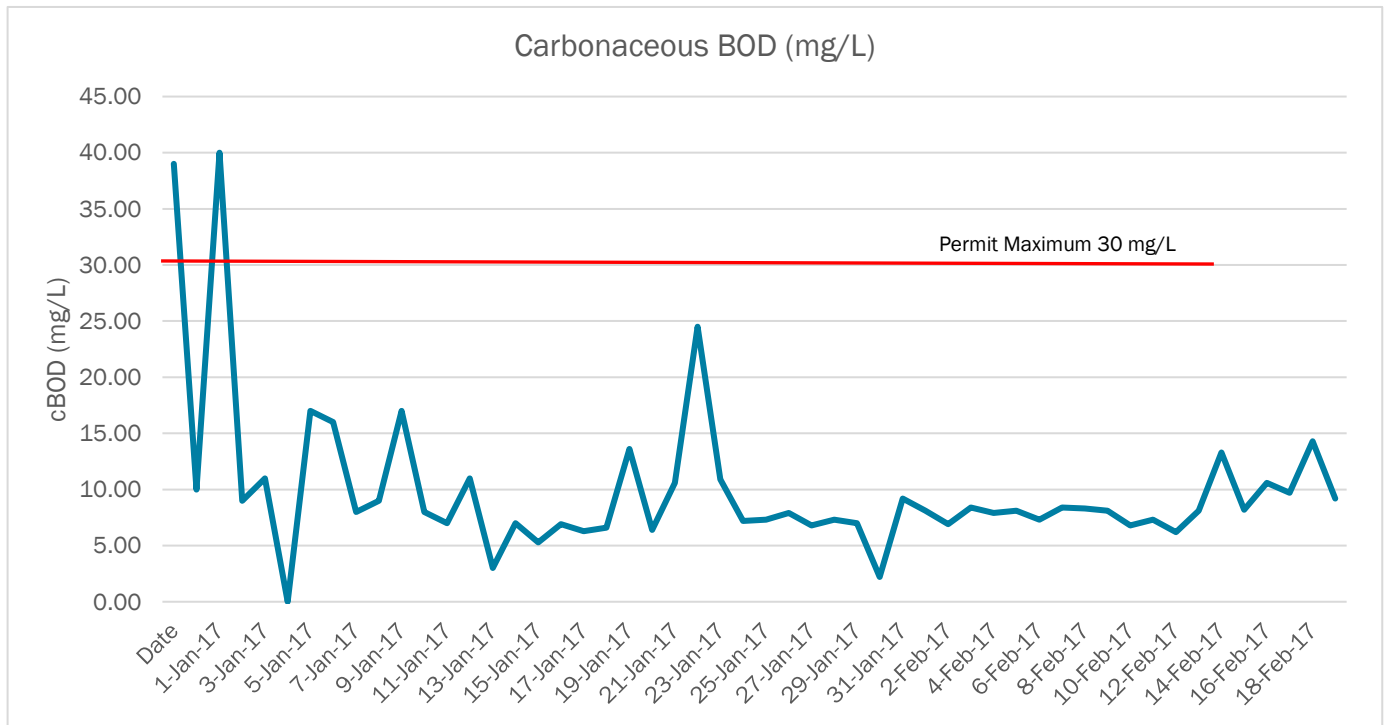
Figure 7 Whistler Wastewater Plant Annual Average Suspended Solids (mg/L) 2005 - 2017



Carbonaceous Biochemical Oxygen Demand

Carbonaceous BOD exceedances were recorded on January 4th and January 18th 2017 due to a slight biological upset. The January 18th exceedance is due to a solids overload in the secondary clarifier.

Figure 8 Whistler Wastewater Treatment Plant Weekly Carbonaceous BOD (mg/L) 2017

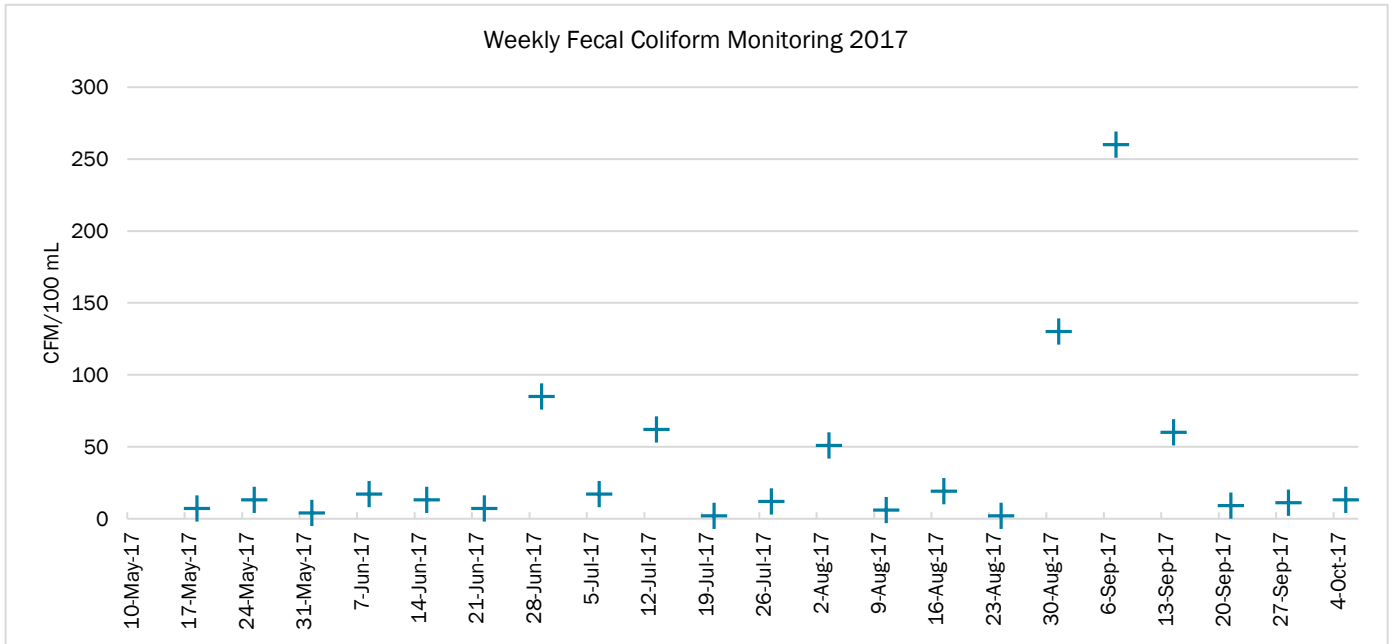


Effluent Disinfection

As per the Operational Certificate, the WWTP disinfects effluent with UV from May 15 to October 15. 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. The highest fecal coliform reading was 260 CFM/100mL on September 7. This was the only (1) elevated reading of 2017 compared to two (2) higher than 200 CFM/100mL in 2016. The results are not thought to be a result of the effectiveness of the 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 9 Whistler Wastewater Plant Weekly Fecal Coliform (CFM/mL) 2017



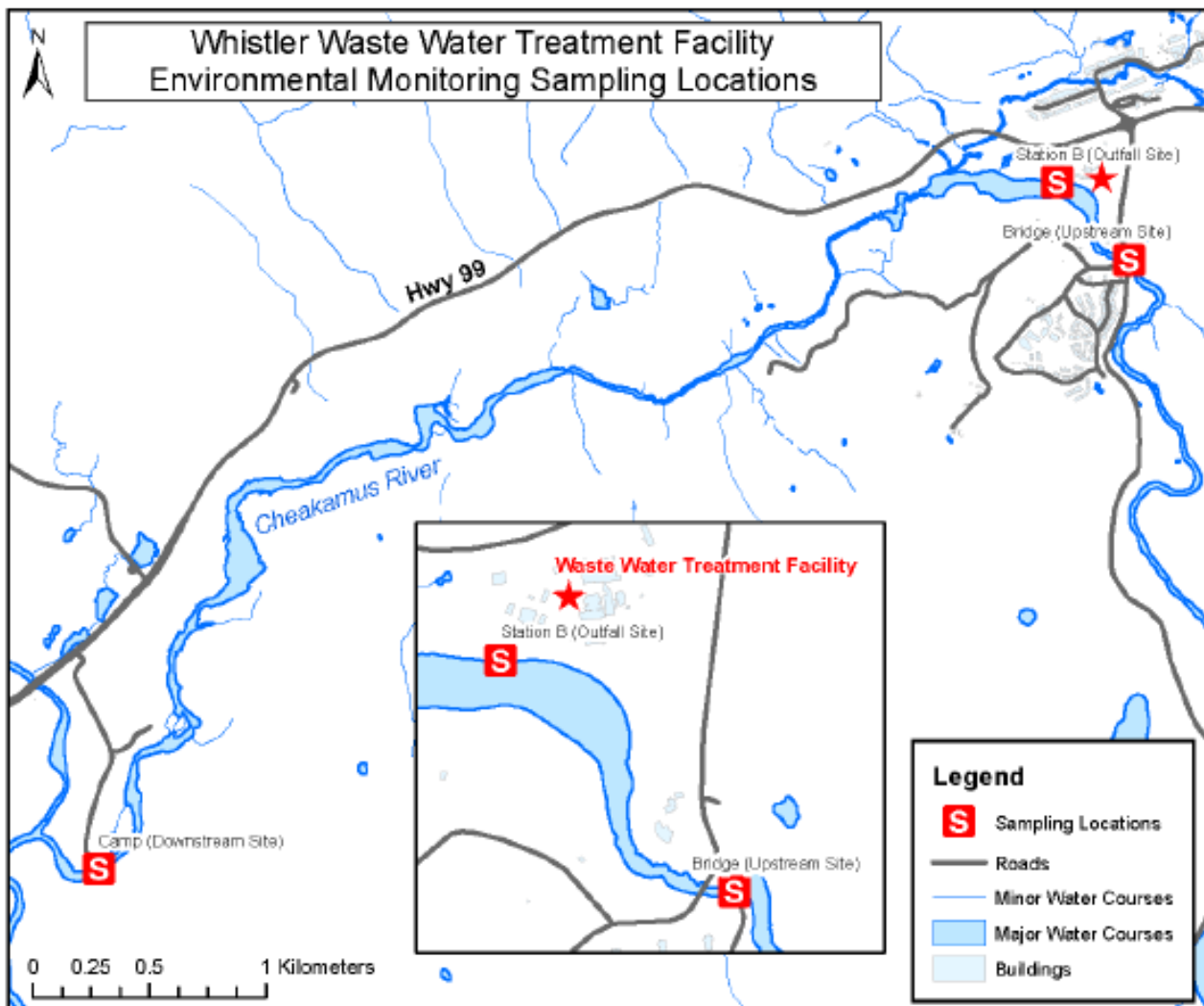
Effluent Toxicity

Four (4) LC50 toxicity tests were performed in compliance with the operating permit. The results are 100% of rainbow trout fry surviving in raw (100% concentration) effluent for 96 hours.

3.0 RECEIVING ENVIRONMENT MONITORING

The receiving environment for the final effluent of the WWTP is sampled once per month by WWTP staff, and the samples are submitted to a certified laboratory. This provides an accurate representation of conditions in the receiving environment throughout the year. The plant operating permit requires the RMOW monitor two sampling stations, with samples taken three times per year. The RMOW maintains a monitoring program in 2017 sampling in three locations, every month of the year. Some results fall below laboratory detection limit and are thus represented as equal to the laboratory detection limit. The monitored parameters are compared at three sampling locations, Upstream, Outfall and Downstream (see Map 1). The upstream sampling location, Bridge, is located approximately 100 metres above the outfall, which is at Station B, and the downstream sampling location, Camp, is located approximately 4 kilometres downstream of the outfall.

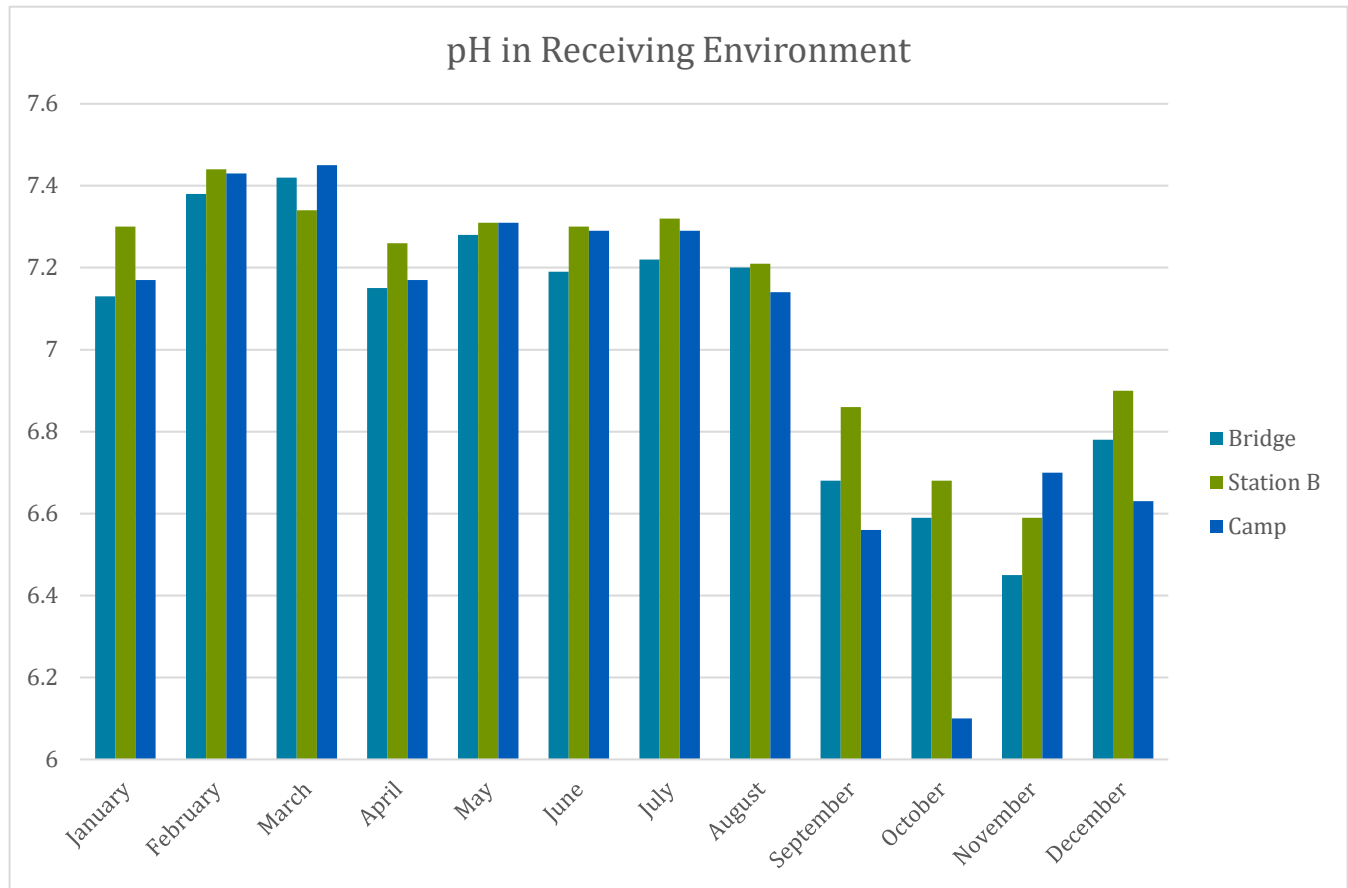
Map 1 Whistler Wastewater Treatment Plant Environmental Monitoring Sampling Locations



pH in Receiving Environment

There was a significant drop in pH at the Camp sample site in the month of October. This drop does not mirror the pH measurements for this time period from past years

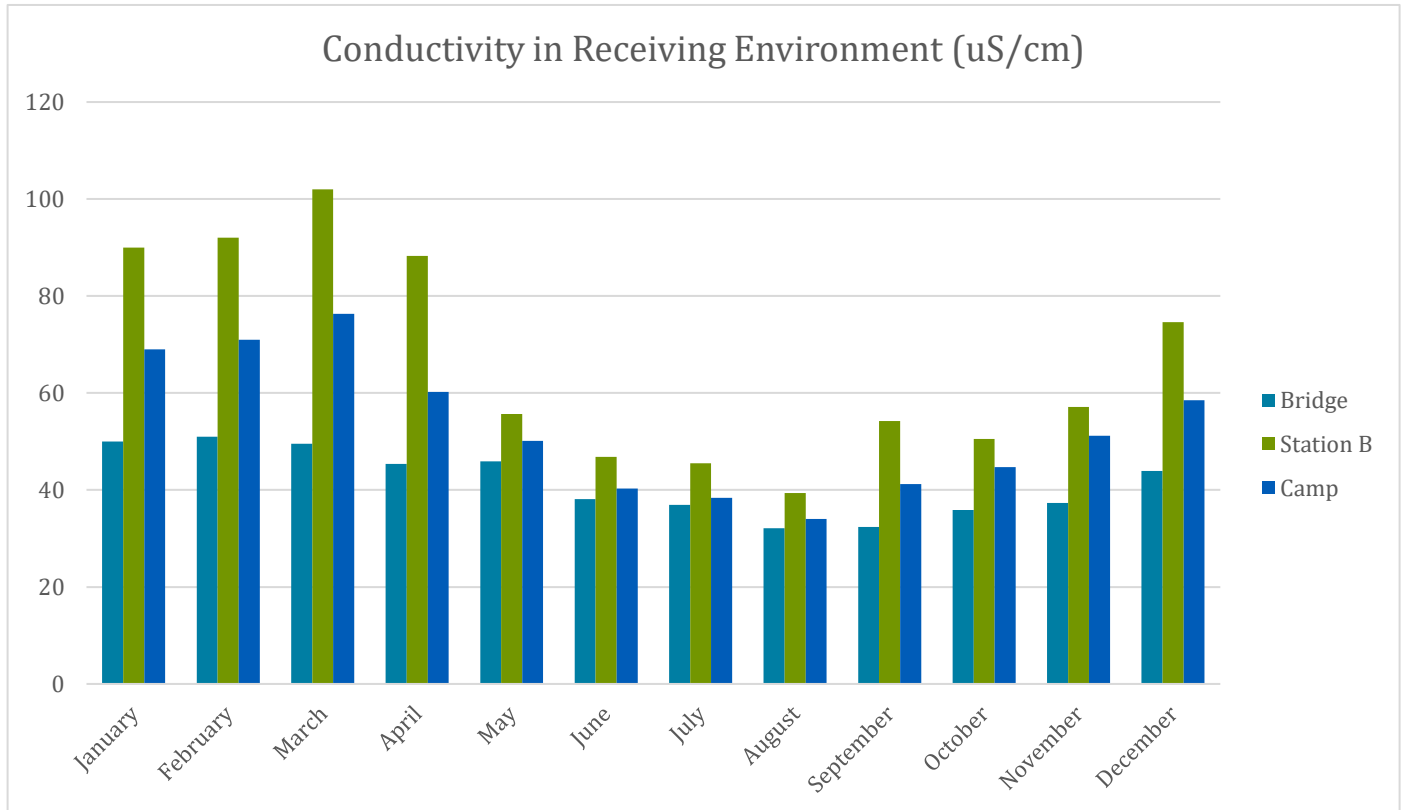
Figure 10 Whistler Wastewater Treatment Plant pH monitoring in receiving environment 2017



Conductivity in Receiving Environment

The sampling displays highest conductivity at the Outfall sample location. This is similar to previous years with highest conductivity displayed during the winter months when the river flow is at its lowest. Throughout the year, the observed increase in conductance has started to dissipate before the downstream sampling location.

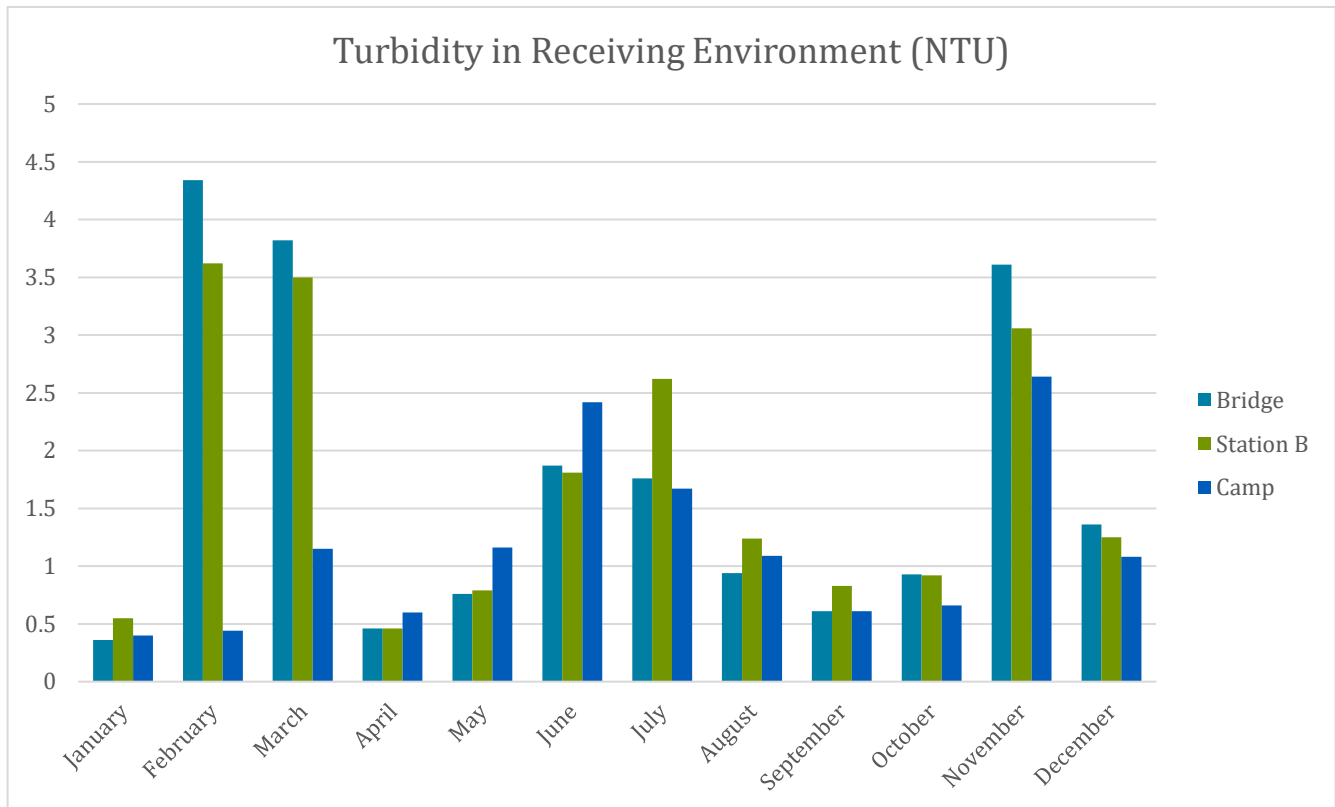
Figure 11 Whistler Wastewater Treatment Plant conductivity monitoring (uS/cm) in receiving environment 2017



Turbidity in Receiving Environment

In 2017, high turbidity levels were detected in February and March at the upstream and outfall locations. This higher level of turbidity had dissipated to a more normal level by the downstream sample site. A higher level of turbidity was reached in November, however it is still within one (1) NTU reading from the upstream reading.

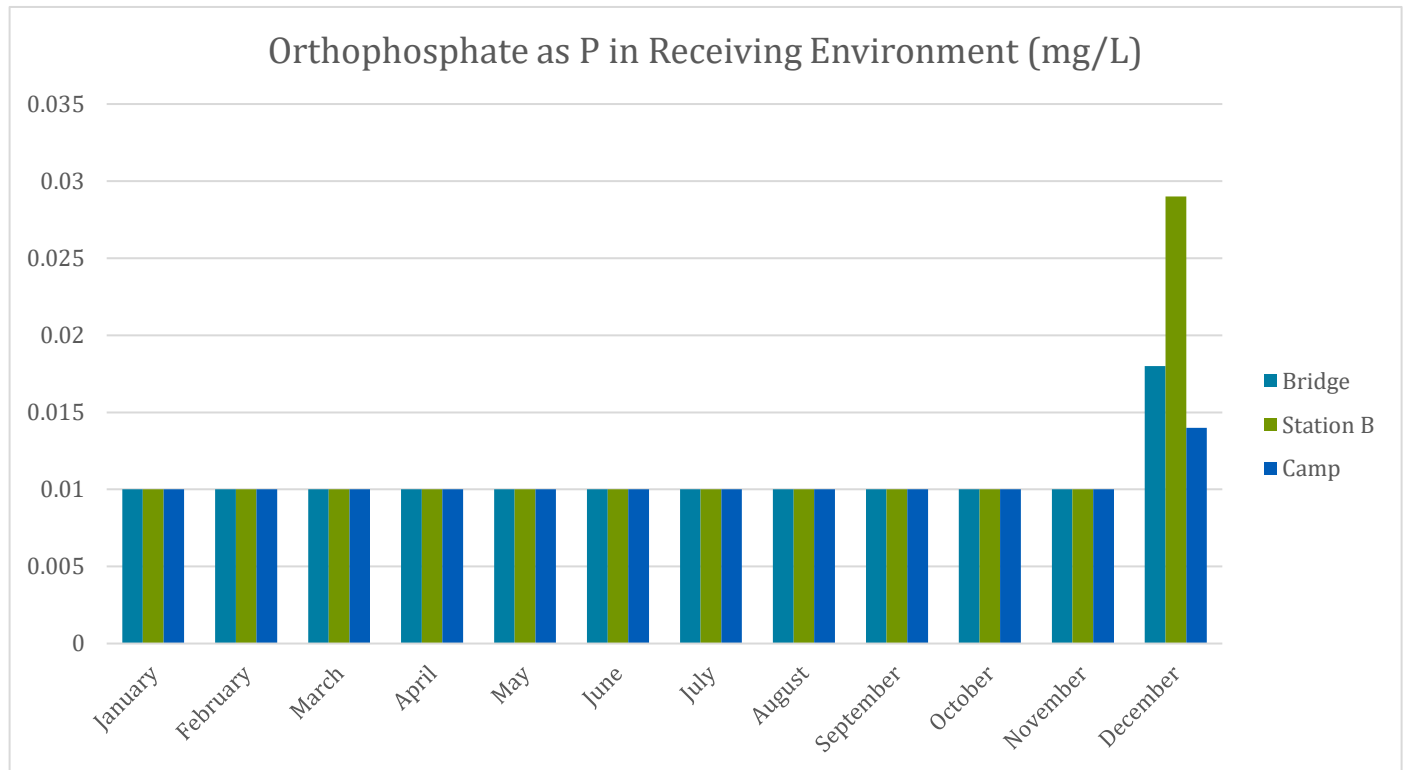
Figure 12 Whistler Wastewater Treatment Plant turbidity monitoring (NTU) in receiving environment 2017



Orthophosphate (PO₄-P) in Receiving Environment

The majority of PO₄-P values in the receiving environment in 2016 were below the laboratory detection limit of 0.01 mg/L. The month of December displayed a higher PO₄-P level in December of 0.028 mg/L at the outfall location, 0.018 mg/L upstream and 0.014 mg/L.

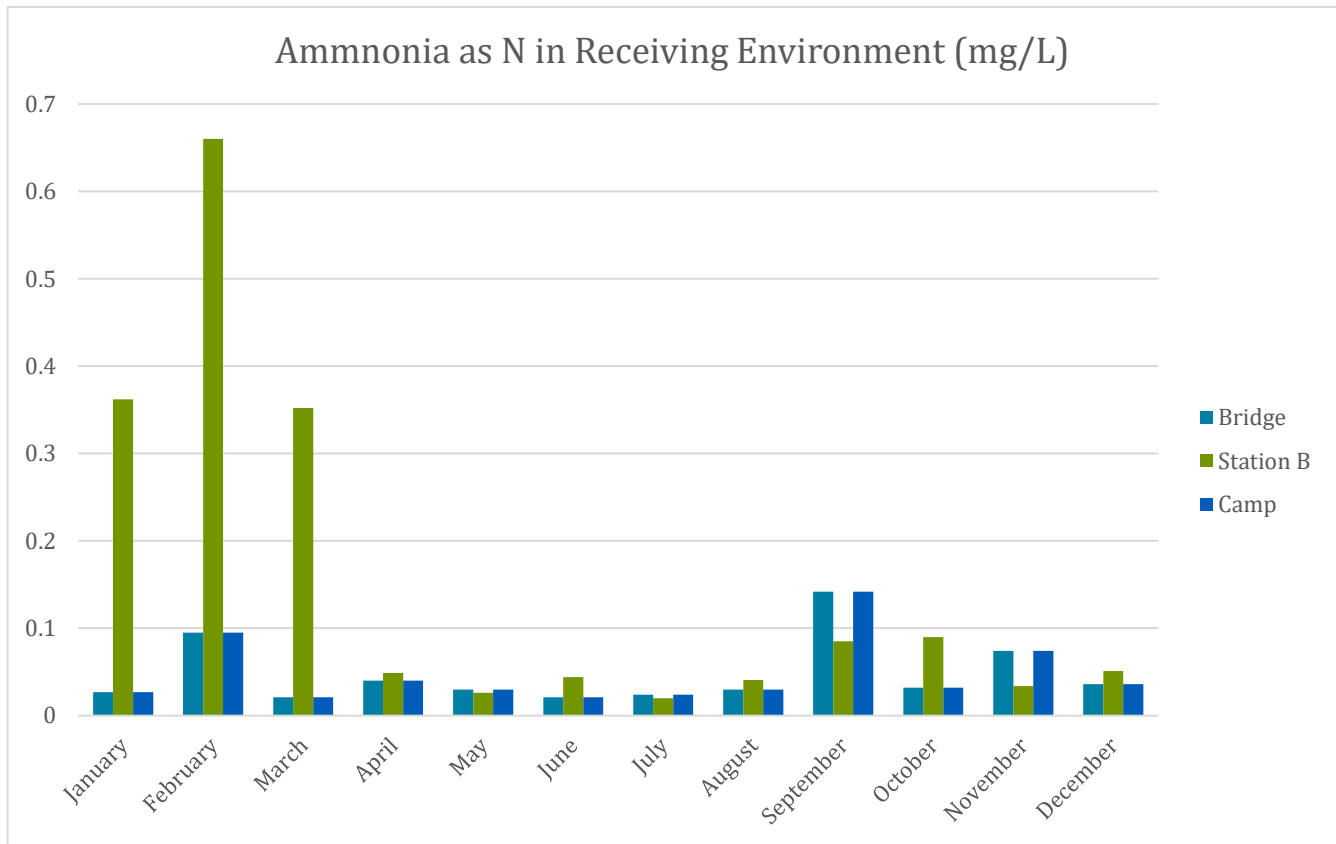
Figure 13 Whistler Wastewater Treatment Plant orthophosphate monitoring (mg/l) in receiving environment 2017



Ammonia (NH₃-N) in Receiving Environment

The NH₃ levels at the outfall location were higher than other levels in January, February and March. In each instance, the level was higher than the upstream and had returned to background level once at the downstream sampling location.

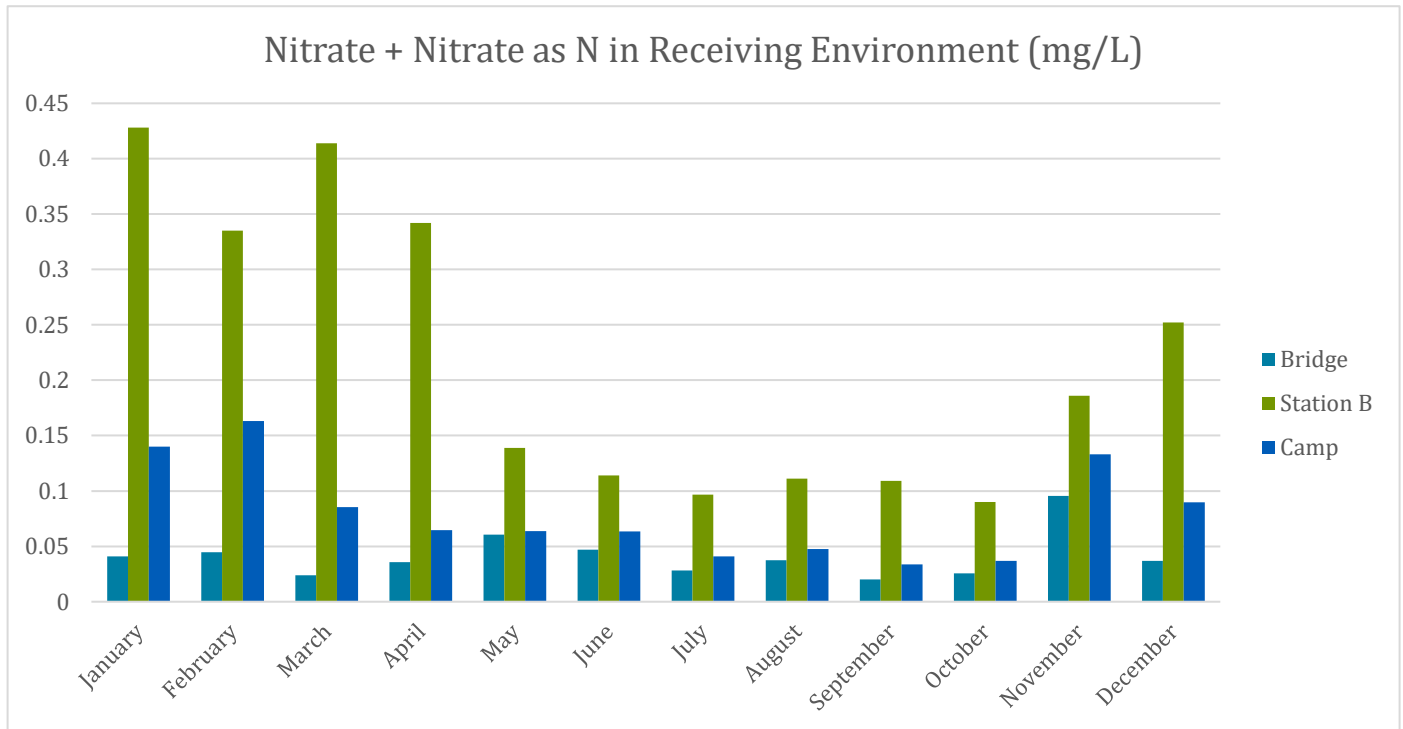
Figure 14 Whistler Wastewater Treatment Plant ammonia monitoring (mg/L) in receiving environment 2017



Nitrate + Nitrite (N+N) in Receiving Environment

There were elevated levels of nitrate and nitrite at the outfall sampling location every month. These spikes did show significant dissipation at the downstream sampling location, almost returning to background levels. During the summer sampling events, the effects on the receiving environment were reduced. This was consistent with the monitoring in previous years.

Figure 15 Whistler Wastewater Treatment Plant nitrogen monitoring (mg/L) in receiving environment 2017



4.0 CONCLUSION

This report fulfills the requirements for the Operational Certificated ME-01452. Any further inquiries can be directed to the Utilities Group Manager Gillian Woodward at gwoodward@whistler.ca.

APPENDIX A – WASTE WATER TREATMENT PLANT DATA TABLE

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)
17-01-01	13893	16.0		0.03	0.4		
17-01-02	12805	18.8		0.05	0.6		
17-01-03	11594	14.4		0.04	0.5		
17-01-04	11507	14.0	39.00	0.03	0.3	0.76	
17-01-05	11193	16.0		0.05	0.5		
17-01-06	11229	22.2		0.07	0.7		
17-01-07	11567	18.4		0.07	0.8		
17-01-08	10957	15.6		0.05	0.5		
17-01-09	10006	11.4		0.05	0.5		
17-01-10	9930	11.2		0.03	0.3		
17-01-11	9792	9.4	10.00	0.09	0.9	0.45	
17-01-12	9952	8.8		0.14	1.4		
17-01-13	10705	8.6		0.16	1.7		
17-01-14	12178	14.4		1.30	15.8		
17-01-15	11655	6.6		0.19	2.2		
17-01-16	11651	7.2		0.02	0.2		
17-01-17	14645	6.8		0.16	2.3		
17-01-18	14863	87.0	40.00	0.01	0.1	3.52	
17-01-19	14122	52.2		0.13	1.8		
17-01-20	12936	30.4		0.04	0.5		
17-01-21	13555	3.0		0.20	2.6		
17-01-22	12777	7.4		0.04	0.5		
17-01-23	11327	5.6		0.06	0.7		
17-01-24	11259	4.2		0.03	0.3		
17-01-25	11052	12.4	9.00	0.07	0.7	0.33	
17-01-26	10837	2.6		0.16	1.8		
17-01-27	11447	4.8		0.16	1.9		
17-01-28	11869	7.6		0.05	0.5		
17-01-29	12358	7.4		0.01	0.1		
17-01-30	11563	9.8		0.05	0.6		
17-01-31	10971	13.4		0.04	0.4		
17-02-01	10445	7.8	11.00	0.04	0.4	0.52	
17-02-02	10512	5.8		0.03	0.3		
17-02-03	10975	8.0		0.05	0.6		
17-02-04	11761	12.2		0.06	0.7		
17-02-05	10591	5.4		0.09	0.9		
17-02-06	10653	7.0		0.05	0.6		
17-02-07	10652	9.0		0.05	0.6		

17-02-08	10286	8.8	N/A	0.08	0.9	n/a
17-02-09	10340	8.8		0.04	0.4	
17-02-10	11367	4.8		0.18	2.0	
17-02-11	12484	6.0		0.72	9.0	
17-02-12	12187	n/a		n/a	n/a	
17-02-13	11746	11.6		0.04	0.5	
17-02-14	12170	11.6		0.02	0.2	
17-02-15	15299	10.4	17.00	0.01	0.2	0.34
17-02-16	14877	3.6		0.07	1.0	
17-02-17	14483	6.2		0.09	1.3	
17-02-18	14030	4.8		0.16	2.2	
17-02-19	13836	6.2		0.06	0.8	
17-02-20	13105	8.2		0.02	0.3	
17-02-21	12795	5.6		0.01	0.1	
17-02-22	12468	7.4	16.00	0.25	3.1	0.62
17-02-23	12350	7.2		0.60	7.4	
17-02-24	12202	5.4		1.11	13.5	
17-02-25	12748	11.8		1.21	15.4	
17-02-26	11491	7.0		0.28	3.2	
17-02-27	11168	6.0		0.02	0.2	
17-02-28	10977	5.6		0.01	0.1	
17-03-01	10693	5.4	8.00	0.02	0.2	0.39
17-03-02	11042	9.8		0.18	1.9	
17-03-03	12317	5.8		0.46	5.6	
17-03-04	12401	6.8		0.70	8.6	
17-03-05	11733	6.6		0.30	3.5	
17-03-06	10793	9.6		0.15	1.6	
17-03-07	10477	8.0		0.18	1.9	
17-03-08	10434	8.4	9.00	0.61	6.4	0.49
17-03-09	10562	7.4		0.42	4.4	
17-03-10	10997	12.6		0.49	5.4	
17-03-11	12046	11.2		0.78	9.4	
17-03-12	13489	8.4		0.38	5.1	
17-03-13	13218	7.6		0.06	0.8	
17-03-14	14747	9.4		0.22	3.3	
17-03-15	15545	7.4	17.00	0.20	3.1	0.67
17-03-16	15032	11.8		0.34	5.1	
17-03-17	14786	7.4		0.44	6.5	
17-03-18	14726	10.6		0.13	1.9	
17-03-19	13979	10.4		0.10	1.4	
17-03-20	12924	9.2		0.14	1.8	
17-03-21	12739	7.8		0.10	1.3	
17-03-22	13851	8.2	8.00	0.28	3.9	0.76
17-03-23	13751	7.8		0.33	4.5	

17-03-24	14355	10.4		0.26	3.7	
17-03-25	14874	8.4		0.78	11.6	
17-03-26	13687	6.2		0.38	5.2	
17-03-27	13125	7.8		0.03	0.4	
17-03-28	13866	7.8		0.21	0.2	
17-03-29	15342	7.0	7.00	0.08	1.2	0.50
17-03-30	14681	8.6		0.74	10.9	
17-03-31	14834	3.4		0.77	11.4	
17-04-01	17094	9.6		0.62	10.6	
17-04-02	15470	10.0		0.34	5.3	
17-04-03	13413	9.0		0.09	1.2	
17-04-04	12825	9.2		0.17	2.2	
17-04-05	13695	10.2	11.00	0.27	3.7	4.64
17-04-06	14103	10.2		0.26	3.7	
17-04-07	14761	7.6		0.85	12.5	
17-04-08	15351	5.2		0.65	10.0	
17-04-09	14063	6.2		0.40	5.6	
17-04-10	13634	7.6		0.30	4.1	
17-04-11	12984	6.4		0.44	5.7	
17-04-12	12956	7.4	3.00	0.62	8.0	0.86
17-04-13	13740	6.0		0.53	7.3	
17-04-14	14665	2.2		0.72	10.6	
17-04-15	14822	3.0		0.46	6.9	
17-04-16	13904	5.0		0.39	5.5	
17-04-17	12616	9.6		0.29	3.6	
17-04-18	12846	8.0		0.23	2.9	
17-04-19	12679	7.6	7.00	0.21	2.7	0.57
17-04-20	11784	9.2		0.35	4.1	
17-04-21	11620	6.6		1.07	12.5	
17-04-22	12287	5.2		1.01	12.4	
17-04-23	11583	7.6		0.10	1.2	
17-04-24	10619	8.4		0.10	1.0	
17-04-25	10225	7.4		0.10	1.1	
17-04-26	9982	8.4	5.30	0.10	1.0	0.35
17-04-27	9857	3.6		0.47	4.7	
17-04-28	10108	2.8		0.78	7.8	
17-04-29	11018	3.2		0.81	9.0	
17-04-30	9891	8.4		0.30	2.9	
17-05-01	9,280	8.4		0.30	2.8	
17-05-02	8,776	2.4		0.20	1.7	
17-05-03	9,051	6	6.90	0.20	1.8	0.42
17-05-04	9,582	8.6		0.83	8.0	
17-05-05	10,385	3.8		0.88	9.1	
17-05-06	10,772	4.8		0.52	5.6	

17-05-07	10,011	6.6		0.42	4.2		
17-05-08	8,943	10.0		0.55	5.0		
17-05-09	8,753	5.8		0.60	5.3		
17-05-10	8,920	8.4	6.30	0.62	5.5	0.99	
17-05-11	9,761	11.8		0.81	7.9		
17-05-12	9,790	9.2		0.94	9.2		
17-05-13	9,693	9.2		0.49	4.7		
17-05-14	9,233	8.8		0.52	4.8		
17-05-15	8,761	7.2		0.09	0.8		
17-05-16	8,578	4.8		0.07	0.6		
17-05-17	8,526	6.0	6.60	0.07	0.6	0.33	15.000
17-05-18	8,539	8.4		0.10	0.9		7.000
17-05-19	9,170	8.4		0.13	1.2		
17-05-20	10,110	6.4		0.10	1.0		
17-05-21	10,892	4.6		0.10	1.1		
17-05-22	9,936	7.0		0.09	0.9		
17-05-23	9,298	7.0		0.10	1.0		
17-05-24	8,804	9.2	13.60	0.09	0.8	0.32	120.000
17-05-25	8,768	8.8		0.06	0.5		13.000
17-05-26	8,853	10		0.05	0.4		
17-05-27	9,799	7.2		0.09	0.9		
17-05-28	9,584	8.0		0.06	0.5		
17-05-29	8,967	9.0		0.06	0.6		
17-05-30	8,965	7.4		0.03	0.3		
17-05-31	8,720	7.4	6.40	0.10	0.9	0.45	15.000
17-06-01	8,882	5.4		0.17	1.5		4.000
17-06-02	9,371	13.0		0.13	1.2		
17-06-03	9,739	7.0		0.13	1.3		
17-06-04	8,913	8.4		0.11	1.0		
17-06-05	9,415	6.6		0.13	1.3		
17-06-06	8,961	7.4		0.05	0.4		
17-06-07	8,771	11.0	10.60	0.07	0.6	0.40	17.000
17-06-08	8,751	16.2		0.05	0.4		17.000
17-06-09	8,907	8.6		0.06	0.5		
17-06-10	9,369	6.2		0.11	1.1		
17-06-11	8,985	13.4		0.05	0.5		
17-06-12	8,632	5.6		0.04	0.3		
17-06-13	8,564	5.8		0.06	0.5		
17-06-14	8,573	6.4	24.50	0.03	0.3	0.34	41.000
17-06-15	8,025	6.8		0.11	0.9		13.000
17-06-16	9,388	10.6		0.07	0.7		
17-06-17	10,383	5.4		0.10	1.0		
17-06-18	9,501	9.8		0.05	0.5		
17-06-19	7,952	9.6		0.06	0.5		

17-06-20	8,861	7.4		0.02	0.2		
17-06-21	9,570	8.7	10.90	0.10	0.9	0.38	72.000
17-06-22	9,534	12.2		0.04	0.4		7.000
17-06-23	9,480	8.8		0.05	0.4		
17-06-24	9,615	11.6		0.09	0.9		
17-06-25	9,999	9.0		0.04	0.4		
17-06-26	10,213	9.6		0.10	1.0		
17-06-27	9,249	9.0		0.10	0.9		
17-06-28	9,269	9.4	7.20	0.03	0.3	0.47	40.000
17-06-29	9,247	11.6		0.03	0.3		85.000
17-06-30	9,592	10.2		0.04	0.4		
17-07-01	11293	11.8		0.13	1.5		
17-07-02	11610	11.2		0.04	0.5		
17-07-03	10942	12.4		0.02	0.2		
17-07-04	10047	12.2		0.05	0.5		
17-07-05	10143	12.0	7.30	0.10	1.0	0.36	14.000
17-07-06	9873	11.6		0.04	0.4		17.000
17-07-07	9649	9.2		0.08	0.8		
17-07-08	10317	9.2		0.05	0.5		
17-07-09	10099	10.8		0.07	0.7		
17-07-10	10102	12.6		0.06	0.6		
17-07-11	10047	9.6		0.03	0.3		
17-07-12	9546	11.8	7.90	0.01	0.1	0.35	4.000
17-07-13	9604	11.6		0.02	0.2		62.000
17-07-14	9800	9.0		0.10	1.0		
17-07-15	9922	11.0		0.07	0.6		
17-07-16	9712	11.8		0.07	0.6		
17-07-17	9462	14.6		0.16	1.5		
17-07-18	9666	12.8		0.10	0.9		
17-07-19	9553	10.6	6.80	0.07	0.7		6.000
17-07-20	9744	12.6		0.05	0.5		2.000
17-07-21	9832	10.2		0.07	0.7		
17-07-22	9984	12.6		0.06	0.6		
17-07-23	10030	10.4		0.07	0.7		
17-07-24	9838	10.4		0.06	0.5		
17-07-25	9561	12.6		0.08	0.8		
17-07-26	9627	9.6	7.30	0.06	0.6	0.34	7.000
17-07-27	9998	12.0		0.13	1.3		12.000
17-07-28	10105	8.8		0.05	0.5		
17-07-29	10830	10.2		0.05	0.5		
17-07-30	10397	14.8		0.04	0.4		
17-07-31	10062	7.2		0.04	0.4		
17-08-01	9630	10.4		0.02	0.2		
17-08-02	9672	8.2	7.00	0.24	2.3		53.000

17-08-03	9665	12.6		0.06	0.6	0.26	51.000
17-08-04	9924	21.6		0.06	0.6		
17-08-05	10868	13.8		0.07	0.8		
17-08-06	11056	17.0		0.07	0.7		
17-08-07	10400	13.8		0.03	0.3		
17-08-08	9931	10.6		0.05	0.5		
17-08-09	9767	11.4	2.20	0.03	0.3	0.25	1.000
17-08-10	9750	8.6		0.08	0.8		6.000
17-08-11	10048	8.4		0.05	0.5		
17-08-12	10441	7.6		0.06	0.6		
17-08-13	9937	6.0		0.04	0.4		
17-08-14	9598	6.8		0.04	0.4		
17-08-15	9446	11.2		0.05	0.4		
17-08-16	9506	7.6	9.20	0.05	0.4	0.24	17.000
17-08-17	9739	13.6		0.04	0.4		19.000
17-08-18	10056	9.0		0.04	0.4		
17-08-19	10804	13.2		0.05	0.6		
17-08-20	10345	9.8		0.02	0.2		
17-08-21	10329	11.6		0.02	0.2		
17-08-22	10033	11.4		0.02	0.2		
17-08-23	9653	11.2	8.10	0.01	0.1	0.22	24.000
17-08-24	9274	11.0		0.04	0.4		2.000
17-08-25	9438	7.2		0.04	0.4		
17-08-26	9835	10.2		0.04	0.4		
17-08-27	9709	12.0		0.03	0.3		
17-08-28	9373	17.8		0.04	0.4		
17-08-29	9150	10.0		0.07	0.6		
17-08-30	9084	11.2	6.90	0.03	0.2	0.34	80.000
17-08-31	11084	20.4		0.04	0.4		130.000
17-09-01	11670	10.8		0.06	0.7		
17-09-02	9678	11.4		0.04	0.4		
17-09-03	10324	24.8		0.01	0.1		
17-09-04	8373	44.8		0.06	0.5		
17-09-05	8784	7.2		0.09	0.8		
17-09-06	8900	10.6	8.40	0.03	0.3	0.24	240.000
17-09-07	7797	10.0		0.02	0.2		260.000
17-09-08	8740	10.4		0.07	0.6		
17-09-09	9466	8.2		0.04	0.3		
17-09-10	8708	9.0		0.04	0.3		
17-09-11	8051	12.8		0.03	0.2		
17-09-12	8035	7.2		0.04	0.3		
17-09-13	7890	10.8	7.90	0.03	0.2	0.25	27.000
17-09-14	7886	7.6		0.05	0.4		60.000
17-09-15	8114	7.6		0.03	0.2		

17-09-16	8746	35.2		0.07	0.6		
17-09-17	6977	28.0		0.01	0.1		
17-09-18	7497	19.0		0.02	0.1		
17-09-19	7297	19.2		0.02	0.1		
17-09-20	7055	6.8	8.10	0.06	0.4	0.18	43.000
17-09-21	7066	10.6		0.01	0.1		9.000
17-09-22	7847	6.8		0.02	0.2		
17-09-23	8637	7.8		0.02	0.2		
17-09-24	8288	6.8		0.03	0.2		
17-09-25	8564	8.0		0.03	0.3		
17-09-26	8547	7.9		0.02	0.2		
17-09-27	8348	8.4	7.30	0.08	0.7	0.27	3.000
17-09-28	7693	14.2		0.07	0.5		11.000
17-09-29	7662	13.2		0.04	0.3		
17-09-30	8022	13.6		0.04	0.3		
17-10-01	7570	8.4		0.04	0.30		
17-10-02	6844	6.0		0.03	0.21		
17-10-03	6874	9.8		0.02	0.14		
17-10-04	6964	8.8	8.40	0.09	0.63	0.29	8.000
17-10-05	6881	9.0		0.03	0.21		13.000
17-10-06	7432	10.2		0.03	0.22		
17-10-07	8706	11.6		0.03	0.26		
17-10-08	9045	9.6		0.02	0.18		
17-10-09	7955	11.2		0.04	0.32		
17-10-10	7323	21.6		0.03	0.22		
17-10-11	6923	13.0	8.30	0.06	0.42	0.31	70.000
17-10-12	6572	26.4		0.02	0.11		300.000
17-10-13	6847	16.4		0.07	0.45		
17-10-14	6438	13.6		0.10	0.64		
17-10-15	6808	13.6		0.02	0.14		
17-10-16	7187	11.4		0.01	0.07		
17-10-17	8565	10.4		0.01	0.09		
17-10-18	7909	9.2	8.10	0.01	0.08	0.22	
17-10-19	10736	9.8		0.01	0.11		
17-10-20	9873	9.0		0.02	0.20		
17-10-21	10242	8.6		0.01	0.10		
17-10-22	9656	9.4		0.01	0.10		
17-10-23	8040	5.0		0.05	0.40		
17-10-24	7800	9.0		0.05	0.39		
17-10-25	7482	9.4	6.80	0.04	0.30	0.17	
17-10-26	7346	7.6		0.02	0.15		
17-10-27	7456	9.8		0.02	0.15		
17-10-28	8030	5.6		0.02	0.18		
17-10-29	7611	6.0		0.15	1.14		

17-10-30	7177	7.6		0.02	0.14	
17-10-31	7016	5.6		0.03	0.21	
17-11-01	7241	6.0	7.30	0.43	0.43	0.58
17-11-02	7171	6.8		0.35	2.51	
17-11-03	7517	6.8		0.59	4.44	
17-11-04	8639	8.8		0.73	6.31	
17-11-05	7707	3.4		0.66	5.09	
17-11-06	7020	7.4		0.71	4.98	
17-11-07	6818	5.8		0.76	5.18	
17-11-08	6703	7.8	6.20	0.78	0.78	0.98
17-11-09	6847	9.4		0.81	5.58	
17-11-10	7537	8.8		0.83	6.26	
17-11-11	9275	10.3		0.72	6.65	
17-11-12	10110	8.6		0.71	7.15	
17-11-13	9346	10.4		0.49	4.54	
17-11-14	9427	9.2		0.42	3.99	
17-11-15	9370	6.8	8.10	0.65	6.10	0.81
17-11-16	8971	8.4		0.75	6.75	
17-11-17	9294	8.6		0.79	7.30	
17-11-18	10500	10.6		0.72	7.56	
17-11-19	11380	11.2		0.72	8.19	
17-11-20	10483	8.4		0.43	4.51	
17-11-21	11313	8.4		0.70	7.92	
17-11-22	16712	6.4	13.30	0.38	6.35	0.79
17-11-23	19852	9.0		0.10	2.00	
17-11-24	18491	10.0		0.33	6.08	
17-11-25	18390	6.2		0.10	1.80	
17-11-26	19528	6.6		0.05	0.98	
17-11-27	15017	5.4		0.06	0.90	
17-11-28	13567	5.0		0.03	0.41	
17-11-29	12062	6.8	8.20	0.13	1.57	0.40
17-11-30	11919	10.0		0.19	2.26	
17-12-01	12045	11.6		0.10	1.3	
17-12-02	12817	10.4		0.12	1.5	
17-12-03	11920	7.8		0.10	1.2	
17-12-04	10796	6.8		0.16	1.7	
17-12-05	10168	12.2		0.20	2.1	
17-12-06	9507	17.0	10.60	0.10	1.0	0.57
17-12-07	9445	17.6		0.10	1.0	
17-12-08	9802	15.0		0.33	3.2	
17-12-09	11043	18.0		0.43	4.7	
17-12-10	10752	12.2		0.33	3.5	
17-12-11	9992	13.8		0.29	2.9	
17-12-12	9342	9.8		0.29	2.7	

17-12-13	9232	14.3	9.70	0.22	2.0	0.53
17-12-14	9377	12.0		0.23	2.2	
17-12-15	9878	11.4		0.27	2.7	
17-12-16	10271	12.4		0.24	2.5	
17-12-17	11066	12.6		0.30	3.3	
17-12-18	11034	12.0		0.17	1.9	
17-12-19	11211	12.0		0.20	2.2	
17-12-20	10948	16.4	14.30	0.10	1.1	0.46
17-12-21	11773	15.8		0.07	0.8	
17-12-22	11626	14.8		0.08	0.9	
17-12-23	12193	15.0		0.08	1.0	
17-12-24	12497	17.8		0.06	0.7	
17-12-25	12627	12.8		0.07	0.9	
17-12-26	12580	19.2		0.07	0.9	
17-12-27	13040	20.2	9.20	0.07	1.0	
17-12-28	13337	23.0		0.03	0.3	
17-12-29	13679	21.3		0.02	0.2	
17-12-30	13694	17.2		0.02	0.3	
17-12-31	14449	19.2		0.03	0.4	

APPENDIX B – ENVIRONMENTAL MONITORING SITE DATA TABLE

		January	February	March	April	May	June	July	August	September	October	November	December
		Camp	Camp	Camp	Camp	Camp	Camp	Camp	Camp	Camp	Camp	Camp	Camp
Nitrate as N	mg/L	0.14	0.149	0.085	0.065	0.064	0.064	0.041	0.048	0.034	0.037	0.133	0.09
Nitrite as N	mg/L	<0.010	0.014	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Phosphate, Ortho as P	mg/L	<0.01	<0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.014
Ammonia as N, Total	mg/L	0.027	0.095	0.021	0.04	0.03	0.021	0.024	0.03	0.142	0.032	0.074	0.036
Turbidity	NTU	0.4	0.44	1.15	0.6	1.16	2.42	1.67	1.09	0.61	0.66	2.64	1.08
pH	pH units	7.17	7.43	7.45	7.17	7.31	7.29	7.29	7.14	6.56	6.1	6.7	6.63
Conductivity (EC)	uS/cm	69	71	76.3	60.2	50.1	40.3	38.4	34	41.2	44.7	51.2	58.5
Nitrate+Nitrite as N	mg/L	0.14	0.163	0.0853	0.0646	0.0639	0.0636	0.0408	0.0475	0.0338	0.0369	0.133	0.0899
		Bridge	Bridge	Bridge	Bridge	Bridge	Bridge	Bridge	Bridge	Bridge	Bridge	Bridge	Bridge
Nitrate as N	mg/L	0.041	0.045	0.024	0.036	0.061	0.047	0.028	0.038	0.01	0.026	0.096	0.037
Nitrite as N	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Phosphate, Ortho as P	mg/L	<0.01	<0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.018
Ammonia as N, Total	mg/L	0.165	0.026	0.021	0.04	0.025	0.031	0.02	0.034	0.064	0.076	0.029	0.045
Turbidity	NTU	0.36	4.34	3.82	0.46	0.76	1.87	1.76	0.94	0.61	0.93	3.61	1.36
pH	pH units	7.13	7.38	7.42	7.15	7.28	7.19	7.22	7.2	6.68	6.59	6.45	6.78
Conductivity (EC)	uS/cm	50	51	49.5	45.4	45.9	38.1	36.9	32.1	32.4	35.9	37.3	43.9
Nitrate+Nitrite as N	mg/L	0.041	0.0448	0.024	0.0356	0.0607	0.047	0.0282	0.0375	<0.0200	0.0256	0.0956	0.0369
		Station B	Station B	Station B	Station B	Station B	Station B	Station B	Station B	Station B	Station B	Station B	Station B
Nitrate as N	mg/L	0.38	0.27	0.361	0.33	0.139	0.114	0.097	0.111	0.073	0.09	0.186	0.252
Nitrite as N	mg/L	0.048	0.065	0.054	0.012	<0.010	<0.010	<0.010	<0.010	0.035	<0.010	<0.010	<0.010
Phosphate, Ortho as P	mg/L	<0.01	<0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.029
Ammonia as N, Total	mg/L	0.362	0.66	0.352	0.049	0.026	0.044	0.02	0.041	0.085	0.09	0.034	0.051
Turbidity	NTU	0.55	3.62	3.5	0.46	0.79	1.81	2.62	1.24	0.83	0.92	3.06	1.25
pH	pH units	7.3	7.44	7.34	7.26	7.31	7.3	7.32	7.21	6.86	6.68	6.59	6.9
Conductivity (EC)	uS/cm	90	92	102	88.3	55.7	46.8	45.5	39.4	54.2	50.5	57.1	74.6
Nitrate+Nitrite as N	mg/L	0.428	0.335	0.414	0.342	0.139	0.114	0.0967	0.111	0.109	0.0901	0.186	0.252