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Misrepresentation Document**

June 14, 1999

Mr. C. Bell, Planner  
Regional Municipality of Haldimand-Norfolk  
City of Nanticoke, Planning & Economic Development  
Field Office  
101 Nanticoke Creek Parkway  
Townsend, Ontario  
N0A 1S0

Dear Mr. Bell:

**RE: Proposed Zoning Amendment Application for Part Lot 12, Concession 12  
Former Township of Walpole, City of Nanticoke**

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As per your request, staff have reviewed the report titled *Level 2 Hydrogeological Study in Support of a Category 2 Class A Quarry Below Water License Hagersville, Ontario* prepared by AGRA Earth and Environmental Limited, on behalf of Nichols Gravel Limited and have concluded that its attempt to document existing geologic and hydrogeologic site conditions and evaluate the effect of quarry operations on water resources and groundwater consumers in the area is inadequate.

In terms of hydrogeologic background for this area, the proposed quarry is located two kilometres southwest of Hagersville, on the north side of Highway 6. The area of the proposed quarry is 94.3 hectares and consists of a strip of rectangular properties extending from the CN railroad to Road 9. There are four other quarries between Hagersville and the proposed quarry which were abandoned in the 1970's, and are now filled with water. Northeast of Hagersville there is also an operational quarry operated by Lafarge. In the past, there have been several well interference complaints from both the operational and abandoned quarry. Several of the complaints related to the abandoned quarries have been documented in a 1972 Ministry of Environment report titled *Report on the Investigation of Well Interference Complaints near Hagersville*. This report concluded that the deepening of a quarry from 15 to 27 metres caused well interference of several domestic wells at distances of several kilometres. The proposed quarry will be 15 metres deep.

The geology of the site consists layers of porous, fractured bedrock overlain by two to four metres of glaciolacustrine clay. The bedrock consists of approximately two metres of limestone of the Onondaga Formation, over eight metres of limestone to shaley limestone of the Bois Blanc Formation, over the Springvale Sandstone and the Bertie Formation. Water quality in the bedrock declines with depth, and many of the deeper domestic wells in the area have sulphur tasting water.



One to two kilometres north of the site, the bedrock surface drops sharply along the buried Onondaga Escarpment from close to surface to depths of more than 20 to 30 metres below ground. North of the Escarpment, the bedrock is filled by overburden material and the Escarpment is not visible on surface. South of the Escarpment, the bedrock slopes gently down towards Lake Erie. The Escarpment is an important Hydrogeological feature. It represents a high point in the bedrock aquifer, and a groundwater divide exists in the upper bedrock between the proposed quarry and the Escarpment. The Escarpment is also associated with higher hydraulic conductivity values in the bedrock. Hydraulic conductivity is a measure of the materials ability to transmit water and is an important parameter to determine if the impacts of quarry dewatering are to be accurately predicted. The increased hydraulic conductivity close to the Escarpment means that the impacts from the Lafarge Quarry north of Hagersville will affect a wider area relative to the proposed quarry.

### **Report Methodology and Assumptions**

The report relies heavily on a computer model (Visual Modflow version 2.6) to predict the impacts of the quarry on existing groundwater resources in the area. The results of computer models are highly dependent on what information was inputted into the model, and changing key assumptions or input parameters by a small amount can greatly affect the predicted impact. In this case, the model relies on very limited data from five on site wells collected in two days in November 1998 to characterize groundwater conditions over an area measured in square kilometres for a 50 year period. This information was supplemented with topographic maps and data from the Hagersville Tire Fire site, located more than seven kilometres away. The limited database of field data greatly reduces the amount of confidence that can be placed in the model.

Staff had several questions about the computer model which were subsequently addressed by the consultant in a May 26 1999 fax. However, after reviewing the initial data provided by the consultant, staff remains concerned that the proponent has not provided sufficient data to support the model's initial conditions and the available field data used to select the hydraulic conductivity is not representative.

The initial, pre-dewatering conditions relied heavily on topographic maps in order to estimate groundwater levels from elevations of streams in the local area. In doing this, the consultants assumed that a hydraulic connection exists between the streams and the bedrock. This may be a reasonable assumption for the larger streams in the area such as Sandusk Creek or the stream along the northern boundary of the model. However, anecdotal evidence, supported by field observations from May of 1999 and data from 1:10,000 topographic maps indicates that several of the smaller streams are dry during the summer months, suggesting these streams only flow in response to surface runoff and are not connected to the bedrock aquifer. Without groundwater data in the form of water levels from nearby wells and mini piezometers along the creek, it is not safe to assume the streams reflect bedrock water levels conditions. This is important along the west and south side (Harlop Drain is fed by the Municipal Sewage Treatment plant) of the quarry, where the presence of streams appears to mitigate predicted impacts. However, if a good hydraulic connection between the streams and the bedrock does not exist, actual quarry impacts may be greater than predicted by the model.

Similarly, the Ministry is concerned that the hydraulic conductivity values selected for the model underestimate actual conditions. Slug tests and single well pumping tests only estimate the hydraulic conductivity of the rock immediately adjacent to the wells, and may miss vertical fractures in the rock which are capable of transmitting large volumes of water. In a fractured bedrock like this one, the actual "bulk" hydraulic conductivity of the rock is commonly much higher than the hydraulic conductivity determined from slug and single well pump tests. Furthermore, slug test and single well pump tests are notoriously inaccurate, and the actual hydraulic conductivity may be wrong by a multiple of ten or more.

The lack of adequate field data for this study means that there is a strong probability that the actual impacts of the quarry will be much greater than impacts predicted by the model. As a result, model variant 2 should be considered the most accurate scenario, but may still underestimate actual quarry impacts.

#### **Ministry concerns about the domestic well survey**

The domestic well survey completed by the consultant is inadequate. During the survey, a total of two residents were contacted in person, out of the many of households and businesses in the area likely to be impacted. Of those two households visited, water levels were taken on only one occasion, and samples for chemical analysis were not collected from either of the two wells. The proponent should also be aware, that some livestock, particularly poultry, are sensitive to changes in water quality and mitigating well interference by simply drilling a deeper well into an aquifer of poorer quality, may not be satisfactory to the well owner. The Ministry would not be able to issue a Permit-to-Take Water for this application until a thorough domestic well inventory has been completed, with water quality data and multiple water level measurements from each accessible domestic well within the area of potential impact has been collected. A thorough well survey should clearly indicate how the well is used, and if possible, the amount of water used on a regular basis. For those wells which are used for watering cattle, poultry or irrigation, the proponent may wish to record the productivity of the well in a short pump test

#### **Ministry concerns about the proposed monitoring**

The proposed monitoring program suggested by the consultant is also inadequate. A monitoring program acceptable to the Ministry would consist of, but should not be limited to, the following:

1. Quarterly measurements of water levels in the five wells on site (MW 1 to 4, and the farm well);
2. Quarterly measurements of water levels in all accessible domestic wells in the area to be impacted. This area should extend at least one kilometre out from the boundaries of the quarry. After a period of several years, when water level trends have been documented, the number of sites and frequency of measurements can be reduced. Quarterly measurements of water levels need only continue through out the life of the quarry in those wells closest to the quarry;

3. The construction of multilevel monitors in key locations around the perimeter of the site, where they will not be destroyed by quarry activities. The purpose of these wells is to establish permanent monitoring points to provide comparable water level and water chemistry data over the life of the quarry without disruption by quarry activities or changes in permission agreements between domestic well owners and the quarry. Water levels should be taken at these wells on a quarterly basis;
4. Quarterly measurements of surface water levels in the two abandoned quarries to the north and east of the proposed sites;
5. The establishment of mini-piezometers at key locations in nearby surface water bodies to establish groundwater recharge-discharge regimes. These should be monitored on a quarterly basis;
6. Quarterly measurements of stream flow at key points along Harlop Drain and the stream to the west of the proposed quarry;
7. Quarterly water quality measurements in the surface water stream destined to receive water due to quarry dewatering activities and
8. Water quality monitoring from the multilevel monitors and domestic wells.

These monitoring requirements are to establish groundwater conditions before and during quarry dewatering activities and check the models initial conditions. The proponent should also be aware, that it will be necessary to record the amount of water pumped from the quarry and the water quality of that water once dewatering activities begin.

In the mitigation section of the report, the consultant states that "If a complete loss of water can be directly linked to dewatering at this quarry, the quarry operator will arrange for the installation of a new well or make other arrangements with the affected resident to ensure that an adequate supply of potable water is provided.". The proponent should be aware that it is not necessary for water loss to be complete before the operator is obliged to correct the problem, and the onus of determining the quarries responsibility in the case a well interference complaint will fall upon the quarry operator. In addition to the above requirements, the quarry must prepare a complaint resolution procedure which is acceptable to the Ministry. The present complaint resolution procedure does not clearly state under what conditions the proponent will take action.

### Summary

The report prepared by AGRA does not document existing groundwater conditions to the satisfaction of the Ministry, and the Ministry has some concerns that groundwater impacts will be more extensive than shown in the computer model. In order to fully assess the impacts of the proposed quarry on the area's groundwater resources, staff recommends that the proponent resubmit the application once the field work outlined above has been completed. This second application should

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incorporate the new field data and also include a well interference complaint resolution procedure.

Should you have any questions or wish to discuss these comments further, please contact me at (905) 521-7864.

Yours truly,

*Barbara Ryter*

Barbara Ryter  
Environmental Planning Officer  
Air, Pesticides & Environmental Planning

cc. Mr. J. Evans, AGRA Earth & Environmental Ltd., 440 Phillip Street, Waterloo, Ontario