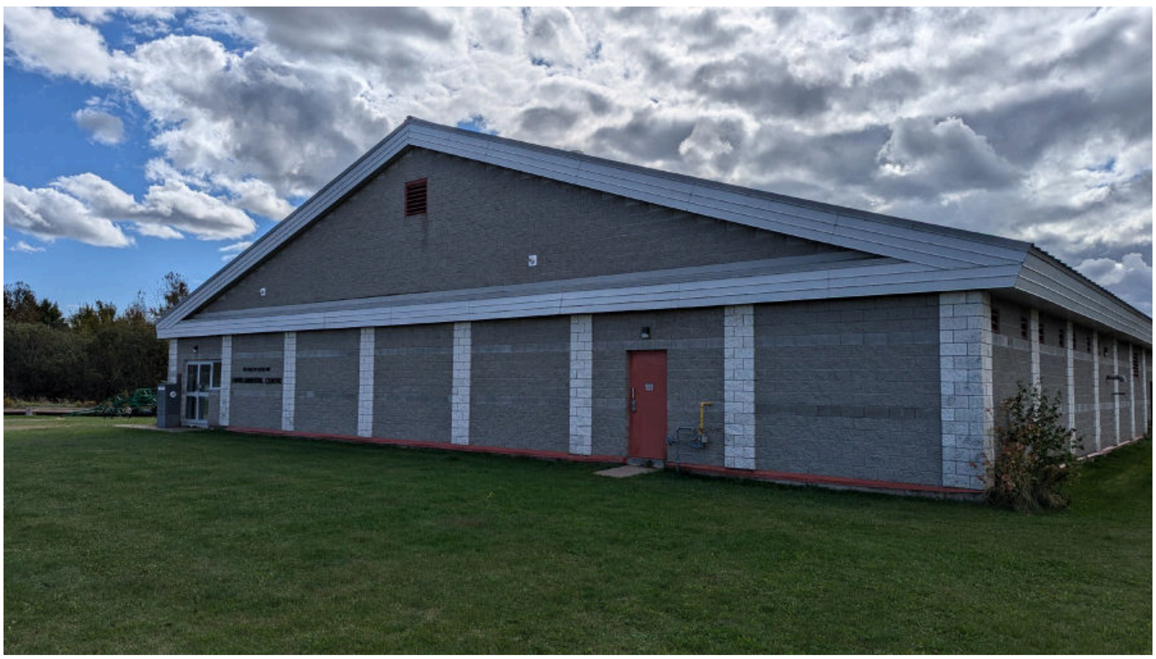
# The Corporation of the Township of Macdonald, Meredith and Aberdeen Additional

*Environmental Centre Condition Overview*



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2458.03

**TABLE OF CONTENTS**

## EXECUTIVE SUMMARY

This report summarizes activities and findings of a condition assessment and evaluation of the water and sewage treatment plants (WTP and STP) serving the Village of Echo Bay. Both plants are located at the Echo Bay Environmental Centre. The purpose of the condition assessment and evaluation is to evaluate the condition of physical assets and to assess their operational performance. The process considered treatment targets and requirements outlined in Ministry of the Environment, Conservation and Parks (MECP) guidelines and regulations, as well as the Drinking Water License (DWL) and Drinking Water Works Permit (DWWP). Industry best practices are also considered.

Raw water from Lake George flows through an intake structure to the low lift wet well from where it is pumped to the filter trains at the WTP. The WTP employs coagulation followed by flocculation (polymer assisted) and clarification before dual media rapid sand filtration. Filtered water is pumped through granular activated carbon (GAC) and chlorinated before passing through clearwells (two operated in series providing adequate CT) and into the high lift pump wells for pumping to the distribution system. Backwash wastewater is stored in a settling tank. Supernatant is discharged to the adjacent STP and settled solids are pumped to the STP.

Sanitary sewage generated within the Village of Echo Bay is collected by a gravity sewer network and directed to the STP influent works via a system of 3 sewage lift stations. Heavier and larger solids are removed by the influent works bar screens and grit channel prior to sewage being distributed to 2 primary clarifiers for additional solids settling and scum removal. Sewage is then directed to a system of 3 rotating biological contactors (RBCs) for biological treatment. Before flowing to 3 secondary clarifiers, aluminum sulphate is added to the sewage to enhance solids settling and aid in phosphorus removal. From the secondary clarifiers, treated sewage flows to the effluent channel where it is disinfected using ultraviolet irradiation, metered and discharged into the outfall sewer and effluent diffuser in Lake George. Sludge generated at the STP is held in septic tanks, thickened and disposed of annually.

Condition assessments were conducted considering input from the Ontario Clean Water Agency (OCWA), the operator of the plants, and performance evaluations were conducted by reviewing available plant data and considering industry guidelines and practices. The overview reveals that the facility and equipment are generally in good condition and performing well with identified opportunities for improvement.

## 1.0 BACKGROUND

Reviews of the WTP and STP serving the Village of Echo Bay were undertaken to support the completion of a condition assessment and performance evaluation ("Condition Overview"). The purpose of the Condition Overview is to evaluate the condition of physical assets and to assess the operational performance of the plants. Results from the Condition Overview will be used by the Township to support its asset management planning and to identify opportunities to optimize performance of each plant. The goals and objectives are:

1. Identify equipment condition/maintenance and operational limitations/restrictions and opportunities for improvement;
2. Provide an independent outlook on plant operations and potential to optimize performance;
3. Identify performance limiting factors at all major unit processes; and,
4. Evaluate each plant considering relevant MECP regulations, guidelines and governing documents.

The approach followed while completed the Condition Overview considers the United States EPA manual "Optimizing Water Treatment Plant Performance Using the Composite Correction Program - 1998 Edition".

## 2.0 INTRODUCTION

Staff from Kresin Engineering Corporation (KEC) and OCWA met to discuss the objectives of the Condition Overview and review any known issues with the plants. Following this initial meeting and discussions the activities below were completed:

1. Plant tours.
2. Informal interviews with WTP operators and management.
3. Review of historical data from plant operations.
4. Review of available technical plans and reports.
5. Evaluation of unit processes and equipment.
6. Overview of building envelope and building mechanical and electrical systems.
7. Report preparation.

In evaluating the plants, the following MECP documents were referenced:

1. Ontario Design Guidelines for Drinking Water Systems and Sewage Works;
2. Procedure for Disinfection of Drinking Water in Ontario;
3. O.Reg 170/03;
4. STP Environmental Compliance Approval (ECA);
5. Drinking Water Works Permit; and,
6. Drinking Water License.

## 3.0 WATER TREATMENT PLANT

The treatment train at the WTP, commissioned in 1998, is housed within the Environmental Centre located at 137 Highway 17 East and consists of an intake structure and pipeline, raw water well and low lift pumps, 2 conventional filtration plants, GAC contactors, clearwells and high lift pump well and pumps. Chlorinated water is stored in the below ground clearwells prior to being pumped to the distribution system and elevated tank. The WTP services approximately 200 water distribution system connections.

### 3.1 Intake and Intake Pipeline

The intake located in Lake George includes a polyethylene drum (2.21 metres in diameter), weighted down with sand bags and covered with a polyethylene conical cover. A 508mm diameter polyethylene riser, perforated at its top, extends upward from the drum. The intake structure partially embedded into the lake bottom, in some 12 metres of water and its intake ports are wrapped with 20mm HDPE mesh to prevent large objects from entering the intake.

Table 3.1 presents a summary of the 40 year design flows (as identified in the Operations Manual) and the associated intake velocities. Intake velocities for each of the flow rates are below the velocity normally associated with the formation of frazzle ice (i.e. 75mm/s) as identified in the MECP's Guidelines for the Design of Drinking Water Systems.

**Table 3.1: Summary of Intake Velocities**

| 40 Year Design Criteria | | Intake Velocity |
|---|---|---|
| **Condition** | **Flow Rate (l/s)** | **(mm/s)** |
| Average Day | 9.27 | 17 |
| Maximum Day | 21.6 | 40 |
| Peak Hour | 34.8 | 60 |

Chlorine injectors are also provided at the raw water intake to facilitate protection from zebra mussel infestation.

The intake pipe from the intake structure to the raw water well is a 300mm diameter SDR26 polyethylene pipe approximately 1,600 metres in length. Provisions to back-flush the intake pipe have been incorporated into the high lift pump discharge header.

### 3.2 Raw Water Well and Low Lift Pumps

Raw water from the lake is fed by gravity into a concrete screening chamber, measuring some 2.25m x 4.30m x 4.8m deep (at high water level) upstream of the raw water well from which water is drawn through two (2) coarse screens into the raw water well.

Three (3) low lift pumps are located in the 3.0m x 4.3m x 4.8m deep (at high water level) raw water well. Each pump is rated at 8.2 l/s at 15.4 metres TDH and equipped with a 100mm diameter discharge pipe. The low lift pumps are called into duty based on the finished water elevation in the clearwells and discharge raw water into a 150mm common header fitted with an air release valve, a globe valve, a turbidity meter and a pH meter. The common header directs to either one or both filtration plants.

## 3.3 Filtration Plants

The WTP is equipped with 2 identical package filtration plants each having a capacity of 8.2L/s and containing a flocculator, clarifier and dual media filter. Prior to water entering the flocculator, coagulant and flocculant are added to the raw water and mixed using an inline static mixer. A flow meter is also provided on the raw water header pipe ahead of where the pipe tees into two (2) 100mm diameter pipes, each discharging to a filtration plant.

### 3.3.1 Coagulant (Aluminum Sulphate)

Alum is injected into the raw water at the 150mm diameter header pipe at a location upstream of the static mixer.

Two (2) metering pumps, complete with back pressure valves and check valves, each rated at 7.74 L/hr provide alum injection. Liquid alum is stored in an 18.2 $m^3$ fiberglass tank that is located within a concrete containment area in the WTP.

### 3.3.2 Flocculant (Polymer)

Polymer, to aid in floc formation, can be injected at the static mixer on the low lift header, downstream of the alum injection point. The original liquid polymer system had been abandoned in favour of a dry polymer system that incorporated two (2) polyethylene mixing tanks and two (2) metering pumps, complete with back pressure valves and check valves, each rated at 7.74 L/hr provide polymer injection. Historically, Ciba "magna floc" LT220 was the polymer used at the WTP.

The static mixer is fitted with four (4) injection ports to facilitate injection of alum (since relocated upstream in the header pipe), sodium hypochlorite (pre-chlorination), sodium hydroxide and polymer.

### 3.3.3 Flocculation

Each of the two (2) flocculation tanks (one for each train) are equipped with flocculators and floc recirculation pumps and are designed to provide up to 30 minutes of flocculation at the 20-year maximum day flow (design flow) of 1,418 $m^3$/day. Flocculators provide the required energy for floc formation and floc recirculation pumps convey flocculated water into the clarifier through a 150mm diameter pipe to the distribution header. Flocculation is enhanced by the use of the recirculation pumps to maintain a higher water elevation in the clarifier than in the flocculator allowing for the return of some settled floc through a vertical riser connected to the sludge collection header.

### 3.3.4 Clarifiers

One (1) upflow rectangular clarifier (2.13m x 3.095m x 2.36 m deep), fitted with inclined tube settlers, follows each of the flocculation tanks. The clarifiers are each rated at 8.2 L/s and together provide a retention time of 18.4 minutes and a surface settling (rise) rate of 4.88 m/hr at the design flow. Clarified water is collected across the surface of the clarifier through 3 perforated collection troughs above the tube settlers.

Sludge blowdown or clarifier flushing occurs approximately every 12 hours. A portion of the sludge collected at the clarifier bottoms is re-directed to the upstream flocculation tank and a portion is directed to the waste surge tank for settling. Clarifier flushing is achieved using finished water sprayed over the tube settlers from above using a series of ten (10) nozzles.

### 3.3.5 Dual Media Filters

Water is directed from each clarifier to the filtration plant's dual media filter, comprising silica sand and anthracite. The filters are 2.13m x 1.175m x 2.36m deep, rated at 8.2 L/s (roughly 11.8m/hr). Filtered water exits the filter through 150mm diameter underdrain systems that combine at a common 200mm diameter filter effluent pipe discharging into the GAC pump well.

Filter backwash frequency is controlled based on time lapse or filter headloss and backwash wastes are discharged to the surge tank and then pumped to the waste clarifier for settling and disposal. A 150mm diameter backwash pipe and a 100mm diameter filter to waste pipe are located on the filter effluent lines and are isolated by motorized valves. Two (2) backwash pumps, each rated at 29.4 L/s at 12.0m TDH convey finished water from the clearwells, at a rate of $44m^3/m^2/hr$ to achieve 30% bed expansion during backwashing.

### 3.3.6 Granular Activated Carbon Contactors

Two (2) separate and identical GAC contactors (Napier Reid model GPW 30) are utilized to remove dissolved organic material through adsorption. Each GAC filter is 1.83m in diameter and 3.83m deep and has a design flow of 8.2 L/s. Water from the GAC well is pumped, via three GAC submersible pumps each rated at 8.2 L/s at 7.9m TDH, to the GAC splitter box where it flows downward through a GAC layer. GAC pumps are called into duty based on the finished water elevation in the clear wells.

Once through the GAC media, water flows into a 150mm diameter underdrain pipe within a 215mm thick layer of support gravel. Water from each 150mm effluent pipe is chlorinated using sodium hypochlorite and combined into a 200mm diameter GAC effluent pipe discharging into clearwells 1 and/or 2 (operator selected).

Upstream of the 200mm diameter header, the GAC effluent piping (from each filter) is equipped with three (3) connecting pipes, one used during normal filter operation, one to provide backwash water and one for filter rinse (i.e. filter to waste). These pipes are isolated by motorized valves.

Filter backwashing occurs based on filter headloss and/or time lapse. The filter backwash pumps are rated at 18.7 L/s at 12.0m TDH and pump finished water from the high lift wells through the media from the bottom of the filter. Backwash waste is discharged to the surge tank and then to the waste clarifier for settling and disposal.

## 3.4 Finished Water Storage

Finished water is stored in a system comprised of two (2) clearwells that are interconnected with piping fitted with manually operated butterfly valves to allow each cell to be isolated for maintenance without interrupting plant operations. Water flows through the clearwells into high lift wells 1 and 2. At high water level, clearwell 1 provides a volume of 230m$^3$ and clearwell 2 - 179m$^3$.

## 3.5 High Lift Pumping

Treated water is pumped to distribution by a high lift pumping system comprising 4 vertical turbine pumps each with a capacity of 8.2L/s at 50m of TDH. High lift pumps 1 and 2 draw from high lift well 1 and pumps 3 and 4 from high lift well 2.

Each high lift pump discharges through a hydraulic check valve and manual gate valve into a 250mm diameter watermain supplying the distribution system and elevated storage tank. Chlorine residual concentration is measured for compliance and chlorine is added, if needed, in the 250mm diameter pipe. Flow to the distribution system is also metered.

## 3.6 Operations/Controls

The WTP is not staffed 24 hours a day and is monitored remotely by OCWA using a software-based SCADA system to help ensure an uninterrupted supply of treated water to the distribution system. A SCADA HMI computer is provided in the control room at the WTP.

## 3.7 Laboratory

In addition to the control room, a laboratory is also provided at the WTP. Raw and treated water sample taps are accessible at a sample sink located within the laboratory in addition to a rudimentary fume hood and analytical equipment.

## 4.0 SEWAGE TREATMENT PLANT

Like the WTP the STP, commissioned in 1998, is at the Environmental Centre located at 137 Highway 17 East and consists of influent works with 2 fixed bar screens and 2 grit channels, a flow equalization tank, 2 primary clarifiers, 3 rotating biological contactors, 3 secondary clarifiers, 2 septic tanks, a lime mixing tank, ultraviolet irradiation effluent disinfection, outfall chamber with flow measurement, and an outfall diffuser in Lake George. The STP services approximately 200 connections.

### 4.1 Influent Works

Raw sewage pumped from the Church Street pumping station, environmental centre pumping station and the WTP waste clarifier enters a concrete influent channel before being split to flow through 1 of 2 manually cleaned bar screens. The aluminum bar screens are constructed with 26mm clear spacing between bars. Influent passes the bar screens and flows through the grit channels where heavier solids (eg. gravel) is removed from the flow stream. Grit channels are cleaned manually.

The influent works can accommodate a peak sewage flow of 2,583$m^3$/d. From the influent works, raw sewage flows through a 300mm diameter raw sewage pipe into the primary clarifier splitter box.

### 4.2 Flow Equalization Tank

When influent flow exceeds the capacity of the primary clarifiers it overflows the primary clarifier splitter box into a 97$m^3$ aerated flow equalization tank. A duplex pumping system returns the contents of the equalization tank to the primary clarifier splitter box when flow conditions allow.

### 4.3 Primary Clarifiers

From the primary clarifier splitter box, raw sewage is directed into one of the 2 primary clarifiers through individual 250mm diameter primary clarifier feed pipes. Flow that cannot be accommodated by one or both primary clarifiers passes over a weir and into a 300mm diameter raw sewage overflow pipe that discharges into the flow equalization tank. Coagulant (aluminum sulphate) may be added to the raw sewage at the primary clarifier splitter box to aid in solids settling.

Raw sewage is discharged near the centre (top) of each primary clarifier and within a 1.0m diameter stilling well. Floatables are removed from the clarifiers via floating air-lift scum skimmers and are discharged through scum discharge boxes to septic tank 2. Each clarifier is equipped with a submersible pump to remove primary sludge (settled solids) to the primary sludge splitter box from where it discharges into septic tanks 1 and 2. Clarified effluent flows under scum baffles and over effluent weirs into a 250mm diameter primary clarifier effluent pipe that conveys sewage to the RBC splitter box.

### 4.4 Rotating Biological Contactors

Once in the RBC splitter box, sewage can be diverted into 1, 2 or all 3 of the rotating biological contactors for secondary treatment. Each RBC unit is housed within an 8.1m x 4. m concrete tank with fiberglass reinforced plastic (FRP) insulated cover and is constructed of 6 banks of rigid polypropylene sheets on steel frames. Electric drive motors turn the RBC shafts, supported at each end on pillow block bearings, at a constant rate to expose the media sheets to sewage and maintain the biological mats. Upon entering the RBCs, 4 coarse bubble diffusers aerate the sewage and, as sewage flows through the RBC is treated through 4 stages to remove and reduce the biological oxygen demand of the sewage. Each RBC can handle a sewage flow of 1,418$m^3$/d.

Prior to discharging from each RBC into a common 200mm diameter RBC effluent header, coagulant (aluminum sulphate) can be added to the effluent to aid in phosphorus removal and improve solids settling in the downstream secondary clarifiers.

## 4.5 Secondary Clarifiers

RBC effluent can be directed to any arrangement of the 3 downstream secondary clarifiers by opening and closing isolation valves on the 200mm diameter RBC effluent header. Under normal operating conditions, each clarifier receives effluent from its corresponding RBC into a circular stilling well at the center of each clarifier. Secondary sludge air lifted from the bottom of each clarifier and scum removed using a floating air-lift skimmer is directed to sludge boxes (1 for each clarifier). Waste sludge and scum is then discharged into a common 150mm diameter secondary sludge header from where it can be directed to either septic tank 1 or 2 (or both).

Secondary clarifier effluent flows under scum baffles and over perimeter weirs before discharging into a 250mm diameter secondary clarifier effluent pipe for disinfection, flow metering and disposal.

## 4.6 Effluent Disinfection, Flow Metering and Disposal

Once discharged into the plant effluent channel, sized to handle a peak sewage flow of 2,583$m^3$/d, secondary clarifier effluent is exposed to ultraviolet irradiation to reduce the E. Coli count prior to flowing through a Parshall flume for flow measurement (logged by the SCADA system). Disinfected final effluent then flows through a 300mm diameter treated effluent pipe into the outlet chamber to the 400mm diameter effluent pipe and diffuser for disposal in Lake George.

The outlet chamber is equipped with a submersible pump that supplies treated effluent to a yard hydrant system for general use at the STP.

## 4.7 Septic Tanks

The STP includes 2 septic tanks that receive wastes from the various treatment processes. Each tank is equipped with a mixer to avoid excessive settling and a submersible pump to transfer contents to the lime mixing tank. Should either of these pumps fail, overflow weirs are provided that would direct flow to the lime mixing tank.

## 4.8 Lime Mixing Tank

Waste sludge is stabilized by the addition of lime in the lime mixing tank. Lime stabilization reduces odour and pathogenic bacteria content and increases solids content. The lime mixing tank is equipped with a mixer to aid the stabilization process as well as a submersible pump to transfer sludge through a 150mm diameter sludge loading pipe to be trucked for disposal.

## 4.9 Aeration

Aeration is provided in the equalization tank and in each RBC using coarse bubble diffusers and air provided from a system of 3 electric blowers. The same blower system provides air to the air lift systems at the primary and secondary clarifiers.

## 4.10 Odour Control

The STP is equipped with 2 odour control units, 1 treating headspace air at septic tank 2 and the lime mixing tank and a second unit treating headspace air at septic tank 1. Each of these units are original to the STP.

## 4.11 Influent and Effluent Composite Samplers

To comply with influent and effluent quality sampling and analysis requirements outlined in the ECA, composite samplers are located at the influent works and effluent channel to automatically draw composite sewage samples. The samples collected are sent to a laboratory for analysis and the results are used in compliance reporting as well as process performance assessments. Each of the composite samplers are original to the STP.

## 5.0 ENVIRONMENTAL CENTRE BUILDING AND GROUNDS

The following are discussed in Section 5.0:

1. Grounds
2. Building envelope;
3. Heating, ventilation and air conditioning; and,
4. Utilities.

### 5.1 Grounds

Access to the Environmental Centre is from Highway 17 in the community of Echo Bay. The main entry door faces Highway 17 on the east side of the building with parking near the main entry door. The rear portion of the Environmental Centre property is secured using a 1.8m high chain link fence with vehicle gates provided at the front and rear on the west side of the building. A granular surfaced service area is provided at the rear of the building.

### 5.2 Building Envelope

Building perimeter walls are constructed of concrete block (interior side), vapour barrier, 50mm rigid insulation, 25mm air space and are faced with architectural block (exterior side). The roof is constructed with wooden trusses, is insulated with batt insulation and sheathed with steel roofing. Soffit and fascia are also steel. Ceilings are cement board over vapour barrier.

The east-west sloping roof directs runoff and snow to sides of the building without doors. With the exception of the main entry vestibule, the building does not have windows.

### 5.3 Building HVAC

Heat is provided by 7 natural gas fired and 3 electric unit heaters hung from the ceiling throughout the building controlled by either a central thermostat (gas units) or integral thermostats (electric units). Electric wall insert heaters are provided in the vestibule, electrical room and washroom and are controlled by integral thermostats. Through-wall Heating/cooling units are provided in each of the office and laboratory though the unit servicing the laboratory seems to have been removed when the washroom facility adjacent to the east exterior wall was constructed.

Systems including an exhaust fan and air intake are provided in each of the 4 chemical rooms/areas. Exhaust fans are also provided in the main WTP area, electrical room and in the washroom. Six (6) ceiling fans in the main WTP area and 2 in the generator/blower room provide air circulation.

### 5.4 Building Utilities

Three (3) Phase, 600V electrical supply is provided by the local utility and by a 180kW diesel engine standby power generator set. Potable water and sanitary sewage services are provided locally at the Environmental Centre.

## 6.0 HISTORICAL IMPROVEMENTS

Table 6.1 summarizes some of the major capital improvements that have been made at the Environmental Centre since 2010:

**Table 6.1: Summary of Historical Capital Improvements**

| Year | Improvement |
|---|---|
| 2012 | UV disinfection system replaced.<br>SCADA system upgrade and new HMI computer. |
| 2013 | RBC#2 replaced complete with bearings. |
| 2014 | RBC#1 replaced complete with bearings. |
| 2015 | RBC#3 replaced complete with bearings. |
| 2018 | WTP and GAC controls system improvements.<br>Wireless communication upgrades (Lake St. and Church St. SPS). |
| 2019 | Raw water pump, chemical pump panels, chlorine and turbidity analyzers.<br>Septic tank pumps and Lake St. SPS pump. |
| 2020 | Heating system improvements, dehumidification and roof repairs. |

In addition to a new raw water pump and analytical equipment being on-hand and ready for installation at the WTP, OCWA has also replaced some sewage handling pumps at the STP.

## 7.0 SUMMARY OF FINDINGS – WATER TREATMENT PLANT

The WTP performs in compliance with MECP requirements as is confirmed by review of OCWA quarterly and annual reports in addition to annual MECP Inspection Reports. WTP components are generally in good condition.

### 7.1 Intake and Intake Pipeline

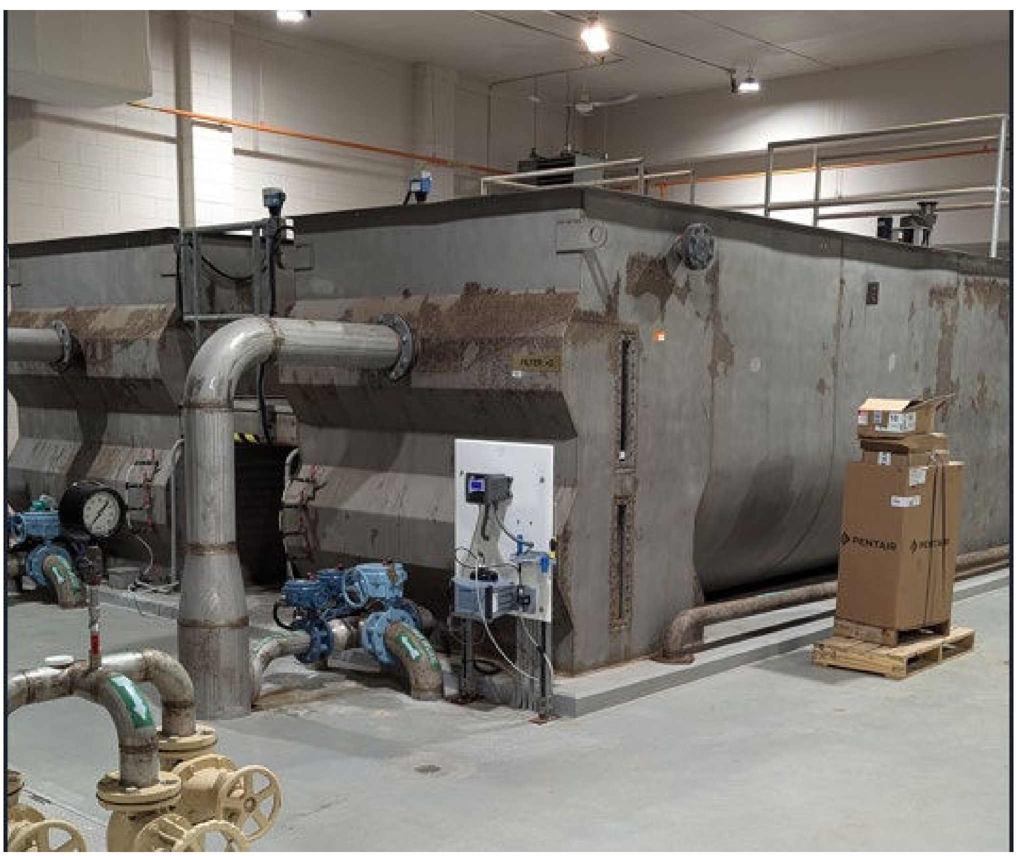
The intake and intake pipeline were last inspected by a diver more than 5 years ago. Although no indications of failure or damage to this infrastructure have presented (e.g. elevated raw water turbidity), an inspection should be undertaken at the next opportunity to coordinate this work with reservoir inspections.

### 7.2 Raw Water Well and Low Lift Pumps

One of the 3 raw water pumps has failed and a replacement pump is on-site at the WTP for installation. OCWA has identified a need to replace the isolation valve on the raw water header upstream of the filtration plants. OCWA should continue to monitor the functionality of the raw water pumps and associated valves.

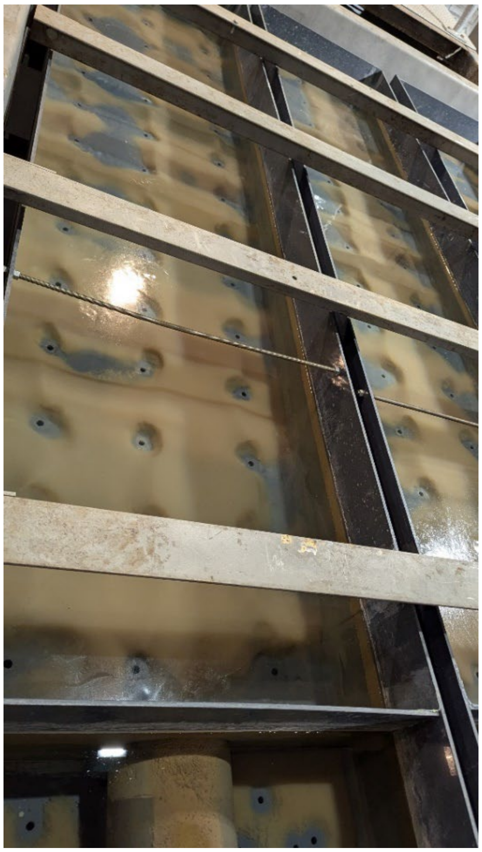
### 7.3 Filtration Plants

The stainless steel filtration plant tanks (filters and GAC contactors) are displaying signs of corrosion (see photo 7.1). To protect the tanks from further rusting or pitting and potential failure, they should be cleaned, re-passivated and clear coated.



Photograph 7.1: Corrosion on Filter Train Tanks

The flocculators are reportedly in good condition; however, the floc recirculator on each treatment plant has failed. Operation of the floc recirculators are critical to the effective operation of the treatment train and they should be reinstated. Though the inclined tube settlers within the clarifiers were not able to be viewed, it is likely that they are in good condition. Build-up of what appeared to be "alum floc" deposited on top of the perforated collection troughs was observed (see photo 7.2), indicating an opportunity for operational improvements. A similar observation, the build-up of floc or "mud balls" on the surface of one of the dual media filters, was also made.



Photograph 7.2: Floc Build-Up on Top of Clarifier Troughs

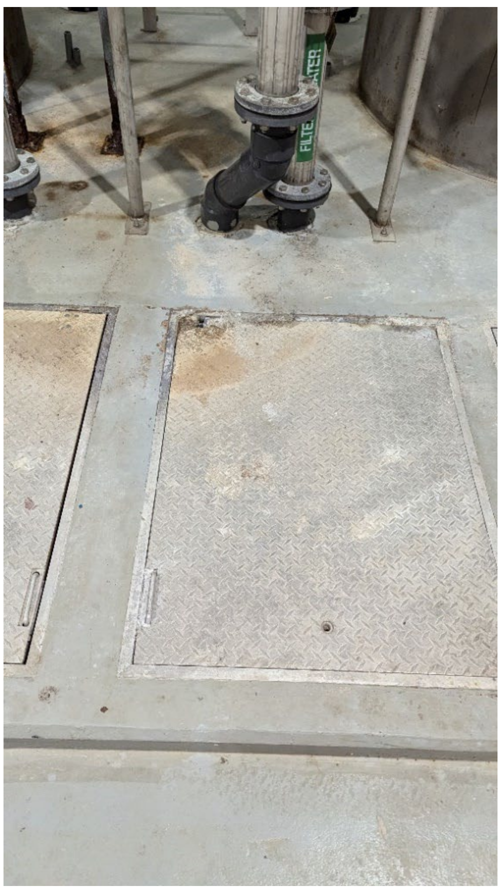
Alum dose was noted by OCWA to be in the range of 35 to 40mg/L, which is a high dose and could be causing or contributing to the observed build-up on the clarifier collection troughs. The floc recirculators re-direct a portion of already flocculated water from the top of the clarifier back to the flocculation tanks to aid in the formation of new floc. This also aids in the formation of settleable floc for proper removal (by settling) in the clarifier, potentially at a reduced alum dose. The addition of polymer also aids in the formation of floc with improved characteristics (size, mass and bond strength) that support effective settling/clarification. Once the floc recirculators are reestablished, the coagulation and flocculation process should be reviewed to include assessment of alternative coagulants and flocculants and doses. This will also assist OCWA in responding to seasonal or event based changes in raw water turbidity.

Backwash wastewater is typically less than 5% of the plant flow. Referencing the filter and GAC contactor backwashing procedures described in the WTP operating manual, it is estimated that roughly 55m$^3$/d of water would be consumed for this purpose (if backwashing once daily). OCWA's allowance of 1,622m$^3$/month is appropriate for assessing plant performance in lieu of using actual metered backwash water flows.

Considering the age of the filter media, its replacement should be planned for in conjunction with GAC media replacement. OCWA is implementing a staged replacement of submersible GAC transfer and backwash pumps and this practice should continue until all submissible pumps have been replaced. Similarly, OCWA's program of renewing online analytical equipment should also continue.

## 7.4 Finished Water Storage

Finished water reservoirs and high lift pump wet wells were last inspected more than 5 years ago. Although no indications of biological growth or build-up of sediments have been reported (e.g. elevated treated water turbidity), the tanks should be inspected using a remote-operated-vehicle at the next opportunity and coordinated with intake and intake pipeline inspections. Isolation valves should continue to be exercised by OCWA. Damage to a GAC well access hatch was observed (see photo 7.3) which should be repaired to ensure the ongoing integrity of filtered water.



Photograph 7.3: Damaged GAC Well Hatch

## 7.5 High Lift Pumping

One of the 4 high lift pumps has failed and is out of service while a second is original to the WTP. The flow meter is reportedly in good condition and is also original to the plant.

Both pumps should be replaced and OCWA should continue to monitor the functionality of the high lift pumps and associated valves.

## 7.6 Operations/Controls

SCADA programming and hardware was upgraded more than 10 years ago and OCWA maintains the programming using an in-house technician. To protect against WTP and STP interruptions, the HMI computer in the control room should be replaced with new equipment. If possible the current HMI computer should be retained as an emergency backup.

## 7.7 Laboratory

Equipment in the laboratory is obsolete. OCWA relies on the spectrophotometer for analysis of process related parameters and consideration can be given to upgrading this to a Hach DR1900.

## 8.0 SUMMARY OF FINDINGS – SEWAGE TREATMENT PLANT

Similarly to the WTP, the STP is also operated and performs in compliance with MECP requirements, as confirmed by review of OCWA quarterly reports, and its components are in generally good condition.

### 8.1 Influent Works

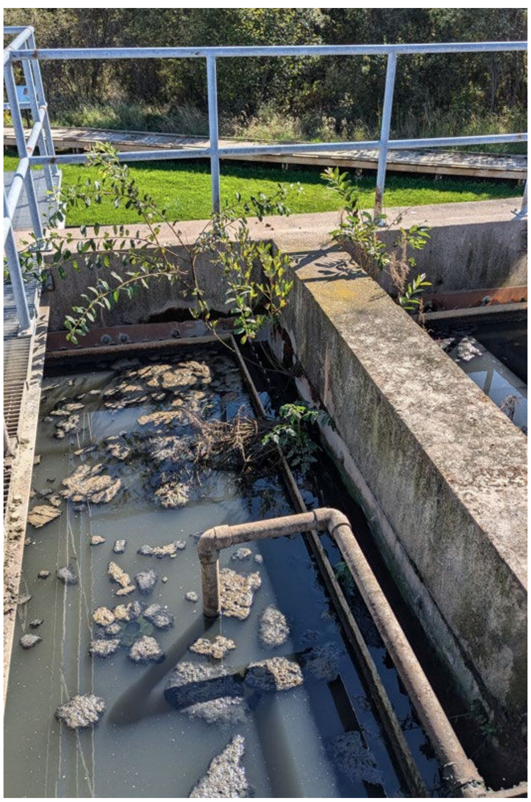
Other than flow control sluice gates at the discharge end of the influent channels, the influent works have no equipment that require mechanical maintenance. Both the influent screens and grit channels require periodic cleaning, the screens on a more frequent basis. Screenings and grit were originally meant to be disposed of manually via the grit chute and waste bin. The waste bin was not present during the site visit and removed screenings were noted to be piled adjacent to the screens. OCWA should develop and implement an effective grit and screenings management procedure that removes these materials from the site for proper disposal as they are produced.

### 8.2 Flow Equalization Tank

OCWA should continue implementing its sewage pump renewal program and include the 2 transfer pumps located within the flow equalization tank.

### 8.3 Primary Clarifiers

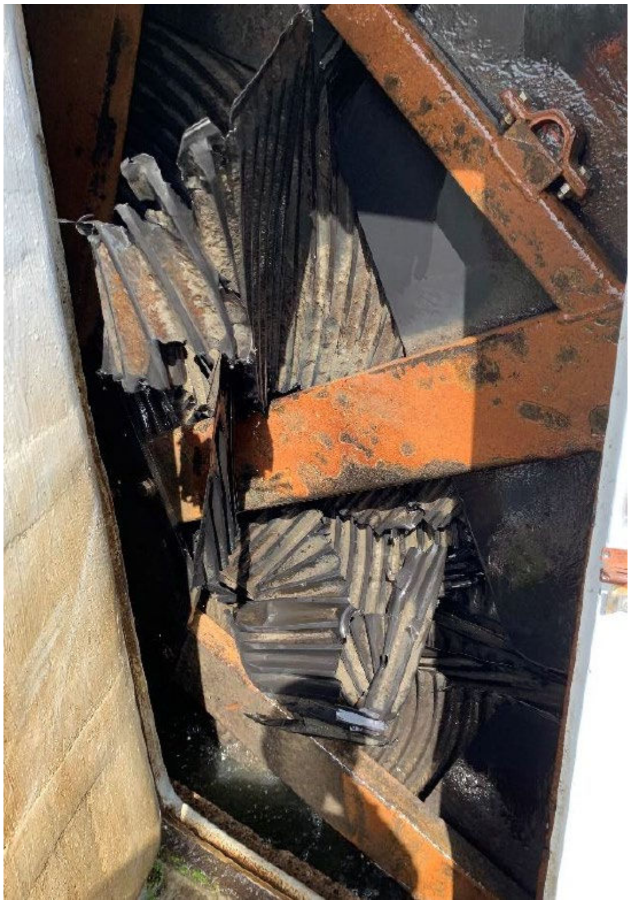
Scum was observed to be accumulating within the primary clarifiers and vegetation was established in the clarifiers (see photo 8.1). The vegetation should be removed, the clarifiers cleaned (pressure washed if required) and the scum air lift systems rehabilitated.



Photograph 8.1: Primary Clarifier Vegetation and Scum Build-Up

## 8.4 Rotating Biological Contactors

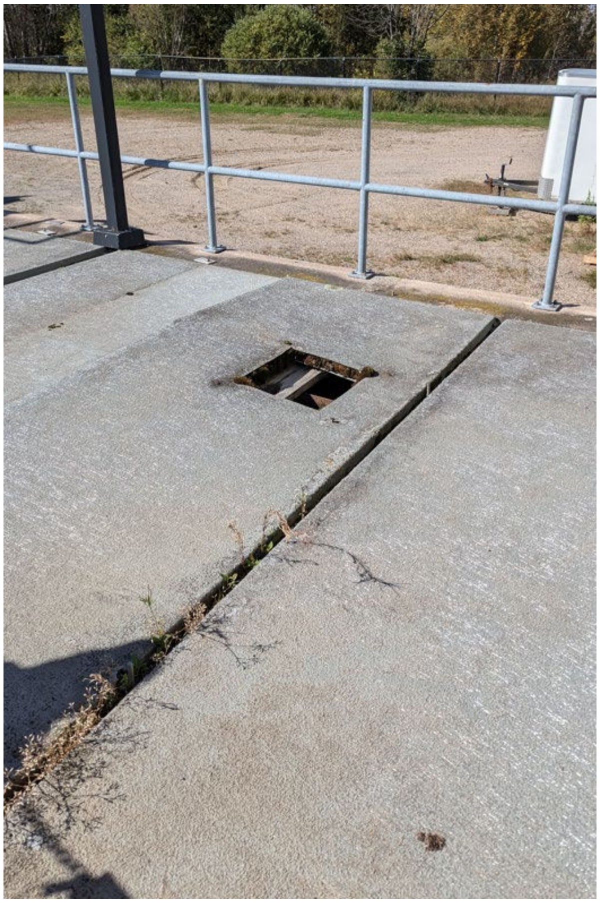
Though not original to the plant, the RBCs have been in service between 9 to 11 years and OCWA has observed that media in RBC #2 has shown signs of failing (see photo 8.2). With proper maintenance, the design life of the pillow block bearings exceeds 20 years. The shaft and media support frames are corrosion resistant. Considering that signs of media failure were observed, and that the RBC's are similar in age (or older) to the original RBC's when they were replaced, the FRP enclosures should be removed to allow detailed inspection of all media packs on each RBC.



Photograph 8.2: RBC #2 Media Failure (photo by OCWA)

## 8.5 Secondary Clarifiers

Secondary clarifiers were not able to be viewed fully due to them being covered with insulated FRP panels, which were observed to be in poor condition and should be replaced. Despite this, vegetation was observed to be growing within and/or around the clarifiers (see photo 8.3). The current panels are not easily removed impeding operations staff as clarifier operating conditions are not easily observed and hindering clarifier wash-down and process monitoring activities. Ease of removal should be considered when identifying replacement covers. Once the clarifiers are able to be accessed, vegetation should be removed and the clarifiers cleaned (pressure washed if needed). Accumulated sludge and scum are removed from the secondary clarifiers by an air lift system the condition of which is not known and should be investigated and rehabilitated, if necessary, following replacement of the FRP panels.



Photograph 8.3: Insulated Secondary Clarifier Covers

## 8.6 Effluent Disinfection, Flow Metering and Disposal

Effluent disinfection, flow metering and the outfall reported by OCWA to be functioning well. OCWA should continue to monitor the functionality of these systems.

## 8.7 Septic Tanks

Septic tank waste pumps (there are 2 of them, 1 in each tank) have recently been replaced by OCWA and are functional. The mixers are original to the STP and should be replaced.

## 8.8 Lime Mixing Tank

The lime mixing tank houses a sludge loading pump for sludge removal from the plant. This pump is not normally used, as a vac-truck has been used for several years to complete this task. The mixer in the lime mixing tank is original to the STP and should be replaced.

## 8.9 Aeration

OCWA reports no issues with the blowers and aeration system and no observations suggesting otherwise were observed during the site visit by KEC. OCWA should continue to maintain and operate the blowers in accordance with manufacturer’s recommendations.

## 8.10 Odour Control Units

Both odour control units (see photo 8.4) are original to the plant, beyond their service lives and are not functioning. Both units should be replaced.

Photograph 8.4: Odour Control Unit #2

## 8.11 Influent and Effluent Composite Samplers

The influent and effluent composite samplers (see photo 8.5) are original to the plant, are beyond their service lives and are in poor condition. Both units should be replaced.

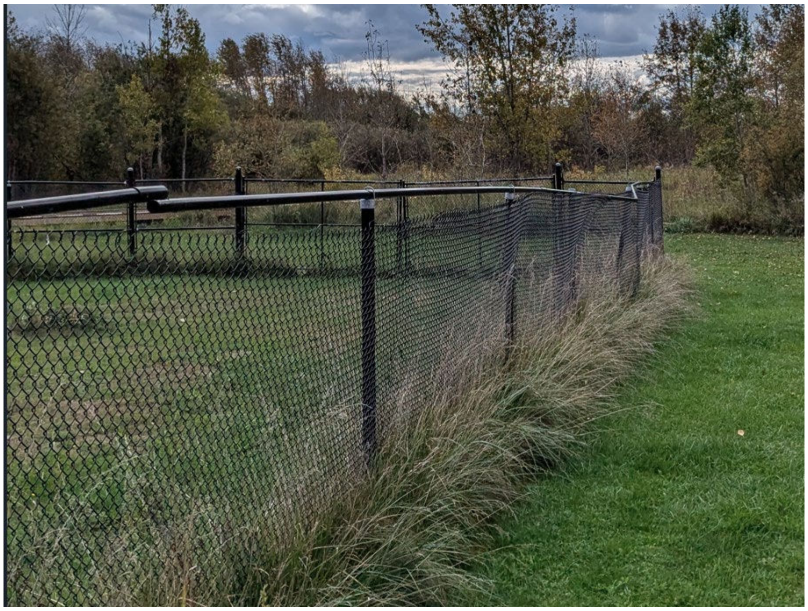
Photograph 8.5: Influent Composite Sampler

## 9.0 SUMMARY OF FINDINGS – BUILDING AND GROUNDS

Observations concerning building envelope, HVAC and utilities systems are presented in the following subsections.

### 9.1 Grounds

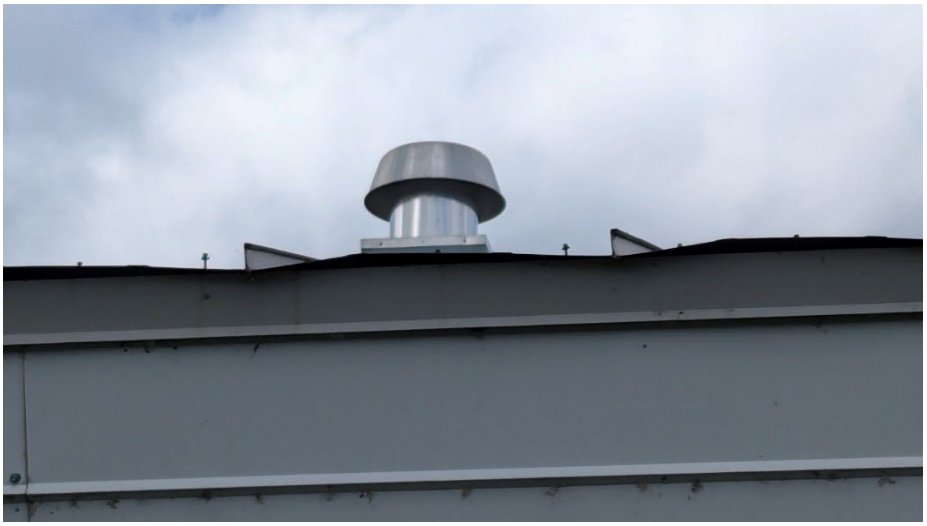
The Environmental Centre grounds appear to be well maintained. Damage to the chain link fence (see Photo 7.1) at the rear of the building was observed and likely due to snow removal activities and/or frost heaving. Efforts should be made to repair the fencing to avoid the damage progressing.



Photograph 7.1: Damage to Chain Link Fence

### 9.2 Building Envelope

Having undergone roof repairs within the past 5 years, the building envelope is in good condition. It was noted during the site visit that several roof fasteners required re-setting along the east edge of the roof (see photo 7.2). These should be re-set as soon as possible to avoid potential damage to the roof.



Photograph 7.2: Screws Along the East Roof Edge Requiring Re-Setting

## 9.3 Building HVAC

Improvements to the HVAC system (including the addition of dehumidifiers) were made within the past 5 years and no related issues were identified by OCWA or during the site visit by KEC. Proper system operation, judged by making observations of the environmental condition in the Environmental Centre building, should continue to be monitored by OCWA.

## 9.4 Building Utilities

Building utilities are in good condition and no capital improvements are required.

## 10.0 CONCLUSION AND SUMMARY OF RECOMMENDATIONS

The Environmental Centre Building, WTP and STP are in generally good condition. The grounds and building appear to be well maintained and opportunities for maintenance improvements exist at each the WTP and STP. Operationally, the plants comply with MECP requirements and opportunities for improvements have been identified that would help ensure that the design lives of components are achieved, while safeguarding operational effectiveness and optimizing operating costs.

Tables 10.1, 10.2 and 10.3 present summaries of recommendations associated with the WTP, STP and building/grounds, respectively, as presented in Sections 7.0, 8.0 and 9.0. Cost estimates are provided (inflated for the suggested year of implementation) and should be considered order of magnitude allowances to guide the budgeting process. It is suggested that a 20% contingency be applied to these values to allow for market fluctuations and engineering support.

**Table 10.1: Summary of Recommendations - WTP**

| Recommendation | Cost Estimate | Priority (Years from 2025) |
|---|---|---|
| 1. Inspection of Intake and intake pipe. | $12,500 | 1-2 years |
| 2. Install new raw water pump. | $2,500 | When needed |
| 3. Continue to monitor pump and valve functionality (raw and high lift). | $0.00 | Ongoing |
| 4. Clean and re-passivate filter and GAC tanks. | $120,000 | 3-5 years |
| 5. Replace floc recirculators. | $30,000 | 1 year |
| 6. Review alternative coagulants and flocculants. | $15,000 | 1 year |
| 7. Replace filter and GAC media. | $170,000 | 2-3 years |
| 8. Renew online analytical equipment. | $25,000 | Annually (for 3 yrs) |
| 9. Inspect reservoirs and pump wells. | $7,500 | 1-2 years |
| 10. Continue to exercise reservoir sluice gates. | $0.00 | Ongoing |
| 11. Replace GAC pump well access hatch. | $25,000 | 1-2 years |
| 12. Replace two high lift pumps. | $25,000 | 1 year |
| 13. Replace SCADA HMI computer. | $10,000 | 1 year |
| 14. Replace laboratory water quality meter. | $10,000 | 2-3 years |

**Table 10.2: Summary of Recommendations - STP**

| Recommendation | Cost Estimate | Priority |
|---|---|---|
| 1. Develop and implement grit and screenings management procedure (OCWA). | $0.00 | 1 year |
| 2. Remove vegetation and clean scum from primary clarifiers. | $0.00 | Ongoing |
| 3. Rehabilitate primary clarifier scum air lift systems. | $35,000 | 1-2 years |

| Table 10.2: Summary of Recommendations - STP | | |
|---|---|---|
| **Recommendation** | **Cost Estimate** | **Priority** |
| 4. Remove RBC covers, inspect media packs and shaft, replace media packs as needed.* | $25,000 | 1 year |
| 5. Replace secondary clarifier insulated covers. | $60,000 | 2-3 years |
| 6. Remove vegetation and clean scum from secondary clarifiers. | $0.00 | Ongoing |
| 7. Assess and rehabilitate secondary clarifier scum air lift systems. | $40,000 | 2-3 years |
| 8. Verify functionality of UV system. | $0.00 | Ongoing |
| 9. Replace septic and lime tank mixers (x3). | $55,000 | 1-2 years |
| 10. Process pump replacements. | $15,000 | Annually (for 5 yrs) |
| 11. Replace odour control units (x2). | $85,000 | 3-5 years |
| 12. Replace composite samplers (x2). | $50,000 | 2-3 years |

* the allowance for item 4 includes for the replacement of 1 media pack.

| Table 10.3: Summary of Recommendations – Building and Grounds | | |
|---|---|---|
| **Recommendation** | **Cost Estimate** | **Priority** |
| 1. Repair chain link fence. | $2,500 | Maintenance – ASAP |
| 2. Re-set roof screws. | $0.00 | Maintenance - ASAP |
| 3. Monitor for proper operation of building systems. | $0.00 | Ongoing |

## 11.0 CLOSURE

Should you have any questions or require additional information regarding the contents of this condition overview report, please contact the undersigned.

Thank you.

Respectfully Submitted:
**Kresin Engineering Corporation**

Chris Kresin
Digitally signed by Chris Kresin
Date: 2024.11.15 15:15:49 -05'00'

Chris Kresin, M.Sc.(Eng.), P.Eng.
President

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