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June 16, 2010

County of Grey
595 9th Avenue East
Owen Sound, Ontario
N4K 3E3

Attention: Randy Scherzer, Senior Planner/GIS Coordinator

Re.: Beaver Valley Village: Response to January 29 and April 9 (2010) correspondence from D.C. Slade Consultants Inc.

Dear Mr. Scherzer,

As requested, I have reviewed the correspondence dated January 29, 2010 from D.C. Slade Consultants Inc. This correspondence responds to comments prepared on behalf of the County of Grey by myself dated December 22, 2009 and to comments from R.J. Burnside & Associates on behalf of the Municipality of Grey Highlands dated December 11, 2009.

In summary, the proponent's consultants agreed to comply with some of the recommendations provided on December 22, 2009 but not with others. Some of the recommendations were intended 1) to determine the extent of seasonal variations in baseline conditions, specifically ground water levels, and groundwater and surface water quality; and 2) to provide data to support the conclusions made regarding the source of groundwater recharge (sinking stream versus widespread percolation recharge). Daryl Cowell indicated in the January 29, 2010 correspondence that some of the additional work is not necessary, and Geoff Rether did not specifically comment on the recommendations that I provided.

Based on the studies completed to date, I believe the proposed development is feasible. However, there will be a low risk for:

- 1) Insufficient water supply at a few wells developed on-site.
- 2) Lowering of water levels at existing wells.
- 3) An increase in nitrate loading at on-site or downgradient wells as a result of the infiltration of sewage effluent.
- 4) Bacterial or other contamination of on-site wells from surface water, for example from the Wodehouse Creek downstream ponor or from the Karst Area B sinkholes.

Although these risks are low, they justify the requirement for well water treatment and for ongoing monitoring of groundwater quality and water levels. If changes are greater than anticipated, then there would be opportunity for future development to be adapted to prevent excessive impacts to groundwater supplies.

Subsequent to the January 29, 2010 correspondence, D.C. Slade Consultants Inc. prepared a set of proposed draft plan conditions dated April 9, 2010. One of these conditions (#16) was intended to address the concerns of the hydrogeology and karst reviewers and it is included here as Attachment 1. I have since discussed the proposed conditions with both Daryl Cowell and Geoff Rether. Based on those discussions, I propose revisions to Condition #16 that I hope will be mutually agreeable and that will meet the intent of my previous recommendations from December 22, 2009.

The following revisions and comments are provided in reference to parts a to f of Condition #16:

- a: This requirement should be revised to also include inspections of the sinkholes at Karst Area A to ensure that they are not impacted by site grading and that there is no accumulation of construction debris.
- b: Acceptable as presented.
- c: This requirement should be revised to specify the water quality parameters to be tested. Ideally, there should be a suite of basic parameters (major ions, nutrients, bacteria) that should include nitrates, sodium and chloride. The parameters tested previously were ideal. Furthermore, the results of the water quality and pumping tests for each well should be reviewed by a hydrogeologist to ensure that 1) the groundwater levels on site do not drop excessively, and 2) the groundwater quality does not deteriorate unexpectedly as the individual lots are developed. Since it is anticipated that the individual lots will be developed over a period of time, this routine review will serve as a groundwater monitoring program. This will address concerns over groundwater supply and quality.
- d: It is recommended that both Test Well 1 and 4 are monitored with data loggers for one year rather than just Test Well 4 for two years. The hydraulic conductivities of Test Well 1 and 4 are 9.6×10^{-5} and 4.6×10^{-6} , respectively, based on the results of the pumping tests reported by Wilson Associates (October 19, 2009 Report). As such, the hydraulic conductivity of Well 1 is 21 times higher than Well 4 and, therefore, it is more likely to be karstic. The time interval for data storage should be no greater than 1 hour and 30 minutes would be preferable. In the comments provided by Geoff Rether in the January 29, 2010 correspondence, he indicated that electrical conductivity would be monitored in addition to water level. Since there is expected to be considerable temporal and spatial variation in water temperature and chemistry, I strongly recommend that the electrical conductivity in the water column of each well is profiled in advance to determine an appropriate placement for the data loggers. The methodology and interpretation of well profiling was first described by Smart and Worthington (2003). From my experience, measurements every metre are sufficient except where there are sharp changes in temperature or conductivity where it may be necessary to measure every 10 cm for short intervals. The profiling results will also prove

invaluable when interpreting the data for the two wells. Ideally, the data loggers should be placed where there is expected to be good circulation of groundwater.

The water level in Test Well 5 should also be measured to determine typical seasonal variations. This can be accomplished through manual measurements while conducting other fieldwork on site.

e: Acceptable as presented.

f: It is recommended that the area included in the well survey should be extended eastward to the Niagara Escarpment since residences along the Escarpment are downgradient from the proposed development. It is also my understanding that letters will be sent by mail to request land owners to participate in the survey. It will then be up to the proponent to arrange for the door to door interviews and any measurements.

One additional requirement should be added. The results of the pre-construction well survey and the results of the additional baseline measurements should be reported by the proponent's hydrogeologist.

References Cited

Smart, C.C. and R.H. Worthington, 2003. Electrical conductivity profiling of boreholes as a means of identifying karst aquifers. In Beck, B.F. and Lamoreaux & Associates, eds., *Sinkholes and the Engineering and Environmental Impacts of Karst*, Proceedings of the Ninth Multidisciplinary Conference, Sept. 6-10, Huntsville, Alabama, p. 265-276 (Published by the American Society of Civil Engineers, Geotechnical Special Publication No. 122)

I trust this meets your current requirements. Should you have any questions regarding the recommendations, please do not hesitate to contact me.

Sincerely,



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Attachment 1: Condition #16 of Proposed Draft Plan Conditions

(Submitted by Andrew Pascuzzo, D.C. Slade Consultants Inc., dated April 9, 2010)

16. That the Subdivision Agreement includes a provision requiring the Owner to implement the recommendations of the Hydrogeological and Karst Report(s) provided in correspondence between Mr. Geoff Rether and Mr. Daryl Cowell and the Peer Review consultants R.J. Burnside & Associates Ltd. and Marcus J. Buck that includes:

- a) a requirement to conduct regular inspections of the ponor to ensure it does not become blocked during the construction of the stormwater facility and associated subdivision servicing
- b) a requirement to disinfect all private water supplies through properly maintained UV (or equivalent)
- c) a requirement that a well be constructed and subjected to contractor's testing, for the purpose of identifying water quality and quantity, prior to issuance of a building permit on a lot by lot basis
- d) a requirement that Test Well 4 to be equipped with a datalogger and be monitored for a period of 2 years
- e) a requirement to re-develop, disinfect and re-sample Test Well 5
- f) a requirement that a door to door survey of all residences within 200m of the developed portion of the site occur to establish pre-existing conditions. Any resident's refusal to participate, either directly or by ignoring the survey will be documented.