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

From: **Director of Public Works**

2021 Annual Wastewater System Performance

RECOMMENDATIONS

1. **That County Council receive Report PW 2022-09 entitled "2021 Annual Wastewater System Performance," including the individual 2021 Annual Wastewater Treatment Plant Summary Reports;**

2. **And further, that County Council receive the 2021 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 (the County) 11 municipal wastewater systems and biosolids processing in 2021.
- Of note, the County's nine wastewater treatment plants (WWTPs) provided effective treatment and demonstrated continued exceptional performance in 2021. Based on approximately 4,489 WWTP effluent samples collected and analyzed in 2021, six of the nine County municipal WWTPs achieved 100% compliance ratings (with the remaining three receiving compliance ratings of Thamesford 99%, Drumbo 96%, and Plattsville 95%).
- A summary of annual wastewater system capital investments and an overview of key maintenance activities that were completed on the wastewater infrastructure assets is also noted.
- Consistent with the County's direction of innovative and green technology, various optimization projects/studies (Ingersoll WWTP) and equipment upgrades (Woodstock WWTP, Plattsville WWTP) were completed in 2021 to further offset facility non-renewable energy consumption and reduce greenhouse gas emissions.

Implementation Points

Following Council adoption of this report, the 2021 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, 2022. These reports will also be posted on the 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 2022 Operating and Capital Budgets of the respective wastewater systems.

Communications

As indicated, the 2021 Annual Wastewater System Performance Report and the 2021 Biosolids Summary Report will be posted to the County website by March 31, 2022 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 Area Municipality CAO and Public Works senior management respectively.

The County communicates the performance of key Public Works systems (Water, Wastewater, and Waste Management) annually to the public through an annual social media campaign after the last performance report has been submitted to Council later this year.

Strategic Plan (2020-2022)

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

Background

The County's wastewater treatment, biosolids management and wastewater collection systems are all supervised by an appropriately licensed Overall Responsible Operator (ORO) and designated Operators in Charge (OIC) as required by Ontario Regulation (O.Reg.) 129/04.

Wastewater Treatment and Biosolids Processing Systems

The 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 sewage forcemains 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 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 (BCSF), located adjacent to the County Waste Management Facility.

Wastewater Collection Systems

The County owns 11 sewage collection systems, nine of which are also operated and maintained by the County. The remaining two are operated and maintained by the City of Woodstock and the Town of Tillsonburg under service contracts with the County which were last renewed in 2006 and 2012 respectively.

The wastewater collection systems include approximately 631 kilometers of sanitary sewers and forcemains, 8273 manholes, 123 grinder pump systems, 2 odour control facilities and 36 sewage pumping stations (including 401 Service Centre and Verspeeten Cartage).

Wastewater Reporting Requirements

The annual reporting requirements are set out in each wastewater facility's Environmental Compliance 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

2021 Annual WWTP System Summary Reports

The individual annual WWTP system reports will be available for review by the public on the County's website at http://www.oxfordcounty.ca/Services-for-You/Water-Wastewater/Wastewater/Annual-report by March 31, 2022. Highlights include:

- 11 communities were served by the County's municipal wastewater systems.
- Approximately 14.6 million cubic metres of wastewater was responsibly treated.
- Approximately 4,489 WWTP effluent samples were collected and analyzed, from which an overall facility ECA compliance of 98.4% (72 failed samples) was achieved.
- WWTP facilities were also largely compliant with the MECP Final Design Objectives (objectives) and Final Effluent Compliance Limits (compliance limits):
    - Compliance limits are maximum acceptable concentration for an effluent parameter permitted by the MECP, as detailed within each WWTP ECA. The limits are determined to prevent impairment to the quality of the receiving water body. The Owner is legally obligated to operate and maintain the treatment system to ensure the compliance limits are achieved.
    - Objectives are non-enforceable effluent quality values which the Owner is obligated to use best efforts to strive towards achieving on an ongoing basis. These objectives are to be used as a mechanism to trigger corrective action proactively, and voluntarily, before environmental impairment occurs and before the compliance limits are exceeded.

Drumbo WWTP

In 2021, the Drumbo WWTP was 96% compliant with all its regulatory compliance limits (35 exceptions). Specific exceedances of compliance limits and/or effluent objectives are as follows:

- In July and August, WWTP aeration equipment malfunctions led to non-compliance with several parameters - Total Ammonia Nitrogen (TAN), TAN loading, Total Suspended Solids (TSS).
- In October, heavy precipitation caused the flows to exceed the rated treatment capacity for half the month resulting in non-compliance (TSS, TSS loading).
- The WWTP failed to meet single sample effluent objective once for Dissolved Oxygen (DO) and monthly average effluent objectives on 20 occurrences for TSS, Flow, TAN, Carbonaceous Biochemical Oxygen Demand ($CBOD_5$) and Total Phosphorus (TP).

To address these operational constraints, Phase I construction began in 2021 to expand the treatment facility capacity, using a new membrane bioreactor technology, with a target in-service date of 2023. This WWTP capacity expansion will also provide additional capacity to service growth as well as allow for the continued delivery of effective, safe and dependable services.

In 2021, a Feasibility Study was also commenced to investigate further potential wastewater system servicing opportunities that may support additional growth in Drumbo. The Feasibility Study is anticipated to be completed in 2022 and will provide input to the servicing strategies under consideration as part of the County-wide Water and Wastewater Master Plan to be completed in 2023.

Ingersoll WWTP

In 2021, the Ingersoll WWTP achieved 100% compliance to its regulatory compliance limits. Specific exceedances of effluent objectives are as follows:

- The WWTP failed to meet single sample effluent objectives on six occurrences for TSS, TP, pH, E. coli and the monthly average effluent objectives on one occurrence for TSS.
- The majority of these objective failures were related to a mechanical issue within the WWTP. In May, a secondary clarifier collector chain broke, resulting in poor settling. The repair was completed and WWTP performance improved.

In the fall of 2021, the County initiated a pilot co-digestion project which was consistent with the County's direction of Innovative and Green Technology. The project will explore the potential benefits of co-digesting FOG (fats, oils, and grease) with municipal sludge in the Ingersoll WWTP anaerobic digester in order to optimize digester operation and provide increased renewable biogas production which can be used to offset WWTP energy demands derived from fossil fuels. The project is anticipated to be completed in 2022 at which time the viability of full-scale implementation will be assessed.

Various capital improvements were completed at the Ingersoll WWTP in 2021, which will result in notable energy and cost savings. The replacement of older equipment with more efficient units is anticipated to realize an annual electrical avoidance of 55,714 kWh (equivalent greenhouse gas emission reduction of approximately 2.2 Tonne CO_2e per year). The completed 2021 upgrades are estimated to avoid an additional $8,914 in yearly energy costs.

Mount Elgin WWTP

In 2021, the Mount Elgin WWTP had no effluent compliance limits for the system; however, the ECA requires the County to use best efforts to operate the WWTP with $CBOD_5$ and TSS objectives < 10 mg/L, both of which were met in 2021.

As per the 2022 Business Plan and Budget, Public Works has initiated design work for the Phase 3 capacity expansion of the Mount Elgin WWTP in order to service future growth in the community.

Norwich WWTP

In 2021, the Norwich WWTP achieved 100% compliance to its regulatory compliance limits. Specific exceedances of effluent objectives are as follows:

- The WWTP failed to meet monthly average effluent objectives on seven occurrences for TSS, TSS loading, TP, and TP loading.
- County Staff have been undertaking various proactive operational adjustments to correct the objective exceedances, such as increasing alum dosage to lower effluent phosphorus concentrations, and isolating the lagoons during discharge to decrease effluent TSS.

A Municipal Class Environmental Assessment (EA) Study continues for the Norwich WWTP which will determine the most cost-effective, environmentally sound and sustainable approach to expand the WWTP capacity and service growth in Norwich over the next 25 years. The Class EA Study is anticipated to be completed in 2023.

Plattsville WWTP

In 2021, the Plattsville WWTP achieved 95% of its regulatory compliance limits for all parameters in the effluent (8 exceptions). Specific exceedances of compliance limits and/or effluent objectives are as follows:

- In October, a high level of algae was observed in the lagoons which resulted in a non-compliance for TSS and TSS Loading.
- The WWTP failed to meet the single sample effluent objectives on 24 occurrences for TSS, E. coli, and TAN.
- The WWTP failed to meet the monthly average effluent objectives on five occurrences for TSS and TAN.
- County Staff have implemented various operational strategies in an attempt to meet ECA objectives.

Of note in 2021, the County received Silver level recognition from the Grand River Conservation Authority Watershed-Wide Optimization Program for the Plattsville WWTP based on its 2020 system performance and regulatory compliance.

Various capital improvements were also completed at the Plattsville WWTP in 2021, which will result in notable energy and cost savings. The replacement of older equipment with more efficient units is anticipated to realize an annual electrical avoidance of 31,135 kWh (equivalent greenhouse gas emission reduction of approximately 1.2 Tonne CO_2e per year). The completed 2021 upgrades are estimated to avoid an additional $4,982 in yearly energy costs.

In 2021, a Feasibility Study looking into the potential for future WWTP expansion was completed. The feasibility study addressed treatment optimization and advanced technologies that would assist with operational issues and provide additional capacity for growth. The Study will provide input to the servicing strategies under consideration as part of the County-wide Water and Wastewater Master Plan to be completed in 2023.

Tavistock WWTP

In 2021, the Tavistock WWTP achieved 100% compliance to its regulatory effluent limits. Specific exceedances of effluent objectives are as follows:

- The WWTP failed to meet single sample effluent objectives on seven occurrences for TSS and TAN.

An application to increase the rated capacity of the Tavistock WWTP was submitted to the MECP in 2021 based on strong historical performance, recent aeration upgrades to enhance treatment, and alignment with the rated capacity of the Tavistock water system. The re-rating is currently under consideration by the MECP with an anticipated approval in 2022.

Thamesford WWTP

In 2021, the Thamesford WWTP met 99% of its regulatory compliance limits for all parameters in the effluent (11 exceptions). Specific exceedances of compliance limits and/or effluent objectives are as follows:

- Colder temperatures in February and March impacted aeration operational efficiency which resulted in higher ammonia concentrations in the WWTP effluent and a TAN non-compliance.
- The WWTP failed to meet single sample effluent objectives on 40 occurrences for TSS, TP and TAN.
- The WWTP failed to meet the monthly average effluent objectives on nine occurrences for TSS and TAN.

County Staff implemented microbial process changes (with the addition of seed aeration sludge from the Woodstock WWTP and Ingersoll WWTP) which resulted in nitrification process improvement. County Staff also have introduced an advanced warning system to detect any future potential upsets to the aeration system (nitrification process). Additional capital upgrades to the aeration system and headworks screening are currently being designed, with construction planned in 2023.

Tillsonburg WWTP

In 2021, the Tillsonburg WWTP achieved 100% compliance to its regulatory effluent limits. Specific exceedances of effluent objectives are as follows:

- The WWTP failed to meet single sample effluent objectives on 20 occurrences for TSS, E. coli, TP, $CBOD_{5.}$
- The WWTP failed to meet the monthly average effluent objectives on four occurrences for TSS.
- During the months of January, June, November and December, the WWTP experienced higher effluent containing TSS. County staff increased the polymer dosing to the secondary clarifier to aide with settling. Additionally, centrifuge dewatering operations were increased to make room in the digesters for increased raw sludge loading and wasting from the secondary clarifier.

In 2021, Phase 1 construction upgrades were initiated which will include new headworks, primary clarifiers, secondary clarifier, blowers, waste activated sludge (WAS) thickening, and various piping and control upgrades. 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, resulting in more resilient infrastructure.

In 2021, a year-long WWTP optimization project was completed involving the MECP Innovations Branch and Plant Operations. This work was part of Performance Based Training that aides Operators in the understanding of techniques and concepts to optimize plant performance. This project focused on mass balance control and operator process testing techniques that assisted the staff in their efforts to maintain WWTP compliance with regulatory effluent limits. Wastewater operator skill sets developed from this project have application across all the wastewater treatment operations.

Woodstock WWTP

In 2021, the Woodstock WWTP achieved 100% compliance with its regulatory effluent limits. Specific exceedances of effluent objectives are as follows:

- The WWTP failed to meet single sample effluent objectives on three occurrences for TP, TAN, and E. coli.

In 2021, the MECP selected the Woodstock WWTP to be a part of the Ontario Wastewater Surveillance Initiative (initiative); a collaboration which includes 13 institutions, 34 Public Heath Units and 117 Communities. The initiative involved the detection of the COVID-19 virus in wastewater and provides Public Health Units with another tool to aide in tracing infection. The Woodstock WWTP collected influent samples, which were analyzed by the Western University in London, Ontario. The results were provided to Southwestern Public Health in an attempt to predict the location and spread of the virus in the community.

In 2021, an inflow and infiltration (I&I) study was initiated to locate and reduce I&I in Woodstock's North Trunk Sewer catchment area. The County is actively pursuing ways of sustainably reducing I&I flow into its wastewater collection system to allow for increased wastewater capacity both within the collection system and the WWTP. Potential capacity gained through I&I reduction will serve to support future development while minimizing or deferring future wastewater infrastructure capital upgrades and energy requirements.

Various capital improvements were also completed at the Woodstock WWTP in 2021, which will result in significant energy and cost savings. The replacement of older equipment with more efficient units and the use of variable speed drives to control energy output is anticipated to realize an annual electrical avoidance of 201,964 kWh (equivalent greenhouse gas emission reduction of approximately 8.1 Tonne CO_2e per year). The completed 2021 upgrades are estimated to avoid an additional $32,315 in yearly energy costs.

2021 Wastewater System Infrastructure Investments

As per the revised 2021 Forecast in the 2022 Business Plan and Budget, the County invested over $17 million in rate supported wastewater infrastructure which included, but is not limited to, several notable capital projects as follows:

- Phase 1 Capacity Expansion of Drumbo WWTP ($4,500,000)
- Norwich WWTP Capacity Expansion Class EA Study ($115,000)
- Phase 1 Upgrades of Tillsonburg WWTP ($7,000,000)
- Water and Wastewater SCADA Master Plan ($720,000)
- Jack Poole (Woodstock) Trunk Sewer ($240,000)
- Woodstock North Trunk I&I Study ($205,000)
- Ingersoll Sanitary Sewer Replacements ($630,000)
- Ingersoll Sewer Re-lining ($200,000)
- Woodstock Sanitary Sewer Replacements ($1,400,000)
- Innerkip Odour Control – Ozone Upgrade ($133,000)
- Thamesford WWTP Facility Upgrades ($40,000)
- Tillsonburg (Stoney Creek) Sanitary Forcemain Replacement ($180,000)

In addition to the above noted capital investments in wastewater infrastructure, the County continues to prioritize the long term sustainability of its wastewater systems. Of note, the County manages its wastewater infrastructure asset inventory, adds and tracks asset

information, and regularly generates asset maintenance work orders using a digital asset management system (Cartegraph). Through proactive asset management, the County strives to optimize the service life of its wastewater assets and promote the overall long term sustainability of its wastewater system. The County continues to integrate its wastewater infrastructure, among other assets, within the corporate Asset Management Systems Enhancement project as part of overall compliance to O. Reg. 588/17 – Asset Management Planning for Municipal Infrastructure, under the *Infrastructure for Jobs and Prosperity Act, 2015*.

The County Public Works Department follows industry best management standards to annually monitor the levels of service and financial performance of its wastewater infrastructure and to ensure our wastewater infrastructure assets are maintained in good condition through effective preventative maintenance, optimized infrastructure decision-making and strategic capital planning (replacement, repair, expansion). In this regard, the ongoing Modernization Service Delivery Review is currently assessing the most appropriate and cost effective way for the County, and its service providers (Woodstock, Tillsonburg), to provide water distribution and wastewater collection services while maintaining or improving service levels. The SDR findings will be reported to County and Area Municipal Councils in March/April, 2022.

In addition, the County is currently undertaking a County-wide Wastewater Master Plan (Master Plan) to identify preferred wastewater servicing strategies to meet the County's growth needs to the year 2046 as well as provide effective on-going servicing continuity for existing settlement areas across the County as appropriate. Through this Master Plan, the long term ability of the County's wastewater system to service existing wastewater flow projections, as well as future growth needs, is being assessed in detail in terms of sustainable, affordable and reliable infrastructure. Oxford County Council will be receiving several upcoming updates regarding the Master Plan, which is targeted for completion in June, 2023.

2021 Maintenance of Wastewater System Infrastructure

In addition to the wastewater system capital investments noted above, several planned preventative maintenance activities are carried out annually to help optimize the useful service life and efficiency of wastewater infrastructure assets. A number of key maintenance activities are noted below for wastewater collection and wastewater treatment infrastructure respectively.

Wastewater Collection Infrastructure:

Preventative Maintenance Activity	Quantity
Sanitary Sewer Flushing	89,378 m
Sanitary Sewer CCTV inspection	48,292 m
# of Grinder Pump Inspections	50
# of Sanitary Manhole Inspections	1,709
# of Sanitary Manholes Repaired/Replaced/Adjustments *	58
# of Sewer Blockages Cleaned	4
# of Septic System Inspections	172

* excludes Woodstock & Tillsonburg manhole activities

In terms of corrective maintenance, Public Works repaired 3 forcemain breaks in 2021 and resolved 12 customer complaints (odour, sewage blockage, damaged manhole covers, etc.) that were received from within the various wastewater systems across the County.

Wastewater Treatment Infrastructure:

Preventative Maintenance Activity	Quantity
Equipment Lubrications	137
Equipment Inspections	29
Minor Equipment Maintenance and Repairs	173
Instrumentation and Flowmeter Calibrations	56
Standby Power Generator Maintenance	79
Digester Clean-outs	1

Overall, Oxford wastewater operators performed over 670 maintenance tasks in 2021 to support the efficient and reliable operation of its wastewater treatment plant assets.

Wastewater Overflow/Spill Incidents

As summarized in the table below, in 2021, there were three wastewater spill incidents involving the collection system and one wastewater overflow incident involving a treatment plant. All incidents were reported to the MECP at the time of the occurrence and corrective actions were taken to contain the occurrences.

Overflow/Spill Incident	Corrective Action Taken	System Affected	Volume (m^3)
Collection System			
A leak occurred at an air release valve on a sanitary forcemain.	Wastewater was contained within an excavated area. Vac-trucks were brought in to clean up the spill, and the air release valve was repaired. The event was reported to the MECP.	Tavistock	70
A leak occurred on the sanitary forcemain near the main Sewage Pumping Station.	Spill area was excavated and repairs completed. A Vac-truck was used to clean up the area, and the saturated soil was removed for disposal. The event was reported to the MECP.	Innerkip	86
A leak occurred on a sanitary forcemain.	Spill area was excavated and repairs completed. A Vac-truck was used to clean up the area, and the saturated soil was removed for disposal. The event was reported to the MECP.	Innerkip	3
WWTP			
A sudden, heavy rain event overloaded the hydraulic pumping capacity at the treatment plant, resulting in a backup of water into the collections system and an overflow of sewage from the on-site main pumping station.	Staff responded by operating the on-site main pumping station with all pumps in local control mode to maximize pumping volumes and flow rates, and provided oversight in case of an operational malfunction. This prevented further backup and decreased the duration and volume of the overflow. The event was reported to the MECP.	Ingersoll WWTP	98

2021 Annual Biosolids (Non-Agricultural Source Material) Summary Reports

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

Biosolids Generation

In 2021, there were approximately 6,800 wet tonnes of dewatered biosolids generated by the Woodstock, Ingersoll and Tillsonburg WWTPs which were taken for storage at the County BCSF.

- The Thamesford WWTP transferred approximately 3,200 m^3 of partially digested biosolids to the Woodstock and Ingersoll WWTPs for primary co-thickening.
- The Drumbo WWTP transferred approximately 1,800 m^3 of raw sludge to the Woodstock WWTP for primary sludge co-thickening.
- The Mount Elgin WWTP transferred 113 m^3 of septage sludge (tank maintenance cleanout material) to the Ingersoll WWTP for processing.

Land Application Program

In 2021, there were approximately 5,800 wet tonnes of dewatered biosolids applied to agricultural land. The quality of biosolids from all facilities were compliant with the Nutrient Management Act

Biosolids Centralized Storage Facility

When the biosolids 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 or spills during operation in 2021 and no complaints (i.e. odour) were received in connection with the BCSF.

The continued enforcement of the Oxford County Sewer Use By-law serves to help protect the quality of the biosolids. Oxford maintains an active monitoring and enforcement group with the goal of improving the quality and reducing the quantity of biosolids produced.

Conclusions

The 2021 Annual Wastewater Systems Summary Reports demonstrate Public Works' continued oversight of the County's municipal wastewater systems in order to effectively service Oxford residents and businesses, while providing responsible environmental stewardship and support to public health. The County continues to institute industry best management standards to annually monitor the levels of service and financial performance of its wastewater infrastructure and to ensure wastewater infrastructure assets are maintained in good condition through effective preventative maintenance, optimized infrastructure decision-making and strategic capital planning (replacement, repair, and expansion).

In this regard, the ongoing Modernization Service Delivery Review is currently assessing the most appropriate and cost effective way for the County, and its service providers (City of Woodstock and Town of Tillsonburg), to provide water distribution and wastewater collection services at levels which are consistent with industry standards and best practices.

SIGNATURES

Report Author:

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Original signed by

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ATTACHMENTS

Attachment 1: 2021 Annual Wastewater Treatment Plant (WWTP) Reports
Attachment 2: 2021 Year-End Biosolids Annual Report