

For Information Only

Wastewater Operational Savings

Presented To: Operations Committee

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Type: Correspondence for Information Only

Resolution

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Relationship to the Strategic Plan / Health Impact Assessment

This report supports initiatives to "Optimize Asset Service Life through the Establishment of Maintenance Plans" (1.1) and "Demonstrate Innovation and Cost-Effective Service Delivery" (1.5) as laid out in the City of Greater Sudbury's Strategic Plan for 2019-2027. More specifically, the date presented shows how Wastewater Treatment Operations continue to avoid significant utilities costs while performing critical equipment repairs and upgrades to enhance operational effectiveness.

Report Summary

The report provides approximate costs for operational projects and repairs completed in 2019 by Wastewater Treatment employees, along with estimated savings through participation in the IESO ICI program and operational initiatives. Details are also provided on the costs associated with the new Sudbury WWTP generator. This report was requested as part of the annual update on Wastewater Operations and Energy Savings presented to the Operations Committee on June 15, 2020.

Financial Implications

The work completed by Wastewater Treatment employees to address equipment failures and process issues achieved saving through offsetting contractor costs and improving operational efficiencies at various CGS facilities.

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Summary:

Due to the diligent work of Wastewater Treatment employees, significant electricity cost mitigation and operational savings have resulted from participation in the Industrial Conservation Initiative (ICI) program and through preventative maintenance (tank cleaning) activities as shown below:

Year	Electricity Cost Avoidance (\$)	Operational Savings (\$)	Maintenance & Repair Costs (\$)
2017	\$ 211,918	\$ -	\$ -
2018	\$ 300,093	\$ 180,000	\$ 90,576
2019	\$ 421,402	\$ 78,500	\$ 363,418
Total	\$ 933,414	\$ 258,500	\$ 453,994

Net Savings:	\$ 737,920
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In addition to the net savings achieved, a number of critical equipment repairs were completed in 2019 at the Azilda, Lively and Sudbury WWTPs. These repairs, which were performed by Wastewater Treatment employees, were completed with no compliance issues or adverse environmental incidents, for a total of approximately \$72,140 as follows:

- Azilda, Lively & Sudbury WWTP Clarifier Repairs: \$29,380
- Azilda WWTP MCC Fire Repairs: \$8,390
- Lively WWTP Tank Repairs: \$34,370

Background:

As part of the annual update on Wastewater Operational Projects and Energy Savings given to the Operations Committee on June 15th 2020, a follow up report was requested to provide additional details on the following items:

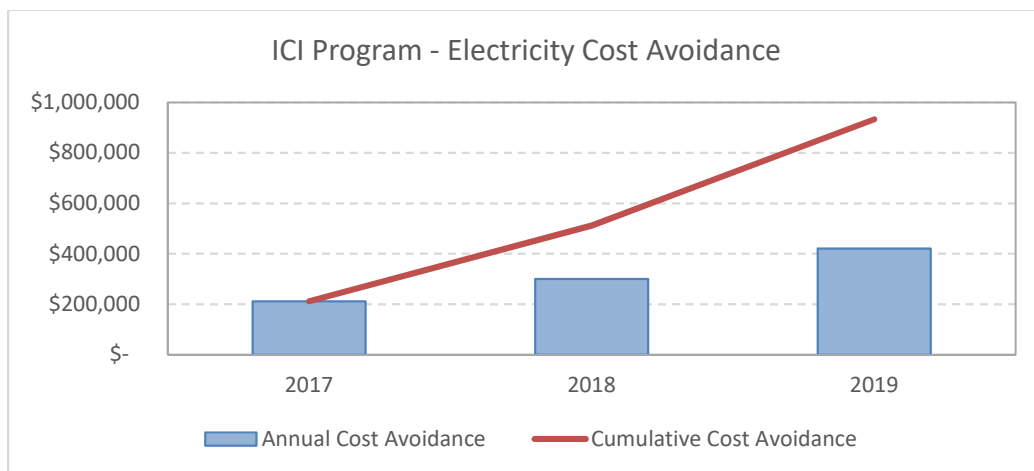
1. Cumulative electricity costs avoided through participation in the Industrial Conservation Initiative (ICI) for the period from 2017 to 2020;
2. Estimated cost for the Sudbury Wastewater Treatment Plant (WWTP) generator project, including the incremental cost to classify the generator as a “standby” (instead of “emergency”) unit;
3. Total costs and energy savings resulting from the tank cleaning and preventative maintenance activities from 2018 to 2020, and;
4. Cost associated with critical equipment repairs at the Azilda, Lively and Sudbury WWTP completed in 2019.

Electricity Cost Avoidance:

I. Cumulative Savings from the ICI Program

As detailed in the initial report submitted to Operations Committee, the Sudbury WWTP participates in the Industrial Conservation Initiative (ICI), which is administered by the Independent Electricity System Operator (IESO). By reducing the electrical consumption at the plant during the 5 peak electrical power demand hours in Ontario during a given year, staff can significantly reduce the amount of Global Adjustment billed to the facility the following year.

The Sudbury WWTP has been participating in the ICI since 2016, resulting in mitigated electrical costs starting in May of 2017. Annual and cumulative cost avoidance achieved by participating in the program are as follows:



II. Sudbury WWTP Generator Project

As part of long term capital planning and asset management, a project is currently underway to install a new generator at the Sudbury WWTP, our largest wastewater facility. Although the main driver for this work is to increase the available power during a power outage (as the existing emergency generator cannot fully power the facility), it also provided an opportunity to mitigate additional utility charges.

By investing additional funds into emissions control measures for the proposed diesel generator, we are able to operate it as a “standby”, rather than an “emergency”, unit. This provides the flexibility to run the generator outside of planned or forced power outages, allowing the Sudbury WWTP to completely remove itself from the electrical grid during the 5 peak hours used to calculate GA charges. If the facility is able to successfully do this, we will be able to completely mitigate the GA currently charged to the facility.

Current estimate costs and savings for the generator project are as follows¹:

- Total estimated cost for SWWTP Generator: \$6,015,000
- Cost for emissions control²: \$750,000
- Global Adjustment Cost Mitigation³: \$280,500

Based solely on the costs mitigated through Global Adjustment abatement, the cost of the additional emissions control equipment required to operate as a standby unit has a payback of 2.7 years.

Operational Savings & Preventative Maintenance:

The City of Greater Sudbury currently operates 10 wastewater treatment facilities, 9 of which use an activated sludge process. In this type of treatment bacteria, protozoa, and other microorganisms (the “activated sludge”) feed on organic matter in the wastewater, removing contaminants such as phosphorous and ammonia. In order to promote microbial growth and proper mixing where this process occurs, air is continually injected into the aeration tanks using high capacity blowers.

Over time, even under ideal conditions, the piping and headers used to blow air into the tanks can plug (due to dirt or sludge accumulation) or break as they reach the end of their effective service life. These failures significantly reduce the effectiveness of mixing and oxygen transfer in the treatment process. Ideally, preventative cleaning and maintenance should be performed every 5 to 7 years, however, historically Wastewater Treatment has done these tasks on a much less frequent timeframe.

To address these deficiencies, a pilot project was done in 2018 to clean one of the eight aeration tanks at the Sudbury WWTP. The goal was not only to address process deficiencies, but also to assess the resulting energy savings from improving the aeration efficiency. Based on the results, a three year tender to clean out the aeration tanks at all CGS wastewater treatment plants, and the chlorine contact chamber at the Sudbury WWTP was issued.

A summary of the costs incurred, and estimated savings for 2018 and 2019 is as follows:

Year	Plant	Tank	Cost (\$)			Est. Savings (\$/year)
			Cleanout	Maintenance	Total	
2018	Sudbury	Aeration Tank 4	\$ 78,856	\$ 11,720	\$ 90,576	\$ 180,000
2019	Sudbury	Aeration Tank 1	\$ 65,000	\$ 11,720	\$ 76,720	\$ 62,500
2019	Sudbury	CI Contact Chamber	\$ 238,834	\$ -	\$ 238,834	\$ - ⁴
2019	Walden	Aeration Tanks 1 & 2	\$ 41,865	\$ 6,000	\$ 47,865	\$ 16,000

¹ Capital cost estimates obtained from Akli Ben-Anteur, Water/Wastewater Project Engineer, 14-Aug-2020

² Incremental costs required to operate as a “standby” unit

³ Estimated as 75% of the actual Global Adjustment charges from 06 2019 to 06 2020.

⁴ Cleaning the chlorine contact chamber does not result in any energy savings. However, it improves the quality of the final effluent and ensures that the facility is running at full capacity.

The funds to complete the tank cleanouts and preventative maintenance has been made available without increasing the water rate past the approved amounts due to the cost mitigation and operational savings achieved as part of other initiatives.

It is expected that the tank cleaning program will cost approximately \$350,000 a year for 2020 and 2021, which will be the end of the current three year contract. It is anticipated that a new contract will be tendered at this point to begin clean outs of the Capreol and Wahnapiatae Lagoons to ensure ongoing operational sustainability and environmental compliance.

Critical Equipment Repairs:

A number of key equipment failures occurred in 2019 which affected treatment operations. In all cases, repairs were completed by wastewater treatment employees without any releases or non-compliance incidents, and were as follows:

I. Clarifiers, Various Facilities

Clarifiers are large circular tanks that separate the activated sludge from the final effluent, which is disinfected and discharged to the environment. In smaller facilities, the loss of a clarifier could result in significant compliance issues as the sludge, which contains all of the nitrogen and phosphorous removed from the raw wastewater, would not be effectively separated from the effluent. In larger facilities with multiple clarifiers, such as the Sudbury WWTP, the capacity of the facility would be reduced until repairs are completed.

The clarifiers that were repaired in 2019 were as follows:

Facility / Tank	Potential Impact	Approximate Repair Cost (\$)	Notes
Sudbury WWTP Clarifier #2	Reduced Capacity	\$ 2,590	Capacity of Sudbury WWTP reduced by 17% during repairs
Azilda WWTP	Non-Compliance (Final Effluent)	\$ 840	Components required were covered under warranty
Lively WWTP	Non-Compliance (Final Effluent)	\$ 5,950	Flow diverted to Walden WWTP during repairs

II. Azilda WWTP Fire

In March 2019, a failure in a Motor Control Centre (MCC) resulted in a fire which damaged key electrical infrastructure at the facility. The root cause of the failure was identified as a starter motor for a blower that was approximately 40 years old. The facility operated in a limited capacity while repairs were completed in approximately 1 day.

Total cost of the repairs was approximately \$8,390.

III. Lively WWTP Tank Walls

The Lively WWTP suffered a number of failures on the clarifier and vessel walls in late 2019. These failures resulted in a number of non-compliances as partially treated wastewater short circuited the process. Flow was diverted to the Walden WWTP while wastewater treatment staff worked with a local contractor to execute repairs.

Total cost of the repairs was approximately \$34,370.