2022 Wastewater Collection & Treatment Annual Report

Photo credit: Alsid Prime

2022

Wastewater Collection & Treatment Annual Report

DISTRICT OF CLEARWATER

209 Dutch Lake Road

Box 157

Clearwater BC V0E 1N0

Tel: 250-674-2257

Table of Contents

1.0 Introduction

Located along Yellowhead Highway #5, approximately 125 km north of Kamloops, Clearwater spans over 5,447 hectares with a population of 2,548 residents (2021 Census). The District of Clearwater was incorporated as a municipality in December of 2007, making it one of the newest municipalities in British Columbia. Clearwater is also known as the gateway to the World-famous Wells Gray Provincial Park. Tourism in Clearwater continues to bring travelers from around the world to experience the beautiful Canadian wilderness. Within the heart of Clearwater you will find Dutch Lake, which allows residents and tourists to enjoy year-round activities like swimming, fishing, paddle boarding, canoeing and ice skating.

The District of Clearwater's Wastewater treatment plant is located at 385 Webber Road Clearwater, BC. The Wastewater treatment plant is certified as a Class II Wastewater treatment facility and a Class I Wastewater Collection System. The Wastewater collection system serves approximately 200 residents, 21 businesses, 2 schools and a hospital. It provides primary and secondary treatment prior to discharge into the receiving environment.

2.0 Wastewater Collection System

2.1 Wastewater Collection System – History

The wastewater collection system was first established 1971 with the construction of Weyerhaeuser subdivision. Approximately 1.6 km of gravity sewer main was installed with an inverted siphon connecting the subdivision to the wastewater treatment plant.

There was a small extension of 0.2 km of gravity sewer to the system to connect the high school in 1974.

The Weyerhaeuser subdivision completed a second phase, adding an additional 0.44 km to the collection system in 1978.

Between the years of 1986 – 1990, Clearwater expanded the collection system to include another 0.3 km of gravity sewer main, connecting some of the local businesses to the system.

Through the years of 1995 – 1997, Clearwater completed the third phase of Weyerhaeuser subdivision and extended the collection system north across Yellowhead Highway #5. This added 1.1 km of gravity sewer main to the system.

In 1998, on the recent extension across Yellowhead Highway #5, Clearwater had received its first sewer lift station (Eden Rd) in the collection system. This addition to the system included 0.2 km of sanitary forcemain and another 0.2 km of gravity sewer.

Clearwater expanded the collection system east of the Weyerhaeuser subdivision in 2001. This extension provided 1.25 km of sanitary forcemain, 0.35 km of gravity sewer main and the second sewer lift station (Park Dr) in the collection system. Clearwater's Dr. Helmcken Memorial Hospital is now connected to the sewer system via this lift station.

Through the years 2005 – 2012, Clearwater completed multiple extensions to its sewer collection system on the north side of Yellowhead Highway #5. These included 0.73 km of gravity sewer main, 0.5 km of sanitary forcemain and its third sewer lift station (Clearview Rd) within the collection system.

Clearwater completed construction of its fourth sewer lift station (Raft River) in 2017 and the installation of 0.47 km of sanitary forcemain and 0.25 km of gravity sewer main.

2.2 Wastewater Collection System – Lift Station Details

2.2.1 Eden Road Lift Station

The Eden Rd lift station was constructed in 1998 and consists of a 1.8 m wide x 4.9 m deep concrete chamber complete with two (2) 5 horsepower FLYGT pumps. The lift station level is controlled by an ultrasonic transducer located inside the lift station and is monitored by a PLC in a kiosk, within the fenced compound. Eden Rd lift station is connected to the Districts SCADA system, and the station will alert the District operators if any alarms are activated. This lift station is not connected to a back-up power generator but does have a UPS (uninterrupted power supply) hard wired into the PLC. The UPS will last up to 1 hour during a power outage. Eden Rd lift station collects wastewater flow from multiple commercial buildings nearby. A Back-up pump is stored at Public Works that can be installed in the event of a pump failure.

2022 activities to report.

- Eden lift station ran an average of 77 minutes a day.
- In Mar/2022, Eden lift station experienced a power outage lasting 22 hrs. Throughout the power outage, the District staff frequently monitored the levels visually to ensure the lift station did not overflow. Pump trucks were on standby as a precaution, but the gravity collection system was large enough to retain the sewage until the power came back on. None of the commercial businesses reported a sewage back-up into their buildings.
- District operators complete daily inspections of the lift station and record data from the HMI on the PLC.
- Approximately every 4 months, operators add 4 gallons of lift station degreaser to the station to help with the extra grease that builds up in the wastewater flow from the restaurants.
- The District operators wash down the grease build up on the walls, cables and chains inside the lift station with a pressure washer as needed.

2.2.2 Park Drive Lift Station

The Park Dr lift station was constructed in 2001 and consists of a 1.8 m wide x 5.5 m deep concrete chamber complete with two (2) 10 horsepower MYERS pumps. The lift station level is controlled by an ultrasonic transducer located inside the lift station and is monitored by a PLC in a kiosk, within the fenced compound. Park Dr lift station is connected to the Districts SCADA system, and the station will alert the District operators if any alarms are activated. This lift station has a UPS hard wired into the PLC and is connected to a diesel generator to provide back-up power in the event of a power outage. The diesel generator is located at the Raft River Lift station and is wired through underground conduits to the Park Dr lift station. Park Dr lift station collects wastewater flow from Dr. Helmcken Memorial Hospital, Evergreen Acres (55+ complex), 12 residential lots and the wastewater flow from Raft River lift station. A Back-up pump is stored at Public Works that can be installed in the event of a pump failure.

2022 activities to report.

- Park lift station ran an average of 38 minutes a day.
- In Mar/2022, Park lift station ran for 22 hours on back-up power with zero issues.
- Park lift station was pumped down and cleaned out with a hydro-vac truck to remove any grit from the bottom of the lift station.
- District operators complete daily inspections of the lift station and record data from the HMI on the PLC.
- Once in the spring and again in the fall, the District operators wash down the grease build up on the walls, cables and chains inside the lift station with a pressure washer.

2.2.3 Clearview Rd Lift Station

The Clearview Rd lift station was constructed in 2002 and consists of a 1.8 m wide x 5.3 m deep concrete chamber complete with two (2) 3 horsepower MYERS pumps. The lift station level is controlled by floats located inside the lift station and a basic control panel inside a small building. Clearview Rd lift station is not connected to the Districts SCADA system and provides alarm state issues through a rotating red beacon and a siren mounted to the small building within the fenced compound. This lift station is not connected to a back-up power generator. Clearview Rd lift station collects wastewater flow from a 32 lot subdivision.

2022 activities to report.

- Clearview lift station ran an average of 2 minutes a day. (There are currently only 4 lots built out, so this lift station sees little use)
- In Mar/2022, Clearview lift station experienced a power outage lasting 22 hrs. Through the power outage, the District staff monitored the levels visually to ensure the lift station did not overflow. Pump trucks were on standby as a precaution, but due to the low number of houses built out in the subdivision, the lift station never reached a critical level. None of the residents reported a sewage back-up into their building.
- District operators complete daily inspections of the lift station and record pump hours from the control panel.

2.2.4 Raft River Lift Station

The Raft River lift station was constructed in 2017 and consists of a 1.8 m wide x 5.4 m deep one piece fiberglass chamber complete with two (2) 11 horsepower FLYGT pumps. The lift station level is controlled by an ultrasonic transducer located inside the lift station and is monitored by a PLC in a kiosk, within the fenced compound. Raft River lift station is connected to the Districts SCADA system, and the station will alert the District operators if any alarms are activated. This lift station is connected to a diesel generator to provide back-up power in the event of a power outage. The generator is located within the Raft River compound. Raft River lift station collects wastewater flow from the adjacent Elementary school and a couple of residential properties nearby.

2022 activities to report.

- Raft River lift station ran an average of 49 minutes a day.
- In Mar/2022, Raft River lift station ran for 22 hours on back-up power with zero issues.
- Raft River lift station was pumped down and cleaned out with a hydro-vac to remove any grit from the bottom of the lift station.
- Raft River lift station had pump #2 fail in Aug/2022. The pump was sent out for a full rebuild and was back in service by Dec/2022. The lift station ran on Pump #1 while pump #2 was being rebuilt.
- District operators complete daily inspections of the lift station and record data from the HMI on the PLC.
- District operators complete and record a weekly inspection of the back-up generator, and once a month, the generator is run for 20 minutes to maintain proper lubrication & maintenance.

3.0 Wastewater Treatment Plant

3.1 Wastewater Treatment Plant – History

The wastewater treatment plant was first established in 1970 and consisted of two Facultative lagoons and a chlorine contact basin before the effluent discharged into the North Thompson River.

In the fall of 2010, the wastewater treatment plant completed a major upgrade. This upgrade included abandoning and filling in the chlorine contact basin, abandoning one facultative lagoon, converting the second facultative lagoon into a lined aerated cell, constructing two new rapid infiltration basins, a small concrete building for the blowers and the capping of the effluent outfall into the North Thompson River.

The wastewater treatment plant completed its second major upgrade in the fall of 2015. This upgrade included a new septage receiving station building, a new lined aerated septage receiving lagoon, three new lift stations, a grinder and an auger for screening, a polymer mixing tank, a sludge wasting red box and three new monitoring wells.

In the summer of 2017, the wastewater treatment plant completed a small upgrade to improve the septage receiving station. This upgrade included constructing a below ground storage tank complete with a new connection for dumping, a flow meter to record influent and an in-line pump for processing.

The wastewater treatment plant started construction of a two-phase upgrade in the spring of 2020. Phase one was completed in 2021, which included a second lined aerated cell, a new headworks unit for screening, two flow meters (one to record influent from the Districts wastewater collection system and a second to record effluent out of cell #2 to the RIB's), two new lift stations, a third rapid infiltration basin and a second septage receiving dump station complete with a lined aerated lagoon.

In the winter of 2022, the wastewater treatment plant completed the second phase of the 2020 two phase upgrade. This included a large drying bed cell and the installation of two new monitoring wells.

3.2 Wastewater Treatment Plant – Details

In 2022, the District of Clearwater's Wastewater Treatment plant treated a total of 124,116 m^3 (124,116,000 L) of effluent and collected a total of 115,092 m^3 (115,092,000 L) of wastewater influent from multiple sources (See flow charts in appendix A). These sources are broken down into three categories. Septage Receiving Station, TMX Dump Station and District's Wastewater Collection System. The wastewater treatment plant is connected to the District's SCADA system and any of the stations will alert the District operators if an alarm is activated.

3.2.1 Septage Receiving Station

The Septage Receiving station (SRS) receives raw wastewater influent from septic pump trucks that clean out residential and commercial septic tanks, BC Park facilities and construction porta-potties. The septic trucks connect to a 150 mm (6") standpipe that directs influent through a flow meter and into a below ground storage tank that holds roughly 68 m^3 (68,000 L). Operators then pump out the raw wastewater through an inline rotary pump & grinder, into an auger to screen out inorganic material. The screened wastewater gravity flows from the auger to a lift station (LS#3) complete with a 2.2 horsepower pump and a 22.5 m^3 (22,500 L) balancing tank. Lift station #3's level is controlled by an ultrasonic transducer inside the lift station and is monitored by a PLC inside the MCC room. The wastewater from LS#3 is pumped into the aerated septage receiving lagoon for primary treatment.

The septage receiving lagoon has a capacity of 647 m^3 (647,000 L) and has two lift stations (LS#1 & LS#2) connected. Lift station #1 was constructed in 2017 and it consist of a 2.6 m deep x 1.2 m wide one piece fiberglass chamber complete with one (1) 2.2 horsepower FLYGT pump to control the decanting process. Lift station #1's level is monitored by an ultrasonic transducer inside the lift station and is connected to a PLC inside the MCC room. The decant flow is pumped to a control structure which combines the flow with the District's wastewater collection system upstream of the headworks unit and then into Cell #1 for further treatment. Lift station #2 was constructed in 2017 and it consist of a 3.4 m deep x 1.2 m wide one piece fiberglass chamber complete with one (1) 2.2 horsepower FLYGT pump to control the sludge wasting process. Lift station #2's level is monitored by an ultrasonic transducer inside the lift station and is connected to a PLC inside the MCC room. The sludge waste is pumped to a

mixing room where polymer is injected into the flow and sent to a large sludge mate box for dewatering. The dried sludge is then transferred to a holding cell onsite until enough sludge is accumulated to haul away to an approved site.

3.2.2 TMX Dump Station

The TMX dump station was constructed in 2021 to receive wastewater influent from septic pump trucks that collect wastewater from the various Trans-Mountain camps within a 125 km radius of Clearwater. Septic trucks connect to a 150 mm (6") standpipe that directs wastewater influent through a flow meter and into an aerated lagoon that holds 430 m^3 (430,000 L) for primary treatment. Lift station #4 is connected to the TMX lagoon and it consist of a 4.7 m deep x 1.5 m wide one piece fiberglass chamber complete with two (2) 3 horsepower FLYGT pumps. Lift station #4's level is controlled by an ultrasonic transducer inside the lift station and is monitored by a PLC inside the MCC room. The TMX wastewater is pumped to a control structure which combines the flow with the District's wastewater collection system upstream of the headworks unit and then into Cell #1 for further treatment.

3.2.3 District's Wastewater Collection System

The District's wastewater collection system all gathers to a single inverted syphon line, down through an inline flow meter and into the headworks unit. The headworks unit was constructed in 2020 and consists of an ultrasonic transducer above the flow channel, a grinder in the channel, an auger and a bypass channel complete with a bar screen. The ultrasonic transducer is monitored by a PLC which turns the auger on and off according to the set levels. The auger screens out all inorganic material from the influent. Once the influent passes through the auger screen, the influent is directed to Cell #1 for primary treatment. Cell #1 is a large, aerated lagoon with a storge capacity of 10,300 m^3 (10,300,000 L). The influent travels around a curtain through the middle of the cell, to a pipe that connects Cell #1 to Cell #2. Cell #2 is a second large, aerated lagoon with a storage capacity of 11,175 m^3 (11,175,000 L). The influent travels around a curtain through the middle of the cell, to a pipe that connects to lift station #5 (LS#5). LS#5 was constructed in 2020 and consists of a 1.2 m wide x 4.7 m deep one

piece fiberglass chamber complete with one (1) 3 horsepower FLYGT pump. The lift station level is controlled by an ultrasonic transducer located inside the lift station and is monitored by a PLC in the MCC room. The final effluent is pumped from LS#5 through an inline flow meter to a control structure that allows District operators to direct the effluent to anyone of the three (3) rapid infiltration basins (RIBs). RIB #1 and RIB #2 were built in 2010 and have a storage capacity of 2,860 m^3 (2,860,000 L) each. RIB #3 was constructed in 2020 and has the capacity to store 1,040 m^3 (1,040,000 L).

3.2.4 Blowers

The District's wastewater treatment plant has a small 6 m x 8 m concrete building that houses four (4) Kaeser air compressor blowers complete with variable frequency drives (VFD) for each unit. The concrete building also houses the control panel for the Headworks unit that screens out inorganic material from the wastewater collection system flow. These blowers provide aeration to the following locations:

- Blower #1 is a 25 hp blower that provides aeration to the Cell #1 lagoon.
- Blower #2 is a 15 hp blower that provides aeration to the Cell #2 lagoon.
- Blower #3 is a 10 hp blower that is used as a backup blower in the event that one of the other three blowers fail.
- Blower #4 is a 10 hp blower that provides aeration to the SRS lagoon.

In addition to the blowers mentioned above, the District has another small 1.5 m x 1.8 m concrete building that houses a single blower. Blower #5 is a 10 hp blower that provides aeration to the TMX lagoon and is controlled by a VFD which is located in a nearby kiosk.

District operators complete daily inspections of each unit and record the data from each blower and its VFD.

3.2.5 Monitoring Well Data

In 2022, the District of Clearwater had recognized that it was not in compliance with its permit requirements of a minimum of four (4) monitoring wells. In Oct, the District had completed the installation of two (2) new monitoring wells to ensure the District was meeting and exceeding the minimum requirements. Below are the bi-annual sample results and water level data for 2022.

2022 June Monitoring Well Sample Data

Well ID	Ammonia	Nitrate/Nitrites	Dissolved Phosphorous	Chlorides
MW14-1N	<0.050	<0.0200	0.0112	40.2
MW14-2E	3.33	6.59	0.227	20.1
MW14-3W	11.3	5.16	0.0154	81.4

*Units measured in mg/L

2022 December Monitoring Well Sample Data

Well ID	Ammonia	Nitrate/Nitrites	Dissolved Phosphorous	Chlorides
MW14-1N	<0.050	0.0821	0.0054	36.6
MW14-2E	5.83	0.0274	0.871	47.2
MW14-3W	12.4	0.0171	0.0132	65.1
MW22-4	0.091	<0.0100	<0.0050	6.16
MW22-5	16.8	1.2	0.0132	64.1

*Units measured in mg/L

* All monitoring well sampling procedures were in accordance with the British Columbia field sampling manual.

2022 Monthly Monitoring Wells – Water Level Data

Month	MW14-1N	MW14-2E	MW14-3W	MW22-4	MW22-5
Jan	7.3	7	6.5	N/A	N/A
Feb	7.4	6.9	6.3	N/A	N/A
Mar	6.9	6.7	6.1	N/A	N/A
April	6.3	6.8	6.5	N/A	N/A
May	7.43	7	6.65	N/A	N/A
June Week 1	7.89	7.57	7.15	N/A	N/A
June Week 2	8.28	8.01	7.57	N/A	N/A
June Week 3	8.6	8	7.5	N/A	N/A
June Week 4	8.69	8.26	7.95	N/A	N/A
June Week 5	8.87	8.31	8.08	N/A	N/A
July	8.92	8.31	8.1	N/A	N/A
Aug	8.37	7.71	7.5	N/A	N/A
Sept	7.72	7.06	6.85	N/A	N/A
Oct	7.29	6.69	6.56	3.02	3.5
Nov	6.91	6.35	6.09	2.64	3.14
Dec	6.73	6.18	5.92	3.91	2.99

*Units measured in meters

3.2.6 Effluent Data & Sample Results

In 2022, the District of Clearwater had struggled to stay in compliance with its permit. There was a total of six (6) Non Compliance Reports submitted through the year as seen in the table below. Multiple factors contributed to this struggle which include, a large staff turnover, lack of understanding how the WWTP operated, lack of education & training and many years of improper operation and maintenance. With the help of our contracted operations supervisor, education & training, the District has made excellent forward progress. This can be seen in the last quarter of the year.

2022 Monthly Effluent Sample Results

Month	BOD	TSS	NCR Required/Submitted
Jan	84.4	40.9	NCR Submitted for BOD
Feb	73.7	25.2	NCR Submitted for BOD
Mar	27	16.3	In Compliance
April	110	51	NCR Submitted for BOD
May	285	43.2	NCR Submitted for BOD
June	55.7	124	NCR Submitted for BOD & TSS
July	10.2	30	In Compliance
Aug	8.8	90	NCR Submitted for TSS
Sept	<7.0	<10.0	In Compliance
Oct	<7.0	<10.0	In Compliance
Nov	13.2	11.2	In Compliance
Dec	13.6	16	In Compliance

*Units measured in mg/L

*Maximum allowable = BOD<45mg/L & TSS<60mg/L

* NCR = Non-Compliance Report

* BOD, TSS sampling procedures were in accordance with the British Columbia field sampling manual.

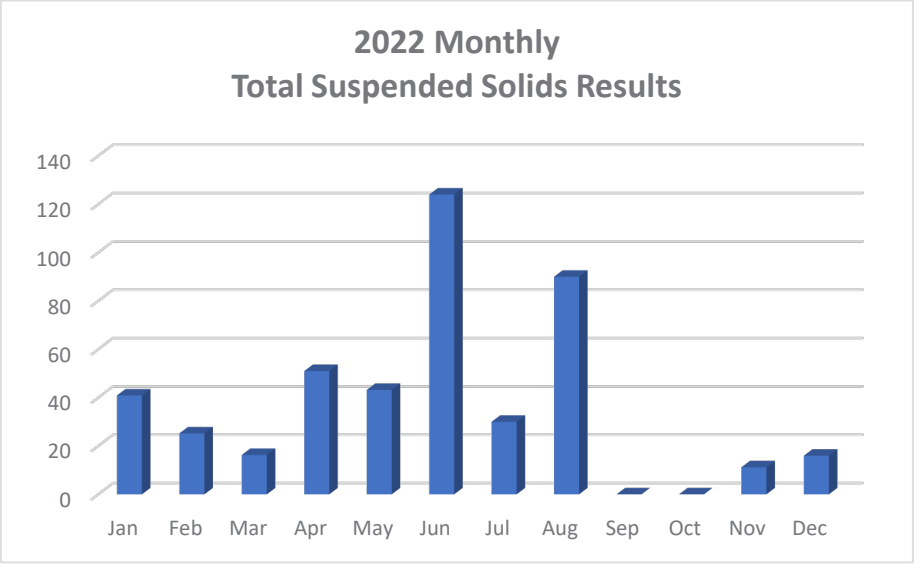
District operators record the effluent discharge totals and compile an average daily flow on a weekly basis. As seen in the table below, The District experienced its highest effluent discharge flows of 517 m^3/D in week #5 and its lowest effluent discharge flows of 205 m^3/D in week 7. Due to the Trans-mountain pipeline expansion project through the North Thompson area, the WWTP would receive different volume amounts of Influent from week to week. This would help explain why the average daily flow jumps around so much.

2022 Weekly Effluent Discharge Volumes

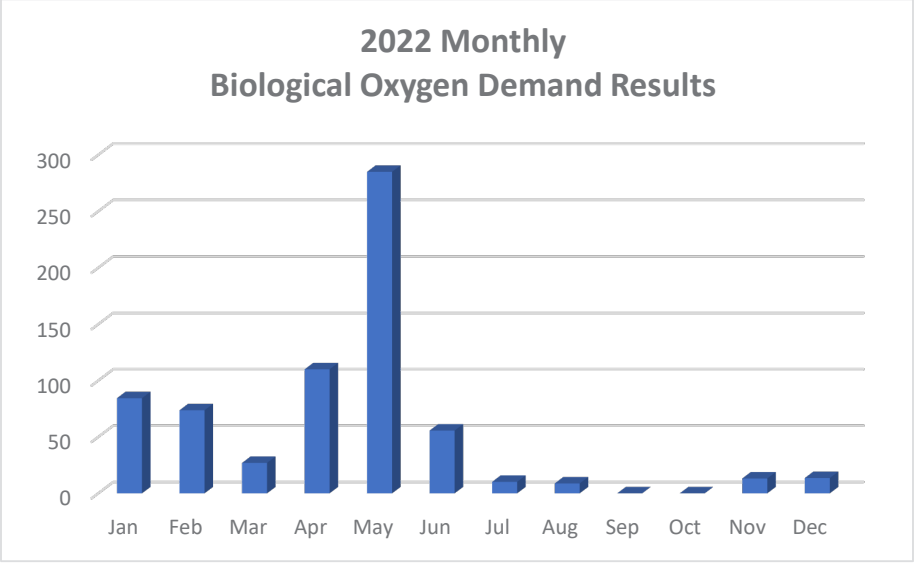
Week	Average Daily Flow		Week	Average Daily Flow
1	257 m^3/D		**27**	471 m^3/D
2	343 m^3/D		**28**	343 m^3/D
3	343 m^3/D		**29**	428 m^3/D
4	343 m^3/D		**30**	428 m^3/D
5	517 m^3/D		**31**	490 m^3/D
6	416 m^3/D		**32**	366 m^3/D
7	205 m^3/D		**33**	428 m^3/D
8	342 m^3/D		**34**	428 m^3/D
9	428 m^3/D		**35**	390 m^3/D
10	331 m^3/D		**36**	381 m^3/D
11	439 m^3/D		**37**	343 m^3/D
12	428 m^3/D		**38**	428 m^3/D
13	428 m^3/D		**39**	428 m^3/D
14	343 m^3/D		**40**	343 m^3/D
15	230 m^3/D		**41**	343 m^3/D
16	283 m^3/D		**42**	343 m^3/D
17	257 m^3/D		**43**	514 m^3/D
18	380 m^3/D		**44**	317 m^3/D
19	306 m^3/D		**45**	368 m^3/D
20	343 m^3/D		**46**	343 m^3/D
21	343 m^3/D		**47**	361 m^3/D
22	343 m^3/D		**48**	324 m^3/D
23	428 m^3/D		**49**	343 m^3/D
24	395 m^3/D		**50**	343 m^3/D
25	376 m^3/D		**51**	257 m^3/D
26	386 m^3/D		**52**	334 m^3/D

*Maximum allowable effluent discharge is 600m^3/D

*Week 1 starts Jan,1/2022 & Week 52 Ends Dec,31/2022



*TSS measured in mg/L



*BOD measured in mg/L

2022 Activities to report.

- Lift station #1 was pumped down and washed out for inspection of the chamber. Operators pulled the pump and completed an inspection of the pump.
- Lift station #2 was pumped down and washed out for inspection of the chamber. Operators pulled the pump and completed an inspection of the pump.
- Lift station #3 was pumped down and washed out for inspection of the chamber. Operators pulled the pump and completed an inspection of the pump.
- Lift station #5 had the outside of the chamber exposed approx. 1.2 m deep to insulate the outside. This will help with the ice build up in the winter months.
- Lift station #5 was pumped down and washed out for inspection of the chamber. Operators pulled the pump and completed an inspection of the pump.
- Lift station #4 had the chamber lid insulated to help with ice build up in the winter months.
- In Apr, RIB #3 was cleaned out.
- In Oct, the broken section of the SRS floating decanter was removed, and the remaining section was set up on a cable system to give the operators full control of the decanting process.
- In Dec, the blower for Cell #1 had a ground fault inside the motor. We are currently awaiting a new motor for the blower. The new motor is anticipated to be received in spring of 2023. Cell #1 is currently running on the backup blower.

4.0 Operators

In 2022, the District of Clearwater recognized the need to have a Wastewater Treatment II operator to be in compliance with its WWTP permit. The District executed a contract with Richard Bastiaansen (Cloudburst Waterworks Services) to oversee the WWTP operations and to help educate the operators to ensure that the District was following its conditions of permit. The District has also identified training targets for staff focusing on wastewater operations.

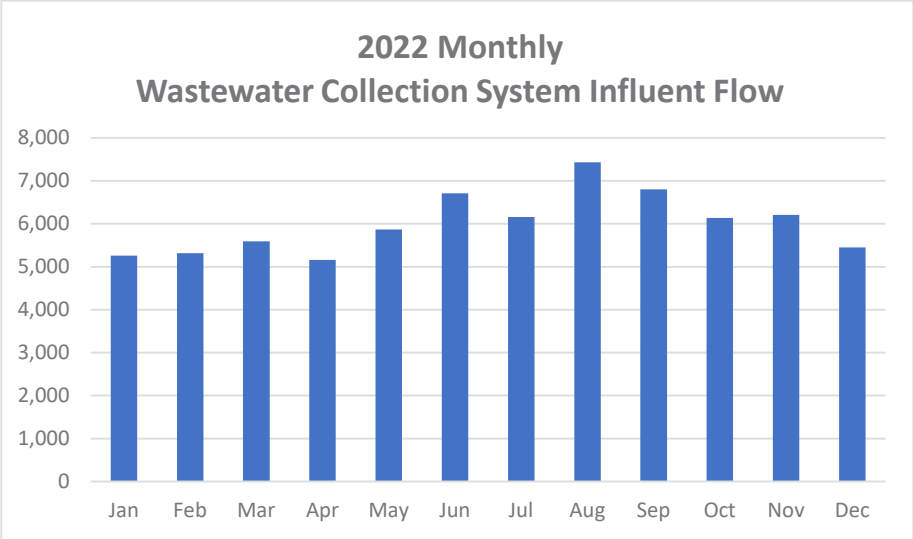
Operator	Position	Certification
Richard Bastiaansen	Contracted Supervisor	WWT II
Shane Woolliscroft	Chief Operator	WWT I, WD I
Britton Fraser	Utility Operator II	WD IV, WT I, WWT I, WWC I
Josh Visscher	Utility Operator II	WT III, WD III, WWC I
Clayton Sollows	Labourer	OIT
WT – Water Treatment, WD – Water Distribution, WWC – Wastewater Collection WWT – Wastewater Treatment, OIT – Operator In Training		

5.0 Future Projects For 2023

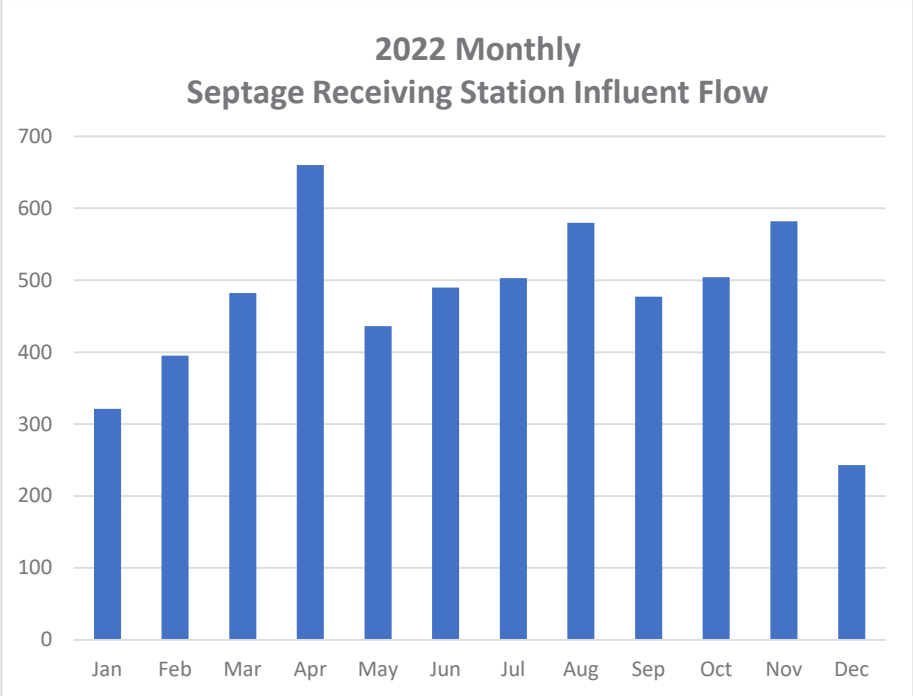
- Request for quotes to de-sludge Cell #2.
- Clean out RIB #1 and RIB #2.
- Purchase a portable floating skimmer to remove duckweed from the lagoons and RIBs.
- Research and purchase a new decanter head for the SRS lagoon.

Appendix A

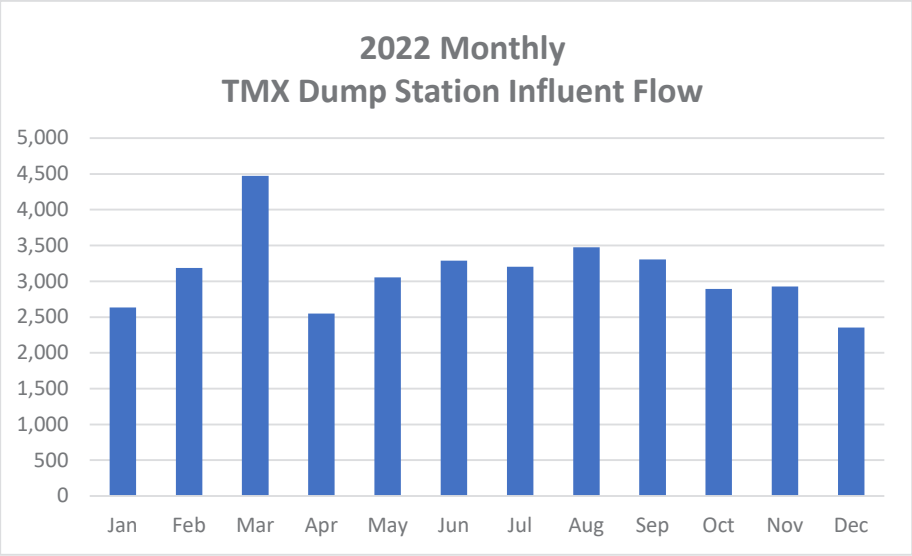
Flow Charts in m^3



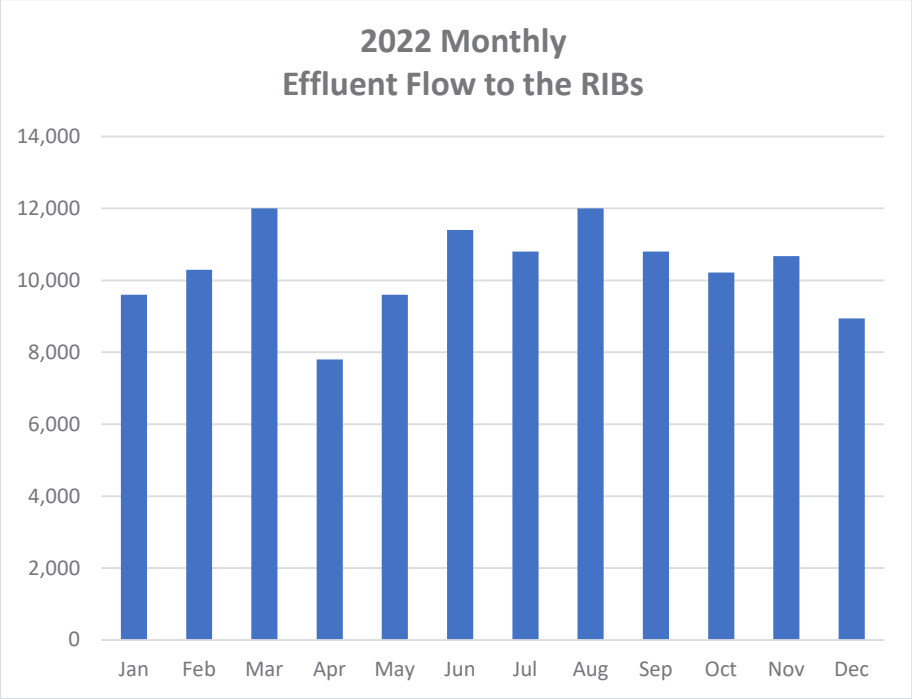
*Annual average of 197 m^3/D of Influent received



*Annual average of 15.5 m^3/D of Influent received



*Annual average of 102 m^3/D of Influent received



*Annual average of 340 m^3/D of Effluent discharged