CATARAQUI BAY
WASTEWATER TREATMENT PLANT

2021 ANNUAL REPORT

1 EXECUTIVE SUMMARY

Cataraqui Bay Wastewater Treatment Plant (WWTP) operates under Ministry of the Environment, Conservation and Parks, ECA number 3714-9YURZF. The facility was compliant with all but one of the conditions outlined in condition 7 of the above-mentioned ECA. The non-compliant month and effluent parameter is described in the following sections of this report.

The average daily flow through the plant was 27,225 m3/day.

There were no bypass events at the Cataraqui Bay WWTP and there was one bypass event within the Kingston West Sewage Collection System in the reporting year. The details of the bypass are listed in Appendix B, Tables 2 and 3, in the Bypass Summary section of this report.

Plant staff continue to maintain operations during the facility upgrades. There has been continued planned and reactive maintenance as well as capital works at both the facility and within the collection system. Details regarding these improvements are in the report.

We have continued to provide additional training to staff at the facility to increase their knowledge of the process upgrades currently underway.

2 PLANT DESCRIPTION AND TREATMENT PROCESS

The following is a process overview and description of the treatment steps taken at Cataraqui Bay Wastewater Treatment Plant (WWTP). The descriptions contained within this report relate to ECA number 3714-9YURZF.

A detailed description of the upgraded WWTP will be provided when the facility performance report relates to ECA number 4163-ACPPRK.

Grit Removal

The first step in the treatment process is grit removal. This is accomplished by introducing air into the bottom of the grit channel. The heavier solids in the wastewater settle to the bottom of the tank, while the organics that require treatment stay in suspension and move on to the next step of the treatment process.

Screening

The second operation is the removal of large particles and floating debris such as wood, rags and plastics from the raw water. These items are removed using mechanical screens that rake the debris from the wastewater stream and onto a belt conveyor.

Flow Splitting

The screened wastewater discharges into a channel where a flow splitter divides the flow into two separate channels that lead to both C and D plants. The channels are equipped with motorized gate valves to control the flow rate to each plant.

Primary Settling

The heavier organics settle by gravity to the bottom of the primary clarifiers. This forms a sludge blanket on the bottom of the tank. The settled sludge is collected by collector flights and scraped into a hopper at the end of the tank. The settled sludge is then pumped to digestion facilities for further treatment. As wastewater is discharged from the primary clarifiers, it is dosed with aluminum sulfate for phosphorus removal.

Aeration

Organic matter is broken down by microorganisms in the Aeration tanks. The microorganisms are supplied with air, and food (which is provided by the primary clarifier effluent). Healthy populations of microorganisms are maintained by returning some of the biomass from the final clarifiers. The aeration process effectively removes 95% of the biochemical oxygen demand from the incoming wastewater.

Final Settling

After the breakdown of the wastewater is completed, the mixture of microorganisms (mixed liquor) from the aeration tanks flows into the final clarifiers for solid-liquid separation. The biomass formed in the aeration tanks settles to the bottom of the final clarifiers. A portion of this biomass is returned to the head of the aeration tanks. The remainder of the biomass is pumped to sludge thickening facilities.

Disinfection

The supernatant effluent from the final clarifiers is then directed to the disinfection facilities. Chlorine is dosed to the wastewater just prior to entering the chlorine contact tank where disinfection of the final effluent occurs. Just after exiting the chlorine contact tank the wastewater is dosed with calcium thiosulphate for de-chlorination to ensure no chlorine remains in the water entering the receiving stream.

Outfall

After de-chlorination, the disinfected effluent from the chlorine contact tank is discharged back to Lake Ontario through a 1500 mm and a 900 mm outfall sewer. The diffusers at the ends of the sewer lines are located 25 m offshore and 16 m below water surface level.

Sludge Thickening

The sludge thickening facility consists of two rectangular holding tanks, dual rotating drum thickeners and a polymer system. Sludge is thickened from 0.5% solids to approximately 3.5% solids before being pumped to the digester facilities.

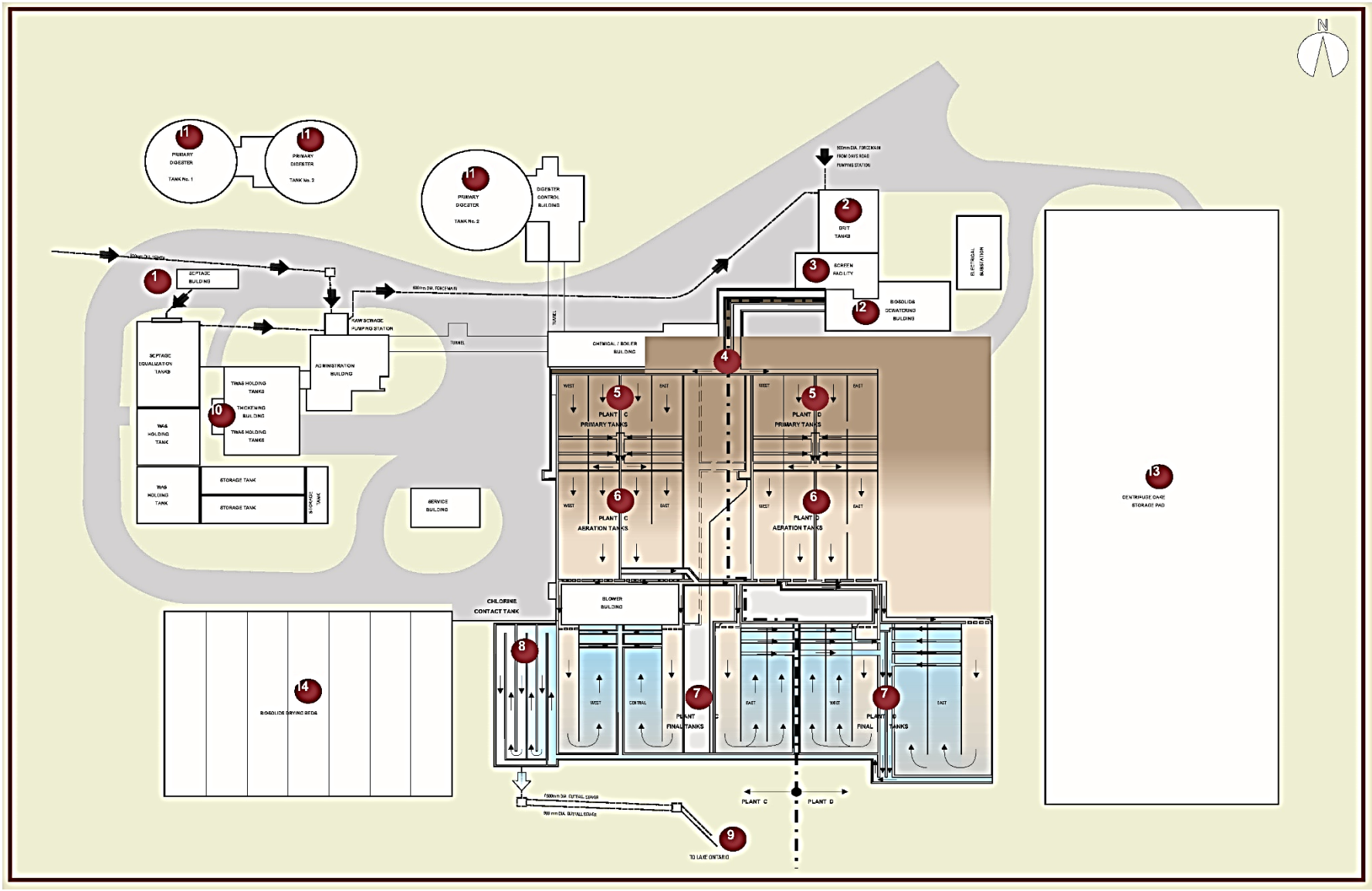
Biosolids Management

The sludge from the primary and final clarifiers as well as the sludge from the thickening process is pumped to the digester facilities. The digester facilities consist of one primary digester, one secondary digester and a holding tank. In the primary digester, the sludge is heated, mixed and re-circulated under controlled anaerobic conditions. The anaerobic digestion process produces gas and biosolids. The gas produced is rich in methane which is used as fuel for the boiler system which in turn provides heat for the digestion process. The biosolids produced through sludge digestion are dewatered and used on agricultural lands as a nutrient and soil conditioner when weather and crop conditions permit.

Biosolids Dewatering

The biosolids produced through digestion are dewatered by centrifugation. The centrifuged cake produced is land applied when weather and crops permit.

Figure 1 – Cataraqui Bay Wastewater Treatment Plant General Layout



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3 OPERATION

Adequate staffing as well as preventative maintenance and regular equipment inspections resulted in minimal disruptions to operations of the plant. Non flushable materials such as wipes and grease continue to be more prominent in the sewer system resulting in some operational and maintenance challenges. Utilities Kingston is still implementing a public education program to make customers more aware of what materials should not be flushed down the sewers. This program has included radio and newspaper campaigns, social media campaigns such as Twitter and Facebook, bill stuffers, information on back of parking tickets, and bus information signs. This has been an ongoing campaign for the past three years with positive results.

The Corporation of the City of Kingston submitted a Notice of Modification to Sewage Works to the Ministry of Environment, Conservation, and Parks (MECP) in June 2021. This modification was the switch of coagulants used for primary clarification from Aluminum Sulphate to Ferric Chloride. The request was approved and the plant began using Ferric Chloride in August.

Cataraqui Bay Treatment Plant had one non-compliant monthly average result for Total Phosphorous (TP) in the month of September. This non-compliant result was reported to the MECP. The maximum monthly average concentration of TP in the final effluent is 1.0 mg/L. In the month of September, the plants monthly average concentration of TP was 1.3 mg/L. Part of the cause for the increased TP concentration was due to operational difficulties while adjusting the plant to the change in coagulants used in the primary clarifiers. Operators were able to make adjustments and the effluent concentrations of TP for the remainder of the year were within compliance.

4 PLANT PERFORMANCE

The plant has several effluent limits and objectives outlined in the ECA Number 3714-9YUKZF. The plant was compliant with all Final Effluent limits aside from the non-compliant level of TP in the month of September. A detailed breakdown of the effluent limits and objectives are listed below as well as the final effluent results for the Cataraqui Bay Wastewater Treatment Plant. Raw Influent, and Final Effluent samples were collected and submitted to a third party laboratory at or above the required frequencies based on the ECA.

The effluent objectives, limits, and associated results for the Cataraqui Bay Wastewater Treatment Plant are displayed below.

5 BIO-SOLIDS MANAGEMENT

Cataraqui Bay Wastewater Treatment Plant processed 46,943.20 m3 of liquid sludge through the centrifuge. Approximately 2,630 m3 of sludge cake was stored on site until Terra Pure Environmental applied it to land on licensed agricultural fields.

The location and date of land application of the Bio-solids produced largely depend on weather, and the crops being grown on the receiving lands. Appendix B, Table 1 below contains the Non-Agricultural Source Materials Plan (NASM) numbers and addresses of receiving lands for bio-solids produced by the City of Kingston.

6 MAINTENANCE

Staff continue to use our preventative maintenance program in accordance with manufacture's recommendations.

Additional Maintenance completed this year:

- Annual infrared scans of HV electrical
- Routine vibration monitoring
- Diesel generator repair and maintenance
- Dual fuel boilers #1 and 2# complete tube and back plate replacement
- Secondary treatment aeration blower motors completely rebuilt on Blowers #1, #3

7 EQUIPMENT CALIBRATIONS

Third party contractors calibrated all of the plant flow meters, online analyzers, and lab equipment. As a result the facility saw limited downtime of major equipment and saw very few mechanical or electrical failures this year. Calibration records are available upon request.

8 CAPITAL WORKS

In October 2016 work began on plant wide upgrades. The original proposed project completion timeline was 4 years (2016-2020). Although the original proposed completion date has passed, the Cataraqui Bay WWTP continues to undergo an extensive process, electrical/instrumentation, and mechanical upgrade.

Additional capital works within our sewage collection system include:

- Construction of the new Days Road Pumping Station has begun.
- Work on the new forcemain from Portsmouth pumping station to Cataraqui Bay WWTP has begun.

9 COMPLAINTS

In the 2021 reporting year, the Cataraqui Bay WWTP received several official complaints related to odour. Due to the WWTP upgrades currently underway, and a change in process, some odours have been detectable to nearby residents. Operators began measuring for Hydrogen Sulphide gas (H2S), which is a by-product of the treatment process, and is most often the source of offensive odours. H2S was measured at several locations throughout the treatment process to build a baseline of H2S levels. In August 2021 the coagulant used in the primary clarification process was changed from Aluminum Sulphate, to Ferric Chloride. This coagulant change has greatly reduced the levels of H2S being produced within the treatment process. No further complaints were received after our coagulant change. When the facility upgrade is complete, it is expected that odours will be reduced even further.

10 BYPASS SUMMARY

Appendix B, Table 2 summarizes the location, volume, and duration of the only bypass event for the reporting year. Appendix B, Table 3 summarizes the test results from the sample taken during the bypass event.

11 BYPASS RESULT INTERPRETATIONS

All bypass discharges have a high bacteria count due to the lack of disinfection. CBOD5, TP, and TSS results are typical raw sewage influent levels. Best efforts are made to capture the debris contained in any discharges to the lake. After each bypass event, shoreline inspections near discharge points are done to monitor any debris that may come ashore, and clean-up is done if debris is found.