To: **Warden and Members of County Council**

From: **Director of Public Works**

2020 Annual Wastewater System Performance

RECOMMENDATIONS

1. **That County Council receive Report No. PW 2021-06 entitled "2020 Annual Wastewater System Performance," including the individual 2020 Annual Wastewater Treatment Plant Summary Reports;**

2. **And further, that County Council receive the 2020 Annual Biosolids (Non-Agricultural Source Material) Summary Report, including the performance summary of the County's wastewater treatment plant biosolids processing, land application program and biosolids centralized storage facility.**

REPORT HIGHLIGHTS

- This report summarizes the annual performance of Oxford County's nine municipal wastewater treatment plant (WWTP) systems and biosolids processing in 2020.

- Oxford County WWTPs provided effective treatment and demonstrated continued exceptional wastewater system performance in 2020. Based on approximately 4,368 WWTP effluent samples collected and analyzed in 2020, five of the nine County municipal wastewater systems achieved 100% compliance ratings (with the remaining four receiving compliance ratings of 97%, 98%, and two plants with 99%).

- Consistent with Oxford County's direction of innovative and green technology, various optimization (Ingersoll WWTP, Tavistock WWTP) and solar power (Woodstock WWTP) projects were undertaken in 2020 to offset energy consumption.

Implementation Points

Following Council adoption of this report, the 2020 Annual WWTP Reports (Attachment 1) and Biosolids Report (Attachment 2) will be submitted to the Ministry of the Environment, Conservation and Parks (MECP) in accordance with regulatory requirements by March 31, 2021. These reports will also be posted on Oxford County's website for public access.

Financial Impact

There are no financial impacts as a result of this report. Any required actions that will result in expenditures have been accounted for in the 2021 Operating and Capital Budgets of the respective wastewater system.

Communications

As indicated, the 2020 Annual Wastewater System Performance reports and the 2020 Biosolids Summary report will be posted to the County website for public access by March 31, 2021 at http://www.oxfordcounty.ca/Services-for-You/Water-Wastewater/Wastewater/Annual-reports. The results of each system's performance report will also be shared directly with its local area municipal CAO and Public Works director/manager.

The County communicates to the public its performance on all Public Works performance reports (Water, Wastewater, and Waste Management) through an annual social media campaign after the last report has been submitted to Council (March 31, 2021).

Strategic Plan (2015-2018)

					
WORKS WELL TOGETHER	***WELL CONNECTED***	***SHAPES THE FUTURE***	***INFORMS & ENGAGES***	***PERFORMS & DELIVERS***	***POSITIVE IMPACT***
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DISCUSSION

Background

Oxford County wastewater treatment, biosolids management and wastewater collection systems are all supervised by an appropriately licensed Overall Responsible Operators (ORO) and designated Operators in Charge (OIC). In addition, the County systems are staffed with trained licensed Operators, as required by Regulation.

Wastewater Treatment and Biosolids Processing Systems

Oxford County operates and maintains:

- Three conventional activated sludge mechanical WWTPs (Woodstock, Ingersoll, Tillsonburg)
- One extended air WWTP (Thamesford)
- One wastewater Sequencing Batch Reactor (SBR) plant (Drumbo)
- Three wastewater lagoon-based systems (Norwich, Plattsville, Tavistock)
- One Recirculating Sand Filter (RSF) wastewater system (Mount Elgin)

Wastewater from the communities of Embro and Innerkip is transferred via a sewage forcemain to the Woodstock WWTP for treatment.

At the three conventional WWTPs, waste sludge generated during wastewater treatment is stabilized and dewatered through either aerobic or anaerobic digestion. The remaining product, known as biosolids, is a valuable and beneficial fertilizer-like soil nutrient which can be land applied in the agricultural sector (i.e. farms having a non-agricultural source material plan) as per the Oxford County Biosolids Management Master Plan. When the material cannot be directly land applied during the winter months, biosolids are stored at the County's Biosolids Centralized Storage Facility (located adjacent to the Oxford County Waste Management Facility).

Wastewater Collection Systems

Oxford County owns 11 sewage collection systems, nine of which are also operated and maintained by Oxford County. The remaining two are operated and maintained by the City of Woodstock and the Town of Tillsonburg under service contract with Oxford County.

The wastewater collection systems include approximately 604 km of sanitary sewers and forcemains, 35 sewage pumping stations and two odour control facilities. Additionally, the County contractually operates a private sewage pumping station (401 Service Centre).

Wastewater Reporting Requirements

The annual reporting requirements are set out in each wastewater facility's Environmental Certificate of Approval (ECA) and are generally outlined as follows:

- Preparation and submission of the report to the District Manager of the MECP within 90 days following the end of the period being reported on (which is March 31 since December 31 is the County's year-end).
- A summary and interpretation of all monitoring data and a comparison to the effluent limits set out in the ECA.
- A description of any operating problems encountered and corrective actions taken.
- A summary of all maintenance carried out on any major structure or equipment.
- A summary of any effluent quality assurance or control measures undertaken.
- A summary of the calibration and maintenance carried out on all effluent monitoring equipment.
- A tabulation of all generated biosolids and a summary of all disposal locations.
- A summary of any complaints, abnormal events, upset conditions, by-passes or spills.
- Any other information specifically required by the District Manager.

Comments

2020 Annual WWTP System Summary Reports

While the full details are provided in the individual WWTP reports (Attachment 1), the overall WWTP system highlights include:

- 11 communities were served through nine separate wastewater systems.
- Approximately 14.7 million cubic metres of wastewater was responsibly treated.
- Approximately 4,368 WWTP effluent samples were collected and analyzed, from which an overall facility ECA compliance of 99% (43 failed samples) was achieved.
- WWTP facilities were also largely compliant with the MECP effluent objectives (which serve as early warning indicators and operational flags that staff monitor in order to ensure that ECA effluent compliance limits are not exceeded).
- One wastewater collection system spill incident occurred which did not result in sewage discharges to the environment.

Drumbo Sequencing Batch Reactor (SBR)

- The Drumbo SBR was 98% compliant with all its regulatory effluent limits (13 exceptions). The non-compliance (NH_3) was a result of some very high organic material that entered the plant in the late fall.
- As mentioned above, plant performance late in the year was impacted by black, organic material contained within the influent that was very high in nutrients. The source of material was investigated, the plant cleaned out and the forcemain to the plant was swabbed.
- The Drumbo SBR had the occasional objective exceedances due to ongoing operation nearing its rated capacity. Accordingly, Oxford County is currently undertaking construction to expand the treatment facility capacity (new membrane bioreactor technology) to address these operational constraints with a target in-service date of 2022.

Tillsonburg WWTP

- The Tillsonburg WWTP was 99% compliant with all of its regulatory limits (7 exceptions). A non-compliance (TSS) occurred late in the year. Treatment during 2020 was complicated by events of high-strength influent (TSS/oil) and equipment malfunctions that hindered operational performance. As a result, the plant failed to meet effluent objectives discharge limits 26 times in 2020 (TSS, E. coli, TP, $CBOD_5$).
- The Town of Tillsonburg implemented a new sewer flushing program this year, which helped to reduce the effects of the increased solids loading to the plant, especially during high flow periods. Staff at the plant intensified the solids removal processing at the treatment facility throughout the year, in order to remain compliant. In the future, regular sewer flushing will decrease the accumulation of material in the wastewater collection system and reduce the stress on treatment plant operations. Sewer Use By-law staff are investigating the source of the oil that impacted the plant late in the year.
- Phase 1 WWTP construction upgrades, including new headworks, primary clarifiers, secondary clarifier, blowers, waste activated sludge (WAS) thickening, and various piping and control upgrades will commence in spring, 2021. As detailed in Report No. PW 2020-54, the upgrades will strategically address WWTP system bottlenecks to improve operational performance and free up servicing capacity.

Ingersoll WWTP

- The Ingersoll WWTP was 100% compliant with all its regulatory limits.
- Failure to meet effluent objectives (TSS, TP, NH_3, E. coli) occurred 23 times in 2020. Most of these objective failures were related to plant hydraulics and clarifier baffle plates were installed to slow down the aeration effluent flow, which improved solids settling and resulted in decreased total suspended solid concentrations within the effluent.
- 2020 energy enhancements, consistent with the County's direction of innovative and green technology, resulted in reduced WWTP energy demand (cost savings) as follows:
  - Electricity consumption avoidance over 2019 and 2020 totals 489,400 kWh (equivalent greenhouse gas emission reduction of approximately 21 Tonne CO_2e) when the flow per electrical consumption is normalized with the 2018 data (prior to plant upgrades). Specifically, in 2020, the WWTP processed wastewater at a reduced energy cost of 1.71 m^3/kWh (versus 1.49 m^3/kWh in 2018 – prior to plant upgrades and optimization).

Plattsville Lagoon

- The Plattsville Lagoon achieved 100% compliance with its regulatory effluent limits.
- Failures to meet effluent objectives at the Plattsville Lagoon occurred on two occasions (TSS) within the first week of the discharge season. In the past few years, changes to the operational processes along with plant equipment (electrical and chemical equipment) improvements have dramatically reduced the objective exceedances.

Tavistock Lagoon

- The Tavistock WWTP provided effective treatment, meeting 100% of its regulatory limits and objectives for all parameters in the effluent discharged to the Hohner Drain (eventually to the Thames River).
- In 2020, upgrades to the existing aeration system (Cell 1) and berm repairs were completed, along with the removal of approximately 11,253 wet tonnes of biosolids.
- These plant upgrades, consistent with the County's direction of innovative and green technology, will serve to offset WWTP energy demand (cost savings) as follows:
  - Electricity consumption avoidance in 2021 is projected at approximately 946,200 kWh (equivalent greenhouse gas emission reduction of approximately 40.7 Tonne CO_2e) based on the more efficient aeration system. The 2020 upgrade will avoid approximately $115,000 in annual energy costs going forward and also avoid an estimated $100,000 in capital equipment costs that would have been otherwise required to install higher capacity blowers for the existing aeration system.

Mount Elgin WWTP

- The Mount Elgin WWTP has no effluent compliance limits for the system; however, the ECA requires Oxford County to use best efforts to operate the WWTP within $CBOD_5$ and TSS effluent objectives < 10 mg/L, both of which were met in 2020.

Thamesford WWTP

- The Thamesford WWTP met 99% of its regulatory compliance limits for all parameters in the effluent (8 exceptions). The non-compliance (NH_3) occurred in June with the occurrence of filamentous bacteria. Process changes and seed sludge from surrounding plants was brought in and, shortly afterwards, the nitrification process improved.
- Failure to meet effluent objectives at the Thamesford WWTP occurred on 25 occasions (TSS, CBOD, TP, NH_3) in 2020. Operational challenges have presented themselves since the extensive modifications of 2018, when a local major food processing plant had ceased operations. Operators strive to meet ECA objectives on a continual basis.

Norwich Lagoon

- The Norwich Lagoon achieved 97% compliance with its regulatory effluent limits (ten exceptions). Most of these exceptions were due to operational challenges in managing pond short-circuiting and wastewater system inflow and infiltration.
- 12 effluent discharge monthly objective exceedances (TSS, BOD, NH_3, TP, E. coli) occurred throughout the year. Various operational processes have been undertaken by staff to address these objective exceedances, including the use of a recirculation pump system to lower TSS and E. coli levels, altering the time of the discharge to be at maximum daily temperatures to assist in nitrification, and the isolating of the ponds when discharging.
- A lagoon feasibility study was completed in 2020 to review bacterial exceedances in the lagoon effluent, assess operational optimization opportunities and consider various technologies which may be suitable in providing expanded lagoon treatment capacity. The findings of this study served to further inform the Norwich WWTP Expansion Class EA Study currently underway in 2021.

Woodstock WWTP

- The Woodstock WWTP achieved 100% with its regulatory limits.
- All effluent discharge objectives listed in the WWTP's ECA were met.
- In 2020, County of Oxford began working with McMaster University, joining the COVID-19 Wastewater Consortium of Ontario. An innovative study was launched to detect COVID-19 in wastewater, and to trace the spread of the virus within the community. The study brings together industry, private labs, technology firms, government and universities, to help pool resources and expertise to best respond to current and future pandemics. Testing is underway, primarily focusing on the Woodstock Wastewater Plant and collections system, with plans to test other Oxford municipalities in 2021.
- 2020 energy enhancements, consistent with the County's direction of innovative and green technology, were as follows:
    - The 490 kW net-metered solar farm installed in 2019 was fully commissioned in May, 2020. It is projected to offset about 847,000 kWh of energy consumption per year.
    - One of the plant's anaerobic digesters was cleaned out in 2020. This allowed for maintenance to the digester sludge recirculation system and gas mixing equipment within the digester. These activities will enhance the digestion process to maximize biogas production for the unit. The biogas in turn is used as fuel for the plant's boiler system, to provide heat to the facility, and decrease the reliance on supplied natural gas.

Collection System Performance

As summarized in the table below, in 2020, there was one incident involving the collection system which did not result in any discharge to the environment. The incident was reported to the MECP at the time of the occurrence and corrective actions were taken to prevent future occurrences.

Overflow/Spill Incident	Corrective Action Taken	System Affected	Volume (m^3)
Collection System			
A sanitary sewer leak occurred at a construction site. An excavator was digging and broke the forcemain connected to a pump station.	The wastewater was contained within the excavated area. Vac-trucks were brought in to clean up the spill, and the forcemain was repaired. The event was reported to the MECP at the time.	Tillsonburg	15

2020 Annual Biosolids (Non-Agricultural Source Material) Summary Reports

The Annual Biosolids (Non-Agricultural Source Material) Report (Attachment 2) provides the required detail regarding the biosolids program to the MECP regarding the amounts of biosolids generated at each WWTP, the quantities transported, the quantities stored at the BCSF and the quality and quantities of biosolids reused beneficially as a nutrient on agricultural land.

Biosolids Generation

In 2020, there were approximately 6,300 wet tonnes of dewatered biosolids generated by the Woodstock, Ingersoll and Tillsonburg WWTPs and taken to storage at the County of Oxford BCSF. The Thamesford WWTP land applied 2,800 m^3 of liquid biosolids and transferred 2,600 m^3 of partially digested biosolids to the Woodstock and Ingersoll WWTPs for primary co-thickening. The Drumbo WWTP transferred approximately 1,400 m^3 of raw sludge to the Woodstock WWTP for primary sludge co-thickening. The Woodstock digester cleanout generated close to 2,600 m^3 of liquid biosolids which were land applied, while the Tavistock Lagoon cleanout generated roughly 11,253 wet tonnes of biosolids that, due to high molybdenum content, was used as cover material at the Oxford County Waste Management Facility.

Land Application Program

In 2020, there were approximately 7,300 wet tonnes of dewatered biosolids and 5,400 m^3 of liquid biosolids land applied. The quality of biosolids from all facilities were compliant with the Nutrient Management Act (NMA) regulations governing NASM with the exception of Tavistock biosolids which were taken to the Oxford County Waste Management Facility.

Biosolids Centralized Storage Facility

When the material cannot be directly land applied during the winter months, biosolids are stored at the County's BCSF which is designed to provide a minimum of 240 days storage. The capacity that the BCSF can store is approximately 7,000 m^3 of biosolids material. There were no upsets/spills during operation in 2020 and no complaints (i.e. odour) were received in connection with the BCSF.

The regular application of Oxford County Sewer Use By-law serves to actively monitor the quality and quantity of biosolids produced.

Conclusions

The 2020 Annual WWTP and Biosolids Summary Reports show continued excellent performance for the County's wastewater systems. Issues that arose were generally minor in nature and were resolved in a timely fashion. All biosolids generated in Oxford County WWTPs and applied on agricultural lands in 2020 met the NMA regulations.

SIGNATURES

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ATTACHMENTS

Attachment 1: 2020 Annual Wastewater Treatment Plant (WWTP) Reports
Attachment 2: 2020 Year-End Biosolids Annual Report