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August 11, 2015

**Ms. Lisa-Beth Bulford**
Lake Simcoe Region Conservation Authority
120 Bayview Parkway, Box 282
Newmarket, Ontario, L3Y 4X1

*MGP File: 14 - 2260*
*Your File:*

Dear Ms. Bulford:

**RE: Zoning By-law Amendment and Plan of Subdivision Applications**
**Highland Gate Developments Inc.**
**21 Golf Links Drive**
**Town of Aurora, Regional Municipality of York**
**IMS File No.: PSDC600C4, POFG156, PZOA548**

Please accept this letter which has been prepared in consultation with members of the applicant's consulting team, and is a comprehensive response to the above noted Lake Simcoe Region Conservation Authority (LSRCA) comment letter received by the Town of Aurora, dated April 10, 2015. This letter also reflects the meetings which were held with the staff of the LSRCA on June 1st, June 3rd, and June 16th. Additional discussions with the Conservation Authority were held as required.

For your convenience, the original comments have been provided in italics below.

*Development Impacts on Natural Heritage and Hydrologic Features*
*There are four locations within this plan that propose alteration to a watercourse and interference with wetlands to facilitate development: 1) adjacent to High Density Block 224, 2) adjacent to the intersection of Street A and Timberlane Trail, 3) the watercourse crossing adjacent to the connection of Street F with Murray Drive, 4) removal of on-line ponds in Block 207.*

*High Density Block 224*

1. *Further explanation is required to support the proposed watercourse realignment and floodplain cut/fill analysis of Tannery Creek to accommodate the expansion of an area for residential development in Block 224. Details are required that identify the proposed development, the extent of the works, the impact to the natural heritage and hydrologic features in the area (qualitative and quantitative analysis) and the restoration proposed. Justification is required to demonstrate conformity with Section 3.1 of the Provincial Policy Statement and guidelines associated with the implementation of Ontario Regulation 179/06 of the Conservation Authorities Act. The need for a 2.7 metre retaining wall to accommodate this change must be specifically addressed in the justification provided.*

The realignment of the creek proposed by Highland Gate Developments Inc. ("HGDI") will permit the upstream pond to be taken offline, providing fish passage and enhancement and restoration to this portion of Tannery Creek. This is in keeping with section 9.2.2 of the LSRCA's Guidelines for the Implementation of Ontario Regulation 179/06, which encourages the removal of online ponds and restoration of the site. The proposed realignment is an extension of the channel re-naturalization and potential weir removal design that was previously completed by LSRCA Stewardship Staff, but has not yet been implemented. The realignment proposed by HGDI will include aspects of the re-naturalization works previously contemplated by the LSRCA.

In the proposed HGDI design, consideration was given to accommodate a high density block and adjustments to the design were made, to ensure the proposed building was outside of the floodplain. In order to accommodate the development requirements and maintain an acceptable watercourse setback, a 2.7m high retaining wall was required. The 2.7 metre retaining wall coincides with the floodplain. Figure 2.13 in the Functional Servicing and Stormwater Management report prepared by SCS Consulting Group outlines the extent of the works required for the proposed realignment. The conceptual channel design will follow this submission.

A conceptual site plan (Drawing A102 prepared by &CO) was submitted with the application, which generally illustrates the proposed works on Block 224. The details of development for this block will be provided through a future site plan control application. The block is appropriate to accommodate a future 10-storey building outside of the floodplain and therefore it, and any future development on it, will be consistent with Section 3.1 of the PPS. The buffer and setbacks that have been applied to the realigned watercourse are suitable for the adjacent high density block as outlined in the associated Natural Heritage Evaluation, (Beacon 2015).

2. *LSRCA Stewardship Staff have completed restoration work within this section of Tannery Creek in the past and we have documentation related to the channel re-naturalization and potential weir removal which can be used to tie into the existing conditions.*

HGDI supports the original channel re-naturalization and potential weir removal originally contemplated by Stewardship Staff to enhance the function of this portion of the creek, as reinforced by LSRCA Guidelines. The design proposed achieves the same objectives as the original design, with modifications to accommodate the proposed land use adjacent to the creek. Further opportunities for enhancements and restoration will be explored in consultation with the LSRCA, for inclusion in the Restoration and Compensation Plan. The Restoration and Compensation Plan is proposed to be submitted as a condition of draft approval.

*Street A and Street F*

3. *Street A and Street F are within lands subject to the ORMCP. As such, the EIS must demonstrate conformity with Section 41 (1), (4), (5) and (6) of the ORMCP related to infrastructure in proximity to key natural heritage features and hydrologically sensitive features. Demonstration of how Section 41 (5 a-e) has been addressed must be provided for these two roads. In particular, provide justification for the need for Street A being a permanent through street and not a dead end with emergency only access to Timberlane Trail.*

Section 41(5) requires that it be demonstrated that: there is a need for a road and no reasonable alternative for the road; that adverse effects to the ecological integrity to the Plan Area will be minimized; through design considerations that key ecological and recreational linkages will be maintained and where possible improved or restored; landscape design will use native plant species to the extent possible; and that the long-term landscape management will maintain and where possible, improve or restore the health, diversity, size and connectivity of the key natural heritage feature or hydrologically sensitive feature.

Development within the Minimum Vegetation Protective Zone ("MVPZ") is allowed under section 26(2) which permits transportation infrastructure, as described under Section 41 (1) (public highways being one), where the need has been demonstrated and where there is no reasonable alternative.

The planning justification for Street A is provided in Section 2.5.1 of the Planning Opinion Report. The report summarizes that there is no alternative to an encroachment of Street "A" into the MVPZ of the wetland to provide a second access to ensure adequate movement of emergency service vehicles, which is required for the safety and security of Street "A". This is also reiterated in Section 9.0 of the Transportation Consideration report prepared by BA Group. To minimize the effects to the ecological integrity of the Plan Area, the narrowest Right of Way standard for the Town was selected. This limits the physical element of the road to its smallest footprint, thus minimizing the extent of any disturbance.

With regard to linkages, Street A will require the removal of a small section of wetland. This current wetland does not link to any other existing feature to the west, where the road is proposed and removal of the wetland would occur and the north-south riparian linkage is compromised by the existing street Timberline Trail. The removed area of the wetland will be replaced within proximity to the retained portion of the wetland. A planting plan will be developed for this area and will include native plant species that will enhance the function of the retained and created wetland. The plan is proposed to be submitted as a condition of draft approval and included in the Restoration and Compensation Plan. Given the very small portion of wetland required for removal to accommodate the road, the relocation of this area will not have an adverse effect on the ecological integrity of the Plan Area.

Similarly with regard to Street F, there is no other reasonable access to this portion of the plan without exceeding the generally accepted length of 400-500m for a road with a single connection point as stated in Section 9.0 of the Transportation Considerations report prepared by BA Group.

A planting plan will also be developed for the area that is disturbed as a result of the extension of the crossing for Street F and the corresponding compensating cut/fill. The planting plan will include native plant species that will enhance the function of the feature. The plan is proposed to be submitted as a condition of draft approval and included in the Restoration and Compensation Plan. Despite the extent of the work required to extend the culvert crossing and implement the corresponding cut/fill, no adverse effects on the ecological integrity of the Plan Area is expected given the watercourse within the property boundary was lined by manicured grass.

Section 41(4) is satisfied given that all of the requirements of 41(5), as described above, have been met.

For clarification, by virtue of subsection 31(4) of the ORMCP, Section 41(6) of the ORMCP is not applicable, as the subject property is within a Settlement Area.

4. *It is recommended that the proposed Street F culvert should be connected to the existing Murray Drive culvert and should match into the existing watercourse. Encroachments are to be minimized. The report, figures and hydraulic model are to be updated accordingly. Figure 2.15 should also show details of the existing Murray Drive culvert.*

Acknowledged. A crossing condition assessment report was completed by WSP Canada Inc. in July 2015 (see Attachment SCS-1) and it concluded that overall, the existing culvert was in good condition and that future extension of the culvert crossing is feasible. The culvert has been added to the model. Local channel works will be required to facilitate a smooth transition from the constructed culvert to the existing channel. Details of the existing culvert will be added to Figure 2.15. The model and updated figure will follow this submission.

5. *An incremental cut/fill analysis will be required for the proposed Street F crossing in order maintain floodplain storage. Please update the report and hydraulic modelling as required. This analysis will also be required for Street A, if grading is proposed in the floodplain just north of Timberline Trail.*

Acknowledged. An incremental cut/fill analysis has been completed for the proposed Street F crossing and Street A. The cut/fill analyses are attached in Attachment SCS-2. The updated model will follow this submission.

As shown, there will be a reduction of approximately 6 $m^3$ of floodplain volume as a result of the proposed Street A extension. This is considered negligible; however, should LSRCA require a compensating cut, it could be provided by cutting the area immediately to the east of the proposed retaining wall along the east limit of Street A. As shown in the calculations, the fill can be balanced with the cut within 0.25 m vertical increments.

The Street F crossing will be located in an existing floodplain backwater area that is created by the existing Murray Drive culvert crossing. Therefore, as discussed with LSRCA, an incremental floodplain cut/fill volume balance is not required, only a total volume balance. As shown in Attachment SCS-2, the total net fill volume associated with the proposed extension of the double culverts and Street F road crossing is approximately 2,443 $m^3$. If necessary, the areas on either side of the watercourse south of the proposed crossing that are within the HGDI property could be cut to provide a maximum cut of approximately 1,640 $m^3$ of possible compensating cut. This potential cut, in combination with the actual volume available within the extended culverts (approximately 551 $m^3$) results in a net overall fill (or deficit in cut) of approximately 252 $m^3$.

*On-line Pond Removal – Western Creek*

6. *The EIS suggests that the three on-line ponds within Block 207 will be removed as part of this development proposal. The following matters should be addressed as part of any online pond removal proposal:*

a. *Downstream flows should not increase as a result of the removal of the on-line pond(s). Options to maintain the existing stage discharge should be explored.*

As discussed at a recent site meeting (June 16, 2015) with LSRCA staff, design options will be explored to maintain the existing stage discharge to the extent feasible. In general, the conceptual design options will maintain the existing opening size through the existing weir and maintain the function of the berm to the extent feasible. The conceptual channel design drawings will follow this submission.

b. *Natural channel design methods should be used.*

Acknowledged. Natural channel design and bioengineered treatments will be used as part of the restoration plan. The conceptual channel design drawings will follow this submission.

7. *Until such time as it has been confirmed that the on-line ponds will be removed, setbacks to existing natural heritage features (i.e. wetlands etc.) should be shown on the draft plan and development limits should reflect these limitations.*

A drawing (Attachment MGP-1) has been provided illustrating setbacks to existing natural heritage features overlaid on the Draft Plan.

The LSRCA *Guidelines for Implementation of Ontario Regulation 179/06 Development, Interference with Wetlands and Alteration to Shorelines and Watercourses Regulation* (April 24, 2015) indicates in section 9.2.2 , that the LSRCA will encourage the removal of existing on-line ponds and the restoration of the site. The draft plan reflects the general approach of the LSRCA to remove on-line ponds with an estimated resultant development limit. Furthermore, the policies of Sections 22 and 26 of the ORMCP permit site alteration with respect to land within key natural heritage features and hydrologically sensitive features and/or the related minimum vegetation protection zone for the purposes of conservation and flood or erosion control projects, if the alteration has been demonstrated to be necessary in the public interest after all alternatives have been considered. The removal of the on-line ponds will improve the water quality and aquatic habitat of the watercourse by removing the stagnating conditions of the current ponds, and such work therefore meets the definition of a conservation project. The VPZs would then be established from the feature, once the on-line ponds are removed and a natural channel restored, in accordance with the LSRCA guidelines.

*General*

8. *Proposed watercourse realignments must demonstrate that any upstream or downstream erosion and/or flooding are being addressed appropriately.*

Natural channel design principles will be applied to the watercourse realignment, including bioengineering techniques and hydraulically-sized materials, in order to ensure that erosion and/or flooding concerns are appropriately addressed. The conceptual channel design drawings will follow this submission.

9. *A Restoration and Compensation Plan will be required to quantify all unavoidable impacts to natural heritage features, such as wetlands, and watercourse realignments and enclosures. An*

*impact assessment of all applicable Key Natural Heritage Features and the Hydrologically Sensitive Features should be provided. All removed KHNFs/HSFs and associated VPZ must be quantified and provided for in the form of compensation. Compensation should be determined in an overall sense detailing compensation loss, potential locations for enhancement and overall compensation type. Please note that the replacement rates for wetland habitat and their associated VPZ is 3:1.*

A Restoration and Compensation Plan will be prepared to quantify all unavoidable impacts to natural heritage features. This plan will provide a compensation strategy which details areas of local restoration and enhancement, including the proposed watercourse realignments. It will provide a detailed assessment of all mitigation, restoration and compensation strategies employed pre-construction, during construction, and post-construction, from a qualitative and quantitative perspective.

The Restoration and Compensation Plan will illustrate the locations of trees and vegetation communities that are proposed to be preserved, as well as replacement and enhancement plantings that are proposed to compensate for the removal of existing vegetation and trees and enhance the extent and diversity of the vegetation communities within the site. The Restoration and Compensation Plan will be designed to benefit the overall ecological integrity of the site by enhancing habitats, improving riparian cover and increasing canopy cover throughout the proposed development.

The Restoration and Compensation Plan will include a summary of the ecological enhancements that are anticipated to be achieved through the implementation of the recommendations set out in the plan. This will include the small area of wetland that will be removed by the proposed Street A; the extension of the Murray Street crossing; the on-line pond removals and riparian enhancements; and the Tannery Creek realignment.

The 3:1 ratio for the replacement of wetland removed to accommodate proposed infrastructure has been recommended by the LSRCA. The location of the replacement wetland will be refined through detailed design, but will likely occur in association with the park blocks (e.g., Block 207 or Block 209).

Based upon our preliminary assessment, plantings proposed as a component of the development will result in a compensation ratio that will exceed three trees planted for each tree that is proposed to be removed, which exceeds the compensation ratio of 3:1 that is typically recommended by both LSRCA and the Town of Aurora.

The plan is proposed to be submitted as a condition of draft approval.

10. *It is recommended that the mitigation/enhancement/compensation plan be provided under a separate cover demonstrating the qualitative and quantitative impacts against the proposed enhancements and restoration.*

It is proposed that the Restoration and Compensation Plan will be submitted as a condition of draft approval.

11. *As part of the required restoration strategy we recommend including:*

a. *Removal of instream engineered bed protection as per Section 9.4 of the EIS, where appropriate;*
b. *The installation of habitat enhancements such as rock/wood basking areas in the wetland;*
c. *The use of snags and wood debris in the woodlands; and*
d. *Development setbacks that can be used for corridor connectivity.*

The recommended aspects of the compensation strategy are noted and will be included, as appropriate, as part of the Restoration and Compensation Plan. It is proposed that the Restoration and Compensation Plan be submitted as a condition of draft approval.

*Development Limits*

12. *The proposed development includes modification of natural heritage features and hydrologic features. Apart from the PPS, the natural heritage policies of the ORMCP take precedence on the western portion of the subject lands and the Official Plan of Aurora natural heritage policies take precedence on the eastern portion. To clearly illustrate the existing natural heritage and natural hazard restrictions present on the site, we request that mapping showing all existing natural heritage features and natural hazards with their associated setbacks be provided. Proposed modifications and the associated changes to development setbacks can then be identified separately for consideration.*

A comprehensive drawing, illustrating all natural heritage and hazard features and their setbacks as per the Provincial Policy Statement (PPS) and the Oak Ridges Moraine Conservation Plan (ORMCP), as applicable, has been provided by MGP (Attachment MGP-1). The development plan has been overlaid on this figure.

*Natural Heritage*

13. *Confirmation of the presence of the following Key Natural Heritage Features (KNHF) and their appropriate vegetation protection areas as per the ORMCP and PPS must be completed and illustrated on the draft plan to confirm the development limits of this site.*

    a. *Significant valleylands*
    *We recommend that a figure is provided identifying the areas that qualify as per the definitions under the ORMCP and Natural Heritage Reference Manual (NHRM). Please note that Figure 4 in the Landform Conservation Assessment identifies the slopes greater than 15% within the study area that may meet the tests to qualify as significant valleyland.*

A valleyland is defined as:*…a natural area that occurs in a valley or other landform depression that has water flowing through or standing for some period of the year.*

Based on the above definition, portions of the West Tributary east of Bathurst Street and within the central block (but not including that which extends north of the central park block) and the East Tributary west of Murray Drive are considered valleyland. These areas of valleyland have been assessed

against the criteria for Significant Valleylands in the ORMCP as per Technical Paper #1 *Identification of Key Natural Heritage Features* below.

*They function as or have the potential to function as:*

*Passageways for water demonstrating flowing or standing water for a significant portion of time…including intermittent flow but not including presence of water associated with a single storm event;*

All of the watercourses are permanent.

*Significant wildlife corridors within the ORM or between the ORM and adjacent natural features;*

The watercourse corridor upstream of Bathurst Street does provide habitat, but the downstream corridor through the former golf course and residential areas provides limited wildlife habitat and would not meet the definition of "significant wildlife corridor". The riparian corridor does not connect natural features as the downstream portion is an existing residential area.

*Natural buffers between adjacent land uses and hydrological features either within or downstream of the significant valleylands.*

The former golf course was designed around the watercourses and valleylands. The steep slopes of the area east of Bathurst Street precluded any development. Within the central block and the east tributary, the valleyland had been part of the former golf course.

*Significant riparian wildlife habitat;*

The riparian vegetation of the area east of Bathurst Street is dominated by low quality, non-native species (e.g., Manitoba Maple and Buckthorn). Portions of riparian corridor within the central block have some natural vegetation closely associated with the watercourse. There is very little natural vegetation associated with the riparian area of the East Tributary. Based on field surveys and professional judgment, none of these areas would constitute "significant riparian wildlife habitat".

| **ORMCP Criteria** | **Comment** | | |
|---|---|---|---|
| **Significant Valleylands include:** | **East of Bathurst** | **Central Block** | **East Tributary** |
| • Streams with well defined morphology (i.e., floodplains, meander belts, and valley slopes) having an average width of 25 m or more; | Is greater than 25 m in width from top of bank to top of bank (based on contours) | Is greater than 25 m in width from top of bank to top of bank (based on contours) | Is greater than 25 m in width from top of bank to top of bank (based on contours) |
| • All spillways and ravines with flowing or standing water for a period of no less than two months in an average year. Such features must be | Meets length, width, and height criteria, but with an area of 0.44 ha does not meet the size criterion. | There are two small areas within Central Block which have 5 m, 15% slopes ; around the | Meets length, width, and height criteria. Does not meet slope of 15% (it is about 10%) |

| | | | |
|---|---|---|---|
| greater than 50 m in length; 25 m average width with a well-defined morphology (i.e., two valley walls of 15% slope or greater with a minimum height of 5 m, and valley floor), and having an overall area of 0.5 ha or greater; and | | western pond, and around the eastern pond. The areas between and outside of the ponds do not meet the slope criteria. | and is less than 0.5 ha in area. |
| • Additional features identified by the approval authority that are consistent with one or more of the functions described above. | None | None | None |

The portion of valleyland adjacent to Bathurst Street does not meet the criteria for significant valleyland.

Despite the two areas associated with the ponds within the central block meeting the slope criteria to be considered significant valleyland, the majority of the central block area outside of the pond blocks does not meet the slope criteria; therefore, the valley is not considered "significant". The central block is proposed to be redeveloped as a park and restoration block.

The portion of the East Tributary south of Murray Drive does not meet the criteria for significant valleyland.

b. *Significant wildlife habitat*
*We recommend that a chart be provided identifying the potential for candidate or known significant wildlife habitat (SWH) that exists within the study area. This includes potential Eastern Wood-Pewee habitat and Breeding Amphibian Habitat (as result of the surveys undertaken in 2015). The identified Eastern Wood-Pewee is a Special Concern species, identification of whether SWH exists in the small off-site woodland near the northeast corner of this property as per the Natural Heritage Reference Manual is recommended. Please examine how the species will be impacted and mitigated for by the proposed development and BMPs. The results of the amphibian surveys should be provided as an addendum.*

The *Significant Wildlife Habitat Technical Guide* (Ontario Ministry of Natural Resources 2010) provides four categories of significant wildlife habitat: 1) Habitats of seasonal concentrations of animals; 2) Rare vegetation communities or specialized habitat for wildlife; 3) Habitat of species of conservation concern; and 4) Animal movement corridors.

The criteria associated with these categories have been applied to the Highland Gate redevelopment area and the results of this assessment are summarized in the table below.

| SWH Criteria | Applicability to Study Area | Basis of Opinion |
|---|---|---|
| **1. Habitats of seasonal concentrations of animals:** | | |
| • areas where animals occur in relatively high densities for the species at specific periods in their life cycles and/or in particular seasons | No suitable habitat present | Field Surveys |
| • seasonal concentration areas, which tend to be localized and relatively small in relation to the area of habitat used at other times of the year, e.g.:<br>o Winter deer yards<br>o Moose late winter habitat<br>o Colonial bird nesting sites<br>o Waterfowl stopover and staging areas<br>o Waterfowl nesting habitat<br>o Shorebird migratory stopover sites<br>o Landbird migratory stopover areas<br>o Raptor wintering areas<br>o Wild turkey wintering areas<br>o Turkey vulture summer roosting areas<br>o Reptile hibernacula<br>o Bat hibernacula<br>o Bullfrog concentration areas<br>o Migratory butterfly stopover areas | No suitable habitat present | Field Surveys |
| **2. Rare vegetation communities or specialized habitat for wildlife:** | | |
| • **rare vegetation communities include:** | | |
| o areas that contain a provincially rare vegetation community (as per Bakowsky [1996]) | None present | Background Information<br>Field Surveys (ELC Mapping) |
| o areas that contain a vegetation community that is rare within the planning area, e.g.:<br>o bogs | None present | Background Information<br>Field Surveys (ELC Mapping) |

| SWH Criteria | Applicability to Study Area | Basis of Opinion |
|---|---|---|
| ○ fens<br>○ prairies<br>○ alvars<br>○ savannahs<br>○ rock barrens<br>○ sand barrens<br>○ forest stands with rare tree associations and/or rare tree species | | |
| • **specialized wildlife habitats include:** | | |
| ○ areas that support wildlife species that have highly specific habitat requirements, e.g.: | | Field Surveys and mapping |
| ○ Large (30 to 100+ ha) "premier" woodlands that provide enough suitable forest-interior bird nesting habitat (minimum 100 m from any edge habitat) | None present | |
| ○ Large (minimum 10 ha) "premier" grassland areas required to provide enough suitable area-sensitive grassland bird nesting habitat | None present | |
| ○ Old-growth forest | None present | |
| ○ Foraging areas with abundant mast (e.g., oak, beech) | None present | |
| ○ Amphibian woodland breeding ponds | None present | |
| ○ Turtle nesting areas | None present | |
| ○ Specialised raptor nesting habitat | None present | |
| ○ Moose licks, calving and aquatic habitat areas | None present | |
| ○ Mink/otter denning sites | None present | |
| ○ Cliffs | None present | |
| ○ Springs and seeps (e.g., within forests) | None present<br>Possibly within forest on adjacent property (e.g., to southwest); other seeps | |

| SWH Criteria | Applicability to Study Area | Basis of Opinion |
|---|---|---|
| | within open manicured areas of golf course. | |
| ○ areas with exceptionally high species diversity or community diversity, e.g.:<br>○ Highly diverse areas (e.g., forests with a variety of vegetation communities and dominant tree cover are most likely to have the highest diversity of plant and wildlife species) | Golf course was highly manicured with very few natural vegetation communities.<br>There are no forests or woodlands within the subject property. The adjacent woodland to southwest likely has fairly high function and may be of higher quality. There is no development proposed adjacent to or within 30 m of this feature and therefore impact to this feature is unlikely. | Field Surveys<br>Professional Judgment |
| ○ areas that provide habitat that greatly enhances species' survival | None present | Field Surveys<br>Professional Judgment |
| **3. Habitat of species of conservation concern:** | | |
| • includes the habitat of species that are rare or substantially declining, or have a high percentage of their global population in Ontario | None on subject property | Field Surveys |
| • includes "Special Concern" species identified under the ESA on the SARO List, which were formally referred to as "vulnerable" in the *Significant Wildlife Habitat Technical Guide* | No species of "Special Concern" were recorded from the subject property. One provincially "Special Concern" species was recorded from the adjacent woodland in the southwest corner: Eastern Wood-Pewee. A single breeding pair was identified in the woodland. As there is no development proposed within 30 m of this | Background Information<br>Field Surveys |

| SWH Criteria | Applicability to Study Area | Basis of Opinion |
|---|---|---|
| | woodland, there is likely to be no impact as a result of the proposed development. | |
| • species identified as nationally endangered or threatened by the Committee on the Status of Endangered Wildlife in Canada, which are not protected in regulation under Ontario's ESA | None present<br><br>One Butternut (Endangered) was observed on an adjacent property. The record was submitted to the MNRF, who have indicated that no further action is necessary (See Attachment BEACON-1). | Field Surveys (breeding birds, breeding amphibians, vegetation inventory) |
| • excludes habitats of endangered and threatened species covered under PPS policy 2.1.3(a) | Acknowledged. | |
| **4. Animal movement corridors:** | | |
| • habitats that link two or more wildlife habitats that are critical to the maintenance of a population of a particular species or group of species | None present | Field surveys and mapping |
| • habitats with a key ecological function to enable wildlife to move, with minimum mortality, between areas of significant wildlife habitat or core natural areas | None present | Field Surveys<br>Professional Judgment |

There is no SWH identified on the subject property. The adjacent woodland, from which the Eastern Wood-Pewee was heard calling, is on private property and is therefore not the subject of detailed investigations. As a 30 m buffer has been applied to this woodland, it is anticipated there would be no impact on the function of this woodland post-development. The buffer at its extreme northeasternmost limit is proposed to be reduced. As this area of reduced buffer is at the furthest edge of the woodland that is slightly separated from the remainder of the woodland by a watercourse, and given that the Eastern Wood-Pewee was recorded from the larger block, it remains unlikely there will be any impact on the function of the woodland.

Section 12.6.4 of the Aurora Official Plan provides direction for Endangered, Threatened and Special Concern Species and Their Habitats. With respect to Species of Special Concern, subsections b and c are as follows:

> *b) Development and site alteration is not permitted within the habitat of endangered, threatened, or special concern species as identified on the Species at Risk in Ontario List and Provincially rare species on the Oak Ridges Moraine.*
> *c) Council shall encourage private land and stewardship which protects and enhances the habitat of threatened, endangered and special concern species.*

There is no development proposed within 30 m of most of the southwest woodland, and it will be further buffered by a parkette block that will include some naturalization. The adjacent woodland, from which the Eastern Wood-Pewee was heard calling, is on private property and is therefore not the subject of detailed investigations.

14. *For features within the jurisdiction of the ORMCP, the setbacks provided on the draft plan should be confirmed to address the following minimum vegetation protection zones provided in the Plan and technical guidelines:*

    a. *A minimum 30 metre setback from the meanderbelt for all Permanent and Intermittent Streams (Table on page 58 of ORMCP)*

Acknowledged. A 30 m setback from the meander belt for all Permanent and Intermittent Streams is provided on lands within the ORMCP. As it relates to the proposed development there are four main reaches that are considered unconfined, and would thus have a meander belt associated with them: WT2A, WT3-1A, WT3-1C and WT3-2A.

As identified in section 6.1.1 of the Geomorphic Assessment Report (Beacon), with the exception of the proposed Street A (Reach WT2A), the redevelopment plan does not propose encroachment within the meander belt width. A new drawing (Attachment MGP-1) has been created which shows the appropriate meander belt width setback for all unconfined reaches. The updated Geomorphic Assessment Report will be updated and the associated figures which reflect the meander belt width information will follow this submission.

    b. *A minimum 30 m setback from the stable top of the valley wall, as defined by the conservation authority, where Fish Habitat exists within well-defined valley features (ORMCP technical guidelines)*

Fish habitat setbacks have been applied to the edge of the watercourse within the ORMCP area.

15. *For the study area outside of the jurisdiction of the ORMCP, we recommend that the following information be considered in determining the appropriate setbacks from natural heritage and hydrologic features:*

*a. Investigate and confirm the thermal regime of the watercourse in consultation with LSRCA staff*

Temperature loggers have been placed in all watercourses. Thermal regimes will be confirmed in the fall of 2015.

*b. If significant wildlife habitat exists as a result of the breeding amphibian surveys, the proposed minimum buffer of 15m wetland habitat should be reassessed.*

Breeding amphibian surveys have been completed, the results of which are presented in Attachment BEACON-1. We note that the small wetland pond (WPB) at the southwest corner of the property, which provides habitat for Wood Frog, Green Frog and Spring Peeper, will be reviewed with the Town and Conservation Authority for possible retention within the proposed park block.

16. *For the study area outside of the jurisdiction of the ORMCP, all recommended setbacks to natural heritage features (e.g. watercourses and wetlands) should be applied consistently to appropriately define the limits of development on this site. In particular, the following features and setbacks shown on the eastern portion of the draft plan require further clarification:*

    *a. The drainage feature within Block 219 between Street I and Street J*

Drainage feature TC1-2, located between Street I and Street J, was reviewed during the Site Walk with LSRCA on June 3, 2015. While we recognize that this feature meets the Conservation Authority definition of a watercourse, insofar as it is an "identifiable depression in the ground in which a flow of water regularly or continuously occurs", it was agreed in the field with LSRCA staff that the overall function of this feature is limited. Approximately 30 m in length, this feature flows between two stormwater infrastructure components, and is not daylighted at any other point within the proposed development until reach TC1-1, where 15 m buffers to development have been applied. This feature does not provide fish or amphibian habitat. Under the proposed development scenario, this feature will be maintained within a 15 m wide corridor and existing vegetation will be protected from development impacts.

17. *For the study area within the jurisdiction of the ORMCP, the following features and setbacks shown on the western portion of the draft plan require further clarification and assessment in conformity with the minimum vegetation protection zone as per the ORMCP:*

    *a. The staked significant woodland adjacent to Lots 29 & 30 (minimum 30 metres)*

The portion of the staked woodland adjacent to Lots 29 and 30 in the extreme northeastern corner of this woodland includes the area of trees in the rear yards in the existing residential lots to the south. Therefore, as the vast majority of the woodland edge has a 30 m buffer, a reduced buffer in this very small portion of the woodland, with a minimum width of 5 m, will be sufficient to ensure the features and functions of the larger woodland are maintained post-development. This variable buffer will contain a granular (i.e., permeable) trail, to be located at the outermost edge of the buffer and dense plantings will be installed adjacent to the edge of the woodland feature. An additional trail connection

between the proposed trail adjacent to the woodland and Petch Crescent, within the reduced buffer, is being reviewed with Town staff.

b. *The watercourse adjacent to future development Block 226 (minimum 30 metres from meanderbelt)*

The watercourse adjacent to Block 226 is a confined watercourse, and therefore a setback to the meander belt is not applicable, in accordance with the MNR Technical Guide to River Erosion Hazards (2002).

18. *Prior to finalizing the development limits of the site, all wetland communities and boundaries present must be confirmed through a staking exercise with LSRCA staff during the appropriate seasonal conditions. Please note that based on observations by LSRCA staff during previous site visits, the presence of wetland habitat in areas surrounding all watercourses must be verified.*

The limits of wetlands were staked in the field by LSRCA staff on June 3, 2015. All natural heritage features have now been staked by the LSRCA. These limits have been surveyed and are shown on Attachment MGP-1.

*Natural Hazards*

19. *The Geomorphic Assessment (Beacon 2015) provides erosion hazard assessments for specific reaches of the watercourses present. However, erosion hazard setbacks should be identified for all permanent and intermittent streams. It should be noted that the natural heritage setback for permanent and intermittent streams in the ORMCP is from the edge of the meanderbelt. As such, if appropriate this information should be translated into the mapping of this setback for all unconfined watercourses.*

Acknowledged. A new drawing (Attachment MGP-1) has been created which shows the appropriate meander belt width setback for all unconfined reaches. The revised Geomorphic Assessment Report will be updated and the associated figures reflecting the meander belt width information will follow this submission.

20. *Toe erosion information reported in the Golder Geotechnical Investigation (Feb 2015), Beacon Geomorphic Report (Feb 2015) and in Section 9.0 of the SCS Report is not consistent. For example, only 2 locations of toe erosion are reported in the SCS Report and six are noted in the other two reports. In addition, the Toe Erosion Allowance for Area 2 is 1 metre in one report and 2 metres in another. The Erosion Hazard Limit calculation shown on Figure 9.1 of the SCS Report also appears incorrect. The edge of watercourse and stable top of slope elevations should be identified on Figure 9.1. We recommend that figures similar to Figure 9.1 in the SCS report be provided for each reach identified with a slope hazard. All development limits associated with slope hazards should be identified on the draft plan. In particular, we note that on the current draft plan Lots 128-131 and Block 222 do not have a slope hazard identified even though this is a reach where toe erosion was identified in the reports.*

The correct Toe Erosion Allowance for Area 2 is 1 m, as reported in the SCS and Beacon reports. The Toe Erosion Allowance for Area 2 in the final version of the Golder report will be updated (from 2 m to 1 m). The erosion hazard limit for the other 4 areas (Areas 3, 4, 5 and 6) was reported on in Section 5.5 of Golder's Geotechnical Investigation and was not further analyzed in the Functional Servicing and Stormwater Management Report ("FSSR") as the erosion hazard limit did not affect or govern the proposed limit of development. As requested, the erosion hazard limit for each of these areas will be illustrated on separate figures and will follow this submission. The edge of the watercourse and stable top of slope elevations will be identified on Figure 9.1. The setback distance calculations in support of Figure 9.1, as well as the Figure itself, will follow this submission.

21. *On the draft plan, the labelling of Stable Top of Bank should be corrected to Erosion Hazard Limit to represent the fact that a setback to stable top of bank is included in the hazard limit.*

Acknowledged. The label has been corrected on the updated draft plan (Attachment MGP-2).

22. *The rear of lot 28 is to be removed from the Floodplain. The draft plan should be revised accordingly.*

Acknowledged. The rear of lot 28 has been removed from the floodplain on the updated draft plan (Attachment MGP-2).

23. *A 10 metre development setback to the floodplain is not provided as part of this development application. The statement on page 26 of the Beacon EIS Report (Feb 2015) should be corrected.*

Page 26 of the Natural Heritage Evaluation will be revised to exclude that reference. An updated report will be provided.

*General Natural Heritage*

24. *A feature based water balance for the wetlands, woodlands and watercourses has not been provided. Catchment changes impacting the features have not been identified and further details are required ensuring that pre- to post- conditions are maintained thereby maintaining ecological function such as amphibian breeding or baseflow for fish habitat.*

Three natural heritage features, illustrated on Figure 4 of Beacon Environmental's Natural Heritage Evaluation, have been identified in close proximity to the subject property which could be affected by changes in site water balance, including:

(i) the ORM Woodland to the southwest (located within Catchment D immediately upstream of the site);
(ii) the ORM Wetland to the north (located below the confluence of Catchments C and D, immediately downstream of the site) and
(iii) the Non-ORM Woodland to the northeast (located within Catchment A, immediately downstream of the site).

Each of these features is located along tributaries of Tannery Creek, and all three features are assumed to be sustained with flows (i.e., catchment surplus, which includes both infiltration and runoff) conveyed from their corresponding catchments (Attachment GOLDER-1). A two-step water balance was developed for each of the three catchments in order to evaluate the change in local water budget that may be expected at each of the natural heritage features.

*Step 1: Developing Water Balances for External Contributions*
The first step in the water balance was to develop an estimate of contributing flows from the portions of each catchment external to the subject property. The water balances for external contributing catchments is assumed to be remain identical under pre-development and post-development conditions (e.g. no additional development in watershed areas west of Bathurst St. or south of the site shown on Attachment GOLDER-1).

The catchments contributing to each of the six tributaries crossing the site were delineated using OBM contours and are shown on Attachment GOLDER-1. Of these six catchments, three catchments are assumed to convey flows to the natural heritage features, including:

(i) Catchment A (which feeds the Non-ORM Woodland downstream of the site);
(ii) Catchment E (which feeds the ORM Wetland downstream of the site); and
(iii) Catchment D (which feeds the ORM Woodland upstream of the site as well as the ORM Wetland downstream of the site). *Note that a small portion of Catchment D is downstream of the ORM Woodland feature and was therefore excluded from the water balance assessment.*

Undeveloped land use designations within these three catchments were assigned based on the areas of forest, woodlots, wetlands and water bodies shown in OBM mapping. Developed land use areas were estimated using the number and locations of residential buildings, commercial buildings, and roads shown on the OBM mapping. The coverage of each land-use designation is presented in Table 1 below.

**Table 1: External Areas Contributing to Features**

| Contributing External Catchment to Natural Heritage Feature | Area (ha) | | | | Total (ha) |
|---|---|---|---|---|---|
| | Treed Land Use | Open Land Use | Existing Developed (Impervious) Land Use | Wetland or Open Water Land Use | |
| **ORM Woodland (Catchment D Upstream of Site)** | 59.0 | 76.7 | 3.3 | 0.3 | 139.4 |
| **ORM Wetland (Catchments D & E)** | 115.4 | 201.4 | 11.8 | 3.5 | 332.2 |
| **Non-ORM Woodland (Catchment A)** | 45.4 | 220.2 | 36.0 | 0.5 | 302.1 |

Note: Land use assigned as follows:

- *Treed Land Use* areas are taken as the forest areas shown in OBM mapping

- *Open Land Use* areas are taken as any catchment areas not accounted for in Treed, Existing Development (Impervious) and Wetland or Open Water land uses
- *Existing Developed (Impervious) Land Use* areas were estimated including all building areas shown in OBM mapping, a 12 m width multiplied by the length of arterial road shown in the catchment, a width of 9 m multiplied by the length of collector roads, a width of 6 m multiplied by the length of local roads, and a per-unit area of 152 $m^2$ (representing 140 $m^2$ roof and 12 $m^2$ driveway) for every housing unit shown on the OBM mapping
- *Wetland or Open Water Land Use* areas are shows as wetland or water polygons on OBM mapping

Annual water budget values for external contributing catchments were calculated by applying the same water holding capacity (WHC) values previously employed for the subject property water balance (described in the hydrogeology report) to the land use designations presented in Table 1. Specifically, WHCs were assigned as follows:

(i) 350 mm for the treed land use areas (average annual surplus of 243 mm/yr);
(ii) 75 mm open pervious areas (average annual surplus of 338 mm/yr);
(iii) impervious area runoff was assumed to be 90% of the 865 mm/yr annual precipitation (average annual surplus of 779 mm/yr)
(iv) open water areas were assumed to equate to annual precipitation minus annual potential evapotranspiration (average annual surplus of 239 mm/yr).

The resulting water budget contributions (annual surplus values, infiltration coefficient assumptions, and annual infiltration values) for each land use area are shown in Table 2 below.

**Table 2: Water Budget Contributions**

| Feature | Land Use | | | |
|---|---|---|---|---|
| | **Treed Land Use** | **Open Land Use** | **Existing Developed (Impervious) Land Use** | **Wetland or Open Water Land Use** |
| **WHC (mm)** | **350** | **75** | **-** | **-** |
| **Impervious (%)** | 0 | 0 | 1 | 1 |
| **Infiltration Coefficient** | 0.5 | 0.4 | 0 | 0 |
| **Annual Surplus (mm/yr)** | 243 | 338 | 779 | 239 |
| ***Annual Infiltration (mm/yr)*** | *121.5* | *135.2* | *0.0* | *0.0* |
| ***Annual Runoff (mm/yr)*** | *121.5* | *202.8* | *779* | *239* |

The contributing catchment areas (presented in Table 1) and average annual water budget contributions (presented in Table 2) were combined to estimate the annual contributions from external catchments to each of the three natural heritage features (see Table 3). As previously discussed, these values do not include any site development areas, and are therefore not expected to change from pre- to post-development conditions.

**Table 3: External Catchment Water Budget Results (Not Including Site Contribution)**

| External Areas | Surplus ($m^3$/yr) | Infiltration ($m^3$/yr) | Runoff ($m^3$/yr) |
|---|---|---|---|
| **ORM Woodland (Catchment D)** | 429,000 | 175,000 | 254,000 |
| **ORM Wetland (Catchment D & E)** | 1,062,000 | 413,000 | 649,000 |
| **Non-ORM Woodland (Catchment A)** | 1,136,000 | 353,000 | 783,000 |

*Step 2: Adding Water Budget Contributions from Subject Property Contributions to External Water Budget Contributions*

Finally, the contribution from the subject site areas (as previously reported) was added to the external catchment contributions for each of the three features. The results are shown in Table 4, Table 5, and Table 6 below. In the case of the ORM Woodland, some drainage from the site to the feature has been identified under existing conditions. Under the post-development scenario, this drainage will be maintained and additional LID measures could be explored within Blocks 188 and 209, if required.

**Table 4: Feature Water Budget: Surplus (Including Site Contribution)**

| Feature | Surplus ($m^3$/yr) | | |
|---|---|---|---|
| | Existing | Proposed with Low-Impact Development | Change (%) |
| **ORM Woodland** | To be updated in final report | | |
| **ORM Wetland** | 1,194,000 | 1,212,000 | 18,000 (+1.5%) |
| **Non-ORM Woodland** | 1,162,000 | 1,173,000 | 11,000 (+0.9%) |

**Table 5: Feature Water Budget: Infiltration (Including Site Contribution)**

| Feature | Infiltration ($m^3$/yr) | | |
|---|---|---|---|
| | Existing | Proposed with Low-Impact Development | Change (%) |
| **ORM Woodland** | To be updated in final report | | |
| **ORM Wetland** | 345,000 | 342,000 | -3,000 (-0.9%) |
| **Non-ORM Woodland** | 361,000 | 360,000 | -1,000 (-0.3%) |

**Table 6: Feature Water Budget: Runoff (Including Site Contribution)**

| Feature | Runoff ($m^3$/yr) | | |
|---|---|---|---|
| | Existing | Proposed with Low-Impact Development | Change (%) |
| **ORM Woodland** | To be updated in final report | | |
| **ORM Wetland** | 849,000 | 869,000 | 20,000 (+2.4%) |
| **Non-ORM Woodland** | 800,000 | 813,000 | 13,000 (+1.6%) |

Generally, the results for the ORM Wetland and the Non-ORM Woodland show an increase in surplus of between 10,000 $m^3$/yr and 17,000 $m^3$/yr (approximately 0.3 L/s and 0.5 L/s average flow over the entire year), and a decrease in infiltration less than or equal to 1,000 $m^3$/yr (less than 0.1 L/s average flow over the entire year. Given the relatively minor changes in surplus and infiltration, it is unlikely that there will be a resultant change in the ecological function of the ORM Wetland and non-ORM Woodland. Neither of these features provides breeding amphibian habitat. The results for the ORM Woodland will follow this submission.

25. *The EIS references the installation of servicing across watercourse WT3-1C and 10 new SWM outlets however limited information is provided. Please provide the locations of all new outfalls on a figure(s), assess the impacts to the features and their associated vegetation protection zone (VPZ) including mitigation & restoration. ORMCP Section 41 (5) must be addressed for all outlets and service crossings within key natural heritage features and their VPZ for the western portion of the site. For locations on the eastern portion of the site the outlets should be located outside*

*of the features, as well as the VPZ, where possible. Justification for all locations should be provided in the EIS.*

The conceptual locations of the proposed storm outfalls and the 100 year water levels in the receiving watercourses are illustrated on updated Figures 2.6 to 2.10 of the Functional Servicing and Stormwater Management Report (FSSR) and have been located at the low points in order to provide a gravity outlet for the storm drainage (refer to Attachment SCS-3). The inverts of the outlets have been located above the 100 year water levels in the receiving creeks, where possible. As discussed with the LSRCA, in all cases where it is not possible to have the outlet invert above the 100 year water level, the inverts of the control structures upstream of the storm outlets are above the 100 year water levels in the receiving creeks to ensure there are no back water conditions acting on the control structures. Where headwalls are to be located within the VPZ of watercourses, they will be naturalized. These planting plans will be provided in the Restoration and Compensation Plans. It is proposed that the Restoration and Compensation plans be submitted as a condition of draft approval.

26. *Discussions of stormwater management should be included into the EIS including any potential for hydrological support to the existing features through the installation of LIDs, where applicable. Confirmation is required whether any LID enhancements are proposed to be installed in the VPZ. Section 41 (5) of the ORMCP would apply to any infrastructure proposed in the western portion of the site.*

There are no LIDs proposed within the VPZ.

27. *The details regarding grading requirements in the study area are limited. A figure should demonstrate where grading may be required outside of the proposed development limit and an impact assessment undertaken. The response should include mitigation measures and restoration. Please note, at the detailed design stage, any additional grading proposed outside of the approved development limit will not be permitted.*

A figure has been prepared illustrating all grading areas within the MPVZ and buffers to features (refer to Attachment SCS-4). A Restoration and Compensation Plan is proposed to be submitted as a condition of draft approval.

28. *Enhancement Plans will be required at detailed design as per the requirements of the Town Official Plan (Section 12.6.1. (e) & (f) (ii) and ORCMP (section 23 (d)) to naturalize the vegetation protection zones of the identified natural heritage and hydrologic features on site. The use of bioengineering techniques may be appropriate in some areas where erosion has been identified along the banks of the existing watercourses. Restoration plans should include lands inside and outside of the jurisdiction of the ORMCP to adequately address these policies.*

It is acknowledged that a Restoration and Compensation Plan will be required at detailed design and will include lands throughout the subject property.

29. *A Trails Impact Study will be required as a draft plan condition. Given the urban area, small mammal use should be considered for the foot bridges and open bottom culverts as determined by the EIS wildlife occurrences.*

It is acknowledged that a Trails Impact Study will be required as a draft plan condition and will address wildlife movement with respect to all natural heritage system crossings.

30. *Please identify the point locations or the transect line used to complete the breeding bird surveys.*

The breeding bird surveys were conducted using a roaming survey technique in which the entire property was surveyed to within 50 m of its outer boundary. All birds heard or observed were recorded as breeding when in suitable habitat. Flyovers and late migrants were also recorded. The approximate survey route is illustrated on Attachment BEACON-2.

31. *During the site reconnaissance a weir was noted at the downstream end of Pond 3, confirmation is required whether this fish barrier is proposed for removal.*

The weirs associated with on-line ponds will be removed as part of the restoration of these areas. It is the intent of the restoration to improve watercourse function and enhance fish habitat, both within and downstream of the property. The conceptual channel design drawings will follow this submission.

32. *The overall tree removal on the property has not been quantified and a restoration/replacement plan should be provided in order to identify the total tree replacement required. The draft Urban Forest Study for the Town of Aurora can be used as a guideline for the overall strategy. Please note that tree removal will only be allowed within the approved draft plan limit.*

A total of 1179 trees/vegetation units were inventoried within the former golf course lands, as reported in the Tree Inventory and Assessment Report prepared by Schollen and Company. Of the 1179 trees inventoried, 784 trees/units are proposed to be removed either due to health/condition concerns, due to species quality or to accommodate the proposed development. A total of 121 trees of the 1179 inventoried were identified to be 'suitable for transplantation' (non-native/invasive species will not be transplanted). Based upon a preliminary assessment of the proposed landscape and open space plans for the project, approximately 2600 trees are proposed to be planted throughout the community. This is a compensation ratio of slightly more than 3:1. This number is preliminary and will be refined as the detailed design of the landscape plans for the community is advanced.

33. *A note should be included in the Tree Inventory Assessment Report and on the drawings relating to tree removal being conducted during the appropriate breeding bird window, unless otherwise required, wherein a qualified ecologist will complete a nesting survey prior to any removals.*

A note will be added to the Tree Inventory and Assessment Report that all vegetation removal must occur in compliance with the federal *Migratory Birds Convention Act* and the provincial *Fish and Wildlife Conservation Act*. Where vegetation removal is contemplated within the breeding bird season, a qualified ecologist will conduct a nesting survey prior to any disturbance. An updated Tree Inventory and Assessment Report will be provided.

34. *Invasive species or aggressive non-natives should not be included in the list for relocation in the Tree Inventory Assessment Report. Additionally, relocated non-native species will not be accepted as plantings in VPZs to features.*

Invasive/non-native species have been excluded from the list of trees that are proposed to be transplanted. Plantings proposed adjacent to features and their associated VPZs will be proposed as native species that are indigenous to the bioregion.

35. *A monitoring program (considered a key component of the York Region EIS submission) should be created to study the impacts of the development on the natural heritage area including adaptive management where appropriate. This may include biological inventories, water quality sampling and interim and final report.*

A detailed monitoring plan is proposed to be submitted as a condition of draft approval. Aspects of the plan may include the components presented in the following table.

| Ecosystem Component | Objective(s)/Rationale |
|---|---|
| Groundwater Resources | Implementation of post construction infiltration tests for the downspout disconnections to verify that the infiltration rates in the receiving vegetated areas are above 15 mm/hr. |
| Surface Water Resources | Implementation of a water quality monitoring program to determine whether the proposed stormwater management facilities and LID components perform as designed. Operation, maintenance and monitoring requirements identified in SWM Design Guidelines (MOE 2003) as well as in any conditions associated with future MOECC Environmental Compliance Approvals shall be implemented. |
| Geomorphology | Assessing changes in channel morphology as a result of increased urbanization and on-line pond removals<br>Monitoring of key areas for excessive bank erosion and channel migration<br>Determining excessive changes in channel slope and bed level, bed form configuration, and sediment accumulation or depletion in realigned watercourse sections. |
| Terrestrial Resources | Assessing changes in the structure and composition of vegetation within the natural heritage system over time.<br>Evaluating the effectiveness of buffers in reducing encroachment related impacts to protected features within the natural heritage system. |
| Aquatic Resources | Assessing the use of potential habitat by fish to demonstrate increase in extent of enhanced and naturalized fish habitat |
| Erosion and Sediment Controls | Implementation of ESC inspections as per approved drawings. |
| Tree Protection Fencing | Monitoring of trees and tree protection fencing by a qualified arborist |

*Floodplain Delineation and Modifications*

36. *The existing and proposed 100 year and Regional Floodplain are to be delineated on all Figures in the SCS Report (Feb, 2015) where applicable (i.e. Servicing and Grading Plans, Figure 2.15 and 9.1).*

Acknowledged. Figures will be updated accordingly and will follow this submission.

37. *Floodplain Mapping Figure 2.14 (SCS, 2015)*

    a. *The watercourse layer is difficult to identify on the figure. Please provide a more distinct line type to clarify the watercourse location in relation to the cross-sections. As well, please identify that the watercourse name as Tannery Creek on the drawing.*

The watercourse layer will be revised to provide a more distinct line type in order to clearly identify the location of the watercourse. As discussed with the LSRCA staff in a review meeting on June 1, 2015, Tannery Creek (with the corresponding reach number identified in brackets) will be shown on both Figures 2.13 and 2.14. The updated figures will follow this submission.

    b. *It appears that there are several cross-sections that intersect other cross-sections in the hydraulic model and mapping. Please revise the affected cross-sections at West Trib Reach 47, cross-section 8217 and 8211; East Tributary Reach 43 cross-section 8311 in the hydraulic model. Please update any affected mapping.*

At cross-section 8217, the cross-section ID leaders shown in Figures 2.13 and 2.14 were interpreted to be part of the cross-section. The thickness of the leader has been changed (Attachment SCS-2) to clearly differentiate the cross-sections from the section ID leaders. Cross-section 8211 has been trimmed to ensure the cross-sections do not intersect. We note that these revisions have no impact to the resulting flood elevations.

    c. *It appears that there are several locations where cross-sections do not contain the floodplain such as East Tributary Reach 43 cross-section 8310 and 8307.75. In addition, a cross-section revision will be required at West Tributary Reach 47 cross-section 8210 and West Tributary Reach 46 cross-section 8222 to fix a discrepancy in the bounding polygon. An option could involve trimming cross-section West tributary reach 47 cross-section 8210 and moving cross-section West Trib Reach 46 cross-section 8222 toward Cranberry Lane. Please revise affected cross-sections in the model and the associated figures.*

Floodplain mapping was completed to the extent of the subject property boundary. As discussed in the LSRCA review meeting on June 1, 2015, the length of cross-section 8210 will be trimmed to exclude Tannery Reach 46. Tributary Reach 43 cross-section 8310 will be adjusted and cross-section 8307.75 will be extended towards Murray Drive. West Tributary Reach 46 cross-section 8222 will be adjusted. These revisions will not impact the flood lines. The revised cross-sections and associated figures will follow this submission.

*38. Please provide an index of the drawings and related crossing information provided on the Data CD in Appendix B specifically used in support of the dimensions and inverts that were revised in the hydraulic model. This information will be used as a reference in the crossing description in the HECRAS model for future users of the updated watershed model.*

An index of the drawings and related crossing information will follow this submission.

*39. HECRAS model HRE_rev5e- SCSPRE and POST*

*a. Please document the digital surface or survey data source used to update the hydraulic sections identified.*

Acknowledged. Information for the survey data source will be provided in the model which will follow this submission.

*b. It appears that the regional event is overtopping the roadway at Tannery Creek Reach 40 Bridge 8307.5, but this is not indicated in the delineation of Figure 2.14. Please clarify and update as necessary.*

Figure 2.14 has been revised to illustrate that the Regional water surface elevation spills over the Devlin Place Bridge (8307.5), refer to Attachment SCS-2. A portion of the Regional Storm flows are conveyed across the road and back into the watercourse, while a portion of the flows are conveyed east along Devlin Place and north along Murray Drive, ultimately spilling back into the East Tributary (Tannery Creek Reach 40) at the low point on Murray Drive at the existing double culvert crossing. In order to allow the flows to continue to spill on the south side of this low point on Murray Drive, grates above the proposed box culvert extensions will be provided to allow the spill to be conveyed to the watercourse. The HEC-RAS model does not simulate this spill and instead conservatively assumes the full Regional peak flow of 47.8 $m^3/s$ is reaching the proposed double culvert extension at Street F.

*40. HECRAS model HRE_rev5e-SCS-POST*

*a. It appears that non-georeferenced cross-sections were added to the hydraulic model Tannery Creek Reach 26 under proposed conditions. Please update hydraulic model as needed.*

Acknowledged. The cross-sections added to the hydraulic model at Tannery Creek Reach 26 will be georeferenced. The updated model will follow this submission.

*b. The manning's n selected for the overbank proposed conditions of 0.08 appear too high. Please provide additional information to support the proposed overbank manning's n.*

As discussed in the LSRCA review meeting on June 1, 2015, the manning's 'n' of 0.08 was used for the overbanks in the proposed condition to provide a more conservative estimate of the Regional flood elevations, as the proposed overbanks will ultimately be naturalized (as opposed to the current manicured grass condition).

41. *It appears that the revised flow file rev5e-SCS-Rev may not have been used for the hydraulic modeling. Please clarify and provide details of any flow file changes (i.e. 2-100 year flows) in the report.*

The model was simulated with the rev5e-SCS-Rev, however, the Regional flow information did not change as the Regional flow was not modified or revised. The 2 to 100 year flow data was modified at Reach 26, 40, 43, 45, 46, and 47 from "Existing Peak Flows" to "Future Peak Flows" at flow nodes 62, 52, 44, 48, 42, 40, respectively. The flow information was obtained from *Table 16: Existing and Future Peak Flows at Key Points of Holland River Watershed* in the *Hydrology Report (Final) – Hydrologic and Hydraulic Modeling for the West Holland River, East Holland River and Maskinonge River Watersheds prepared by CCL, dated June 2005*. The final model will ensure the future 2 to 100 year flows (rev5e-SCS-Rev) are utilized in the proposed conditions model. The final model will follow this submission.

42. *It appears that cut/fill information for the cross-sections 8448.5, 8449 and 8449.5 on Tannery Creek Reach 26 (Figure 2.13 Tannery Creek Realignment) was not modified on the affected cross-sections in the hydraulic model post conditions. Please revise cross-sections as necessary.*

Geometry of cross-sections will be revised to represent the proposed retaining walls. This will have no impact on the floodlines. The revised cross-sections will follow this submission.

43. *Please provide comment in the report and provide tabular analysis in Appendix H on the variation in floodplain elevation and velocity change between the SCS existing and proposed conditions for the channel and overbank for the proposed Tannery Creek re-alignment and Street F crossing. Additional cross-sections will also be required at the extent of the proposed cut between cross-sections 8448.50 & 8448 and 8450 & 8449.5 for the Tannery Creek re-alignment. This analysis will also be required for Street A, if grading is proposed in the floodplain just north of Timberline Trail.*

Acknowledged. A summary table will be provided for the variation in floodplain elevation and velocity between the SCS existing and proposed conditions for the proposed Tannery Creek re-alignment, Street F crossing, and Street A. Additional cross-sections will also be provided between cross-sections 8448.50 & 8448 and 8450 & 8449.5. The summary table and cross-sections will follow this submission.

*Concrete Dam Removal – Tannery Creek*

44. *Downstream flows cannot increase as a result of the removal of the existing concrete dam structure on Tannery Creek. It is recommended that options to maintain the existing stage discharge of the structure be explored. Please also provide additional details with respect to the existing and proposed conditions and reference the applicable rating tables and information in the Appendix.*

In general, the conceptual design options will maintain the existing opening size through the existing weir and maintain the function of the berm to the extent feasible. The conceptual channel design drawings as well as additional information related to the applicable rating tables will follow this submission.

*Stormwater Management*

*Hydrology and Quantity Control*

45. *Table 2.2 on Page 9 references Runoff Coefficients in the title and note, however it appears to only tabulate CN values.*

Acknowledged. *Runoff Coefficients* will be removed from the title of Table 2.2. The updated table will follow this submission.

46. *The Pre-Development Drainage Plan (Figures 2.1 & 2.2) should also identify the existing minor system and storm outlets.*

As discussed in the LSRCA review meeting on June 1, 2015, the minor system drainage arrows will be shown for the external catchment areas. The revised figures will follow this submission.

47. *The Post-Development Drainage Plan (Figures 2.3 & 2.4) should also identify minor system, storm outlets, quantity control/super pipes and uncontrolled areas.*

A note will be included on Figures 2.1 and 2.2 which will reference Figures 2.6 to 2.10 for the location of the proposed storm outlets, quantity control/super pipes, and minor system flow information. Asterisks will be added to the catchment IDs of the uncontrolled area. The updated figures will follow this submission.

48. *The Pre-Development flow summary Tables 2.3, 2.4 & 2.5 are to reference the associated drainage areas.*

Associated drainage areas will be included in the pre-development flow summary tables (Tables 2.3, 2.4, and 2.5). The updated summary tables will follow this submission.

49. *The Post-Development flow summary Tables 2.9, 2.10, 2.11, 2.12, 2.13 & 2.14 are to reference the associated drainage areas for Allowable and Post Development flow. Please also include the applicable catchment ID(s) for the required storage columns.*

Associated drainage areas and catchment IDs will be included in the post-development flow summary tables (Tables 2.9, 2.10, 2.11, 2.12, 2.13, and 2.14). The updated summary tables will follow this submission.

50. *It is noted that different hydrology modelling methods were used for east and west portions of the site. The VO2 hydrology model is to be utilized to provide a consistent modelling approach for the proposed development and external areas. In addition, a post to pre-development peak flow (2-100 year storms) assessment is to be completed for the entire site and external drainage areas at Nodes B1 and C1, (similar to the assessment completed at Node A) to demonstrate that there will be no increase in flows downstream of the development.*

As requested, VO2 hydrology modelling has been completed for the areas draining to Nodes B and C to demonstrate that there will be no downstream impacts (refer to Attachment SCS-5).

The Highland Gate Overall VO2 model was derived from hydrology modelling previously prepared by CCL entitled 'Hydrology Report (Final) Hydrologic and Hydraulic Modeling for the West Holland River, East Holland River and Maskinonge River Watersheds' (CCL, 2005). The Highland Gate development makes up a portion of five catchments and three tributaries within the CCL model, as shown in '1587-VO2 Catchments – Overall VO2 Model' Figure (Attachment SCS-5).

Catchment 186 was modelled in the 1st Submission of the FSSR (SCS, February 2015). To create a model for the East and West Tributaries (Catchments 178, 180, 182, and 184), the CCL model was modified to separate the areas within the proposed Highland Gate development from the remainder of the catchments, as shown in the '1587-VO2 Model Schematic' Figure (Attachment SCS-5).

Several changes were required to Catchment 178:

- The existing development and pond located downstream (to the north) of the proposed Highland Gate development were removed from the model.
- A 14 ha (50% impervious) area and associated Route Reservoir (representing an off-line facility) upstream of the proposed Highland Gate development were removed from the model. It appears this area and facility were erroneously entered in the CCL model.

Both adjustments were confirmed in discussion with the LSRCA (July 22, 2015). All other catchments remained as they were in the CCL report, except for removing the areas within the proposed Highland Gate development from the larger CCL catchments.

Three scenarios were modelled;

1. The existing condition scenario,
2. The proposed development scenario with extended detention (25 mm event) control and quantity control as per the volumes proposed in the FSSR that were calculated based on the Modified Rational Method, and
3. The proposed development scenario with only extended detention (25 mm event) control provided in the superpipes.

A comparison of the resulting 4 hour Chicago and 12 hour SCS 2 to 100 year storm event peak flows in the East and West Tributaries at the downstream limit of the proposed Highland Gate development for the existing conditions and the two proposed scenarios is provided in Attachment SCS-5 ('1587-Trib VO2 Results-FSSR Superpipes' and '1587-Trib VO2 Results-Ext Det Only'). As shown, peak flows were generally reduced from existing to proposed conditions for the 2 to 100 year storm events. Some scenarios showed increases in post-development flows compared to existing flows for the 4 hour Chicago 2 and 5 year return period events; however, further attenuation of the peak flows during smaller return period events will occur within the roadside LIDs which were not accounted for in the model.

We note that although the total storage volumes provided in the superpipes in Scenario 2 (extended detention control and quantity control volumes proposed in the FSSR) are greater than the storage volumes provided in Scenario 3 (extended detention control only), the resulting peak flows at the downstream limits of the site are higher, indicating that providing greater quantity controls causes

increases in the peak flows. This is due to the timing of the peaks of the attenuated hydrographs lining up more closely with the peaks of the upstream flows.

Therefore, SCS recommends that the superpipes be sized for only the extended detention to more closely match the pre-development peak flows at the downstream site limits and to minimize the amount of infrastructure and maintenance required by the Town of Aurora associated with the amount of required superpipes.

51. *An additional Target Flow Node is required at the existing Headwall at Golf Links Drive (between existing lots 42 & 43) to demonstrate that there is no increase in flow to the existing 1200mm storm sewer. A Pre-Development and Post-Development conveyance capacity of the swale, inlet headwall and 1200mm storm sewer should also be completed to demonstrate that drainage is contained within the proposed swale and existing storm sewer with no increase in water levels or HGL.*

An additional Target Flow Node has been added at the existing Headwall at Golf Links Drive. There is no increase in flow to the existing 1200mm storm sewer. A summary table will be provided to summarize existing unattenuated flows (3.14 $m^3/s$), existing attenuated flows (2.87 $m^3/s$), and proposed peak flows (2.87 $m^3/s$) at the headwall. A pre- and post-development swale conveyance capacity analysis will follow this submission.

52. *In addition to the provided VO2 modelling schematic, a hard copy of the model output summary is to be provided in the report for both pre-development and post-development conditions.*

As discussed in the LSRCA review meeting on June 1, 2015, due to the large amount of VO2 data for the proposed development, a digital 'Microsoft Word' copy of the VO2 detailed output file has been provided on a CD (refer to Attachment SCS-5).

53. *In addition to the 12-hour SCS Type II distribution, please also include hydrologic modelling for the 4 hour Chicago distribution.*

Acknowledged. The 4 hour Chicago storm distribution has been included in the VO2 modelling (refer to Attachment SCS-5).

54. *Rainfall amounts for the VO2 model should be based on the current intensity-duration-frequency (IDF) curves for the Town.*

Rainfall amounts for the VO2 model have been corrected to match the Town's IDF curve (refer to VO2 modelling in Attachment SCS-5).

55. *Additional clarification and supporting information is required in the report text and Appendix to support the Duhyd, Route Reservoir and rating tables utilized in the Pre-Development VO2 hydrology model.*

Further clarification in the text and Appendices to support the VO2 hydrology model will follow this submission.

56. *Please reference and include an excerpt of the existing storm sewer design sheet in the Appendix to support the existing/target flow for Node C5.*

The existing storm sewer design sheet was included at the beginning of Appendix C to illustrate the target flow for Node C5. The existing storm sewer design sheet will be labelled for better identification in the updated report.

57. *Please demonstrate that the inverts of the proposed storm sewer or superpipe storage is above the adjacent watercourse 100 year water level.*

Please refer to response #25.

*Quality and Erosion Control*

58. *The available Biofiltration volume calculation for the cul-de-sac appears incorrect. It appears that the void ratio for the storage media was not utilized in the calculation. Please review and revise the report and calculations accordingly.*

Acknowledged. The biofiltration volume calculation for the cul-de-sac will be revised to include a void ratio of 0.4. The calculations will follow this submission.

59. *Based on a review of the Summary of Biofiltration Volumes in Appendix D, it appears that a few of the proposed available Biofiltration volumes are less than the required. Please identify all catchments that cannot achieve the required quality or erosion control volume in Section 2.5.1 and 2.5.2 and clearly identify constraints/reasons why quality and erosion control should/cannot not be provided (e.g. why can the 0.36ha in Area 2 not drain to an LID?).*

Acknowledged. Areas will be identified where quality or erosion control volumes are not satisfied and an explanation will follow this submission. Figure 2.4 has been updated to depict which subcatchments are not providing any quality and/or quantity controls (refer to Attachment SCS-5).

60. *As noted previously, the VO2 hydrology model is to be utilized, therefore the required erosion control (25mm extended detention) volume is to be calculated utilizing the hydrology model 25mm runoff volume (4 hour, Chicago Distribution). Please revise the report and calculations accordingly.*

Acknowledged. The 25 mm extended detention volume has been calculated using the VO2 model (refer to modelling in Attachment SCS-5).

61. *Further to the above, please demonstrate how the 25mm runoff volume will be detained and released over 24 hours within the Biofiltration swale(s).*

Calculations for the various subcatchments with superpipe controls have been provided (see Attachment SCS-5). As shown and as discussed at the LSRCA review meeting on June 1, 2015, the minimum 24 hour detention time for the 25 mm runoff is not achievable with a minimum 75 mm

diameter orifice and ranges from approximately 2 hours to 10 hours.

*Phosphorus Budget*

62. *The Open Water area in Table 2.18 does not appear to match the Pre-Development Phosphorus Loading calculations in Appendix F.*

The Open Water area should be 0.27 ha as per the calculation in Appendix F. Table 2.18 and Figure 2.11 will be updated accordingly and will follow this submission.

63. *Please provide additional details and supporting information for the proposed 0.34 ha Stream Buffer in the Post-Development Phosphorus Loading calculations for Block 224 & 225.*

Stream buffer treatment will be removed from the post-development phosphorus loading calculations for Block 225, as the existing parking lot will remain in the post-development conditions.

*Drainage*

64. *100 year capture should be mentioned in Section 2.5.3, 2.6.2 and 2.7 where applicable. It is also recommended that the emergency overland flow routes be provided in the event that the storm sewers are blocked.*

Acknowledged. The FSSR will be updated to mention the 100 year capture in Sections 2.5.3, 2.6.2, and 2.7, if applicable. The 100 year capture will be determined upon confirmation of the stormwater strategy in terms of the level of quantity control to be provided beyond the extended detention (25mm event) control. Emergency overland flow routes will also be provided in the updated report.

*Servicing Plans*

65. *The Servicing Plans are to include a location Key Plan.*

Acknowledged. A key plan will be included on the updated Servicing Plans which will follow this submission.

66. *Existing Culvert Crossings are to be shown on the Servicing Plans.*

Acknowledged. Existing culvert crossings will be shown on Figures 2.6 to 2.10. The updated Servicing Plans will follow this submission.

67. *Please refer to Natural Heritage Comment 25 above, with regard to all stormwater outlets and service crossings. The storm outlet headwalls should be located outside of the VPZ, where possible.*

Acknowledged. The headwalls will be located outside of the VPZ where possible. This will be confirmed at detail design.

*Grading Plans*

*68. The Grading Plans are to include a location Key Plan.*

Acknowledged. A key plan will be included on the updated Grading Plans which will follow this submission.

*69. Existing Culvert Crossings are to be shown on the Grading Plans.*

Acknowledged. Existing culvert crossings will be shown on the grading drawings. The updated grading drawings will follow this submission.

*70. Please demonstrate how the outfall swale at Block 188 (Node C3) will drain to the watercourse.*

Conveyance calculations will be provided to demonstrate the capacity of the proposed swale is sufficient to convey the major flow to the watercourse. The conveyance calculations will follow this submission.

*71. Please show the proposed retaining wall for Block 224 on Grading Plan 5 (Figure 5.5).*

Acknowledged. The proposed retaining wall will be shown for Block 224. The updated Grading Plan (Figure 5.5) will follow this submission.

*72. Site drainage cannot be directed to existing Lot 1 as proposed on Grading Plan 3. Please review and revise accordingly.*

Acknowledged. The grading will be revised accordingly. The grading plan will follow this submission.

*General Hydrogeological Comments*

*73. The preliminary hydrogeological investigation report indicates that the depth to groundwater was measured in monitoring wells twice, once in December 2014 and once in January 2015. It is unclear what the shallow water table conditions are on the site and how the water levels respond to seasonal influences. Additional groundwater level data need to be obtained from the monitoring wells on site with the focus being on the spring monitoring period. In addition, it is highly recommended that data loggers be installed where feasible to clearly assess the short and long term changes in the water levels (i.e. the response to seasonal influences).*

There are 16 observation wells equipped with pressure transducer data loggers and an additional 11 very shallow observation wells that are being monitored on a weekly basis. This monitoring program will be continued to monitor seasonal water level change in both shallow and deep observation wells. The monitoring wells will remain in place until the start of construction. A minimum of one (1) year of monitoring data will be collected prior to the start of construction. The locations of the observations wells are shown on Figure 1 (Attachment GOLDER-4). The monitoring data will follow this submission.

*74. The hydrogeological report does not contain a discussion (or figure) on the shallow groundwater flow direction(s) on and around the site; therefore it is unclear if the selection of catchments*

*used within the water balance is appropriate (i.e. shallow groundwater flow is similar to surface drainage patterns on the site). Please provide a figure demonstrating groundwater movement on the site and a discussion on how it relates to the delineated drainage catchments used within the water balance.*

The groundwater flow in the water table aquifer is illustrated in Figure 1 (Attachment GOLDER-4). This drawing was prepared using a blanket of water levels collected on June 11, 2015 from 34 upper aquifer monitoring wells. Figure 1 illustrates shallow groundwater flowing from areas of high elevation to areas of lower elevation throughout the site.

75. *Figure 2 within the Preliminary Hydrogeological Investigation report indicates a number of boreholes were constructed on or adjacent to the site in support of previous studies. It is unclear if any the borehole logs (or water levels) from these studies may further supplement the information contained with the recent report. Please provide any additional information that is available and comment on the consistency of results obtained between previous studies and the current drilling/monitoring program.*

The borehole logs from earlier investigations were used to inform the current borehole drilling program and monitoring well installation program. We are of the opinion that the drilling program completed at the site during 2014 and 2015 adequately describes the geological stratigraphy and hydrogeological conditions at the site. Results from the 2014 and 2015 drilling program are generally consistent with the earlier investigations.

76. *There has been limited hydrogeological impact assessment on the streams and wetlands within the reports provided. More information on the these features and their functions, including a discussion of surface-groundwater interactions, groundwater discharge areas will need to be provided including how the proposed development may potentially impact these features. Please provide more information and location figure of the wetland and streams on or near the site and determine whether they rely on surface drainage from the site, groundwater discharge or both? In addition, please provide a discussion on how the proposed development will potentially impact the surface drainage, infiltration/recharge, groundwater flow that supports these features?*

Additional work has been done in the ORM-Wetland that indicates that a thin layer (0.3 to 0.8 m) of organic muck overlies a substrate of varved silt and clay in the low lying areas of the site. The silt and clay couplets (varves) are interpreted to be Schomberg Pond deposits which overly till. Based on our investigations there are no natural discharges of groundwater to wetlands on the site. The wetlands are present in low lying generally flat areas and are supported by overland flow of surface water. Potential impacts have been addressed through a water budget analysis (see response to comment #24). The water budget has identified minor changes in surplus and infiltration, but this is not expected to result in a change in the ecological function of the features.

At depths below these deposits the fringes of the granular Oak Ridges Moraine deposits are present. The Oak Ridges Moraine deposits form the aquifer unit identified at the eastern side of the site at depths of approximately 30 m and this aquifer is under confined artesian conditions. Where old Town of Aurora wells intersect this aquifer, to the north of the proposed Highland Gate development, these

wells flow uncontrolled and contribute to surface water. No changes are proposed near the existing wells that would alter the surface water flows.

77. *The geotechnical report indicated that groundwater conditions will require management for the design and construction of underground utilities, foundations, basements and any other underground structures. It was further suggested that a PTTW would likely be required during construction due to high groundwater levels and artesian conditions found across the site. Due to several of the monitoring wells near proposed lots and the condo block exhibiting artesian conditions, it is unclear from the data and information provided if there maybe long-term dewatering/depressurization of the aquifer required? Additional information will need to be provided in order to assess any long-term and short-term dewatering requirements, including:*

    - *The location and rate/volume of dewatering required;*
    - *Proposed monitoring during dewatering; and*
    - *Proposed mitigation measures to address the potential effects of aquifer depressurization/dewatering during construction*

In the condo block area flowing artesian conditions were observed from the Oak Ridges Moraine aquifer, which was encountered at a depth of about 40m in Borehole 14-216. With only two (2) levels of underground parking and the associated foundation required to support the condominium, the excavation for the condominium will not intercept the underlying aquifer. Constructing a foundation that relies on continuous dewatering is not preferable, nor intended for this site. The details of development for this block, including the proposed foundation design, will be provided through a future site plan control application.

Construction dewatering will likely be required in several areas across the site. Due to the predominant fine grained materials on the site, the dewatering volumes are expected to be low; however, given the size of the site a Permit to Take Water will be required.

As noted in Section 5.6.1 of the geotechnical report, depressurization of the underlying aquifer in the vicinity of Boreholes 14-5 and 14-209 will likely be required to facilitate excavation for the proposed roadway and associated services. As noted in Section 5.7 of the geotechnical report, a hydrogeological assessment supporting a Permit to Take Water ("PTTW") application will be prepared at the detailed design stage. The PTTW will be submitted to the Ministry of the Environment for approval, in consultation with the Conservation Authority. The assessment will include monitoring and mitigation measures that would address potential effects of aquifer depressurization / dewatering within the excavations.

*Water Balance Comments*

78. *The hydrogeological report indicates that the record period of 1960-2006 for the Richmond Hill Environment Canada MET station was used for the water budget analysis. It was further indicated that the Meteorological Service Data Analysis and Archive division of Environment Canada provided the monthly water budget summary, including monthly average precipitation, ET and surplus value for a range of water holding capacities. Please provide the monthly precipitation, ET and surplus values to support the water balance calculations. In addition, more*

*information should be provided on the source of the water budget summaries obtained from Environment Canada. Is this a paid service Environment Canada offers or can the water budgets be obtained directly from their website?*

Environment Canada's monthly values for precipitation, rainfall, snowmelt, potential evapotranspiration, actual evapotranspiration, surplus, and soil storage for the water holding capacities used in the analysis (75 mm and 350 mm) are provided in tables below. The results for water budgets can be ordered (for a nominal fee) from the Climate Services Division of Environment Canada. These are compiled for stations with sufficient daily data from Environment Canada records.

**Table 7: Richmond Hill 75mm WHC Average Year Water Budget**

| Month | Temperature (Deg C) | Precipitation (mm) | Rainfall (mm) | Snowmelt (mm) | Potential Evapotranspiration (mm) | Actual Evapotranspiration (mm) | Deficit (mm) | Surplus (mm) | Snow on Ground (mm) | Soil (mm) |
|---|---|---|---|---|---|---|---|---|---|---|
| Jan | -6.7 | 62 | 19 | 19 | 1 | 1 | 0 | 36 | 46 | 75 |
| Feb | -5.7 | 55 | 22 | 28 | 1 | 1 | 0 | 49 | 51 | 75 |
| Mar | -0.7 | 62 | 39 | 61 | 9 | 9 | 0 | 91 | 13 | 75 |
| Apr | 6.6 | 70 | 67 | 16 | 34 | 34 | 0 | 49 | 0 | 74 |
| May | 13.1 | 77 | 77 | 0 | 78 | 78 | 0 | 13 | 0 | 61 |
| Jun | 18.3 | 79 | 79 | 0 | 114 | 106 | -8 | 4 | 0 | 30 |
| Jul | 21.1 | 78 | 78 | 0 | 135 | 98 | -37 | 2 | 0 | 10 |
| Aug | 20.1 | 85 | 85 | 0 | 119 | 83 | -36 | 2 | 0 | 10 |
| Sep | 15.8 | 76 | 76 | 0 | 80 | 66 | -14 | 4 | 0 | 16 |
| Oct | 9.2 | 66 | 66 | 0 | 40 | 36 | -4 | 6 | 0 | 40 |
| Nov | 3.2 | 81 | 74 | 5 | 13 | 13 | 0 | 38 | 1 | 69 |
| Dec | -3.4 | 73 | 33 | 19 | 2 | 2 | 0 | 44 | 22 | 74 |
| Avg. | 7.5 | 865 | 715 | 148 | 626 | 527 | -99 | 338 | | |

**Table 8: Richmond Hill 350mm WHC Average Year Water Budget**

| Month | Temperature (Deg C) | Precipitation (mm) | Rainfall (mm) | Snowmelt (mm) | Potential Evapotranspiration (mm) | Actual Evapotranspiration (mm) | Deficit (mm) | Surplus (mm) | Snow on Ground (mm) | Soil (mm) |
|---|---|---|---|---|---|---|---|---|---|---|
| Jan | -6.7 | 62 | 19 | 19 | 1 | 1 | 0 | 17 | 46 | 320 |
| Feb | -5.7 | 55 | 22 | 28 | 1 | 1 | 0 | 33 | 51 | 335 |
| Mar | -0.7 | 62 | 39 | 61 | 9 | 9 | 0 | 79 | 13 | 348 |
| Apr | 6.6 | 70 | 67 | 16 | 34 | 34 | 0 | 48 | 0 | 349 |
| May | 13.1 | 77 | 77 | 0 | 78 | 78 | 0 | 13 | 0 | 335 |
| Jun | 18.3 | 79 | 79 | 0 | 114 | 114 | 0 | 4 | 0 | 296 |
| Jul | 21.1 | 78 | 78 | 0 | 135 | 135 | 0 | 2 | 0 | 239 |
| Aug | 20.1 | 85 | 85 | 0 | 119 | 116 | -3 | 2 | 0 | 205 |
| Sep | 15.8 | 76 | 76 | 0 | 80 | 77 | -3 | 4 | 0 | 201 |
| Oct | 9.2 | 66 | 66 | 0 | 40 | 39 | -1 | 2 | 0 | 226 |
| Nov | 3.2 | 81 | 74 | 5 | 13 | 13 | 0 | 16 | 1 | 276 |
| Dec | -3.4 | 73 | 33 | 19 | 2 | 2 | 0 | 23 | 22 | 303 |
| Avg. | 7.5 | 865 | 715 | 148 | 626 | 619 | -7 | 243 | | |

79. *The recently submitted water balance tables provide calculations on a subcatchment scale along with Figure 1 with identifies the various development areas (i.e. Northeast, Southeast, Northwest, Southwest and Middle). It is unclear if the arrows on the figure indicate surface or groundwater divides and what the exact boundaries of the divides are? In addition, it is unclear which areas on the figure correspond to each subcatchment/development area? Please provide a figure that demonstrates these areas more clearly.*

Revised Figures 1, 2, and 3 (Attachments GOLDER-1, GOLDER-2, and GOLDER-3) show in more detail the different catchment areas (A, B, C, D, E, and F) crossing the site, and which site areas drain to which catchment. Furthermore, the site water budget result tables have been redefined based on the tributary catchment they contribute to, including:

- Table 9: Existing Condition Site Land Use
- Table 10: Proposed Condition Site Land Use
- Table 11: Existing Condition Site Water Budget
- Table 12: Proposed Condition Site Water Budget Without LIDs
- Table 13: Proposed Condition Site Water Budget With LIDs

**Table 9: Existing Condition Site Land Use**

| Overall Catchments | Area ($m^2$) | | | | | | | | Total ($m^2$) |
|---|---|---|---|---|---|---|---|---|---|
| | Open | Treed | Wetland or Open Water | Existing Developed (Impermeable) | Existing Developed (Permeable) | Proposed C15 | Proposed C18 | Proposed Roadway | |
| **Water Holding Capacity (mm)** | 75 | 350 | Water | Impervious | 75 | 75 | 75 | 75 | - |
| **Impervious Fraction** | 0 | 0 | 1 | 1 | 0 | 0.42 | 0.42 | 1 | - |
| **Infiltration Coefficient** | 0.4 | 0.5 | 0 | 0 | 0.4 | 0.4 | 0.4 | 0 | - |
| ***Annual Surplus (mm/yr)*** | 338 | 243 | 239 | 778.5 | 338 | 523.0 | 523.0 | 778.5 | - |
| ***Annual Infiltration (mm/yr)*** | 135.2 | 121.5 | 0 | 0 | 135.2 | 78.4 | 78.4 | 0 | - |
| **Catchment A** | 55,998 | 2,225 | 0 | 6,061 | 4,164 | | | | 68,447 |
| **Catchment B & C** | 78,890 | 0 | 0 | 318 | 0 | | | | 79,208 |
| **Catchment E & D** | 214,839 | 16,540 | 19,388 | 4,647 | 0 | | | | 255,414 |
| **Catchment F** | 5,922 | 0 | 1,096 | 0 | 0 | | | | 7,018 |
| ***TOTAL*** | *355,649* | *18,765* | *20,484* | *11,026* | *4,164* | *0* | *0* | *0* | *410,087* |

**Table 10: Proposed Condition Site Land Use**

| Overall Catchments | Area ($m^2$) | | | | | | | | Total ($m^2$) |
|---|---|---|---|---|---|---|---|---|---|
| | Open | Treed | Wetland or Open Water | Existing Developed (Impermeable) | Existing Developed (Permeable) | Proposed C15 | Proposed C18 | Proposed Roadway | |
| **Water Holding Capacity (mm)** | 75 | 350 | Water | Impervious | 75 | 75 | 75 | 75 | - |
| **Impervious Fraction** | 0 | 0 | 1 | 1 | 0 | 0.42 | 0.42 | 1 | - |
| **Infiltration Coefficient** | 0.4 | 0.5 | 0 | 0 | 0.4 | 0.4 | 0.4 | 0 | - |
| ***Annual Surplus (mm/yr)*** | 338 | 243 | 239 | 778.5 | 338 | 523.0 | 523.0 | 778.5 | - |
| ***Annual Infiltration (mm/yr)*** | 135.2 | 121.5 | 0 | 0 | 135.2 | 78.4 | 78.4 | 0 | - |
| **Catchment A** | 16,663 | 2,225 | 0 | 5,823 | 4,164 | 9,172 | 18,609 | 12,909 | 69,563 |
| **Catchment B & C** | 12,656 | 0 | 0 | 0 | 0 | 8,420 | 39,936 | 18,558 | 79,570 |
| **Catchment E & D** | 101,220 | 16,284 | 18,659 | 4,633 | 0 | 25,792 | 60,644 | 26,704 | 253,936 |
| **Catchment F** | 0 | 0 | 0 | 0 | 0 | 2,804 | 3,118 | 1,096 | 7,018 |
| ***TOTAL*** | 130,538 | 18,509 | 18,659 | 10,456 | 4,164 | 46,188 | 122,307 | 59,267 | 410,087 |

**Table 11: Existing Condition Site Water Budget**

| Catchment | Surplus ($m^3$/yr) | Infiltration ($m^3$/yr) | Runoff ($m^3$/yr) |
|---|---|---|---|
| **A** | 26,000 | 8,000 | 18,000 |
| **B+C** | 27,000 | 11,000 | 16,000 |
| **E+D** | 85,000 | 31,000 | 54,000 |
| **F** | 2,000 | 1,000 | 1,000 |
| **SUM** | 140,000 | 51,000 | 89,000 |

**Table 12: Proposed Condition Site Water Budget Without LIDs**

| Catchment | Surplus ($m^3$/yr) | Infiltration ($m^3$/yr) | Runoff ($m^3$/yr) |
|---|---|---|---|
| **A** | 37,000 | 5,000 | 32,000 |
| **B+C** | 44,000 | 6,000 | 38,000 |
| **E+D** | 112,000 | 22,000 | 90,000 |
| **F** | 4,000 | 0 | 4,000 |
| **SUM** | 197,000 | 33,000 | 164,000 |

**Table 13: Proposed Condition Site Water Budget With LIDs**

| Catchment | Surplus ($m^3$/yr) | Infiltration ($m^3$/yr) | Runoff ($m^3$/yr) |
|---|---|---|---|
| **A** | 37,000 | 7,000 | 30,000 |
| **B+C** | 44,000 | 7,000 | 37,000 |
| **E+D** | 112,000 | 25,000 | 87,000 |
| **F** | 4,000 | 1,000 | 3,000 |
| **SUM** | 197,000 | 40,000 | 157,000 |

80. *The water balance does not provide an assessment of tributaries and wetland features on and/or adjacent to the site. Although the water balance has been completed based on subcatchments on the site it is still unclear which catchment support the features on or near the site and if the drainage volumes to these features will be maintained post development. It will be necessary to quantify and the amount of water that will need to be mitigated through surface runoff and/or infiltration to support these features. Please provide:*

    a. *A figure that clearly indicates pre- and post-development drainage areas as shown within the water balance calculations.*
    b. *Quantify the amount of water that will be contributing to each feature pre- and post-development;*
    c. *Demonstrate how pre-development runoff to each feature will be maintained; and*
    d. *Demonstrate how the infiltration deficit is being mitigated throughout the site.*

Please refer to response #24.

81. *It appears an infiltration factor of 0.4 was selected for landscaped areas (including golf course, landscaped, and urban lawns) and 0.5 was selected for treed areas. The MOE Hydrogeological Information Requirement for Land Development Applications (1995) requires infiltration factors be selected based on topography, soils and vegetation. There has been no discussion on the selection of infiltration factors based on these criteria. Please provide more information on the selection of infiltration factors based on the average slope, soil conditions, and vegetation for each catchment in the pre-development water balance. In addition, please indicate how the*

*post-development calculations accounted for changes in imperviousness, vegetation, soil conditions, grading and site design and using adjusted infiltration factors based on these changes.*

Annual infiltration factors for site land uses were estimated using the values in Table 3.1 of the MOE Stormwater Management Planning and Design Manual (March 2003). These values provide a rough estimate of infiltration factors based on topography, soils, and cover. The assumed annual infiltration value (as a fraction of the annual surplus) is based on the sum of the three factors:

Topography:
- Flat land, average slope < 0.6 m/km (0.3)
- Rolling Land, average slope 2.8m to 3.8m/km (0.2)
- Hilly Land, average slope 28m to 47 m/km (0.1)

Soils:
- Tight impervious clay (0.1)
- Medium combinations of clay and loam (0.2)
- Open Sandy loam (0.4)

Cover:
- Cultivated Land (0.1)
- Woodland (0.2)
- Open Sandy loam (0.4)

Based on the above factors, the infiltration factors selected for the pervious areas of each land use in the model are shown in Table 14 below. Generally, topography and soils changes between pre- and post- development were considered negligible, and the changes in infiltration factor were due to changes in the vegetation factor (where areas were converted from forest or treed areas to proposed development cover) and/or increases in impervious areas.

Table 14: Site Land Use Infiltration Factors

| Land Use | WHC (mm) | Impervious (%) | Pervious Area Infiltration Factor | | | |
|---|---|---|---|---|---|---|
| | | | Topography | Soil | Vegetation | Total |
| **Open** | 75 | 0 | 0.1 | 0.2 | 0.1 | 0.4 |
| **Treed** | 350 | 0 | 0.1 | 0.2 | 0.2 | 0.5 |
| **Wetland or Open Water** | Water | 1 | - | - | - | 0 |
| **Existing Developed (Impermeable)** | Impervious | 1 | - | - | - | 0 |
| **Existing Developed (Permeable)** | 75 | 0 | 0.1 | 0.2 | 0.1 | 0.4 |
| **Proposed C15** | 75 | 0.42 | 0.1 | 0.2 | 0.1 | 0.4 |
| **Proposed C18** | 75 | 0.42 | 0.1 | 0.2 | 0.1 | 0.4 |
| **Proposed Roadway** | Impervious | 1 | - | - | - | 0 |

Note that the above factors apply only to the pervious portion of land use areas. Impervious portions assume an infiltration factor of 0 (i.e. 100% of surplus becomes runoff).

82. *The recently provided Figure 1 indicates the post-development land uses; however it isn't clear on how these land uses correspond to the water budget tables? In addition, a figure demonstrating pre-development land uses has not been provided. Please provide figures demonstrating both pre- and post-development land uses that correspond to the water balance calculations.*

Figure 1 (Attachment GOLDER-1) shows the external land uses contributing to the tributaries, while Figure 2 (Attachment GOLDER-2) and Figure 3 (Attachment GOLDER-3) show the subject property land uses for the pre- and post-development conditions, respectively. Land use designations both on the figures and in the water budget tables have been relabeled to provide greater clarity.

83. *The recently provided Figure 1 indicates that the existing parking and condo block on the western portion of the site is "existing developed (to be retained/redeveloped)" and "existing developed (no Lots)". It is unclear how these areas are represented within the water balance? Please provide more detail on what is to occur within these areas and how they are being represented within the water balance.*

The condo areas are assumed to be unchanged between existing and proposed conditions, with the building surface and parking shown as impermeable and the landscaped area around the building as permeable.

84. *The type of land uses indicated within the pre- and post-development water balance tables is unclear. For example, what type of land use is 'developable – no lots proposed', 'developable-existing permeable'? Does this mean the area labelled 'golf course – open' is not developable? In addition, it is unclear which areas refer to roofs, roads and driveway in the post-development water balance. Please include a brief description of each land use type (pre- and post-development) used within the water balance and relating it back to the selected infiltration factor.*

Land use designations have been simplified as shown in Table 15 below. It should be noted that the areas shown for the proposed development (Proposed C15 and Proposed C18) refer to lot types and include both pervious areas (landscaped) and impervious areas (roofs and driveways). Differentiation between impervious and pervious surfaces is accounted for by using the impervious (%) values (as shown in Table 14 for the C15 and C18 land uses).

**Table 15: Land Use Designations**

| Land Use | Includes |
|---|---|
| Open | Agricultural areas, non-treed parkland areas, existing non-paved areas |
| Treed | Forests, treed parkland areas |
| Wetland or Open Water | Wetlands or ponds |
| Existing Developed (Impermeable) | Existing roads, rooftops, driveways |
| Existing Developed (Permeable) | Existing landscaped areas |
| Proposed C15 | Proposed lots including roofs, driveways, and landscaped areas. Percentages for roofs and driveways are specified in Table 20. |
| Proposed C18 | Proposed lots including roofs, driveways, and landscaped areas. Percentages for roofs and driveways are specified in Table 20. |
| Proposed Roadway | Proposed paved roadways and shoulders |

*Water Balance Mitigation Comments*

85. *The hydrogeological report provides several suggestions for passive LIDs, including estimates on their potential to reduce runoff from the site. Further information is needed to confirm if these mitigation methods will be sufficient to maintain pre-development infiltration volumes. Currently the water balance does not explicitly identify which areas are roadways, driveways or roof tops; therefore it is difficult to ascertain which areas the proposed mitigation measures refer too. In addition, it is unclear if infiltration/runoff is being mitigated on a catchment basis. Please provide a post-development water balance that incorporates all mitigation measures that will identify if infiltration and runoff to surface water features are being maintained post-development.*

A feature based water budget has been provided in response to Comment 24. The water budget highlights the pre- to post-development changes in flows to these features, and includes the effects of the proposed LIDs. The results from the water budget suggest a decrease in infiltration to these features of between 0% and 0.9% from their contributing catchments.

86. *Currently the LIDs proposed within the Hydrogeological Investigation report are suggestions and it appears they have not been explicitly identified within the SWM report. All LIDs and their specifications need to be indicated on the appropriate engineering drawing and documented within the SWM report. Although some particulars on the design and specifications can be completed at the Detailed Design stage it is essential that the feasibility (i.e. location and physical suitability) along with the constraints for each LID be identified at this stage.*

Details for the lined and unlined bioretention features are included in the SWM report. Refer to Figure 6.2, 6.3, and 6.5 in the FSSR. The downspout disconnection will be implemented on all lots. This will be clarified in the updated FSSR.

Since the submission, groundwater levels measured in Spring 2015 were used to refine which bioretetion features could be unlined (i.e. available for infiltration), and these results (i.e., lengths of swale and which drainage catchments they are located in) were used to estimate infiltration from these LID features. The monitoring data from the observations wells, which identifies the feasible locations for the unlined bio-retention swales, will follow this submission.

87. *Vegetated Filter strips have been proposed for 50% of roadways. It is unclear where these will be located? Are they the 'swales' being proposed within the SWM report (i.e. drawing 2.5)? If so, all information needs to be consistent with that contained within the FSR/SWM report (i.e. it appears that the SWM report currently suggests that they will be swales and used for filtration/quality control not infiltration).*

The vegetated filter strips naming convention has been changed to unlined bio-retention features to match the designs in the SWM report. The estimate of the features which can be unlined (i.e., available for infiltration) was revised downwards to a total length of 165 m in catchments C, D, and E (as shown in the notation on Attachment GOLDER-3), and the water budget has been updated accordingly. The water budget for all catchments has been revised to reflect the locations of the proposed unlined bio-retention features. Figure 2.5 from the FSSR will be updated to reflect the lined vs. unlined bioretention feature lengths that were provided to Golder to complete the water budget. The updated figure will follow this submission.

88. *Vegetation filter strips should only be considered as a water balance mitigation method if:*

    - *The location is confirmed per the pervious comment. All information is consistent with that contained within the FSR/SWM report (i.e. SWM report confirms that they will be used for infiltration not filtration).*
    - *Additional water level data is obtain within at these locations to confirm the water table is low enough for infiltration to occur (i.e. >1 meter below the surface)*
    - *Infiltration rates of the underlying material confirmed through testing*
    - *Confirm these locations meet the physical suitability (per TRCA & CVC 2010) – depth to water table > 1 meter below the surface, slope is between 1 to 5% and the maximum flow path over the impermeable surface with less than 25 meters.*

As discussed, the extent of the unlined bio-retention swales has been revised downwards to a total length of 165 m to reflect groundwater elevations measured in Spring 2015. The distribution of these unlined features has been taken into account in the proposed condition water budget estimates. The monitoring data from the observations wells, which identifies the feasible locations for the unlined bio-retention swales, will follow this submission.

89. *For the downspout disconnect the hydrogeological report assumes that there will be a runoff reduction of 25%, with a total infiltration volume of 11,300 m3 being achieved across the site. Assuming the roof runoff is subject to ET occurring on the grassed swales it is being directed to and an infiltration factor of 0.4 being applied this maybe an over estimate on the infiltration occurring from the downspout disconnection? These calculations should be introduced within the water balance table (previous comment) to confirm appropriate assumptions and realistic infiltration volumes to be achieved through this practice. In addition to the water balance table,*

*the following information will need to be provided on the downspout disconnection to vegetated areas:*

*a. Please confirm the average flow path length and slope that conveys runoff away from the buildings.*
*b. Please confirm if the downspout disconnection will be to vegetated areas or grassed areas?*

The downspout disconnection will lead to either a vegetated area or a landscaped area. The slopes leading away from the foundation will be 2% based on the required lot slope, and the total length of the pervious area will be a minimum of 5 m. Evaporation losses from this area were accounted for in the water balance for the landscaped areas, and the runoff reduction shown in the Low Impact Development Planning and Design Guide was therefore assumed to be the result of infiltration.

*90. The hydrogeological report suggests that driveway runoff should be directed via grading to the adjacent lawns rather than to the street, thereby allowing an estimated 50% of incident precipitation to drain towards adjacent landscaped areas. It is unclear which driveways are being referred to and how they will be graded to drain towards landscaped areas (typically driveways drain towards roadways). Please provide drawings or details to demonstrate the feasibility of this LID.*

The water budget has been updated to remove this LID from the calculation.

*91. According to the hydrogeological report, presently only passive LID techniques have been identified on the site to mitigate the post-development infiltration deficit. With the current LID implementation it is estimated that 95% of infiltration can be maintained post-development. It is recommended that additional opportunities to implement LIDs on the site should be explored in order to meet pre-development infiltration targets as demonstrated within the water balance.*

Several additional means of increasing infiltration continue to be considered in conjunction with the building program. However, these options will not be finalized until detailed design. Among the options being considered are:

- Rain Barrels; The use of rain barrels as a lot level control will allow some roof runoff to be captured, stored, and subsequently used to maintain landscape features. The amount of runoff reduction is contingent on the size of barrels used. The majority of this water is expected to be lost through evapotranspiration, with some increased infiltration. Rain barrels may be offered as an option to future homeowners. The use of rain barrels is dependent on landowner participation, and thus the potential effect cannot be gauged at this stage.

- Permeable Pavement; A type of permeable pavement may be offered as an option for driveways at locations where seasonally high groundwater is deeper than 1 m below the surface. While road surfaces in these areas are already being serviced by unlined bio-retention swales, the use of permeable pavement for driveways should be considered at the detailed design phase and will be subject to the participation of future landowners. Estimates of the effect of this LID control (in terms of increased infiltration) are not included in calculations at this time.

Please contact the undersigned if you have any questions or require any additional information.

Sincerely,

**Malone Given Parsons Ltd**
**SCS Consulting Group Ltd.**
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**Schollen & Company**
**Golder Associates**
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