

Response to EBR# 10EBR006.R by applicant Dr. William Nuttley, Ph.D.

The first page of EBR Review #10EBR006.R identified two specific allegations:

- The ministry made an error calculating treatment capacity.
- Data from the Lake Partners Program indicated possible environmental problems related to lagoon operations.

Neither of these allegations was properly addressed during the review. Points 2 and 3 below address the first allegation and point 8 addresses the second allegation. All of the points listed below are presented to highlight some of the problems with the Review Summary published by the MOE. There are many other inaccuracies in the review but they would be better addressed after the resolution of the concerns presented herein.

1 The review stated (pg.3), “The design approach used by the ministry to confirm the capacity of the NSL facility was based on continuous operation of the lagoons, described in this review as plug flow reactors.” The main point of my application for review was that the facility does not operate as a continuous plug flow reactor. The analysis assumed the exact point I was contesting. The Town of Noëlville is continuously occupied but the NSL facility is not a continuous plug flow reactor. According to the original Certificate of Approval #1-485-77-006 issued July 13, 1977, it is, “a 300 day retention waste stabilization pond, constructed in two cells.” Open air waste stabilization ponds are fundamentally different from plug flow reactors, which are closed systems. The failure of the review to recognize this fundamental difference is the primary source of all the other errors in the report.

The same paragraph further states that there is, “a continuous flow through the lagoon” and “as wastewater moves through the lagoon system, water quality improves.” That is a correct textbook description of a plug flow reactor system but it does not pertain to the operation of the NSL facility. The NSL is an outdoor pond that fills from the bottom up. After one month of inflow, the water in the pond is about 1 foot deep. After two months, it is about 2 feet deep. All of the contents are mixed and there is no ‘flow through the system’ as there is in a plug flow system which has no axial mixing of contents flowing through the system.

Also on page 3, the report states, “the lagoons typically, though are not required to, discharge equal volumes of effluent simultaneously”. Actually, the amended Certificate of Approval specifically prohibits simultaneous release of the lagoon cells, as the authors noted on page two of the same report.

2 One apparent source of confusion involves the concept of Hydraulic Retention Time. Hydraulic systems are pressurized fluidic systems and many continuous flow systems are hydraulically driven. The amended Certificate of Approval 9346-7SLKMD for the works refers to, “a design retention time of 300 days” but does not mention hydraulic retention time. Hydraulic retention time does not apply to the NSL facility because the lagoons are not hydraulic systems, although there is a hydraulic system for pumping waste from the pumping station to the lagoons.

In the General Findings on page 26, the review states that, “Judicious selection and proper calculation of the hydraulic retention time (HRT)” is important, but the review never addresses the issue. They do indicate that HRT can be calculated using lagoon volume and flow rate as $HRT = V/Q$. The flow rate, Q, is derived according to the formula $Q = V/HRT$. This circular reasoning does not constitute “judicious selection” of the HRT. The 300 HRT was used as the result of the consistent confusion between the 300 day retention time in a waste stabilization pond (see NSL Certificate of Approval) and the 300 day HRT of a continuous plug flow reactor (not found at the NSL facility).

3 The approach that we used to establish capacity was assessed as part of the review process and the review stated, “using a total facility volume of 143,186 m³ and a 365 day per year operation for the NSL facility, the applicants arrived at an average capacity of 392 m³/day for the NSL facility”(page 4). That is correct; we followed the definitions contained in the amended Certificate of Approval. The review then stated, “The approach used by the applicants would result in setting the design flow capacity of the lagoons at 392 m³/day based on a 365 day hydraulic retention time”. That is NOT correct; our approach was definitely NOT based on a 365 day hydraulic retention time. It was based on the fact the sewage flows to the works for 365 day per year in accordance with the definitions of *average daily flow* and *rated capacity* specified on pages 3 and 4 of the amended Certificate of Approval 9346-7SLKMD, which reads in part:

For the purpose of this Certificate of Approval and the terms and conditions specified below, the following definitions apply:

“Average Daily Flow” means 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.

“Rated Capacity” means the Average Daily Flow for which the Works are approved to handle

We did not use the term ‘hydraulic’ retention time because it is not appropriate when considering a non-hydraulic system. Our approach is based on the operation of “a 300 day retention waste stabilization pond” as described in the original and amended Certificates of Approval. It is troubling that someone else’s confusion was projected onto us.

The authors of the review offered their own definition of capacity (Q) based on the calculation $HRT = V/Q$ where HRT is defined as, “the theoretical amount of time required for a given flow to pass through a unit process”. That is an acceptable text book definition of HRT in a plug flow reactor but it is not applicable to the NSL facility and it is inconsistent with the definitions that were explicitly specified in the Certificate of Approval under review. Did MOE staff have access to the correct document for the review? The review mentions Certificate of Approval #9346-75LKMD many times but the actual Certificate of Approval number is 9346-7SLKMD.

4 The review explained that, “the maximum fall discharge volume is 25,440 m³” and concluded that, “operating the NSL facility in batch mode would violate the maximum effluent BOD₅ (sic) loading requirement and result in an exceedance of the maximum effluent discharge volume during the fall season”. If that is the case, then the allowable maximum effluent discharge volume during the fall season was exceeded in 2008, 2009 and 2010, with fall discharge volumes of 112,670 m³, 51,996 m³ and 56,336 m³, respectively. For each of these discharges, the annual lagoon report provided by OCWA stated that the releases were in compliance with the Certificate of Approval for the Noëlville lagoons. Either the rationale used in the review to reject our approach was flawed or multiple flow exceedances at the NSL have gone unreported by OCWA.

The answer, of course, is that the review is flawed. The 25,440 m³ is based on effluent CBOD₅ at 25 mg/L. If the effluent levels are lower than that then a higher discharge rate can be achieved without exceeding maximum CBOD₅ loading of 31.8 kg/day. That is why the facility has been operating with fall discharges averaging 76,000 m³ for the last three years without CBOD₅ loading exceedances. The reviewers simply got it wrong.

5 The lagoon storage requirements are addressed on page 11, and defined as;

$$V_l = Q_d(365-20) - V_f = 477(365-20) - 25,440 = 139,125 \text{ m}^3$$

The review concludes that, “The total storage capacity of 143,168 m³ provided by the NSL facility satisfies the storage requirement of 139,125 m³ required by the operational constraints.” However, the report also concludes, on page 26, that an important design consideration was, “to allow for sufficient depth for sludge”. The amount of sludge in the lagoon was assessed by OCWA in 2010 and determined to reduce actual lagoon capacity to 135,138 m³. Therefore, the adjusted total storage capacity of 135,138 m³ provided by the NSL facility DOES NOT satisfy the storage requirement of 139,125 m³ required by the operational constraints of the approach used by Ministry staff.

6 Figure 1 of Appendix A depicts the performance of the NSL in the “continuous operation” approach advocated in the review. It is important to realize that our proposed batch treatment methodology also operates in a system that receives ‘continuous’ inflow (the sewers in Noëlville are functional 365 days a year, see point 3). Continuous operation of the sewer system does not necessitate the use of a plug flow reactor vessel instead of a batch treatment mode of operation. In fact, the graph presented in Appendix A, Figure 1 depicts the operation of a batch process. The assessment presented in Appendix A, Figure 1 does not reflect the operation of a continuous plug flow reactor for the following reasons;

- 1- The large volume fluctuations in the model indicate batch releases, not continuous flow operation. A continuous flow reactor would be filled to capacity then operated with a continuous flow into and out of the unit. Continuous discharge would violate the seasonal discharge requirement stipulate in condition 8 on page 8 of the actual certificate of approval #9346-7SLKMD.

- 2- The sewage in the model is not retained for an average of 300 days (300 day HRT), which it should be according to the review's definition of hydraulic retention time in a plug flow reactor.
- 3- Spring volumes in the model exceed 140,000 m³, greater than the actual volume of the lagoon, which was determined by OCWA in 2010 to be 135,138 m³
- 4- The model requires both lagoons to be drained down in the spring. Sewage entering the lagoon in late April and early May receives no treatment and is rapidly discharge into the environment. That can't be good.

7 The review states that, "The design documentation indicates a 269-day hydraulic retention time" (page 10), but the 1977 Certificate of Approval for the construction of the lagoon specifies, "a 300 day retention waste stabilization pond". Please specify what 'design documentation' is being referred to so we can review this material.

8 The final paragraph of the review stated;

"The results of the sediment sampling did not isolate the NSL facility as the primary source of impaired water quality in Wolseley Bay. This was concluded on the basis of the June 2009 sampling results and the observation of the significant downstream distance between Wolseley Bay and the NSL facility."

A primary source of impaired water quality in Wolseley Bay was not identified because it was not investigated. The June 2009 sampling was a single time point at two sites in Wolseley Bay and two points in the French River, all downstream of the NSL. There are no possible results from that analysis that could, even in theory, isolate the NSL as the primary source of nutrient loading in Wolseley Bay. Such an analysis would require testing sites at various points upstream and downstream of the NSL both before and after discharge events. I, and other volunteers, have spent 4 years collecting 100s of data points for the Ontario Lake Partners Program to address this issue. Some of the results, representing 4 sites which were sampled 6 times in 2009, were included in our application for review. The results from this sampling showed a clear spike in phosphorous levels downstream of the NSL facility following discharge events. Our data was simply ignored by the reviewers. The review identified the Lake Partners data in the specific allegations on page 1 but it was not mentioned again.

The review's conclusion with respect to Wolseley Bay was based solely on the distance between Wolseley Bay and the NSL facility, and the unwavering position held by MOE staff that pollution cannot travel 13 km downstream. That was the stated position of MOE officials before the June 2009 sampling and the sampling by MOE staff was not designed to investigate the source of contaminants, only the extent of contamination.

Summary

We are very disappointed with the Environmental Bill of Rights review because it did not address the realities of the operations at the NSL facility. The description in the Certificate of Approval 9346-7SLKMD clearly indicates that the facility is an open air waste stabilization pond, not a continuous plug flow reactor system. Additionally, the analysis considered sewage pumped from the village sewer system but ignored many other factors that significantly affect lagoon capacity. These factors include sludge accumulation (6 % of total volume), net precipitation directly onto the lagoons (20 % of total volume), and sewage delivered directly to the lagoon by the local sewage hauler (5 % of total volume). The decision to ignore these factors while performing the review insured that the conclusions of the EBR review process are not applicable to the actual, real world operation of the sewage treatment lagoons. We are now more concerned than ever about the management of Ontario's 100s of waste water treatment lagoons since the review did confirm that the nearby St. Charles lagoon (and presumably many others) is operated using the same flawed methodology. That should be a concern to anybody who is sincerely interested in responsible environmental stewardship. Anybody. *Please.*



Satellite image of Noelville sewage lagoons off of highway 64. The town of Noelville is to the left of the lagoons.