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HYDROGEOLOGICAL PEER REVIEW OF REPORT ENTITLED "HYDROGEOLOGICAL IMPACT STUDY, PLAN SUB-DIVISION, 0 MOUNT PLEASANT ROAD, CALEDON, ON" BY SIRATI & PARTNERS CONSULTANTS LTD.

Ms. Lee-Yates,

The following provides a summary of our hydrogeological peer review of the report entitled "Hydrogeological Impact Study, Plan Sub-Division, 0 Mt. Pleasant Road, Caledon, ON" by Sirati & Partners Consultants Ltd.

1.0 INTRODUCTION

The applicant is proposing to create an 8-lot estate on a 12-hectare area. The terms of reference for this peer review were provided in the RFQ dated February 12, 2019 and were related to hydrogeology and do not include any potential impacts related to the municipal wells or natural environment which are being reviewed by others. This peer review focussed on the following:

- Conformity to the Town of Caledon Official Plan PERC Secondary Plan policies, specifically Sections 7.1.8.3, 7.1.8.13 and 7.1.18.5;
- Adequacy of the hydrogeological study;
- Any long term and short-term impacts to groundwater quantity and quality for the down gradient private water supply wells;
- Any potential impacts on private wells in the surrounding area; and
- Adequacy of any proposed mitigation measures, if appropriate.

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2.0 SCOPE OF CONSULTANTS HYDROGEOGICAL WORK PROGRAM

The scope of work of Sirati & Partners Consultants included the following:

- A review of available geological and hydrogeological information for the site and surrounding areas was conducted, providing background information to allow for characterization of regional hydrogeological conditions.
- A site inspection of the property was conducted to review existing site conditions including identification of any hydrogeological features such as significant areas of potential groundwater recharge or areas of groundwater discharge.
- Measurement of groundwater levels was conducted to confirm the groundwater table levels and elevations using existing boreholes/monitoring wells drilled/installed during the geotechnical investigation program.
- In-situ hydraulic conductivity tests (rising-head tests) were conducted in the existing monitoring wells and hydraulic conductivity of the underlying soils in order to determine potential dewatering requirements.
- A water well survey was conducted for properties within approximately 500 m radius of the site boundary and well information was obtained from the property owners where possible, and if permission was granted.
- A preliminary water balance study was conducted for the proposed development for pre-development and proposed post-development conditions at the subject lands.

The hydrogeological report provided a summary of environmental features, physiography, topography, drainage and geology based on public sources of information. A total of eight (8) boreholes were drilled in overburden ranging from 8.2 m to 11.2 m below ground surface. Samples were obtained using split spoon sampling techniques with N values recorded. The samples were logged and analyzed for moisture content in the laboratory.

Monitoring wells were installed in five (5) of the boreholes to allow for groundwater level monitoring. Ground water levels were measured in the monitoring wells on June 16, 2017 and July 11, 2017 and over a period of six (6) months from October 2017 to March 2018.

Two in-situ hydraulic conductivity tests were conducted on the monitoring wells and the results analyzed by an accepted methodology. A groundwater level contour plan was created using the groundwater level data. The groundwater level contour plans indicate a general northeastward direction of groundwater flow.

A plot of the water well records in the MOECC database was provided in the report. The plot indicates 17 wells within a 500 m radius around the property. A door to door well survey was conducted at the properties within 500 m of the site. One well was identified immediately north of the property, although the consultant was unsuccessful in contacting the property owner to obtain well information.

The report provided an assessment of the potential requirements for construction dewatering. The report indicated that since the average groundwater level elevations were below the final excavation there would not be a requirement for construction dewatering. The report indicates that the existing groundwater levels are below the level of the drainage tiles at houses and that no long-term dewatering requirements estimates related to the groundwater table are possible.

Section 12 of the hydrogeological report provides an assessment of potential impacts associated with short-term pumping of groundwater and indicates that there will be no well interference impacts since there will be no construction dewatering. We are in agreement with this conclusion but recommend that if unanticipated construction dewatering should be required, the potential for well interference should be re-evaluated.

An assessment of potential nitrate impacts has not been provided (i.e., using applicable guidelines). This should be provided in a revised or supplemental report.

A water balance was conducted for pre- and post-development conditions. The water balance indicated a deficit of 658 m^3/annum in infiltration. The report indicates this can "very easily be compensated through application of appropriate LID measures using the run-off generated at the site." The report further notes that LID measures are not provided in the hydrogeological reports so I am unable to verify whether the LID measures would compensate for the infiltration deficit.

3.0 CONFORMANCE TO TOWN OF CALEDON OFFICIAL PLAN PERC SECONDARY PLAN POLICIES

The following provides an evaluation of the conformance of the SPL hydrogeological report (indicating relevant data in the geotechnical report) with Sections 7.1.8.3, 7.1.8.13 and Section 7.1.18.5 of the Town of Caledon Official Plan PERC Secondary Plan Policies.

Section 7.1.8.3

Section 7.1.8.3 of the Town of Caledon Official Plan indicates that an applicant for an estate residential plan of subdivisions will be required to undertake any studies deemed necessary to assess the termination probability of contaminants of wells on nearby properties by septic system leachate or other source of contamination likely to be caused by proposed development. This section further indicates that the applicant may be required to carry out any redesign or remedial works necessary to minimize the probability of contamination.

A nitrate loading assessment was not carried out by the consultant. This should be completed to assess the potential affects of nitrate loadings from the septic systems on surrounding water wells. No monitoring program redesign or remedial works were provided. The OP further notes that this requirement may be increased or reduced according to the size and characteristic of the property and availability of fence line geotechnical/hydrogeological information on adjacent properties.

Section 7.1.8.13

The drilling program included eight (8) boreholes ranging in depth from 8.2 m to 11.2 m, with a total drilling of 73 m. In comparison the Town of Caledon Official Plan (OP) indicates that a minimum of 100 metres of soil boring normally will be required for each half township lot. The total drilling meterage of 73 is below 100 m, but on a 30-hectare area. The report should confirm whether the boreholes were sited based on air photo interpretation and soils mapping in conformance with the OP.

The boreholes were logged at regular intervals and standard penetration tests were performed in conformance with the OP. Three (3) soil samples were obtained from representative geologic units on the site and analyzed in a laboratory for grain size as required by the OP.

The OP indicates that water samples are to be collected from surface water features and from the principal aquifers encountered in the boreholes, located on and adjacent to the site and appropriately preserved and delivered to the laboratory for analysis.

Section 7.1.18.5

The OP indicates that a hydrogeology report is to be prepared summarizing the available domestic well and borehole records and the characteristics and quality of the existing water table and deeper confined aquifers. The report does provide borehole location records plan as well as a location plan for MOECC water well records includes a summary of the records in an appendix (although these are not specifically analyzed or discussed in the text). The water wells should be analyzed and discussed in relation to the potential nitrate impacts.

The OP further indicates that the Hydrogeology Report should take into consideration applicable provincial guidelines such as the Guideline for Sewage and Water servicing. This guideline is not referred to specifically in the hydrogeology report.

There is no monitoring program in the report to assess whether surrounding water wells will be affected by the residential development. A monitoring program may be required should a nitrate impact assessment indicate the potential for affects on surrounding wells.

Part of the terms of reference request an assessment of the mitigation plan for potential impacts. There is no mitigation plan in the hydrogeological report for any wells potentially affected by site development such as construction dewatering for residences or trenching excavations.

The hydrogeological report is considered to be in compliance with the OP except for the following:

1) Groundwater quality samples were not obtained and analyzed;

2) A nitrate impact assessment was not conducted; and

3) A monitoring and mitigation program was not provided (if required, based on the results of the impact assessment).

4.0 CONCLUSIONS

The following conclusions are provided based on the peer review.

1) The report does provide an adequate analysis of the potential for water well interference impacts related to construction dewatering associated with the proposed development;

2) A nitrate impact assessment according to Guideline D-5-4 has not been prepared for the site;

3) The report does not provide an adequate indication of the potential for nitrate impacts associated with the proposed development, or a monitoring plan to detect nitrate impacts, or a plan to mitigate against impacts;

4) There is no indication in this report of a monitoring program to evaluate the potential nitrate impacts of the proposed residential development on surrounding water wells; and

5) There is no mitigation plan provided in the report to resolve any potential nitrate impact effects of the proposed development on surrounding water wells.

5.0 RECOMMENDATIONS

1) An evaluation of the potential for nitrate impacts or surrounding water wells should be provided. This should include collection and analysis baseline groundwater to determine general chemistry and existing nitrate concentrations; and

2) A plan should be developed to monitor and mitigate any nitrate impacts related to the proposed development based on the results of a nitrate impact assessment.

6.0 CLOSING

We trust that this peer review meets your requirements and if you have any questions or concerns please do not hesitate to contact the undersigned.

Yours truly,

Golder Associates Ltd.

Dr. Sean McFarland, P.Geo.
Senior Hydrogeologist and Principal

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