



June 20, 2014
Our File: 114006-2

Township of Puslinch
RR 3, 7404 Wellington Road 34
Guelph, ON N1H 6H9

Attention: Mr. Robert Kelly
Chief Building Official

Re: Hydrogeologic Assessment – Peer Review
Prepared by Groundwater Science Corp.
Proposed Spencer Pit
Township of Guelph/Eramosa

Dear Mr. Kelly:

As per your request, we have reviewed the Report entitled '*Hydrogeologic Assessment – Tri City Lands Ltd. Proposed Spencer Pit, Part Lots 14, 15, 16 and Lots 17 & 18, Concession B, Township of Guelph/Eramosa, County of Wellington*' (February 2014) prepared by Groundwater Science Corp (GSC). This report was completed as part of a Category 3, Class "A" License Application under the Aggregate Resources Act (ARA) to extract more than 20,000 tonnes of aggregate per year from "above the water table". We provide you with the following comments pertaining to the Hydrogeological Assessment and in response to the circulation regarding a zoning by-law amendment application. We understand the recommendations provided herein may be submitted and form an objection under the ARA consultation process.

The 51.16 hectare (126.4 acre) subject property is located in the southwest portion of the Township of Guelph/Eramosa and abuts the Township of Puslinch along its southerly boundary. The proposed extraction area is 42.45 hectares (104.9 acres) with a proposed annual tonnage limit of 650,000 tonnes. Based on the results of the Geotechnical Investigations associated with the site, it has been determined that there is a minimum of approximately 2.0 million tonnes of sand and gravel above the water table. The projected Site Life of the Spencer Pit is estimated to be between 5 to 7 years.

The Hydrogeological Report was prepared to characterize the site setting, groundwater occurrence and water table elevations, and to investigate the potential for adverse effects on the local water resources. The investigative methodology included a review of background reports, including site-specific data (i.e. previous test pit investigations) and additional field investigations including borehole logging, monitoring well installation and water level measurements. The aggregate extraction is to occur from a minimum of 1.5 m above the water table and no dewatering or groundwater diversion will reportedly occur as part of the operation. However, as noted in the Hydrogeologic Assessment, the proposed aggregate processing would include washing activities, which may require a separate application for a Permit to Take Water (PTTW) and Environmental Compliance Approval (ECA) from the Ministry of the Environment (MOE). The PTTW and/or ECA application would include the preparation of technical support documents and a separate review of the potential impacts by the MOE.

Private Water Wells

The local water well records on file with the MOE Water Well Information System were reviewed and summarized by GSC to assess both the geology and hydrogeology. The water well records indicate that the majority of the 27 wells identified within (or just beyond) 500 m of the site are completed in bedrock to depths of 10.6 to 61.6 m

below ground surface (bgs) and one well is completed in the overburden to a depth of 13.1 m. It is noted that upon further review, this overburden domestic well is reportedly located to the southwest and crossgradient to the Site and, based on the figure provided, is situated beyond the 500 m radius. Based on our review, it is assumed that GSC has inferred that impacts to this overburden well are not likely.

With respect to the water supply wells, we generally concur with the report findings that:

'the bedrock aquifer forms the primary source of water for local supply wells. All of the local water supply wells are located upgradient (east and north) or cross-gradient (north or south) of the site. There are no reported domestic wells located downgradient of the Site, between the site and either the existing quarry or river.'

However, given that the coordinates provided in the MOE well records are not always accurate combined with the proximity of the proposed pit to several residences along Hespeler Road, it is suggested that correlation of the MOE well records to the nearby residences be attempted. Based on the dwelling locations shown in the Figures provided, the wells associated with several properties situated to the north and west of the Site along Hespeler Road/Hwy 124 are likely within 100 m of the Site. In addition, the Summary Report (April 2014) prepared by Harrington McAvan Limited indicates that the closest off-site residence is located to the west of the property, which, based on the Figures provided, appears to abut the property line to the west. No well was identified for this parcel of land within the MOE Well Records, even though it is reasonable to expect that one would exist (where no municipal services are available).

While we concur that it is reasonable to expect that the proposed aggregate operation will not impact local bedrock water supply wells, we recommend that the existence, location, type and construction of nearby wells be further investigated through, as a minimum, a door to door survey. Such information will likely be required for a PTTW and would assist in the event of an interference complaint. It is recommended that the survey encompass properties to the north and west of the site that have frontage along Hespeler Road/Hwy 124 and any dwellings identified within 120 m of the Site. This type of survey would also facilitate a review of the potential existence of shallow domestic water wells, dug or otherwise, that may be present in proximity to the site.

Groundwater Elevation Map

The report suggests that the water table occurs within the unconfined bedrock aquifer, and slopes relatively steeply from west to east and that the water table along the southeast and east edges of the site is controlled by surface water features (with assumed discharge to these features) adjacent to the Site, including (i) the Speed River and associated valley wetlands and (ii) the ponds within the adjacent inactive/closed quarry. One additional surface water feature was identified approximately 30 m to the east of the site and is described as an unnamed intermittent tributary. The identification of these surface water/discharge features and their approximate elevations is well documented in the report. However, this information could be used to further develop the overall groundwater flow regime associated with the proposed pit property and the area downgradient of the proposed pit.

Based on a comparison of the water levels to the reported bedrock elevations, the GSC Report concludes that *'the water table is approximately 3 to 4 m below the bedrock surface near County Road 124 and 4 to 6 m below the bedrock surface along the southeast and east edges of the Site'*. Based on the information provided from the 3 monitoring wells and the Barn Well and given that pit operations are proposed to extend to bedrock surface and must maintain a minimum separation distance from the water table of 1.5 m, we concur with the overall conclusions of this assessment. However we offer the following comments pertaining to the establishment and delineation of the groundwater table elevation:

1. On page 8 of the report GSC describes that the elevation data for the water level monitors was determined by a level survey completed by GSC relative to an assumed ground surface elevation of 318.0 masl at BH1 (based on Site Plan elevation contours). While this provides an approximate elevation and establishes the elevation of each monitoring point relative to BH1, it does not provide an exact ground surface elevation or reference elevation for future measurements (i.e. top of casing

[TOC] elevation). Given the nature of the activities at the site and the importance of establishing an accurate water table elevation for comparison to the bedrock surface elevation, it is recommended to provide elevation data based on established geodetic elevations.

2. This comment is provided in reference to the water levels presented for BH3. Table 2 which summarizes the water level elevations indicates that the water level in this well is in the range of 296.7 while the water level in Figure 4 indicates that the water level is in the range of 298 masl. While this potential error would serve to increase the distance between the water table and the top of bedrock, it is recommended that the water table contours or Table 2 be corrected to reflect this inconsistency.
3. While the water elevation data established from the monitoring wells provides sufficient data for the evaluation of the on-site groundwater flow regime, given the existence of several surface water features and discharge areas in close proximity (i.e. within 500 m) to the Site, and the known elevations of these features presented in the GSC report, we recommend that a larger-scale water level assessment be presented. The following elevations were provided in the report:

LOCATION/FEATURE	ELEVATION (Reported)
POND 1 (East Quarry Pond)	292 masl
POND 2 (West Quarry Pond)	299 masl
Speed River elevation (based on topographic mapping)	290 to 295 masl
Speed River elevation (based on X-Section A-A')	290 masl
Valley floor (page 5 of GSC Report) – assumed wetland complex within Speed River Valley	Below 296 masl
Unnamed Intermittent Tributary – adjacent to site	301 to 304 masl
Bedrock Surface Elevation	303 to 314 masl
Bedrock Potentiometric Surface	296 to 309 masl

It is recommended that this information be incorporated into Figure 4 to aid in the establishment/verify the water table contours and the associated 'boundary conditions' in the vicinity of the Site.

4. To further support development of the water table elevations and for clarity (and associated mapping on Figure 4 and 5), we recommend the following updates to supporting figures:
 - a. that the highest water table elevation measured since the implementation of the monitoring program be presented.
 - b. the inclusion of the water level measurement used for each monitoring location and the associated bedrock surface elevation as determined from the borehole log could be included along with the Well ID.

Impact Assessment

Although we concur that the proposed extraction will have no direct effect on the water levels and the local groundwater system, further assessment of the existence, location, type and construction of potential nearby wells (drilled and/or dug) along Hespeler Road/Highway 124 and within 120 m of the Site has been recommended. Based on our experience at similar sites, it is typically in the best interest of all parties to document the condition of nearby wells and any potential water quality/quality issues prior to the development of a site so that, should problems arise, the status of a private water supply prior to site development can be referenced.

Based on the GSC report, the rehabilitation plan will reportedly create a large enclosed drainage area that will ultimately result in a conversion of existing run-off to future groundwater recharge. It is interpreted that surface water run-off within the open pit will infiltrate through the coarse-grained soils or directly into the

bedrock, through fractures. Any on-site recharge will enter the groundwater system and will generally migrate toward the Speed River Valley. Based on the inferred high permeability and infiltration rates of water through the coarse-grained soils and fractured bedrock, significant or long-term pooling of water after precipitation events is not anticipated during operational periods.

However, the potential for impacts to groundwater is considered to arise from direct infiltration of surface water into the bedrock, where the overburden materials have been completely removed. In this scenario, surface activities can influence groundwater quality directly, or without attenuation through the unsaturated zone. To mitigate potential impacts to bedrock groundwater quality, it is recommended that pit operations prevent activities that expose contaminants to groundwater in these areas. It is recommended that operational practices and/or mitigative measures be addressed in these areas. Such mitigative measures, may include limitations on placement/location of fuel handling storage, and stormwater sediment and erosion controls.

Monitoring

It is our understanding that the monitoring program proposed in Section 7.1 of the GSC Report recommends that water level measurements be obtained from the existing network of four (4) on-site wells on a monthly basis for a period of one year and subsequently on a quarterly basis for an additional two years. At the end of the three year monitoring period, it is proposed that the monitoring program would be discontinued if no groundwater impacts were observed.

While we find the program to be more than sufficient for the period of time it covers, it is noted that information collected over the life of the pit operation would provide additional information regarding the potential for interference with area water resources. Therefore, it is recommended that water level information be collected from on-site monitoring wells on at least a twice annual basis for the operational life of the proposed pit.

Summary Remarks

In general, we concur with the findings of the Hydrogeological Study, which states that *'there is no potential for adverse effects to groundwater and surface water resources and their uses; and, no potential or significant impacts to local natural environment features or water wells associated with the Spencer Pit extraction as proposed'*. However, to provide more certainty regarding the findings and provide sufficient information regarding the potential for interference with area resources, several recommendations have been provided herein. A summary of the recommendations is:

- To complete a door-to-door survey at properties to the north and west of the site that have frontage along Hespeler Road/Hwy 124 and any dwellings identified within 120 m of the Site. This information should be used to update the area well search and identify the potential for unregistered shallow/dug wells in the area.
- To update the groundwater elevation and supporting mapping by:
 - Confirming geodetic elevation (as opposed to an assumed elevation at ground surface),
 - Updated contours based on elevations presented for BH3,
 - Inclusion of known surface water level elevations and surface water features,
 - Presentation of high groundwater elevation data and bedrock surface elevation at each borehole (data point).
- To update mitigative measures to include consideration of operations in areas where bedrock exposed through extraction processes.
- To update the water level monitoring program to include data collection over the operational period of the pit.



Please feel free to contact me should you wish to discuss these recommendations in more detail.

Yours Truly,

GM BluePlan Engineering Limited

Per:

A handwritten signature in blue ink, appearing to read 'Matthew Nelson', written over a light blue horizontal line.

Matthew Nelson, M.Sc. P. Eng. P. Geo.

MN/af

cc: Steve Conway, GM BluePlan Engineering
Amanda Pepping, GM BluePlan Engineering