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April 9, 2014

Via: Email and Mail (sdenhoed@hardenv.com)

Mr. Stan Denhoed, M.Sc., P.Eng.
Sr. Hydrogeologist
Harden Environmental Services Limited
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Dear Mr. Denhoed:

Re: Harden Response to Burnside Review of Hydrogeological Summary Report
Hidden Quarry Site for Township of Guelph Eramosa
Letter Dated January 14, 2014
File No.: 300032475.0000

Thank you for your letter of January 14 2014 that provides your response to several issues and concerns addressed by R.J. Burnside & Associates Limited (Burnside) in our letter of November 12, 2013.

Burnside is primarily concerned with the impact of the proposed quarry on:

- Water levels in the upgradient domestic wells,
- The water quality in the down gradient domestic wells and,
- Rockwood Well 4

Although additional information has been provided in the latest letter, the predictions regarding the response of the fracture systems in the bedrock aquifer need to be confirmed through on going data collection and a thorough investigation of nearby domestic wells.

For consistency, our comments are presented using the same numbering as those contained in the Harden letter.

1.0 Karst

Burnside concurs with Harden that there is no evidence of cavernous karst features within the site. There have been a number of boreholes advanced into the underlying bedrock and as Harden indicates there is no evidence of cavernous karst features. However, the Rockwood area is identified by the Ontario Geological Survey as a Karst area and the water producing intervals in the bedrock are described as micro karst by some fractured bedrock specialists. It is Burnside's understanding that local residents

have expressed concern that Karst features may exist beneath the Site, primarily because of the disappearance of Tributary B. Harden has indicated that there can be flow in Tributary B entering the north end of the Site and under dry conditions there is no flow in the tributary as it exits the southern portion of the site. It is not clear to Burnside if the flow always terminates at the same point in Tributary B or whether there is some variation depending on weather conditions. Clarification of this would assist in understanding whether this is a "disappearing stream" or simply an intermittent stream that dries up during the summer months.

2.0 Water Quality

Harden had originally calculated a nitrate (nitrogen) mass balance in their response letter to Burnside comments on the M15 well drilling. Harden has now recalculated the nitrogen mass balance assuming that the lower 33% of the fractured bedrock does not contribute to dilution of nitrogen. As a result the anticipated nitrogen value has increased from 4.38 to 4.54 mg/L at the down gradient property line.

Burnside recommends that detailed water level and water quality data be obtained from M15 (and also M16) following completion as a multi-level monitor so that the assumptions used in the mass balance calculation can be verified. In particular, water quality data should be collected from the various screened intervals along with the other wells on site and applied to Table1.

Deeper Water Sources

The Burnside comments had suggested that the quarry would allow the shallow groundwater to mix with water from deeper zones in the bedrock. These deeper zones at 36 and 41 m are currently secure sources of groundwater that are recharged over time by water moving into those formations. Burnside indicates that the excavation of the quarry into these factures will cause the water in the deeper fracture system to be under the influence of surface water and associated bacteria and viruses such as cryptosporidium and giardia. The existing secure water supply in the deep bedrock aquifer will therefore be changed to a surface water source for an unknown distance from the quarry. Burnside indicated that once the quarry is finished, there will be a large surface water body directly in contact with the bedrock fracture system which may allow rapid movement of water pathogens towards bedrock wells down-gradient at the site.

Harden concurred that the quarry activities will result in the mixing of groundwater from various depths and indicates that test results from monitoring well M15 indicates that confining conditions occur at depth. This suggests that the water sources at depth are somewhat isolated from shallower groundwater sources unless exposed to anthropogenic contamination. Harden goes on to indicate that the majority of wells obtain water from the upper and middle portions of the aquifer exposing those wells to contamination from anthropogenic activities and possibly surface water already. Harden concludes that the quarry is being developed in an area already susceptible to contamination from the ground surface. Harden concurs that the mixing of water in the quarry will occur, however they note that this mixing already occurs in each bedrock well drilled in the area including the deep well servicing the mushroom farm. The aquifer is also exposed to surface contaminants from the Eramosa River Valley and the Blue Springs Creek Valley.

Burnside agrees that each individual well allows an opportunity for connection between the shallow and intermediate depths in the bedrock and as a result water quality in these wells will be impacted by anthropogenic sources. This is only true for the deep bedrock wells; the shallow bedrock wells in the area do not allow mixing. The quarry will connect a much larger number of fractures and will also allow the opportunity for pathogens and bacteria from waterfowl, other wildlife and near quarry runoff to directly enter the surface water body and ultimately the down-gradient water system. Although pathogens and bacteria can be dealt with by currently available home treatment technology it is Burnsides opinion that most residents would prefer to have a "clean" source of water that does not require treatment. As a result this was the intent of Burnside suggesting that the quarry stop at a somewhat shallower depth in order to allow the opportunity for impacted down gradient wells to obtain water from the deeper fracture systems.

GUDI Condition in Proposed Rockwood Well 4

Burnside has suggested that the quarry may result in the classification of future Well Number 4 as groundwater under the direct influence of surface water (GUDI). Harden provides a detailed assessment from excerpts from Ontario Regulation 178-03 and the conditions anticipated at the future Well Number 4. Harden concludes that proposed Well Number 4 will be flagged as potentially GUDI even in the absence of the proposed quarry, and that there are other potential sources of surface water contamination closer than the proposed quarry. Harden suggests that it is unlikely that fractures are isolated to the extent that interconnections to the bedrock surface will not occur between proposed Well Number 4 and the proposed quarry. Based on the information currently available, Burnside concurs with the Harden assessment of the GUDI status of future well 4. Once Well Number 4 has been constructed, testing will be undertaken to see whether there is any connection between pumping at the new well and water level responses at the quarry.

Pathogen Movement

Harden Figure 4 provides information showing the wells that are down-gradient from the quarry. Harden indicates that these are the only wells that have any risk of water quality impacts. It is Harden's opinion that the detailed monitoring program will identify chemical and bacteriological movement from the quarry and contingency measures are in place in the event that a local well is impacted. Harden indicates that recent testing of the Guelph Limestone Quarry found that the water met all the drinking water quality standards for a comprehensive suite of parameters.

It is Burnside's opinion that Harden should undertake a detailed well inventory and water quality assessment of the wells that surround the quarry. The assessment should include a sampling of wells in the spring and fall of 2014 in order to establish baseline conditions. Sampling should continue on a semi-annual basis until a sufficient baseline of data is established prior to quarry operations. Once sufficient baseline data has been collected an individual approach to addressing the potential for impact should be devised for each well. Burnside is of the opinion that wells within 500 m of the site that are located in pits or have buried well heads should be proactively upgraded so that the wells meet Ontario Regulation 903 and are easily monitored. Data collected from the

domestic well survey and re-construction and testing of M15 should be used to update the groundwater model and refine the predicted impacts.

Quarry Depth Limitation

The flow profiling at M15 indicates that there are significant fractures at elevations of 318 masl and 324 masl (42 and 36 m below ground surface respectively). The proposed quarry will extend to an elevation of 320 masl. Harden indicates that they do not think that limiting the depth of the quarry to an elevation greater than 324 masl will guarantee protection of the lower fracture set. They suggest that rather than limiting the depth of the quarry that mitigation of water quality issues be undertaken at the few down-gradient wells as they occur since there are proven effective measures designed specifically to address such water quality problems.

It is Burnsides opinion that most residents would prefer to have a safe secure source of water that does not require treatment rather than treating water that has been impacted by quarry activities. As a result, Burnside recommends that the current water quality be established for all of the wells within 500 m of the site and individual plans be devised to protect the water quality for each well.

3.0 Private Wells with Shallow Fracture Sources of Water

It is Burnside's contention that shallow wells have the greatest potential to be impacted by quarry activities. As a result, Harden identified the shallow wells on Figure 5 and indicates that none of the shallow wells are located up-gradient of the quarry. The shallow wells are located down-gradient of the quarry where water levels will rise. Harden indicates that with respect to wells that are up-gradient of the quarry it is their opinion that the magnitude of change will not affect the functioning of the domestic wells. Harden indicates that this opinion will be verified upon the completion of a detailed pre-bedrock extraction water well survey. If an up-gradient well is found, during a flow test, to have a drawdown near to the location of the pump then the pump will be set to a deeper depth.

Harden disagrees with Burnsides recommendation to proactively modify all existing well as a necessary step. In the case of wells that may currently be impacted by surface runoff such as those in well pits, the improvements to the well head may result in improved quality which would reduce the likelihood that the quarry operators will have to provide water quality treatment in the future.

The plan for protection of existing wells should be devised once the domestic well survey is completed.

4.0 Groundwater Model Parameter - Hydraulic Connectivity

In this section Harden uses data obtained from well M15 and the laws of super positioning in order to assess the potential impacts of drawdown in the quarry on neighbouring domestic wells. In order to estimate the magnitude of impact at the nearest private wells shown on Figure 6, Harden calculated the cumulative drawdown from each of six dewatering wells at each private well. The drawdown was estimated using the modified equilibrium equation (Cooper and Jacob, 1946). Harden also

includes a list of nine conditions that need to be met in order for the Cooper and Jacob method to be valid. Although many of the conditions are not met, it is Burnside's opinion that this method does provide additional support for the groundwater model used by Harden in the December 2012 report. Harden indicates that the analytical analysis confirms that:

- The results obtained from the model are reasonable;
- If a lower fracture set does not contribute water to the quarry the water will fill more slowly but the impact on local wells is similar to the full depth scenario; and
- The maximum drawdown in the nearest wells is always less than will occur in the quarry.

Burnside recommends that following reconstruction of M15 as a multi-level well, hydraulic and water quality data be collected from each of the screened intervals and used to improve the current interpretation of the hydrogeologic environment. Harden also indicates that their exercise supports the assertion that a shallower quarry will not result in significantly less impact. It was Burnside's suggestion that the quarry be terminated at a shallower depth in order to reduce the potential for the lower fractures to be impacted; thereby providing an opportunity for potentially impacted domestic wells to be drilled deeper.

5.0 Brydson Spring and Blue Springs Creek

Burnside's agrees with Harden's assertion that the 2.5 m water level change in the quarry will not change the water level along the Southern boundary. However, a lowered water level at the northern end of the site will result in a reduced hydraulic gradient and therefore discharge from the bedrock to the Brydson Spring may be reduced.

A spring flows because the water level in the ground is above grade. The degree that the water level is above grade could range from 0.1 to 10 m. A change in water levels less than 1 m can result in a reduction in flow. The conditions at this spring including flow volume and water quality should be characterized to establish a baseline condition and the spring should be included in the monitoring program.

6.0 Rock Extraction Water Level Change

Harden uses four pumping wells to simulate potential impacts to local wells during the initial rock excavation from the sinking cut. The simulation results in a maximum predicted drawdown of 0.87 m at the nearest well.

Burnside agrees that based on a maximum drawdown of 2.5 m in the sinking cut is not likely to result in significant impacts to nearby wells. However, it is unclear why the maximum drawdown cannot be the same as the depth of the sinking cut. This conservative value seems appropriate until the impacts predicted by the model can be confirmed.

Regardless of the maximum drawdown agreed to, it is Burnside's opinion that this value is the maximum total drawdown allowed, not the amount that is allowed with each

sinking cut. Details need to be provided regarding the location for monitoring the drawdown and also the method for establishing the pre extraction reference water level needs to be agreed upon.

Combined Impact from Rockwood Well No. 4 and Hidden Quarry

It is Burnside's opinion that the combined effect of the quarry and proposed Rockwood Well 4 cannot be predicted until M15 and the well are constructed and tested. The quarry will introduce bacteria into portions of the previously confined aquifer. Without detailed investigations there is no way to reliably predict the connection of fractures in the quarry with fractures found in domestic wells. The domestic well survey and water level/water quality monitoring program needs to be designed to identify the wells most likely to be impacted so they can be proactively protected.

7.0 Aquitard

Agreed

9.0 Monitoring Plan, Trigger Levels and Contingency Plan

The monitoring program should reference the pre extraction well survey that will include water quality/quantity testing and indicate the wells will be potentially involved in the monitoring program. Trigger levels for water quality and water levels should be established once baseline conditions are established. Investigation of the proposed pre-quarry well survey locations in Figure C-2 should be mandatory. Residents at wells W25 to W30 and W36 to W40 should be asked if they are willing to participate in the monitoring program.

1.0 On Site Monitoring Program

All of Burnside's suggestions have been incorporated into the monitoring program.

2.0 Trigger Levels

2.1 Trigger Levels for the Bedrock Aquifer

Agreed.

2.2 Trigger Level for Northwest Wetland

No comments.

3.0 Contingency Measures

3.1 Groundwater Levels and Northwest Wetland

Agreed.

3.2 Groundwater Quality

JDCL has agreed to Burnside's additions to the program.

4.0 Pre-Bedrock Extraction Water Well Survey

See comment under 3.0 Private Wells with Shallow Fracture Sources of Water.

10.0 Well Complaint

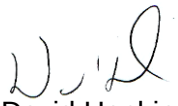
No comments.

11.0 Next Stages

Burnside agrees to the list of next steps but continues to request a reduction in the depth of the quarry and proactive improvements in surrounding existing wells based on the results of the well survey future documentation on this site should include detailed information on the domestic wells, construction and testing of M15/M16 and information on the Brydson Spring.

Yours truly,

R.J. Burnside & Associates Limited



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