September 1, 2015
Our File: 105160

City of Guelph
1 Carden Street
Guelph ON N1H 3A1

Attention: Mrs. Mary Angelo, P. Eng
Ms. April Nix

Re: Guelph Lake Subdivision
With Prejudice
City of Guelph

Dear Mrs. Angelo and Ms. Nix:

On August 7, 2015 by email, the following including figure and drawings was submitted to address Engineering, Parks and Planning comments related to the revised location of the enhanced infiltration structure along the Longfellow-Park slope:

- Park's and Engineering have agreed that the infiltration structure can be placed in the slope adjacent to Longfellow Drive and along the southerly slope of the Park block. The infiltration structure will have a length of approximately 190 metres. This places the enhanced infiltration gallery on lands controlled by the City.
- Park's has requested that there be no cleanout risers or exposed hazards be constructed on the south slope of the park in the location of infiltration structure. The clean out risers will be incorporated as part of the works on the Longfellow slope with no exposed structures in the Park slope.
- Park's and Engineering want these slopes planted with low maintenance vegetation. This work will be addressed as part of the preparation of the Environmental Implementation Report.
- Park's has requested the trail connection through the Helmar Well property be shown on the Plans. The revised grading plan being provided with this email show the trail extension. The design of the trail extension will be included in the Environmental Implementation Report as stated in the Draft Plan conditions.

On August 25, 2015, following internal review and discussions between Ms. Nix and Mr. Stephenson, the following concerns were put forth:

1. Plantings and buffer enhancement on the slope in accordance with the details in the EIS.

2. Hydrogeological overview of the functioning of the infiltration system in the proposed location versus the rear yard location.

3. Confirmation that the proposal will not result in seepage or breakouts on the slope.

4. Confirmation the infiltration will continue to feed the wetlands and the "hydrogeological" gradients will function.

Item 1: Slope Plantings

There are no restrictions from an engineering perspective to planting woody vegetation on the slopes with the exception of the final locations for access points to the system for maintenance. The final location of the access points will be determined at detailed design. The attached figures and drawings show probable locations.

Item 2: Achieving Baseflow Conditions

The most recent stormwater management design includes the location of the infiltration gallery generally congruent with the top of slope adjacent to Longfellow Drive and the Park. The most recent design is similar to previous submissions in terms of overall length of infiltration system but changes the location of the infiltration system. The system remains as a "dispersed" approach to maximize infiltration area perpendicular to the inferred groundwater flow direction, and over the length of Wetland 'D.'

Preliminary testing has been completed using the Guelph Permeameter to measure the hydraulic conductivity of subsoils at the topsoil interface in three locations along the proposed location of the enhanced infiltration structure. Based on this testing, the average hydraulic conductivity of the subsoil at the topsoil interface in this area is 3.3 mm/hour, in comparison to the 1.5 mm/hour determined from slug tests in the deeper boreholes. At detailed design, additional testing will be completed at various locations throughout the site for the design of the "enhanced" infiltration systems required to maintain the post to pre recharge on the site.

The water budget review shows that overall the water budget will be within approximately 2% of the pre-development conditions. As such, it is reasonable to expect baseflow conditions will be maintained within the channel. In particular, the infiltration system congruent with the Wetland 'D' area and the stormwater pond directly upgradient will provide for recharge conditions, supporting a high groundwater table and groundwater discharge to the wetland and associated channel.

Item 3: Seepage From Slope

The system has been designed to promote infiltration and protect against preferential flow along the native soil interface and/or mounding that would allow for breakout at the base of slope. A typical cross-section of the system in relation to the slope is enclosed and provided as Figure 9.

The separation from base of slope is beyond the 1:1 slope expected for unsaturated flow conditions. To promote infiltration, a sandy soil will be used within the 1:1 slope. At the base of the sand media, the topsoil surface will be stripped and "roughed" with a toothed bucket to maximize surface area and access to underlying weathered soil (as often employed during installation of tile bed systems in low permeability silt or clayey soils). To prevent break-out along the toe of the slope, the surface soils will be over excavated with low-permeability backfill used to "key" into underlying soils to prevent short circuiting of the groundwater flows. Lastly, break-out will be prevented by an overflow system that directs water from the infiltration system to the stormwater management facility if the hydraulic head rises to the top of the infiltrator system.

Unrelated to groundwater seepage at the base of slope, it should be noted that the soils in the low-lying areas beyond the base of the slope have been observed to be wet/saturated during wet periods of the year. This is consistent with groundwater monitoring information that shows water levels close to ground surface at periods of the year in these low lying areas.

Item 4: Gradients versus Proximity

The channel within the Wetland can be approximated to act as a "constant head" boundary, meaning that the head will be constant through the channel throughout time. While there may be some minor fluctuation throughout the year, the channel has been noted to be flowing a majority of the year.

The overall (or average) gradient across the property is expected to be maintained, although some local variation may occur. For example, where infiltration is diverted from one area and replaced in another, the following can be expected:

- In the area from where infiltration is diverted, the water level may be slightly lower, creating a lower gradient ("flatter" peizometric surface).
- Where infiltration is promoted, localized mounding will occur, creating a slightly steeper gradient.
- Since the infiltration across the system is similar, the "average" gradient will be similar.

The channel is approximately 45 m downgradient from the infiltration gallery, where local influences upgradient will not be realized. Therefore, the gradient experienced at the channel will be reflective of the system average. Under the proposed scenario where water balance is maintained, the "average" gradient will therefore be similar to pre-development conditions.

Accompanying this letter, please find the following Figures, Drawings, and Table:

- Drawing 1 – Preliminary Grading Plan – North
- Drawing 2 – Preliminary Grading Plan – South
- Drawing 3 – Longfellow Drive – Sta. 1+200 to 1+500 – Plan and Profile
- Drawing 4 – Longfellow Drive – Section A-A to Section C-C
- Figures 9(a) to (d) – Typical Enhanced Infiltration Gallery Details
- Preliminary Recharge Balance Calculations

We trust this is the information required to resolve this matter.

Yours truly,

GM BLUEPLAN ENGINEERING LIMITED
Per:

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

Christopher R. Sims, P.Eng.

MN/CRS
Encl.