

Re: French River Sewage Treatment Lagoon Capacity
EBRO File Number: 10EBR006.R

Thank you for agreeing to our request to undertake a review of the Certificate of Approval No. 9346-7SLKMD for the Noëlville sewage treatment lagoons in the Municipality of French River. You have requested further clarification from us, which is provided herein.

1) The method of calculation used in the application to arrive at the figures for retention time and capacity of the sewage treatment lagoons cited in the application

The retention time (300 days) and capacity of the sewage treatment lagoons (143,168 m³) are specified in the Certificate of Approval. The central issue of the review is the *rated capacity* of the works, and its relation to retention time. The Certificate of Approval defines the *rated capacity* as “the *average daily flow* for which the works are approved” (Certificate of Approval, page 4). The *average daily flow* is further defined as “the cumulative total sewage flow to the sewage works during a calendar year divided by the number of days during which sewage was flowing to the sewage works that year” (Certificate of Approval, page 3). The works receives sewage flow for 365 days a year, therefore, the cumulative total sewage flow must be determined to calculate the *average daily flow*, and hence, the *rated capacity*.

The cumulative total sewage flow is the amount, or volume, of sewage that the works can handle. The Certificate of Approval states that the volume of the works is 64,994 m³ in Cell No.1 and 78,174 m³ in Cell No.2, giving a total volume of 143,168 m³. Therefore, if each cell is to be filled and emptied once a year, the maximum *average daily flow* is 143,168 m³ / 365 days = 392 m³/day. If both cells were filled and emptied twice a year then the works could handle approximately 784 m³/day, but the works would not achieve the designed retention time and would not provide proper treatment for the sewage. The retention time, in combination with operation on a seasonal discharge basis (see below), dictates that each cell may be discharged only once a year.

The Certificate of Approval describes the works in part as “a seasonal retention facultative lagoon with a design retention time of 300 days, including two (2) cells arranged in parallel...” (Certificate of Approval, page 2), and specifies in the General Provisions of Condition #1 (Certificate of Approval, page 4, 1(2)) that the works shall be operated “in accordance with the description given in this *Certificate*”. The retention time is the amount of time that the waste is *held* in the cells for treatment, approximately 150 days per cell. It is not the same as *the number of days during which sewage was flowing to the sewage works*, which is the correct parameter to use when calculating the *average daily flow*, as described in the Certificate of Approval. The error in calculating the current rated capacity was made by dividing the cumulative total sewage flow by the retention time (300 days) rather than dividing by the *number of days during which sewage was flowing to the sewage works that year* (365 days). An average daily flow of 477 m³/day for 365 days would result in 477 X 365 = 174,105 m³ per year, which is 22% greater than the 143,168 m³ capacity of the works.

Condition #8 (Certificate of Approval, page 8) refers to SPECIAL OPERATIONS – SEASONAL DISCHARGE and stipulates that “the owner shall operate the works such that the

discharge of effluent is conducted on a semi-annual discharge basis during each calendar year” over “a maximum period of twenty (20) days”. That means that there are only 2 opportunities a year, spring and fall, to empty the lagoon contents into the environment so that they can be refilled. This places clear constraints on the operation of the lagoons, such that only one of the two cells can be discharge per season if the designed retention time for treatment of the sewage is to be achieved. As one cell is being discharged, sewage is still entering the second cell. There is no way to hold the sewage in the second cell for treatment and still discharge both cells within 20 days. Therefore, each cell can be filled and discharge only once a year.

2) A published document/reference to the method of calculation used in the application, such as its source, e.g., a standard, protocol, textbook or otherwise.

The information for the calculations came from the Certificate of Approval itself and from reports from the Ontario Clean Water Agency (OCWA). The retention time and method of calculation for the *average daily flow* (and therefore the *rated capacity*) are specified in the Certificate of Approval itself. The works is designed to receive sewage 365 days a year and operate on a semi-annual discharge schedule. If both cells are discharged in the same season, the contents of second cell have not been properly held for treatment. We have enclosed a copy of the MOE Communal Sewage Inspection Report for the period and the 2008 Annual Report by OCWA which demonstrate the problems that can occur when a cell is discharged without adequate retention time. In the fall of 2008 the North Cell was discharged from October 21st to October 30th. The South Cell was then discharged from November 3rd to 13th, with a retention time of only a few days. This resulted in the discharge of over 42 million litres of undertreated sewage with suspended solids in excess of the compliance criteria in the Certificate of Approval. The Effluent Limit for CBOD5 Loading for the South Cell was also above the effluent limits (2008 MOE Inspection Report, page 3) and the levels of *E.coli*, NO₂, TKN and ammonium were much higher than those of the North Cell effluent, which had been held for 150 days and received proper treatment (OCWA Fall 2008 Release Report, compare North and South Cell levels). Such early discharges have become standard practice (once in 2007, twice in 2009) and have had detrimental effects on the receiving water including increased nutrient loading (data from MOE’s Ontario Lake Partners Program) and annual blue-green algae blooms that are increasing in size and duration every year.

We have also included a copy of a report prepared for the MOE by Michael Gundry, P.Eng. of the firm Totten Simss Hubicki Associates (now part of AECOM Technology Corporation). In this report Mr. Gundry discusses lagoon operation and notes (page 4) “most facultative lagoons treating municipal waste waters are designed for a detention time of 180 days due to seasonal discharge requirements.” The Certificate of Approval stipulates a retention time of 150 days per cell, presumably to allow time for discharge and lagoon maintenance. The key point is that each cell receives water for about half a year and the two cells combined must hold a year’s worth of sewage.

We have also prepared an appendix to illustrate lagoon performance and discharge requirements at different flow levels.

Summary

Due to the seasonal discharge regime and the retention time required for efficient waste water treatment, only one cell can be discharge per seasonal event. Therefore, the two cells combined have to be able to hold 365 days worth of sewage. Therefore, the maximum cumulative total sewage flow is 143,168 m³ and the maximum *average daily flow* is 143,168 m³/ 365 days = 392 m³/day. It is impossible for the system to average more than 392 m³/day and still operate as prescribed in the Certificate of Approval.

At the current rated capacity of 477 m³/day the lagoons fill in 300 days and therefore cannot be operated on the seasonal discharge schedule prescribed in the Certificate of Approval. The only way to deal with flows above the actual capacity of 392 m³/day is to discharge a lagoon prematurely without proper treatment. This has occurred on multiple occasions in recent years, including during the spring of 2007, the fall of 2008, and in both the spring and fall of 2009.

It is also important to remember that this discussion ignores the effects of rainwater and sludge accumulation in the lagoons, both of which lower the capacity of the lagoons and therefore the average daily flow that can be treated. For example, the French River area has a mean annual water surplus (precipitation minus evaporation) of about 330mm (13 inches) per year¹, which could cause a reduction in available lagoon volume by about 20% and put capacity at about 310 m³/day.

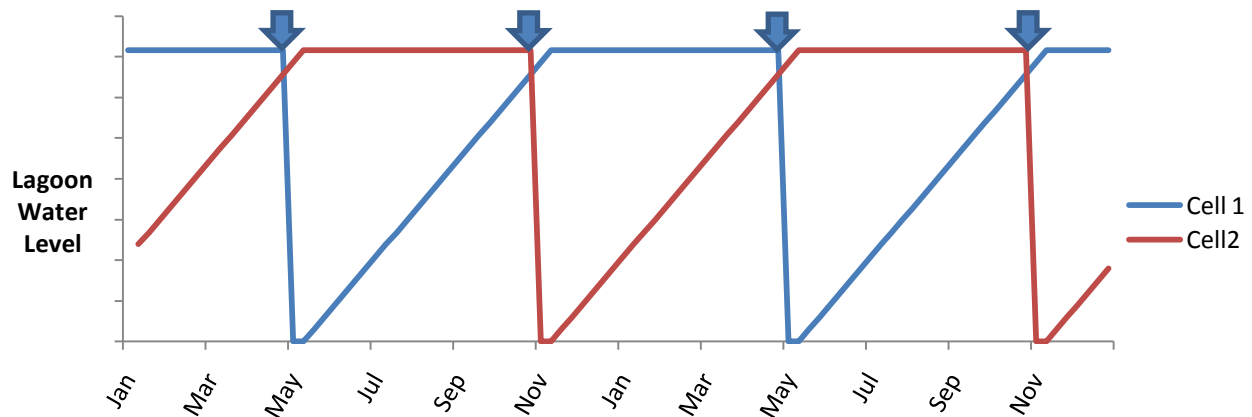
¹ L.J.Chapman & M.K.Thomas, The Climate of Northern Ontario, Climatological Studies, Number 6, Toronto, 1968.

Appendix

This appendix has been prepared to explore lagoon operations over a 2 year period at various flow rates. The illustrations have been prepared assuming idealized condition for two lagoons of equal volume with a constant flow rate and discharge windows exactly 6 months apart.

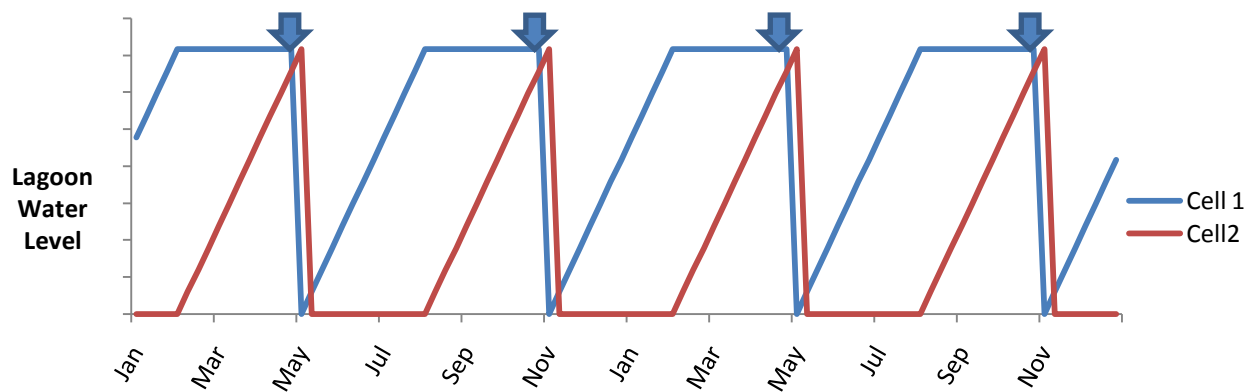
1-At 392 m³/day the lagoons each fill once a year, as depicted in Figure 1. The horizontal portion(s) of the lines are the retention period(s) when sewage is held in the lagoons for treatment. The blue arrows represent the semi-annual, spring and fall seasonal discharge events.

Figure 1 - 392 m³/day



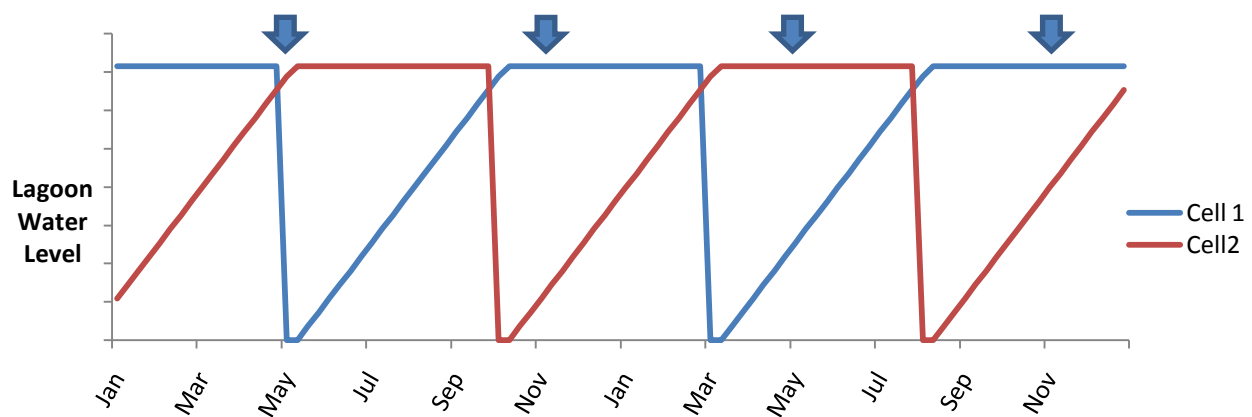
2-At 784m³/day the contents of each cell are release twice a year (Figure 2). The contents of Cell 1 are held for about 75 days before discharge but the sewage in Cell 2 must be discharged with minimal retention time of a few days in order to meet the seasonal discharge schedule. If Cell 2 was held for 75 days as Cell 1 was filling before being discharged, then discharges would occur in February, when the receiving waters are frozen over, or in August, when water levels are at their lowest and the receiving water is barely flowing, if at all. Neither of these discharge times provides the adequate flow to incorporate the effluent into the environment. Note that on the seasonal discharge schedule Cell 2 sits empty and unused for half of the year.

Figure 2 - 784m³/day, seasonal discharge



3-At the current rated capacity of 477m³/day the lagoons cannot meet their performance criteria as specified in the Certificate of Approval. That is because at 477m³/day the lagoons would fill in 300 days and for 65 days of the year there would be nowhere for the raw sewage to go. If the cells were discharged just in time to receive more sewage on a 300 day schedule as depicted in Figure 3, then discharges would occur in the summer and winter seasons with the problems noted above. At this rate of one discharge every 5 months, there would be 12 discharges over a 5 year period, with one discharge in each calendar month.

Figure 3 - 477 m³/day, late discharge



In order to follow the seasonal discharge schedule at 477 m³/day, the cells must be released early with insufficient holding time in order to be empty to receive sewage when the opposite cell is filled, as depicted in Figure 4. Note that under these conditions the cells hold the sewage for very short and in some circumstances no retention time at all while on the other hand the cells sit empty, and therefore unutilized, for extended periods of time. A review of the OCWA annual lagoon reports confirms that such premature discharges have indeed been occurring at the Noëlville sewage treatment works on a regular basis, as outlined in our initial submission on this matter.

Figure 4 - 477 m³/day, seasonal discharge

