WILLS

PARTNERS IN ENGINEERING, PLANNING & ENVIRONMENTAL SERVICES

August 18, 2022

Adele Arbour
Temporary Manager of Building and Planning
760 County Road 36
Trent Lakes, ON
K0M 1A0

Attention: Ms. Arbour

Re: Peer Review of Hydrogeological Study
Sewage System Monitoring
Pigeon Lake Commercial Cabins
16 Fire Route 94A, Municipality of Trent Lakes, County of Peterborough, Ontario
D.M. Wills Project No. 20-85099

D.M. Wills Associates (Wills) has reviewed comments and recommendations made by Stantec Consulting Ltd. (Stantec) with respect to the first submission of the following Wills' report:

- *Hydrogeological Study. Pigeon Lake Commercial Cabins 16 Fire Route 94A, Point Pleasant, Municipality of Trent Lakes, County of Peterborough, Dated October 7, 2021.*

Wills' report was submitted on behalf of Stephen Lennox (Client), in support of a Zoning By-law Amendment (ZBA) application for 16 Fire Route 94A, Municipality of Trent Lakes, County of Peterborough, Ontario (Subject Property).

Stantec's review comments/recommendations were provided to Wills in the Peer Review of Hydrogeological Study (April 14, 2022), prepared by Mr. Roger Freymond, P. Eng, Senior Hydrogeologist, and Grant Whitehead, P. Geo, Senior Hydrogeologist. We have addressed the comments in the order they were presented.

1. Flow Rates

Stantec Comment:

Page 1: "*The Study indicates that the sewage flows will be 8,500 L/day, while the FSR states the water demand is 12,600 L/day based on a maximum occupancy of 28 persons. Please reconcile these numbers and confirm if sewage flows could exceed 10,000 L/day. If sewage flows exceed 10,000 L/day, then this would be considered a large subsurface*

disposal system and the application would be subject to MECP review and an Environmental Compliance Approval (ECA)"

Wills' Response:

Wills agrees that if sewage flows exceed 10,000 L/day, the system would be considered a large subsurface sewage disposal system and an ECA would be required. Wills confirms that the flows will remain below 10,000 L/day, and Wills' updated Functional Servicing Report provides a domestic water demand that ranges from 5,670 L/day to 9,450 L/day based on the Ministry of the Environment Design Guidelines for Drinking-Water Systems (2008).

2. Setback Requirements

Stantec Comment:

Page 1: "*Given the shallow depth to bedrock, a mounded disposal system is being proposed. A raised bed takes up considerable space and it is not clear from the drawings and sketches provided that the Site is large enough to build everything while maintaining minimum setback distances. Please provide a scaled drawing showing all proposed structures and minimum setback distances.*"

Wills' Response:

Wills agrees that setback distances provided in the OBC must be maintained. Please refer to Figure 2 and Figure 3 in the updated Functional Servicing Report that show the relevant setbacks with respect to the proposed sewage disposal system, cabins, and shoreline.

3. Background Total Phosphorus Concentrations in Pigeon Lake

Stantec Comment:

Page 2: "*The Study focuses on Total Phosphorus (TP) as the primary contaminant of concern and quotes a 2018 Study showing TP concentrations in Pigeon Lake ranging from 14-19 µg/L. Since the TP range is below the Provincial Water Quality Objective (PWQO) of 20 µg/L, the Study proceeded under the assumption that Pigeon Lake was a Policy 1 waterbody. The issue is that a recent surface water quality sample collected as of the Environmental Impact Study (GHD, 2020) at the Site shows a TP concentration of 54 µg/L. There needs to be some discussion as to how this data impacts the suitability of the Site for subsurface sewage disposal.*"

Wills' Response:

Wills agrees that having an accurate evaluation of the background TP concentrations in Pigeon Lake is imperative to ensure that the proposed sewage system does not degrade the lake's water quality. For this reason, the following report was consulted during our review of the background water quality of Pigeon Lake:

- *Pigeon Lake Watershed Characterization Report* (2018) prepared by the Kawartha Regional Conservation Authority (KRCA). This report was compiled in 2018, however, contains data and in depth monitoring of Pigeon Lake from 2012 onwards (by the KRCA and partner groups). This document was created to provide quality data in support of the Pigeon Lake Management Plan (released in 2019 by KRCA), which is the roadmap for development on Pigeon Lake. The main goals of this plan are to maintain excellent water quality in the lakes and their tributaries for human use and ecological needs, and to promote sustainable human and natural resource management activities that protect and enhance the overall watershed and lake health.

Additionally, the annual report, *2021 Annual Lake Water Quality Report* (May 2022) prepared by the Kawartha Lake Stewards Association, provides an annual evaluation of the water quality of the Kawartha Lakes. Based on monitoring and surface water sampling conducted in 2020 by the Lake Partner Program, the report indicates that Pigeon Lake generally maintains a TP concentration of approximately 16 µg/L.

Furthermore, the Ministry of Environment, Conservation and Parks (MECP) provides public access to the Lake Partner Program Map. Historical data for TP concentrations at all of the surface water monitoring stations on Pigeon Lake, and the feeder lake for the northeast portion of Pigeon Lake and Big Bald Lake, is accessible via this interactive map. The following table summarizes the results of surface water TP monitoring, at locations most proximal to the Subject Property from 2018-2019.

Table 1 – Lake Partner Program TP Monitoring Results 2018-2019

Year	Big Bald Lake STN 6941 Site ID 2	Big Bald Lake STN 6941 Site ID 1	Pigeon Lake STN 6919 Site ID 13	Pigeon Lake STN 6919 Site ID 12
2018	11.6 µg/L (3 readings)	10.2 µg/L (12 readings)	15.4 µg/L (15 readings)	15.3 µg/L (18 readings)
2019	-	13.2 µg/L (9 readings)	16.45 µg/L (12 readings)	15.9 µg/L (18 readings)

Following review of the GHD EIS report, Wills' understands that the elevated TP reading (noted on page 18, in Table 3.5 Surface Water Quality Results) was taken as a field measurement at one location on July 10, 2020 at 9:30 am.

In view of the continuous water quality monitoring and robust data set for Pigeon Lake (in close proximity to the Subject Property), and for Big Bald Lake, as well as the reports prepared by the KRCA and the Kawartha Lake Stewards Association, Wills maintains the recommendation of the Policy 1 water quality categorization of Pigeon Lake.

4. Nutrient Attenuation

Stantec Comment:

Page 2: "*Stantec appreciates that the soil has low calcium content and is likely quite acidic. However, the phosphorus attenuation capacity of the Site may still be quite low, particularly if the effluent short circuits through shallow bedrock fractures, travels along the bedrock/overburden interface and/or migrates to areas where there is no soil cover whatsoever. Stantec would be more comfortable if the design assumed that the only reliable phosphorus attenuation occurs in the engineered soil brought onsite to construct the raised bed and mantle.*"

Wills' Response:

Wills agrees that nutrient retention, specifically TP, will likely be isolated to the raised bed. For this reason, Wills maintains the recommendation provided by the MECP during our consultation, and included in MECP guidance documents, that a raised bed of at least two to three metres of acidic soil (< 2% calcium) is required as separation between the absorption trenches and the underlying bedrock.

Soil testing on the Subject Property suggests that the acidity criteria is satisfied for the native materials, and importing soil from a local source for the raised bed is recommended. Additionally, Wills recommends that imported soil (for use in the raise bed construction) should be tested to ensure it meets the acidity target (> 2% calcium).

Stantec Comment:

Page 2: "*Un-ionized ammonia is also a concern and needs to be discussed. The time it takes for the effluent to travel from the raised bed to Pigeon Lake will be small and the opportunity for chemical conversion to nitrate will be minimal. This means that the proposed Waterloo Biofilter system will need to be operating optimally all the time so that the unionized ammonia has a chance to convert to nitrate and be removed by the system. The manufacturer should be consulted to determine if this is feasible.*"

Wills' Response:

Based on Wills correspondence with Waterloo Biofilter, and following our review of manufacturer-provided case studies, it is our understanding that the Waterloo Biofilter system is capable of >90% removal of total nitrogen. As explained by the manufacturer, this degree of nitrogen removal is feasible with the WaterNOx-LS denitrification unit, provided that the system owner adheres to all required maintenance and monitoring activities.

Stantec Comment:

Page 2: "*in the conclusions of the report, it states that effluent nitrate concentrations should not exceed the Canadian Council of Ministers of the Environment water quality guidelines for Protection of Aquatic Life of 13 mg/L at the point of discharge. Given the short travel time and limited potential for any effluent dilution prior to the point of discharge into Pigeon Lake, the Waterloo Biofilter would need to provide treatment to this level. Has Waterloo Biofilter been consulted to determine if this level of treatment for nitrate is feasible? What would the installation and O&M costs be to operate such a system? Some case studies highlighting the performance of the Waterloo Biofilter system in similar settings would be helpful.*"

Wills' Response:

Wills agrees that effluent dilution prior to the point of discharge into Pigeon Lake will be minimal. Based on the reviewed case studies, a Waterloo Biofilter system using the WaterNOx-LS denitrification unit can provide a level of treatment that will satisfy the target concentration of 13.0 mg/L leaving the system.

In one of the reviewed case studies, influent total nitrogen concentrations ranged from 43.0 mg/L to 68.8 mg/L with a six-month average concentration of 57.1 mg/L. Weekly effluent had a six-month average of 4.8 mg/L, with a total nitrogen reduction over the six-month period of 91.6%.

In the second case study, the six month average total nitrogen concentration was 60.4 mg/L, with an average six month effluent total nitrogen concentration of 11.9 mg/L following treatment.

5. Sewage System Effluent Quality Monitoring

Stantec Comment:

Page 2: "*Additional details are needed with respect to how the system would be monitored to ensure that the effluent quality consistently meets criteria at the point of discharge for TP, unionized ammonia, and nitrate.*"

Wills' Response:

Wills agrees that continual monitoring and manufacturer recommended maintenance should be conducted to ensure the efficient operation of the proposed sewage disposal system. Wills anticipates that two to three surface water monitoring stations located down gradient of the system will be required, and water quality monitoring for TP, unionized ammonia, and nitrate should be conducted.

Wills proposes to work with the Client to develop a surface water quality monitoring program, following detailed design of the sewage disposal system, and once the operation schedule of the proposed development is confirmed.

We trust the contents of this letter are satisfactory for your purposes. Please feel free to contact our office if you have any questions.

Respectfully submitted,

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LT/IA/mp