



January 7, 2020
Project Number: 190615-00

Mr. David Welwood
Principal Planner
Planning, Development & Legislative Services
Region of Waterloo
150 Frederick Street, 8th Floor
Kitchener, ON N2G 4J3

**Re: Shantz Station Aggregate Pit, Township of Woolwich
Hydrogeological Review**

Dear Mr. Welwood:

BluMetric Environmental Inc. (BluMetric™) was retained by the Regional Municipality of Waterloo to conduct a hydrogeological peer review of the proposed Shantz Station Aggregate Pit near Maryhill in the Township of Woolwich. The purpose of the review was to determine if the hydrogeological studies that have been undertaken have used the appropriate process and technical approach to determine if there are any potential impacts on the groundwater and surface water resources from the proposed operations.

Documents reviewed as part of this assessment included:

- Level 1 and Level 2 Hydrogeological Investigation Proposed Category 3, Class 'A' Pit Above-Water-Table prepared by MTE Consultants Inc dated May 10, 2019.
- Planning Justification Report & ARA Summary Statement, Shantz Station Pit, prepared by MHBC Planning dated May 14, 2019.
- Five site plan drawings prepared by MHBC Planning dated May 2019.
- Region of Waterloo's draft Guidelines for Hydrogeological Assessments for Proposed Mineral Aggregate Resources Extraction Projects dated Aug 2008. (referred in this review as the Region's Guidelines).

A short meeting was held between BluMetric and MTE on December 19, 2019 to discuss aspects dealing with the surface water and groundwater flow to Wetland 1. Further information from this meeting is discussed in that section of this review.

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Deviations from Region's Hydrogeological Guideline

The MTE study area was 500 m from the site. The Region's Guidelines indicate a 1 km distance for the door-to-door survey of private wells. Wells within 1 km of the site should be identified with justification provided on why a 500 m radius for the survey is adequate.

The MTE report indicates that fuel will be stored on site. The Region's Guidelines indicate that in such cases, petroleum hydrocarbon monitoring, both baseline and ongoing, should be conducted. This has not been done and is not included in the proposed monitoring program.

The monitoring conducted in the MTE report does not include temperature monitoring of the groundwater or surface water as required in the Region's Guidelines. With the removal of material above the water table, there is potential that surface water groundwater flux, could increase. With the increased near surface flux flowing to Hopewell Creek, then there is also a possibility of increasing the temperature in the Creek that is classified as a cold water creek. Baseline and ongoing temperature monitoring of the groundwater and surface water should therefore be completed.

The Region's Guidelines indicate that, at a minimum, water levels should be obtained quarterly during site operations. MTE has recommended monitoring three times a year and this appears to be adequate for this site. However, with only five overburden monitoring wells and six mini-piezometers, it will be necessary to collect levels at all monitoring points on each occasion. This was not always the case in the data presented in the MTE report. The Guideline also requires a minimum of two years of data. MTE has verbally communicated that the monitoring conducted in 2018 (including geochemical analyses as discussed below) continued in 2019 and therefore this frequency requirement appears to have been met.

Groundwater samples were collected for geochemical analyses from two on-site groundwater monitors in July 2018. The Region's Guidelines indicate that all monitors (5 overburden wells in this case) should be sampled in the spring and later summer on an annual basis. The analyses conducted in 2018 were quite extensive and the parameters to be used as a baseline in all monitors could therefore be reduced. As stated in the Guidelines, the monitoring program may allow for a progressive decrease in monitoring at two to five year intervals as sufficient information is collected to understand the scope of impacts, if any, of extraction.

The removal of material above the water table could affect the potential buffering capacity not only of the temperature during the active life of the extraction operations but also the potential impacts of nutrients if the site is returned to agricultural uses as part of site rehabilitation. Measures to mitigate detrimental nutrient loading to the surface water should be consider as part of the rehabilitation plans.

Wetland 1 and Hopewell Creek

The MTE report indicates that tile drains in the southwest corner of the site will remain in place. Figure 2, Operation Plan, shows proposed culverts under berms in this area as well. There is no mention, however, in the MTE report or the Operation Plan of the tile drain system that feeds into Wetland 1 (part of the Breslau Wetland) Complex in the northwest corner of the site or the tile drain along the east property boundary near MW2 that would drain to Hopewell Creek. The sentence below is from the MTE report:

Following extraction, in the event that tile drains were removed during aggregate extraction, Capital Paving in consultation with the land owner will re-install tile drains in suitable locations as required. (Section 7.5, page 19).

Is this statement in reference to all tile drains on the site or just the system in the southwest corner that was discussed in the earlier portion of the section in the report? Re-installing tile drains post extraction is related to surface water flow during the extraction. MTE indicated that surface water flow can be maintained during the site life but it is not known if this will be through the tile drains or overland flow. MTE also indicated that the surface water outlet along the north property boundary going toward the open water/wetland around MP5 could not be physically located. The exact configuration of the tiles and their depths are not fully known as the information was provided by the property owner. This is quite normal in this type of situation and is usually fully determined only when extraction begins.

Appendix F in the MTE report is the Micro Drainage Analysis which also deals with Wetland 1. A small note that the reference to sub-catchment area draining to Wetland 1 in Table 1.1 is 102/202 but in Figures 1.1 and 1.2 it shows these areas as 102 and 201, respectively. The analysis states (page 2):

Pre-development annual infiltration flows do not contribute directly to Wetland 1 according to the groundwater contours developed within the Level 1 and 2 Hydrogeological Investigation (MTE, 2019) and illustrated on Figure 1.2. Groundwater flows appear to travel generally west near Wetland 1, and likely flow north towards downstream portions of the wetland complex as they flow west, eventually forming a tributary to Hopewell Creek.

Do the tile drains in the northwest corner of the site not contribute to Wetland 1? The analysis also states (page 4):

The total area of surface drainage which is being transformed from a direct surface water catchment of Wetland 1 is 21.75 ha. This represents a reduction of contributing drainage area to the larger wetland complex of 8.9 %.

It is not clear as this may contradict earlier statements.

The next paragraph in Appendix F, states:

Considering the changes to the surface drainage areas in the during/post extraction period, Wetland 1 will observe a decrease in annual surface water contributions of 23,313 m³. The lost surface water contributions will be replaced by infiltrated groundwater flows to Wetland 1, which result in an additional 87,782 m³ of water contributing to the wetland annually.

But if infiltration does not contribute to the wetland and “Groundwater flows appear to travel generally west near Wetland 1, and likely flow north towards downstream portions of the wetland complex...” then how will there be increased flow to the wetland? Does this consider the wetland as a whole? What will happen to Wetland 1 in the vicinity of MW1, MP6 and MP5?

Overall, clarification on the current surface water drainage and groundwater flow to Wetland 1 and changes during and post- excavation is required including the role or non-role of the existing tile drains, overland flow and infiltration to the groundwater.

Section 7.1 of the MTE report (page 17) states:

As such, MTE does not anticipate any adverse effects to either Wetland 1 or Hopewell Creek as a result of the proposed pit development.

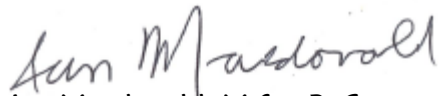
Please confirm that this statement includes no adverse effects on wetland functions as a result of the increased groundwater flow, if this will be determined solely on water level measurement in MP5 and MP6, or if other means will be used for confirmation.

Reporting

The MTE report indicates that the results of the monitoring (this would need to include both water level and geochemical analyses) be retained by the proponent so it is available if requested by agencies. The Region should require a submittal of this information and interpretation of the data annually, at least initially and potentially at a decreasing frequency if the monitoring is decreased as noted above.

Please do not hesitate to contact the undersigned if you have any questions.

Sincerely yours,
BluMetric Environmental Inc.


Ian Macdonald, M.Sc., P. Geo.
Senior Hydrogeologist



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