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Our Project No.: AA16-053B

Michael Witmer, BES, MPA, MCIP, RPP
City of Guelph
1 Carden Street
Guelph, ON N1H 3A1

Re: 19-59 Lowes Road, City of Guelph
Scoped EIS Addendum Report

Dear Mr. Witmer:

This report is to satisfy the requirement for an additional Scoped EIS Addendum as determined through the comments provided by the City of Guelph (dated February 15, 2018) and Cole Engineering (dated February 16, 2018). Please review the EIS Addendum for approval of the 15-59 Lowes Road Environmental Impact Study completed by Aboud & Associates, May 31, 2017.

In preparing this addendum letter, the following documents were reviewed and should be read in conjunction with this report.

- Lowes Road Property (19, 29, 35, 41, 51 and 59 Lowes Road), Guelph Functional Servicing Report (Stantec, June 2018)
- Preliminary Stormwater Management Report 19-59 Lowes Road, Guelph ON Revision #3 (Stantec, May 2018)
- Hydrogeology Study (Englobe, 2018)
- Geotechnical Investigation Report (Englobe, 2018)
- Hanlon Creek Watershed Plan (HCWP) (MMM, 1993)
- Hanlon Creek State-of-the-Watershed Study (HCSWS) (PEIL, 2004)

1.0 Proposed Development

The proponent is proposing to construct 36 single family dwellings, driveways, a private condominium road and a stormwater management facility on lands located at 19-59 Lowes Road. The subject lands are currently comprised of six properties, each with a single detached dwelling.

2.0 Background and Context

The Hanlon Creek Watershed is located within the south part of the City of Guelph and is approximately 2,640 hectares in area (PEIL, 2004). The central part of the watershed, which contains the proposed development also contains the majority of the Hanlon Creek Provincially Significant Wetland and is located on outwash gravel plain as Hanlon Creek approaches the Speed River. As of 2000, the land use within the Hanlon Creek Watershed consisted of built environment (residential, commercial etc.) (36%) and agricultural (23%) with the remainder (41%) being a mix of swamp, meadow, water etc. (PEIL, 2004).

The proposed development is located on the north side of Lowes Road, west of Gordon Street in the City of Guelph. The proposed development is not within the Grand River Conservation Authority regulation limit and does not include any features within the Natural Heritage System as defined under the schedules of the City of Guelph Official Plan. We are in receipt of comments from the GRCA dated February 16, 2018 which advise that the GRCA has no objection to the proposal and that a GRCA permit will not be required. The existing outlets are located within the 120m adjacent lands to the Hanlon Creek Swamp PSW, and significant woodlands. The development is proposing to discharge stormwater that has been treated on site through a comprehensive SWM strategy into perforated pipes which outlet to existing established outlets located within the 70m wide buffer of the Hanlon Creek PSW.

Aboud & Associates was retained by Reid's Heritage Homes in order to complete an Environmental Impact Study for this proposed development, which was submitted to the City of Guelph on June 1, 2017. City of Guelph staff provided comments on August 8, 2017 which recommended conditional support of the scoped EIS subject to the completion of an EIS Addendum. Due to the proposed development requiring a zoning by-law amendment, the development and EIS were brought to the attention of EAC for their comments on potential natural heritage impacts. An Addendum to the EIS addressing City of Guelph and EAC comments provided on August 8, 2017 and August 9, 2017, respectively, was submitted to the City of Guelph on November 17, 2017.

2.0 EIS Addendum Items

Based on further comments from the City of Guelph staff as well as peer review comments provided by Cole Engineering, it was determined that the following items would be addressed within the second EIS Addendum.

2.1 Natural Feature Water Balance

"The EIS and supporting documents were specifically to include a natural feature water balance per comment 10 above. This is required to demonstrate the potential impacts as a result of the proposed development and how they are being mitigated."

Stantec completed a feature-based water balance for the 62.1 ha catchment area that drains to Tributary E, as delineated in the Preliminary Stormwater Management Report (Stantec, 2018). The results of the feature-based water balance indicate that based on the proposed development, and its infiltration strategy, the change in annual infiltration/recharge values for the catchment is 0 mm/year, however there will be an increase in surface runoff on an annual basis. Following development of the 1.7ha site, the increase in annual surface runoff within the 62.1ha catchment was calculated to be 187mm or a surplus of 5mm/year, ultimately representing a 3% increase. The highest surplus of runoff occurs in April with 854mm, while the lowest occurs in December with 270mm.The feature-based water balance and calculations, in their entirety, can be found in the Preliminary Stormwater Management Report (Stantec, 2018).

The addition of surplus runoff to an existing wetland system can have a variety of impacts on the ecological and hydrologic function, including altering both the physical and chemical characteristics of the wetland (USEPA, 1996). As noted in the Hanlon Creek Watershed Plan (MMM, 1993), the increase in impermeable surfaces can affect several aspects of the ecosystem, including the lowering of the water table. Alteration to the existing moisture conditions due to this lowering has the potential to shift the wetland community composition allowing drier species to inhabit the wetland. In addition, the catchment draining to Tributary E may also be impacted by changes in flow and temperature regime, as well as a reduction in the potential for seasonal discharge (MMM, 1993). The composition of the buffer situated between the wetland feature and the outlets may alter as a result of the additional runoff. Currently the buffer consists mainly of dry-fresh non-native grasses and herbaceous species. With the increase in surface runoff and the potential pooling, the vegetation may shift to predominantly hydrophilic species.

In order to analyze the potential impacts of the proposed development on the ecological and hydrologic function of the existing features, the Wetland Water Balance Risk Evaluation (Risk Evaluation) developed by the TRCA (2017) was utilized. The Risk Evaluation was developed to help proponents determine the level of risk their proposed development may pose to the ecological integrity of a wetland based on changes to its hydrology. The Risk Evaluation considers the magnitude of potential hydrologic change as well as the sensitivity of the flora and fauna species identified within the wetland. Based on the evaluation of the criteria, TRCA has developed a decision tree to categorize the development proposal into one of three levels of risk: Low, Medium or High. After completing the Risk Evaluation, the proposed development was categorized as being Low Risk to the existing wetland feature. The analysis in its entirety can be found in *Appendix 1*.

Based on the location of the proposed development in relation to the nearby wetland, Stantec has detailed specific stormwater management measures to be implemented in order to reduce the surplus surface flow as best as possible. The Clean Water Collector (CWC) is a system that is proposed to receive clean runoff from 29 rooftops in the proposed development to encourage groundwater recharge, match annual pre-development infiltration volumes per the City DEM, and provide quantity control by reducing the overall volume of runoff to the proposed SWM facility. In addition to the CWC, an Oil Grit Separator is proposed to treat more than 90% of the average annual runoff from roadway and driveway runoff and to remove Total Suspended Solids (TSS). Both the CWC overflow and discharge from the OGS eventually drain into a dry SWM facility which is primarily designed as a quantity control system. The outlet from the dry SWM facility conveys discharge to an enhanced grass swale prior to discharging through a perforated pipe to the outlet. The function of the enhanced grass swale is to slow the water to permit sedimentation, filtration through the root zone and soil matrix, evapotranspiration, as well as infiltration into the underlying native soil (CVC, 2010).

The SWM strategy detailed above uses innovative approaches in order to reduce, retain and treat runoff throughout the proposed development from rooftop to final discharge from the outlet. Furthermore, having the existing buffer acclimatized to additional surface flows due to the surrounding development will aid in mitigating the flows as the vegetation species present are known to absorb nutrients and induce the settling of sediments prior to them reaching the wetland feature. In addition, seeing as the maximum and minimum anticipated runoff volumes are within the monthly historical ranges (Stantec, 2018) the surplus surface runoff is not expected to negatively impact the existing natural features.

2.2 Analysis of Flow Impacts on Natural Features

"The EIS notes an annual increase in runoff to the wetland of 3,384m^3 per year and that this represents the equivalent of 0.16mm event over the direct surface runoff of the entire (Hanlon?) watershed. Given that we are dealing with a sub catchment for an unnamed tributary that connects to Tributary E of the Hanlon Creek subwatershed- this would appear to be a substantial increase. The submitted EIS addendum adds rates (mm/yr) based on supplement information regarding infiltration and water balance information for the site, yet neither document provides an analysis on how this demonstrates the protection or enhancement of the quality and quantity of water of the hydrological functions of the wetland. The peer review comments provided by Cole Engineering also identified concerns and provided recommendations regarding these concerns which should also be incorporated and addressed.

Based on the feature-based water balance completed by Stantec, the surplus in surface runoff to the wetland feature is calculated to be 5 mm/year, which represents a 3% increase over the 62.1ha catchment on an annual basis.

Additional site visits were conducted to investigate the wetland feature within the identified drainage catchment. The wetland feature within drainage catchment currently consists of two different vegetation communities, a White Cedar Mineral Coniferous Swamp, approximately 45.53 ha, and a Poplar Mineral Deciduous Swamp, approximately 1.19 ha. Through field observations, it was noted that the Poplar community, closest to the existing residential dwellings consists largely of grasses, sedges and herbaceous species throughout standing water, and that numerous standing snags of Balsam Poplar (*Populus balsamifera*) and Trembling Aspen (*Populus tremuloides*) are present, indicating a transition within the community. Through examining Google Earth imagery from 2006 to 2017, it was noted that the transition can be attributed to the significant influx of discharge from SW02 as the channel formed by the discharge from SW02 is evident beginning in 2013 and coincides with changes in the canopy. Although the canopy experiences slight changes, the approximate size and shape of the above noted community has not significantly altered, indicating that the Eastern White Cedar Swamp has not been influenced by the additional surface flows. The surface runoff triggering this transition has likely caused a shift in the vegetation present in the buffer community, resulting in the growth of highly tolerance species such as Reed Canary Grass (see Sections 2.3 & 2.4).

It is recognized that the addition of surplus runoff from the proposed development will not prevent the current ecological transition, however the surplus runoff traversing through the various components of the SWM strategy will provide quality control benefits including polishing and removal of total suspended solids, which will reduce the potential of sedimentation negatively impacting the existing native grass and herbaceous species. The Preliminary Stormwater Management Report (Stantec, 2018) indicates that the surplus surface runoff that eventually exits SW01 is first contained within the dry SWM prior to discharging through an enhanced grassed swale to the perforated pipe outlet. The report notes that the dry SWM facility was designed as a quantity control system with passive water quality benefits, while the purpose of the grassed swale is to decrease the flow velocity, thus encouraging the sedimentation of particulate matter prior to being discharged from the perforated pipe. The combination of these SWM methods will provide an overall minimum removal rate of 88% of total suspended solids. While it is recognized that the proposed development will result in surplus runoff, the noted efficiency of on-site SWM facilities allows the runoff to be discharged onto adjacent lands containing marginal amounts of total suspended solids. Ecological Land Classification data sheets for the wetland communities can be found in *Appendix 2*.

2.3 Hanlon Creek Watershed Plan

"Furthermore the EIS was to incorporate and address the recommendations and requirements from the Hanlon Creek Subwatershed Study. Specifically staff note that a primary recommendation from the subwatershed study for tributary E was that no urban drainage was to be permitted. The study recognized however, that for areas where there is an existing positive drainage outlet, that this outlet and its associated drainage was to be maintained and support overland flow/flood functions (which would appear to be consistent with its present day use).

The subwatershed study specifically does not support higher peak flows or increased in volume to tributary E including its surrounding wetland due to concerns regarding terrestrial and thermal impacts. A proposed SWM approach should be following the subwatershed study recommendations- please clarify."

"The role of the buffer zone present between the wetland and SW02/SW01 was also based on the recommendations of the subwatershed study. Specifically the 50m buffer was established to provide upland/early successional habitat for wildlife foraging adjacent to the wetland, including deer. Staff again note that these areas were not intended to facilitate increases in peak flow or volume being conveyed to tributary E."

The subject property is an area where there is an existing positive drainage outlet to the wetland buffer. Due to the increase in impervious surface, it is recognized that there will be an increase in surface runoff. In order to ensure that the increase is minimal, Stantec (2018) has proposed the installation of a dry SWM pond designed primarily for water quantity control, which has been designed to detain the volume resulting from the Regional rainfall event. Although the installation of the dry SWM pond will capture larger volumes of water, it will also result in longer discharge out of SW01.

The HCWP (MMM, 1993) indicates that the buffer around the wetland edge closest to the proposed development consists of second growth aspen and shrubs in the old field that protect parts of the swamp. MMM (1993) also states that the buffer is required to increase upland habitat and screen for wildlife, and that the marsh and deciduous habitats are used heavily by deer.

As determined through the field studies conducted for the EIS (AA, 2017), the current buffer community consists of a Dry- Moist Old Field Meadow dominated by Reed Canary Grass (*Phalaris arundinacea*) with Goldenrod (*Solidago sp.*) and many non-native forbs including Wild Carrot (*Daucus carota*), Common Dandelion (*Taraxacum officinale*) and Canada Thistle (*Cirsium arvense*). Reed Canary Grass is tolerant of a broad range of environmental stresses including cold, heat, drought and flooding (Casler, 2010). Its strong presence indicates past disturbance, as this species tends to thrive in areas with high nutrient levels, irregular hydrology and high levels of sediment (Jakubowski, Casler & Jackson, 2010), however Reed Canary Grass is also known to promote the settling of sediment due to its ability to produce numerous shoots and stabilize soils (Werner & Zedler, 2002).

Throughout the additional studies conducted for the wetland feature, a White-tailed Deer as well as multiple tracks were observed along the wetland-meadow edge. These observations indicate that although the buffer continues to perform its identified function in the HCSWS, it is conducive to wildlife foraging and movement.

Vegetation within the buffer such as Reed Canary Grass has a high tolerance to anthropogenic disturbances from irregular hydrology as well as increased sediment and nutrients. The additional surface water caused by the proposed development is not expected to have a negative impact to the currently buffer community and its ecological functions.

2.4 Outlet Enhancement

"In order to prevent similar channelization impacts as seen around SW02 due to the changes in the patterns of drainage conveyance from SW02 from the site the EIS and SWM design should consider the need for dissipation control post outlet as part of the mitigation approach. Restoring and enhancing the area beyond the outlet with additional plantings as part of a mitigation approach is also encouraged."

It is recognized in the Preliminary Stormwater Management Report (Stantec, 2018) that there will be changes in the patterns of surface flow exiting SW01 due to the proposed development, that have the potential to alter the existing vegetation community immediately adjacent to the outlet. Currently, flows discharging from SW01 disperse into a riprap lined apron with a small, 2-3 metre channel, eventually discharging into a densely vegetated meadow community with no evidence of channelization (Stantec, 2018). As noted above the existing meadow community consists primarily of Reed Canary Grass, known to slow the velocity of outflows and reduce sedimentation due to its multitude of shoots (Werner & Zedler, 2002). Channelization and erosion are not anticipated to occur within the buffer based on Stantec's findings therefore seeing as the flow rates are similar to existing conditions with minor increases to flow duration for the majority of rainfall events (Stantec, 2018), and the attributes of the established meadow community, enhancement plantings are not being recommended.

2.5 Terrestrial Crayfish

"Within the EIS addendum and based on email correspondence (August 21, 2017) terrestrial crayfish searches were completed- with no evidence of the species within the wetland limit near SW02, that said the report concludes that the broader wetland complex remains "candidate habitat" for SWH. Terrestrial crayfish are a species which is reliant on the shallow ground water regime and is highly sensitive to changes of wetlands hydro period/shallow ground water regime, particularly during the summer months when the species is more active. How has the potential changes resulting in the increase of runoff being discharged to the wetland been considered in terms of these types of ecological functions?"

According to the Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E (MNRF, 2015), two species of terrestrial crayfish (*Fallicambarus fodiens* and *Cambarus diogenes*) are found within south-western Ontario. Both of these species are considered semi-terrestrial, primary or secondary burrowers that largely inhabit wetlands (Giasu et al, 1996). *Fallicambarus fodiens* is known to prefer stagnant waters, however it can be found in temporary streams throughout southern Ontario (Giasu et al 1996), while *Cambarus diogenes* usually occurs in low-lying woodland areas along rivers, streams and ponds (Helms et al 2013). Both species typically construct an elaborate burrow complex with several openings, occasionally topped with a chimney (Giasu et al, 1996). Burrows of *Cambarus diogenes* are usually constructed in clay-dominated soils containing hypoxic/anoxic water to a depth ranging from 15cm to 5m, depending on groundwater conditions (Helms et al. 2013). *Fallicambarus fodiens* burrows tend to be less complex, typically having one entrance and extends in a vertical disposition, unless blocked by a tree root or rock, for approximately 1 metre (Thoma & Armitage, 2008). Burrows of *Fallicambarus fodiens* are usually plugged from within at the entrance or below the surface and frequently lack water at the peak of summer (Thoma & Armitage, 2008).

Based on their anatomy, crayfish are able to endure periods of exposure to moist air and can move between terrestrial and aquatic environments when their oxygen source has been depleted (Reynolds et al, 2013). Burrowing crayfish dig their burrows to extensive depths so they can access groundwater during drought periods and can avoid freezing in the winter (Pintor & Soluk, 2006). *Fallicambarus fodiens* has been noted to have a higher tolerance towards soil and water contaminants which allows it to inhabit a larger fundamental niche compared to other species (Maloney & Simon, 2015).
The ecological functions and habitats of terrestrial crayfish have been considered through the implementation of the SWM measures established by Stantec (2018) for the proposed development. The Significant Wildlife Habitat Mitigation Tool (MNRF, 2014) has been utilized as a guide to ensure minimal impact to the wetland feature and potential crayfish habitat. As per the Significant Wildlife Habitat Mitigation Tool (MNRF, 2014), this development avoids vegetation clearing, excavation, draining and filling directly in the habitat eliminating the impacts of soil compression and contamination as well as obstruction between burrowing habitat and areas of temporary or permanent water. In addition, the water balance study was completed for the wetland feature, indicating a 3% increase in surface runoff to the wetland feature, ultimately confirming that there will be no measurable change in the water table level or in surface water quality or quantity. MNRF (2014) also recommends that surface runoff be directed away from potential crayfish burrows in order to avoid sedimentation that could negatively affect the crayfish's ability to dig burrows. The conveyance of the previously treated surplus runoff through the enhanced grassed swale to SW01 allows it to be discharged as far as possible from the existing wetland feature reducing the potential for foreign sediment to inundate the potential habitat.

2.6 Bat Habitat- Mitigation and Timing Windows

"With respect to bat habitats and species at risk, in addition to the recommended bat boxes, should there be consideration of timing windows (for demolition or buildings and erecting houses)? Details regarding the design of boxes can be dealt with through the EIR."

Following the assessment of the site trees and existing buildings for the presence of bat maternity colonies, Aboud & Associates Inc. recommended the installation of bat houses within the proposed development as a feasible mitigation measure to compensate for the removal of existing suitable roost trees (AA, 2017).

Sources were reviewed to determine the optimal timing window for demolition of the existing structures and construction of the proposed development. Mitchell-Jones developed Bat Mitigation Guidelines (2004) to assist with land-use planning and development operations where bats have the potential to occur. It is noted within these guidelines that most bats show distinct seasonal changes in behavior and roost selection, so impacts from development can vary seasonally. Furthermore, timing can vary depending on the species, however the majority of roosts are only used seasonally, therefore there is some period when bats are not present. Mitchell-Jones identified that maternity roosts are generally occupied between May and September, while hibernation sites are inhabited between October and March, depending on weather. *Table 1* used within the Bat Mitigation Guidelines (Mitchell-Jones, 2004) details the optimum period for carrying out works depending on the usage of the site by bats.

Table 1. Optimum Working Periods

Bat Usage of Site	**Optimum Period for Carrying Out Works (some variation between species)**
Maternity	October 1st- May 1st
Summer (not a proven maternity site)	September 1st – May 1st
Hibernation	May 1st – October 1st
Mating/Swarming	November 1st – August 1st

In addition, the Protocol for Wildlife Protection during Construction (City of Ottawa, 2015) states that the most sensitive time for some birds, small mammals and other wildlife that occupy vacant buildings or other structures is March through mid-August, which is the breeding season for most species. Although this protocol recognizes a broader grouping of wildlife, the timing window essentially aligns with that of Mitchell-Jones (2004).

The roosting and hibernation patterns of three bat species at risk in Ontario (Little Brown Myotis, Northern Myotis and Tri-coloured Bat) were also reviewed to ensure the timelines matched those mentioned by Mitchell-Jones (2004). Little Brown Myotis spends the spring and summer occupying the maternity roost, moving to their hibernation sites in August to breed and enter hibernation in September (MNRF, 1984). Tri-coloured Bat enters hibernation sites in October and remains there until the end of April (MNRF, 1984). Northern Myotis has been known to begin hibernation from September to early November and emerging between March and May the following year (Caceres & Barclay, 2000).

The findings of the bat surveys conducted as part of the EIS Addendum (AA, 2017) indicated there was no evidence of bats within the existing structures. If demolition of the structures is to occur during summer months, it is recommended that an additional investigation of the structures is completed to ensure they are vacant. Following demolition, there will not be any structures remaining on the site that contain potential roosting habitat, therefore the erection of new structures is not a concern in regards to disturbing potential bat species.

2.7 Retention of Notable Trees

"Given the Engineering comments regarding the periphery swale approach around the site, it would appear that there is an opportunity to reconsider protection of trees along the west side of the site, particularly the Eastern White Pines (T145-T162). The majority of these native trees are in good or excellent condition and provide various benefits and services to the neighbourhood and City including reduction of air pollution, habitat for urban wildlife, mental health benefits, carbon sequestration and screening/aesthetic improvement. Given their condition and location, these trees are high priority for preservation."

"In addition to the Eastern White Pines, staff have noted a number of other notable trees based on size, condition and species on the site and would encourage consideration for preservation of these trees during site redesign to address the remainder of the City's comments. Consider integrating these trees into the proposed urban landscape (i.e. amenity areas, stormwater area, front or rear yards) and including trees no. T142, T143, T90, T91, T41, T31-T37."

Based on review of the revised site plan and grading by AA Arborist James Dennis, the removal of the Eastern White Pines (T145-162) is still recommended due to the installation of a grassed swale as part of the SWM strategy. Based on the current site plan, trees not recommended for preservation are still in conflict with the proposed development, either as constructed features or infrastructure. The preservation of additional trees (T142, T143, T90, T91, T41, T31-37) was considered, however in order to implement the necessary SWM facilities throughout the site, the trees are recommended for removal. As the majority of the trees are native and in good or excellent condition, they will be regulated under the City of Guelph Tree By-law and require compensation plantings.

2.8 Temperature Regime (Cole Engineering February, 2018)

"The flow regime in the nearby unnamed tributary and Tributary E was not discussed. According to the Hanlon Creek Subwatershed Study, Hanlon Creek is a coldwater system but the temperature regime of those tributaries has not been established. If these tributaries are cold or coolwater, they may be negatively impacted by changes in water temperature related to the proposed development. The statement in the January 2018 response matrix that no groundwater seeps were identified in the ELC is not conclusive."

The Monitoring program implemented by the HCSWS (PEIL, 2004) in 2001 indicated the downstream reaches of Tributary E (further downstream from the permanent station at the Clairfields subdivision) reached a maximum summer temperature of 23°C, slightly above the recommended maximum value of 22°C (Hanlon Creek Watershed Plan, 1993). The range in daily fluctuations of 4-5°C is broader than what has been observed in the upstream reaches and is a result of higher exposure to air temperature and direct sunlight (HCSWS, 2004). Another monitoring station was located within Tributary D, upstream from the confluence with Tributary E (HCSWS, 2004). Similar to the downstream reaches in Tributary E, maximum observed temperatures in summer months exceed the recommended value, likely caused by the headwaters being more exposed within the Clairfields subdivision (HCSWS, 2004).

Based on electrofishing surveys, the HCWP concluded that water temperature and groundwater discharge were the primary factors controlling Brook Trout distribution. Furthermore, the HWCP (MMM, 1993) indicates that it is standard practice within the province to state that a coldwater stream must maintain a temperature below 22°C in order to preserve its coldwater fishery potential, and that as long as temperatures are maintained below this level, developments are generally permitted to proceed. Based on the temperature threshold identified and the temperature ranges gathered by the HCSWS, Tributary E can be classified as being a cool-cold water stream.

Due to Brook Trout requiring specific conditions, it is important that the adjacent vegetation community is able to maintain cooler temperatures via canopy cover and groundwater inputs. It is recognized that watercourses are naturally dynamic features and for that reason assessing the site-specific impacts is difficult, however the Ecological Buffer Guideline Review (Beacon, 2010) considers several environmental variables, including stream temperature, and provides information pertaining to adequate vegetative buffers as a result of numerous academic studies. Based on this guideline, buffers to moderate stream temperature as well as provide core habitat protection functions are found to range from 10 metres to 200 metres based on site-specific conditions.

The existing Eastern White Cedar swamp surrounding Tributary E within the drainage catchment from the proposed development is densely vegetated and well established. The extensive canopy coverage of the Eastern White Cedars throughout keep the community including Tributary E well-shaded helping to maintain the cool-cold water regime. The consistent shading by the canopy also aids in deterring the invasion of non-native species as the majority require periods of sunlight to establish. Although the broad coniferous swamp community does not contain high species diversity, its stability allows it to help maintain the existing conditions of Tributary E, thus the proposed development will not negatively impact its thermal regime.

3.0 Summary and Conclusion

The above responses are intended to satisfy the comments provided by City of Guelph and Cole Engineering pertaining to the proposed development at 19-59 Lowes Road. It is our opinion that implementation of the recommendations within the 19-59 Lowes Road EIS, 1st EIS Addendum (AA, 2017) and the above 2nd EIS Addendum will ensure that there will be no negative impact to the ecological function of the Provincially Significant Hanlon Creek Wetland Complex.

Prepared by:

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MNRF Certified Ecological Land Classification
MNRF Certified Wetland Evaluation

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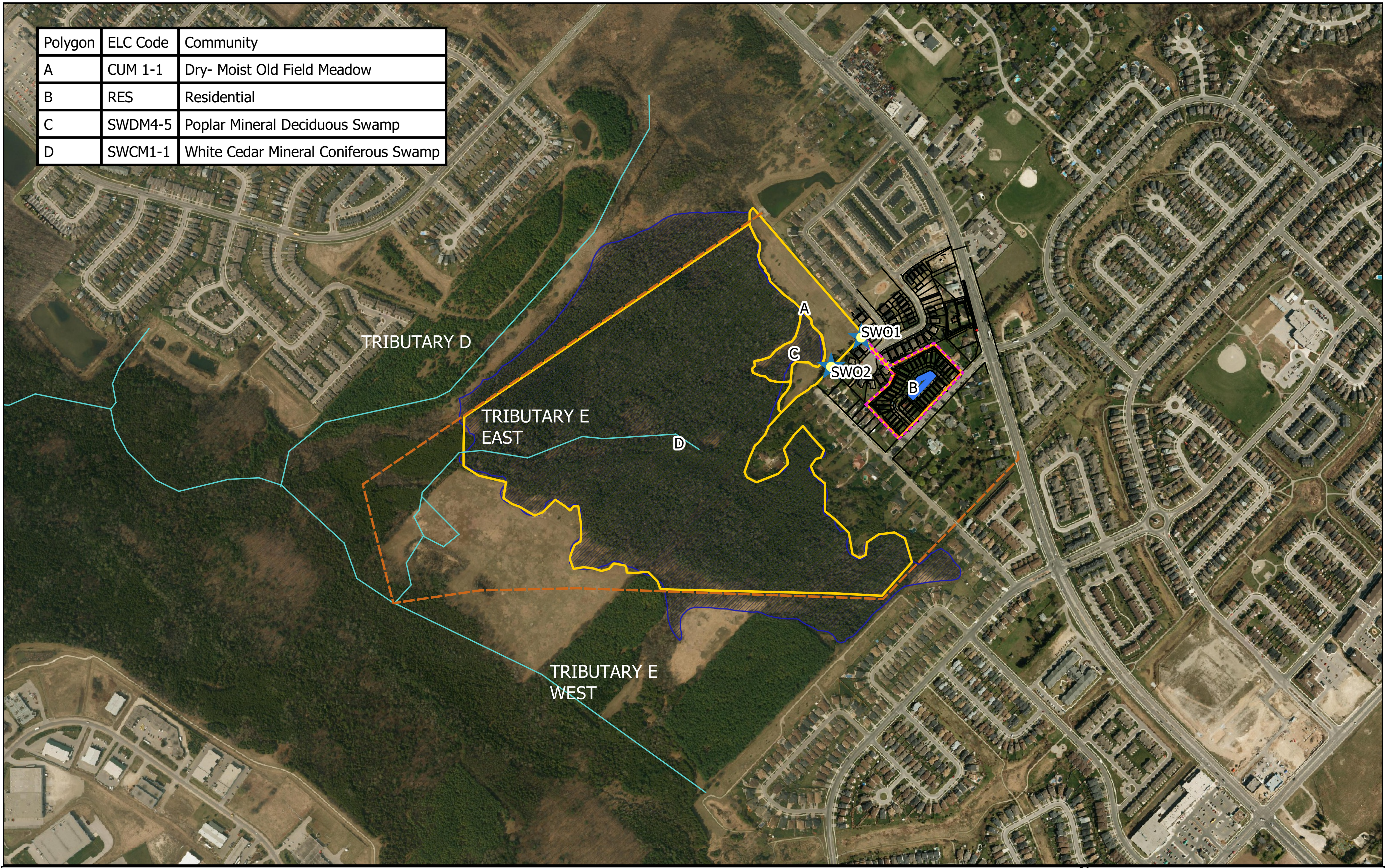
FIGURE

Polygon	ELC Code	Community
A	CUM 1-1	Dry- Moist Old Field Meadow
B	RES	Residential
C	SWDM4-5	Poplar Mineral Deciduous Swamp
D	SWCM1-1	White Cedar Mineral Coniferous Swamp



LEGEND

DRAINAGE CATCHMENT
WATERCOURSE
STORMWATER OUTLET
PROPOSED DEVELOPMENT
ECOLOGICAL LAND CLASSIFICATION
PROVINCIALLY SIGNIFICANT WETLAND

Information Sources:

1. Orthophotography provided by First Base Solutions Accessed June, 2018.
2. Drainage area and watercourses provided by Stantec, 2018
3. PSW limits provided by Land Information Ontario
4. Ecological Land Classification provided by Aboud & Associates, 2017

Title:

EXISTING CONDITIONS
& DRAINAGE CATCHMENT

Project:

15-59 LOWES ROAD
CITY OF GUELPH

N

Date: JUNE 2018

Project: AA16-053B

Scale: 1 : 10000

ABOUD & ASSOCIATES INC.
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Figure No:

1

APPENDIX 1

TRCA Risk Evaluation

Appendix 1. TRCA Risk Evaluation

The completion of the feature based water balance allows an analysis to be completed that can determine the potential impacts of the proposed development on the ecological and hydrologic function of the existing natural feature. In order to conduct this analysis, the Wetland Water Balance Risk Evaluation (known herein as the Risk Evaluation) developed by the TRCA (2017) was utilized. The Risk Evaluation was developed to help proponents determine the level of risk their proposed development may pose to the ecological integrity of a wetland based on changes to its hydrology. The Risk Evaluation recognizes that the hydrology of a wetland defines several aspects of its physical, chemical and ecological characteristics, and is therefore one of the most important variables influencing ecological function.

The Risk Evaluation is comprised of four (4) steps, including determining the wetlands that could potentially be impacted, the magnitude of potential hydrologic change, the sensitivity of the wetland to hydrologic change and assigning a level of risk. Each step has been completed based on the proposed development and is detailed below.

Step 1. Determining the Proposed Wetlands Potentially Impacted

As determined through the EIS (Aboud & Associates Inc., 2017), a portion of the Provincially Significant Hanlon Creek Wetland Complex has the potential to be impacted by the increase in surface runoff from the proposed development. As mentioned above, the catchment area that will retain this runoff is 62.1 ha in size and drains to Tributary E.

Step 2. Determine the Magnitude of Potential Hydrologic Change

In order to determine the magnitude of potential hydrologic change the following criteria are considered:

i. The proportion of impervious cover in the catchment of the wetland that would result from the proposal
ii. The degree of change in the side of the wetland catchment
iii. Water taking from, or discharge to, surface water bodies or aquifers directly connected to the wetland
iv. The impact on locally significant recharge areas

Impervious Cover

The Risk Evaluation uses the equation below to determine an Impervious Cover Score (S)

$$S = \frac{\mathrm{IC} * \mathrm{Cdev}}{\mathrm{C}}$$

Where IC is the proportion of impervious cover (%) proposed within the area of wetland catchment that is within the proponent's holdings, Cdev is the total development area of the catchment (ha), and C is the size of the wetland's catchment (in ha). Based on the proposed development the Impervious Cover Score was calculated using the following values.

$$S = \frac{60 * 16.1}{62.1}$$

$$S = 15.6$$

Catchment Size

Based on the proposed development, the catchment size is not changing and will remain at 16.1 ha.

Water Taking

As part of the Risk Evaluation, a wetland within or adjacent to a proposed development is considered impacted when water taking is anticipated to require MOECC EASR registration (>50,000 L/day). At this point the magnitude and duration of water taking is unknown, however at servicing there may need to be some minor groundwater pumping (Pers. Comm. T Fraser).

Recharge Areas

According to the GRCA Grand River Information Network, the proposed development as well as the catchment area are located within a Significant Groundwater Recharge Area (SGRA) with a vulnerability (from 1-10, 10 being the most vulnerable) of 4. Known SGRA within a wetland's surface and groundwater catchments can be more sensitive to change than other areas (TRCA, 2017). Proposed development within these areas may cause an increase the risk of a significant change to the wetland water balance since these areas may contribute disproportionately to interflow and shallow groundwater discharge to the wetland (TRCA, 2017).

Table 1 (TRCA, 2017) below indicates the potential magnitude that each of the criteria within Step 2 may have on the existing wetland feature.

Table 1. Criteria used to evaluate the probability and magnitude of hydrological change

Criteria	High Magnitude	Medium Magnitude	Low Magnitude
Impervious Cover Score	>25%	**10-25%**	<10%
Increase or decrease in catchment size	>25%	10-25%	**<10%**

Water taking or discharge	Dewatering exceeding MOECC EASR limits (>400,000 L/day) for > 6 months anticipated	Dewater within MOECC EASR limits (50,000-400,000 L/day) for > 6 months anticipated OR Dewatering exceeding MOECC EASR limits (>400,000 L/day) for < 6 months anticipated	**Dewatering within MECC EASR limits (50,000-400,000 L/day) for < 6 months anticipated***
Impact to recharge areas *	Impact (e.g. replacement with impervious cover) to >25% of locally significant recharge areas*	Impact (e.g. replacement with impervious cover) to 10-25% of locally significant recharge areas*	**Impact (e.g. replacement with impervious cover) to < 10% of locally significant recharge areas***
Note: Where there is no proposed alteration to the catchment imperviousness or size and water taking is below MOECC EASR registration requirements (<50,000 L/day), a feature-based water balance analysis as defined in the TRCA SWM document (2012) is not required. See section 1.4 (Applicability)			

Step 3. Determine the Sensitivity of the Wetland

Vegetation Community

Vegetation communities consisting of natural cover are defined by the Ontario Ecological Land Classification (ELC) system and vary based on several factors including soils, climate, physiology and hydrology. The Risk Evaluation recognizes the range in sensitivity between different vegetation communities and TRCA Ecologists have ranked ELC communities based on their sensitivity to hydrological change into three levels (low, medium & high). AA Ecologist Shannon Davison re-visited the portion of the Hanlon Creek PSW within the catchment area to ensure correct identification of the vegetation communities. It was determined that the catchment area consists of two wetland communities, a small Birch-Poplar Mineral Deciduous Swamp on the edge where there is constant sump pump discharge and a large White Cedar Mineral Coniferous Swamp which constitutes the rest of the catchment area. According to the TRCA vegetation community rankings, both communities are classified as having medium sensitivity and are tolerant of slight hydrological change.

Fauna Species

Several fauna species are adapted to specific hydrological conditions or are associated with certain vegetation within wetland communities. Similar to the vegetation communities, TRCA Ecologists categorized fauna species (low, medium & high) based on their sensitivity to hydrological change within their habitats. The individual species with the highest sensitivity level determines the sensitivity of the fauna community to hydrological change. Only two species, Mallard and Great Blue Heron (flying overhead), noted on the Fauna list were observed while on site. Both of these species are listed as having low sensitivity.

Flora Species

As with fauna, there is a strong correlation between wetland hydrology and the existing vegetation community. Furthermore, vegetation species can require specific hydrological conditions while others are able to thrive in a broader range of hydrological conditions (TRCA, 2017). TRCA Ecologists have categorized wetland vegetation species based on their sensitivity to hydrological change (low, medium & high). The high sensitivity category is met when multiple high sensitivity species are detected at a feature, medium sensitivity category is met when multiple medium sensitivity species are detected at a feature, and the low sensitivity category is met in all other cases (TRCA, 2017). Based on the vegetation inventory conducted, the majority of the species that occur within the wetland catchment have been ranked as having medium sensitivity.

Significant Wildlife Habitat for Hydrologically Sensitive Species

Wetlands can provide crucial habitat to a large number of species that are very sensitive to hydrological change as well as those that endure critical life stages at specific times of the year. In recognition of this habitat, the TRCA exercises precaution by stating that significant wildlife habitat for species ranked as having high sensitivity to hydrologic change require increased protection. Based on none of the species observed being classified as high sensitivity, increased protection is not required as per the Risk Evaluation.

Hydrological Classification

The hydrogeomorphic setting of a wetland influences its sensitivity to hydrologic change (TRCA, 2017). The Risk Evaluation uses four distinct hydrological wetland classifications defined in the Ontario Wetland Evaluation System (2013): isolated, palustrine, riverine and lacustrine. Based on the Hanlon Creek Swamp Complex evaluation completed in 1994 by the Ministry of Natural Resources, the majority of the wetland is classified as being Palustrine.

Table 2 (TRCA, 2017) below indicates the criteria used to evaluate the sensitivity of the wetland to hydrologic change within Step 3.

Table 2. Criteria used to evaluate the sensitivity of the wetland to hydrologic change

Criteria	High Sensitivity	Medium Sensitivity	Low Sensitivity
Vegetation Community Type (ELC)	Presence of a high sensitivity vegetation community	**Presence of a medium sensitivity vegetation community**	No high or medium sensitivity criteria satisfied
High Sensitivity Fauna Species **	Presence of a high sensitivity species	Presence of a medium sensitivity species	**No high or medium sensitivity criteria satisfied**
High Sensitivity Flora Species **	Presence of multiple high sensitivity species	**Presence of multiple medium sensitivity species OR Presence of one high sensitivity species**	No high or medium sensitivity criteria satisfied
Significant Wildlife Habitat	Presence of Significant Wildlife Habitat, as defined by OMNRF (2014), for high sensitivity species*	N/A	**No high criteria satisfied**
Hydrological Classification Considering Ecology	**Isolated/Palustrine AND Presence of medium or high sensitivity vegetation communities* OR medium or high sensitivity flora or fauna species**	Isolated/Palustrine AND No medium or high sensitivity vegetation communities* AND no medium or high sensitivity flora or fauna species* present	Riverine/Lacustrine

*See Risk Evaluation document for community and species rankings by hydrological sensitivity

Step 4. Risk Characterization

Based on the criteria evaluated in steps 2 and 3, the TRCA has developed a decision tree (Figure 1) to categorize the development proposal into one of three levels of risk; Low, Medium or High. Based on the categorization, the proposed development qualifies as being Low Risk to the existing wetland feature.

1

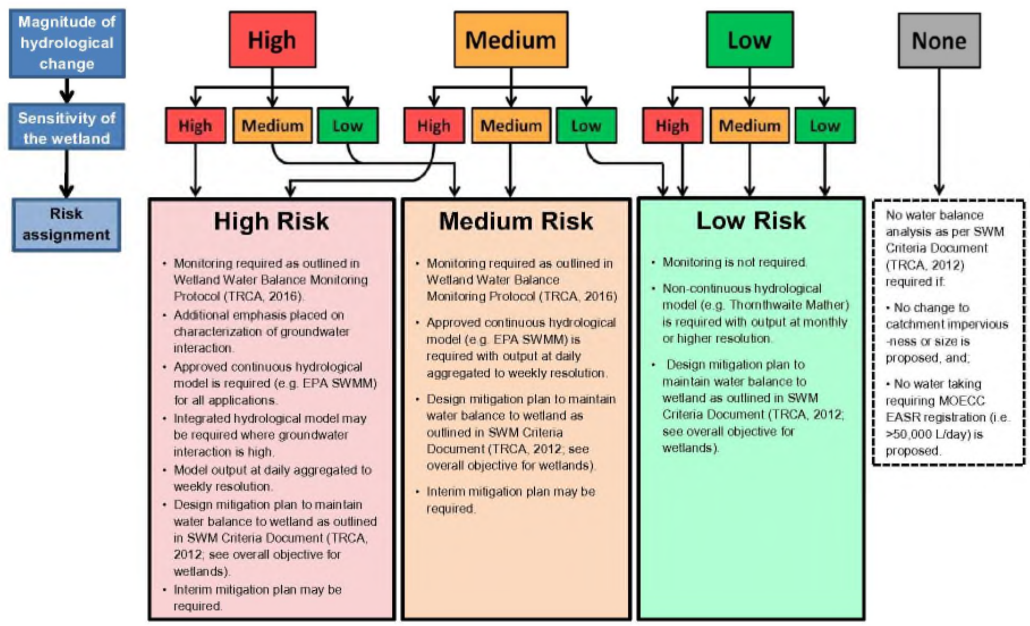

Figure 3: Wetland Risk Evaluation Decision Tree

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Figure 1. TRCA Risk Assessment Decision Tree

APPENDIX 2

Ecological Land Classification Forms

ELC COMMUNITY DESCRIPTION & CLASSIFICATION

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T:519.822.6839 . F:519.822.4052 . info@aboudtng.com . www.aboudtng.com

Project: 15-59 Lowes Road **Project #:** 16-053B **Observer(s):** SD

Weather conditions: **Date:**

Temp (°C)	Wind*	Cloud Cover	Precipitation	Precipitation(24hrs)
25	2	0	None	None

*Beaufort Scale: 0- (0 km/hr), 1- (1-5km/hr), 2- (6-11km/hr), 3- (12-19km/hr), 4- (20-28km/hr), 5- (29-38km/hr), 6- (39-49km/hr)

Polygon:	Polygon UTM	Community Series	Ecosite	Vegetation Type
C	E: 564658.29 N: 4817618.11	SWD	SWDM4- Mineral Deciduous Swamp	SWDM4-5- Poplar Mineral Deciduous Swamp

System
Terrestrial **Wetland**
Aquatic

Topographic Feature
Lacustrine Riverine Bottomland Terrace Valley slope **Tableland** Rolling upland
Cliff Talus Crevice Cave Alvar Rockland Beach Bar Sand dune Bluff

Dominant Plant Form
Plankton Submerged Floating-lvd. Graminoid Forb
Lichen Bryophyte **Deciduous** Coniferous Mixed

Cover
Open Shrub
Treed

History
Natural
Cultural

Community Class
Beach-Bar Sand Dune Bluff Cliff Talus Alvar Rock Barren Crevice-Cave Sand Barren Meadow Tallgrass
Prairie Savannah Woodland Forest Thicket Cultural **Swamp** Fen Bog Marsh Open Water Shallow Water

Stand Description:

Community Age
Pioneer Young **Mid-Aged** Mature Old Growth

Basal Area (m²/ha)

Standing Snags
Rare **Occasional** Abundant Dominant

Deadfall Logs
Rare **Occasional Abundant** Dominant

Health
Low **Medium** High

Sensitivity
Low **Medium** High

Botanical Quality
Low **Medium** High

Slope
none **gentle** moderate steep (simple or complex)

Soil Analysis:

Soil Drainage
Very Rapid Rapid Well Moderately Well Imperfect **Poor** Very Poor

Soil Moisture Regime
Dry Fresh Moist **Wet**

Effective Soil Texture
Organic- 0- 15cm
Sandy Clay Loam 15cm- 60cm

Depth to Mottles / Gley
Sample: M - 15 cm / G - 20 cm

Depth to Groundwater metres
at surface **less than 1m** more than 1 m

Depth to Bedrock metres
at surface less than 1m **more than 1 m**

Vegetation Layer		Height ¹	Cover ²	Dominant Species per Vegetation Layer
1	Canopy	2	3	POPBALS > POPTREM > THUOCCI > SALXFRAG
2	Subcanopy	3	2	SALIX SP. = ALNINCA
3	Understorey	4	2	ALNINCA > POPBALS
4	Ground Layer	6	4	GRASS SP. > ALNINCA > GALTRIF > SCICYPE

¹ ***Height Code***: 1=>20m, 2=10m-20m, 3=2m-10m, 4=1m-2m, 5=0.5m-1m, 6=0.2m-0.5m, 7= < 0.2m ² ***Cover Codes***: 0 = none, 1 = 0%- 10%, 2 = 10%- 25%, 3 = 25%-60%, 4= >60%

Size Class Analysis ³	R	O	O	R
³ *Abundance Code*: RS=Rare, O=Occasional, A=Abundant, D=Dominant	< 10 cm DBH	10 to 24 cm DBH	25 to 50 cm DBH	> 50 cm DBH

Evidence of Disturbance:
Constant flow of sump pumps from adjacent housing.

Wildlife / Habitat Observations / Comments:
American Crow, American Robin, White-tailed Deer, Red-winged Blackbird, Northern Cardinal (pair)

				Community Name	Code	% Coverage
Inclusion		Complex				
Inclusion		Complex				
Inclusion		Complex				

Plant Species List	Layer / Abundance *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Trees				
POPULUS BALSAMIFERA	O	O	R	R
THUJA OCCIDENTALIS	R			
POPULUS TREMULOIDES	R			
SALIX X FRAGILIS	R			
Shrubs and Woody Vines				
SALIX SP.		O		
ALNUS INCANA		O	O	A-O

Plant Species List	Layer / Abundance *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Ferns & Fern Allies, Herbs, Graminoids				
TYPHA ANGUSTIFOLIA				R
EQUISETUM FLUVIATILE				R
GRASS SP.				D
RANUNCULUS REPENS				R
SOLIDAGO SP.				R
CIRSIUM ARVENSE				O-R
OXALIS STRICTA				R
TARAXACUM OFFICINALE				O-R
CHELIDONIUM MAJUS				O-R
GALIUM TRIFIDUM				O
CAREX SP.				R
MENTHA ARVENSIS				R
MYOSOTIS LAXA				R
VICIA CRACCA				R
SCIRPUS CYPERINUS				O
SOLANUM DULCAMARA				R
IMPATIENS CAPENSIS				R
ONOCLEA SENSIBILIS				O-R

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Project: 15-59 Lowes Road **Project #:** 16-053B **Observer(s):** SD
Weather conditions: **Date:**

Temp (°C)	Wind*	Cloud Cover	Precipitation	Precipitation(24hrs)
25	2	O	None	None

*Beaufort Scale: 0- (0 km/hr), 1- (1-5km/hr), 2- (6-11km/hr), 3- (12-19km/hr), 4- (20-28km/hr), 5- (29-38km/hr), 6- (39-49km/hr)

Polygon:	Polygon UTM	Community Series	Ecosite	Vegetation Type
D	E: 564477.93 N: 4817627.04	SWC- Coniferous Swamp	SWCM1- White Cedar Mineral Coniferous Swamp	SWCM1-1- White Cedar Mineral Coniferous Swamp

System: Terrestrial, Wetland, Aquatic

Topographic Feature: Lacustrine, Riverine, Bottomland, Terrace, Valley slope, Tableland, Rolling upland, Cliff, Talus, Crevice, Cave, Alvar, Rockland, Beach, Bar, Sand dune, Bluff

Dominant Plant Form: Plankton, Submerged, Floating-lvd., ~~Graminoid~~, Forb, Lichen, Bryophyte, Deciduous, Coniferous, Mixed

Cover: ~~Open~~, Shrub, Treed

History: Natural, Cultural

Community Class: Beach-Bar, Sand Dune, Bluff, Cliff, Talus, Alvar, Rock Barren, Crevice-Cave, Sand Barren, Meadow, Tallgrass, Prairie, Savannah, Woodland, Forest, Thicket, Cultural, Swamp, Fen, Bog, Marsh, Open Water, Shallow Water

Stand Description:

Community Age: Pioneer, Young, Mid-Aged, Mature, Old Growth

Basal Area (m²/ha)

Standing Snags: Rare, Occasional, Abundant, Dominant

Deadfall Logs: Rare, Occasional, Abundant, Dominant

Health: Low, Medium, High

Sensitivity: Low, Medium, High

Botanical Quality: Low, Medium, High

Slope: none, gentle, moderate, steep (simple or complex)

Soil Analysis:

Soil Drainage: Very Rapid, Rapid, Well, Moderately Well, Imperfect, Poor, Very Poor

Soil Moisture Regime: Dry, Fresh, Moist, Wet

Effective Soil Texture
Sandy Clay Loam

Depth to Mottles / Gley
Sample: M - -25 cm / G - 30 cm

Depth to Groundwater metres: at surface, less than 1m, more than 1 m

Depth to Bedrock metres: at surface, less than 1m, more than 1 m

Vegetation Layer		Height [1]	Cover [2]	Dominant Species per Vegetation Layer
1	Canopy	2	4	THUOCCI >> POPBALS
2	Subcanopy	3	3	THUOCCI
3	Understorey			
4	Ground Layer	6	2	POPBALS > TAROFFI > SOL SP. > ALNINCA

[1] ***Height Code***: 1=>20m, 2=10m-20m, 3=2m-10m, 4=1m-2m, 5=0.5m-1m, 6=0.2m-0.5m, 7= < 0.2m [2] ***Cover Codes***: 0 = none, 1 = 0%- 10%, 2 = 10%- 25%, 3 = 25%-60%, 4= >60%

Size Class Analysis [3]				
[3] *Abundance Code*: RS=Rare, O=Occasional, A=Abundant, D=Dominant	< 10 cm DBH	10 to 24 cm DBH	25 to 50 cm DBH	> 50 cm DBH

Evidence of Disturbance:

Wildlife / Habitat Observations / Comments:
Blue Jay

				Community Name	Code	% Coverage
Inclusion		Complex				
Inclusion		Complex				
Inclusion		Complex				

Plant Species List	Layer / Abundance *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Trees				
THUJA OCCIDENTALIS	D	D		
POPULUS BALSAMIFERA	R			O
Shrubs and Woody Vines				
ALNUS INCANA				R

Plant Species List	Layer / Abundance *Abundance Code*: R=Rare, O=Occasional, A=Abundant, D=Dominant			
	1	2	3	4
Ferns & Fern Allies, Herbs, Graminoids				
SOLIDAGO SP.				R
TARAXACUM OFFICINALE				R
RANUNCULUS REPENS				R