1 ADDENDUM TASK 2.0: EFFLUENT DISCHARGE PARAMETERS

1.1 FOCUS REPORT TASKS DESCRIPTION

- Explain why the total nitrogen parameter has changed to 6 mg/L (daily maximum) from the 3 mg/L (proposed in the August 11, 2017 receiving water study).
- Provide data to support assertions that chemical oxygen demand (COD) can be reduced to the proposed limit.

1.2 DISCUSSION

1.2.1 Nitrogen

Nitrogen (N) in the effluent can exist in various forms, some that are available to the organisms during the treatment process and others that are not available (inert). The large majority of inorganic nitrogen is available, while organic nitrogen may or may not be available depending on the structure and degree of degradation of the organic nitrogen-containing molecules. The sum of inorganic nitrogen and degraded organic nitrogen is what is available to the treatment process.

During the laboratory-scale Veloia/AnoxKaldnes treatability study, analyses of nitrogen fractions in the untreated effluent showed that almost all nitrogen was present in organic forms, with very little available inorganic nitrogen. As was expected, this confirms that additional nitrogen must be added as a nutrient to maintain optimum biological removal efficiency.

Further analyses of the treated effluent indicated that roughly 2 mg/l was determined to not be available during treatment and remains as an inert soluble N fraction after treatment. The total nitrogen (TN) in the treated effluent discharge will then be made up of this inert N + any excess available N nutrient dosage + N present in outgoing total suspended solids (TSS).

With very well settled outgoing treated effluent samples, a discharge level around 5 mg/l TN was achieved in the tests. This is a better result than what can be achieved in practice, as lab settling of solids is more efficient than what is typically achieved in the field.

To account for the inert N present, the high lab efficiency and typical nutrient dosing residuals, it was recommended that a concentration of 3 mg/l was not unlikely achievable and 6 mg/l should be carried forward to the Receiving Water Study.

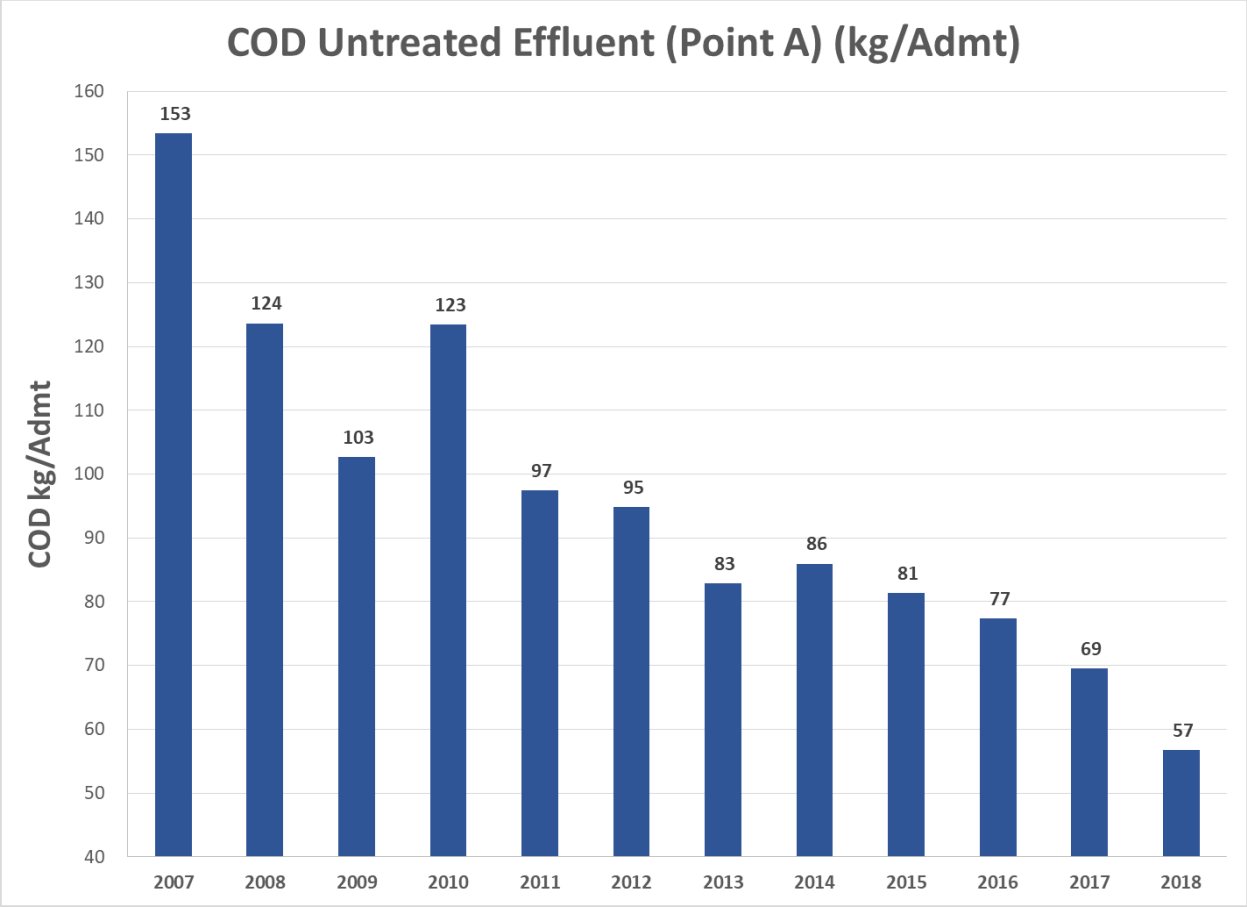
1.2.2 COD

As a condition of NPNS's industrial approval, a study was undertaken to identify all sources of COD contributing to mill effluent and develop a plan to achieve reductions of COD in untreated effluent (at Point A) over the term of the Industrial Approval. The COD study, attached, was completed in December of 2016. The report outlines the significant improvements that have been made since 2007, the year used to benchmarked NPNS untreated effluent quality against other Canadian mills (AMEC, Boat Harbour Return to Tidal Re-evaluation, April 2010).

Figure 1-1 of this COD study has been updated to include recent mill data. NPNS has made significant continuous improvements in untreated effluent quality realized in part by in-mill improvements undertaken by Paper Excellence Canada since it purchased the mill in 2011. These improvements include:

- Brownstock Screen Room Closure and Washer Upgrades (2011);
- Black Liquor Emergency Storage Tank (2011);
- Black Liquor Evaporator Plant Upgrade (2012);
- Indirect condenser and Ejector Set for Evaporator Plant (2016);
- Additional sewer measurements (conductivity and pH probes) (2017);
- Modification to Recaust Area Sewer System (2018);
- Improved shutdown and start-up management procedures (ongoing); and
- Continuous Improvement Activities (ongoing).

Figure 1-1: Evolution of Untreated Effluent COD (at Point A), 2007 - 2018



A benchmark COD of 1,900 mg/l was set for the duration of the Industrial Approval. The intention of this IA condition was to drive continuous improvement in black liquor losses at NPNS. The implementation plan that was developed, in conjunction with NSE, requires NPNS to test COD of untreated effluent daily and report incidents that are more than double the benchmark value (indicating that an incident outside of normal operations has occurred). Incidents are individually investigated at NPNS to determine what appropriate corrective actions will be implemented. It is important to note that NPNS has never diverted effluent flow to the spill pond at the BHETF related to these incidents. Effluent on these occasions was treated normally running through the BHETF. As the BHETF provides effective treatment even during upset conditions, none of the events have led to a reportable environmental exceedance of treated effluent discharging from the BHETF.

Condition 6 (e) iii) of the Industrial Approval outlines that NPNS must achieve a 50% reduction in untreated effluent COD, based on the benchmark, by the end of the IA term (January 2020). In other words, NPNS should operate below 950 mg/l by January, 2020. The annual average COD for untreated effluent in 2018 was 723 mg/l (measured as total COD), thus proving that the reduction is being met. NPNS will continue to report and investigate incidents that are more than two times the 1,900 mg/l benchmark as it has done since the implementation of the IA.

Effluent quality metrics based on concentration will need to be re-evaluated after in-mill cooling towers are installed in the future as mill water reduction will increase the concentration of untreated effluent without increasing the amount of pollutants that the effluent contains.

1.3 SIGNATURES

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