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M E M O R A N D U M

TO: Lori Duquette, Senior Environmental Officer, North Bay Office

FROM: Rod Sein, Surface Water Specialist, Northern Region

RE: North Temagami Lagoon EXP 2017 study Net Lake

This memo addresses the October 26th, 2017 Surface Water Impact Assessment-Temagami North Lagoon final report prepared by exp Services Inc. The exp report was requested by MOECC to support the request of the Municipality to remove condition 12 of the ECA regarding the installation of an *E. coli* disinfection system for treatment of the final effluent prior to discharge into Net Lake. *E.coli* disinfection is generally not required in properly operating lagoon systems. The 2008 Sewage Design Guideline document recommends two criteria for *E.coli* counts in final effluent. The monthly geometric mean counts should not exceed 200 organisms per 100mL in any STP discharge. This may be relaxed if the effluent is shown to cause no *"adverse effects on downstream beneficial water uses."* In the case where there is combined sewage overflows, and *"where the sewage discharge affects swimming and bathing beaches and other areas where there a health concerns"* the effluent must be disinfected and counts cannot exceed 1000 organisms per 100 mL. The PWQO for *E.coli* is 100 organisms per 100mL.

Background

The ECA specifies monthly sampling for *E.coli* in the final effluent. Prior to 2006, more than one sample was collected enabling a geometric mean to be calculated. In 2011, extremely elevated *E. coli* counts were measured in the final effluent during the winter months, (January-April). In years preceding and after 2011, *E. coli* counts of this magnitude were sporadic in nature however counts did exceed 1000 organisms per 100 mL 12X and over 200 organisms per 100mL 40X. Elevated counts were mostly

observed during the winter months. Counts of this magnitude strongly suggest that the lagoon is not operating properly.

Jan. 2006	38,000
Jan. 2011	83,200
Feb. 2011	220,000
Mar. 2011	70,000
Apr. 2011	60,000
Jan. 2012	2,400
Feb. 2013	19,400
Jan. 2014	1,600
Jan.2017	5600
Mar.2017	2700
Dec.2017	2700

The effluent discharges into Net Lake which is a recreational water body.

In addition to reviewing the exp report, I examined lagoon *E. coli* data for the period 2002-2017 in conjunction with weather data from the closest station located at Earlton airport.

Receiving waters

Net Lake (759 ha., mean depth 8.1m maximum depth 42.7m) has two main basins, west and east that are separated by a narrows. There is a public beach in the east basin as well as a municipal drinking water intake. The intake is located approximately 500m north of the lagoon's outfall. Both of these features are upstream of the lagoon's discharge as the lake flows in a southwesterly direction into Cassels Lake. The exp study was requested so that the impact of the lagoon's effluent on Net Lake could be determined. The following comments pertain to the report and address the conclusions and recommendations contained therein.

1. A total of 15 discrete sites within Net Lake were sampled by exp staff during the months of May-August 2017. One water sample was collected at each site. E.coli counts were all well below PWQO. The highest count (53 organisms per 100mL) was found at a background location located in the narrows between the two basins of the lake.

2. A model (WASP 8) was used to simulate E.coli dispersion from the outfall by using a conservative tracer. This is a commonly used approach. The results of the model were somewhat predictive of nearfield counts but did not accurately predict bacteria counts in the background station.

3. No in situ monitoring was used to supplement the model therefore there is uncertainty as to the behavior of the outfall plume from the lagoons.

4. E.coli counts from May-August were very low (5 organisms per 100mL). Since there is only one data point from the lagoon E.coli variability is unknown. If counts remained low throughout May-August then the higher counts observed upstream at background station 2 are likely from another source as mentioned.

5. Since the high effluent counts typically occur in the winter, the only sector of the population that may be at risk would be ice-fishers in the near field of the outfall. However this would have to involve both the presence of high *E. coli* counts in the lake water as well as the consumption of this contaminated raw lake water. Since no winter sampling has occurred when the *E. coli* counts were highest (>1000) the impact of these high counts on Net Lake remains unknown.

6. In my analysis of the *E.coli* and weather data, I discovered a positive correlation between summer total precipitation and winter *E. coli* counts. This does provide some insight into the sporadic nature of the elevated counts (years with more summer rain may lead to higher *E. coli* in the winter…less rain lower counts). It may suggest that short circuiting of the effluent is occurring, but there are certainly other factors, both physical and environmental that may contribute to the high variability observed in E.coli counts e.g. Ice cover, snowfall, runoff.

7. Based on my assessment of the historic data from the municipality, the lagoon cannot consistently produce *E. coli* counts that are within provincial guidelines during the winter months. As discussed above the reasons may be related to summer rainfall and effluent short circuiting.

Recommendations

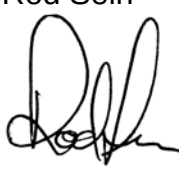
1. Since short circuiting of the effluent may be occurring, an assessment of the lagoons is necessary. Dredging maybe required to provide better mixing and more detention time of the effluent.

2. I would like to see an increase the monitoring frequency of E. coli to weekly so that bacterial variability can be assessed.

3. Since the highest *E. coli* counts occur in the winter months, winter monitoring of conditions under the ice would help to assess bacterial water quality near the lagoon outfall.

4. Use of in situ techniques to map outfall dispersion would be beneficial (e.g. dye study).

Rod Sein



RS/rs/