# Appendix A – Project Team Meeting Minutes

September 2023

**IBI GROUP**
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# Minutes

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| **To/Attention** | See distribution below. | **Date** | November 1, 2019 |
| **From** | John Bayley, P.Eng. | **Project No** | 1116954 |

**Subject** Region of Waterloo
**Maple Grove Road Improvements and Corridor Study - Class Environmental Assessment Study - Project Team Meeting 1**
Regional Municipality of Waterloo, 100 Maple Grove Road, Cambridge - Operations Boardroom, Thursday, October 31, 2019, 9:00 AM – 12 Noon

**Present**

**Region of Waterloo**
Delton Zehr, Project Manager, Design and Construction
Frank Kosa, Head, Transportation Capital Projects
Mike Jones, Supervisor, Traffic Engineering
Tabot Eneme, Transportation Planning Engineer
Karl Kiefer, Region of Waterloo, Councillor
Matt Cowan, Region ATAC Committee Member

**City of Cambridge**
Donna Reid, City of Cambridge, Councillor
Alex Nichols, City of Cambridge

**IBI Group**
John Bayley, IBI Group (PM/Transportation Engineering) - Chair
Scott Johnston, IBI Group (Transportation Planning)
Sergei Filippov, IBI Group (Transportation Engineering)

**Regrets** NA

**Distribution** All Present and Regrets

| **Item Discussed** | **Action By** |
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| **Item Discussed** | **Action By** |
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| Meeting commenced at 9:00 am | |
| **1. Purpose of the Meeting** | |
| **1.1** To introduce the project team and discuss the study objectives and project approach. A PowerPoint presentation and open discussion followed. | *Info* |
| 1.1.1 Study Communications | |
| ▪ Matt Cowan, Region ATAC Committee Member – will be responsible to communicate the study with members of the ATAC committee, providing periodic updates to both the Committee and the Project Team on a reciprocal basis. | ATAC |
| ▪ Alex Nichols, City of Cambridge – will be responsible to communicate the study with members of various departments at the City of Cambridge including infrastructure planning and improvements needs, providing periodic updates to both the City Staff and the Project Team on a reciprocal basis. | CITY |
| ▪ Tabot Eneme – will be responsible to communicate the study with Region Transportation Planning staff, providing periodic updates to both the Region Staff and the Project Team on a reciprocal basis. | RMW (TE) |
| ▪ Mike Jones– will be responsible to communicate the study with Region Traffic Operations staff, providing periodic updates to both the Region Staff and the Project Team on a reciprocal basis. | RMW (MJ) |
| **1.2 Scope and Objectives** | *Info* |
| 1.2.1 To provide suitable corridor capacity for existing and future traffic while accommodating growth in ongoing local area developments and allow for increased traffic associated with Region-wide community growth. | |
| 1.2.2 To satisfy the Region's goals related to the safe and efficient movement of goods, and satisfy the transportation needs of the community including the overall active transportation networks as identified in the Region's Transportation Master Plan (RTMP) and Active Transportation Master Plan (ATMP). | |

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| 1.2.3 To plan for future growth and provide necessary roadway improvements to alleviate traffic congestion and peak hour challenges due to high volumes and heavy truck traffic. | |
| 1.2.4 To address ongoing concerns regarding intersection operations and accident history. Of particular concern is the intersection of Hespeler Road and Maple Grove Road where vehicle collisions and collision severity are a significant concern. The study will focus on and address other potential operational concerns at various locations in the corridor. | |
| **1.3 Study Progress** | *Info* |
| ▪ Schedule/Completed Studies and Ongoing Activities<br>▪ Project awarded to IBI Group in August 2018<br>▪ Notifications to property owners for permission/consent to enter for survey and field studies. (Issued by RWM – Sep. 14, 2018 and later by IBI Group/Subs on date of site visits.)<br>▪ Commencement of Data Collection activities – September 2018<br>▪ Initial Roundabout Screening (RMW Trans. Planning) – January 2019 and updated in March 2019 | |
| **2. Intersection Control Studies – CIMA – June to August 2019** | *Info* |
| **3. Data Collection and Preliminary Findings** | *Info* |
| Field Investigations – September 2018 to July 2019 | |
| **3.1 Topographic Survey** | *Info* |
| ▪ The project topographic survey - Nov. 2018- Apr. 2019 | |
| **3.2 Data Collection** | *Info* |
| ▪ Fluvial Investigations – Nov. 2018 – April 2019<br>▪ Tree Inventory – Fall 2018 - Spring 2019<br>▪ Geotechnical Investigation (Field) – Dec 2018 – Feb. 2019<br>▪ Geotechnical Reporting – March – June 2019<br>▪ Hydrogeology (Field) - Dec 2018 – Feb. 2019<br>▪ Private Well Investigations, Monitoring Well readings and Hydrogeological Study (Reporting) – March 2019 - July 2019 | |

| Item Discussed | Action By |
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| **3.3 Base Plan Creation – Completed** | *Info* |
| **3.4 Sub-consultant/Specialist Reporting Status** | *Info* |
| ▪ Topographic Survey Complete - Completed Survey in hand<br>▪ Geotechnical Investigation - Completed – Draft Report in hand<br>▪ Hydrogeological Investigation - Completed – Draft Report in hand<br>▪ Well Survey - Completed – Draft Reporting in hand<br>▪ Archaeology and Cultural Heritage Investigation – Completed – Draft Report prepared October 2019<br>▪ Natural Environment – Field work completed – awaiting summary of natural inventory and observations<br>▪ Roundabout Screening – Completed – Summary reporting in hand and provided to CIMA for ICS completion<br>▪ Intersection Control Study – Completed – Draft Reporting In hand | |
| **4. Project Scope and Progress - proposed overall schedule and progress so far.** | *Info* |
| **4.1 Project Schedule** | *Info* |
| 4.1.1 The overall Project Schedule and milestones were reviewed and updated provided relative to the passage of time and impacts of ongoing studies. | |
| **4.2 Current Project Milestones** | *Info* |
| ▪ Start of Assignment: October 2018<br>▪ Ground Survey & Commence Background Studies - Fall 2018<br>▪ Develop Base Plans - Winter 2019<br>▪ Complete Background Studies - Fall/Spring - 2018/2019<br>▪ Project Team Meeting # 1 - Review Purpose, Studies, Master Plans and Define Evaluation Criteria - October 2019<br>▪ Notice of Commencement – November 2019<br>▪ Project Team Meeting # 2 – Finalize Evaluation - January 2020<br>▪ PCC # 1 – Spring 2020 - Present initial Findings to the Public | |

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| ▪ Project Team Meeting # 3 – Review Comments and Discuss Option Revisions – Spring 2020<br>▪ Project Team Meeting # 4 – Finalize Revised Options and updated Evaluations – Spring/Summer 2020<br>▪ PCC # 2 - Fall 2020 - Present "Preferred Alternative" to the Public<br>▪ Project Team Meeting # 5 – Finalize Project Recommendation - Fall 2020<br>▪ Regional Council Approval – Fall 2020 - Winter 2021<br>▪ File Class Environmental Assessment ESR - Fall 2020 - Winter 2021<br>▪ Notice of Study Completion – Winter 2021<br>▪ Public Review Period (30 Days)<br>Confirmation of Project Completion – Winter 2021 | |
| **4.3 Risk Assessment - Dependencies and Schedule Challenges**<br>▪ Efficient exchange of information from ongoing studies both internal and external to the project;<br>▪ Availability and suitability of base data from various information sources;<br>▪ Staff and Project Team vacations, and holiday breaks;<br>▪ Confirmation of Stakeholder needs – City infrastructure, etc.<br>▪ Previously unforeseen challenges? | *Info* |
| **4.4 Schedule Impacts To-Date**<br>4.4.1 Notice of Study Commencement – Delayed due to ongoing studies including:<br>▪ RTMP Update – On Region Website now.<br>▪ Airport Area Transportation Study – Final Report Pending<br>▪ Roundabout Screening (Done)<br>▪ Intersection Control Study (ICS) (Done) | *Info* |
| **4.5 Major Steps that follow:**<br>▪ Initial Screening of Alternatives and Bypass Option | IBI Group |

| Item Discussed | Action By |
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| ▪ Development and Evaluation of Alternatives | IBI Group |
| ▪ Identify Preliminary Preferred Alternative | IBI Group |
| **5. Transportation Study findings affecting the Maple Grove Road Study** | *Info* |
| **5.1 RTMP Update and ROWAAT Status** | *Info* |
| 5.1.1 Tabot Eneme confirmed that the Region's Transportation Master Plan update has been completed and uploaded the Region's Website. There was related discussion on the following topics: | |
| ▪ The RTMP confirm the need to widen Maple Grove Road to four lanes in the 5 -10 year horizon. | |
| ▪ Highway 401 construction impacts on the Maple Grove road traffic volumes in recent years. | |
| ▪ The impacts of the closures on Highway 401 and the EDR designation at Maple Grove Road. | |
| ▪ It was agreed that a traffic count update would be beneficial in Spring 2020 to update the current conditions. | RMW (TE) |
| 5.1.2 Scott Johnston provided an overview of the Region of Waterloo Airport Area Transportation Study (ROWAAT) and referred to the various alternatives and overall uncertainty as to which alternative would be brought forward without a separate Class EA study of the Shantz Station Road realignment if/when necessitated by future Airport expansion. | |
| In general the options included six alternatives with variations (12 in total): | |
| ▪ 1 - Cul-de-sac Shantz Station Road north and south of the runway extension | |
| ▪ 2, 2A - Tunnel Shantz Station Road beneath runway | |
| ▪ 3, 3A, 3B - Realignment of Shantz Station Road around runway | |
| ▪ 4, 4A - Realignment of Shantz Station Road to connect to Speedsville Road | |
| ▪ 5 - Realignment of Shantz Station Road to connect to Beaverdale Road | |
| ▪ 6, 6A, 6B - Realign Shantz Station Road to connect to Maple Grove Road/Hespeler Road | |

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| 5.1.3 Rankings:<br>▪ Alternative 2A - 1st (7.5) - Poss. Det. Eval. Score - Alt. 2a - 3rd (11 Pts.)<br>▪ Alternative 3B - 2nd (7.2) - Poss. Det. Eval. Score - Alt. 3B - 2nd (10 Pts.)<br>▪ Alternative 3A - 3rd (6.2) - Poss. Det. Eval. Score - Alt, 3A - 5th (9 Pts.)<br>▪ Alternative 4A - 4th (6.0) - Poss. Det. Eval. Score - Alt. 4A - 9th (9 Pts.<br>▪ Alternative 2/3/6B - 5th (5.5) - Poss. Det. Eval. Score - Alt. 6B - 1st/ Alt. 3 - 4th (9 Pts.)<br>Conclusion, Top 5 alternatives are similar in both evaluations and overall impact and should be carried forward for further study. | |
| 5.1.4 Alternative #1 (the 'Do Nothing' alternative that involved providing a 'cul-de-sac' along Shantz Station Rd) and Alternative #2 (tunnelling under the runway) more or less ruled out for not meeting some strategic network alternatives (cul-de-sac) and cost prohibitive (Tunneling). The remaining route options include realigning in some way:<br>Speedsville Rd (Alternatives 3, 3A, and 3B); or<br>Beaverdale Rd (Alternatives 4, 4A and 5); or<br>Vance and Chilligo Rd with potential connection to Hespeler Rd (Alternatives 6, 6A and 6B). | |
| 5.1.5 Amongst the alternatives, none of them 'stood out' as the most feasible. Each will be subjected to further refinements and carried forward as potential alternatives for detailed review as part of a future EA. | |
| 5.1.6 From a traffic impact standpoint, an ultimate realignment of Shantz Station Road to Hespeler Rd (Via Vance and Chilligo Rd – i.e., Alternative #6B) will result in the least traffic impact on Maple Grove Road. | |
| **5.2 Traffic - Roundabout Screening and ICS Study** | *Info* |
| 5.2.1 Findings from Roundabout Screening:<br>▪ Fountain Street (not in Project) – Roundabout planned | |

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| ▪ Vondrau Drive – Roundabout screened out during Region's screening process<br>▪ Boxwood Drive – Roundabout carried forward for ICS<br>▪ Speedsville Road - Roundabout carried forward for ICS<br>▪ Compass Trail – Not considered for roundabout or signals – Right-in and Right-out only will be considered (TBC).<br>▪ Old Maple Grove Road – Roundabout carried forward for ICS<br>▪ Beaverdale Road - Roundabout carried forward for ICS<br>▪ Hespeler Road – Roundabout recommended in ICS | |
| 5.2.2 Findings from Intersection Control Study:<br>▪ Fountain Street (not in Project) – Roundabout planned<br>▪ Vondrau Drive – Traffic signals recommended<br>▪ Boxwood Drive – Roundabout recommended (Under review due to land requirements and proximity to Speedsville Road)<br>▪ Speedsville Road - Traffic signals recommended<br>▪ Compass Trail – Not considered for roundabout or signals – Right-in and Right-out or left in only from WB Maple Grove Road. (TBC).<br>▪ Old Maple Grove Road – Roundabout carried forward for ICS (but only with By-pass Option)<br>▪ Beaverdale Road - Roundabout recommended<br>▪ Hespeler Road – Roundabout recommended in previous ICS | *Info* |
| **5.3 Traffic Analysis - Vissim Model**<br>An existing condition Vissim simulation was presented in video format and a partial future conditions simulation was presented for the roundabouts at Hespeler Road and Beaverdale Road to illustrate the anticipated operation at those locations. The entire corridor will be modelled and the following scenarios will be presented to the Project Team at the next meeting and later to the Public. | *Info* |
| ▪ Existing conditions - calibrated base model | IBI Group |
| ▪ Future conditions model without Maple Grove Road improvements presenting the potential impacts of traffic growth on roadway and intersection operations. | IBI Group |

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| ▪ Future conditions model based on ICS recommendations with 2036 traffic volumes; and, | IBI Group |
| ▪ Modified Future conditions model based on ICS recommendations and with or without a bypass including intersection modifications based on initial screening of the bypass and the physical impacts on property. | IBI Group |
| **5.4 Network Planning Considerations** | *Info* |
| 5.4.1 Status of Highway 401 Widening and Traffic Impacts | |
| ▪ Need to get updated traffic counts to adjust the models. | RMW (TE) |
| 5.4.2 Future runway expansion at Waterloo Regional Airport | |
| ▪ Airport Area Transportation Study has no official status but was undertaken to identify options in support of the RTMP update and possible impacts on Maple Grove Road | |
| ▪ Future EA will be required to establish best solution for Shantz Station Road and area network improvements. | |
| 5.4.3 Other ongoing studies include the following: | |
| ▪ Highway 124 EA Study | |
| ▪ Go Transit Service to Cambridge | |
| ▪ Development Studies including the Hunt Club Traffic Impact Study | |
| ▪ Future North-South Corridor for community access and connection between the New Highway 7 and Highway 401 | |
| ▪ Ongoing Cambridge East Side Lands study and developments. | |
| **6. Overall Concepts and Preliminary Layout – Presented at this Meeting** | |
| **6.1 Geometric Design Criteria and Roadway Classification** | |
| 6.1.1 Prepared and ready for submission | IBI Group |
| **6.2 Existing Conditions** | *Info* |
| 6.2.1 Underground infrastructure included. | |
| **6.3 Photographic Mosaic** | *Info* |
| 6.3.1 Various site conditions represented. | |
| **6.4 Basic Alternatives** | *Info* |

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| 6.4.1 Overall all signals, all roundabouts and hybrid solutions presented and discussed – evaluations will follow | |
| 6.4.2 Bypass plan and profile presented and discussed – evaluations will follow | |
| 6.4.3 Intersection options at Hespeler Road Maple Grove Road intersection presented and discussed – evaluations will follow | |
| 6.4.4 Ellis Creek Bridge cross section and possible options including widening and or separated pedestrian bridge(s) discussed – evaluations will follow | |
| **6.5 Overall Plan Mosaic with and without aerial base photography** | *Info* |
| **6.6 Base Road Alignment Alternatives – Horizontal and Vertical Alignments** | *Info* |
| 6.6.1 It is generally accepted that Maple Grove Road will be centered on the existing roadway corridor and acknowledged that provisions were made in previous EA study, design and construction to accommodate the future roadway build out. | |
| 6.6.2 Highlighted in the presentation were watercourse crossings and specifically potential impacts at Speedsville Road Intersection (Provincially Significant Wetlands (PSW), Hunsperger Municipal Drain and Property encroachments both existing and possible. | |
| **6.7 By-Pass Sample** | *Info* |
| 6.7.1 A basic by-pass alignment and profile was presented and will be subject to refinement if carried forward for a detailed evaluation. Highlighted were the potential costs, property acquisition, options for crossing of Beaverdale Road (Overpass grade separation, cul-de-sacs on Beaverdale Road, at grade intersection, and roundabout options) and the location of connections with existing transportation facilities. | |
| **6.8 Cross-Sections and Standards** | *Info* |
| 6.8.1 Highlighted were the proposed standard Region design criteria as basis of the typical road cross section. Modified sections will/may be required due to impacts and limitations due to proximity of adjacent features/constraints. | |

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| **6.9 Development Considerations** | *Info* |
| 6.9.1 Development is ongoing along the study corridor, particularly at the east end between Speedsville Road and Hespeler Road. | |
| 6.9.2 Compass Trail and Briardean Road are two newer development roads in the area. | |
| 6.9.3 Briardean will be closed shortly as part of the development conditions and access to the developments will generally be from intersections on Speedsville Road south of Maple Grove Road and Compass Trail at Maple Grove Road. Based on past commitments in the development process. | |
| 6.9.4 The ultimate Compass Trail intersection may be limited to Right-in and Right out from/to Compass Trail and WB left to SB from the east i.e. Left out from Compass Trail will be restricted. | |
| **6.10 Natural Features and Constraints** | *Info* |
| 6.10.1 Several significant natural features are present within the study area:<br>▪ Watercourses:<br>1. Ellis Creek,<br>2. East Creek; and,<br>3. Middle Creek.<br>▪ Wetlands:<br>▪ Ellis Creek Wetland Complex, Speed River Wetland Complex and Maple Grove Road Wetland Complex which are all Provincially Significant Wetlands (PSW).<br>▪ The West Creek Wetland Complex, a non-PSW wetland, is also present (MNRF 2014). Several Significant Woodlands that are designated as Core Environmental Features are present throughout the study area (MNRF 2014, RMOW 2015).<br>▪ A portion of the Speed River Significant Valley, (RMOW 2015), occurs within the study area. North of Maple Grove Road, the study area falls within the natural heritage system governed by the Growth Plan for the Greater Golden Horseshoe (MNRF 2014). | |
| Field studies included the following: | |

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| ▪ Three-season vascular flora inventories (Fall 2018, Spring and Summer 2019);<br>▪ Vegetation community (ELC) mapping (2018 and 2019);<br>▪ Inventory and assessment by Certified Arborists of trees ≥ 10 cm DBH within and immediately adjacent to the study area ROW (2019);<br>▪ Bat cavity tree habitat assessments within and immediately adjacent to the study area ROW (2019);<br>▪ Three breeding bird surveys (2019);<br>▪ Two crepuscular breeding bird surveys (2019);<br>▪ Three anuran call surveys (2019);<br>▪ Aquatic habitat mapping and fish community assessments (Fall 2018); and<br>▪ Examination of Significant Wildlife Habitats and habitats for Species at Risk in the field that were identified as candidate during a desktop screening exercise. | |
| **6.11 Drainage** | |
| ▪ Drainage will be reviewed as a part of the study and will include consideration of storm sewers (existing and proposed) improvements needed, Stormwater Management provisions including Low Impact Development (LID) subject to status of groundwater protection requirements (to be confirmed through contact with Regional Hydrogeologists) and detention (ideally within adjacent developments) | IBI Group |
| **6.12 Utilities** | |
| 6.12.1 Existing and proposed utilities will be investigated in general and confirmed as part of the study. | IBI Group |
| **6.13 Municipal Servicing** | |
| 6.13.1 Region Water Services is to be contacted to confirm their current water main requirements relative to the Maple Grove Road corridor. (Contacts are Kevin Dolishny and John Holowackyj) | IBI Group/RMW |
| 6.13.2 Alex Nichols advised that City of Cambridge sanitary forcemain is being planned for crossing of Maple grove Road in the area of Speedsville Road. Other needs will be investigated and reported back to the Project Team. | City |

| Item Discussed | Action By |
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| **7. Preliminary Cost Estimates** | *Info* |
| **7.1 Preliminary Estimating for Budget Updates (June 2019)** | *Info* |
| 7.1.1 Conceptual Cost Estimates have been completed for Budgeting update/confirmation | |
| 7.1.2 Orders of magnitude – $45M to 70M or more depending on Bypass need. Preliminary estimates include general allowances for Utilities and Property. | |
| **7.2 Conceptual estimate costs have been prepared for the following:**<br>▪ Corridor with all Signalized Intersections<br>▪ Corridor with all Roundabouts<br>▪ Fly-over Options<br>▪ Corridor with new Bypass connection to Hespeler Road<br>▪ Hybrid Options | *Info* |
| **8. Public Process/Study Schedule** | *Info* |
| 8.1.1 The Municipal Engineers Association of Ontario's Class Environmental Assessment study process is being followed under the Schedule "C" requirements. | |
| 8.1.2 The process will include Notice of Study Commencement, two Public Consultation Centres (PCCs) and Notice of Study Completion including mandatory advertised 30-day public review period. | IBI Group/RMW |
| **9. Next Steps – Open Discussion** | |
| **9.1 The next steps were discussed and included in the preceding and following sections. In general, the following are the next steps before the next Project Team Meeting:**<br>▪ Issue official Notice of Study Commencement<br>▪ Prepare Roadway alternatives for evaluation<br>▪ Evaluation of preliminary alignment options<br>▪ Complete background and field studies<br>▪ Prepare for First Public Consultation Centre | IBI Group/RMW |

| Item Discussed | Action By |
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| **10. Other Business** | |
| **10.1 Communications** | |
| 10.1.1 Responsibilities were noted above in relation to ATAC, RMW and City involvement. | |
| ▪ City Interests are to be confirmed through internal reviews at the City and reported back the Project Team. | City (Alex) |
| ▪ ATAC Feedback are to be confirmed through reviews with the committee membership and reported back the Project Team. | ATAC (Matt) |
| ▪ Region staff will review internal communications with their respective Region departments and report back to the Project Team. | RMW (TE/MJ) |
| 10.1.2 Region is investigating the use of On-line tools to enhance the public outreach and participation in the Maple Grove Road Class EA study. Region may use the “Engage” application for this project. | RMW (DZ) |
| 10.1.3 IBI Group will set up a Project Team FTP site for project team information sharing. | IBI Group |
| **10.2 ATAC Interests** | *Info* |
| 10.2.1 Matt Cowan advised of the following general interests/concerns from the committee: | |
| ▪ Provisions for Active Transportation users including pedestrians, cyclists and transit throughout the corridor. Mat mentioned the Netherlands study and will provide a link to the documents for perusal by the Project Team members. | |
| ▪ The committee is particularly interested in the consideration of shared uses for the corridor including dedicated facilities and the treatments at intersections which might include cross-rides and similar protection strategies. | |
| ▪ Also noted were pedestrian and cyclist overpass at busy locations (Maple Grove Road and Hespeler Road) and Ellis Creek (in lieu of existing bridge widening). | |
| ▪ Warrants for pedestrian signals where applicable. | |
| ▪ Compliance with AODA requirements and the Act. | |

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| ▪ Consideration of the possible use of autonomous vehicles, ride sharing, etc. the RTMP provides general statements reading these and future technologies due to their relative uncertainties at the time of study completion. | *Info – TBC* |
| **10.3 Residential Area at Old Maple Grove Road** | |
| ▪ Residents have expressed interests in closure and cul-de-sac at west end of Old Maple Grove Road. City staff will review the City's support and need for a by-law for closure and cul-de-sac on Old Maple Grove Road. | IBI Group/RMW |
| **10.4 Stakeholders and Agency Liaison** | *Info* |
| 10.4.1 The following are stakeholders in the study: | |
| ▪ Property Owners | |
| ▪ Area Businesses | |
| ▪ City of Cambridge | |
| ▪ Utility Agencies | |
| ▪ First Nations – Process - Region's Guiding Policy/Process to be followed. | |
| 10.4.2 Review and Approval Agencies | |
| ▪ GRCA | |
| ▪ Province of Ontario: | |
| Environment, Conservation and Parks | |
| Heritage, Sport, Tourism and Culture Industries | |
| Agriculture, Food and Rural Affairs | |
| Indigenous Affairs | |
| Municipal Affairs and Housing | |
| Natural Resources and Forestry | |
| Transportation | |
| ▪ Federal | |
| Department of Fisheries and Oceans | |
| Canada Coast Guard – Navigable Waterways | |

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| **11. Next Meeting**<br>The next meeting has not been confirmed but will be held in January 2020.<br>Meeting adjourned at 12:05 pm<br>***This meeting summary was prepared by IBI Group at the request of the client and is based on notes recorded by IBI Group at the time of the meeting. If there are any errors, omissions or required additions and/or clarifications please provide them within one week of receipt of the meeting summary.*** | IBI Group/RMW |

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# Minutes

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| **To/Attention** | See distribution below. | **Date** | December 17, 2019 |
| **From** | John Bayley, P.Eng. | **Project No** | 1116954 |

**Subject** **Region of Waterloo**
**Maple Grove Road Improvements and Corridor Study - Class Environmental Assessment Study** – Technical Team Meeting 2
December 17, 2019, 9:30am, IBI Group (Waterloo office), 101-410 Albert Street, Waterloo, ON - Grand Meeting Room

**Present**

**Region of Waterloo**
Delton Zehr, Project Manager, Design and Construction
Frank Kosa, Head, Transportation Capital Projects
Mike Jones, Supervisor, Traffic Engineering
Tabot Eneme, Transportation Planning Engineer

**IBI Group**
John Bayley, IBI Group (PM/Transportation Engineering) - Chair
Arend Lootsma, IBI Group (Municipal Engineering)
Sergei Filippov, IBI Group (Transportation Engineering)
Scott Johnston, IBI Group (Transportation Planning)
Josh Wilson, IBI Group (Transportation Planning)

**CIMA+**
Phil Weber, CIMA Canada Inc. (ICS Consultant)

**Regrets:** NA

**Distribution:** Darryl Spencer, Region of Waterloo
All Present and Regrets

| Item Discussed | Action By |
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| **Meeting commenced at 9:30 am** | |
| **1. Introductions**<br>1.1 All in attendance were introduced. | Info. |
| **2. Purpose of the Meeting –** Review of Traffic study findings and | |

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| design considerations affecting the Maple Grove Road Study | |
| **3. Recap of Project Team Meeting #1**<br>3.1 Project Team Meeting #1 was held at the Region of Waterloo Operations Centre on October 31, 2019<br>3.1.1 The meeting discussions were not reviewed in detail at this meeting and are summarized in the minutes of that meeting. | *Info.* |
| **4. Traffic Analysis and Reporting**<br>4.1 Opportunities and Constraints – Formal statement of need and justification will be developed and confirmed prior to the first PCC.<br>Much of the overall justification comes from past study, updates to the RTMP, and considerations relative to the overall network requirements.<br>4.2 **Model Inputs**<br>4.2.1 The VISSIM models account for very high population and employment growth, with significant development planned in the surrounding areas. It was noted that required timing of certain corridor and intersection improvements will be largely dependent on how quickly this future development occurs.<br>4.2.2 It was suggested that a sensitivity analysis may be appropriate to normalize traffic growth estimates based on historic growth trends. It was also suggested that new traffic counts could be undertaken to ensure previous counts were not affected by construction on Highway 401.<br>**Post meeting note:** Tabot sent a follow-up email stating that upon further review: a) future traffic estimates were in fact developed with consideration of historic growth trends and so a sensitivity analysis is not deemed necessary; and b) existing traffic volumes were only marginally affected by the construction on Highway 401, and so undertaking new counts is not required.<br>4.2.3 The Vissim models were calibrated using current travel time estimates from a field review completed by IBI Group.<br>4.3 **Initial Findings**<br>4.3.1 IBI Group presented the initial findings of the VISSIM analysis, which were discussed on an intersection-by-intersection basis: | *Info.*<br>**See post meeting note**<br>*No action needed*<br>*Info.*<br>*Info.* |

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| • **Vondreau, Boxwood**<br>○ Both intersections operate well signalized or as 2-lane roundabout.<br>○ Traffic signals are recommended for easier truck access.<br>• **Speedsville**<br>○ 2-lane roundabout operates poorly due to high NBL volumes.<br>○ Traffic signals operate satisfactorily if dual NBL lanes are provided.<br>○ 3 x 2-lane roundabout (3 E/W lanes) operates satisfactorily, but requires more property and has a higher cost.<br>• **Briardean**<br>○ To be closed (cul-de-sac), with access to Maple Grove Road provided via Compass Trail.<br>• **Compass**<br>○ Outbound left-turn would require vehicles to cross multiple lanes of high-speed traffic at heavy volumes; prohibiting the left-out is recommended for safety reasons (i.e. LI/RI/RO).<br>○ **Post Meeting Note:** *The development intersection was approved with an all movements access so the final assessment will require further discussion and clarification before reporting to the public.*<br>▪ VISSIM – refinements may be needed as it did not appear WBL traffic was slowing down to make the left turn.<br>○ Even if not constructed immediately, there is still opportunity for future study of a 2-lane roundabout as a potential ultimate design.<br>○ The Hunt Club TIS confirmed that signals are not warranted at Compass Trail. Region will also provide Mattamy Homes TIS. | Tabot/Darryl<br><br>IBI Group |

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| • **Old Maple Grove**<br>○ May be closed (cul-de-sac) subject to City request, a change residents would likely support as there have been concerns over cut-through traffic and speeding.<br>• **Beaverdale**<br>○ 2-lane roundabout operates well in 2036, but moderate congestion anticipated in 2041.<br>○ 3x2-lane roundabout (3 E/W lanes) could be protected for as a potential ultimate design.<br>• **Maple Mills Development**<br>○ Recent development plan includes a new access off Maple Grove between Beaverdale and Hespeler (a second access is also shown but is restricted to emergency services only).<br>○ Several questions yet to be determined, including possible access restrictions (e.g. RI/RO) and pedestrian crossing considerations.<br>○ IBI Group/Region to follow-up on development plans and supporting studies (including TIS if available).<br>• **Hespeler**<br>○ 2 x 3-lane roundabout (three N/S lanes) is shown to operate very poorly in both 2036 and 2041.<br>▪ VISSIM – refinements needed for the EBR bypass lane, to allow for earlier entry and to provide a longer acceleration lane on exit.<br>○ Discussion on need and timing of Hespeler flyover<br>▪ NBL flyover greatly improves operations in 2036 and 2041.<br>○ Bow-tie design was also considered by Region, however one of the main downsides is it is not possible to phase this type of design, so essentially the entire cost is required up-front.<br>4.3.2 Video segments for the VISSIM model outputs were viewed to illustrate the overall operational expectations. | RMW/IBI Group<br><br>IBI Group |

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| **5. Active Transportation** | |
| 5.1 The Region requested that IBI Group consider methods to assess/discuss/present impacts on AT operations and safety. | IBI Group |
| 5.2 The Region emphasized that with multi-lane roundabouts, consideration must be given to ensuring safe pedestrian crossings. | |
| 5.2.1 Could explore opportunities/costs to provide PXO's with flashing beacons at locations with high pedestrian volumes/crossings. Type "C" crossings were noted as a current Region preference on divided multi-lane roads. | M.Jones/IBI Group |
| **6. Public Consultation - PCC #1** | |
| 6.1 Public input is important, and content cannot be presented in such a way that it seems the design has already been determined before PCC #1. | *Info.* |
| 6.2 Goal is to present screening of high-level alternative solutions, for example<br>• Widening vs. other solutions<br>• Roundabouts vs. traffic signals<br>• Discussion of AT facility types | |
| 6.3 Consider whether it makes more sense to present findings at a 'corridor level' (e.g. roundabout corridor vs. signalized corridor vs. hybrid), or to present findings intersection-by-intersection. | IBI Group/RMW |
| 6.3.1 Regardless of general approach, it probably makes the most sense to separate Hespeler & Maple Grove from the rest of the corridor. | |
| 6.4 Region will prepare the Public Information Package with assistance from IBI Group. | RMW/IBI Group |
| **7. Design/Evaluation:** | |
| 7.1 **Vision for the Corridor (YouTube)** | |
| 7.1.1 IBI Group presented a YouTube visualization of the future corridor created using InfraWorks 360 | *Info.* |
| 7.2 **Design Criteria – Region/City** | |
| 7.2.1 IBI Group acknowledged the Design Criteria established for the | |

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| study corridor which have been forwarded to the Region for general concurrence. The Geometric Design criteria are important as they will form the basis for much of the road geometry development and assessment of impacts as a result. | RMW |
| 7.3 **Guidance Documents** – RTMP, ATMP, Cambridge Master Plans, etc. | *Info.* |
| 7.4 Alternative Design Cross Sections (pedestrian and cyclist considerations); | |
| 7.4.1 A base cross section was created to commence the plan development and is premised for the most part on corridor guidelines, past study recommendation and updated to the current Region standard and practises. Multi-use trail is recommended in the ATMP and has been used in the base cross section. | |
| 7.4.2 Other ongoing initiatives including separation of cyclists and pedestrians will also be considered in the cross section evaluations of the study. Where possible, protection for future active transportation needs will be accommodated in the design considerations and assessments. A separated boulevard cycle track will be considered for evaluation. | IBI Group/RMW |
| **8. Evaluation of Solutions and Alternatives** | |
| 8.1 Base evaluation criteria for cross section (core widening) vs. Plan Impacts as well as specific solutions at Hespeler Road intersection will be assessed. | *Info.* |
| 8.2 IBI Group has prepared a draft evaluation matrix as a starting point to confirm the intended evaluation criteria and desired evaluation methodology. | RMW |
| 8.3 A short list of various potential solutions has been prepared by IBI Group and will be presented to the public following Technical Team concurrence along with confirmation of the solutions that are recommended for further consideration. The identified possible solutions are attached to these minutes. | RMW |
| 8.4 The detailed evaluation criteria and general presentation were also discussed and are attached to these minutes. | *Info.* |
| 8.5 Based on the potential magnitude of possible impacts for the intersection and multi-lane widening scenarios, related property | |

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| impacts and associated encroachment on adjacent natural features will be the most significant considerations in the study and evaluation of alternatives. | IBI Group/RMW |
| 8.6 Discussion included the question of whether the Maple Grove Road would qualify as a roundabout corridor base on the numerous intersections affected and their relative spacing and overall function.<br><br>Ira Needles Boulevard and Franklin Boulevard are two similar examples in the Region and not far from the project is the Queen Street - Hespeler Road roundabout which serves the same general cross-section of roadway users that will be affected by the Maple Grove Road improvements. | RMW |
| 8.7 **Corridor Improvement Priorities** | |
| 8.7.1 Aside from the traffic analysis discussed and the overall transportation needs identified in the RTMP and ATMP documents, The Active Transportation Advisory Committee (ATAC) will also be consulted regarding support for the study recommendations. | IBI Group/RMW |
| 8.7.2 The RTMP suggested consideration of the need for a by-pass roadway connection with Hespeler Road to accommodate the high volume of trucks and specifically oriented east-west traffic to-from the south connection with Highway 401. | *Info.* |
| 8.7.3 The analyses undertaken for the intersection of Hespeler Road at Maple Grove Road/Fischer Mills Road suggest that the bypass roadway would not provide a better function than enhancements at the Hespeler Road Intersection as noted above and would function very much like a flyover concept at the Hespeler Road intersection where property is more readily available and where an enhanced free flow right turning provision for the heavy EB to SB movement and trucks can be accommodated. | RMW |
| 8.7.4 It will be important to confirm if a Maple Grove Road - Hespeler Road Intersection bypass would be considered further to protect for property that would be required. Preliminary indication is that the related costs would far outweigh the operational benefit which for the most part the analyses indicate does not seem to be the case. | RMW |

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| 8.7.5 Modification at Old Maple Grove<br>8.7.5.1 The City of Cambridge is being consulted regarding their interest in closing the Old Maple Grove Road connection at Maple Grove Road or implementing a right in/right out intersection operation as a minimum. | RMW/City |
| **9. Active Transportation Needs – Cycling, Pedestrians and Intersection and Mid-block Road Crossings**<br>9.1 This item was discussed at various times during the meeting and is noted herein accordingly. | *Info* |
| **10. Identification of GRT Needs in Corridor**<br>10.1 GRT will be consulted to identify their intended service routes and associated transit provisions within the corridor to allow for their incorporation in the study recommendations. Transit considerations will be included in the evaluation criteria. | IBI Group/RMW |
| **11. Project Estimate Refinements – Staged Costs and Total Costs**<br>11.1 Detailed costs reviews were not discussed but will be undertaken to assess the relative costs of the Roundabout/Fly-over concept vs. the Bowtie Roundabout and related grade separation at Hespeler Road. | *Info.* |
| **12. Updated Schedule for Project Team Meetings: GRAAC, ATAC, RCC etc.**<br>12.1 An updated general schedule is appended to these minutes. | *Info.* |
| **13. Public Consultation: Notice of Commencement, "Engage" Website, PCC's 1 and 2.**<br>13.1 Region is setting up the "Engage" website for Public input and information<br>13.1.1 Draft Notice of Study Commencement has been forwarded to the Region for posting.<br>13.1.2 A preferred design solution will be confirmed at the first PCC and the design alternatives will be evaluated and presented at the second PCC along with confirmation of the preferred design alternative. | RMW<br>RMW<br>IBI Group/RMW |

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| 13.2 Heading | Info |
| **14. Next Steps – Open Discussion**<br>14.1 The next steps were discussed and included in the preceding and following sections.<br>14.2 In general, the following are the next steps before the next Project Team Meeting:<br>▪ Issue official Notice of Study Commencement<br>▪ Prepare Roadway alternatives for evaluation<br>▪ Evaluation of preliminary alignment options<br>▪ Complete background and field studies<br>▪ Prepare for First Public Consultation Centre | Info |
| **15. Other Business**<br>15.1 Street Lighting<br>15.1.1 Mike Jones inquired if centre median lighting was being consider in the preliminary evaluations and it was confirmed that centre roadway light would be considered as well as boulevard lighting option.<br>15.2 PCC #1 Presentation<br>15.2.1 It was agreed that the first PCC presentation will include the following:<br>o Existing conditions<br>o Background studies<br>o Issues and constraints<br>o Possible solutions<br>o Screening of solutions<br>o Possible design options<br>o Typical cross sections and costs<br>o AT options/evaluation of Sections<br>o Potential property impacts | IBI Group/RMW |

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| ○ Study and implementation timeline | |
| **16. Next Meeting**<br>16.1 The next meeting will be a Project Team meeting and will be held in January 2020. Next Technical Team meeting has not been confirmed.<br>**Post Meeting Note:** *Next PT Meeting is being held on Monday, January 27, 2020 starting at 1:00PM*. | Info. |
| **Meeting adjourned at 12:05 pm** | |
| This meeting summary was prepared by IBI Group at the request of the client and is based on notes recorded by IBI Group at the time of the meeting. If there are any errors, omissions or required additions and/or clarifications please provide them within one week of receipt of the meeting summary. | Info |

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# Minutes

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| **To/Attention** | See distribution below | **Date** | March 19, 2021 |
| **From** | John Bayley, P.Eng. | **IBI Project No.** | 117540 |
| | | **Region Project No.** | 07116 |

**Subject** Region of Waterloo
**Maple Grove Road Improvements and Corridor Study - Class Environmental Assessment Study – Project Team Meeting 3**
On-Line (Virtual) Microsoft Teams Meeting
March 19, 2021, 9:00 AM – 12 PM

**Present**

**Region of Waterloo**
Karl Kiefer, Councillor
Justin Armstrong, Senior Engineer, Transportation Expansion
Marcos Kroker, Head, Transportation Expansion
Mike Jones, Supervisor, Traffic Engineering
Darryl Spencer, Senior Engineer, Transportation Planning
Matt Cowan, ATAC Committee Member

**City of Cambridge**
Donna Reid, Councillor
Alex Nichols, Project Engineer, Development Engineering

**IBI Group**
John Bayley, PM/Practice Lead, Transportation Engineering - Chair
Michael McGann, Manager, Transportation Engineering
Patrick Garel, Transportation Engineering
Scott Johnston, Transportation Planning

**Regrets** NA

**Distribution** All Present and Regrets

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| **The following documents were included in the Meeting Agenda Package and are also appended to the Meeting Minutes**<br>• Attachment 1 - Table of (PCC #1) Public Comments and Project Team Responses<br>• Attachment 2 - Table 1 – Evaluation of Widening Alternatives<br>• Attachment 3 - Table 2 – Evaluation of Cross-Section Design Alternatives | |
| **Meeting commenced at 9:00 am** | |
| **1. Recap of Study Purpose**<br>**1.1** Project scope, objectives, and justification were reviewed as follows:<br>1.1.1 To provide suitable corridor capacity for existing and future traffic while accommodating growth in ongoing local area developments and allow for increased traffic associated with growth.<br>1.1.2 To satisfy the Region's goals related to the safe and efficient movement of goods and transportation needs of the community, including active transportation as identified in the Region's Transportation Master Plan (RTMP) and Active Transportation Master Plan (ATMP), including Regional goals related to multi-modal, and active transportation.<br>1.1.3 To plan for future growth and provide necessary roadway improvements to alleviate traffic congestion and peak hour challenges due to high volumes and heavy truck traffic. | |
| **2. Progress To-date of Class EA Study Process**<br>**2.1** An overview of the EA Study process completed since Project Team Meeting #2 (held on January 27, 2019) was provided as follows:<br>2.1.1 Background studies completed:<br>▪ Intersection Control Studies – Updated and Completed – February 2020<br>▪ Vissim Micro-simulation – Completed – February 2020<br>▪ Natural Environment Studies – All field work Completed – Existing Conditions Report Submitted – June 2020 – Presented at PCC#1 | |

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| ▪ Storm Drainage Report – Draft Report - Updated February 2021<br>▪ Evaluation of Design Alternatives – September 2020 – February 2021<br>▪ Noise Impact Assessment – all four widening alignment alternatives – Draft Report – Completed March 2021<br>2.1.2 A question was asked about how COVID-19 has affected this EA. IBI Group provided the following response:<br>▪ This study is looking at the 2041 forecast for traffic volumes, which was projected by a pre-pandemic baseline, and based on growth. Industry standard practice at this time is to continue based on pre-pandemic numbers, as long-term implications of COVID-19 are unknown.<br>▪ Region staff also noted that Public Consultation Centre #1 (PPC #1) was presented virtually on the Region's EngageWR platform, and PCC #2 will follow the same format.<br>2.1.3 IBI Group provided a summary of Public Consultation Centre #1 (PCC #1) as follows:<br>2.1.4 PCC #1 was open for viewing on the Region's EngageWR website from July 27, 2020 through August 31, 2020.<br>2.1.5 Public Advertisements were posted in The Record and Cambridge Times newspapers, as well as on the Region's Website. For residents and businesses within the Study area, direct notification was provided by direct mailing and hand delivery.<br>2.1.6 Understanding that not all residents have access to the EngageWR website, accommodations were stated in the publications/letters indicating that hard copies of all PCC materials could be provided by the Region upon request.<br>2.1.7 PCC #1 is summarized in a formal Public Consultation Summary report document that will be included in the appendices of the Environmental Study Report and will include the following highlights:<br>▪ During the review period for PCC #1, the Study's EngageWR webpage was visited 159 times.<br>▪ Ninety-seven (97) visitors are characterized as 'Aware', as they viewed at least one webpage. Sixty (60) visitors are characterized as 'Informed' as they viewed documents or visited multiple | |

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| webpages. Eight (8) visitors are characterized as 'Engaged', and either participated in the survey or asked a question.<br>▪ In addition to the questions received through the project website, an additional eleven (11) residents provided questions/feedback directly to the Region through either phone or email. In total nineteen (19) comments were received following PCC #1.<br>▪ It was noted that seven (7) of the comments received were submitted by property owners whose property is adjacent to the Maple Grove Road corridor.<br>▪ It was noted that, in general, when members of the public support the project, they typically do not leave a comment. It was felt that this may have attributed to the relatively low number of comments received.<br>2.1.8 The Technical Team requested that all members of the Project Team review the Attachment 1 (Table of (PCC #1) Public Comments and Project Team Responses), and kindly provide any comments to the Technical Team.<br>2.1.9 Prior to PCC #2, a "Local Businesses Contributing Heavy Truck Traffic" Meeting will be scheduled, where the Technical Team will present the Recommended Design Alternative to local businesses contributing heavy truck traffic to the corridor, and answer any questions they may have about the project. The businesses that will be invited to the meeting are those in immediate proximity to the corridor who are known or reasonably expected to contribute heavy truck traffic to the Maple Grove Road corridor. As requested, Councillor Kiefer and Councillor Reid will both be invited to attend the meeting, which will be held on-line via Microsoft Teams or Zoom. | *All Members of Project Team*<br><br>*IBI Group / RMW* |
| **3. Transportation Study Findings**<br>Intersection Control Studies and a Vissim Micro-simulation were both completed in 2020. The results of the analyses provide the following summary of intersection types that are recommended along the Maple Grove Road corridor:<br>- Fountain Street (previously approved by Region Council and not part of the current Class EA project) – Roundabout planned/approved<br>- Vondrau Drive – Traffic Signals Recommended | |

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| - Boxwood Drive – Traffic Signals Recommended<br>- Speedsville Road – Traffic Signals Recommended (Northbound dual left turn lanes required)<br>- Compass Trail - Restricted to Right-in, Right-out and Left-in only. Additional control (e.g. signalized intersection or roundabout) is not warranted at this time<br>- Old Maple Grove Road – Right-in and right out, or cul-de-sac. Roundabout carried forward through ICS<br>- Beaverdale Road - Roundabout recommended<br>- Hespeler Road – Roundabout recommended in previous ICS<br>3.1.1 It was noted that the closure of Old Maple Grove Road by installation of a cul-de-sac is supported by property owners along Old Maple Grove Road, as it would prevent cut-through traffic that is currently experienced. The installation of a cul-de-sac is also supported by City of Cambridge staff, as discussed at, and documented in the meeting minutes, for the Roundabout Coordination Committee (RCC) Meeting held in December 2020. | |
| **4. Evaluation of Alternative Widening Alignments**<br>**4.1** The following alternatives were considered for the widening of Maple Grove Road from 2-lanes to 4-lanes:<br>▪ "Do Nothing" Alternative - Maintain status quo<br>▪ Concept No. 1 - Widening equally about the centreline<br>▪ Concept No. 2 - Widening to the North<br>▪ Concept No. 3 - Widening to the South<br>▪ Concept No. 4 - Modified "Hybrid Widening Concept" to minimize overall impacts<br>**4.2** The "Do Nothing" alternative was included to establish a baseline for each alternative to be compared to. To evaluate each alternative against one another, the following evaluation criteria were considered:<br>▪ Natural Environment;<br>▪ Social Environment;<br>▪ Transportation and Operations; and | |

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| ▪ Cost.<br><br>Quantitative assessments were used to determine greatest and least impact for each alternative. Harvey Ball Visualization was used in the Evaluation Table (Table 1) to illustrate the Least to Most Preferred alternatives for each evaluation criteria. It should be noted that Do Nothing alternative does not address the Project Opportunities, supported by Regional Policies.<br><br>**4.3** Summary of Alternative Widening Alignment Evaluation<br><br>4.3.1 IBI Group reviewed a series of figures, which showed the differences between the widening alternatives.<br><br>4.3.2 IBI Group reviewed Table 1 – Evaluation of Widening Alternatives with the Project Team and summarized as follows:<br><br>▪ Natural Environment – Concepts 1 and 4 were preferred, as they had fewer impacts to existing trees than Concepts 2 and 3, and also had the least potential impact to wildlife habitat.<br><br>▪ Social Environment – All alternatives ranked equally for most Social Environment sub-criteria; however, Concept 4 was most preferred as it would require the least amount of property.<br><br>▪ Transportation and Operations – All alternatives ranked equally for this criterion as they all satisfy the transportation needs of the community, including active transportation as identified in the Region's Transportation Master Plan (RTMP) and Active Transportation Master Plan (ATMP).<br><br>▪ Cost – All alternatives ranked equally in terms of estimated capital cost since widening one way or another did not have a significant impact in overall construction costs.<br><br>▪ Overall, Concept 4 – Modified "Hybrid Widening Concept" to Minimize Overall Impacts, was recommended as the preferred alternative. The main deciding factors were that the Hybrid Concept has the least potential impact to trees and wildlife habitat and would require the least amount of property (i.e. lower Social Environment and Cost impacts).<br><br>▪ It was noted by Regional Staff that the purpose of the Hybrid Alternative was to develop a 'best case scenario', which is a combination of the other alternatives to minimize overall potential impacts on the environment. | |

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| **5. Evaluation of Cross-Section Design Alternatives**<br>**5.1** The following shortlisted cross-section alternatives were evaluated:<br>▪ "Do Nothing" Alternative – Retain roadway cross-section in its current configuration.<br>▪ Alternative A – Widen the Road to 4-Lanes with Raised Centre Median, and 3.0m Multi-Use Path on both sides.<br>▪ Alternative B – Widen the Road to 4-Lanes with Raised Centre Median, 1.8m concrete sidewalks, and 1.7m separated roadside bike lanes with rollover curb.<br>Each of these cross-section alternatives will fit within the proposed corridor width for Maple Grove Road and do not require additional property acquisition when considering the property required for the alignment alternatives evaluated.<br>**5.2** The "Do Nothing" alternative was included to establish a baseline for each alternative to be compared to. To evaluate each alternative in comparison to the others being considered, the following evaluation criteria were considered:<br>▪ Natural Environment;<br>▪ Social Environment;<br>▪ Transportation and Operations; and<br>▪ Cost.<br>Qualitative assessments were used to determine how each alternative rated for each criterion, ranging form 'Poor' to 'Excellent'.<br>**5.3** Summary of Cross-Section Design Alternative Evaluation<br>5.3.1 IBI Group reviewed cross-section illustrations for both Alternative A and Alternative B and identified the differences between the two for the Project Team. It should be noted that the Do Nothing alternative does not address the Project Opportunities, supported by Regional Policies.<br>5.3.2 IBI Group reviewed Table 2 – Evaluation of Cross-Section Design Alternatives with the Project Team and summarized as follows:<br>▪ Natural Environment – Alternative A was rated 'very good', while Alternative B was rated 'good'. The cross-section for Alternative A received a higher rating because it has the least pavement area | |

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| for active transportation requiring less winter maintenance and de-icing effort adjacent to watercourses, as well as greater potential for stormwater management and/or landscaping opportunities.<br>▪ Social Environment – Both Alternatives A and B were rated 'very good', although Alternative A provides the greatest amount of boulevard space available for landscaping/ streetscaping, and snow storage.<br>▪ Transportation – Both Alternatives A and B were rated 'very good', although Alternative A would require the lowest overall transportation operations/maintenance requirements.<br>▪ Cost – Alternative A was rated 'very good', while Alternative B was rated 'good'. Alternative A had the lowest expected capital (i.e. construction) and operating (i.e. maintenance) costs.<br>▪ Overall, Alternative A was carried forward as the preferred cross-section design alternative.<br>**5.4** Discussion on Evaluation of Cross-Section Design Alternatives<br>5.4.1 M. Cowan (ATAC) noted that there are growing concerns of mixing of cyclists/pedestrians on Multi-Use Paths (MUPs). Cyclists must slow down to avoid pedestrians, and serious cyclists would need to ride on the road rather than the MUP.<br>5.4.2 Regional Staff noted that Alternative B (1.8m concrete sidewalks, and 1.7m separated roadside bike lanes with rollover curb) would provide separation between cyclists and pedestrians and was an alternative that was carried forward and evaluated. However, Alternative B was not recommended by the Technical Team due to increased impacts to the natural environment (increased de-icing near watercourses), and also increased infrastructure life-cycle cost including initial capital investment, as well as long-term maintenance (i.e. multiple snow-clearing passes would be required).<br>5.4.3 Regional Staff also noted that Region's Transportation Master Plan (RTMP) identifies different types of cyclists. The 'strong and confident' cyclists are typically avid cyclists who might elect to ride on the roadway in any event. The Multi-Use Path may be more likely to encourage cyclist use going forward, since a separated MUP provides a safer place for families to ride, as opposed to a facility immediately adjacent to traffic. | |

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| 5.4.4 Regional Staff also noted that there is also an opportunity for future study if congestion on the MUP becomes an issue. The 4.25m wide boulevard provides options such as widening the MUP, if congestion is identified as a future concern.<br>5.4.5 Also considered by the Technical Team is the character of the area, the type of adjacent land use and the commercial and industrial nature of the corridor. Other off-road facilities are planned within the adjacent developments ongoing in the area and those facilities are subject to local municipal policy. | |
| **6. Summary of Recommended Intersection Configurations, Widening Alternative and Cross-Section Alternative**<br>The Technical Team Recommendations were summarized by IBI Group as follows:<br>6.1.1 Signalized intersections at Vondrau Drive, Boxwood Drive, and Speedsville Road.<br>6.1.2 Roundabouts at Beaverdale Road and Hespeler Road.<br>6.1.3 Recommended Widening Alternative: Concept 4 – Modified "Hybrid Widening Concept" to minimize overall impacts.<br>6.1.4 Recommended Cross-Section Alternative: Alternative A – Widen the road to 4-lanes with raised centre median, and 3.0m Multi-Use Path on both sides. | |
| **7. Confirmation of Project Team Support for Recommended Widening Design Alternative and Cross-Section Alternative**<br>**7.1** IBI Group asked all members of the Project Team if the Project Team supports Widening Alternative Concept 4 and Cross-Section Alternative A.<br>**7.2** All Project Team members agreed that they are in support of the recommended alternatives and had no objections. | |
| **8. Next Steps in the Study Process**<br>**8.1** IBI Group summarized the next steps in the Study as follows:<br>• Local Businesses Contributing Heavy Truck Traffic Meeting is scheduled for early to mid-April 2021<br>• PCC #2 is currently planned for June 2021 | |

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| • Recommended Design presented to Regional Council, after PCC#2, is currently planned for Fall 2021<br>• Finalize the Environmental Study Report (ESR) is currently planned for the Fall of 2021<br>• Place the ESR on the Public Record for 30-day review is currently planned for late 2021 or early 2022 | |
| Meeting adjourned at 11:45 pm | |
| ***This meeting summary was prepared by IBI Group at the request of the client and is based on notes recorded by IBI Group at the time of the meeting. If there are any errors, omissions, or required additions and/or clarifications, please provide them within one week of receipt of the meeting summary.*** | |

## Public Comments and Project Team Responses - Public Consultation Centre #1

| No. | Themes | Comment | Project Team Response |
|---|---|---|---|
| 1 |  | *Q. What do you like about the Alternative Design Solutions that are being carried forward for the Maple Grove Road corridor and intersection improvements?*<br>Needed to expand # of lands | The Project Team acknowledges these comments and will consider them in developing a Preferred Design Alternative. |
| 2 |  | *Q. What do you like about the Alternative Design Solutions that are being carried forward for the Maple Grove Road corridor and intersection improvements?*<br>Worried about roundabout on Beaverdale/Maple Grove infringing on my property, trees, and privacy<br>*Q. What challenges or considerations do you see with the Alternative Design Solutions that are being carried forward?*<br>No positives and lots of negatives for residences, more traffic, more noise, more pollution - lived in Cambridge all my life and progress is not my favorite word | The Project Team acknowledges these comments and will consider them in developing a Preferred Design Alternative.<br>One of the goals of the planning and design process for this project is to minimize the impact on adjacent properties and the need to acquire private property.<br>In areas where property or temporary access is required, the property owner will be contacted directly by the Region of Waterloo legal services staff. Compensation would be provided at fair market rates based on recent similar area sales.<br>The 2018 Regional Transportation Master Plan (RTMP) Update proposes widening Maple Grove from 2 to 4 lanes between Hespeler Road and Vondrau Drive to accommodate existing and forecast traffic volumes and improve operations. Identifying potential environmental (natural, social, and economic) impacts associated with road widening, and recommending mitigating measures to be included as part of the project, are part of the study process.<br>As part of the study process, a Noise Study, to determine current and forecasted sound levels, will be completed per Regional policy. |

| No. | Themes | Comment | Project Team Response |
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| 3 |  | *Q. What do you like about the Alternative Design Solutions that are being carried forward for the Maple Grove Road corridor and intersection improvements?*<br><br>Like double lanes, transit access, cycle and side walk proposal and making it family friendly given that Maple Grove is becoming a residential area between Speedsville Road and Hespeler Road with new subdivisions springing up with River Mill (aka Mattamy homes) and also at the corner of Hespeler Road and Maple Grove Road. - We like the idea of CUL-DESAC on Old Maple Grove Road as we have cars speeding at 60 to over 100 km/h speeds causing a danger to children, pets, pedestrians, cyclists and students crossing the road for school bus pick up/ drop off. - Please consider street lighting for Old Maple Grove Road and name change by adding ""old"" to Old Maple Grove Road. - Since relocation of underground services would be required and we understand that fiberoptic cables run along Maple Grove road, please consider expanding it to improve internet service on Old Maple Grove Road or allowing Rogers to cable our street. The 13 houses on old Maple Grove share 5 MBP from Bell, and it feels worse than a third world country.<br><br>*Q. What challenges or considerations do you see with the Alternative Design Solutions that are being carried forward?*<br><br>Your plan did not discuss Commercials trucks or HTVs. Having reviewed the AADT #s, we noticed that we have 4% or approximately 800 trucks driving through this predominantly residential area so we are requesting Absolutely "NO HTV" OR COMMERCIAL TRUCKS"" and that these trucks be diverted west side to the 401 towards Sports World Drive, given the recent expansion of Highway 8 / 401 intersection. This would save the region a substantial amount by not having to look at a major change at Maple Grove and Hespeler road junction where a well-planned roundabout would suffice and help slow down the speeds at which vehicles sometimes cross that intersection. Two of our family vehicles were crashed into at that intersection over the last 4 years.<br><br>*Q. What new information should the Project Team consider when reviewing the Alternative Design Solutions?*<br><br>Our property at (REDACTED) backs onto the proposed road improvements of Maple Grove Road. We have the plans that show we could severe off 0.74 acres and offer it for residential development if roadway access to Maple Grove Road is granted. Our adjacent neighbour to the East and across the road on the Northside of Maple Grove have access to Maple Grove Road for residential purposes. we would encourage our neighbour to the east to consider adding residences to his 2 vacant lots. Altogether these 3 vacant lots (ours +his ) is almost 3 acres altogether and can be used for multi-residential purposes. | The Project Team acknowledges these comments and will consider them in developing a Preferred Design Alternative.<br><br>Old Maple Grove Road is a local road, with changes subject to City of Cambridge approval and/or implementation, including implementing a cul-de-sac and infrastructure upgrades (e.g. renaming and/or signage changes). These comments have been forwarded to the City of Cambridge for consideration.<br><br>A Transportation Report will be included in the final study reporting (i.e. Environmental Study Report) for this Schedule C Class EA. Traffic forecasting, including truck traffic, will be included.<br><br>The Region's truck route policy identifies all Regional roads as truck routes, unless the roadway may be incapable of supporting heavy truck traffic due to design and/or condition of the road. Due to employment lands along, and in proximity to, the study corridor, a truck restriction will not be considered as part of this study.<br><br>In areas where property or temporary access is required, the property owner will be contacted directly by the Region of Waterloo legal services staff. Compensation would be provided at fair market rates based on recent similar area sales. |

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| 4 |  Environment  Commercial Vehicles  Other Improvements | *Q. What do you like about the Alternative Design Solutions that are being carried forward for the Maple Grove Road corridor and intersection improvements?*<br>Nothing about this is appealing. The alternate route would be a better solution so that it gets away from the residential areas. Why not consider a ramp from 401 to Speedsville Road.<br>*Q. What challenges or considerations do you see with the Alternative Design Solutions that are being carried forward?*<br>The noise of the trucks going through the residential areas will be ridiculous. Its already totally annoying when the truck use their engine brakes coming up to the intersections.<br>*Q. What new information should the Project Team consider when reviewing the Alternative Design Solutions?*<br>The truck count you have is not realistic. Living along this road (REDACTED) I would say its more like 20% trucks. I formal noise study needs to be conducted along the residential area. During the last assessment we were promised a noise barrier. Why is not mentioned here?" | The Project Team acknowledges these comments and will consider them in developing a Preferred Design Alternative.<br>The 2018 Regional Transportation Master Plan (RTMP) Update proposes widening Maple Grove from 2 to 4 lanes between Hespeler Road and Vondrau Drive to accommodate existing and forecast traffic volumes and improve operations.<br>As part of the study process, a Noise Study, to determine current and forecasted sound levels, will be completed per Regional policy.<br>A Transportation Report will be included in the final study reporting (i.e. Environmental Study Report) for this Schedule C Class EA. Traffic forecasting, including truck traffic, will be included.<br>Truck traffic ratios (%) will be reviewed based on actual count data and forecasting of truck traffic will be based on that ratio. |
| 5 |  Active Trans. Improvement  Intersection Improvements | *Q. What do you like about the Alternative Design Solutions that are being carried forward for the Maple Grove Road corridor and intersection improvements?*<br>Separated bicycle lane and/or multi-user pathway and roundabouts.<br>*Q. What challenges or considerations do you see with the Alternative Design Solutions that are being carried forward?*<br>Interactions between cyclists and motorists at crossings (right-of-way is ill defined). Bike lights may need to be installed so cyclists can ride in intersection rather than walk across per Ontario HTA.<br>*Q. What new information should the Project Team consider when reviewing the Alternative Design Solutions?*<br>Surface of separated bike lanes are often not as good as on-road lanes. Warping is already evident on Fountain St multiuser pathway. Might consider better subsurface for pathway or keep lane on road to utilize road subsurface." | The Project Team acknowledges these comments and will consider them in developing a Preferred Design Alternative.<br>Alternative cross-section designs for the corridor (e.g. active transportation concepts) will be evaluated and presented at a second Public Consultation Centre (PCC 2) planned for Spring/Summer 2021.<br>As part of this study, at signalized intersections with continuous active transportation/cycling facilities, cross-rides (for cyclists) will be considered. |

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| 6 |    | *Q. What do you like about the Alternative Design Solutions that are being carried forward for the Maple Grove Road corridor and intersection improvements?*<br>It is overdue to create this roadway for four lanes of traffic.<br>*Q. What challenges or considerations do you see with the Alternative Design Solutions that are being carried forward?*<br>Widening is not the only matter for consideration in my opinion. The residential development which is currently underway south of the roadway plus the proposed development at the Maple Grove and Highway 24 will bring additional vehicular traffic on top of additional truck traffic related to the future industrial developments.<br>*Q. What new information should the Project Team consider when reviewing the Alternative Design Solutions?*<br>How to integrate traffic flow at the intersections of Speedsville, Briardean and Compass Trail, especially traffic turning into and out of these residential areas Was the recently spent money at Maple Grove and Compass Trial a poor investment of resources considering that much of it will be torn up when the change to four lanes takes place. Would it not have been more prudent to widen the stretch from Briardean east to Old Maple Grove to four lanes now rather than just the left turn lane widening portion at Compass Trail?" | The Project Team acknowledges these comments and will consider them in developing a Preferred Design Alternative.<br>The 2018 Regional Transportation Master Plan (RTMP) Update proposes widening Maple Grove from 2 to 4 lanes between Hespeler Road and Vondrau Drive to accommodate existing and forecast traffic volumes and improve operations.<br>A Transportation Report will be included in the final study reporting (i.e. Environmental Study Report) for this Schedule C Class EA. Traffic forecasting, including truck traffic, will be included.<br>Through the Traffic Impact Study, completed as part of the Hunt Club Subdivision development application process, it was determined that a westbound left turn lane off of Maple Grove Road onto Compass Trail was required and funded entirely by development charges (i.e. not tax base).<br>It is a legislated requirement through the *Environmental Assessment Act*, that a study is required prior to proceeding with road widening: this is that study.<br>A requirement of the EA process is to mitigate potential environmental impacts, including economic. As a result, this study will attempt to mitigate potential throwaway costs through recommended improvements, in the context of overall project life cycle costing. |
| 7 |     | *Q. What do you like about the Alternative Design Solutions that are being carried forward for the Maple Grove Road corridor and intersection improvements?*<br>As much as we would all probably like to keep Maple Grove as it is, I can see that with increased traffic it will become congested. I think it is a good idea to close Old Maple Grove at the end, it does not need to be a through street. Briardean should close as you stated. The most important part is to get a roundabout installed at Maple Grove and Hespeler Road. There are so many accidents at this location, often very bad accidents, there have been a number of deaths. It needs to be a min 2 lane roundabout, so it can move some traffic. This should have a long south merge lane to take south bound Maple Grove Road traffic on to Hespeler Road without using the roundabout. Same with west bound Fishermills from Hespeler Road north (less expensive and almost as good as a fly over)<br>*Q. What challenges or considerations do you see with the Alternative Design Solutions that are being carried forward?* | The Project Team acknowledges these comments and will consider them in developing a Preferred Design Alternative.<br>As local roads, closure of Old Maple Grove Road and Briardean Road are subject to City of Cambridge approval and/or implementation. These comments have been forwarded to the City of Cambridge for consideration.<br>A Transportation Report will be included in the final study reporting (i.e. Environmental Study Report) for this Schedule C Class EA, including traffic forecasting based on existing and planned development.<br>Alternative cross-section designs for the corridor (e.g. active transportation concepts) will be evaluated and presented at a second Public Consultation Centre (PCC 2) planned for Spring/Summer 2021. |

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| | | I don't like the fly over design proposal for the roundabout at Maple Grove Road and Hespeler Road. Its ugly and not in keeping with the surrounding area, plus it is not required if a roundabout is built correctly. I also don't like the right only proposal at Compass trail, that is just a housing estate, it is fine as it is now, at some point it might need lights. I don't think the idea of a west by pass to miss the roundabout at Maple Grove Road and Hespeler Road is a good idea, its probably not required. I think you need to look at the cross traffic flow at the current intersections, for sure Maple Grove Road is busy at certain times, but other than Speedsville Road most of the other intersections are not that busy. Certainly Maple Grove Road and Beaverdale Road is 95% Maple Grove Road traffic, does that warrant a roundabout?<br>*Q. What new information should the Project Team consider when reviewing the Alternative Design Solutions?*<br>Do you know how much traffic the new Amazon warehouse located on Maple Grove Road will add? I think you should look at the possibility of a separate bike / pedestrian path some distance away from the road, this will create a user friendly alternative to traffic on the road. | |
| 8 |  | *General Comment*<br>With the industrial development soon coming behind the Regional Operations Centre on Maple Grove Road plus several significant residential developments around Maple Grove Road, widening of the Roadway will indeed be appropriate.<br>However, the recent roadwork done between Compass Trail and Briardean raises questions to me of its fiscal prudence. All of that work will be wasted when it is dug up to widen all of Maple Grove Road to four lanes.<br>What reasons could there have been to do a half-baked job in that area rather than widening that section to four lanes now?<br>I am interested in participating in discussions as development moves forward. | The Project Team acknowledges these comments and will consider them in developing a Preferred Design Alternative.<br>Through the Traffic Impact Study, completed as part of the Hunt Club Subdivision development application process, it was determined that a westbound left turn lane off of Maple Grove Road onto Compass Trail was required and funded entirely by development charges (i.e. not tax base).<br>It is a legislated requirement through the *Environmental Assessment Act*, that a study is required prior to proceeding with road widening: this is that study.<br>A requirement of the EA process is to mitigate potential environmental impacts, including economic. As a result, this study will attempt to mitigate potential throwaway costs through recommended improvements, in the context of overall project life cycle costing.<br>Please accept this as confirmation that you have been added to the Project Contact List. |
| 9 | | *General Comment*<br>Trouble accessing documents on the EngageWR project site on August 14, 2020 | Resolved August 14, 2020 - software update required by user. |

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| 10 | Property | *General Comment*<br>I am the owner of (REDACTED) I have concerns on how the widening Maple Rd will affect my property as it approaches Beaverdale Rd .The extra lane will be at a higher elevation them my land' I have a row of 50 feet high spruces that may be also affected and I also have a stream for run off water that passes through this property that ends up going into a water drain system that crosses under Maple Grove . | The Project Team acknowledges these comments and will consider them in developing a Preferred Design Alternative.<br><br>One of the goals of the planning and design process for this project is to minimize the impact on adjacent properties and the need to acquire private property.<br><br>In areas where property or temporary access is required, the property owner will be contacted directly by the Region of Waterloo legal services staff. Compensation would be provided at fair market rates based on recent similar area sales.<br><br>Stormwater management will be part of the preliminary design included in this study phase, as well as the subsequent detailed design and construction/implementation phases. |
| 11 | Property | *General Comment*<br>I have read the Maple Grove Road Improvements, class EA PCC No.1 Information Package and see that part of my property may be required for the possible roundabout and road widening at the Maple Grove Beaverdale Rd. intersection as I own the corner property on the north side of Maple Grove. At this time, I am not sure if there any more information to read, drawings available for viewing, I also read that the project team will present the preferred design alternatives and intersection controls at the second Public Consultation Center. Any Updates and clarifications would be gratefully Appreciated | The Project Team acknowledges these comments and will consider them in developing a Preferred Design Alternative.<br><br>In areas where property or temporary access is required, the property owner will be contacted directly by the Region of Waterloo legal services staff. Compensation would be provided at fair market rates based on recent similar area sales.<br><br>Stormwater management will be part of the preliminary design included in this study phase, as well as the subsequent detailed design and construction/implementation phases.<br><br>Alternative cross-section designs for the corridor (e.g. active transportation concepts) will be evaluated and presented at a second Public Consultation Centre (PCC 2) planned for Spring/Summer 2021. |
| 12 | Property<br>Environment | *General Comment*<br>Our home is located (REDACTED). It appears that there will be a roundabout at that corner, we have a large stand of pine trees that hopefully will not come into play leaving our presently private setting exposed to the ongoing traffic. Hopefully the roundabout could be adjusted for us to keep that privacy. We also have 2 (zoned R1) vacant residential building lots behind our home to the west on Maple Grove Road, we have one entrance onto Maple Grove Road which I would assume would continue, we have been paying extreme property taxes on those lots for the last 20 years and would hope to not lose the value on those 2 | The Project Team acknowledges these comments and will consider them in developing a Preferred Design Alternative.<br><br>One of the goals of the planning and design process for this project is to minimize the impact on adjacent properties and the need to acquire private property.<br><br>In areas where property or temporary access is required, the property owner will be contacted directly by the Region of Waterloo legal services staff. |

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| | | properties. We would appreciate any comments that you would have on our properties, and would like to know if we should be doing anything further at this point to protect our interest. | Compensation would be provided at fair market rates based on recent similar area sales. |
| 13 |  Other Improvements  Active Trans. Improvements | *General Comment*<br>Consider future installation of east and west exit only interchange onto 401, now that the Speedsville bridge has been widened. Appears lands available, and will reduce eastbound traffic on Maple Grove Road.<br>just reviewing the plans for the possible proposed bike lanes on Beaverdale Road, in my opinion those lanes would not be necessary as there is limited bike traffic now and should be in the future and I would imagine that the costs to do that would be prohibitive as there are storm sewers and curbs to be moved and possible road widening to some extent to accommodate those lanes. | The Project Team acknowledges these comments and will consider them in developing a Preferred Design Alternative.<br><br>Consideration of additional interchanges on Highway 401 is under the Ministry of Transportation of Ontario jurisdiction and is beyond the ability of this EA to address. Widening of Maple Grove Road was found to be required based on the Region's 2018 Transportation Master Plan (TMP) Update. The Region's TMP has aggressive targets to encourage modal shift from automobiles to other forms of transportation, including transit, cycling, and walking. The Region has invested heavily over the past several years in both transit and active transportation infrastructure; however, widening of Maple Grove Road is still required based on future forecast traffic volumes along this section of roadway to adequately accommodate traffic.<br><br>A Transportation Report will be included in the final study reporting (i.e. Environmental Study Report) for this Schedule C Class EA, including traffic forecasting. |
| 14 |  Cul-De-Sac  Driveway Access  Public Engagement | *General Comment*<br>I own the land at (REDACTED) I just wanted to know if the access to the main Maple Grove Road will be closed of or made a cul-de-sac, as I intend to build one day here<br>(REDACTED) is my neighbor but he can't get involved due to conflict. Let me know. I did register in the engage website as well, thanks | The Project Team acknowledges these comments and will consider them in developing a Preferred Design Alternative.<br><br>Old Maple Grove Road is a local road, with changes subject to City of Cambridge approval and/or implementation, including implementing a cul-de-sac. If a cul-de-sac were implemented on Old Maple Grove Road, access would remain at Beaverdale Road.<br><br>Please accept this as confirmation that you have been added to the Project Contact List. |

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| 15 |  <br>  <br>  <br>  <br>  | *General Comment*<br><br>On behalf of our client Maple Mills (Hespeler) Limited, we have reviewed the information associated with the Online Public Consultation Centre #1 and offer the following comments:<br><br>The Maple Mills lands are identified as future development lands and are draft approved. As you may be aware, there are conditions of draft approval that relate to the design of the intersection of the public road and Maple Grove Road. Through the draft approval process there was significant discussion with the City and Region and study completed on the intersection.<br><br>The preferred option to widen Maple Grove Road to 4 lanes is supported in principle. The preliminary information identifies that no land is required from the Maple Mills property. It is noted that a daylight triangle at Maple Grove Road and Hespeler Road is identified for dedication through the plan of subdivision. From our client's perspective, full support will be based on the design of the intersection of the proposed public road and Maple Grove Road.<br><br>It is unclear how the preliminary designs incorporate the proposed public road from the plan of subdivision to Maple Grove Road. Further discussion needs to occur on the potential for a left-turn lane into the plan of subdivision or a roundabout at the new public road intersection with Maple Grove Road. This discussion will be important as the long-term improvements are proposing a significant change to the intersection of Maple Grove Road and Hespeler Road and for determination of a preferred alternative.<br><br>We would appreciate the background information that has been used to determine any preliminary noise mitigation considerations. We understand a full noise study will be prepared for the preferred option. The subject lands are designated High Density Residential and consideration should be given that residential uses would be permitted to the full extent on the site, subject to zoning setback provisions.<br><br>We request that you add us to the mailing list and that we continue to be notified of any future meetings or reports.<br><br>We would also appreciate the opportunity for discussion on the options as it appears that the options do not fully consider the potential integration of the public road from the proposed subdivision. | The Project Team acknowledges these comments and will consider them in developing a Preferred Design Alternative.<br><br>One of the goals of the planning and design process for this project is to minimize the impact on adjacent properties and the need to acquire private property.<br><br>In areas where property or temporary access is required, the property owner will be contacted directly by the Region of Waterloo legal services staff. Compensation would be provided at fair market rates based on recent similar area sales.<br><br>Refer to Conditions 31 and 32 as part of the June 21, 2019 Decision of Draft Approval of Plan of Subdivision for 30T-16101, 4045 Maple Grove Road (Maple Mills (Hespeler) Ltd.):<br><br>31. a) That Street A access onto Regional Road No. 38 (Maple Grove Road) shall be right-in/right-out access with a centre median on Maple Grove Road, unless the Owner/Developer can demonstrate that a left-in movement can be accommodated to the satisfaction of the Regional Municipality of Waterloo, through a Transportation Impact Study Addendum and a detailed design that also account for any modifications to the west leg of the Regional Road No. 24 (Hespeler Road) and Regional Road No. 38 (Maple Grove Road) signalized intersection.<br><br>b) That prior to final approval, the Owner/Developer obtains a Regional Road Access Permit for Street A access and for the proposed Street B right-in/right-out access onto Regional Road No. 38 (Maple Grove Road).<br><br>32. That prior to final approval, the Owner/Developer enters into a development agreement with the Regional Municipality of Waterloo to complete a Transportation / Stationary Noise Study for Blocks 1 and 2 prior to Site Plan Approval, to the satisfaction of the Regional Municipality of Waterloo, and if necessary, enters into a subsequent agreement to provide for implementation of the approved noise attenuation measures. Further, the development agreement with the Regional Municipality of Waterloo is to include the provision for the inclusion of the following noise warning clause in all offers of purchase and sale and/or rental agreements for all residential units within Blocks 1 and 2:<br><br>"Purchasers/tenants are advised that sound levels due to increasing road traffic on Maple Grove Road (Regional Road No. 38) and Hespeler |

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| | | | Road (Regional Road No. 24) may on occasions interfere with some activities of the dwelling occupants as the sound levels exceed the sound level limits of the Municipality and the Ministry of the Environment, Conservation and Parks. This dwelling unit has been designed with the provision for adding central air conditioning at the occupant's discretion. Installation of central air conditioning by the occupant in low and medium density developments will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the sound level limits of the Municipality and the Ministry of the Environment, Conservation and Parks."<br><br>A Transportation Report will be included in the final study reporting (i.e. Environmental Study Report) for this Schedule C Class EA, including traffic forecasting based on existing and planned development. This is separate and distinct from Draft Plan Condition of Approval 31, which would remain a requirement of the developer as applicable.<br><br>As part of the study process, a Noise Study, to determine current and forecasted sound levels, will be completed per Regional policy (Part B). This is separate and distinct from Draft Plan Condition of Approval 32, which would remain a requirement of the developer per Regional policy (Part A).<br><br>Please accept this as confirmation that you have been added to the Project Contact List. |
| 16 |  | *General Comment*<br><br>We are investigating in the lands identified as 1380 Beaverdale Road which is about 33 acres. We are in the process of undertaking studies for the potential redevelopment for residential uses. Please refer to attached map indicating the location of the property. Secondly, we are reviewing sanitary and water servicing options which would include the extension of these services along Beaverdale Road north to Beaverdale/Maple Grove intersection ,right along Maple Grove to Hespeler Road connecting to services on Fisher Mills Road .<br><br>A few questions that we have related to Municipal Class EA are as follows;<br><br>1. Are the existing and future municipal servicing for the area being investigated as part of the EA? Normally the future servicing would be located in the road right of way of Maple Grove and the two construction works would be undertaken concurrently.<br><br>2. Can you clarify and confirm if the road works are undertaken, with the necessary future municipal service (water and sewer) needs of the area? | The Project Team acknowledges these comments and will consider them in developing a Preferred Design Alternative.<br><br>Servicing studies would be within the City of Cambridge's scope/jurisdiction and are not included under the scope of the Maple Grove Road Schedule C Class Environmental Assessment. These comments have been forwarded to the City of Cambridge for consideration.<br><br>The City of Cambridge would need to advise the Region of Waterloo with respect to municipal (i.e. City) servicing needs to accommodate city development.<br><br>Widening of Hespeler Road is not included in the scope of this study.<br><br>Old Maple Grove Road and Briardean Road are a local roads, with changes subject to City of Cambridge approval and/or implementation, including implementing a cul-de-sac. |

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| | | 3. Are their road widenings required along the Hespeler Road corridor required to accommodate the potential plans? If so, is this contemplated in this EA? What is the worst case scenario in terms of road widening from the options you have outlined?<br>4. I note that on Figure 3B, there is a cul de sac? What is this for?<br>5. I also note that in your project area, you include a large portion of lands fronting onto Beaverdale Road, what is contemplated to be done in the areas as noted in yellow?<br>We would appreciate response to these questions and please keep us posted on future PPC meetings. | Beaverdale Road is a local (i.e. City of Cambridge) road and, as such, only the intersection with Maple Grove Road is included in the scope of this study. It is unclear what figure/s you are referring to – please advise.<br>Please accept this as confirmation that you have been added to the Project Contact List. |
| 17 | Development | *General Comment*<br>Will there be consideration given to the City of Cambridge Official Plan designated future residential areas for the new servicing infrastructure along Maple Grove Road? Specifically, planned low and medium density residential areas are designated along Beaverdale Road and Briardean Road which would outlet north to Maple Grove Road and require capacity in sanitary sewers and watermains.Will the Region be considering stormwater management pond facilities for quantity and quality control of the right-of-way, or will discharge be directly to the creeks? | The Project Team acknowledges these comments and will consider them in developing a Preferred Design Alternative.<br>Servicing studies would be within the City of Cambridge's scope/jurisdiction and are not included under the scope of the Maple Grove Road Schedule C Class Environmental Assessment.<br>The City of Cambridge would need to advise the Region of Waterloo with respect to municipal (i.e. City) servicing needs to accommodate city development.<br>Stormwater management will be considered as part of this study. The SWM study will acknowledge regulatory requirements of the GRCA and requirements of respective sub-watersheds, as applicable. |
| 18 | Public Engagement | *General Comment*<br>Please add to mailing list | Please accept this as confirmation that you have been added to the Project Contact List. |
| 19 | Public Engagement | *General Comment*<br>Please add to mailing list | Please accept this as confirmation that you have been added to the Project Contact List. |

## Table 1 – Evaluation of Widening Alternatives

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| | ***NOTE:*** ALL WIDENING ALTERNATIVES INCLUDE WIDENING MAPLE GROVE ROAD TO FOUR THROUGH TRAFFIC LANES, AS THE PREFERRED SOLUTION OF THE REGION'S TRANSPORTATION MASTER PLAN, WITH CONTINUOUS RAISED MEDIAN AND TURN LANES AT INTERSECTIONS. INTERSECTION TYPES WERE DETERMINED THROUGH THE ASSESSMENT OF TRAFFIC OPERATIONS AND CAPACITY ANAYLYSIS DURING PHASE 2 OF THIS STUDY. CROSS-SECTION DESIGN ALTERNATIVES ARE EVALUATED IN TABLE 2. | | | | |
| **EVALUATION CRITERIA** | **DO NOTHING**<br>**"MAINTAIN STATUS QUO"** | **CONCEPT NO. 1**<br>**WIDENING EQUALLY ABOUT EXISTING CENTRELINE** | **CONCEPT NO. 2**<br>**WIDENING TO THE NORTH** | **CONCEPT NO. 3**<br>**WIDENING TO THE SOUTH** | **CONCEPT NO. 4**<br>**MODIFIED "HYBRID WIDENING CONCEPT" TO MINIMIZE OVERALL IMPACTS** |
| **Description of Alternative** | **This alternative is carried forward for comparative purposes only but is pre-screened out for not satisfying the project Problem/Opportunity Statement, which should be based on the Region's Transportation Master Plan and Active Transportation Master plan preferred solutions. (i.e. widening and active transportation facilities). "Do Nothing" assumes that no changes of any kind are made within the corridor.** | **This alternative includes balanced widening in the existing corridor from Vondrau Drive to Hespeler Road.** | **This alternative includes balanced widening from Vondrau Drive to east of Boxwood Drive, then shifting widening to the north from east of Boxwood Drive (Sta. 4+840) to Beaverdale Road, and a balanced widening from there to Hespeler Road.** | **This alternative includes balanced widening from Vondrau Drive to east of Boxwood Drive, then shifting widening to the south from east of Boxwood Drive (Sta. 4+840) to Beaverdale Road, and a balanced widening from there to Hespeler Road.** | **This alternative includes balanced widening from Vondrau Drive to east of Boxwood Drive, then shifting widening to the north from east of Boxwood Drive (Sta. 4+840) to east of Middle Creek (Sta. 5+840). From Sta. 5+840, the widening is typically balanced, as it is in Option 1, and remains there to termination at Hespeler Road.** |
| **LEGEND:** | **LEAST PREFERRED** ○ ◔ ◑ ◕ ● **MOST PREFERRED** | | | | |
| | **ASSESSMENT DESCRIPTOR** Poor Fair Good Very Good Excellent | | | | |
| | Each alternative presented here includes a centralized crossing of the existing bridge at Ellis Creek Bridge. The Ellis Creek bridge cross-section alternatives are summarized separately. | | | | |
| **Criteria Description** | **1. Natural Environment** | | | | |
| **Aquatic Habitat and Fisheries**<br>How might the alternative affect the aquatic life and habitats contained within the various watercourses crossing Maple Grove Road? | ● No impact on existing watercourses. Culvert widening is not required. | ◑ Culvert widening on both sides (or full replacement) would be required at Middle Creek east of Boxwood Drive, at Speedsville Road on the Hunsperger Drain, at Middle Creek east of Speedsville Road, and at East Creek. 107m of existing culvert extensions | ◑ Culvert widening on the north side (or full replacement) would be required at Middle Creek east of Boxwood Drive, at Speedsville Road on the Hunsperger Drain, at Middle Creek east of Speedsville Road, and at East Creek. 115m of existing culvert extensions | ◔ Culvert widening on the south side (or full replacement) would be required at Middle Creek east of Boxwood Drive, at Speedsville Road on the Hunsperger Drain, at Middle Creek east of Speedsville Road, and at East Creek. 106m of existing culvert extensions | ◕ Culvert widening on the north side of Maple Grove Road at Middle Creek east of Boxwood Drive, at Speedsville Road on the Hunsperger Drain, and at Middle Creek east of Speedsville Road. 111m of existing culvert extensions are anticipated. |

## Table 1 – Evaluation of Widening Alternatives

| | ***NOTE:*** ALL WIDENING ALTERNATIVES INCLUDE WIDENING MAPLE GROVE ROAD TO FOUR THROUGH TRAFFIC LANES, AS THE PREFERRED SOLUTION OF THE REGION'S TRANSPORTATION MASTER PLAN, WITH CONTINUOUS RAISED MEDIAN AND TURN LANES AT INTERSECTIONS. INTERSECTION TYPES WERE DETERMINED THROUGH THE ASSESSMENT OF TRAFFIC OPERATIONS AND CAPACITY ANAYLYSIS DURING PHASE 2 OF THIS STUDY. CROSS-SECTION DESIGN ALTERNATIVES ARE EVALUATED IN TABLE 2. | | | | |
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| **EVALUATION CRITERIA** | **DO NOTHING**<br>**"MAINTAIN STATUS QUO"** | **CONCEPT NO. 1**<br>**WIDENING EQUALLY ABOUT EXISTING CENTRELINE** | **CONCEPT NO. 2**<br>**WIDENING TO THE NORTH** | **CONCEPT NO. 3**<br>**WIDENING TO THE SOUTH** | **CONCEPT NO. 4**<br>**MODIFIED "HYBRID WIDENING CONCEPT" TO MINIMIZE OVERALL IMPACTS** |
| | | are anticipated.<br>This alternative has slightly more impact on aquatic habitat than a widening to the north side.<br>Balanced widening between Boxwood Drive and Middle Creek has greater direct physical impact on the Hunsperger Drain along the south side of Maple Grove Road than Concepts 2 and 4. | are anticipated.<br>This alternative has slightly less overall impact on aquatic habitat than Concepts 1 and 3.<br>North side widening between Boxwood Drive and Speedsville Road has less physical impact on the Hunsperger Drain than Concepts 1 and 3. | are anticipated.<br>South side widening between Boxwood Drive and Middle Creek has greater physical impact on the Hunsperger Drain along the south side of Maple Grove Road than Concepts 1, 2, and 4.<br>This alternative would require full reconstruction of the municipal drain and greater additional property acquisition affecting additional natural resources. | At East Creek the culvert is widened (or replaced) on both sides of the corridor<br>Hybrid widening with widening to north side between Boxwood Drive and Middle Creek has less physical impact on the Hunsperger Drain than Concepts 1, 2, and 3. |
| | ● Culvert/bridge widening is not required. | ◑ Culvert/bridge widening would require approval from GRCA and would require mitigation of impacts to existing habitat at some watercourses. | | | |

## Table 1 – Evaluation of Widening Alternatives

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| **Terrestrial Habitat (Natural)**<br>How might the alternative affect existing vegetation (i.e. trees & woodlots) and bird/animal habitat within the project area? | No impacts on terrestrial habitat are anticipated. | Some fringe impacts to woodland areas and vegetation communities is anticipated. (Area impacted is 3,330m2)<br>Vegetation removal is otherwise limited to cultural woodland or cultural thicket communities and landscape trees.<br>(97 Trees and 1,675m$^2$ of woodland vegetation are impacted)<br>2 Regionally significant Black Walnut trees on the south side of the Hunsperger Drain may be affected by transition grading to re-establish the drain capacity. | Some fringe impacts to woodland areas and vegetation communities is anticipated. (Area impacted is 3,990m2)<br>Widening entirely on the north side would impact additional fringe vegetation not impacted by the equal widening alignment in other areas.<br>(92 Trees and 2,670m$^2$ of woodland vegetation are impacted)<br>There are no species at risk or Regionally significant Black Walnut trees that would be affected by this option. | Some fringe impacts to woodland areas and vegetation communities is anticipated. (Area impacted is 3,590m2)<br>Vegetation removal is otherwise limited to cultural woodland or cultural thicket communities and landscape trees.<br>(105 Trees and 2,560m$^2$ of woodland vegetation are impacted)<br>2 Regionally significant Black Walnut trees on the south side of the Hunsperger Drain would be affected by transition grading to re-establish the drain capacity. | Minor impacts on fringe woodlands are anticipated for all alternatives. (Area impacted is 3,650m2)<br>Vegetation removal is limited to cultural woodland or cultural thicket communities and landscape trees.<br>111 Trees and 2,190m$^2$ of woodland vegetation are impacted.<br>There are no species at risk or Regionally significant Black Walnut trees that would be affected by this option. |
| **Floodplain/Watercourses**<br>What effect might the alternative have on the floodplain of various watercourses? | Existing flow regime is maintained. Deficiencies would continue. | Culvert widening would occur on both sides of Maple Grove Road at 6 locations and 1 additional location on the north side only. A total of 7 culverts are widened.<br>Total length of culvert extensions is 107m.<br>Grading impacts adjacent to the Hunsperger Drain are less than for Concept 3 and greater than impacts for Concepts 2 and 4. The area | Culvert widenings would occur on both sides of Maple Grove Road at 6 locations and 1 additional location on the north side only. A total of 7 culverts are widened.<br>Total length of culvert extensions is 115m.<br>Grading impacts adjacent to the Hunsperger Drain are less than for Concepts 1 and 3. The area affected is 11,100m2. | Culvert widenings would occur on Maple Grove Road at 6 locations on the north side at 6 locations on the south side. A total of 7 culverts are widened.<br>Total length of culvert extensions is 106m.<br>Widening on south side would directly affect the flow capacity of the existing Hunsperger Drain. The area affected is 14,100m2. | Culvert widenings would occur on Maple Grove Road at 7 locations on the north side at 6 locations on the south side. A total of 7 culverts are widened<br>Total length of culvert extensions is 111m.<br>Grading impacts adjacent to the Hunsperger Drain are less than for Concepts 1 and 3 and similar to Concept 2. The area |

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| | | affected is 12,400m2.<br>Floodplain area impacted by transition grading is 51,740m2. | Floodplain area impacted by transition grading is 52,240m2. | Floodplain area impacted by transition grading is 51,670m2.<br>Grading impacts adjacent to the Hunsperger Drain are greater for this alternative than for the other alternatives. | affected is 11,300m2.<br>Floodplain area impacted by transition grading is 52,390m2. |
| Would there be potential impacts on existing surface water resources? | ○ Do Nothing provides no additional benefit in terms of runoff to surface water locations. | ◑ All alternatives include culvert widening and replacements at some locations and would have some impacts on the floodplains at crossing watercourses, which requires GRCA approval.<br>Four (4) significant crossings are impacted at Middle Creek east of Boxwood Drive, on the Hunsperger Drain at Speedsville Road, at Middle Creek east of Speedsville Road, and at East Creek. There is also a high-level bridge crossing at Ellis Creek, which would remain. Culvert upsizing recommendations are noted in the project Drainage and Stormwater Management report. | | | |
| **Wetlands**<br>What potential impacts does the alternative have on any evaluated and unevaluated wetlands within the project area? | ● Existing Provincially Significant Wetland (PSW) is unaffected. | ◕ This alternative has less impact on wetlands than Concepts 2, 3, and 4.<br>Approximately 3,330m$^2$ of PSW is potentially impacted. | ◑ This alternative has more potential for impact to wetlands than Concepts 1 and 3.<br>Approximately 3,990m$^2$ of PSW is potentially impacted. | ◑ This alternative has slightly more potential for impact to wetlands than Concept 1.<br>Approximately 3,600m$^2$ of PSW is potentially impacted. | ◑ This alternative has less impact on wetlands than Concept 2 but greater impact than Concepts 1 and 3.<br>Approximately 3,650m$^2$ of PSW is potentially impacted. |
| Are there potential impacts groundwater resources? | ○ Surface water runoff would continue to be untreated. Status quo is maintained. | ● Hydrogeological impacts are similar for of the widening alternative alignment concepts and can be mitigated. Most of the project area falls within a well-head protection zone, which limits the potential for runoff infiltration as a water quality measure. The opportunity for enhancement of runoff to surface and groundwater sources has been identified in the Drainage and SWM review. Additional quality measures are recommended in the report for implementation as part of the detailed design, and are to be applied to each alignment alternative, where available real estate permits. | | | |
| **Trees (Landscaping)**<br>Are there any potential impacts to existing tree plantings and tree canopy within the study area? | ● No impact on individual private property landscaping. | ◕ Least impact on private property landscaping.<br>97 trees are directly impacted requiring | ◑ More impact on private property landscaping than Concepts 1 & 4.<br>92 trees are directly | ◑ More impact on private property landscaping than Concepts 1 & 4.<br>105 trees are directly | ◕ Least impact on private property landscaping.<br>101 trees are directly impacted requiring |

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| | | removals.<br>1,675m2 of residential vegetation is potentially affected.<br>2 Regionally significant Black Walnut Trees are directly impacted.<br>Trees that need to be removed can be replaced during construction per Region policy. | impacted requiring removals.<br>2,670m2 of residential vegetation potentially affected.<br>Regionally significant Black Walnut Trees are not directly impacted.<br>Trees that need to be removed can be replaced during construction per Region policy. | impacted requiring removals.<br>2,560m2 of residential vegetation is potentially affected.<br>2 Regionally significant Black Walnut Trees are potentially impacted.<br>Trees that need to be removed can be replaced during construction per Region policy. | removals.<br>2,188m2 of residential vegetation is potentially affected.<br>Regionally significant Black Walnut Trees are not directly impacted.<br>Trees that need to be removed can be replaced during construction per Region policy. |
| **Wildlife**<br>What are the potential impacts of the alternative on "Species at Risk/Endangered Species" within the project area? | ● No impact on wildlife resources. | ● There are no identified species at risk within the area impacted by grading for either of the widening alternatives. | | | |
| Potential impact on confirmed habitat of Eastern Meadowlark, Category 2 Habitat which is a federally and provincially listed property (800 Maple Grove Road). | ● No impact on wildlife resources. | ◕ Impact limited to area within existing designated road "right-of-way" at Category 2 Habitat. | ◕ Impact limited to area within existing designated road "right-of-way" at Category 2 Habitat. | ◕ Impact limited to area within existing designated road "right-of-way" at Category 2 Habitat. | ◕ Impact limited to area within existing designated road "right-of-way" at Category 2 Habitat. |
| Potential impact on confirmed Rare Wildlife Species habitat (Eastern Wood Peewee) at both sides of Middle Creek east of Speedsville Road. | ● No impact on wildlife resources. | ◕ Least potential impact on wildlife habitat. | ◑ 2nd least potential impact on wildlife habitat. | ◑ 2nd least potential impact on wildlife habitat. | ◕ Least potential impact on wildlife habitat. |

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| **Property Contamination**<br>Are there any known or potentially contaminated sites that require further investigation, and how would they affect any improvements? | ● There are no identified sources of contamination noted in the geotechnical investigations or municipal records besides impacts from roadway de-icing practices. Additional ESA Investigation may be required during the detailed design phase of the project in advance of any property takings. | | | | |
| **Stormwater Management**<br>Is stormwater management required? | ● No SWM facilities are required. | ◑ A combination of stormwater management elements is recommended in the Drainage and Stormwater Management report to accommodate increased flows for all alternatives, due to changes in impervious area. | | | |
| Is additional property required for stormwater management facilities? | ● No property is required for SWM facilities. | ◑ A total of 0.10 ha. of private property is expected to be required for SWM facilities. | ◑ A total of 0.10 ha. of private property is expected to be required for SWM facilities. | ◑ A total of 0.10 ha. of private property is expected to be required for SWM facilities. | ◑ A total of 0.10 ha. of private property is expected to be required for SWM facilities. |
| Would there be improvement to water quality for roadway runoff? | ○ Surface water runoff would continue to be untreated. Status quo is maintained. | ● Opportunity for enhancement of existing runoff quality is presented in all alternatives except "Do Nothing". | | | |
| **Overall Natural Environment Ranking** | ***Does not address Problem/Opportunity Statement*** |  |  |  |  |

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| **Criteria Description** | **2. Social Environment** | | | | |
| **Property Impacts**<br>• How does the alternative impact properties along the corridor? | ○ No direct property impact. Access challenges would continue to increase as area traffic volumes and delay increase. | ○ Widening brings traffic closer to buildings and residences, noise levels would increase and as a result may require mitigation or additional property buyouts where resident concers cannot be mitigated. | ○ Widening brings traffic closer to buildings and residences, noise levels would increase and as a result may require mitigation or additional property buyouts where resident concers cannot be mitigated. | ○ Widening brings traffic closer to buildings and residences, noise levels would increase and as a result may require mitigation or additional property buyouts where resident concers cannot be mitigated. | ○ Widening brings traffic closer to buildings and residences, noise levels would increase and as a result may require mitigation or additional property buyouts where resident concers cannot be mitigated. |
| How much property would be required? | ● No additional property is required for this alternative. | ◔ Portions of 23 Private Properties would need to be purchased.<br>2 properties may require a complete buyout.<br>Including potential buyouts, the total of potentially impacted property is 2.49 ha. 1.95 ha. may be required to accommodate the works, including 0.1 ha. for SWM ponds, enhanced swales, and culvert extensions. | ◑ Portions of 24 Private Properties would need to be purchased.<br>2 properties may require a complete buyout.<br>Including potential buyouts, the total of potentially impacted property is 2.39 ha. 1.85 ha. may be required to accommodate the works, including 0.1 ha. for SWM ponds, enhanced swales, and culvert extensions. | ○ Portions of 29 Private Properties would need to be purchased.<br>2 properties may require a complete buyout.<br>Including potential buyouts, the total of potentially impacted property is 2.76 ha. 2.21 ha. may be required to accommodate the works, including 0.1 ha. for SWM ponds, enhanced swales, and culvert extensions. | ◕ Portions of 23 Private Properties would need to be purchased.<br>2 properties may require a complete buyout.<br>Including potential buyouts, the total of potentially impacted property is 2.38 ha. 1.84 ha may be required to accommodate the works, including 0.1 ha. for SWM ponds, enhanced swales,and culvert extensions. |
| **Noise Impact**<br>What effect might the alternative have on noise levels within the study area? | ○ Traffic congestion and delay would extend the duration of noise impacts as traffic volumes increase. | ○ Per Regional Policy, approximately 860m total of noise attenuation is expected at the following locations: Along the rear lot | ○ Per Regional Policy, approximately 860m total of noise attenuation is expected at the following locations: Along the rear lot | ○ Per Regional Policy, approximately 860m total of noise attenuation is expected at the following locations: Along the rear lot | ○ Per Regional Policy, approximately 860m total of noise attenuation is expected at the following locations: Along the rear lot |

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| | | of properties fronting on Old Maple Grove Road, at the Beaverdale Road intersection on the northeast, northwest and southeast corners, and on the north side of Maple Grove Road at west side of Ellis Creek.<br>125m length of noise barrier is also required east side on the north leg of Hespeler Road at Maple Grove Road.<br>Additional Noise mitigation measures are not required according to Regional policy. | of properties fronting on Old Maple Grove Road, at the Beaverdale Road intersection on the northeast, northwest and southeast corners, and on the north side of Maple Grove Road at west side of Ellis Creek.<br>125m length of noise barrier is also required east side on the north leg of Hespeler Road at Maple Grove Road.<br>Additional Noise mitigation measures are not required according to Regional policy. | of properties fronting on Old Maple Grove Road, at the Beaverdale Road intersection on the northeast, northwest and southeast corners, and on the north side of Maple Grove Road at west side of Ellis Creek.<br>125m length of noise barrier is also required east side on the north leg of Hespeler Road at Maple Grove Road.<br>Additional Noise mitigation measures are not required according to Regional policy. | of properties fronting on Old Maple Grove Road, at the Beaverdale Road intersection on the northeast, northwest and southeast corners, and on the north side of Maple Grove Road at west side of Ellis Creek.<br>125m length of noise barrier is also required east side on the north leg of Hespeler Road at Maple Grove Road.<br>Additional Noise mitigation measures are not required according to Regional policy. |
| **Archaeological Impacts**<br>What impact might the alternative have on areas of Archaeological Potential? | ● No encroachment on areas of Archaeological Potential. | ◑ Areas of previously undisturbed right of way or grading encroachment beyond right of way limits must be test pitted or pedestrian surveyed to investigate for archaeological artifacts per Stage 1 Archaeological Assessment (ASI, 2019). | ◑ Areas of previously undisturbed right of way or grading encroachment beyond right of way limits must be test pitted or pedestrian surveyed to investigate for archaeological artifacts per Stage 1 Archaeological Assessment (ASI, 2019). | ◑ Areas of previously undisturbed right of way or grading encroachment beyond right of way limits must be test pitted or pedestrian surveyed to investigate for archaeological artifacts per Stage 1 Archaeological Assessment (ASI, 2019). | ◑ Areas of previously undisturbed right of way or grading encroachment beyond right of way limits must be test pitted or pedestrian surveyed to investigate for archaeological artifacts per Stage 1 Archaeological Assessment (ASI, 2019). |

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| **Cultural Heritage Impacts**<br>What impact might the alternative have on Built Heritage Resources and Features, and Cultural Heritage Landscapes (incl. Wanner House site (AiHc-193), which is within the Study Area)? | ● No encroachment on Wanner House site (AiHc-193). | ◑ 2nd most potential encroachment on potential Archaeological resources associated with the Wanner Homestead property (1900 Maple Grove Road) on the north side east of Middle Creek, per Cultural Heritage Asessment Report (ASI, 2019). | ◔ Most potential encroachment on potential Archaeological resources associated with the Wanner Homestead property (1900 Maple Grove Road) on the north side east of Middle Creek, per Cultural Heritage Asessment Report (ASI, 2019). | ◕ Least potential encroachment on potential Archaeological resources associated with the Wanner Homestead property (1900 Maple Grove Road) on the north side east of Middle Creek, per Cultural Heritage Asessment Report (ASI, 2019). | ◑ 2nd most potential encroachment on potential Archaeological resources associated with the Wanner Homestead property (1900 Maple Grove Road) on the north side east of Middle Creek, per Cultural Heritage Asessment Report (ASI, 2019). |
| Are there any other potential impacts on Built Heritage Resources in the study area? | ● No encroachment on Built Heritage Resources. | ◑ Lands associated with Built Heritage Resources 4, 7, and 11 may be impacted by all alternatives. | ◑ Lands associated with Built Heritage Resources 4, 7, and 11 may be impacted by all alternatives. | ◑ Lands associated with Built Heritage Resources 4, 7, and 11 may be impacted by all alternatives. | ◑ Lands associated with Built Heritage Resources 4, 7, and 11 may be impacted by all alternatives. |
| **Recreational**<br>Are there any recreational institutions with the project area that may be potentially affected by this alternative? | ● No encroachment on Recreational resources. | ◕ The Maple Grove Dog Park is within the study area and would be in the construction zone, but access can be maintained during construction. No other recreational impacts are anticipated. | | | |

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| **Business Impacts**<br>How might the alternative affect existing businesses, and how might the businesses be affected during construction? May businesses be affected by a particular alternative? | ○ Continuing congestion and delay would result in increased operational costs for area businesses. | ● Region Contract standards include maintaining two-way traffic and access to properties at all times during construction. If short-term closure is required, advanced notice would be provided and coordination with the property owner will occur, if required. All alternative concepts improve traffic flow and capacity, and reduce overall delay, supporting efficient access to and from busineses. Business exposure is enhanced through improved traffic flow and ease of access as a result of reduced delay. | | | |
| **Construction Impacts**<br>Is it constructible and how long might construction take? | ● No construction related impacts. | ◑ Construction would be phased over several years and the work in each phase would be staged to minimize traffic delay and maximize construction progress and efficiency. Three construction seasons are anticipated and would be investigated further during the detailed design phase of the project. | | | |
| **Streetscaping**<br>Could the alternative incorporate streetscaping features to maintain and enhance the character of the community? | ○ Do Nothing Alternative excludes changes of any kind. | ● Opportunities for enhanced streetscaping exist within all widening concepts. | | | |
| **Air Quality**<br>What effect might the alternative have on air quality within the study area? | ○ Traffic volume increases and traffic delay would continue to diminish air quality. | ● A reduction in overall traffic delay and related vehicle idling would result in reduced exhaust air emissions and, as a result, should provide improved overall Air quality. | | | |
| **Overall Social Ranking** | ***Does not address Problem/Opportunity Statement*** | ◑ | ◑ | ◑ | ◕ |

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| **Criteria Description** | **3. Transportation** | | | | |
| **Existing Traffic**<br>How does the alternative serve the current volume of vehicular, pedestrian, and cycling traffic? | ○ The existing Maple Grove Road configuration does not satisfy the requirements for existing and forecasted traffic volumes. Congestion and vehicle collisions indicate a need for improvements in the corridor. Active Transportation facilities are not fully supported by the current roadway. | ● A widened Maple Grove Road including active transportation facilities on both sides would serve the current vehicle, pedestrian, and cycling needs and satisfy the Active Transportation requirements. Agrees with Region of Waterloo Active Transportation Master Plan (ATMP). | | | |
| How might existing transit service be affected? | ○ Existing roadway capacity creates delay to transit service. | ● Additional through traffic lane capacity, as well as potential bus stop enhancements may promote greater transit service efficiency within and through the corridor. | | | |
| **Forecasted Traffic/ Transportation Network**<br>Would the alternative efficiently and safely handle the forecasted traffic? | ○ Existing through lanes with turn lanes at intersections would not handle forecasted traffic volumes to 2036 and 2041. | ● Four (4) through traffic lanes, two in each direction, plus turn lanes at intersections would accommodate forecasted traffic volumes to 2036 and 2041. | | | |

## Table 1 – Evaluation of Widening Alternatives

| | ***NOTE:*** ALL WIDENING ALTERNATIVES INCLUDE WIDENING MAPLE GROVE ROAD TO FOUR THROUGH TRAFFIC LANES, AS THE PREFERRED SOLUTION OF THE REGION'S TRANSPORTATION MASTER PLAN, WITH CONTINUOUS RAISED MEDIAN AND TURN LANES AT INTERSECTIONS. INTERSECTION TYPES WERE DETERMINED THROUGH THE ASSESSMENT OF TRAFFIC OPERATIONS AND CAPACITY ANAYLYSIS DURING PHASE 2 OF THIS STUDY. CROSS-SECTION DESIGN ALTERNATIVES ARE EVALUATED IN TABLE 2. | | | | |
|---|---|---|---|---|---|
| **EVALUATION CRITERIA** | **DO NOTHING**<br>**"MAINTAIN STATUS QUO"** | **CONCEPT NO. 1**<br>**WIDENING EQUALLY ABOUT EXISTING CENTRELINE** | **CONCEPT NO. 2**<br>**WIDENING TO THE NORTH** | **CONCEPT NO. 3**<br>**WIDENING TO THE SOUTH** | **CONCEPT NO. 4**<br>**MODIFIED "HYBRID WIDENING CONCEPT" TO MINIMIZE OVERALL IMPACTS** |
| **Traffic Operations**<br>Would the alternative address the identified traffic operational issues along the corridor or at specific locations? | ○ The existing roadway configuration does not address the identified concerns regarding capacity, delays, intersection operation, or collision history. | ● High volume intersection turning movements have been associated with delay and vehicle collisions. Concerns have been expressed directly from the public in feedback from Public Consultation Centre #1 regarding overall vehicle operating speeds, the high volume of trucks, and the number of collisions at the Maple Grove Road and Hespeler Road Intersection.<br>Proposed work to enhance traffic operations for all alternatives includes:<br>• Minor vertical profile improvements proposed to address adjacent grading and widening requirements to suit existing topography and maintain proper cover over critical infrastructure in the corridor meet roadway design speed requirements;<br>• Widening and reconstruction of roadway to address pavement condition and capacity requirement; and,<br>• Provision of upgraded roadside barriers, where culvert and bridge structures are present and adjacent grading dictates.<br>2036 and 2041 traffic volume predictions support consideration of low speed channelized turn lanes for high volume right turn movements at intersections, especially at Hespeler Road and Maple Grove Road. | | | |
| **Access Management**<br>What effect might the alternative have on traffic access to properties fronting on Maple Grove Road? | ○ The existing roadway configuration maintains all movement access at various access points, but congestion delay and collision frequency are expected to increase as the area is further developed and traffic volumes increase. | ● All existing accesses maintained as right-in and right-out with some left turn exceptions subject to planning approvals. Major signalized intersections would permit all movements and Roundabouts at Beaverdale Road and Hespeler Road would also provide for all movements. | | | |

## Table 1 – Evaluation of Widening Alternatives

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|---|---|---|---|---|---|
| | ***NOTE:*** ALL WIDENING ALTERNATIVES INCLUDE WIDENING MAPLE GROVE ROAD TO FOUR THROUGH TRAFFIC LANES, AS THE PREFERRED SOLUTION OF THE REGION'S TRANSPORTATION MASTER PLAN, WITH CONTINUOUS RAISED MEDIAN AND TURN LANES AT INTERSECTIONS. INTERSECTION TYPES WERE DETERMINED THROUGH THE ASSESSMENT OF TRAFFIC OPERATIONS AND CAPACITY ANAYLYSIS DURING PHASE 2 OF THIS STUDY. CROSS-SECTION DESIGN ALTERNATIVES ARE EVALUATED IN TABLE 2. | | | | |
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| **Transportation Demand Management**<br>**Transit**<br>How would the alternative serve future transit needs? | ○ The existing roadway configuration allows for transit operation, but ongoing congestion and delay directly affects transit service schedules and the convenience of transit use. | ● Proposed transit volumes incorporated into traffic forecasts. Proposed transit stops can be incorporated into design. | | | |
| **Cycling**<br>How would the alternative serve future cycling needs? | ○ This alternative excludes additional cycling provisions. | ● Continuous AODA-compliant active transportation facilities on both sides can be accommodated by all concepts, except the "Do Nothing" alternative. | | | |
| **Pedestrians**<br>How would the alternative serve future pedestrian traffic needs? | ○ This alternative excludes any change to pedestrian facilities. | ● Continuous AODA-compliant active transportation facilities on both sides can be accommodated by all concepts, except the "Do Nothing" alternative. | | | |
| **Emergency Services**<br>How would the alternative impact Emergency Service Response times? | ○ The existing roadway configuration would impact response times due to existing and forecasted congestion and delay. | ● Emergency response times are expected to improve due to overall reductions in delay and congestion because of improved traffic flow and capacity. | | | |
| **Overall Transportation Ranking** | ***Does not address Problem/Opportunity Statement*** | ● | ● | ● | ● |

## Table 1 – Evaluation of Widening Alternatives

| | | | | | |
|---|---|---|---|---|---|
| | ***NOTE:*** ALL WIDENING ALTERNATIVES INCLUDE WIDENING MAPLE GROVE ROAD TO FOUR THROUGH TRAFFIC LANES, AS THE PREFERRED SOLUTION OF THE REGION'S TRANSPORTATION MASTER PLAN, WITH CONTINUOUS RAISED MEDIAN AND TURN LANES AT INTERSECTIONS. INTERSECTION TYPES WERE DETERMINED THROUGH THE ASSESSMENT OF TRAFFIC OPERATIONS AND CAPACITY ANAYLYSIS DURING PHASE 2 OF THIS STUDY. CROSS-SECTION DESIGN ALTERNATIVES ARE EVALUATED IN TABLE 2. | | | | |
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| **Criteria Description** | **4. Costs** | | | | |
| **Utility Impacts**<br>What might be the extent of impacts on existing utilities that must be relocated and/or protected to construct the alternative? | ● Existing Utilities are unaffected by the "Do Nothing" Alternative. | ◕ Existing Hydro/Traffic Signal and Telecommunication poles would be affected:<br>• **47 Hydro poles** would have to be relocated under this alternative at approx. cost of **$940,000.00.**<br>• **26 Traffic Signal poles** would have to be relocated under this alternative at approx. cost of $**780,000.00.**<br>• **8 Street Light poles** would have to be relocated under this alternative at approx. cost of **$120,000.00**.<br>**Sub-Total Cost $1.84M** | ◑ Existing Hydro/Traffic Signal and Telecommunication poles would be affected:<br>• **61 Hydro poles** would have to be relocated under this alternative at approx. cost of **$1,220,000.00.**<br>• **26 Traffic Signal poles** would have to be relocated under this alternative at approx. cost of **$780,000.00.**<br>• **10 Street Light poles** would have to be relocated under this alternative at approx. cost of **$150,000.00**.<br>**Sub-Total Cost $2.15M** | ◑ Existing Hydro/Traffic Signal and Telecommunication poles would be affected:<br>• **60 Hydro poles** would have to be relocated under this alternative at approx. cost of **$1,200,000.00.**<br>• **26 Traffic Signal poles** would have to be relocated under this alternative at approx. cost of **$780,000.00.**<br>• **17 Street Light poles** would have to be relocated under this alternative at approx. cost of **$255,000.00**.<br>**Sub-Total Cost $2.23M** | ◕ Existing Hydro/Traffic Signal and Telecommunication poles would be affected:<br>• **46 Hydro poles** would have to be relocated under this alternative at approx. cost of **$920,000.00.**<br>• **26 Traffic Signal poles** would have to be relocated under this alternative at approx. cost of **$780,000.00.**<br>• **10 Street Light poles** would have to be relocated under this alternative at approx. cost of **$150,000.00**.<br>**Sub-Total Cost $1.85M** |
| What are the potential impacts to existing underground utilities such as sanitary sewers, watemains, telecommunications cables and gas facilities? | ● Existing Utilities are unaffected by the "Do Nothing" Alternative. | ◑ No significant impacts to existing underground gas lines, watermains, sewers, or communications cables, anticipated other than minor relocations, adjustments to maintenance holes, etc. | | | |

## Table 1 – Evaluation of Widening Alternatives

| | ***NOTE:*** ALL WIDENING ALTERNATIVES INCLUDE WIDENING MAPLE GROVE ROAD TO FOUR THROUGH TRAFFIC LANES, AS THE PREFERRED SOLUTION OF THE REGION'S TRANSPORTATION MASTER PLAN, WITH CONTINUOUS RAISED MEDIAN AND TURN LANES AT INTERSECTIONS. INTERSECTION TYPES WERE DETERMINED THROUGH THE ASSESSMENT OF TRAFFIC OPERATIONS AND CAPACITY ANAYLYSIS DURING PHASE 2 OF THIS STUDY. CROSS-SECTION DESIGN ALTERNATIVES ARE EVALUATED IN TABLE 2. | | | | |
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| **EVALUATION CRITERIA** | **DO NOTHING**<br>**"MAINTAIN STATUS QUO"** | **CONCEPT NO. 1**<br>**WIDENING EQUALLY ABOUT EXISTING CENTRELINE** | **CONCEPT NO. 2**<br>**WIDENING TO THE NORTH** | **CONCEPT NO. 3**<br>**WIDENING TO THE SOUTH** | **CONCEPT NO. 4**<br>**MODIFIED "HYBRID WIDENING CONCEPT" TO MINIMIZE OVERALL IMPACTS** |
| **Capital Cost**<br>What is the estimated initial capital cost of the alternative (including utility relocations and property acquisition/ decommissioning)? | ● "Do Nothing" alternative has no Capital Cost. | ◑ Preliminary Cost Estimate including the following:<br>• Property Acquisition<br>• Road and Drainage Works<br>• Signals/Illumination<br>• Roadside Protection and Line Markings<br>• Bridges & Culvert Extensions and Replacement<br>• Active transportation facilities and Landscaping<br>• Engineering<br>TOTAL (Excl. HST) = **$52.7M** (Including Utility Impacts) | ◑ Preliminary Cost Estimate including the following:<br>• Property Acquisition<br>• Road and Drainage Works<br>• Signals/Illumination<br>• Roadside Protection and Line Markings<br>• Bridges & Culvert Extensions and Replacement<br>• Active transportation facilities and Landscaping<br>• Engineering<br>TOTAL (Excl. HST) = **$52.6M** (Including Utility Impacts) | ◑ Preliminary Cost Estimate including the following:<br>• Property Acquisition<br>• Road and Drainage Works<br>• Signals/Illumination<br>• Roadside Protection and Line Markings<br>• Bridges & Culvert Extensions and Replacement<br>• Active transportation facilities and Landscaping<br>• Engineering<br>TOTAL (Excl. HST) = **$53.7M** (Including Utility Impacts) | ◑ Preliminary Cost Estimate including the following:<br>• Property Acquisition<br>• Road and Drainage Works<br>• Signals/Illumination<br>• Roadside Protection and Line Markings<br>• Bridges & Culvert Extensions and Replacement<br>• Active transportation facilities and Landscaping<br>• Engineering<br>TOTAL (Excl. HST) = **$52.2M** (Including Utility Impacts) |
| **Cost Ranking** | ***Does not address Problem/Opportunity Statement*** | ◑ | ◑ | ◑ | ◑ |
| **Overall Final Ranking** | ***Does not address Problem/Opportunity Statement*** | Good - Very Good | Good - Very Good | Good – Very Good | Very Good |

| Table 1 – Evaluation of Widening Alternatives | | | | | |
|---|---|---|---|---|---|
| | ***NOTE:*** ALL WIDENING ALTERNATIVES INCLUDE WIDENING MAPLE GROVE ROAD TO FOUR THROUGH TRAFFIC LANES, AS THE PREFERRED SOLUTION OF THE REGION'S TRANSPORTATION MASTER PLAN, WITH CONTINUOUS RAISED MEDIAN AND TURN LANES AT INTERSECTIONS. INTERSECTION TYPES WERE DETERMINED THROUGH THE ASSESSMENT OF TRAFFIC OPERATIONS AND CAPACITY ANAYLYSIS DURING PHASE 2 OF THIS STUDY. CROSS-SECTION DESIGN ALTERNATIVES ARE EVALUATED IN TABLE 2. | | | | |
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| **Carried Forward** | ✗<br>**Not Carried Forward**<br>***Required as part of the Municipal Class Environmental Asessment, but does not address the Problem/Opportunity statement.*** | ✗<br>**Not Carried Forward**<br>***This alternative widening concept does not address the Municipal Class Environmental Assessment's intent to minimize environmental impacts.*** | ✗<br>**Not Carried Forward**<br>***This alternative widening concept does not address the Municipal Class Environmental Assessment's intent to minimize environmental impacts.*** | ✗<br>**Not Carried Forward**<br>***This alternative widening concept does not address the Municipal Class Environmental Assessment's intent to minimize environmental impacts.*** | ✓<br>***Carried forward as preferred alternative widening concept as this alternative addresses the Municipal Class Environmetal Assessment's intent to minimize environmental impacts.*** |

| Table 2 – Evaluation of Cross-Section Design Alternatives | | | |
|---|---|---|---|
| **EVALUATION CRITERIA** | **"Do Nothing" ALTERNATIVE**<br>**Retain Roadway Cross-Section in its Current Configuration** | **ALTERNATIVE A**<br>**Widen the Road to 4-Lanes with Raised Centre Median, and 3.0m Multi-Use Path on both sides** | **ALTERNATIVE B**<br>**Widen the Road to 4-Lanes with Raised Centre Median, 1.8m concrete sidewalks, and 1.7m separated roadside bike lanes with rollover curb** |
| **Description of Alternative** | | • 5.0m raised median with concrete barrier curbs and narrow gutter;<br>• 0.6m curb and gutter, and a storm drainage system;<br>• 3.0m asphalt multi-use path; and,<br>• Additional street lighting. | • 5.0m raised median with concrete barrier curbs and narrow gutter;<br>• 0.6m curb and gutter, and a storm drainage system;<br>• 1.8m concrete sidewalks;<br>• 1.7m separated roadside bike lanes with rollover curb; and,<br>• Additional street lighting. |
| **Natural Environment**<br>How might the alternative affect existing trees, vegetation, wildlife, watercourses, etc.? | ➢ No changes to existing conditions.<br>➢ No removal of existing trees required.<br>➢ No widening of pavement; therefore, less roadway width for terrestrial wildlife crossing.<br>➢ Roadside ditches remain, providing infiltration of stormwater.<br>➢ Maintaining existing road capacity will lead to additional delay and queuing. | ➢ Roadside ditches are filled in, removing benefits of sediment removal from storm water runoff.<br>➢ Increased storm water runoff can be mitigated with stormwater management techniques.<br>➢ Opportunity for tree planting in boulevard.<br>➢ Median provides opportunity for installing measures to capture/ infiltrate stormwater.<br>➢ Wider roadway increases potential for wildlife mortality.<br>➢ Minor encroachment into wetland and municipal drain between Hunsperger Drain crossing east of Boxwood Drive and Middle Creek east of Speedsville Road.<br>➢ Least total pavement area for active transportation requiring winter maintenance and de-icing. (6.0m$^2$/m of roadway) | ➢ Roadside ditches are filled in, removing benefits of sediment removal from storm water runoff.<br>➢ Increased storm water runoff can be mitigated with stormwater management techniques.<br>➢ Opportunity for tree planting in boulevard.<br>➢ Median provides opportunity for installing measures to capture/ infiltrate stormwater.<br>➢ Wider roadway increases potential for wildlife mortality.<br>➢ Minor encroachment into wetland and municipal drain between Hunsperger Drain crossing east of Boxwood Drive and Middle Creek east of Speedsville Road.<br>Mid-range total pavement area for active transportation requiring winter maintenance and de-icing. (7.0m$^2$/m or roadway) 17% more pavement area to maintain in comparison with Multi-use Path alternative. |
| **RATING** | EXCELLENT | VERY GOOD | GOOD |
| **Social Environment**<br>How might the alternative impact archaeological and cultural heritage resources, properties abutting the road (driveways, access), and streetscaping / landscape potential? | ➢ No anticipated archaeological or cultural heritage impacts.<br>➢ No property acquisition required.<br>➢ No improvements for pedestrians, cyclists, or other recreational activities.<br>➢ Maintains current access to adjacent neighbourhoods, but increasing congestion exacerbates access concerns over time.<br>➢ Increasing traffic congestion (delay and queueing) leads to poorer relative air quality. | ➢ No anticipated archaeological or cultural heritage impacts.<br>➢ Community benefits from new pedestrian and cycling facilities.<br>➢ Multi-use path provides additional comfort level for recreational cyclists and separation from vehicular traffic.<br>➢ Relieves traffic congestion facilitating better access to businesses and adjacent neighbourhoods.<br>➢ Less traffic congestion leads to better relative air quality.<br>➢ Cross-section does not influence property impact, noise, or air quality; widening does.<br>➢ Greatest amount of remaining boulevard space available for landscaping and streetscaping. | ➢ No anticipated archaeological or cultural heritage impacts.<br>➢ Community benefits from new pedestrian and cycling facilities.<br>➢ Separated facilities provide additional comfort level for pedestrians and cyclists.<br>➢ Transit vehicles may interfere with cycling activities when patrons are boarding and alighting at the roadside.<br>➢ Relieves traffic congestion facilitating better access to businesses and adjacent neighbourhoods.<br>➢ Less traffic congestion leads to better relative air quality.<br>➢ Cross-section does not influence property impact, noise, or air quality; widening does.<br>➢ Very little remaining boulevard space available for landscaping and streetscaping. |
| **RATING** | FAIR | VERY GOOD | VERY GOOD |

| Table 2 – Evaluation of Cross-Section Design Alternatives | | | |
|---|---|---|---|
| **EVALUATION CRITERIA** | **"Do Nothing" ALTERNATIVE**<br>**Retain Roadway Cross-Section in its Current Configuration** | **ALTERNATIVE A**<br>**Widen the Road to 4-Lanes with Raised Centre Median, and 3.0m Multi-Use Path on both sides** | **ALTERNATIVE B**<br>**Widen the Road to 4-Lanes with Raised Centre Median, 1.8m concrete sidewalks, and 1.7m separated roadside bike lanes with rollover curb** |
| **Description of Alternative** | | • 5.0m raised median with concrete barrier curbs and narrow gutter;<br>• 0.6m curb and gutter, and a storm drainage system;<br>• 3.0m asphalt multi-use path; and,<br>• Additional street lighting. | • 5.0m raised median with concrete barrier curbs and narrow gutter;<br>• 0.6m curb and gutter, and a storm drainage system;<br>• 1.8m concrete sidewalks;<br>• 1.7m separated roadside bike lanes with rollover curb; and,<br>• Additional street lighting. |
| **Transportation**<br>How might the alternative serve the expected vehicular, transit, pedestrian, and cycling traffic? | ➢ Does not satisfy the Region's Transportation Master Plan with respect to vehicular, pedestrian, or cycling facilities.<br>➢ Does not provide adequate capacity for vehicular traffic.<br>➢ Does not improve conditions for Emergency Services, Heavy Trucks, and Transit Vehicles.<br>➢ Does not improved conditions for cyclists or pedestrians. | ➢ Addresses the Region's Transportation Master Plan with respect to vehicular, pedestrian, and cycling facilities.<br>➢ Addresses future traffic capacity needs of the corridor.<br>➢ Reduces congestion and improves conditions for Emergency Services, Heavy Trucks, and Transit Vehicles.<br>➢ Provides separation of pedestrians and cyclists from vehicular traffic.<br>➢ Pedestrian and cyclist conflicts may occur.<br>➢ Addresses transit's concerns regarding on road conflicts with cyclist during boarding and alighting activities.<br>➢ Raised centre median provides physical separation of bi-directional traffic, reducing collisions.<br>➢ Raised centre median provides potential refuge for pedestrians crossing the road mid-block.<br>➢ Lowest Transportation Operations/Maintenance requirements. | ➢ Addresses the Region's Transportation Master Plan with respect to vehicular, pedestrian, and cycling facilities.<br>➢ Addresses future traffic capacity needs of the corridor.<br>➢ Reduces congestion and improves conditions for Emergency Services, Heavy Trucks, and Transit Vehicles.<br>➢ Sidewalk provides separation pedestrians from cyclists and vehicular traffic.<br>➢ Some separation is provided for cyclists from vehicular traffic.<br>➢ Transit has concerns with conflicts between cyclists and boarding and alighting activities at the roadside.<br>➢ Separated bike lane provides some separation from vehicular traffic, but buses stop in these lanes.<br>➢ Raised centre median provides physical separation of bi-directional traffic, reducing collisions.<br>Raised centre median provides potential refuge for pedestrians crossing the road mid-block.<br>➢ 2nd Lowest Transportation Operations/Maintenance requirements. |
| How easily could the alternative be operated and maintained, including snow removal? | | ➢ 3.0m wide pathway can be maintained with pickup truck and plow and allows access for utility vehicles. Can be cleared adequately with single pass and entirely with two-way pass. | ➢ Two facilities require additional maintenance time and expenditure. Curb separated cycle lane has proven challenging to adequately clear for winter use. |
| **RATING** | POOR | VERY GOOD | VERY GOOD |

| Table 2 – Evaluation of Cross-Section Design Alternatives | | | |
|---|---|---|---|
| **EVALUATION CRITERIA** | **"Do Nothing" ALTERNATIVE**<br>**Retain Roadway Cross-Section in its Current Configuration** | **ALTERNATIVE A**<br>**Widen the Road to 4-Lanes with Raised Centre Median, and 3.0m Multi-Use Path on both sides** | **ALTERNATIVE B**<br>**Widen the Road to 4-Lanes with Raised Centre Median, 1.8m concrete sidewalks, and 1.7m separated roadside bike lanes with rollover curb** |
| **Description of Alternative** | | • 5.0m raised median with concrete barrier curbs and narrow gutter;<br>• 0.6m curb and gutter, and a storm drainage system;<br>• 3.0m asphalt multi-use path; and,<br>• Additional street lighting. | • 5.0m raised median with concrete barrier curbs and narrow gutter;<br>• 0.6m curb and gutter, and a storm drainage system;<br>• 1.8m concrete sidewalks;<br>• 1.7m separated roadside bike lanes with rollover curb; and,<br>• Additional street lighting. |
| **Cost**<br>What is the expected total cost of the alternative, including the cost for road construction, utility and street lighting relocations, property acquisitions, traffic signal improvements, and landscaping? | ➢ Do Nothing has no direct Capital Cost.<br>➢ Increased costs for movement of goods and services as congestion increases.<br>➢ No change to maintenance costs for road, pedestrian/ cycling facilities, or landscaping.<br>➢ Increased traffic over fewer travel lanes increases frequency of required maintenance.<br>➢ Increased traffic volume increases congestion and may lead to increased accident frequency due to gap reduction. | ➢ Cross-section unit cost is $2,100/m. (excl. utility relocation costs – see widening alternative concept evaluation – Table 1)<br>➢ Reduced costs for movement of goods and services as congestion decreases.<br>➢ Increased maintenance costs for road, pedestrian/ cycling facilities, and landscaping. | ➢ Cross-section unit cost is $2,200/m. (excl. utility relocation costs – see widening alternative concept evaluation – Table 1)<br>➢ Reduced costs for movement of goods and services as congestion decreases.<br>➢ Increased maintenance costs for road, pedestrian/cycling facilities, and landscaping. |
| **RATING** | FAIR | VERY GOOD | GOOD |
| **OVERALL EVALUATION** | **FAIR** | **VERY GOOD** | **GOOD** |
| **OVERALL RANKING** | **5** | **1** | **2** |
| **TECHNICALLY PREFERRED DESIGN** | ✗ | ✓ | ✗ |
| **JUSTIFICATION** | **Not Carried Forward**<br>**Does not address Problem/Opportunity Statement** | **Carried Forward as the preferred cross-section design alternative.**<br>**Greatest potential for Natural Environment, Social Environment, Transportation, and Cost benefits.**<br>**Greatest overall boulevard area available for landscaping, snow storage, and stormwater management.**<br>**Least area requiring winter maintenance and de-icing adjacent to watercourses.**<br>**Least potential conflict between users and transit buses at, or near, transit stops.**<br>**Lowest expected capital (construction) and operating (maintenance) cost of active transportation alternatives.**<br>**Least impact on existing utilities.** | **Not Carried Forward**<br>**2nd most potential for Natural Environment, Social Environment, Transportation, and Cost benefits.**<br>**2nd most overall boulevard area available for landscaping, snow storage, and stormwater management.**<br>**2nd least area requiring winter maintenance and de-icing adjacent to watercourses.**<br>**Greater potential for conflict between users at, or near, transit vehicle stops than Alternative 1.**<br>**2nd Lowest expected capital (construction) and operating (maintenance) cost of active transportation alternatives.**<br>**2nd least impact on existing utilities.** |

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# Minutes

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| **To/Attention** | See distribution below | **Date** | March 7, 2022 |
| **From** | Michael McGann, P.Eng. | **IBI Project No.** | 117540 |
| | | **Region Project No.** | 07116 |

**Subject** Region of Waterloo
**Maple Grove Road Improvements and Corridor Study - Class Environmental Assessment Study – Project Team Meeting 4**
Online (Virtual) Microsoft Teams Meeting
March 7, 2022, 1:00 – 2:00 PM

**Present**

**Region of Waterloo**
Karl Kiefer, Regional Councillor (Cambridge)
Marcos Kroker, Head, Design and Construction
Darryl Spencer, Senior Engineer, Transportation Planning
Matt Cowan, Region ATAC Committee Member

**City of Cambridge**
Donna Reid, Ward 1 Councillor
Alex Nichols, Project Engineer, Development Engineering

**IBI Group**
Michael McGann, Transportation Engineering (Chair)
Vanessa Ratiu, Transportation Engineering

**Regrets** John Bayley, Transportation Engineering (Consultant PM)
Justin Armstrong, Senior Engineer, Design and Construction (Region PM)
Mike Jones, Supervisor, Traffic Engineer (Region)

**Distribution** All Present and Regrets

| Item Discussed | Action By |
|---|---|
| **The following Attachments were reviewed during Project Team Meeting #4 and have been appended to these Meeting Minutes:**<br>• Attachment 1 – PCC #2 Summary Report<br>• Attachment 2 – PCC #2 Survey Data<br>• Attachment 3 - Table of (PCC #2) Public Comments and Draft Project Team Responses<br>• Attachment 4 – Preliminary Design (Roll Plan) | |
| **Meeting commenced at 1:00 pm** | |
| **1. Introductions**<br>**1.1** IBI Group introduced all members of the Project Team and provided an overview of the Meeting Agenda. | |
| **2. Public Consultation Centre #2 Update**<br>**2.1** IBI Group reviewed Attachment 1 – PCC #2 Summary Report, and provided a summary of Public Consultation Centre #2 (PCC #2) as follows:<br>2.1.1 PCC #2 was held virtually (online) on the Region's EngageWR website from June 28 to July 30, 2021. The purpose of PCC #2 was for the public to provide input on:<br>• The needs and opportunities for improvements on Maple Grove Road;<br>• The alternative solutions considered by the Project Team for Maple Grove Road;<br>• The criteria used to evaluate alternative solutions; and<br>• The Project Team preferred alternative.<br>2.1.2 The Maple Grove Road Engage Webpage for PCC #2 received 254 visitors during the consultation period, with 125 visitors viewing documents or visiting multiple pages, and 62 visitors participating in the online survey and/or providing comments. Survey findings are included in Attachment 2 – PCC #2 Survey Data.<br>2.1.3 62 sets of comments were received by the Project Team. A Table has been prepared (Attachment 3), which includes all public comments and draft Project Team responses for each comment. All | |

| Item Discussed | Action By |
|---|---|
| members of the Project Team are encouraged to review the comments/responses and provide any feedback to the Project Team. The Table will then be finalized and posted to both the Region and EngageWR websites in order that members of the public can review responses to their questions online. | *All Members of Project Team* |
| 2.1.4 Some key concerns identified by respondents include: property impacts, noise mitigation, loss of trees, connections of multi-use paths to adjacent streets, traffic along side streets at major intersections, and access. | |
| 2.1.5 The majority of respondents were in favour of (or neutral with respect to) both widening Maple Grove Road and installing new multi-use paths. | |

| Project Team Preferred Alternative Design Element | In favour | Neutral (no comment) | Against |
|---|---|---|---|
| Maple Grove Road widening | 29 | 23 | 10 |
| New multi-use paths | 37 | 19 | 6 |

**3. Confirmation of the Project Team Preferred Alternative**

**3.1** IBI Group reviewed the Project Team Recommended Design Alternative, as presented in PCC #2, as follows:

- Modified "Hybrid Widening Concept" (Alignment) to Minimize Overall Impacts; and
- Cross-Section Alternative A – Widen the Road to 4-Lanes with Raised Centre Median, and 3.0m Multi-Use Path on both sides.

**3.2** IBI Group reviewed Attachment 4 – Preliminary Design (Roll Plan), which shows the current preliminary design of the Project Team Recommended Design Alternative.

3.2.1 Councillor D. Reid inquired if property would be required at the Beaverdale Roundabout on the north side. She noted that she has received concerns from adjacent property owners that the new roundabout could result in water flowing onto private property. IBI Group noted that property will be required at all four quadrants of the new roundabout, and these areas were identified in the drawings provided during PCC #2. It was noted that existing drainage patterns will be maintained. — *IBI Group / RMW*

3.2.2 Councillor K. Kiefer asked when the widening is scheduled for construction. M. Kroker replied that the current Regional

| Item Discussed | Action By |
|---|---|
| Transportation Capital Program includes Maple Grove Road (construction) in 2025-2026. Councillor K. Kiefer noted that it would be beneficial to have it constructed sooner, as there are large subdivisions being developed in the area and a need for four lanes currently; Councillor D. Reid agreed.<br>3.2.3 IBI Group solicited Project Team confirmation of support for the Project Team Recommended Design Alternative. The (PCC #2) Project Team Recommended Design Alternative was endorsed unanimously. | *RMW* |
| **4. Next Steps and Timing**<br>**4.1** IBI Group noted that the minutes of this meeting will be prepared and circulated along with the draft project team response table and PCC #2 summary report. The Project Team is asked to review within one week after receiving and reply with any comments/feedback. The final Comments and Response Table will then be published on both the Region and EngageWR websites for public review and final reporting (i.e. Environmental Study Report (ESR)) will be finalized.<br>4.1.1 A staff report requesting Regional Council (Committee of the Whole) approval for the project is planned for May 10, 2022. If Committee and Council (May 25, 2022) approval is received, the Notice of (Study) Completion (and filing of the ESR) is expected to be completed in June 2022. | *All Members of Project Team*<br>*IBI Group / RMW* |
| **5. Other Business**<br>**5.1** Justin Armstrong will be presenting the project to the Region's Active Transportation Advisory Committee (ATAC) on Tuesday, March 15th, 2022.<br>**5.2** M. Cowan questioned if tree planting was to be considered during detailed design to replace those removed to accommodate the road widening. M. Kroker noted that the Region typically replaces trees based on a 2:1 ratio and the detailed design package will include a landscaping plan, which will include new tree plantings. Additionally, he noted that the boulevard is quite wide and offers plenty of opportunities for planting. | *RMW*<br>*IBI Group / RMW* |
| Meeting adjourned at 1:35 pm | |
| ***This meeting summary was prepared by IBI Group at the request of the client and is based on notes recorded by IBI Group at the time of*** | |

| Item Discussed | Action By |
|---|---|
| ***the meeting. If there are any errors, omissions, or required additions and/or clarifications, please provide them within one week of receipt of the meeting summary.*** | |

# Appendix B – Public Consultation Centre Information Packages

September 2023

Region of Waterloo

# Information Package

## Maple Grove Road Improvements
## Hespeler Road to Vondrau Drive
## City of Cambridge

**Public Consultation Centre No. 1**

**Dates: Monday, July 27, 2020 – Monday, August 17, 2020**

**Online Review and Comment Period (www.engagewr.ca)**

**What:** The Region of Waterloo is undertaking a Municipal Class Environmental Assessment (EA) of Maple Grove Road to determine improvements to the corridor.

**Where:** Maple Grove Road from Hespeler Road to Vondrau Drive in the City of Cambridge.

**Why:** To provide road improvements for traffic growth and transportation system improvements for pedestrians, cyclists and transit along the corridor.

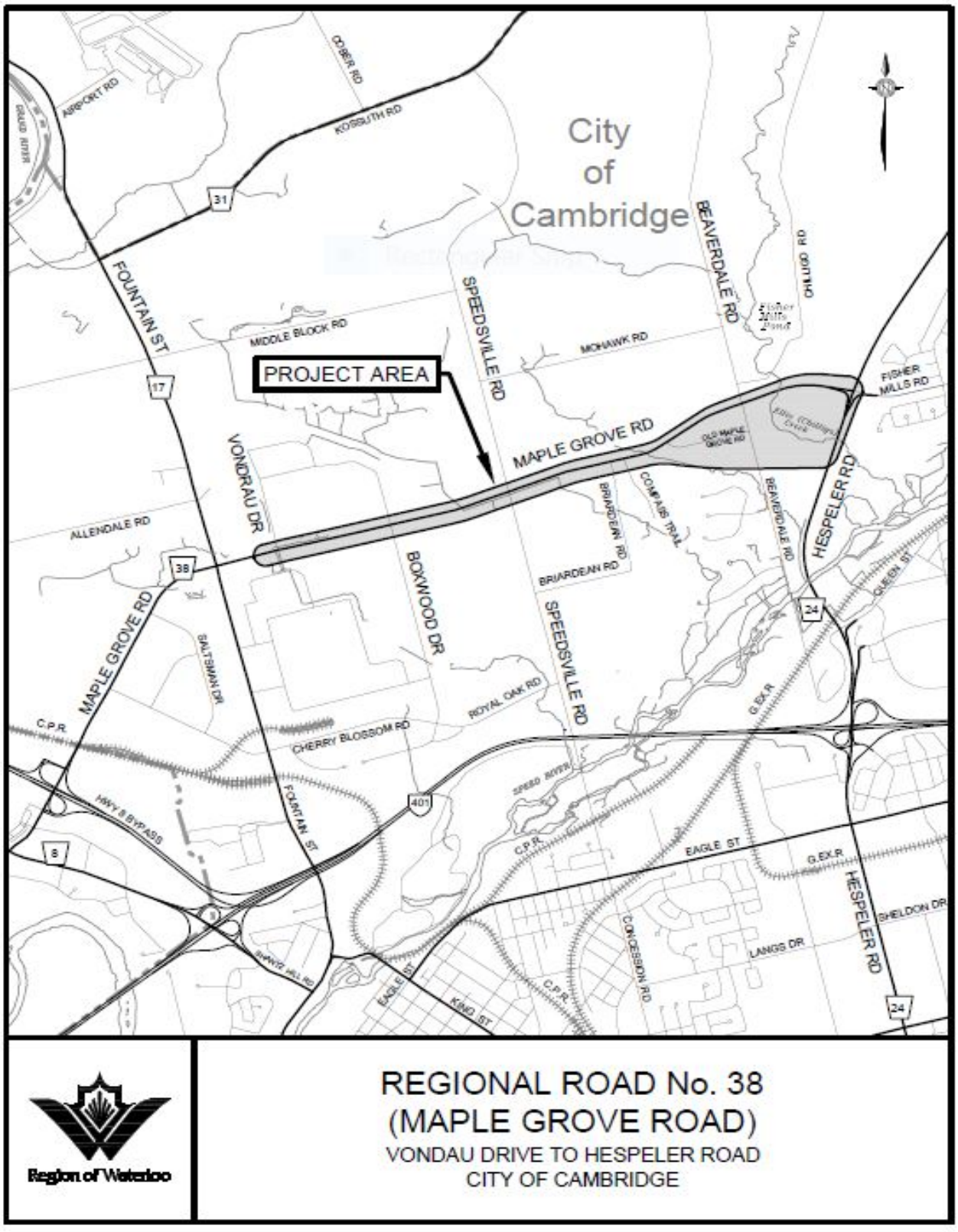
**When:** 2022 - 2027 Construction

(2020 Region Transportation Capital Program)

**Who:** Region of Waterloo Project Manager
Justin Armstrong, P.Eng.
Phone: (519) 575-4400 Ext. 3164
Email: JuArmstrong@regionofwaterloo.ca

**There is a comment sheet at the back of this package. Please fill it out and share your comments with us.**

**Key Plan**


City of Cambridge
PROJECT AREA
MAPLE GROVE RD
FOUNTAIN ST
SPEEDSVILLE RD
BEAVERDALE RD
HESPELER RD
VONDRAU DR
BOXWOOD DR
MIDDLE BLOCK RD
MOHAWK RD
FISHER MILLS RD
ALLENDALE RD
BRIARDEAN RD
COMPASS TRAIL
OLD MAPLE GROVE RD
ROYAL OAK RD
CHERRY BLOSSOM RD
SALTSMAN DR
EAGLE ST
KING ST
LANGS DR
SHELDON DR
CONCESSION RD
HWY 8 BYPASS
C.P.R.
G.EX.R
401
Region of Waterloo
REGIONAL ROAD No. 38
(MAPLE GROVE ROAD)
VONDAU DRIVE TO HESPELER ROAD
CITY OF CAMBRIDGE

## 1. Why is the Region considering this project?

With ongoing development and community growth in the area, the traffic demands on Maple Grove Road are increasing and there is a growing demand for active transportation and transit facilities in the section between Hespeler Road and Vondrau Drive. The 2018 Transportation Master Plan ("Moving Forward") identifies the need to widen this section of Maple Grove Road to provide adequate capacity for forecasted traffic volumes along this corridor.

The 2018 Transportation Master Plan also recommends consideration of a new bypass route to ease some of the congestion at the current intersection of Maple Grove Road at Hespeler Road.

Currently, there are no pedestrian and cycling facilities along Maple Grove Road within the study limits. The existing roadway asphalt on Maple Grove Road from Hespeler Road to Vondrau Drive is in fair to poor condition and in need of rehabilitation or replacement.

Grand River Transit (GRT) routes and stops planned for the future will also be considered in this study.

## 2. Who is directing the project?

The planning and design for this project is being directed by staff from the Region of Waterloo and the City of Cambridge including Region of Waterloo Councillor Karl Kiefer and City of Cambridge Councillor Donna Reid. The consulting engineering firm IBI Group Professional Services (Canada) Inc. has been retained by the Region of Waterloo to assist the Region in leading this Class EA Study and to provide planning and preliminary design services during this phase of this project.

## 3. How is this project being planned?

This project is being planned in accordance with the requirements of the Municipal Class Environmental Assessment (Class EA) process. The Municipal Class EA process is a planning and decision making process approved under the Environmental Assessment Act of Ontario used by municipalities to plan and implement public infrastructure projects in order that potential environmental, transportation, social/economic and cost impacts are considered before a project is approved. Consultation with the public, stakeholders, and federal and provincial agencies is required during the Class EA Study and development of planning and design alternatives and their potential impacts.

This Class EA Study is being completed as a Schedule 'C' Class EA project which applies to larger, more complex projects with the potential for significant environmental impacts (natural, social, cultural and economic) and includes multiple opportunities for public input.

This project is currently in Phase 2 of the Class EA process and this initial Public Consultation Centre is being held for members of the public to become aware of the project and to provide input into the project for further development of alternatives.

Please refer to **Appendix A** for more information about the Class Environmental Assessment process.

### 4. What is the purpose of this Public Consultation Centre?

This Public Consultation Centre is a forum to have interested groups and individuals learn about and provide input on:

a) The needs and opportunities for improvements on Maple Grove Road;

b) The project environment (natural, social, cultural/heritage, and economic);

c) The potential solutions for improvements that have been considered by the Project Team to date;

d) How the design alternatives for improvements will be developed and evaluated and how a preferred design alternative will be identified; and

e) Future public input opportunities planned.

Region and project consultant staff are available before, during, and after the Public Consultation Centre Review and Comment period to answer any questions you may have.

### 5. Didn't the Region already complete a Class Environmental Assessment for Maple Grove Road?

Yes, a larger Class EA study was completed in 2004 which included the Maple Grove Road corridor between King Street in Kitchener and Hespeler Road in Cambridge. Recommended improvements from the 2004 Class EA study were implemented from King Street to Fountain Street between 2006 and 2014. Prior to planned construction between Fountain Street and Hespeler Road, the Region released new Context Sensitive Design Guidelines, an Active Transportation Master Plan and a Transportation Master Plan Update, all with an emphasis on providing different and improved alternatives to meet active transportation and transit needs. The Maple Grove intersection improvements at Fountain Street have since been considered as part of a separate study and a proposed roundabout has been approved by Regional Council at that location. The remaining section of Maple Grove Road between Vondrau Drive and Hespeler Road is now the subject of a separate Class EA that will consider the new guidelines and master plans in determining a recommended design solution.

### 6. Are active transportation upgrades or road widening being considered?

Yes, both active transportation upgrades and road widening are being considered in accordance with current Regional master plans and guidelines.

The 2018 Regional Transportation Master Plan Update has identified the need to widen Maple Grove Road to four lanes and add active transportation improvements for pedestrians, cyclists, and transit between Hespeler Road and Vondrau Drive.

Widening is required to address current and future congestion concerns on Maple Grove Road, taking proposed development in the area into account. A list of current and projected traffic volumes on Maple Grove Road is included in **Appendix B**.

The Context Sensitive Regional Transportation Corridor Design Guidelines (CDG) is a planning policy document that guides the design of Regional roads. The CDG identifies design parameters for necessary features within the road allowance such as vehicle lanes, cycling facilities, sidewalks, and boulevards. In accordance with the CDG, Maple Grove Road is identified as a "Community Connector". Designing Maple Grove Road to support active transportation modes, including walking and cycling, is a fundamental character of this road classification. Please see the **Figure 1** below showing existing and planned active transportation facilities.

Transit (GRT) routes are planned for the future and will also be considered in this study.

The Regional Transportation Master Plan and Corridor Design Guidelines support complete and continuous active transportation facilities on this section of Maple Grove Road for the full length of this project. Boulevard multi-use trails or sidewalks and separated cycling facilities on both sides of the road would satisfy that requirement.

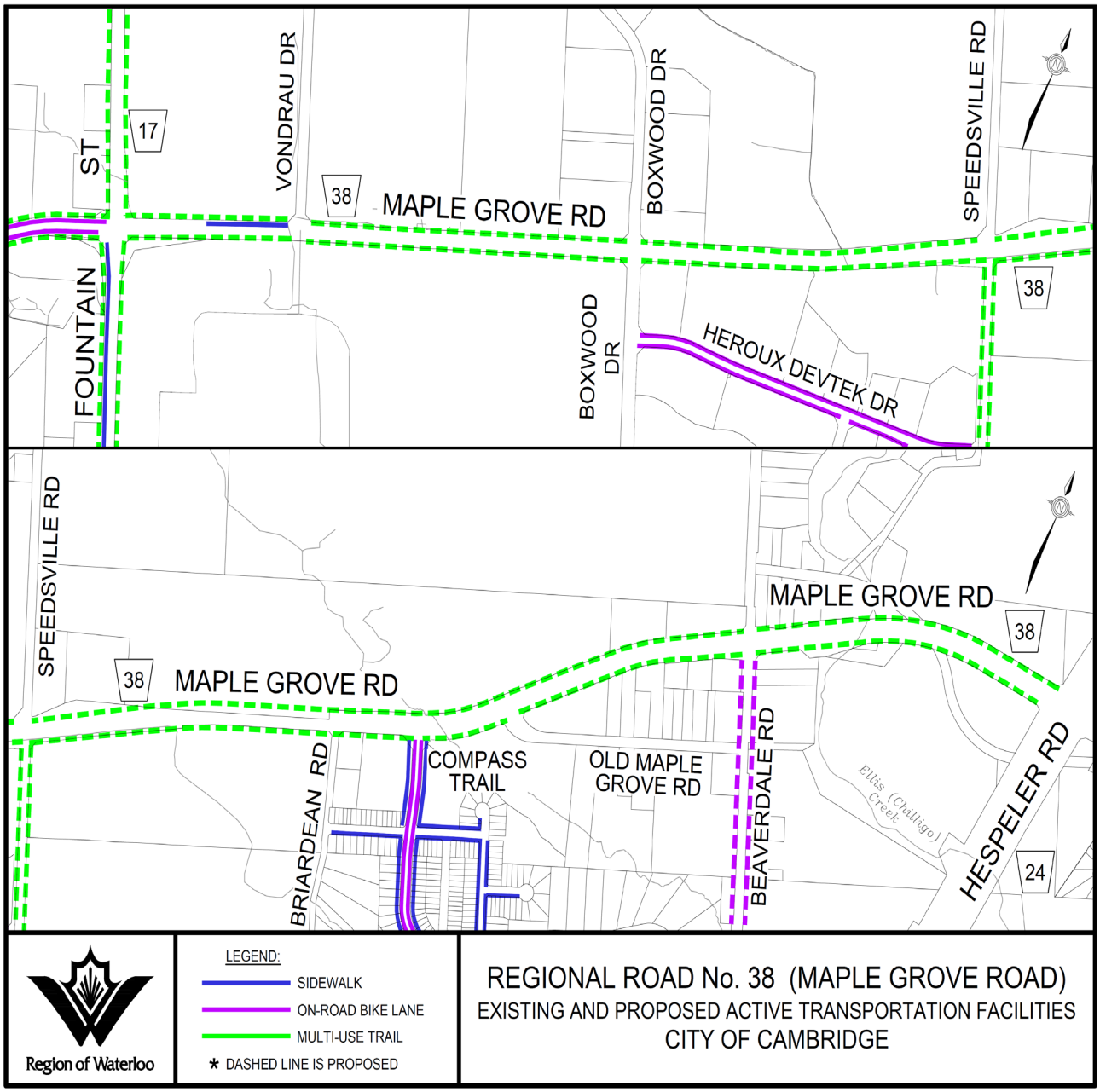



**Figure 1 – Existing and Planned Active Transportation Facilities**

### 7. What potential solutions have been considered so far, and which of these solutions will be further considered and developed into alternative design options moving forward?

The solutions for improvements considered by the Project Team so far are described in the list below. The Project Team has screened and evaluated each of these potential solutions and has made recommendations as described below. For a broader description of the potential solutions and the associated preliminary evaluation of each, please refer to **Appendix C.**

In reviewing the potential solutions, the Project Team considered the widening of Maple Grove Road to manage future traffic growth and forecasted intersection operational deficiencies, as well as adding active transportation facilities as the Region's primary objectives for the corridor.

1) **Do Nothing** – As part of any Class EA process, there is always a consideration of the "Do Nothing" alternative to assess what would happen if no action is taken to address the project concerns beyond typical restoration measures. In this case, the "Do Nothing" solution would involve reconstructing Maple Grove Road in its current two-lane rural cross-section with shoulders and roadside ditches. This solution was screened out because it does not satisfy the Region's primary objectives for the corridor.
   **Recommendation: Do not carry forward**

2) **Traffic Operations Improvements** – Opportunities may exist along the Maple Grove Road corridor to improve the existing traffic signal timings to optimize the amount of traffic capacity that the existing road can safely handle. This solution was screened out as a stand-alone measure because it does not satisfy the Region's primary objectives for the corridor.
   **Recommendation: Do not carry forward as an exclusive option**

3) **Access Management** – As the Maple Grove Road corridor develops, some additional traffic congestion and safety operations difficulties may arise due to vehicles attempting to enter and exit adjacent side-streets and properties with full access. Consideration will be given to consolidating or restricting accesses, raised centre medians, and centre left turn lanes. However, this solution can only satisfy all of the Region's primary objectives for the corridor if it is combined with other solutions.
   **Recommendation: Carry forward in conjunction with other solutions**

4) **Intersection Improvements** – The addition of auxiliary lanes to accommodate identified problem turning movements at intersections would reduce the delay times for traffic to move through the intersection and thus improve the flow along the Maple Grove Road corridor. Consideration will also be given to the need for additional traffic signals and/or centre left turn lanes at intersection with local streets. However, this solution can only satisfy all of the Region's primary objectives for the corridor if it is combined with other solutions.
   **Recommendation: Carry forward in conjunction with other solutions**

5) **Roundabouts** – The Region uses a standard 'screening tool' for determining where roundabouts will be considered. Generally, roundabouts offer a potential alternative to expanding signalized intersections and can be more effective in moving traffic and

reducing delays than signals in some cases. However, this solution can only satisfy all of the Region's primary objectives for the corridor if it is combined with other solutions.
**Recommendation: Carry forward in conjunction with other solutions**

6) **Widening Maple Grove Road** – Widening Maple Grove Road from two to four lanes from Hespeler Road to Vondrau Drive is considered a necessary component of the overall solution for this corridor.
**Recommendation: Carry forward**

7) **Active Transportation Facilities** – Providing facilities for cyclists and pedestrians on Maple Grove Road from Hespeler Road to Vondrau Drive is considered a necessary component of the overall solution for this corridor.
**Recommendation: Carry forward**

8) **Transit Service** –Improvements to the level of service provided by GRT within the corridor would potentially decrease vehicle traffic on Maple Grove Road. New facilities will need to address proposed route changes and to service GRT customers will be necessary as part of this project. However, this solution can only satisfy all of the Region's primary objectives for the corridor if it is combined with other solutions.
**Recommendation: Carry forward in conjunction with other solutions**

9) **Upgrade Other Routes** –Improvements to other nearby routes may re-direct some traffic away from Maple Grove Road. These improvements will continue to be addressed through the Region's Transportation Master Plan and Transportation Capital Program. However, this solution can only satisfy all of the Region's primary objectives for the corridor if it is combined with other solutions.
**Recommendation: Carry forward in conjunction with other solutions**

10) **Build Alternative Routes** – The Regional Transportation Master Plan considers the possible need for new routes within the Regional transportation network as well as possible improvements to existing roads. New routes may increase or decrease future traffic within the existing Maple Grove Road corridor. The need for alternative routes will continue to be addressed through the Region's Transportation Master Plan and Transportation Capital Program but is considered beyond the scope of this Class EA study.
**Recommendation: Do not carry forward as part of this study**

As the Class EA study moves forward, the alternative solutions selected for further consideration will be used to determine alternative design options for the corridor. The design options will be evaluated by the Project Team and presented at a future Public Consultation Centre along with a Preferred Design Solution for review and comment.

### 8. How and when will the Project Team develop design alternatives?

Based on the recommended set of solutions summarized above, the Project Team will develop a set of design alternatives that include widening of Maple Grove Road from two lanes to four with the addition of active transportation facilities in conjunction with signalized intersection improvements and/or roundabouts, transit service improvements, access management and traffic operations improvements. The Project Team will develop and evaluate these design alternatives over the course of the Spring and Summer of 2020 based, in part, on feedback received at this first Public Consultation Centre. The design alternatives including a preferred design alternative will be presented at a second Public Consultation Centre, currently scheduled for Fall 2020.

### 9. How will the Project Team evaluate design alternatives to establish a preferred design alternative?

Once the design alternatives are established by the Project Team they will be assessed against a set of evaluation criteria to determine which design alternative best addresses the problems along Maple Grove Road and the surrounding transportation network. The evaluation criteria will include the following:

| Evaluation Criteria for Maple Grove Road Class Environmental Assessment Study | |
|---|---|
| **Study Element** | **Criteria** |
| **1. Traffic Capacity, Operations & Safety** | |
| **Existing Traffic** | How does the alternative serve the current volume of vehicular, pedestrian, transit and cycling traffic? |
| **Forecasted Traffic / Transportation Network** | Does the alternative accommodate the forecasted traffic to exiting and future planned developments and properties? Will the alternative address the transportation network needs and be compatible with other Transportation Plans? |
| **Safety** | Does the alternative address identified traffic safety issues along the corridor or at specific locations? |
| **Access Management** | What effect will the alternative have on traffic access to properties fronting on Maple Grove Road? |
| **Transit Use** | How does the alternative serve the expected transit needs? |
| **Cycling Needs** | How does the alternative serve the expected cycling traffic needs? |
| **Pedestrian Needs** | How does the alternative service the expected pedestrian traffic needs? |

| | |
|---|---|
| **2. Natural Environment** | |
| **Acquatic Habitat, Fisheries and Surface Water** | How does the alternative affect Middle Creek/Hunsperger Drain, East Creek and Ellis Creek? |
| **Terrestrial Habitat / Vegetation** | How would the alternative affect existing vegetation, i.e., trees, plants and woodlots? |
| **Floodplain** | What effect would the alternative have on the Middle Creek/Hunsperger Drain, Ellis Creek and East Creek floodplains? |
| **Wetlands** | What impacts does the alternative have on any evaluated wetlands within the project area? |
| **Wildlife** | What are the effects of the alternative on species-at-risk/endangered species within the project area? |
| **Property Contamination** | Are there any known or potentially contaminated sites that require investigation and how would they affect the alternative? |
| **3. Social Environment** | |
| **Heritage and Archaeological Impacts** | What impacts does the alternative have on the following: Built Heritage Resources and Features, Cultural Heritage Landscapes and Archaeological impacts? |
| **Cultural & Recreational** | Are there any cultural or recreational institutions within the project area that would be affected by this alternative? |
| **Business Impacts** | How would the alternative affect existing businesses and how will businesses be affected during construction? |
| **Construction Impacts** | Is it constructible? How long will construction last? |
| **Streetscaping** | Can the alternative incorporate streetscaping features to maintain and enhance the character of the community? |
| **Private Property Impacts** | How does the alternative impact the residential and commercial properties along the corridor?<br>How much property will be required, if any, for the alternative? |
| **Air Quality & Noise** | What effect does the alternative have on air quality and noise levels within the project area? |

| 4. Costs | |
|---|---|
| **Utility Relocations / Conflicts** | What would be the extent of impacts on existing utilities that must be relocated and/or protected to construct the alternative? |
| **Initial Capital Cost** | What is the initial capital cost of the alternative? |
| **Life-Cycle** | What is the total life-cycle cost of the alternative including the cost for construction, utility relocations, property acquisitions as well as ongoing operation and maintenance costs? |

### 10. Where will roundabouts be considered on this project?

The implementation of roundabouts will generally be considered at intersections with existing traffic control signals that require additional through lanes or turn lanes to improve capacity. Roundabouts will also be considered at intersections where the projected traffic volumes would warrant new traffic control signals. Based on a preliminary screening, it is currently anticipated that the following intersections on Maple Grove Road will be considered for a potential roundabout:

- **Hespeler Road**
- **Beaverdale Road**
- **Speedsville Road**
- **Boxwood Drive**
- **Vondrau Drive**

Further analysis will be completed by the Project Team at the above locations to determine whether signalized intersection improvements or a roundabout are recommended as part of the overall preferred design alternative to be presented at a second Public Consultation Centre (currently scheduled for Fall 2020).

### 11. What will happen at the intersections where roundabouts aren't being considered?

Based on a preliminary screening by the Project Team, roundabouts will not be considered at the following Maple Grove Road intersections:

- **Old Maple Grove Road** - The Project Team is considering the need to restrict all left turn movements to and from Old Maple Grove Road by extending the raised median on Maple Grove Road across the intersection. This would reduce the operation of Old Maple Grove Road to right-in and right-out only. Alternatively, the Project Team is also considering the option to close off access to Maple Grove Road by constructing a cul-de-sac if supported by the City of Cambridge. A cul-de-sac would provide traffic calming on this primarily residential roadway that is often used as a bypass from and to Beaverdale Road from Maple Grove Road.

- **Compass Trail** - The intersection of Compass Trail currently operates as a full-movement access. However, the Project Team is considering the need to restrict left-turn in and/or left-turn out movements, but allow right-in and right-out movements.
- **Briardeen Drive** - As a condition of the Hunt Club Subdivision Agreement, the developer is required to close Briardeen Road at Maple Grove Road including reinstatement of the roadside ditch along Maple Grove Road. The developer will construct a cul-de-sac or hammerhead turnaround. It is expected that this closure will be completed in the near future.

Further analysis will be completed by the Project Team at the above locations to evaluate alternatives and determine which improvements will be recommended as part of the overall preferred design alternative to be presented at a second Public Consultation Centre (currently scheduled for Fall 2020).

### 12. Will there be any special considerations at the intersection of Maple Grove Road and Hespeler Road?

Yes, based on preliminary studies, a long-term solution to address traffic growth at the Maple Grove Road and Hespeler Road intersection may be required, beyond traditional intersection improvements or roundabout implementation. The Project Team will conduct further analysis on the future performance of intersection improvements and a roundabout at this location, but will also consider other long-term improvements including the following:

- **Single Point Grade Separation** – this alternative would include the construction of a new single point grade separation with traffic control signals on each side of Hespeler Road at Maple Grove Road and Fisher-Mills Road. Please see **Figure 2A and 2B** below for sample single point interchanges.




**Figure 2A – Single Point Grade Separation**

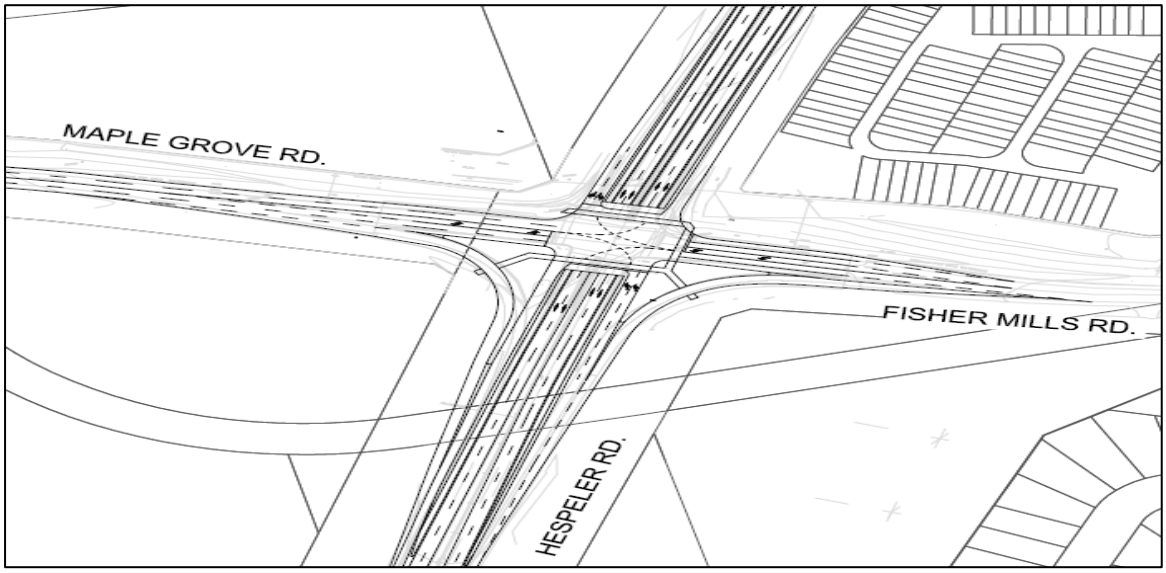



**Figure 2B – Drawing of Single Point Interchange**

- **Construct a Roundabout with a "Fly-Over"** – this alternative would include the phased and ultimate construction of a roundabout at with a fly-over to carry traffic from northbound Hespeler Road to westbound Maple Grove Road. Please see the **Figure 3A and 3B** below showing a roundabout with flyover.




**Figure 3A – Picture Concept of a Roundabout with Fly-Over Grade Separation**

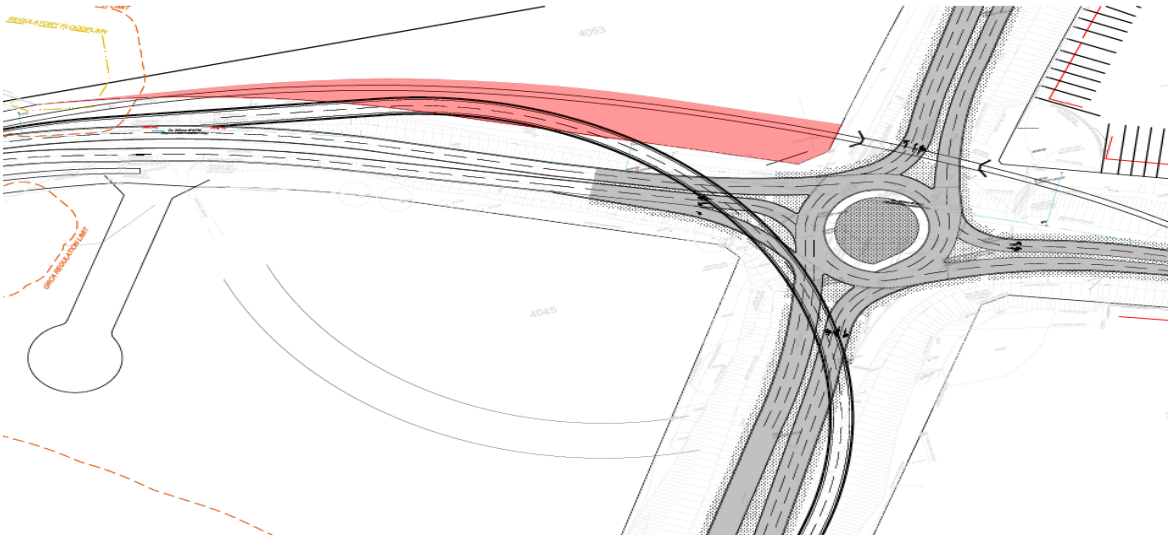


**Figure 3B – Drawing of a Roundabout with Fly-Over Grade Separation**

- **Construct a "bow-tie" or "dog-bone" Roundabout Grade Separation above Hespeler Road** – this alternative would include a grade separation at Hespeler Road and Maple Grove Road that would allow for future capacity expansion of Hespeler Road to travel below or above Maple Grove Road utilizing a double, joined roundabout design (sometimes referred to as a "bow-tie" or "dog-bone" design) to provide full movements access between Hespeler Road and Maple Grove Road. Please see **the Figure 4A and 4B** below of a bow-tie interchanges.



**Figure 4A – Aerial Photograph of Bow-Tie Grade Separation Above 4-Lane Road**



**Figure 4B – Aerial Photograph of Bow-Tie Grade Separation Below 4-Lane Road**

- **Other Alternatives** – the Project Team may also consider other alternatives for this intersection based on further analysis.

Further analysis will be completed by the Project Team at intersection of Maple Grove Road and Hespeler Road to evaluate alternatives and determine which improvements will be recommended as part of the overall preferred design alternative to be presented at a second Public Consultation Centre (currently scheduled for Fall 2020).

### 13. Will a bypass road still be considered linking Maple Grove Road to Hespeler Road?

No, the Project Team has conducted a preliminary analysis on this potential solution and it has been screened out from further consideration.

The Region's Transportation Master Plan identified a bypass road as a potential solution to direct traffic heading to and from Highway 401 away from the intersection of Hespeler Road and Maple Grove Road. This potential solution was screened out because it requires the acquisition of a significant amount of land and the costs would be substantially higher than other potential solutions that would address the primary objectives of this study.

### 14. When will the approved roundabout at Fountain Street and Maple Grove Road be constructed?

A 3-lane roundabout was approved by Region Council in 2010 and all land acquisitions required have been completed. The tentative construction year is 2022 subject to relocation of overhead power lines and resolving underground servicing (water, sanitary, storm) needs for future development in the area to be incorporated with the roundabout construction.

**15. Will the posted speed limit or parking restrictions be changed when Maple Grove Road is reconstructed?**

Within the study limits, Maple Grove Road is currently posted at 70 km/h for most of the corridor length; however, a short section of Maple Grove Road between Boxwood Drive to Beaverdale Road was recently posted at 60 km/h to facilitate a new pedestrian crossing at Compass Trail. In order to provide pedestrian crossing locations and permit appropriate crossing warning systems to be implemented, all pedestrian crossing locations must have a posted speed limit of 60 km/h or less. Considering the recorded average daily speed is 71 km/h or less and implementation of mid-block pedestrian crossing locations require a posted speed limit of 60 km/h or less, the Project Team is considering a recommendation to lower the posted speed limit to 60 km/h for the entire corridor.

**16. What Grand River Transit improvements are being considered?**

Once the Project Team has identified a preferred design alternative, Grand River Transit will be consulted to obtain feedback for the locations of new bus stops, pedestrian crossing locations related to bus stops and any shelter requirements. This information will be presented at the second Public Consultation Centre (currently scheduled for Fall 2020).

**17. Has the Project Team identified alternatives for active transportation facilities?**

The Project Team has identified several preliminary design alternatives that include a boulevard multi-use trail on each side of the road or a concrete sidewalk and an off-road separated cycling facility. These design alternatives and potentially others will be reviewed by the Project Team and recommended active transportation facilities will be included in the preferred design alternative to be presented at the second Public Consultation Centre (currently scheduled for Fall 2020).

**18. How has the natural environment been considered for this project?**

As part of the environmental inventory for the project, a natural Environment Impact Study (EIS) has been completed. Included within the EIS are: amphibian and reptile road mortality surveys, turtle surveys, amphibian call surveys, vegetation community surveys and boundary delineation, and a bat habitat assessment. The review includes areas identified by the Grand River Conservation Authority and includes existing features such as Ellis Creek, Middle Creek/Hunsperger Drain, East Creek and Provincially Significant Wetlands within or adjacent to Maple Grove Road. Additional field assessment will be completed in Spring 2020 as part of preparing the Environmental Study Report. A summary of key findings will be provided at the second Public Consultation (currently scheduled for Fall 2020).

A tree assessment was completed in 2019 to inventory the various trees within the Study Area. The trees were assessed for overall health and significance in order to develop mitigation and protection plans for any trees to be retained, which will be included in the final Environmental

Study Report. Where trees may be impacted or removed, a compensation strategy will be developed as part of the tree management and landscaping design.

**19. How has the cultural/heritage/archaeological environment been considered for this project?**

A Cultural Heritage Resource Assessment was completed in 2019. A review of available cultural heritage resource inventories revealed that although there are properties of heritage significance in the area no heritage properties or features are immediately adjacent to the area of potential roadway expansion. No additional resources were identified through field review.

In addition, a Stage 1 Archaeological Assessment (Background Research and Property Inspection) was completed in January 2019. The Stage 1 background research indicated that there is some potential for archaeological artifacts in areas previously undisturbed by past corridor expansion. The study will recommend additional Stage 2 field investigation (test pitting and pedestrian survey) in specific areas of the corridor.

**20. Has noise mitigation been considered for this project?**

A noise study will be undertaken in 2020 in accordance with Part 'B' of the Region's Noise Policy for Maple Grove Road from Hespeler Road to Vondrau Drive assuming a 4-lane road using the 2036 and 2041 forecasted traffic volumes. The noise study will be summarized at PCC No. 2 (currently scheduled for Fall 2020).

**21. Is any property required for the road improvements?**

One of the goals of the planning and design process is to minimize the impact on adjacent properties and the need to acquire private property. An initial review of the existing road allowance indicates that along the Maple Grove Road corridor most of the road right-of-way is adequate for the required improvements. However, there are locations at intersections where and if an expanded traffic control signalized intersection or a roundabout may be recommended that additional parcels of property would be required. Also, there are a small number of properties east and west of the intersection of Speedsville Road and Maple Grove Road where parcels of property will be required. These property addresses include 1130 Maple Grove Road, 1510 Maple Grove Road, 800 Briardeen Road and Lower Part Lot # 11 on the north side of Maple Grove Road. The property list will be updated at the second Public Consultation Centre when the Project Team will present the preferred design alternatives and intersection controls.

**22. Who will be responsible for the winter maintenance of new multi-use trails, sidewalks and/or separated cycling facilities?**

Maintenance of new active transportation facilities along regional roads with back-lotted properties is the responsibility of the lower tier municipality (City of Cambridge for this project).

### 23. What is the estimated cost of this project?

The cost of this project will depend on the approved improvement alternative, as well as necessary infrastructure relocations, replacements, utility relocations, and property acquisitions. Funding in the amount of approximately $58 Million for the improvements on Maple Grove Road is included in the Region's 2020 Transportation Capital Program. Funding includes approximately $1.0 Million for active transportation facilities, i.e., multi-use trails.

### 24. What is the project schedule and what are the next steps for improvements on Maple Grove Road?

The Project Team will review the public comments received from the Public Consultation Centre and use them to assist the Project Team in developing design alternatives and establishing a preferred design alternative. The alternatives considered and the preferred design alternative will be presented at the second Public Consultation Centre which is tentatively scheduled for Fall 2020. After the second Public Consultation Centre, the Project Team will review the public comments and identify a Recommended Design Alternative to be brought forward for design approval.

Pending design approval by Regional Council, detailed design, property acquisitions and utility relocations will commence, followed by construction which will be completed in stages. Construction is tentatively scheduled to completed in 2022 for the Maple Grove Road and Hespeler Road intersection improvements or roundabout, with construction along the rest of the corridor from 2024 to 2027. Intersection works at Maple Grove Road and Hespeler Road are planned for an earlier start date as it is anticipated that property acquisition will not be required to proceed with construction at this location.

### 25. How will I receive further notification regarding this project?

Property owners and tenants abutting the project site and members of the public requesting further information through the Region's project website ( www.regionofwaterloo.ca ), or registering at this Public Consultation Centre will receive all upcoming public correspondence, and will be notified of all future meetings. Alternatively, you may register on the Region's engage site to receive an email that new information has been posted at www.engagewr.ca.

### 26. How can I provide my comments?

In order to assist the Project Team in addressing any comments or concerns you might have regarding this project, we ask that you fill out the attached Comment Sheet and mail, fax, or email comments to the Project Team members listed below. Alternatively, you may provide your comments on the Region's Engage site at www.engagewr.ca.

We thank you for your involvement and should you have any questions or concerns please contact one of the following:

Justin Armstrong, P.Eng.
Region Project Manager
Region of Waterloo
150 Frederick treet, 6th Floor
Kitchener, ON N2G 4J3
Telephone: (519) 575-4400 Ext. 3164
Fax : (519) 575-4430
Email : JuArmstrong@regionofwaterloo.ca

John Bayley, P.Eng.
Consultant Project Manager
IBI Group
410 Albert Street, Suite 101
Waterloo, ON N2L 3V3
Telephone: (519) 585-2255 ext. 63220
Fax: (519) 585-2269
Email: john.bayley@ibigroup.com

**27. How can I view project information following the PCC?**

All of the PCC display materials and other relative project information, notifications of upcoming meetings, and contact information are available for viewing at the Region of Waterloo municipal office as identified above. Alternatively, you may visit the Region's website at www.regionofwaterloo.ca or the Engage Waterloo Region site at www.engagewr.ca.

## Appendix A – Municipal Class Environmental Assessment Process

### Ontario Environmental Assessment Act

The purpose of the Ontario Environmental Assessment Act (EA Act) is to provide for "the betterment of the people of the whole or any part of Ontario by providing for the protection, conservation and wise management of the environment of Ontario". The term "environment" is applied broadly and includes the natural, social, cultural, built and economic components.

The key principles of successful environmental assessment planning include:

- Consultation with stakeholders and affected members of the public;
- Consideration of a reasonable range of practical alternatives;
- Assessment of the environmental impacts associated with each alternative;
- Systematic evaluation of alternatives; and,
- Clear documentation.

**Municipal Class Environmental Assessment**

The Municipal Class Environmental Assessment (Class EA) is a planning process approved under the Environmental Assessment Act that is used by municipalities to plan infrastructure enhancement projects while satisfying the requirements of the Environmental Assessment Act. Under the Class EA process, projects are planned in one of three ways depending on their scope, complexity and potential for adverse environmental impacts.

**Schedule "A"**

- Includes routine maintenance, operation and emergency activities.
- The Municipality can proceed with this work without further approval or public consultation.

**Schedule "B"**

- Includes projects with potential for some adverse environmental effects.
- These projects are subject to a screening process that includes consultation with directly affected public and agencies.

**Schedule "C"**

- Includes larger, more complex projects with the potential for significant environmental effects.
- These projects are subject to all phases of the Class Environmental Assessment and require a minimum of three (3) points of public contact.

**Public Involvement**

Members of the public that have a stake in the project are encouraged to provide comment throughout the Class Environmental Assessment process. For Schedule "C" projects there are a

minimum of three (3) opportunities for contact. These opportunities typically include two Public Consultation Centres and the Notice of Completion which includes a mandatory 30-day public review period to review the project documentation.

**Class Environmental Assessment Process for Schedule "C" Projects**

**Change in Project Status – Appeal Provision**

It is recommended that all stakeholders (including the proponent, public and review agencies) work together to determine the preferred means of addressing a problem or opportunity. If you have any concerns, you should discuss them with the proponent and try to resolve them. In the event that there are major issues which cannot be resolved, you may request the Minister of Environment by order to require a proponent to comply with Part II of the Environmental Assessment Act before proceeding with a proposed undertaking which has been subject to Class Environmental Assessment requirements. This is called a "Part II Order". The Minister will make on of the following decisions:

1. Deny the request (with or without conditions);
2. Refer the matter to mediation; or
3. Require the proponent to comply with Part II of the Environmental Assessment Act, ordering a full Environmental Assessment.

All stakeholders are urged to try to resolve issues since it is preferable for them to be resolved by the municipality in which a project is located, rather than at the provincial level.

To request a Part II Order, a person must send a written request to:

Minister of Environment
135 St. Clair Avenue West
12th Floor
Toronto, Ontario M4V 1P5

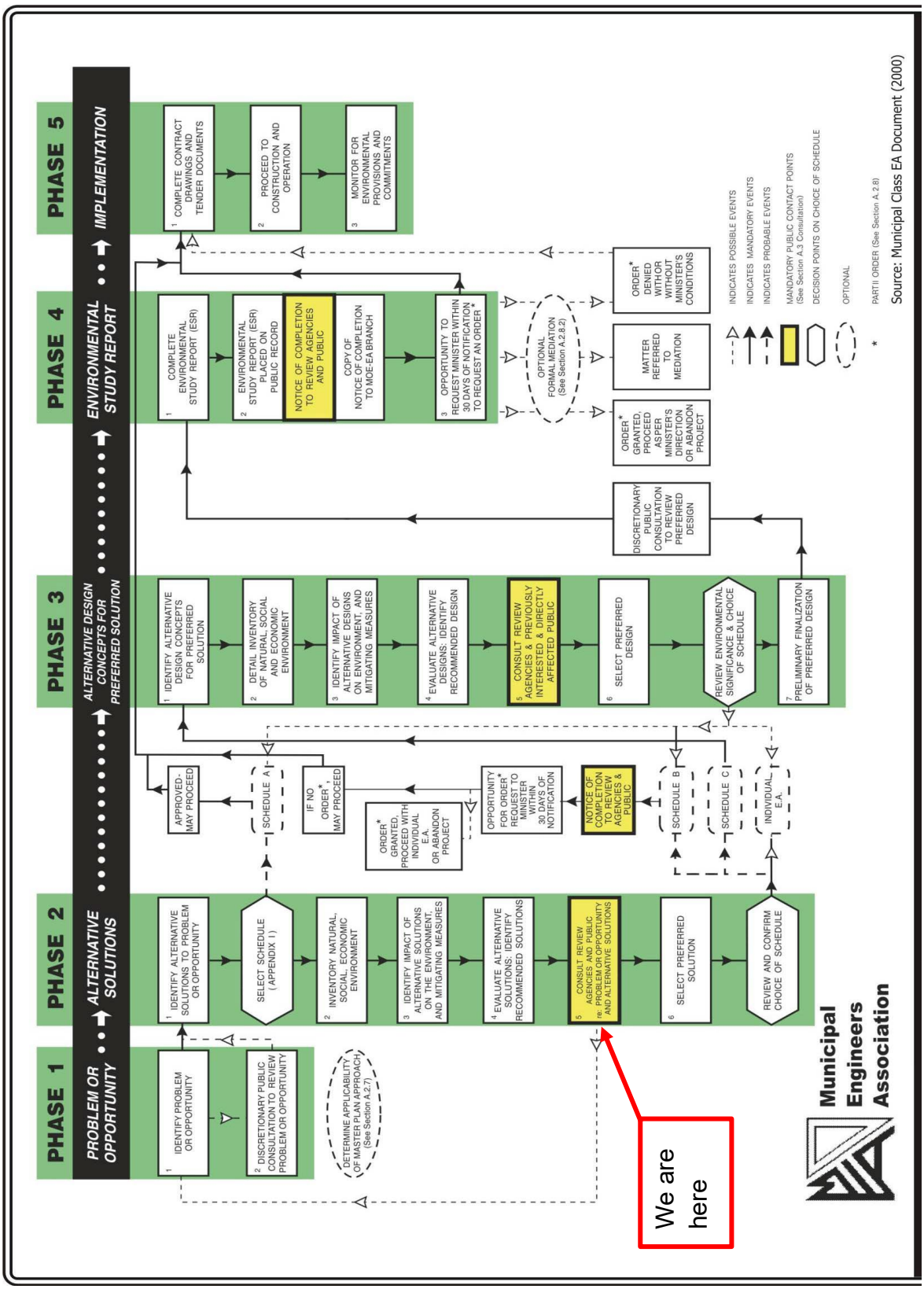
The request must address the following with respect to the identified concerns:

- Environmental Impacts and specific concerns;
- Adequacy of the planning and public consultation process;
- Involvement of the person in the planning process; and,
- Details of discussions held between the person and the proponent.

A process diagram depicting the Class Environmental Assessment process is included on the following page along with an indication of where we area with the current study process.

## Appendix A

## Municipal Engineers Association Class Environmental Assessment Flow Chart



## Appendix B – Current and Forecasted Traffic Volumes on Maple Grove Road

| Road Section | Current (2018) AADT | Forecasted (2036) AADT | Forecasted (2041) AADT | % Trucks | Average Speed (km/h) |
|---|---|---|---|---|---|
| Hespeler Road to Beaverdale Road | 19,700 | 25,220 | 28,090 | 4.0 | 62 |
| Beaverdale Road to Old Maple Grove Road | 18,740 | 24,710 | 27,710 | 5.0 | 67 |
| Old Maple Grove Road to Compass Trail | 20,030 | 26,430 | 29,980 | 4.0 | 60 |
| Compass Trail to Briardeen Drive | 19,800 | 26,380 | 29,930 | 5.0 | 71 |
| Briardeen Drive to Speedsville Road | 18,850 | 26,640 | 30,190 | 5.0 | 71 |
| Speedsville Road to Boxwood Drive | 18,650 | 30,490 | 34,200 | 5.0 | 71 |
| Boxwood Drive to Vondrau Drive | 18,180 | 32,530 | 36,250 | 4.0 | 64 |
| Vondrau Drive to Fountain Street | 19,950 | 32,530 | 36,250 | 7.0 | 53 |

**Appendix C - Summary of the Alternative Solutions for the Maple Grove Road Corridor**

| Planning Alternatives | Description | Preliminary Evaluation | Preliminary Recommendation |
|---|---|---|---|
| **Do Nothing** | This solution identifies what would happen if no action is taken to address current deficiencies within the corridor, in both the short and long terms. This assessment provides a baseline to which other project alternatives may be measured. | The Transportation Study completed as part of this project found that there are existing capacity deficiencies on Maple Grove Road that the "Do Nothing" solution will not remedy. | Do not carry forward |
| **Traffic Operation Improvements** | Opportunities may exist along the Maple Grove Road corridor to improve existing traffic signal timings or to add additional signal systems, to optimize the amount of traffic capacity that the existing road can handle and to improve safety at various intersections. | The Transportation Study found that traffic signal operational improvements still result in a poor Level of Service (i.e. delays) on Maple Grove Road. | Do not carry forward as an exclusive option. |
| **Access Management** | Some of the existing traffic and safety operational issues, within the Maple Grove Road corridor, could be attributed to vehicle operating speeds and attempting to make turns at intersections during the peak traffic periods. Consideration may be given to consolidating or restricting accesses, raised centre medians, and centre left-turn lanes. | Closing, restructuring or combining accesses will not solve the capacity issues on Maple Grove Road as a standalone solution. However, access management may be considered in conjunction with the final recommended concept to enhance the operations and capacity of Maple Grove Road. | Carry forward in conjunction with other recommended alternatives. |
| **Roundabouts** | Roundabouts are characterized by their lack of traffic signals and a circulating roadway providing | This alternative will be analyzed in further detail as the introduction of a series of | Carry forward in conjunction with |

| Planning Alternatives | Description | Preliminary Evaluation | Preliminary Recommendation |
|---|---|---|---|
| | for continual traffic flow through the intersection. Roundabouts generally provide more traffic capacity than standard signalized intersections due to their ability to reduce delays. | roundabouts may reduce the extent of widening, address or reduce traffic delays and improve safety at intersections. All existing major intersections on Maple Grove Road will be analyzed for the suitability of roundabouts and in comparison to Intersection Improvements. | widening alternative solution |
| **Intersection Improvements** | The addition of auxiliary lanes (through and turn lanes) to accommodate increased storage capacity and turning movements at intersections may reduce traffic delay times through the various intersections and improve the flow along Maple Grove Road. Consideration will be given to new designated left turn and right turn lanes at existing intersections, both on Maple Grove Road and the cross streets. | The addition of turning lanes at intersections will not fully solve the capacity and operational deficiencies on Maple Grove Road. However, these improvements may be considered in conjunction with the final recommended concept to enhance the operations and capacity of Maple Grove Road and in comparison to roundabouts. | Carry forward in conjunction with other recommended alternatives |
| **Widening Maple Grove Road** | Widening Maple Grove Road will improve corridor capacity and address existing and future congestion issues. Past studies including the 2004 Class EA and the Regional Transportation Master Plan recommend widening to four lanes. | The widening of Maple Grove Road will be undertaken in conjunction with other improvements, such as intersection improvements and/or roundabouts. | Carry Forward |
| **Active Transportation Facilities** | Providing facilities for cyclists and pedestrians on Maple Grove Road from Hespeler Road to Vondrau Drive is considered a necessary component of the overall solution for this corridor. Off-road alternatives will be considered due to the heavy truck volumes. | Active Transportation Facilities will be undertaken in conjunction with other improvements, such as, Widening Maple Grove Road, intersection improvements and/or roundabouts. | Carry Forward |

| Planning Alternatives | Description | Preliminary Evaluation | Preliminary Recommendation |
|---|---|---|---|
| **Transit Service** | This alternative would improve the level of transit service that may be provided within the corridor, in order to potentially reduce vehicle traffic on Maple Grove Road. | The Regional Transportation Master Plan anticipates increased transit use in the Region and across the City of Cambridge with the ongoing residential development and community growth. Transit service is a necessary integral part of the Maple Grove Road Improvements in conjunction with road widening. | Carry forward in conjunction with other recommended alternatives |
| **Upgrade Other Routes** | By improving other existing road corridors that perform similar functions as Maple Grove Road, and by providing alterative connections to other arterial roads, (e.g., Hespeler Road north of Maple Grove Road to Kossuth Road), traffic could potentially be diverted away from Maple Grove Road. | The traffic study for this project includes consideration of the Region and City transportation master plans for upgrading other routes in the area. This alternative in itself will not address the capacity issues experienced on Maple Grove Road. However, planned upgrades to other roads will have to be undertaken regardless of the alternative chosen for Maple Grove Road. | Carry forward in conjunction with other recommended alternatives |
| **Build Alternative Routes** | The Regional Transportation Master Plans considers the possible need for new routes within the Regional Transportation Network as well as possible improvements to existing roads. New routes and improved roadway may increase or decrease future traffic within the existing Maple Grove Road Corridor. In some cases that may include the diversion of traffic away from the existing Maple Grove Road Corridor and Hespeler intersection. | A preliminary study was undertaken by the Region in relation to possible future expansion of the Waterloo Regional airport lands to the north. The study was investigative in nature only and has no official status. There are no other know planned alternative routes in this area of the Cambridge during the study horizon to 2041. | Do not carry forward |

**Comment Sheet**
**Regional Municipality of Waterloo**
**Maple Grove Road Improvements, Hespeler Road to Vondrau Drive**
**Public Consultation Centre No. 1 – July 27, 2020**

Please complete and place your comments in the comments box at the registration table so that your comments can be considered for this project. If you cannot complete your comments today, please take this home and mail, fax or email your comments by Monday, August 17th, 2020 to:

Justin Armstrong, P.Eng.
Region Project Manager
Region of Waterloo
150 Frederick Street, 6th Floor
Kitchener, ON N2G 4J3
Telephone: (519) 575-4400 Ext. 3164
Fax: (519) 575-4430
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John Bayley, P.Eng.
Consultant Project Manager
IBI Group
410 Albert Street, Suite 101
Waterloo, ON N2L 3V3
Telephone: (519) 585-2255 ext. 63220
Fax: (519) 585-2269
Email: john.bayley@ibigroup.com

**Comments regarding this project:**

_____

_____

_____

_____

_____

_____

_____

_____

Name : _____

Address : _____ Postal Code : _____

Phone : _____ Email : _____

Collection Notice:

All comments and information received from individuals, stakeholder groups, and agencies regarding these projects and meetings are being collected to assist the Region of Waterloo in making a decision. Under the "Municipal Act", personal information (such as name, address, telephone number and property location) which may be included in a submission becomes part of the public record. Questions regarding the collection should be forwarded to the staff member noted above.

**Additional Comments:**

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Region of Waterloo

# Maple Grove Road Improvements
# Vondrau Drive to Hespeler Road
# City of Cambridge
# Information Package

## Public Consultation Centre #2
## Online Review and Comment Period (www.engagewr.ca)
## Monday, June 28, 2021 – Friday, July 30, 2021

**What**: The Region of Waterloo is undertaking a Municipal Class Environmental Assessment (EA) of Maple Grove Road to determine needed corridor improvements.

**Where**: Maple Grove Road between Vondrau Drive and Hespeler Road in the City of Cambridge.

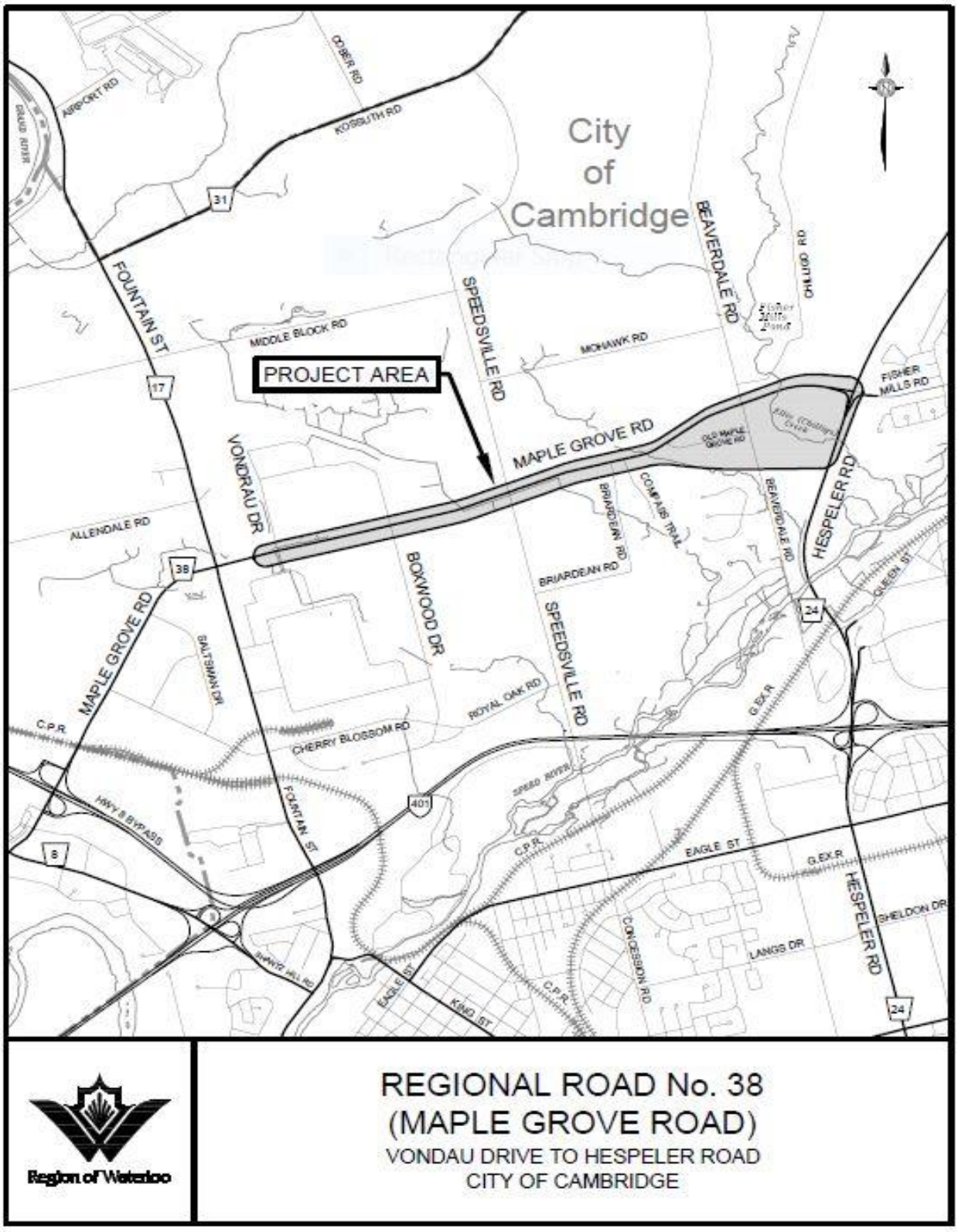
**Why**: To provide road improvements for traffic growth and transportation network improvements for pedestrians, cyclists, and transit along the corridor.

**When**: 2023-2028 Construction
(2021 Region Transportation Capital Program)

**Who**: Region of Waterloo, Project Manager
Justin Armstrong, P. Eng.
Region of Waterloo
Phone: (519) 575-4400 Ext. 3164
Email: JuArmstrong@regionofwaterloo.ca

**There is a comment sheet at the back of this package. Please fill it out and share your comments with us.**

**KEY PLAN**


City of Cambridge
PROJECT AREA
MAPLE GROVE RD
FOUNTAIN ST
VONDRAU DR
SPEEDSVILLE RD
BEAVERDALE RD
HESPELER RD
BOXWOOD DR
MIDDLE BLOCK RD
MOHAWK RD
ALLENDALE RD
BRIARDEAN RD
ROYAL OAK RD
CHERRY BLOSSOM RD
EAGLE ST
LANGS DR
SHELDON DR
CONCESSION RD
KING ST
FISHER MILLS RD
QUEEN ST
C.P.R.
G.EX.R.
HWY 8 BYPASS
401
Region of Waterloo
REGIONAL ROAD No. 38
(MAPLE GROVE ROAD)
VONDAU DRIVE TO HESPELER ROAD
CITY OF CAMBRIDGE

## 1. Why is the Region considering this project?

The 2018 Regional Transportation Master Plan Update has identified this section of Maple Grove Road for widening from 2 to 4 lanes to provide road improvements for traffic growth and active transportation improvements for pedestrians and cyclists, as well as transit, along the corridor.

Maple Grove Road is a key goods movement corridor and an Emergency Detour Route (EDR) for Highway 401.The proposed widening of Maple Grove Road will accommodate growth in the area and provide an efficient corridor for goods movement.

Currently there are no active transportation facilities within this section of Maple Grove Road and there is some transit use, which started in 2014 (Route 203 iXpress). Adding active transportation facilities and improved transit will provide users more, and better connections to, options along this corridor.

## 2. Who is directing this project?

The planning and design for this project is being directed by staff from the Region of Waterloo and City of Cambridge, along with Region of Waterloo (Cambridge) Councillor Karl Kiefer and City of Cambridge (Ward 1) Councillor Donna Reid. A representative from the Region's Active Transportation Advisory Committee is also included on the Project Team. The consulting engineering firm IBI Group has been retained by the Region of Waterloo to provide planning and preliminary design services during the planning phase of this project.

## 3. How is this project being planned?

This project is being planned in accordance with the requirements of the Municipal Class Environmental Assessment (Class EA) process. The Municipal Class EA process is a planning and decision-making process approved under the Environmental Assessment Act that is used by municipalities to plan public infrastructure projects in order that potential environmental impacts are considered before a project is approved. It requires consultation with the public, involved stakeholders, and agencies in consideration of alternatives and their potential impacts on the overall project environment.

This project is being planned as a Schedule C Class EA project, which applies to larger, more complex projects with the potential for significant environmental impacts (natural, social, cultural and economic) and requires multiple opportunities for public input.

The 2018 Regional Transportation Master Plan Update fulfills the requirements of the first two phases of the Maple Grove Road Class EA by: (1) establishing the need and justification for Maple Grove Road Improvements and (2) evaluating alternative methods of addressing corridor needs, including stakeholder consultation.

This study is undertaking Phase 3: Alternatives for the Preferred Solution, which will be followed by Phase 4: The Environmental Study Report documenting the identification of alternative

solutions based on needs and opportunities, evaluation of those alternative solutions in the context of several criteria, and selection of a preferred alternative solution.

## 4. What is the purpose of this 2nd Public Consultation Centre (PCC)?

The purpose of this 2nd Public Consultation Centre is for the public to provide input on:

a) The needs and opportunities for improvements on Maple Grove Road;

b) The alternative solutions considered by the Project Team for Maple Grove Road;

c) The criteria used to evaluate alternative solutions for improvements; and

d) The Project Team preferred alternative.

Region and project consultant staff are available both during and after the Online Review and Comment Period. We request that you fill out the Comment Sheet included within this Information Package and either email, fax, or mail it per the contact information provided on the Comment Sheet. Your comments will be considered by the Project Team in conjunction with all other relevant information in recommending a preferred alternative for this project.

## 5. What has happened since the 1st Public Consultation Centre (PCC)?

Following Public Consultation Centre #1, the Project Team collected and summarized all comments and feedback received. A summary of comments received, complete with responses from the Project Team, are included on both the Regional and EngageWR websites for the Maple Grove Road Improvements Project. The comments will also be summarized in a formal Public Consultation Summary Report, which will be documented in the Environmental Study Report (ESR).

The Project Team finalized the transportation analyses for Maple Grove Road between Vondrau Drive and Hespeler Road and confirmed the proposed intersection types for each intersection along the corridor. A Noise Impact Assessment was also completed for the Maple Grove Road corridor.

The Project Team has evaluated widening alignment, as well as cross-section, alternatives for the widening of Maple Grove Road and has chosen a preferred alternative.

The Project Team met with local businesses on April 8, 2021 to receive feedback on the preferred design alternative.

## 6. Are active transportation upgrades or road widening being considered?

Yes. Both active transportation upgrades and road widening are being considered in accordance with the following Regional master plans and guidelines.

The 2018 Regional Transportation Master Plan Update has identified the need to widen Maple

Grove Road to four (4) through lanes and add active transportation improvements for pedestrians, and cyclists, as well as transit (i.e. GRT), between Vondrau Drive and Hespeler Road.

Widening is required to address current and future traffic congestion concerns on Maple Grove Road, including planned development in the area.

The Context Sensitive Regional Transportation Corridor Design Guidelines (CDG) is a planning policy document that guides the design of Regional roads. The CDG identifies design parameters for necessary features within the road allowance such as vehicle lanes, active transportation, and boulevards. In accordance with the CDG, Maple Grove Road is identified as a “Community Connector”. Designing Maple Grove Road to support active transportation modes, including walking and cycling, is a fundamental character of this road classification.

The Regional Transportation Master Plan and Corridor Design Guidelines all support complete and continuous active transportation facilities on this section of Maple Grove Road for the full length of this project. Boulevard multi-use paths or sidewalks and cycling facilities on both sides of the road would satisfy that requirement.

## 7. Who will be responsible for the winter maintenance of new multi-use paths, sidewalks, and/or cycling facilities?

Maintenance of new active transportation facilities along Regional roads is the responsibility of the local municipality (City of Cambridge for this project).

## 8. Will the posted speed limit be changed?

Within the study limits, Maple Grove Road is currently posted at 70 km/h for most of the corridor. However, a short section of Maple Grove Road between Boxwood Drive and Beaverdale Road was recently posted at 60 km/h to facilitate a new uncontrolled pedestrian crossing at Compass Trail for GRT users. Speed limits will be further evaluated as part of the detailed design portion of the project.

## 9. Are noise barriers being considered for this project?

The Region has a Noise Policy used to determine when noise barriers, such as noise berms or walls, would be recommended as part of an upcoming project. Part B of the Region’s Noise Policy applies when a road widening is being considered. For this project, Part B of the Region’s Noise Policy would apply if Maple Grove Road is widened from two to four lanes.

A noise study has been completed following Part B of the Region’s Noise Policy for Maple Grove Road within the project limits assuming a 4-lane road with forecasted traffic volumes in 2036 and 2041. Based on the noise study results, noise attenuation is recommended at the following locations:

- Approximately 50 metres at No. 915 Briardean Road;
- Approximately 35 metres at No. 124 Compass Trail;

- Approximately 50 metres at No. 1905 Maple Grove Road;
- Approximately 35 metres at No. 2120 Maple Grove Road;
- Approximately 35 metres at No. 2140 Maple Grove Road;
- Approximately 35 metres at No. 2140 Maple Grove Road;
- Approximately 75 metres at No. 1905 Beaverdale Road;
- Approximately 70 metres at No. 1825 Beaverdale Road;
- Approximately 55 metres at No. 616 Fisher Mills Road;
- Approximately 30 metres at No. 610 Fisher Mills Road;
- Approximately 60 metres at No. 600 Fisher Mills Road;
- Approximately 95 metres at No. 566 Fisher Mills Road;
- Approximately 110 metres at No. 1840 Beaverdale Road; and
- Approximately 125 metres at No. 355 Fisher Mills Road.

Part C of the Region's Noise Policy could be applied in those areas where noise barriers are not recommended under Part B of the Noise Policy. Under Part C, a noise barrier may be considered under certain circumstances, if property owners are willing to share in the cost of a noise attenuation.

A summary of Parts B and C of the Region's Noise Policy is included (Appendix A).

## 10. How has the natural environment been considered for this project?

As part of the environmental inventory for the project, an Environment Impact Study (EIS) for the natural environment has been completed. Included within the EIS are: terrestrial surveys, vegetation surveys, breeding bird surveys, nocturnal bird surveys, an anuran call survey, bat habitat assessment, aquatic habitat assessment, and fish community sampling. The review includes areas of concern under the jurisdiction of the Grand River Conservation Authority and includes existing natural features such as Ellis Creek, Middle Creek/Hunsperger Drain, East Creek, and Provincially Significant Wetlands within or adjacent to the Maple Grove Road corridor.

A detailed tree inventory was completed within the study area. The existing trees were assessed for overall health and significance, which will be documented in the Environmental Study Report (ESR) and included in tree protection plans to be acknowledged during the future detailed design phase of the project. Where trees may be impacted or removed, a compensation strategy will be developed as part of the tree management and landscaping design during detailed design. Any vegetation clearing required for the recommended design alternative will occur outside of the seasonal nesting window for birds listed under the Migratory Birds Convention Act.

Information gathered through background review and field investigations, combined with technical input from reviewing agencies, was used to inform the evaluation of alternatives from a

natural environment perspective, as well as determining mitigation strategies to avoid or minimize impacts to natural heritage.

If the recommended design alternative is determined to impact wildlife or their habitat, mitigating measures will be identified in the Environmental Study Report (ESR) to be filed with the Ministry of the Environment, Conservation and Parks (MECP) and addressed during the future detailed design phase of the project.

## 11. How has the cultural / heritage / archaeological environment been considered for this project?

A Stage 1 Archaeological Assessment was completed in January 2019. The background study determined that thirty-one (31) previously registered archaeological sites are located within one kilometre of the study area. The property inspection determined that parts of the study area exhibit archaeological potential and, if proposed to be impacted, will require Stage 2 Archaeological Assessment by test pit or pedestrian survey, prior to any proposed construction. Archaeological impact will be considered further during the development of detailed design work, prior to the construction of any recommended transportation network improvements associated with the Maple Grove Road corridor.

One (1) site within the Study Area retains Cultural Heritage Value or Interest (CHVI). If this site is impacted by construction, it will require Stage 3 site-specific assessment, in order to more fully identify the character, extent, and significance of any potential archaeological deposits, prior to any proposed construction.

The remainder of the study area, having been subjected to deep soil disturbance events, does not retain archaeological potential based on prior archaeological assessment, in particular for slopes in excess of 20 degrees, and low areas with wet conditions.

A Cultural Heritage Resource Assessment was completed in January 2019. A review of available cultural heritage resource inventories revealed that there are no properties within the study area that are Designated under Part IV of the Ontario Heritage Act for their cultural heritage significance. The City of Cambridge Heritage Properties Register includes seven (7) Non-designated (listed) properties within the study area, which contain a Built Heritage Resource, may have cultural heritage value and be considered for future designation under the Ontario Heritage Act.

No direct impacts to identified cultural heritage resources are anticipated.

Where feasible, the recommended design alternative will be designed in a manner that avoids indirect impacts (i.e. tree removal, grading, and/or property acquisition). Where indirect impacts are anticipated adjacent to identified cultural heritage resources, or within the property parcel of an identified resource which will not directly or significantly impact the identified cultural heritage value of a property, a Heritage Impact Assessment (HIA) may be required by the Region of Waterloo and/or the City of Cambridge prior to construction.

Construction activities and staging should be suitably planned and undertaken to avoid impacts to identified cultural heritage resources. Potential archaeological impacts and mitigation measures for cultural heritage resources will be included in the Environmental Study Report to be filed with the Ministry of the Environment, Conservation and Parks.

## 12. Are roundabouts recommended for this project?

Roundabout Screenings and Intersection Control Studies were undertaken for all intersections along Maple Grove Road between Vondrau Drive and Hespeler Road. Roundabouts were considered for all major intersections (Vondrau Drive, Boxwood Drive, Speedsville Road, Beaverdale Road, and Hespeler Road). Expanded Traffic Control Signalized Intersections (including dedicated left- and right-turn lanes) were also considered for all major intersections. Detailed traffic analyses and simulation (VISSIM modeling) were undertaken to determine minimum traffic delays, and highest level of service from a traffic operations perspective.

In addition to the required road widening, traffic signal and intersection improvements, new roundabouts at Beaverdale Road and Hespeler Road, and a new signalized intersection at Boxwood Drive (Figure 1) are supported by the transportation analyses. In addition, the ultimate condition recommends a grade-separated flyover at Hespeler Road.

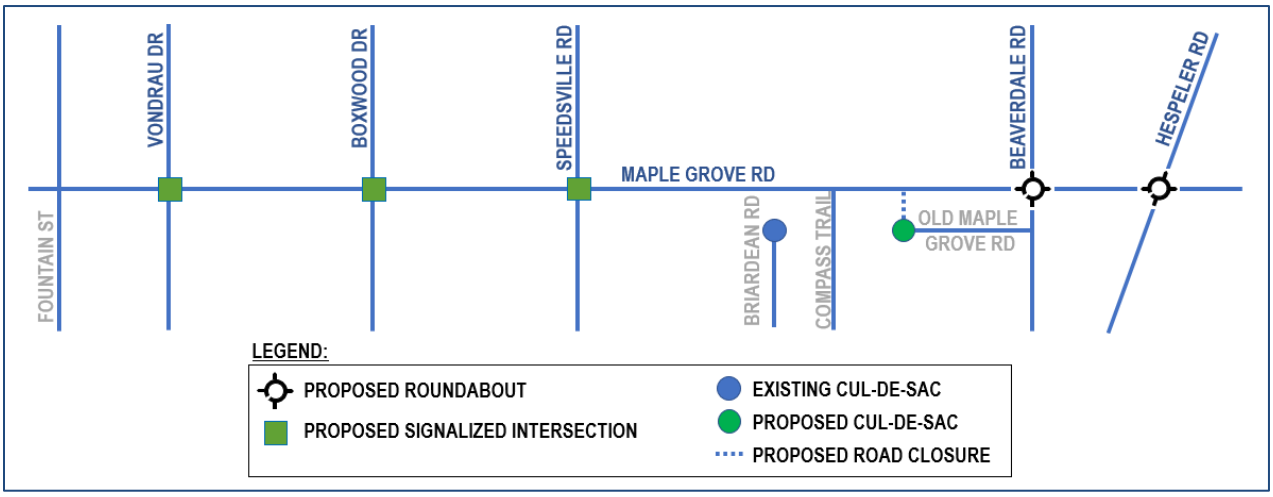



Figure 1. Proposed intersection types for Maple Grove Road.

## 13. What alternative widening alignments were considered for the widening of Maple Grove Road? How were they evaluated?

In addition to the required Do Nothing alternative, four (4) alternatives were evaluated for the widening of Maple Grove Road from two (2) to four (4) lanes:

- **Concept 1** - Widening equally about the corridor centreline;
- **Concept 2** - Widening to the north;
- **Concept 3** - Widening to the south; and
- **Concept 4** - A hybrid of widening north and south to minimize overall potential impacts.

Widening this section of Maple Grove Road to 4-lanes is common to all alternatives, except the Do Nothing alternative, and satisfies Regional goals.

For the evaluation of alternative widening alignments, the Project Team identified evaluation criteria for each of the alternatives to be compared. The evaluation criteria were: Natural Environment; Socio-Economic Environment; Transportation; and Cost. Each evaluation criteria included specific factors and indicators to determine the impacts / benefits of each alternative.

The Do Nothing alternative was screened out because it does not satisfy Region objectives for the corridor as identified in the 2018 Regional Transportation Plan Update (“Moving Forward”). Specifically, the need to widen the roadway to accommodate future traffic growth and forecasted intersection operational deficiencies, as well as adding active transportation and transit facilities, are not addressed by the Do Nothing alternative.

The purpose of the Hybrid Widening alternative (Concept 4) was to develop a best case scenario, which is a combination of the other alternatives to minimize overall potential impacts on the environment. By widening in the direction required to minimize potential overall environmental impacts, the Hybrid Widening alternative meets the intention of the Class EA process.

Following Public Consultation Centre #1, the Project Team reviewed public and agency input, as well as the various inventories and identified constraints, in order to finalize the evaluation of the alternatives.

Results of the Project Team evaluation of widening alternatives was tabulated (Appendix B).

## 14. What cross-section alternatives were considered for Maple Grove Road? How were they evaluated?

Cross-section alternatives (Appendix C) which satisfied the study opportunities for improvement and were evaluated by the Project Team are described below:

- **Do Nothing Alternative** – this alternative would include reconstructing the road in its current 2-lane rural (ditch drainage) cross-section with no active transportation facilities.

- **Alternative A – Widen the Road to 4-lanes with a 5.0m wide Raised Centre Median and Add Multi-use Path (MUP)** – this alternative would widen this section of Maple Grove Road to 4-lanes (divided) and add the following facilities:

    - 3.0 metre wide asphalt multi-use path along both sides;
    - Curb and gutter and a storm drainage system; and
    - Additional street lighting.

- **Alternative B – Widen the Road to 4-lanes with a 5.0m wide Raised Centre Median and Add 1.8m wide Sidewalk and 1.7m Bike Lanes** – this alternative would widen this section of Maple Grove Road to 4-lanes (divided) and add the following facilities:

    - 1.8 metre wide concrete sidewalks along both sides;
    - 1.7 metre wide asphalt roadside bike lanes separated with rollover curb;
    - Curb and gutter and a storm drainage system; and
    - Additional street lighting.

For the evaluation of alternative design cross-sections, the Project Team identified evaluation criteria for each of the alternatives to be compared. The evaluation criteria were: Natural Environment, Socio-Economic Environment; Transportation; and Cost. Each evaluation criteria included specific factors and indicators to determine the impacts / benefits of each alternative.

Results of the Project Team evaluation of alternative design cross-sections was tabulated (Appendix D).

## 15. What is the Project Team Preferred Alternative?

Based on the evaluation of widening alignment alternatives and alternative design cross-sections, including public and agency input, as well as the various inventories and identified constraints, the Project Team's Preferred Alternative includes the following:

- Widening Alignment Alternative – Concept 4 – Hybrid widening concept to minimize overall environmental impacts.

- Cross-Section Alternative A – Widen the road to four (4) lanes, with raised centre median, and 3.0m Multi-Use Path on both sides.

## 16. Is any private property required for the Preferred Alternative?

One of the goals of the planning and design process is to minimize the impact on adjacent properties and the need to acquire private property. An initial review of the existing road allowance indicates that along the Maple Grove Road corridor, there are some areas where the existing road right-of-way will need to be widened in order to accommodate required improvements. In addition, there are locations at intersections where an expanded traffic control signalized intersection or a roundabout will require additional parcels of property. Property requirements will be represented through mapping included in the Public Consultation Centre #2 display boards.

The Region may need to obtain temporary access at some locations along the right-of-way limit for construction grading activities, which will be confirmed through future detailed design. In areas where property or temporary access is required, the property owner will be contacted directly by the Region of Waterloo's Land Purchasing Officer. Compensation would be provided at fair market rates based on recent similar area sales. The Region's property acquisition process (Appendix E) will be followed.

## 17. What is the estimated cost of this project?

The cost of this project will depend on the approved improvement alternative, as well as necessary infrastructure relocations, replacements, utility relocations, and property acquisitions. Funding in the amount of approximately $58 Million for the improvements on Maple Grove Road is included in the Region's 2021 Transportation Capital Program. Funding includes approximately $1.0 Million for active transportation facilities (i.e. multi-use pathways).

## 18. What is the project schedule and what are the next steps for improvements on Maple Grove Road?

The Project Team will review the public comments received from this Public Consultation Centre and use them as input for completion of the Maple Grove Road Class Environmental Assessment.

After consideration of all technical information completed and public input received, the Project Team will present a recommendation to Regional Council in late 2021 or early 2022 for approval of an improvement alternative that best meets the needs of the public while minimizing the overall project impact on the environment.

Pending project approval by Regional Council, detailed design, and utility relocations are scheduled in the 2021 Regional Transportation (10-Year) Capital Program to be completed throughout 2022 and 2023, with construction between 2023 and 2026.

## 19. How will I receive further notification regarding this project?

Property owners and tenants abutting the project site and members of the public requesting to be included on the Project Contact List through this Public Consultation Centre will receive all forthcoming public correspondence and will be notified of all future meetings.

## 20. How can I provide my comments?

In order to assist the Project Team in addressing any comments or concerns you might have regarding this project, we ask that you fill out the attached Comment Sheet and email, fax, or mail your comments to the Project Team members listed below, no later than Friday, July 30, 2021 (the end of the Public Consultation Centre #2 online review and comment period).

We thank you for your involvement and should you have any questions or concerns please contact one of the following:

Justin Armstrong, P. Eng.
Senior Project Manager
Region of Waterloo
150 Frederick Street, 6th Floor
Kitchener, ON N2G 4J3
Telephone: 519-575-4400 Ext. 3164
Fax: 519-575-4430
Email: JuArmstrong@regionofwaterloo.ca

John Bayley, P.Eng.
Associate Director, Practice Lead
IBI Group
410 Albert Street, Suite 101
Waterloo, ON N2L 3V3
Telephone: 519-585-2255 Ext. 63220
Email: john.bayley@ibigroup.com

## 21. How can I view project information following PCC #2?

All of the Public Consultation Centre #2 display materials and other relevant project information, notifications of upcoming meetings, and contact information are available for viewing at the Region of Waterloo municipal office as identified above. Alternatively, you may visit the Region's website at www.regionofwaterloo.ca.

# Comment Sheet
# Regional Municipality of Waterloo
# Maple Grove Road Improvements
# Public Consultation Centre #2
# Online Review and Comment Period – June 28 – July 30, 2021

Please complete and forward this sheet so that your comments can be considered for this project. Please email, fax, or mail your comments within the online review and comment period to:

Justin Armstrong, P. Eng.
Senior Project Manager
Region of Waterloo
150 Frederick Street, 6th Floor
Kitchener, ON N2G 4J3
Telephone: 519-575-4400 Ext. 3164
Fax: 519-575-4430
Email: JuArmstrong@regionofwaterloo.ca

John Bayley, P.Eng.
Associate Director, Practice Lead
IBI Group
410 Albert Street, Suite 101
Waterloo, ON N2L 3V3
Telephone: 519-585-2255 Ext. 63220
Email: john.bayley@ibigroup.com

**Comments regarding this project:**

**Name:**

**Address:**

**Postal Code:**

**Phone:** **Email:**

Collection Notice:

All comments and information received from individuals, stakeholder groups, and agencies regarding these projects and meetings are being collected to assist the Region of Waterloo in making a decision. Under the “Municipal Act”, personal information (such as name, address, telephone number, and property location) which may be included in a submission becomes part of the public record. Questions regarding collection should be forwarded to the staff member noted above.

## Appendix A

## Summary of Region Noise Policy

The Region's Noise Policy is made up of three Parts:

**Part A:** **New development** impacted by existing roads and railways.

**Part B:** **Existing development** impacted by proposed Regional road widenings.

**Part C:** **Existing development** impacted by noise from existing Regional roads.

Since there is no new development proposed, only **Parts B or C** may apply to this project.

The Maple Grove Road Class Environmental Assessment from Vondrau Drive to Hespeler Road is proposing to:

- ✓ **Widen** Maple Grove Road between Vondrau Drive and Hespeler Road – therefore Part B applies.
  - Noise is calculated at a residence **outdoor living area** – typically defined as the backyard or patio within 3 metres of the rear wall of a residential unit.
  - Noise is calculated using a Ministry of the Environment, Conservation and Parks (MECP) model that calculates a 16-hour average noise level for the outdoor living area based on several factors, such as traffic volumes, distance from the outdoor living area to the centre of the road, and elevation differences between the outdoor living area to the centre of the road. The noise level used in the policy is not based on peak levels that may be recorded at a given location/time.

### Part B of Region Noise Policy – Road Widening

The Region will consider designing and constructing a noise barrier if:

- ✓ The projected noise level in 10 years is calculated to exceed 65 dBa; or
- ✓ The projected noise level in 10 years is calculated to exceed 60 dBa and increase the existing noise level by 5dBa or more.

By constructing a noise barrier, projected noise is required to be calculated to be reduced to 60 dBa or less and reduced by 5dBa or more.

### Part C of Region Noise Policy – No Road Widening – Existing Condition

The Region will consider cost-sharing (50-50) noise barrier design and construction if:

- ✓ A resident raises a noise concern; and

- ✓ Existing noise levels are calculated to exceed 60dBa.

If two-thirds (2/3) of affected property owners representing at least 50% of the property value are in agreement to build a noise barrier, all property owners will be responsible to pay 50% of the noise barrier cost (based on length of wall installed along their property line) with payments charged over a period of ten (10) years (in accordance with Local Improvement Act).

Residents may also decide to take other measures such as installing a privacy fence, air conditioning, and/or window improvements at their own expense.

| Evaluation of Widening Alternatives | | | | | |
|---|---|---|---|---|---|
| **Alternative Design Concept** | **DO NOTHING**<br>**"MAINTAIN STATUS QUO"** | **CONCEPT NO. 1**<br>**WIDENING EQUALLY ABOUT EXISTING CENTRELINE** | **CONCEPT NO. 2**<br>**WIDENING TO THE NORTH** | **CONCEPT NO. 3**<br>**WIDENING TO THE SOUTH** | **CONCEPT NO. 4**<br>**MODIFIED "HYBRID WIDENING CONCEPT" TO MINIMIZE OVERALL IMPACTS** |
| **Description** | **This alternative is carried forward for comparative purposes only but is pre-screened out for not satisfying the project Problem/Opportunity Statement. "Do Nothing" assumes that no changes of any kind are made within the corridor.** | **Balanced widening in the existing corridor from Vondrau Drive to Hespeler Road.** | **Balanced widening from Vondrau Drive to east of Boxwood Drive, then shifting widening to the north from east of Boxwood Drive (Sta. 4+840) to Beaverdale Road, and a balanced widening from there to Hespeler Road.** | **Balanced widening from Vondrau Drive to east of Boxwood Drive, then shifting widening to the south from east of Boxwood Drive (Sta. 4+840) to Beaverdale Road, and a balanced widening from there to Hespeler Road.** | **Balanced widening from Vondrau Drive to east of Boxwood Drive, then shifting widening to the north from east of Boxwood Drive (Sta. 4+840) to east of Middle Creek (Sta. 5+840). From Sta. 5+840, the widening is typically balanced, as it is in Option 1, and remains there to termination at Hespeler Road.** |
| **Natural Environment**<br>How might the alternative affect existing trees, vegetation and wildlife? | ➢ No impacts on terrestrial habitat are anticipated.<br>➢ No impact on existing watercourses. Culvert widening is not required.<br>➢ Existing Provincially Significant Wetland (PSW) is unaffected<br>➢ No property is required for SWM facilities.<br>➢ Existing flow regime is maintained. Deficiencies would continue.<br>➢ Surface water runoff would continue to be untreated. Status quo is maintained.<br>➢ No impact on wildlife resources. | ➢ 97 Trees and 1,675m2 of woodland vegetation are impacted.<br>➢ 2 Regionally significant Black Walnut Trees are directly impacted.<br>➢ Floodplain area impacted by transition grading is 51,740m2.<br>➢ Grading impacts adjacent to Hunsperger Drain is 12,400m2.<br>➢ Approximately 3,330m2 of Provincially Significant Wetland (PSW) is potentially impacted.<br>➢ A total of 0.10 ha. of private property is expected to be required for SWM facilities.<br>➢ Culvert widening on both sides (or full replacement) would be required at Middle Creek east of Boxwood Drive, at Speedsville Road on the Hunsperger Drain, at Middle Creek east of Speedsville Road, and at East Creek. 107m of existing culvert extensions are anticipated.<br>➢ Has the second highest physical impact on the Hunsperger Drain along the south side of Maple Grove Road. | ➢ 92 Trees and 2,670m2 of woodland vegetation are impacted.<br>➢ Regionally significant Black Walnut Trees are not directly impacted.<br>➢ Floodplain area impacted by transition grading is 52,240m2.<br>➢ Grading impacts adjacent to Hunsperger Drain is 11,100m2.<br>➢ Approximately 3,990m2 of Provincially Significant Wetland (PSW) is potentially impacted.<br>➢ A total of 0.10 ha. of private property is expected to be required for SWM facilities.<br>➢ Culvert widening on the north side (or full replacement) would be required at Middle Creek east of Boxwood Drive, at Speedsville Road on the Hunsperger Drain, at Middle Creek east of Speedsville Road, and at East Creek. 115m of existing culvert extensions are anticipated.<br>➢ Has the second lowest physical impact on the Hunsperger Drain along the south side of Maple Grove Road. | ➢ 105 Trees and 2,560m2 of woodland vegetation are impacted.<br>➢ 2 Regionally significant Black Walnut Trees are directly<br>➢ Floodplain area impacted by transition grading is 51,670m2.<br>➢ Grading impacts adjacent to Hunsperger Drain is 14,100m2.<br>➢ Approximately 3,600m2 of Provincially Significant Wetland (PSW) is potentially impacted.<br>➢ A total of 0.10 ha. of private property is expected to be required for SWM facilities.<br>➢ Culvert widening on the south side (or full replacement) would be required at Middle Creek east of Boxwood Drive, at Speedsville Road on the Hunsperger Drain, at Middle Creek east of Speedsville Road, and at East Creek. 106m of existing culvert extensions are anticipated.<br>➢ Has the greatest impact on the Hunsperger Drain and would require full reconstruction of the municipal drain | ➢ 101 Trees and 2,188m2 of woodland vegetation are impacted.<br>➢ Regionally significant Black Walnut Trees are not directly impacted.<br>➢ Floodplain area impacted by transition grading is 52,390m2.<br>➢ Grading impacts adjacent to Hunsperger Drain is 11,300m2.<br>➢ Approximately 3,650m2 of Provincially Significant Wetland (PSW) is potentially impacted.<br>➢ A total of 0.10 ha. of private property is expected to be required for SWM facilities.<br>➢ Culvert widening on the north side of Maple Grove Road at Middle Creek east of Boxwood Drive, at Speedsville Road on the Hunsperger Drain, and at Middle Creek east of Speedsville Road. 111m of existing culvert extensions are anticipated.<br>➢ Has the least physical impact on the Hunsperger Drain along the south side of Maple Grove Road. |
| | Does not address the Problem/Opportunity Statement | VERY GOOD | GOOD | GOOD | VERY GOOD |

| Evaluation of Widening Alternatives | | | | | |
|---|---|---|---|---|---|
| **Alternative Design Concept** | **DO NOTHING**<br>**"MAINTAIN STATUS QUO"** | **CONCEPT NO. 1**<br>**WIDENING EQUALLY ABOUT EXISTING CENTRELINE** | **CONCEPT NO. 2**<br>**WIDENING TO THE NORTH** | **CONCEPT NO. 3**<br>**WIDENING TO THE SOUTH** | **CONCEPT NO. 4**<br>**MODIFIED "HYBRID WIDENING CONCEPT" TO MINIMIZE OVERALL IMPACTS** |
| **Description** | **This alternative is carried forward for comparative purposes only but is pre-screened out for not satisfying the project Problem/Opportunity Statement. "Do Nothing" assumes that no changes of any kind are made within the corridor.** | **Balanced widening in the existing corridor from Vondrau Drive to Hespeler Road.** | **Balanced widening from Vondrau Drive to east of Boxwood Drive, then shifting widening to the north from east of Boxwood Drive (Sta. 4+840) to Beaverdale Road, and a balanced widening from there to Hespeler Road.** | **Balanced widening from Vondrau Drive to east of Boxwood Drive, then shifting widening to the south from east of Boxwood Drive (Sta. 4+840) to Beaverdale Road, and a balanced widening from there to Hespeler Road.** | **Balanced widening from Vondrau Drive to east of Boxwood Drive, then shifting widening to the north from east of Boxwood Drive (Sta. 4+840) to east of Middle Creek (Sta. 5+840). From Sta. 5+840, the widening is typically balanced, as it is in Option 1, and remains there to termination at Hespeler Road.** |
| **Socio-Economic Environment**<br>How might the alternative affect the residential and commercial properties abutting the road (driveways, access, property impacts, noise, air quality, streetscaping / beautification potential and archaeological / heritage resources)? | ➢ No direct property impacts. Access challenges would continue to increase as area traffic volumes and delay increase.<br>➢ No additional property would be required.<br>➢ Traffic congestion and delay would extend the duration of noise impacts as traffic volumes increase.<br>➢ No encroachment on areas of Archaeological Potential.<br>➢ No opportunity for enhanced streetscaping. | ➢ Widening brings traffic closer to buildings and residences, noise levels would increase and as a result may require mitigation or additional property buyouts where resident concerns cannot be mitigated.<br>➢ Portions of 23 Private Properties would need to be purchased.<br>➢ 2 properties may require a complete buyout.<br>➢ Including potential buyouts, the total of potentially impacted property is 2.49 ha.<br>➢ Approximately 860m total of noise attenuation is expected at various locations along the corridor.<br>➢ Areas of previously undisturbed right of way or grading encroachment beyond right of way limits must be test pitted or pedestrian surveyed to investigate for archaeological artifacts.<br>➢ Lands associated with three (3) Built Heritage Resources may be impacted.<br>➢ Opportunities for enhanced streetscaping. | ➢ Widening brings traffic closer to buildings and residences, noise levels would increase and as a result may require mitigation or additional property buyouts where resident concerns cannot be mitigated.<br>➢ Portions of 24 Private Properties would need to be purchased.<br>➢ 2 properties may require a complete buyout.<br>➢ Including potential buyouts, the total of potentially impacted property is 2.39 ha.<br>➢ Approximately 860m total of noise attenuation is expected at various locations along the corridor.<br>➢ Areas of previously undisturbed right of way or grading encroachment beyond right of way limits must be test pitted or pedestrian surveyed to investigate for archaeological artifacts.<br>➢ Lands associated with three (3) Built Heritage Resources may be impacted.<br>➢ Opportunities for enhanced streetscaping. | ➢ Widening brings traffic closer to buildings and residences, noise levels would increase and as a result may require mitigation or additional property buyouts where resident concerns cannot be mitigated.<br>➢ Portions of 29 Private Properties would need to be purchased.<br>➢ 2 properties may require a complete buyout.<br>➢ Including potential buyouts, the total of potentially impacted property is 2.76 ha.<br>➢ Approximately 860m total of noise attenuation is expected at various locations along the corridor.<br>➢ Areas of previously undisturbed right of way or grading encroachment beyond right of way limits must be test pitted or pedestrian surveyed to investigate for archaeological artifacts.<br>➢ Lands associated with three (3) Built Heritage Resources may be impacted.<br>➢ Opportunities for enhanced streetscaping. | ➢ Widening brings traffic closer to buildings and residences, noise levels would increase and as a result may require mitigation or additional property buyouts where resident concerns cannot be mitigated.<br>➢ Portions of 23 Private Properties would need to be purchased.<br>➢ 2 properties may require a complete buyout.<br>➢ Including potential buyouts, the total of potentially impacted property is 2.38 ha.<br>➢ Approximately 860m total of noise attenuation is expected at various locations along the corridor.<br>➢ Areas of previously undisturbed right of way or grading encroachment beyond right of way limits must be test pitted or pedestrian surveyed to investigate for archaeological artifacts.<br>➢ Lands associated with three (3) Built Heritage Resources may be impacted.<br>➢ Opportunities for enhanced streetscaping. |
| | Does not address the Problem/Opportunity Statement | GOOD | GOOD | GOOD | VERY GOOD |

| Evaluation of Widening Alternatives | | | | | |
|---|---|---|---|---|---|
| **Alternative Design Concept** | **DO NOTHING**<br>**"MAINTAIN STATUS QUO"** | **CONCEPT NO. 1**<br>**WIDENING EQUALLY ABOUT EXISTING CENTRELINE** | **CONCEPT NO. 2**<br>**WIDENING TO THE NORTH** | **CONCEPT NO. 3**<br>**WIDENING TO THE SOUTH** | **CONCEPT NO. 4**<br>**MODIFIED "HYBRID WIDENING CONCEPT" TO MINIMIZE OVERALL IMPACTS** |
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| **Transportation**<br>How might the alternative serve the expected vehicular, transit, pedestrian, and cycling traffic in terms of travel delay, safety, and emergency access? | ➢ The existing Maple Grove Road configuration does not satisfy the requirements for existing and forecasted traffic volumes. Active Transportation facilities are not fully supported by the current roadway.<br>➢ Existing through lanes with turn lanes at intersections would not handle forecasted traffic volumes to 2036 and 2041.<br>➢ Existing roadway capacity creates delay to transit service.<br>➢ The existing roadway configuration would impact response times due to existing and forecasted congestion and delay.<br>➢ Do Nothing Alternative excludes changes to pedestrian facilities and excludes additional cycling provisions. | ➢ A widened Maple Grove Road including active transportation facilities on both sides would serve the current vehicle, pedestrian, and cycling needs and would agree with the Region of Waterloo Active Transportation Master Plan (ATMP).<br>➢ Four (4) through traffic lanes, two in each direction, plus turn lanes at intersections would accommodate forecasted traffic volumes to 2036 and 2041.<br>➢ Additional through traffic lane capacity, as well as potential bus stop enhancements may promote greater transit service efficiency within and through the corridor.<br>➢ Emergency response times are expected to improve due to overall reductions in delay and congestion because of improved traffic flow and capacity.<br>➢ Continuous AODA-compliant active transportation facilities on both sides can be accommodated by all concepts, except the "Do Nothing" alternative. | ➢ A widened Maple Grove Road including active transportation facilities on both sides would serve the current vehicle, pedestrian, and cycling needs and would agree with the Region of Waterloo Active Transportation Master Plan (ATMP).<br>➢ Four (4) through traffic lanes, two in each direction, plus turn lanes at intersections would accommodate forecasted traffic volumes to 2036 and 2041.<br>➢ Additional through traffic lane capacity, as well as potential bus stop enhancements may promote greater transit service efficiency within and through the corridor.<br>➢ Emergency response times are expected to improve due to overall reductions in delay and congestion because of improved traffic flow and capacity.<br>➢ Continuous AODA-compliant active transportation facilities on both sides can be accommodated by all concepts, except the "Do Nothing" alternative. | ➢ A widened Maple Grove Road including active transportation facilities on both sides would serve the current vehicle, pedestrian, and cycling needs and would agree with the Region of Waterloo Active Transportation Master Plan (ATMP).<br>➢ Four (4) through traffic lanes, two in each direction, plus turn lanes at intersections would accommodate forecasted traffic volumes to 2036 and 2041.<br>➢ Additional through traffic lane capacity, as well as potential bus stop enhancements may promote greater transit service efficiency within and through the corridor.<br>➢ Emergency response times are expected to improve due to overall reductions in delay and congestion because of improved traffic flow and capacity.<br>➢ Continuous AODA-compliant active transportation facilities on both sides can be accommodated by all concepts, except the "Do Nothing" alternative. | ➢ A widened Maple Grove Road including active transportation facilities on both sides would serve the current vehicle, pedestrian, and cycling needs and would agree with the Region of Waterloo Active Transportation Master Plan (ATMP).<br>➢ Four (4) through traffic lanes, two in each direction, plus turn lanes at intersections would accommodate forecasted traffic volumes to 2036 and 2041.<br>➢ Additional through traffic lane capacity, as well as potential bus stop enhancements may promote greater transit service efficiency within and through the corridor.<br>➢ Emergency response times are expected to improve due to overall reductions in delay and congestion because of improved traffic flow and capacity.<br>➢ Continuous AODA-compliant active transportation facilities on both sides can be accommodated by all concepts, except the "Do Nothing" alternative. |
| | Does not address the Problem/Opportunity Statement | EXCELLENT | EXCELLENT | EXCELLENT | EXCELLENT |

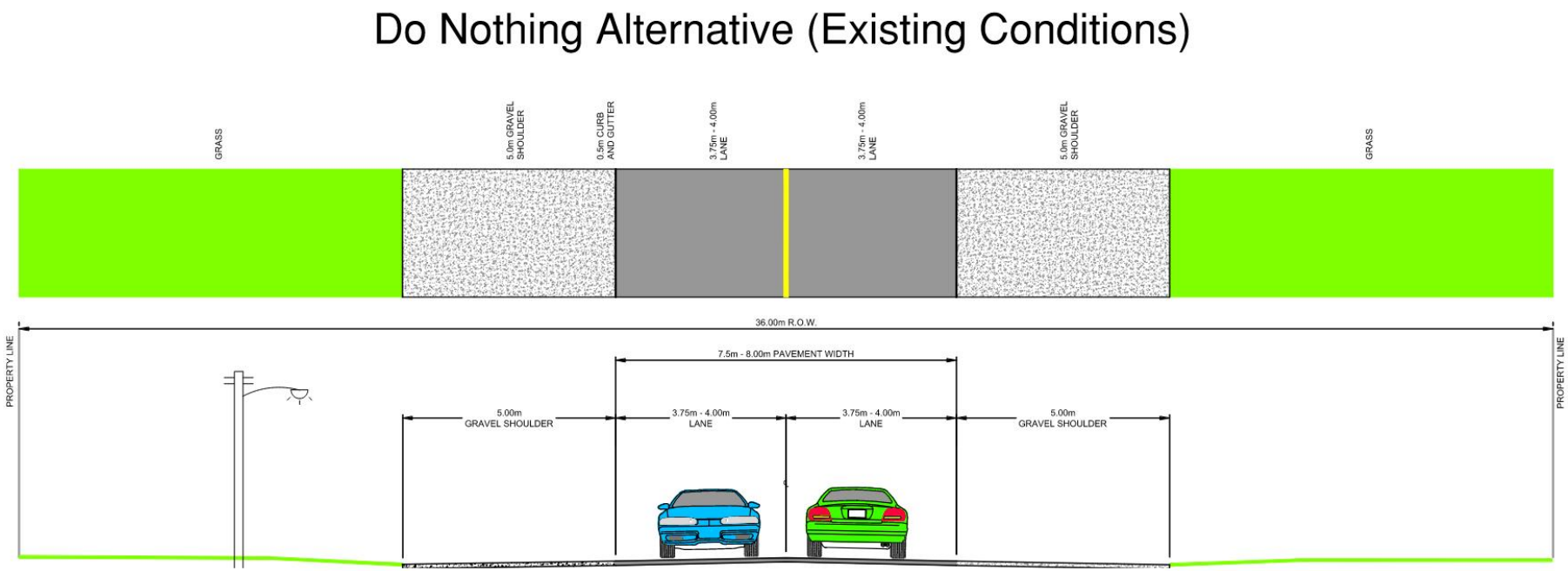
**Appendix B – Project Team Evaluation of Alternative Widening Alignments (Cost / Overall)**

## Evaluation of Widening Alternatives

| Alternative Design Concept | DO NOTHING<br>"MAINTAIN STATUS QUO" | CONCEPT NO. 1<br>WIDENING EQUALLY ABOUT EXISTING CENTRELINE | CONCEPT NO. 2<br>WIDENING TO THE NORTH | CONCEPT NO. 3<br>WIDENING TO THE SOUTH | CONCEPT NO. 4<br>MODIFIED "HYBRID WIDENING CONCEPT" TO MINIMIZE OVERALL IMPACTS |
|---|---|---|---|---|---|
| **Description** | **This alternative is carried forward for comparative purposes only but is pre-screened out for not satisfying the project Problem/Opportunity Statement. "Do Nothing" assumes that no changes of any kind are made within the corridor.** | **Balanced widening in the existing corridor from Vondrau Drive to Hespeler Road.** | **Balanced widening from Vondrau Drive to east of Boxwood Drive, then shifting widening to the north from east of Boxwood Drive (Sta. 4+840) to Beaverdale Road, and a balanced widening from there to Hespeler Road.** | **Balanced widening from Vondrau Drive to east of Boxwood Drive, then shifting widening to the south from east of Boxwood Drive (Sta. 4+840) to Beaverdale Road, and a balanced widening from there to Hespeler Road.** | **Balanced widening from Vondrau Drive to east of Boxwood Drive, then shifting widening to the north from east of Boxwood Drive (Sta. 4+840) to east of Middle Creek (Sta. 5+840). From Sta. 5+840, the widening is typically balanced, as it is in Option 1, and remains there to termination at Hespeler Road.** |
| **Cost**<br>What is the total cost of the alternative, including the cost for road construction, utility and street-lighting relocations, property acquisitions, traffic signal and intersection improvements, and landscaping? | ➢ Existing Utilities are unaffected by the "Do Nothing" Alternative. | ➢ No significant impacts to existing underground gas lines, watermains, sewers, or communications cables, anticipated other than minor relocations / adjustments.<br>➢ 47 Hydro poles, 26 Traffic Signal poles and 8 Street Light poles would have to be relocated, for a total estimated cost of **$1.84M** for utility relocations.<br>➢ Preliminary Total Cost Estimate, including the following:<br>o Property acquisition<br>o Road and Drainage Works<br>o Signals/Illumination<br>o Roadside Protection and Line Markings<br>o Bridges & Culvert Extensions and Replacement<br>o Active transportation Facilities and Landscaping<br>o Engineering<br>➢ **TOTAL** (Excl. HST) = **$52.7M** (Including Utility Impacts) | ➢ No significant impacts to existing underground gas lines, watermains, sewers, or communications cables, anticipated other than minor relocations / adjustments.<br>➢ 61 Hydro poles, 26 Traffic Signal poles and 10 Street Light poles would have to be relocated, for a total estimated cost of **$2.15M** for utility relocations.<br>➢ Preliminary Total Cost Estimate, including the following:<br>o Property acquisition<br>o Road and Drainage Works<br>o Signals/Illumination<br>o Roadside Protection and Line Markings<br>o Bridges & Culvert Extensions and Replacement<br>o Active transportation Facilities and Landscaping<br>o Engineering<br>➢ **TOTAL** (Excl. HST) = **$52.6M** (Including Utility Impacts) | ➢ No significant impacts to existing underground gas lines, watermains, sewers, or communications cables, anticipated other than minor relocations / adjustments.<br>➢ 60 Hydro poles, 26 Traffic Signal poles and 17 Street Light poles would have to be relocated, for a total estimated cost of **$2.23M** for utility relocations.<br>➢ Preliminary Total Cost Estimate, including the following:<br>o Property acquisition<br>o Road and Drainage Works<br>o Signals/Illumination<br>o Roadside Protection and Line Markings<br>o Bridges & Culvert Extensions and Replacement<br>o Active transportation Facilities and Landscaping<br>o Engineering<br>➢ **TOTAL** (Excl. HST) = **$53.7M** (Including Utility Impacts) | ➢ No significant impacts to existing underground gas lines, watermains, sewers, or communications cables, anticipated other than minor relocations / adjustments.<br>➢ 46 Hydro poles, 26 Traffic Signal poles and 10 Street Light poles would have to be relocated, for a total estimated cost of **$1.85M** for utility relocations.<br>➢ Preliminary Total Cost Estimate, including the following:<br>o Property acquisition<br>o Road and Drainage Works<br>o Signals/Illumination<br>o Roadside Protection and Line Markings<br>o Bridges & Culvert Extensions and Replacement<br>o Active transportation Facilities and Landscaping<br>o Engineering<br>➢ **TOTAL** (Excl. HST) = **$52.2M** (Including Utility Impacts) |
| | Does not address the Problem/Opportunity Statement | GOOD | GOOD | GOOD | GOOD |
| **OVERALL EVALUATION** | | **GOOD – VERY GOOD**<br>**(Not Carried Forward)** | **GOOD – VERY GOOD**<br>**(Not Carried Forward)** | **GOOD – VERY GOOD**<br>**(Not Carried Forward)** | **VERY GOOD**<br>**(Carried Forward as Preferred Alternative Widening Concept)** |

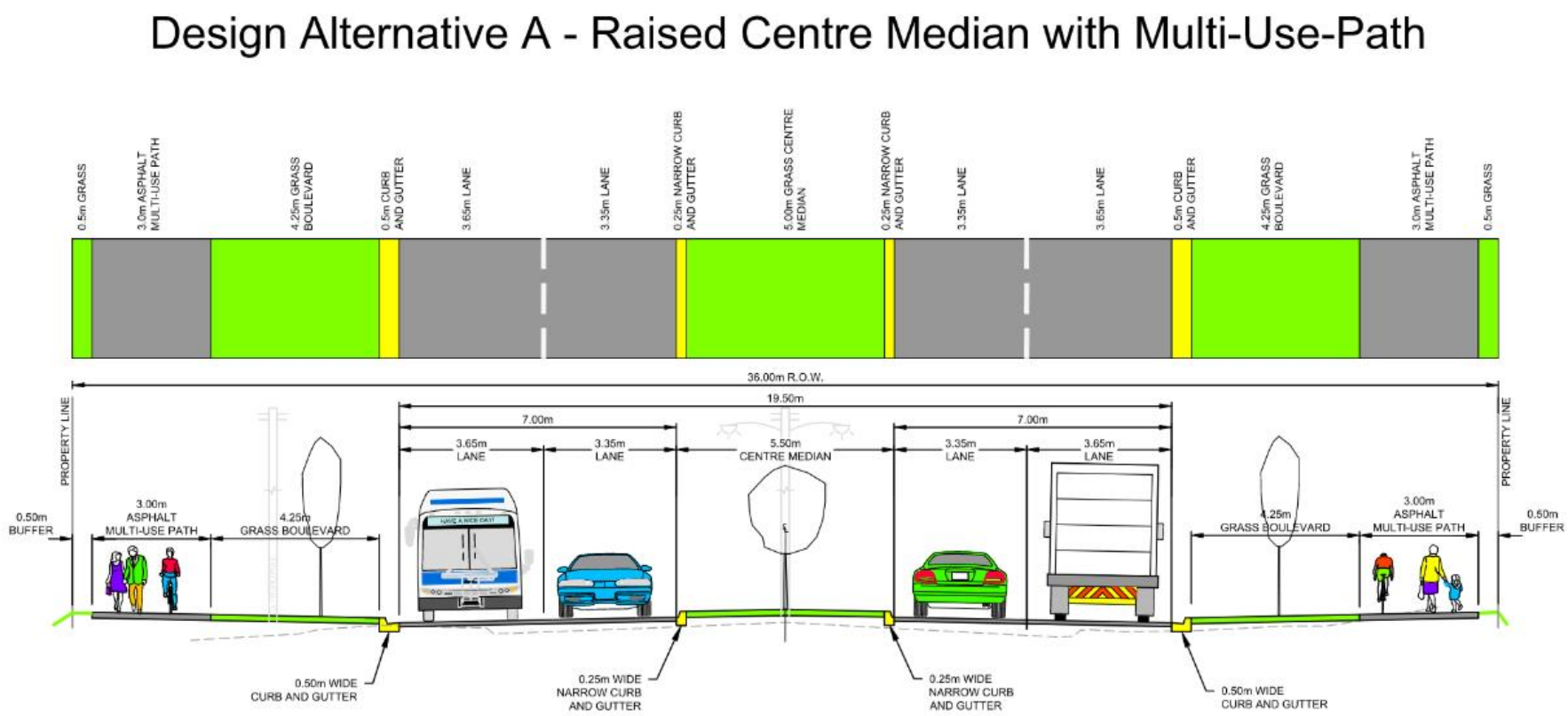
**Appendix C – Alternative Design Cross-Sections**

**Do Nothing Alternative**



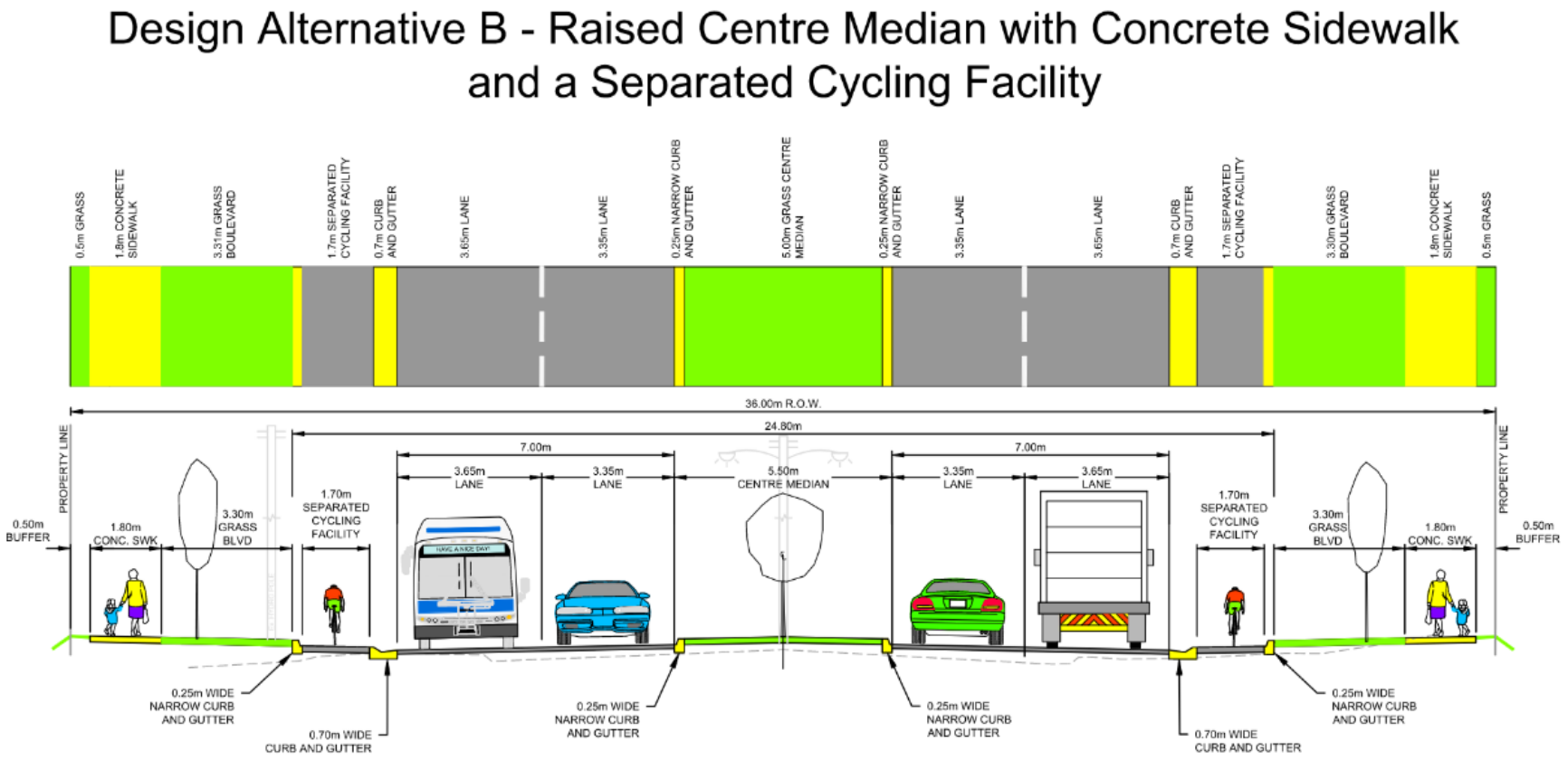
## Appendix C – Alternative Design Cross-Sections

### Design Alternative A - Widen the Road to 4-lanes with a 5.0m wide Raised Centre Median and Add Multi-use Path (MUP)



## Appendix C – Alternative Design Cross-Sections

### Design Alternative B - Widen the Road to 4-lanes with a 5.0m wide Raised Centre Median and Add 1.8m wide Sidewalk and 1.7m Bike Lanes




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Region of Waterloo

## Appendix D – Project Team Evaluation of Alternative Design Cross-Sections (Natural Environment)

| ALTERNATIVE DESIGN CONCEPT | "Do Nothing" ALTERNATIVE<br>Retain Roadway Cross-Section in its Current Configuration | ALTERNATIVE A<br>Widen the Road to 4-Lanes with Raised Centre Median, and 3.0m Multi-Use Path on both sides | ALTERNATIVE B<br>Widen the Road to 4-Lanes with Raised Centre Median, 1.8m concrete sidewalks, and 1.7m separated roadside bike lanes with rollover curb |
|---|---|---|---|
| **Description** | Reconstruction of the road in its current 2-lane rural (ditch drainage) cross-section with no active transportation facilities. | • 5.0m raised median with concrete barrier curbs and narrow gutter;<br>• 0.6m curb and gutter, and a storm drainage system;<br>• 3.0m asphalt multi-use path; and,<br>• Additional street lighting. | • 5.0m raised median with concrete barrier curbs and narrow gutter;<br>• 0.6m curb and gutter, and a storm drainage system;<br>• 1.8m concrete sidewalks;<br>• 1.7m separated roadside bike lanes with rollover curb; and,<br>• Additional street lighting. |
| **Natural Environment**<br><br>How might the alternative affect existing trees, vegetation, wildlife, watercourses, etc.? | ➢ No changes to existing conditions.<br>➢ No removal of existing trees required.<br>➢ No widening of pavement; therefore, less roadway width for terrestrial wildlife crossing.<br>➢ Roadside ditches remain, providing infiltration of stormwater.<br>➢ Maintaining existing road capacity will lead to additional delay and queuing. | ➢ Roadside ditches are filled in, removing benefits of sediment removal from storm water runoff.<br>➢ Increased storm water runoff can be mitigated with stormwater management techniques.<br>➢ Opportunity for tree planting in boulevard.<br>➢ Median provides opportunity for installing measures to capture/ infiltrate stormwater.<br>➢ Wider roadway increases potential for wildlife mortality.<br>➢ Minor encroachment into wetland and municipal drain between Hunsperger Drain crossing east of Boxwood Drive and Middle Creek east of Speedsville Road.<br>➢ Least total pavement area for active transportation requiring winter maintenance and de-icing. (6.0m$^2$/m of roadway) | ➢ Roadside ditches are filled in, removing benefits of sediment removal from storm water runoff.<br>➢ Increased storm water runoff can be mitigated with stormwater management techniques.<br>➢ Opportunity for tree planting in boulevard.<br>➢ Median provides opportunity for installing measures to capture/ infiltrate stormwater.<br>➢ Wider roadway increases potential for wildlife mortality.<br>➢ Minor encroachment into wetland and municipal drain between Hunsperger Drain crossing east of Boxwood Drive and Middle Creek east of Speedsville Road.<br>Mid-range total pavement area for active transportation requiring winter maintenance and de-icing. (7.0m$^2$/m or roadway) 17% more pavement area to maintain in comparison with Multi-use Path alternative. |
| **RATING** | EXCELLENT | VERY GOOD | GOOD |

## Appendix D – Project Team Evaluation of Alternative Design Cross-Sections (Socio-Economic Environment)

| ALTERNATIVE DESIGN CONCEPT | "Do Nothing" ALTERNATIVE<br>**Retain Roadway Cross-Section in its Current Configuration** | ALTERNATIVE A<br>**Widen the Road to 4-Lanes with Raised Centre Median, and 3.0m Multi-Use Path on both sides** | ALTERNATIVE B<br>**Widen the Road to 4-Lanes with Raised Centre Median, 1.8m concrete sidewalks, and 1.7m separated roadside bike lanes with rollover curb** |
|---|---|---|---|
| **Description** | Reconstruction of the road in its current 2-lane rural (ditch drainage) cross-section with no active transportation facilities. | • 5.0m raised median with concrete barrier curbs and narrow gutter;<br>• 0.6m curb and gutter, and a storm drainage system;<br>• 3.0m asphalt multi-use path; and,<br>• Additional street lighting. | • 5.0m raised median with concrete barrier curbs and narrow gutter;<br>• 0.6m curb and gutter, and a storm drainage system;<br>• 1.8m concrete sidewalks;<br>• 1.7m separated roadside bike lanes with rollover curb; and,<br>• Additional street lighting. |
| **Socio-Economic Environment**<br><br>How might the alternative impact archaeological and cultural heritage resources, properties abutting the road (driveways, access), and streetscaping / landscape potential? | ➢ No anticipated archaeological or cultural heritage impacts.<br>➢ No property acquisition required.<br>➢ No improvements for pedestrians, cyclists, or other recreational activities.<br>➢ Maintains current access to adjacent neighbourhoods, but increasing congestion exacerbates access concerns over time.<br>➢ Increasing traffic congestion (delay and queueing) leads to poorer relative air quality. | ➢ No anticipated archaeological or cultural heritage impacts.<br>➢ Community benefits from new pedestrian and cycling facilities.<br>➢ Multi-use path provides additional comfort level for recreational cyclists and separation from vehicular traffic.<br>➢ Relieves traffic congestion facilitating better access to businesses and adjacent neighbourhoods.<br>➢ Less traffic congestion leads to better relative air quality.<br>➢ Cross-section does not influence property impact, noise, or air quality; widening does.<br>➢ Greatest amount of remaining boulevard space available for landscaping and streetscaping. | ➢ No anticipated archaeological or cultural heritage impacts.<br>➢ Community benefits from new pedestrian and cycling facilities.<br>➢ Separated facilities provide additional comfort level for pedestrians and cyclists.<br>➢ Transit vehicles may interfere with cycling activities when patrons are boarding and alighting at the roadside.<br>➢ Relieves traffic congestion facilitating better access to businesses and adjacent neighbourhoods.<br>➢ Less traffic congestion leads to better relative air quality.<br>➢ Cross-section does not influence property impact, noise, or air quality; widening does.<br>➢ Very little remaining boulevard space available for landscaping and streetscaping. |
| **RATING** | FAIR | VERY GOOD | VERY GOOD |

## Appendix D – Project Team Evaluation of Alternative Design Cross-Sections (Transportation)

| ALTERNATIVE DESIGN CONCEPT | "Do Nothing" ALTERNATIVE<br>Retain Roadway Cross-Section in its Current Configuration | ALTERNATIVE A<br>Widen the Road to 4-Lanes with Raised Centre Median, and 3.0m Multi-Use Path on both sides | ALTERNATIVE B<br>Widen the Road to 4-Lanes with Raised Centre Median, 1.8m concrete sidewalks, and 1.7m separated roadside bike lanes with rollover curb |
|---|---|---|---|
| **Description** | Reconstruction of the road in its current 2-lane rural (ditch drainage) cross-section with no active transportation facilities. | • 5.0m raised median with concrete barrier curbs and narrow gutter;<br>• 0.6m curb and gutter, and a storm drainage system;<br>• 3.0m asphalt multi-use path; and,<br>• Additional street lighting. | • 5.0m raised median with concrete barrier curbs and narrow gutter;<br>• 0.6m curb and gutter, and a storm drainage system;<br>• 1.8m concrete sidewalks;<br>• 1.7m separated roadside bike lanes with rollover curb; and,<br>• Additional street lighting. |
| **Transportation**<br><br>How might the alternative serve the expected vehicular, transit, pedestrian, and cycling traffic? | ➢ Does not satisfy the Region's Transportation Master Plan with respect to vehicular, pedestrian, or cycling facilities.<br>➢ Does not provide adequate capacity for vehicular traffic.<br>➢ Does not improve conditions for Emergency Services, Heavy Trucks, and Transit Vehicles.<br>➢ Does not improved conditions for cyclists or pedestrians. | ➢ Addresses the Region's Transportation Master Plan with respect to vehicular, pedestrian, and cycling facilities.<br>➢ Addresses future traffic capacity needs of the corridor.<br>➢ Reduces congestion and improves conditions for Emergency Services, Heavy Trucks, and Transit Vehicles.<br>➢ Provides separation of pedestrians and cyclists from vehicular traffic.<br>➢ Pedestrian and cyclist conflicts may occur.<br>➢ Addresses transit's concerns regarding on road conflicts with cyclist during boarding and alighting activities.<br>➢ Raised centre median provides physical separation of bi-directional traffic, reducing collisions.<br>➢ Raised centre median provides potential refuge for pedestrians crossing the road mid-block.<br>➢ Lowest Transportation Operations/Maintenance requirements. | ➢ Addresses the Region's Transportation Master Plan with respect to vehicular, pedestrian, and cycling facilities.<br>➢ Addresses future traffic capacity needs of the corridor.<br>➢ Reduces congestion and improves conditions for Emergency Services, Heavy Trucks, and Transit Vehicles.<br>➢ Sidewalk provides separation pedestrians from cyclists and vehicular traffic.<br>➢ Some separation is provided for cyclists from vehicular traffic.<br>➢ Transit has concerns with conflicts between cyclists and boarding and alighting activities at the roadside.<br>➢ Separated bike lane provides some separation from vehicular traffic, but buses stop in these lanes.<br>➢ Raised centre median provides physical separation of bi-directional traffic, reducing collisions.<br>Raised centre median provides potential refuge for pedestrians crossing the road mid-block.<br>➢ 2nd Lowest Transportation Operations/Maintenance requirements. |
| How easily could the alternative be operated and maintained, including snow removal? | | ➢ 3.0m wide pathway can be maintained with pickup truck and plow and allows access for utility vehicles. Can be cleared adequately with single pass and entirely with two-way pass. | ➢ Two facilities require additional maintenance time and expenditure. Curb separated cycle lane has proven challenging to adequately clear for winter use. |
| **RATING** | POOR | VERY GOOD | VERY GOOD |

## Appendix D – Project Team Evaluation of Alternative Design Cross-Sections (Cost/Overall)

| ALTERNATIVE DESIGN CONCEPT | "Do Nothing" ALTERNATIVE<br>Retain Roadway Cross-Section in its Current Configuration | ALTERNATIVE A<br>Widen the Road to 4-Lanes with Raised Centre Median, and 3.0m Multi-Use Path on both sides | ALTERNATIVE B<br>Widen the Road to 4-Lanes with Raised Centre Median, 1.8m concrete sidewalks, and 1.7m separated roadside bike lanes with rollover curb |
|---|---|---|---|
| **Description** | Reconstruction of the road in its current 2-lane rural (ditch drainage) cross-section with no active transportation facilities. | • 5.0m raised median with concrete barrier curbs and narrow gutter;<br>• 0.6m curb and gutter, and a storm drainage system;<br>• 3.0m asphalt multi-use path; and,<br>• Additional street lighting. | • 5.0m raised median with concrete barrier curbs and narrow gutter;<br>• 0.6m curb and gutter, and a storm drainage system;<br>• 1.8m concrete sidewalks;<br>• 1.7m separated roadside bike lanes with rollover curb; and,<br>• Additional street lighting. |
| **Cost**<br><br>What is the expected total cost of the alternative, including the cost for road construction, utility and street lighting relocations, property acquisitions, traffic signal improvements, and landscaping? | ➢ Do Nothing has no direct Capital Cost.<br>➢ Increased costs for movement of goods and services as congestion increases.<br>➢ No change to maintenance costs for road, pedestrian/ cycling facilities, or landscaping.<br>➢ Increased traffic over fewer travel lanes increases frequency of required maintenance.<br>➢ Increased traffic volume increases congestion and may lead to increased accident frequency due to gap reduction. | ➢ Cross-section unit cost is $2,100/m. (excl. utility relocation costs – see widening alternative concept evaluation – Table 1)<br>➢ Reduced costs for movement of goods and services as congestion decreases.<br>➢ Increased maintenance costs for road, pedestrian/ cycling facilities, and landscaping. | ➢ Cross-section unit cost is $2,200/m. (excl. utility relocation costs – see widening alternative concept evaluation – Table 1)<br>➢ Reduced costs for movement of goods and services as congestion decreases.<br>➢ Increased maintenance costs for road, pedestrian/cycling facilities, and landscaping. |
| **RATING** | FAIR | VERY GOOD | GOOD |
| **OVERALL EVALUATION** | **FAIR** | **VERY GOOD** | **GOOD** |
| **OVERALL RANKING** | **3** | **1** | **2** |
| **TECHNICALLY PREFERRED DESIGN** | ✗ | ✓ | ✗ |
| **JUSTIFICATION** | **Not Carried Forward**<br><br>**Does not address Problem/Opportunity Statement** | **Carried Forward as the preferred cross-section design alternative.**<br><br>**Greatest potential for Natural Environment, Social Environment, Transportation, and Cost benefits.**<br><br>**Greatest overall boulevard area available for landscaping, snow storage, and stormwater management.**<br><br>**Least area requiring winter maintenance and de-icing adjacent to watercourses.**<br><br>**Least potential conflict between users and transit buses at, or near, transit stops.**<br><br>**Lowest expected capital (construction) and operating (maintenance) cost of active transportation alternatives.**<br><br>**Least impact on existing utilities.** | **Not Carried Forward**<br><br>**2nd most potential for Natural Environment, Social Environment, Transportation, and Cost benefits.**<br><br>**2nd most overall boulevard area available for landscaping, snow storage, and stormwater management.**<br><br>**2nd least area requiring winter maintenance and de-icing adjacent to watercourses.**<br><br>**Greater potential for conflict between users at, or near, transit vehicle stops than Alternative 1.**<br><br>**2nd Lowest expected capital (construction) and operating (maintenance) cost of active transportation alternatives.**<br><br>**2nd least impact on existing utilities.** |

## Appendix E

## Property Acquisition Process Information Sheet

The following information is provided as a general overview of the property acquisition process and is not legal advice. Further, the steps, timing, and processes can vary depending on the individual circumstances of each case.

Once the Class Environmental Assessment is complete and the Environmental Study Report outlining the Recommended Design Concept has been approved, the property acquisition process and the efforts of Regional Real Estate staff will focus on preparation for acquiring the required lands to implement the approved design. Regional staff cannot make fundamental amendments or changes to the approved design concept.

### Property Impact Plans

After the project has been approved and as it approaches final design, the project planners will generate drawings and sketches indicating what lands and interests need to be acquired from each affected property to undertake the project. These drawing are referred to as Property Impact Plans (PIP).

### Initial Owner Contact by Regional Real Estate Staff

Once the PIPs are finalized and available, Regional Real Estate staff will retain an independent appraiser to provide preliminary valuations of the land requirements and their effect on the value of the property. As this process nears completion Real Estate staff will contact the affected property owner/s by telephone and mail to introduce themselves and set-up initial meetings to discuss the project, appraisals, and proposed acquisitions.

### Initial Meetings

The initial meeting is attended by the project engineer and the assigned real estate staff person to brief the owner on the project, what part of their lands are to be acquired or will be affected, what work will be undertaken, when, with what equipment, etc. and to answer any questions. The primary purpose of the meeting is to listen to the owner and identify issues, concerns, effects of the proposed acquisition on remaining lands and businesses that can be feasibly mitigated and/or compensated, and how the remaining property may be restored. These discussions may require additional meetings. The goal of staff is to work with the owner to reach mutually agreeable solutions.

### Goal – Fair and Equitable Settlement for All Parties

The goal is always to reach a fair and equitable agreement for both the property owner and the Region. Such an agreement will provide compensation for the fair market value of the lands and address the project impacts (such as repairing or replacing landscaping, fencing, paving, etc.) such that the property owner will receive the value of the lands acquired and the restoration of their remaining property to the condition it was prior to the Project.

The initial meetings will form the basis of an initial offer of settlement or agreement of purchase and sale for the required lands or interests.

**Steps Toward Offer of Settlement or Agreement of Purchase and Sale**

The general steps toward such an offer are as follows:

1) the Region will obtain an independent appraisal of the fair market value of the lands and interests to be acquired, and an appraisal of any effect on the value of the rest of the property resulting from the acquisition of the required lands and interests;
2) compensation will be estimated and/or works to minimize other effects will be defined and agreed to by the property owner and the Region;
3) reasonable costs of the owner will be included in any compensation settlement;
4) an offer with a purchase price and any other compensation or works in lieu of compensation will be submitted to the property owner for consideration; and
5) an Agreement will be finalized with any additional discussion, valuations, etc. as may be required.

Depending on the amount of compensation, agreements may require the approval of Council. The approval is undertaken in Closed Session which is not open to the public to ensure a level of confidentiality.

**Expropriation**

Due to the time constraints of these projects, it is the practice of the Region to commence the expropriation process in parallel with the negotiation process to ensure that lands and interests are acquired in time for commencement of the Project. Typically, over 90% of all required lands and interests are acquired through the negotiation process. Even after lands and interests have been acquired through expropriation an agreement on compensation can be reached through negotiation, this is usually referred to as a ‘settlement agreement’.

Put simply, an expropriation is the transfer of lands or an easement to a governmental authority for reasonable compensation, including payment of fair market value for the transferred lands, without the consent of the property owner being required. In the case of expropriations by municipalities such as the Region of Waterloo, the process set out in the Ontario *Expropriations Act* must be followed to ensure that the rights of the property owners provided under that *Act* are protected.

For information on the expropriation process, please refer to ‘Expropriation Information Sheet’.

**The following information is provided as a general overview of the expropriation process and is not legal advice. For complete information, reference should be made to the Ontario *Expropriations Act* as well as the more detailed information in the Notices provided under that *Act*.**

## Expropriation Information Sheet

### What is Expropriation?

Governmental authorities such as municipalities, school boards, and the provincial and federal governments undertake many projects which require them to obtain land from private property owners. In the case of the Regional Municipality of Waterloo, projects such as the construction or improvement of Regional Roads sometimes require the purchase of land from private property owners. In many cases, the Region of Waterloo only needs a small portion of the private property owner's lands or an easement for related purposes such as utilities, although in certain instances, entire properties are required.

Usually the governmental authority is able to buy the land required for a project through a negotiated process with the affected property owners. Sometimes, however, the expropriation process must be used in order to ensure that the land is obtained within a specific timeline. Put simply, an expropriation is the transfer of lands or an easement to a governmental authority for reasonable compensation, including payment of fair market value for the transferred lands, without the consent of the property owner being required. In the case of expropriations by municipalities such as the Region of Waterloo, the process set out in the Ontario **Expropriations Act** must be followed to ensure that the rights of the property owners provided under that *Act* are protected.

**Important Note: The Region of Waterloo tries in all instances to obtain lands needed for its projects through a negotiated agreement on mutually acceptable terms. Sometimes, the Region of Waterloo will start the expropriation process while negotiations are underway. This dual approach is necessary to ensure that the Region of Waterloo will have possession of all of the lands needed to start a construction project on schedule. However, it is important to note that Regional staff continues to make every effort to reach a negotiated purchase of the required lands on mutually agreeable terms while the expropriation process is ongoing. If agreement is reached, expropriation proceedings can be discontinued and the land transferred to the Region of Waterloo in exchange for payment of the agreed-upon compensation.**

### What is the process of the Region of Waterloo under the Expropriations Act?

- Regional Council considers a request to begin an application under the ***Expropriations Act*** to obtain land and/or an easement for a specific Regional project. No decision is made at this meeting to expropriate the land. This step is simply direction for the Region of Waterloo to provide a "Notice of Application for Approval to Expropriate" to affected property owners that the process has started to seek approval to expropriate the land.
- As stated in the Notice, affected property owners have 30 days to request a Hearing to consider whether the requested expropriation is "fair, sound and reasonably necessary in the

achievement of the objectives" of the Region of Waterloo. This Hearing is conducted by a provincially-appointed Inquiry Officer. Prior to the Hearing, the Region of Waterloo must serve the property owner with a Notice setting out its reasons or grounds for the proposed expropriation. **Compensation for lands is not determined at this Hearing.** The Inquiry Officer can order the Region of Waterloo to pay the property owner up to $200.00 as compensation for the property owner's costs in participating in this Hearing, regardless of the outcome of the Hearing.

- If a Hearing is held, a written report is provided by the Inquiry Officer to the property owner and the Region of Waterloo. Council must consider the Report within 90 days of receiving it. The Report is not binding on Council and Council may or may not accept the findings of the Report. After consideration of the Report, Council may or may not approve the expropriation of the land or grant approval with modifications. A property owner may wish to make written and/or verbal submissions to Council at the time that it is considering the Report.
- If no Hearing is requested by the property owner, then Council may approve the expropriation of the land after expiry of a 30 day period following service of the Notice of Application for Approval to Expropriate.
- If Council approves the expropriation then, within 3 months of this approval, the Region of Waterloo must register a Plan at the Land Registry Office that describes the expropriated lands. The registration of this Plan automatically transfers title of the lands to the Region of Waterloo, instead of by a Deed signed by the property owner.
- Within 30 days of registration of the Plan, the Region of Waterloo must serve a Notice of Expropriation on the affected property owner advising of the expropriation. Within 30 days of this Notice, the property owner may serve the Region of Waterloo with a Notice of Election selecting the valuation date under the *Expropriations Act* for calculation of the compensation.
- In order to obtain possession of the expropriated lands, the Region of Waterloo must also serve a Notice of Possession setting out the date that possession of the land is required by the Region of Waterloo. This date has to be 3 months or more from the date that this Notice of Possession is served on the affected property owner.
- Within 3 months of registration of the Plan, the Region of Waterloo must provide the affected property owner with payment for the full amount of the appraised fair market value of the expropriated land or easement and a copy of the appraisal report on which the value is based. If the property owner disagrees with this amount, and/or claims other compensation and/or costs under the *Expropriations Act*, the compensation and/or costs matter may be referred to a provincially-appointed Board of Negotiation in an effort to reach a mediated settlement and/or an appeal may be made to the Ontario Municipal Board (OMB) for a decision. In any event, the Region of Waterloo continues in its efforts to reach a negotiated settlement with the affected property owner prior to the OMB making a decision.

# Appendix C – Agency and Stakeholder Contact List

September 2023

Region of Waterloo
Maple Grove Road EA
Mailing List

| | Title | Contact Name | Address | City, PR, PC | Email |
|---|---|---|---|---|---|
| **FEDERAL AGENCIES** | | | | | |
| Fisheries and Oceans Canada | Fishery Protection Program | | 867 Lakeshore Road | Burlington, ON L7S 1A1 | fisheriesprotection@dfo-mpo.gc.ca |
| Transport Canada | Navigable Waters Proteciton Program | | 4900 Yonge St, 4th Floor (PH) | Toronto ON M2N 6A5 | NPPONT-PPNONT@tc.gc.ca |
| **PROVINCIAL AGENCIES** | | | | | |
| Ministry of the Environment, Conservation and Parks | Director (Acting), Environmental Assessment and Permissions Branch | Ms. Heather Malcolmson | 135 St. Clair Avenue West, 1st Floor | Toronto, ON M4V 1P5 | heather.malcolmson@ontario.ca |
| Ministry of the Environment, Conservation and Parks | Environmental Resource Planner and EA Co-ordinator, West Central Region, Air, Pesticides and Environmental Planning | Mr. Trevor Bell | 5775 Yonge Street, Place Nouveau 9th Floor | Toronto, ON M2M 4J1 | trevor.bell@ontario.ca |
| Ministry of Natural Resources and Forestry | District Manager, Guelph District | Ms. Tammy Verhaeghe | 1 Stone Road West | Guelph, ON N1G 4Y2 | tammy.verhaeghe@ontario.ca |
| Ministry of Natural Resources and Forestry | Resources Management Supervisor, Guelph District | Mr. Al Murray | 1 Stone Road West | Guelph, ON N1G 4Y2 | al.murray@ontario.ca |
| Ministry of Natural Resources and Forestry | Resources Operations Supervisor, Guelph District | Mr. Ian Thornton | 1 Stone Road West | Guelph, ON N1G 4Y2 | ian.thornton@ontario.ca |
| Ministry of Indigenous Affairs | Director (Acting), Indigenous Relations Branch | Ms. Lise Chabot | 160 Bloor Street East, Suite 400 | Toronto, ON M7A 2E6 | lise.chabot@ontario.ca |
| Ministry of Citizenship and Multiculturalism | Heritage Planner, Heritage Planning Unit | Ms. Katherine Kirzati | 401 Bay Street, Suite 1700 | Toronto, ON M7A 0A7 | katherine.kirzati@ontario.ca |
| Ministry of Citizenship and Multiculturalism | Team Lead, Heritage Planning Unit | Ms. Karla Barboza | 401 Bay Street, Suite 1700 | Toronto, ON M7A 0A7 | karla.barboza@ontario.ca |
| Infrastructure Ontario | Environmental Specialist, Environmental Management | Ms. Lisa Myslicki | 1 Dundas Street West, Suite 2000 | Toronto, ON M5G 1Z3 | lisa.myslicki@infrastructureontario.ca |
| Ministry of Transportation | Manager, Engineering (Acting) | Mr. Steven McInnis | Exeter Road Complex 4th Flr, 659 Exeter Rd | London, ON N6E 1L3 | steven.mcinnis@ontario.ca |
| **REGIONAL AGENCIES** | | | | | |
| Region of Waterloo, Transportation and Environmental Services | Project Manager | Mr. Justin Armstrong | 150 Frederick Street, 6th Floor | Kitchener, ON N2G 4J3 | juarmstrong@regionofwaterloo.ca |
| Region of Waterloo, Transportation Capital Projects | Senior Project Manager | Mr. Frank Kosa | 150 Frederick Street, 6th Floor | Kitchener, ON N2G 4J3 | fkosa@regionofwaterloo.ca |
| Region of Waterloo, Transportation and Environmental Services | Transportation Planning Engineer | Mr. Tabot Eneme | 150 Frederick Street, 7th Floor | Kitchener, ON N2G 4J3 | teneme@regionofwaterloo.ca |
| Region of Waterloo, Traffic Engineering | Supervisor | Mr. Mike Jones | 150 Frederick Street, 7th Floor | Kitchener, ON N2G 4J3 | mjones@regionofwaterloo.ca |
| Grand River Transit, Transit Development | Supervisor | Mr. Reid Fulton | 150 Frederick Street, 8th Floor | Kitchener, ON N2G 4J3 | |
| Region of Waterloo - Pedestrian Charter Steering Committee | Administrative Support | Ms. Maria Hatzipantelis | 99 Regina Street South | Waterloo, ON N2J 4V3 | hmaria@region.waterloo.on.ca |
| Active Transportation Advisory Committee | Council/Committee Support Specialist | Mr. Tim Brubacher | | | tbrubacher@regionofwaterloo.ca |
| Ecological and Environmental Advisory Committee | Principal Planner - Environmental | Mr. Tim Van Hinte | | | TVanhinte@regionofwaterloo.ca |
| Grand River Accessibility Advisory Committee | Service Planning Associate | Ms. Gina Hackman | | | gina.hickman@uwaterloo.ca |
| Region of Waterloo City Council | Councillor | Mr. Karl Kiefer | 150 Frederick Street, 1st Floor | Kitchener, ON N2G 4J3 | kkiefer@regionofwaterloo.ca |
| **LOCAL AGENCIES** | | | | | |
| City of Cambridge | Project Engineer | Mr. Alex Nichols | 50 Dickson Street | Cambridge, ON N1R 5W8 | nicholsa@cambridge.ca |
| City of Cambridge | Councillor | Ms. Donna Reid | P.O. Box 669, 50 Dickson Street | Cambridge, ON N1R 5W8 | reidd@cambridge.ca |
| **FIRST NATIONS** | | | | | |
| Métis Nation of Ontario | Métis Consultation Unit c/o the Métis Nation of Ontario Head Office | | Suite 1100 – 66 Slater Street | Ottawa, ON K1P 5H1 | |
| Mississaugas of the Credit First Nation | Chief | Mr. R. Stacey LaForme | 2789 First Line Road R.R. #6 | Hagersville, ON N0A 1H0 | Stacey.LaForme@newcreditfirstnation.com |
| Mississaugas of the Credit First Nation | Consultation Manager, Department of Consultation and Accommodation | Ms. Fawn D. Sault | 4065 Hwy 6 North | Hagersville, ON N0A 1H0 | Fawn.Sault@mncfn.ca |
| Six Nations of the Grand River | Chief | Mr. Mark Hill | P.O. Box 5000, 1695 Chiefswood Road | Ohsweken, ON N0A 1M0 | |
| Haudenosaunee Development Institute | To Whom it May Concern | | P.O. Box 714, 600-16 Sunrise Court | Ohsweken, ON N0A 1M0 | hdi2@bellnet.ca |
| Haudenosaunee Resource Centre | Confederacy Secretary | Mr. Hohahes Leroy Hill | 2634 6th Line R.R. #2 | Ohsweken, ON N0A 1M0 | |
| **CONSERVATION AUTHORITY** | | | | | |
| Grand River Conservation Authority | Director of Resource Management | Ms. Nancy Davy | P.O. Box 729, 400 Clyde Road | Cambridge, ON N1R 5W6 | |
| Grand River Conservation Authority | Director of Engineering | Mr. Dwight Boyd | P.O. Box 729, 400 Clyde Road | Cambridge, ON N1R 5W6 | dboyd@grandriver.ca |
| **EMERGENCY SERVICES** | | | | | |
| Region of Waterloo Paramedic Services | Chief | Mr. Stephen Van Valkenburg | 120 Maple Grove Road | Cambridge, ON N3H 4R6 | svanvalkenburg@regionofwaterloo.ca |
| Waterloo Regional Police | Chief | Mr. Bryan Larkin | 200 Maple Grove Road | Cambridge, ON N3H 5M1 | |
| City of Cambridge Fire Department | Chief | Mr. Neil Main | 1625 Bishop Street North | Cambridge, ON N1R 7J4 | |
| **STAKEHOLDERS** | | | | | |
| Active & Safe Routes to School (ASRTS) c/o Region of Waterloo Public Health | | To Whom it May Concern | 99 Regina Street South | Waterloo, ON N2J 4V3 | |
| Allstream | | To Whom it May Concern | 50 Worcester Road | Etobicoke, ON M9W 5X2 | |
| Hydro One Networks | Hydro One Real Estate Management | Ms. Lana Kegel | 185 Clegg Road | Markham, ON L6G 1B7 | lana.kegel@hydroone.com |
| Energy + Inc. | | Ms. Sherri Tilley-Wanklin | 1500 Bishop Street North | Cambridge, ON N1R 5X6 | |

# Appendix D – Indigenous Communities Consultation Log

September 2023

# Maple Grove Road Improvements – Region of Waterloo

# Indigenous Communities Consultation Log

## Region of Waterloo Project Team Contact Information

Justin Armstrong, Senior Engineer, Design and Construction, Region of Waterloo (JuArmstrong@regionofwaterloo.ca)

Marcos Kroker, Head, Design and Construction, Region of Waterloo (MKroker@regionofwaterloo.ca)

John Bayley, Practice Lead, Transportation Engineering, IBI Group (john.bayley@ibigroup.com)

Michael McGann, Manager, Transportation Engineering, IBI Group (michael.mcgann@ibigroup.com)

John Sleath, Project Manager, Cultural Heritage, ASI (jsleath@asiheritage.ca)

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## Indigenous Communities Contact Information

| | | |
|---|---|---|
| **Mississaugas of the Credit First Nation** | | |
| *Fawn Sault<br>Consultation Manager<br>2789 Mississauga Road<br>RR #6<br>Hagersville, ON N0A 1H0<br>Fawn.Sault@newcreditfirstnation.com (undeliverable),<br>Fawn.Sault@mncfn.ca<br><br>Adam LaForme<br>Adam.LaForme@mncfn.ca<br><br>Joelle Williams<br>Joelle.Williams@mcfn.ca | Adrian Blake, MSc.<br>Field Archaeologist<br>Department of Consultation and Accommodation (DOCA)<br>Adrian.Blake@mncfn.ca<br><br>Marie-Annick Prevost, PhD<br>Field Archaeologist<br>Department of Consultation and Accommodation (DOCA)<br>4065 Highway 6 North<br>Hagersville, ON N0A 1H0<br>Marie-Annick.Prevost@mncfn.ca, 905-870-5844 | General<br>MCFN.Consultation@mncfn.ca, DOCA.Admin@mncfn.ca |
| **Six Nations of the Grand River** | **Original (Received March 27, 2020 2:59 PM)** | |
| *Chief Mark Hill<br>1695 Chiefswood Road<br>P.O. Box 5000<br>Ohsweken, ON N0A 1M0<br>markhill@sixnations.ca<br><br>Tanya Hill-Montour, BA (Honours)<br>Archaeology Supervisor<br>(519) 753-0665, tanyahill-montour@sixnations.ca | *Fran Henry<br>franhenry@sixnations.ca<br><br>*Lonny Bomberry<br>Lands and Resources Director<br>lonnybomberry@sixnations.ca<br><br>Robbin Vanstone<br>rvanstone@sixnations.ca | Dawn LaForme<br>Secretary/Receptionist<br>SN Lands & Resources<br>dlaforme@sixnations.ca<br>519-753-0665 |
| **Haudenosaunee Confederacy Chiefs Council (HCCC)** | | |
| *Hohahes Leroy Hill<br>Secretary<br>2634 6th Line Road<br>RR #2<br>Oshweken, ON N0A 1M0<br>jocko@sixnations.ca | | |
| **Haudenosaunee Development Institute (HDI)** | | |
| Raechelle Williams<br>Janice.R.N.W23@gmail.com, janicewilliams@hdi.land<br><br>Tracey General<br>traceyghdi@gmail.com | Wayne Hill<br>tworowarchaeology@gmail.com<br><br>Todd Williams<br>williams.todde@gmail.com | General<br>Hdi2@bellnet.ca |

*Contacts listed in January 24, 2020 MECP Notice of Commencement Acknowledgement Letter to Proponent and Proponent Consultant.

## Indigenous Communities Consultation Log

| Date | From | To | Indigenous Community Contact Details | Format (e.g. mail, email, letter, phone call) | Purpose of Consultation | Nature of Comment(s) | Follow-up required? (Yes/No) |
|---|---|---|---|---|---|---|---|
| January 2020 | Region of Waterloo (DOCS # 3151216, 3193212) | Haudenosaunee Confederacy Chiefs Council | Hohahes Leroy Hill <jocko@sixnations.ca><br><br>2634 6th Line, RR #2<br>Oshweken, ON N0A 1M0 | Mail / Email | Notice of Study Commencement | None received | No |
| January 2020 | Region of Waterloo (DOCS # 3151216, 3193212) | Haudenosaunee Development Institute | <hdi2@bellnet.ca><br><br>16 Sunrise Court, Suite 600<br>P.O. Box 714<br>Oshweken, ON N0A 1M0 | Mail / Email | Notice of Study Commencement | None received | No |
| January 2020 | Region of Waterloo (DOCS # 3151216, 3193212) | Mississaugas of the Credit First Nation | Chief R. Stacey LaForme <Stacey.LaForme@newcreditfirstnation.com><br><br>Margaret Sault <masault@yahoo.com><br><br>Councillor Larry Sault <LarryS@mncfn.ca><br><br>Fawn Sault<br>Consultation Manager<br><Fawn.Sault@mncfn.ca><br><br>2789 Mississauga Road, RR #6<br>Hagersville, ON N0A 1H0 | Mail / Email | Notice of Study Commencement | None received | No |
| January 2020 | Region of Waterloo (DOCS # 3151216, 3193212) | Six Nations of the Grand River | Chief Mark Hill <markhill@sixnations.ca><br><br>Lonny Bomberry<br>Lands and Resources Director<br><lonnybomberry@sixnations.ca><br><br>Fran Henry <franhenry@sixnations.ca><br><br>1695 Chiefswood Road<br>P.O. Box 5000<br>Oshweken, ON N0A 1M0 | Mail / Email | Notice of Study Commencement | None received | No |
| January 2020 | Region of Waterloo | Métis Nation of Ontario | General<br>66 Slater Street, Suite 1100<br>Ottawa, ON K1P 5H1 | Mail | Notice of Study Commencement | None received | No |

| Date | From | To | Indigenous Community Contact Details | Format (e.g. mail, email, letter, phone call) | Purpose of Consultation | Nature of Comment(s) | Follow-up required? (Yes/No) |
|---|---|---|---|---|---|---|---|
| | | | 65 Hanson Avenue, Room 1032<br>Kitchener, ON N2C 2H6 | | | | |
| | | | | | | | |
| July 20, 2020 | Region of Waterloo (DOCS # 3358178) | Mississaugas of the New Credit First Nation | Chief R. Stacey LaForme <Stacey.LaForme@newcreditfirstnation.com><br><br>Margaret Sault <masault@yahoo.com> (Undeliverable)<br><br>Councillor Larry Sault <LarryS@mncfn.ca><br><br>Fawn Sault <Fawn.Sault@mncfn.ca>; <Fawn.Sault@newcreditfirstnation.com><br><br>Mark LaForme <Mark.laforme@newcreditfirstnation.com> | Email | Notice of the first Public Consultation Centre, held online from July 27, 2020 through August 17, 2020. | None received | No |
| July 20, 2020 | Region of Waterloo (DOCS # 3358178) | Six Nations of the Grand River | Chief Mark Hill <markhill@sixnations.ca><br><br>Fran Henry <franhenry@sixnations.ca><br><br>Lonny Bomberry <lonnybomberry@sixnations.ca> | Email | Notice of the first Public Consultation Centre, held online from July 27, 2020 through August 17, 2020. | None received | No |
| July 20, 2020 | Region of Waterloo (DOCS # 3358178) | Haudenosaunee Confederacy Chiefs Council & Haudenosaunee Development Institute | Hohahes Leroy Hill <jocko@sixnations.ca> (Undeliverable)<br><br>General <hdi2@bellnet.ca> | Email | Notice of the first Public Consultation Centre, held online from July 27, 2020 through August 17, 2020. | None received | No |
| | | | | | | | |
| June 14, 2021 | Region of Waterloo (DOCS # 3696809) | Mississaugas of the New Credit First Nation | Chief R. Stacey LaForme <Stacey.LaForme@newcreditfirstnation.com><br><br>Margaret Sault <masault@yahoo.com> (Undeliverable)<br><br>Councillor Larry Sault <LarryS@mncfn.ca> | Email | Notice of the first Public Consultation Centre, held online from June 28, 2021 through July 30, 2021. | None received | No |

| Date | From | To | Indigenous Community Contact Details | Format (e.g. mail, email, letter, phone call) | Purpose of Consultation | Nature of Comment(s) | Follow-up required? (Yes/No) |
|---|---|---|---|---|---|---|---|
| | | | Fawn Sault <Fawn.Sault@mncfn.ca>; <Fawn.Sault@newcreditfirstnation.com><br><br>Mark LaForme <Mark.laforme@newcreditfirstnation.com><br><br>Megan DeVries <Megan.DeVries@mncfn.ca><br><br>Joelle Williams <Joelle.Williams@mcfn.ca> | | | | |
| June 14, 2021 | Region of Waterloo (DOCS #3696807) | Six Nations of the Grand River | Chief Mark Hill <markhill@sixnations.ca><br><br>Fran Henry <franhenry@sixnations.ca><br><br>Lonny Bomberry<br>Lands and Resources Director <lonnybomberry@sixnations.ca><br><br>Tanya Hill-Montour, BA (Honours) <tanyahill-montour@sixnations.ca> | Email | Notice of the first Public Consultation Centre, held online from June 28, 2021 through July 30, 2021. | None received | No |
| June 14, 2021 | Region of Waterloo (DOCS #3696807, 3696815) | Haudenosaunee Confederacy Chiefs Council & Haudenosaunee Development Institute | Hohahes Leroy Hill <jocko@sixnations.ca> (Undeliverable)<br><br>General <hdi2@bellnet.ca><br><br>Wayne Hill <tworowarchaeology@gmail.com><br><br>Todd Williams <Williams.todde@gmail.com> | Email | Notice of the first Public Consultation Centre, held online from June 28, 2021 through July 30, 2021. | None received | No |
| | | | | | | | |
| January 26, 2022 | Region of Waterloo (DOCS # 3947974) | Mississaugas of the Credit First Nation (MCFN) | Fawn Sault <Fawn.Sault@mncfn.ca><br><br>Joelle Williams <Joelle.Williams@mncfn.ca><br><br>Adrian Blake | Email | Request for Stage 1 Archaeological Assessment draft report review.<br><br>Commitment to consult prior to fieldwork starting for areas of archaeological potential where Stage 2 AA is required. | Refer to February 15, 2022 email from MCFN, Marie-Annick Prevost | Yes – prior to Stage 2 AA |

| Date | From | To | Indigenous Community Contact Details | Format (e.g. mail, email, letter, phone call) | Purpose of Consultation | Nature of Comment(s) | Follow-up required? (Yes/No) |
|---|---|---|---|---|---|---|---|
| | | | <Adrian.Blake@mncfn.ca><br><br>Adam LaForme <Adam.LaForme@mncfn.ca><br><br>General <MCFN.Consultation@mncfn.ca>; <DOCA.Admin@mncfn.ca> | | | | |
| January 26, 2022 | Region of Waterloo (DOCS # 3947988) | Six Nations of the Grand River (SNGR) | Chief Mark Hill <markhill@sixnations.ca><br><br>Fran Henry <franhenry@sixnations.ca><br><br>Lonny Bomberry <lonnybomberry@sixnations.ca><br><br>Tanya Hill-Montour <tanyahill-montour@sixnations.ca><br><br>Robbin Vanstone <rvanstone@sixnations.ca> | Email | Request for Stage 1 Archaeological Assessment draft report review.<br><br>Commitment to consult prior to fieldwork starting for areas of archaeological potential where Stage 2 AA is required. | None received – Refer to January 26, 2022 email from SNGR, Tanya Hill-Montour | Yes – prior to Stage 2 AA |
| January 26, 2022 | Six Nations of the Grand River (SNGR), Tanya Hill-Montour (DOCS # 3948638) | Region of Waterloo | Chief Mark Hill <markhill@sixnations.ca><br><br>Fran Henry <franhenry@sixnations.ca><br><br>Lonny Bomberry <lonnybomberry@sixnations.ca><br><br>Robbin Vanstone <rvanstone@sixnations.ca> | Email | Acknowledgement of Stage 1 Archaeological Assessment draft report and commitment to respond on or by February 25, 2022. | N/A | No |
| January 26, 2022 | Region of Waterloo (DOCS # 3947973) | Haudenosaunee Confederacy Chiefs Council & Haudenosaunee Development Institute (HDI) | Hohahes Leroy Hill <jocko@sixnations.ca><br><br>Raechelle Williams <Janice.R.N.W23@gmail.com> <janicewilliams@hdi.land><br><br>Tracey General <traceyghdi@gmail.com><br><br>General | Email | Request for Stage 1 Archaeological Assessment draft report review.<br><br>Commitment to consult prior to fieldwork starting for areas of archaeological potential where Stage 2 AA is required. | None received | Yes – prior to Stage 2 AA. |

| Date | From | To | Indigenous Community Contact Details | Format (e.g. mail, email, letter, phone call) | Purpose of Consultation | Nature of Comment(s) | Follow-up required? (Yes/No) |
|---|---|---|---|---|---|---|---|
| | | | <hdi2@bellnet.ca><br><br>Wayne Hill<br><tworowarchaeology@gmail.com><br><br>Todd Williams<br><Williams.todde@gmail.com> | | | | |
| | | | | | | | |
| February 15, 2022 | Mississaugas of the Credit First Nation, Marie-Annick Prevost<br>(DOCS # 3961503) | Region of Waterloo | Marie-Annick Prevost<br>Marie-Annick.Prevost@mncfn.ca<br><br>Adam LaForme<br>Adam.LaForme@mncfn.ca | Email | Requested clarification regarding two items in the Stage 1 Archaeological Assessment draft report (ASI).<br><br>The two items requiring further clarification are as follows:<br><br>1) "First, regarding the AiHc-220 Archaic camp found by Detritus in 1998 in the study area. Can you clarify if this site has been destroyed by subsequent construction or if the site was declared as having no further CHVI but is still there? In the second scenario, do you think that the site would retain CHVI according to the current S&G? Can you indicate what were the artifact counts at the edge of the site or provide a map?"<br><br>2) "Figure 12 indicates ASI assessed a part of the study area in 1998. This study does not seem to be mentioned in the text or the bibliography. If it was a pedestrian survey, can you clarify what the survey interval was and if any artifacts were found?" | Request for further information regarding AiHc-220 Archaic camp found in the study (Detritus, 1998) | Yes |
| February 23, 2022 | Region of Waterloo<br>(DOCS # 3961503) | Mississaugas of the Credit First Nation (MCFN) | Marie-Annick Prevost<br>Marie-Annick.Prevost@mncfn.ca,<br><br>Adam LaForme<br><Adam.LaForme@mncfn.ca> | Email | Response to clarification request from Marie-Annick regarding the Stage 1 Archaeological Assessment draft report (ASI).<br><br>Reply:<br><br>1) "ASI were not able to obtain a copy of this report. The Ministry (i.e. MHSTCI) has confirmed that the site coordinates are wrong in the OASD and the site is not within | Provide requested information and advise that s.1.3.3 of the Stage 1 Archaeological Assessment report had been revised accordingly | No |

| Date | From | To | Indigenous Community Contact Details | Format (e.g. mail, email, letter, phone call) | Purpose of Consultation | Nature of Comment(s) | Follow-up required? (Yes/No) |
|---|---|---|---|---|---|---|---|
| | | | | | 50m of this study area. Section 1.3.3 of the report has been updated accordingly."<br><br>2) "A pedestrian survey at 5 m intervals was conducted and a non-diagnostic broad projectile point blade was recovered. As a result of the find, a 30 m radius around the find was subject to intensified survey at 2 m intervals. The find spot was more than 50 m from the current Study Area. The property was cleared of further archaeological concern. Section 1.3.3 of the report has been updated accordingly." | | |
| February 24, 2022 | Mississaugas of the Credit First Nation, Marie-Annick Prevost<br>(DOCS # 3961503) | Region of Waterloo | Marie-Annick Prevost<br>Marie-Annick.Prevost@mncfn.ca<br><br>Adam LaForme<br><Adam.LaForme@mncfn.ca> | Email | Confirmed that questions posed by MCFN were answered by the Region and there are no further comments. | N/A | No |
| | | | | | | | |
| March 15, 2022 | Six Nations of the Grand River (SNGR), Tanya Hill-Montour<br>(DOCS # 3980343) | Region of Waterloo | Tanya Hill-Montour<br><tanyahill-montour@sixnations.ca><br><br>Chief Mark Hill<br><markhill@sixnations.ca><br><br>Lonny Bomberry<br><lonnybomberry@sixnations.ca><br><br>Robbin Vanstone<br><rvanstone@sixnations.ca><br><br>Dawn LaForme<br><dlaforme@sixnations.ca> | Email | Reply to January 26, 2022 Region email.<br><br>Tanya Hill-Montour noted that Dawn LaForme would follow up on an agreement for required Stage 2 Archaeological Assessment. | Stage 2 Archeological Assessment Archaeological Monitoring Agreement to be executed prior to field work | Yes |
| March 15, 2022 | Six Nations of the Grand River (SNGR), Dawn LaForme<br>(DOCS # 3980343) | Region of Waterloo | Dawn LaForme<br><dlaforme@sixnations.ca><br><br>Tanya Hill-Montour<br><tanyahill-montour@sixnations.ca><br><br>Lonny Bomberry<br><lonnybomberry@sixnations.ca> | Email | Dawn LaForme provided the SNGR Archaeological Monitoring Agreement for execution prior to Stage 2 Archaeological Assessment fieldwork. | Archaeology Monitor Agreement | Yes |
| March 15, 2022 | Region of Waterloo<br>(DOCS # 3980343) | Six Nations of the Grand River | Tanya Hill-Montour<br><tanyahill-montour@sixnations.ca> | Email | Commitment to consult with SNGR prior to Stage 2 Archaeological Assessment fieldwork after Phase 4 | Stage 2 Archaeological | Yes – prior to |

| Date | From | To | Indigenous Community Contact Details | Format (e.g. mail, email, letter, phone call) | Purpose of Consultation | Nature of Comment(s) | Follow-up required? (Yes/No) |
|---|---|---|---|---|---|---|---|
| | | | Dawn LaForme <dlaforme@sixnations.ca> | | – i.e. filing the ESR and Ministry of the Environment, Conservation and Parks acceptance – of the Environmental Assessment. Specifically, during detailed design between Phases 4 (ESR) and 5 (Implementation).<br><br>Further, commitment to consult with SNGR for Stage 2 AA report review prior to Ministry submission. | Assessment fieldwork, reporting, and sequencing | Stage 2 AA |

# Appendix E – Public Notices

September 2023

Region of Waterloo

# Public Notice

## Notice of Study Commencement

## Maple Grove Road Improvements and Corridor Study Class Environmental Assessment and Preliminary Design City of Cambridge

**The Study:**

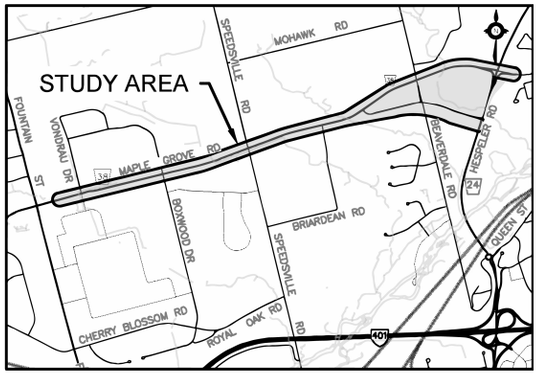
The Region of Waterloo has initiated a Class Environmental Assessment Study (Class EA) and preliminary design for improvements to Maple Grove Road between Fountain Street and Hespeler Road in the City of Cambridge. The study is being undertaken to investigate the need for additional east-west capacity and traffic management improvements along this section of Maple Grove Road, while taking into consideration adjacent land uses. This study will follow a comprehensive, sound and open planning process in order to recognize and accommodate the multi-modal transportation needs of the corridor through a Context Sensitive Design Approach.

**The Process:**

The study will be conducted in accordance with Schedule "C" requirements as outlined in the Municipal Engineers Association "Municipal Class Environmental Assessment," (October 2000, as amended to 2015). This is an approved process under the Ontario Environmental Assessment Act. The Class EA process includes public/external agency consultation, an evaluation of alternative solutions and alternative design concepts, an assessment of potential impacts associated with the proposed improvements, and development of measures to mitigate identified impacts.

**Comments:**

Consultation with interested parties, including the public, businesses, and technical or regulatory agencies will form an integral part of this Class EA study to identify and address interests within the study area. A minimum of two public consultation centres will be held during the study to provide opportunities to meet with the project team, learn about the study, and to share feedback. Upon completion of the study, an Environmental Study Report will be prepared and made available for public review and comment.




**We want to hear from you.** If you have any questions or concerns within the study area, want to know more about the study, or would like to join the project mailing list, please contact the project team:


Delton Zehr, C.E.T.
Project Manager
Transportation and Environmental Services - Design & Construction
Region of Waterloo
150 Frederick Street
Kitchener, ON N2G 4J3
519- 575-4757 ext. 3637
DZehr@regionofwaterloo.ca

John Bayley, P.Eng
Associate Director,
Practice Lead – Transport Engineering
IBI Group
410 Albert Street
Waterloo, ON N2L 3V3
519-585-2255 ext. 63220
john.bayley@ibigroup.com


Study information will be posted on the Region of Waterloo's website: www.regionofwaterloo.ca/en/living-here/resources/Documents/Future-Construction/DC_07116_InfoSheet.pdf.

Subscribe to the Maple Grove Road project page on Engage WR at www.engagewr.ca/admin/projects/cambridge-maple-grove-road to receive email notifications of project information updates.

All comments and information provided become part of the consultation process and are being collected to assist the Region of Waterloo in making a decision when considering design alternatives for road capacity and intersection improvements of Maple Grove Road. All submissions will become part of the public record files for this matter. Personal information collected is under the authority of the Municipal Act, 2001 and in compliance with the Municipal Freedom of Information and Protection of Privacy Act, R.S.O. 1990. Questions about the collection of personal information should be directed to Delton Zehr, Project Manager at dzehr@regionofwaterloo.ca or 519-575-4757 ext. 3637.

Date of Notice: January 10, 2020

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# Region, GRT workers go to the wire

## Talks continued Monday ahead of midnight deadline to avoid strike

JOHANNA WEIDNER
WATERLOO REGION RECORD

WATERLOO REGION — Negotiations continued between Waterloo Region and the union representing Grand River Transit workers on Monday to avert a strike.

The strike deadline was 12:01 a.m. this morning.

"The objective is to get a deal," said Unifor national president Jerry Dias, who was in Kitchener on Monday for ongoing contract talks.

However, he cautioned at a media briefing that both sides were "miles apart."

"If history is any guide, it will be down to the wire," said Mike Murray, the region's chief administrative officer.

The region was hopeful Monday that an agreement could be reached before the midnight deadline.

"It has been a challenging round of negotiations," Murray said. "We're dealing with some important and significant issues."

Dias said local members voted 98 per cent in favour of a strike if an acceptable agreement was not reached.

"There is a lot of frustration among our members," he said of the more than 700 bus drivers represented by local 4304.

In the case of a strike, bus service was to continue to 2 a.m. Tuesday morning.

"We are going to make sure that we get everyone home. People depend on us," Dias said.

All bus service in the region would stop with a strike, which Dias said would have a "catastrophic" impact on those who depend on public transit.

"This will be a complete shutdown of the system," he said.

The union pledged to continue MobilityPlus service for people travelling to scheduled dialysis treatments. The region said MobilityPlus customers can continue to use TaxiScrip.

Dias said a strike would continue until there was an agreement between the region and union.

Key sticking points for the union are wages and workplace issues. Barriers are wanted on buses to protect drivers, and also they object to constant video monitoring.

"There's a lot of real issues that need to be dealt with," Dias said.

Murray declined to comment on specifics, saying issues are best dealt with at the negotiating table.

Contract talks went on all weekend and continued through Monday.

Murray had urged transit riders to prepare for a disruption just in case.

"People should make alternate plans in case there is a strike," he said.

Information and updates can be found at grt.ca and social media.

jweidner@therecord.com
Twitter: @WeidnerRecord




JANEK LOWE WATERLOO REGION RECORD FILE PHOTO

Employees of Grand River Transit were to be in a legal strike position on Tuesday at 12:01 a.m.

# Protection of public paramount, judge tells burglar

## Woman was asleep in Waterloo home when longtime drug addict kicked in her bedroom door at 3 a.m.

ORDON PAUL
ATERLOO REGION RECORD

TCHENER — On Sept. 22, 2018, 3 a.m., a woman asleep in her use on Thorncrest Drive in aterloo heard voices. She asmed it was her roommates d went back to sleep. A few nutes later, a man kicked in bedroom door and entered. e screamed and he fled.

cott Bolster, 50, of no fixed dress, and an accomplice had ned entry to the home by breaking a window. They were looking for things to steal. Blood drops in the house matched Bolster's DNA profile.

On Nov. 23, 2018, at about 2 a.m., Bolster kicked in the front door of a house on Huntingdon Crescent in Waterloo. No one was home. He stole electronics and a child's piggy bank containing $600.

Bolster has a long record, including a dozen previous breakins, and has served penitentiary sentences twice. On Monday, he pleaded guilty to the two break-ins and three counts of breaching house-arrest rules.

Bolster's crimes are fuelled by a longtime addiction to opioids, defence lawyer Hal Mattson told the court. He has been trying to quit. He stayed out of trouble for several months until he became homeless.

Mattson asked Justice Scott Latimer to sentence Bolster to two years less a day at the Ontario Correctional Institute, a Brampton jail known for its drug treatment programs.

"At least this will be an opportunity for him to address his drug addiction problem and maybe no one else will have their house broken into," Mattson said. "I say give this man a chance to rehabilitate himself and I think it would better protect the public."

A sentence of two years or more would be served at a penitentiary. Drug programs at the Brampton jail are better than those at penitentiaries, Mattson said.

The Crown sought five years in a penitentiary.

In this case, protection of the public comes first, the judge said.

"In my view, your interests are subordinate to the interests of the public," Latimer told Bolster. "The people who live in these homes and in our community are entitled to expect that nobody's going to kick the door down."

The judge said Mattson's "pessimistic view" of drug rehab options in the penitentiary system "may or may not be entirely accurate."

He sent Bolster to a penitentiary for four years.

gpaul@therecord.com
Twitter: @GPaulRecord




Region of Waterloo
# Public Notice

### We Want To Hear From You On These Upcoming Projects/Events In Your Area

The full details of any notices are available on our 'News and Public Notices' webpage at www.regionofwaterloo.ca; type 'news' in the search bar at the top of the website to locate the page.

If you have any trouble viewing this information or wish to obtain a full copy of any Public Notice, please contact the Regional Clerk's office at 519-575-4400 or email regionalclerk@regionofwaterloo.ca.

### Public Consultation Centre Roseville Road Reconstruction From 0.6km west of Fischer-Hallman Road to 0.4km east of Fischer-Hallman Road North Dumfries Township

You are invited to a Public Consultation Centre to provide your input into the planning of the Roseville Road (Regional Road 46) Reconstruction.

**Date: Thursday, January 23, 2020**
**Time: 5:00 PM to 8:00 PM**
**Location: Roseville Community Centre, 3195 Roseville Road, Ayr, North Dumfries Township, Ontario**
Contact: Jeff Nyenhuis at 519-575-4735 or jnyenhuis@regionofwaterloo.ca

### Notice of Study Commencement
**Maple Grove Road Improvements and Corridor Study Class Environmental Assessment and Preliminary Design City of Cambridge**

The Region of Waterloo has initiated a Class Environmental Assessment Study (Class EA) and preliminary design for improvements to Maple Grove Road between Fountain Street and Hespeler Road in the City of Cambridge. The study is being undertaken to investigate the need for additional east-west capacity and traffic management improvements along this section of Maple Grove Road, while taking into consideration adjacent land uses. This study will follow a comprehensive, sound and open planning process in order to recognize and accommodate the multi-modal transportation needs of the corridor through a Context Sensitive Design Approach.

If you have any questions or concerns within the study area, want to know more about the study, or would like to join the project mailing list, please contact the project team:

Delton Zehr, C.E.T.
Project Manager
Transportation and Environmental Services - Design & Construction
Region of Waterloo
150 Frederick Street
Kitchener, ON N2G 4400
519- 575-4757 ext. 3637
DZehr@regionofwaterloo.ca

John Bayley, P.Eng
Associate Director,
Practice Lead - Transportation Engineering
IBI Group
410 Albert Street
Waterloo, ON N2L 3V3
519-585-2255 ext. 63220
john.bayley@ibigroup.com

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CAMBRIDGE Times.

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THURSDAY
JANUARY 16, 2020

WEEKLY IN PRINT. MUCH MORE ONLINE ANYTIME. CambridgeTimes.ca

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CAMBRIDGE TOYOTA

# CAMBRIDGE MEMORIAL STAFF GEARING UP FOR THE BIG MOVE

RAY MARTIN
rmartin@cambridgetimes.ca

The new wing of Cambridge Memorial Hospital is about to open following more than two years of delays. For the hospital's staff, the push now is on moving into the new facilities while still maintaining care for the community.

"I am sure everyone is excited as we are to be finally moving into the new building," Don Hall, manager of planning and redevelopment, told the hospital board during the last meeting.

Shifting operations of major hospital departments into the new building hasn't been a simple

See BUSY, page 4




David Bebee photo

Stephan Beckhoff of Cambridge Memorial Hospital demonstrates the new surgical lights in an operating room that do not cast a shadow when someone is between the light and the patient. The demonstration was part of a tour for members of the media of the new CMH wing, Wednesday January 8.


Joey & John
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Gita Rahimi
DD Denturist
Kabir Jalili
DD Denturist

Region of Waterloo

# Public Notice

## Notice of Study Commencement

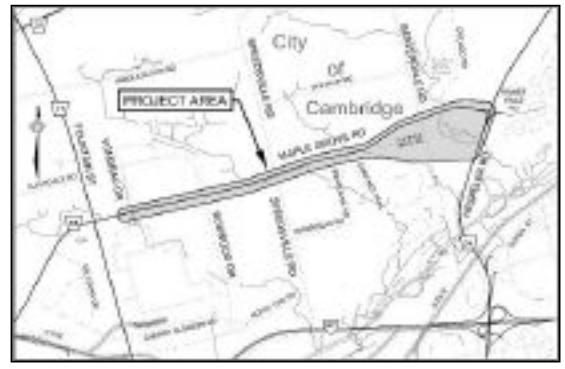
## Maple Grove Road Improvements and Corridor Study Class Environmental Assessment and Preliminary Design City of Cambridge

**The Study:**

The Region of Waterloo has initiated a Class Environmental Assessment Study (Class EA) and preliminary design for improvements to Maple Grove Road between Fountain Street and Hespeler Road in the City of Cambridge. The study is being undertaken to investigate the need for additional east-west capacity and traffic management improvements along this section of Maple Grove Road, while taking into consideration adjacent land uses. This study will follow a comprehensive, sound and open planning process in order to recognize and accommodate the multi-modal transportation needs of the corridor through a Context Sensitive Design Approach.

**The Process:**

The study will be conducted in accordance with Schedule "C" requirements as outlined in the Municipal Engineers Association "Municipal Class Environmental Assessment," (October 2000, as amended to 2015). This is an approved process under the Ontario Environmental Assessment Act. The Class EA process includes public/external agency consultation, an evaluation of alternative solutions and alternative design concepts, an assessment of potential impacts associated with the proposed improvements, and development of measures to mitigate identified impacts.




**Comments:**

Consultation with interested parties, including the public, businesses, and technical or regulatory agencies will form an integral part of this Class EA study to identify and address interests within the study area. A minimum of two public consultation centres will be held during the study to provide opportunities to meet with the project team, learn about the study, and to share feedback. Upon completion of the study, an Environmental Study Report will be prepared and made available for public review and comment.

**We want to hear from you.** If you have any questions or concerns within the study area, want to know more about the study, or would like to join the project mailing list, please contact the project team:

Delton Zehr, C.E.T.
Project Manager
Transportation and Environmental Services - Design & Construction
Region of Waterloo
150 Frederick Street
Kitchener, ON N2G 4400
519- 575-4757 ext. 3637
DZehr@regionofwaterloo.ca

John Bayley, P.Eng
Associate Director,
Practice Lead – Transport Engineering
IBI Group
410 Albert Street
Waterloo, ON N2L 3V3
519-585-2255 ext. 63220
john.bayley@ibigroup.com

Study information will be posted on the Region of Waterloo's website: www.regionofwaterloo.ca/en/living-here/resources/Documents/Future-Construction/DC_07116_InfoSheet.pdf.

Subscribe to the Maple Grove Road project page on Engage WR at www.engagewr.ca/admin/projects/cambridge-maple-grove-road to receive email notifications of project information updates.

All comments and information provided become part of the consultation process and are being collected to assist the Region of Waterloo in making a decision when considering design alternatives for road capacity and intersection improvements of Maple Grove Road. All submissions will become part of the public record files for this matter. Personal information collected is under the authority of the Municipal Act, 2001 and in compliance with the Municipal Freedom of Information and Protection of Privacy Act, R.S.O. 1990. Questions about the collection of personal information should be directed to Delton Zehr, Project Manager at dzehr@regionofwaterloo.ca or 519-575-4757 ext. 3637.

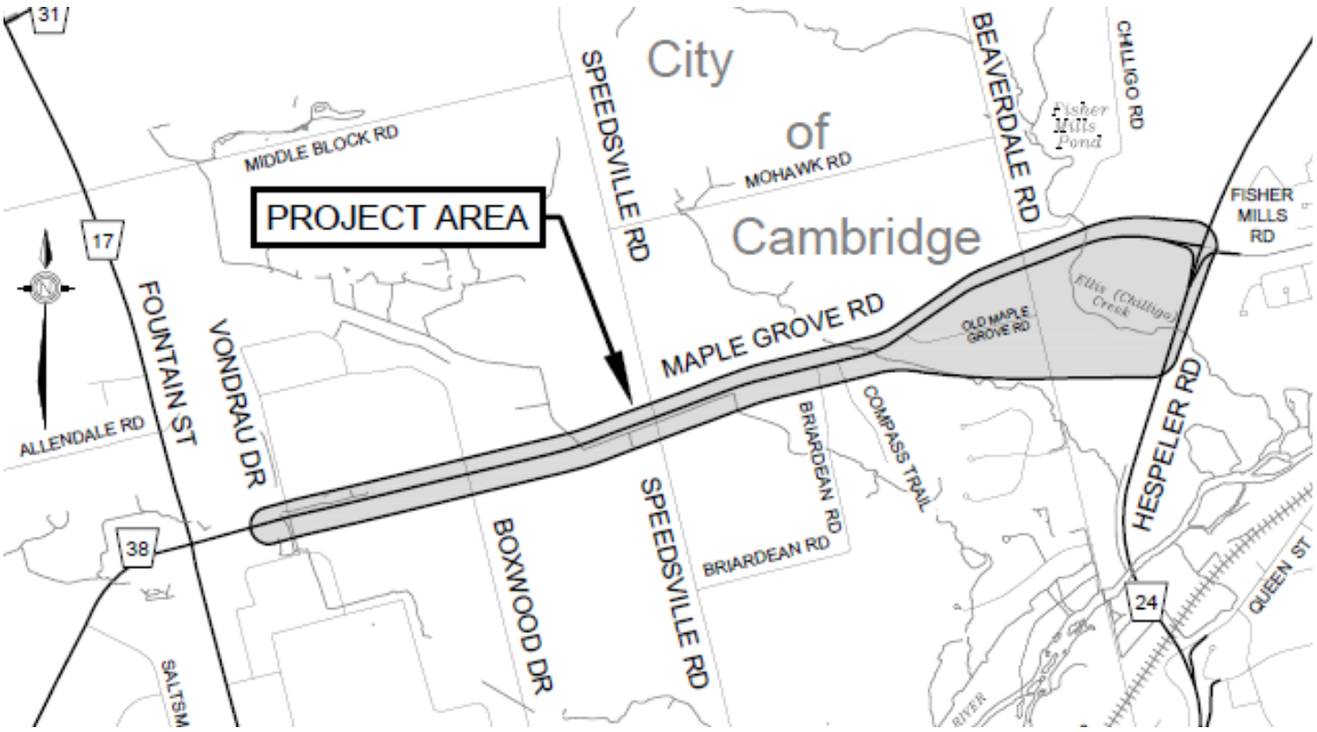
Date of Notice: January 10, 2020

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Region of Waterloo

# Public Consultation Centre #1
# Schedule C Class Environmental Assessment for
# Maple Grove Road Improvements
# from Hespeler Road to Vondrau Drive
# City of Cambridge

The Region of Waterloo invites you to participate in an online **Public Consultation Centre (PCC)** for the Maple Grove Road Improvements Schedule C Class Environmental Assessment (Class EA) in the City of Cambridge.




## Background

The Region of Waterloo is undertaking a Schedule C Municipal Class Environmental Assessment (Class EA) for improvements to the Maple Grove Road (Regional Road 38) corridor from Hespeler Road to Vondrau Drive in the City of Cambridge. Improvements on Maple Grove Road (Regional Road 38) are being considered to provide road improvements for traffic growth and active transportation improvements for pedestrians, cyclists, and transit along the corridor.

The 2018 Regional Transportation Master Plan Update has identified the need to widen Maple Grove Road from two (2) to four (4) through lanes; add active transportation improvements for pedestrians, cyclists, and transit; and improve existing and forecasted traffic operations between Hespeler Road and Vondrau Drive.

## The Process

The study is being conducted in accordance with the requirements of a Municipal Class Environmental Assessment, which is an approved process under the Ontario Environmental Assessment Act (amended through 2019).

This is the First Public Consultation Centre (PCC #1) and the Project Team will be presenting the needs and opportunities for improvements on Maple Grove Road, as well as alternative solutions to address those opportunities, to the public and will be seeking input. PCC #1 is designed to provide interested members of the public, local businesses, community, and agencies the opportunity to get an update on the project work completed to date, and comment on project issues.

**Community Involvement**

The Region of Waterloo encourages members of the public, stakeholder groups, and agencies to actively participate in this study by participating in public consultation opportunities or contacting staff directly with comments or questions. If you wish to be added to the project mailing list, or would like further information on the project and any future public meetings, please visit our website at www.regionofwaterloo.ca or contact:


Justin Armstrong, P. Eng.
Senior Engineer
Region of Waterloo
150 Frederick Street
Kitchener, ON N2G 4J3
Phone: 519-575-4757 Ext. 3164
Email: juarmstrong@regionofwaterloo.ca

John Bayley, P.Eng.
Senior Project Manager
IBI Group
410 Albert Street, Suite 101
Waterloo, ON N2L 3V3
Phone: 519-585-2255 Ext. 63220
Email: john.bayley@ibigroup.com


All interested parties are invited to complete the online questionnaire and add any comments at the Region's EngageWR project site at www.engagewr.ca. Interested parties may complete the survey and submit their comments on the project site between the dates below:

**Open to Comments at www.engagewr.ca : Monday, July 27, 2020**

**Closes to Comments: Monday, August 17, 2020 at 4:30 p.m.**

Plans and other project information will be available for your review and staff will be available to answer your questions. Your comments and input on this project are requested to assist the Project Team in finalizing the Alternative Solution and to prepare a preferred Recommended Design Alternative for this project. Plans can be made available for viewing after July 27, 2020 at Regional Administration Headquarters, Design and Construction, 6th Floor, 150 Frederick Street, Kitchener, Ontario upon request. The plans will also be available online at:

https://www.regionofwaterloo.ca/en/living-here/resources/Documents/Future-Construction/DC_07116_InfoSheet.pdf

If you are unable to review the Consultation Centre content with the review and comment period, but would like to provide comment, please direct your comments to the contacts listed above.

**Accessibility**

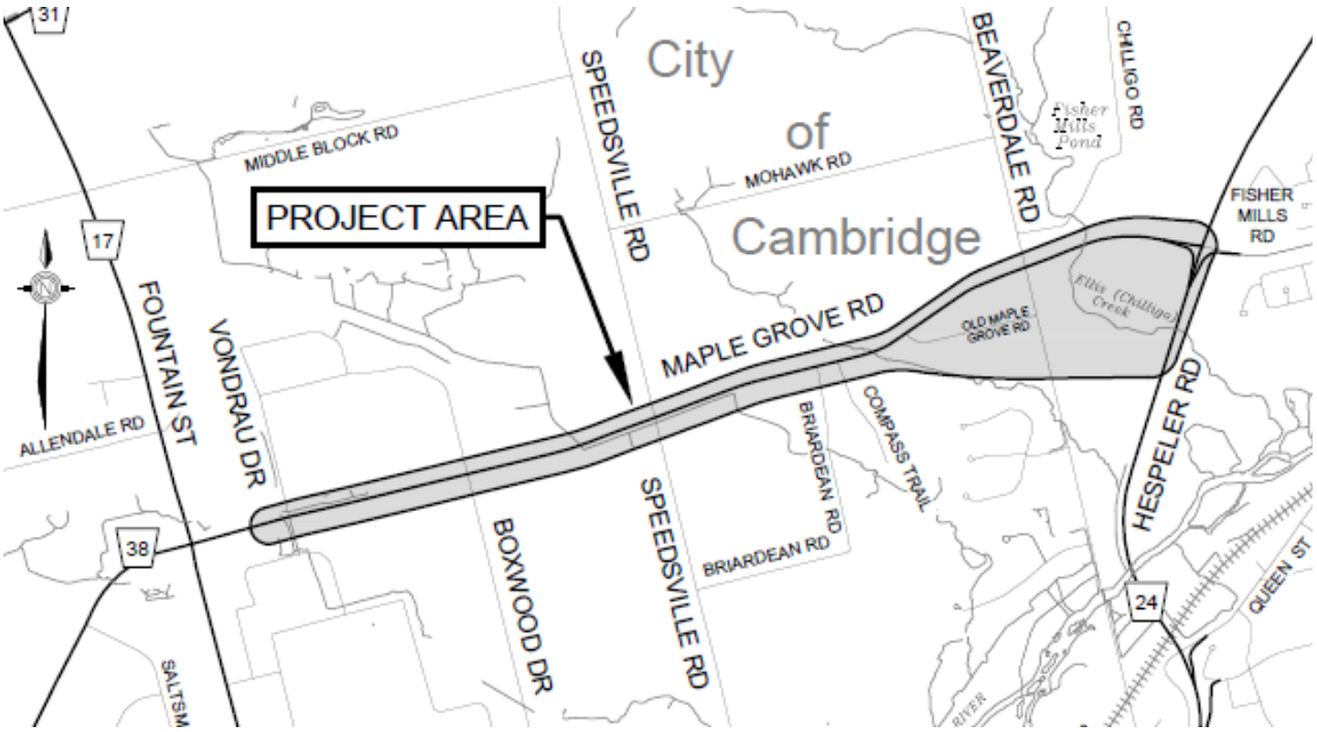
If you require assistance to participate in this online PCC, or to access information in an alternative format, please contact Justin Armstrong (as above) by Monday, August 10, 2020.

All comments and information received from individuals, stakeholder groups and agencies regarding this project are being collected to assist the Region of Waterloo in making a decision. Under the Municipal Act, personal information such as name, address, telephone number, and property location that may be included in a submission becomes part of the public record. Questions regarding the collection of this information should be referred to Justin Armstrong.

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# Public Consultation Centre #2
# Schedule C Class Environmental Assessment for
# Maple Grove Road Improvements
# from Hespeler Road to Vondrau Drive
# City of Cambridge

The Region of Waterloo invites you to participate in an online **Public Consultation Centre (PCC)** for the Maple Grove Road Improvements Schedule C Class Environmental Assessment (Class EA) in the City of Cambridge.




**Background**

The Region of Waterloo is undertaking a Schedule C Municipal Class Environmental Assessment (Class EA) for improvements to the Maple Grove Road (Regional Road 38) corridor from Hespeler Road to Vondrau Drive in the City of Cambridge. Improvements on Maple Grove Road (Regional Road 38) are being considered to provide road improvements for traffic growth and active transportation improvements for pedestrians, cyclists, and transit along the corridor.

The 2018 Regional Transportation Master Plan Update has identified the need to widen Maple Grove Road from two (2) to four (4) through lanes; add active transportation improvements for pedestrians, cyclists, and transit; and improve existing and forecasted traffic operations between Hespeler Road and Vondrau Drive.

**The Process**

The study is being conducted in accordance with the requirements of a Municipal Class Environmental Assessment, which is an approved process under the Ontario Environmental Assessment Act (amended through 2019).

This is the Second Public Consultation Centre (PCC #2) and the Project Team will be presenting the: needs and opportunities for improvements on Maple Grove Road; alternative solutions to address those opportunities; the criteria used to evaluate alternative solutions for improvement; as well as the Project Team preferred alternative, to the public and will be seeking input.

PCC #2 is designed to provide interested members of the public, local businesses, community, and agencies the opportunity to get an update on the project, and comment on project issues.

**Community Involvement**

The Region of Waterloo encourages members of the public, stakeholder groups, and agencies to actively participate in this study by participating in public consultation opportunities or contacting staff directly with comments or questions. If you wish to be added to the project mailing list, or would like further information on the project and any future public meetings, please visit our website at www.regionofwaterloo.ca or contact:


Justin Armstrong, P. Eng.
Senior Engineer
Region of Waterloo
150 Frederick Street
Kitchener, ON N2G 4J3
Phone: 519-575-4757 Ext. 3164
Email: juarmstrong@regionofwaterloo.ca

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Senior Project Manager
IBI Group
410 Albert Street, Suite 101
Waterloo, ON N2L 3V3
Phone: 519-585-2255 Ext. 63220
Email: john.bayley@ibigroup.com


All interested parties are invited to complete the online questionnaire and add any comments at the Region's EngageWR project site at www.engagewr.ca. Interested parties may complete the survey and submit their comments on the project site between the dates below:

**Open to Comments at www.engagewr.ca : Monday, June 28, 2021**

**Closes to Comments: Friday, July 30, 2021 at 4:30 p.m.**

Plans and other project information will be available for your review and staff will be available to answer your questions. Your comments and input on this project are requested to assist the Project Team in finalizing the preferred alternative and to prepare a preferred Recommended Design Alternative for this project.

Information will also be available online at:

https://www.regionofwaterloo.ca/en/living-here/resources/Documents/Future-Construction/DC_07116_InfoSheet.pdf

If you are unable to review the Consultation Centre content with the review and comment period, but would like to provide comment, please direct your comments to the contacts listed above.

**Accessibility**

If you require assistance to participate in this online PCC, or to access information in an alternative format, please contact Justin Armstrong (as above) by Friday, August 6, 2021.

All comments and information received from individuals, stakeholder groups, and agencies regarding this project are being collected to assist the Region of Waterloo in making a decision. Under the Municipal Act, personal information such as name, address, telephone number, and property location that may be included in a submission becomes part of the public record. Questions regarding the collection of this information should be referred to Justin Armstrong.

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Public Consultation Centre #2
Maple Grove Rd. Improvements
Vondrau Dr. to Hespeler Rd.
City of Cambridge
Monday, June 28, 2021 - Friday, July 30, 2021
www.engagewr.ca
Region of Waterloo
For more information:
www.regionofwaterloo.ca
519-575-4400

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Region of Waterloo

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| **Refer To:** | **File No:** | **Date:** |
|---|---|---|
| Justin Armstrong, P.Eng. | 07116.E | May 2, 2022 |

**Property Owners, Tenants, Agencies, and Interested Parties**

**Re: Municipal Class Environmental Assessment (Class EA), Schedule C**
**Maple Grove Road Improvements**
**City of Cambridge**

---

Regional staff will take a report to the May 10 Planning and Works Committee meeting with recommended design alternatives for Maple Grove Road in Cambridge. Staff will also be looking for approval to file a Notice of Completion for this project's Municipal Class Environmental Assessment.

The recommended alternative considered technical information gathered for this study and all public comments received. The project team is recommending the following cross-section elements as the Recommended Design Alternative for the Maple Grove Road corridor between Hespeler Road and Vondrau Drive:

- a three metre-wide multi-use path along each side of the road;
- a five metre-wide raised centre median;
- four lanes of through traffic;
- curb and gutter;
- storm sewers; and
- street lighting.

Funding for the Maple Grove Road Improvements project is included in the Region's 10-Year Transportation Capital Program. The 2022 Transportation Capital Program includes detailed design and construction scheduled for 2022 and 2023 through 2025 respectively.

The Regional Planning and Works Committee meeting on May 10 is scheduled to start at approximately 9 a.m., and is streamed live at regionofwaterloo.ca

The staff report will be available at regionofwaterloo.ca (https://calendar.regionofwaterloo.ca/council) after 4:30 p.m. on Friday, May 6, 2022.

If you wish to appear as a delegation at this meeting, please visit regionofwaterloo.ca and search for **Communicate with Council** to fill out the online form, email regionalClerk@regionofwaterloo.ca, or call 519-575-4400 and ask for the Office of the

Regional Clerk. Deadline for registration is May 3 at noon to be included on the agenda, or Monday, May 9 by 4:30 p.m. to be included in the addendum.

Regards,



Justin Armstrong, P. Eng.
Senior Engineer, Design and Construction
Region of Waterloo
519-575-4400, ext. 3164
JuArmstrong@regionofwaterloo.ca

C.c. Marcos Kroker, Region of Waterloo
Mayor Kathryn McGarry, City of Cambridge
Chair Karen Redman, Region of Waterloo
Councillor Tom Galloway, Planning and Works Committee Chair, Region of Waterloo
Councillor Karl Kiefer, Region of Waterloo
Councillor Helen Jowett, Region of Waterloo

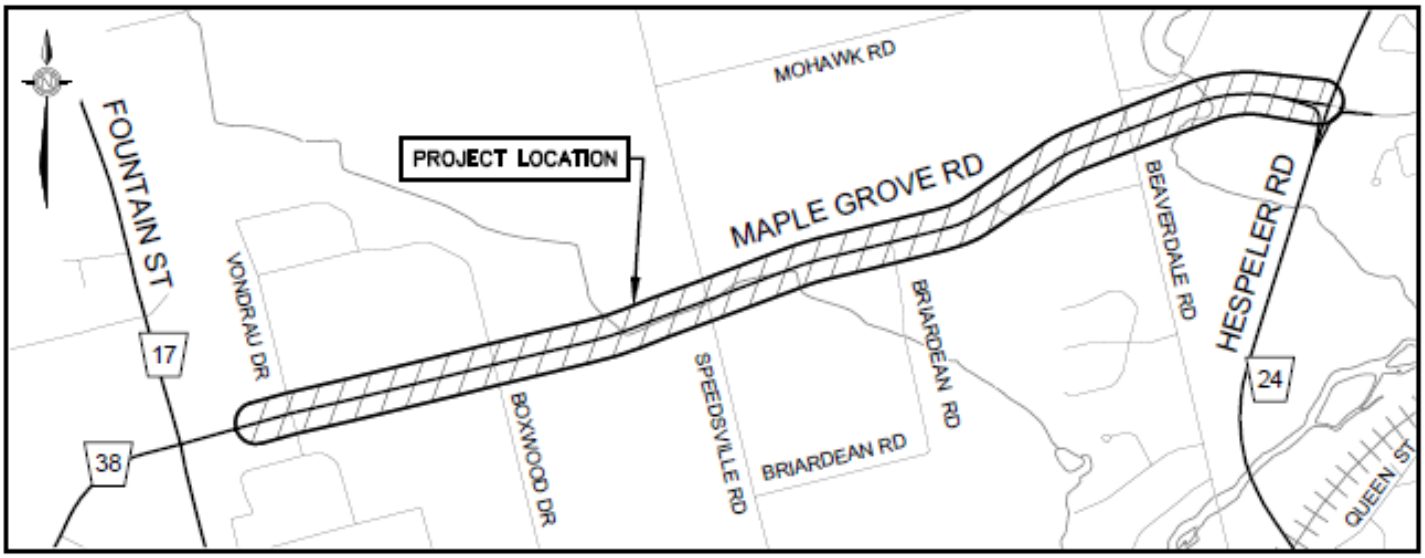
Accessibility: This event is accessible for people with disabilities. If you require assistance to attend or participate in this meeting, or to access information in alternative formats, please contact the Office of the Regional Clerk at least five days prior to the meeting.

All comments and information received from individuals, stakeholder groups, and agencies regarding this project are being collected to assist the Region of Waterloo in making a decision. Under the "Municipal Act", personal information such as name, address, telephone number, and property location, which may be included in a submission, becomes part of the public record. Questions regarding the collection of this information should be referred to Justin Armstrong at the Region of Waterloo.

Region of Waterloo

**Notice of Completion**
**Maple Grove Road Improvements**
in the City of Cambridge
**Municipal Class Environmental Assessment Schedule C**

The Regional Municipality of Waterloo has completed a planning study in accordance with the Ontario *Environmental Assessment Act* following the process for Schedule C projects under Municipal Class Environmental Assessment to address required transportation improvements on Maple Grove Road between Vondrau Drive and Hespeler Road in the City of Cambridge.




The Recommended Design Alternative includes:

- Three-metre-wide multi-use path (MUP) along both sides of the road
- Widening the road from two to four lanes of through-vehicle traffic
- A five-metre-wide raised curb, grassed median
- New curb and gutter and stormwater drainage
- New, additional street lighting

By copy of this notice, the Environmental Study Report is available for a 30-day public comment period in accordance with the requirements of a Municipal Class Environmental Assessment. Subject to comments received, and receipt of required approvals, the project can proceed to construction subject to Regional Council approval.

An electronic version of the Environmental Study Report is available for review online at:

- https://www.engagewr.ca/cambridge-maple-grove-road
- https://www.regionofwaterloo.ca/en/living-here/resources/Documents/Future-Construction/DC_07116_InfoSheet.pdf

A printed copy of the Environmental Study Report is available for review through the Clerk's Offices at either the Region of Waterloo (150 Frederick Street, Kitchener, Ontario) or City of Cambridge (50 Dickson Street, Cambridge, Ontario). If you are unable to view an electronic version of the Environmental Study Report, please contact the Regional Clerk's Office by phone at 519-575-4400 or email at RegionalClerk@regionofwaterloo.ca to make other arrangements.

Interested persons may provide written comments to the Regional Clerk's Office within 30 calendar days from the date of this notice. If concerns regarding this project cannot be resolved in discussion with the Region of Waterloo, a person or party may request the Minister of Environment, Conservation and Parks to make an Order under Section 16 of the *Environmental Assessment Act*. Reasons for timing, how, and where to make a Section 16 Order request are available online at https://www.ontario.ca/page/class-environmental-assessments-section-16-order. Section 16 Order requests must be sent to the Minister of Environment, Conservation and Parks and the Director of Environmental Assessment Branch. A copy of the request should also be sent to the Region and Consultant Project Managers:


Justin Armstrong, P.Eng.
Senior Engineer
Regional Municipality of Waterloo
150 Frederick Street, 6th Floor
Kitchener, Ontario N2G 4J3
Telephone: 519-575-4400 Ext. 3164
Email: juarmstrong@regionofwaterloo.ca

John Bayley, P.Eng.
Director, Senior Practice Lead
IBI Group
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Waterloo, ON N2L 3V3
Telephone: 519-585-2255 Ext. 63220
Email: john.bayley@ibigroup.com


**This Notice was first issued September 26th, 2023.**

The collection of comments and information received from individuals, stakeholder groups, and agencies regarding this project assists the Region of Waterloo in decision-making. Under the *Municipal Act*, personal information such as name, address, telephone number, and property location, which may be included in a submission, become part of the public record. Please direct questions regarding the collection of this information to the persons indicated above.

This notice is pursuant to the Ontario *Environmental Assessment Act*, the Municipal Engineers Association's *Municipal Class Environmental Assessment*, and the direction of the Ministry of the Environment, Conservation and Parks.

# Appendix F – Environmental Impact Study (NRSI)

September 2023



# Maple Grove Road Improvements Class Environmental Assessment

Environmental Impact Study

Prepared for:

IBI Group
c/o John Bayley
410 Albert Street, Suite 101
Waterloo, ON
N2L 3V3

Project No. 2171 | March 2022

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

**Maple Grove Road Improvements Class Environmental Assessment**

**Environmental Impact Study**

## Project Team

| | |
|---|---|
| Brett Woodman | Senior Manager, Terrestrial Biologist and Certified Arborist, Project Manager |
| Heather Fotherby | Terrestrial and Wetland Biologist |
| Jeremy Bannon | Terrestrial and Wetland Biologist, Certified Arborist |
| Andrew Dean | Terrestrial and Wetland Biologist |
| Amy Reinert | Terrestrial and Wetland Biologist |
| Blair Baldwin | Aquatic Biologist |
| Laura Hockley | GIS Specialist and Environmental Analyst |

Report submitted on March 15, 2022



Brett Woodman, M.E.S.
Project Manager
Senior Manager, Terrestrial Biologist and Certified Arborist

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## 1.0 Introduction

Natural Resource Solutions Inc. (NRSI) was retained in September 2018 by the Regional Municipality of Waterloo (RMOW) as part of a team to complete environmental studies to support the Maple Grove Road Improvements Class Environmental Assessment (EA) in the City of Cambridge and RMOW.

In 2004, an Environmental Study Report was filed by the RMOW for the proposed widening and reconstruction of Sportsworld Drive/Maple Grove Road from King Street to Hespeler Road. Phase I and II of the reconstruction of Sportsworld Drive/Maple Grove Road between King Street and Fountain Street was completed in 2007 and 2010, respectively. Due to several changes since the Class EA was completed in 2004, the RMOW has commissioned a new Class EA for additional improvements to Maple Grove Road between Fountain Street and Hespeler Road. Such proposed improvements include, but are not limited to, re-alignment, widening, intersection improvements (i.e., roundabouts, traffic control signals), enhanced pedestrian and cycling facilities, and the rehabilitation and widening of the Ellis Creek bridge.

The new project study area includes all lands within 250 m of the Maple Grove Road Right-of-Way (ROW) between Fountain Street and Hespeler Road (Map 1). The western portion of the study area is mainly characterized by industrial land use while the remaining areas consist of active agricultural fields, residential development and generally small and fragmented natural features including swamp, deciduous forest, coniferous forest, cultural plantation, meadow and marsh communities.

Several significant natural features are present within the study area. Watercourses within the study area include Ellis Creek, East Creek, West Creek and Middle Creek (MNRF 2018a). Several Provincially Significant Wetlands (PSW) are present including, Ellis Creek Wetland Complex, Speed River Wetland Complex and Maple Grove Road Wetland Complex (MNRF 2018a). Non-PSW wetlands include the West Creek Wetland Complex and a small unevaluated wetland (MNRF 2018a). Core Environmental Features designated by the RMOW include PSWs, Significant Woodlands and a portion of the Speed River Significant Valley, which is designated as a Landscape Level System (RMOW 2015). North of Maple Grove Road, the study area falls within the Natural Heritage System governed by the Growth Plan for the Greater Golden Horseshoe (MNRF 2018a). Due to the presence of several watercourse features and

wetlands, the majority of the study area is regulated by the GRCA under Ontario Regulation 150/06 (GRCA 2015). The study area is located within Ecoregion 6E.

This report contains the detailed findings of an Environmental Impact Study to inform the selection and detailed design of a preferred alternative for the proposed improvements to Maple Grove Road that will avoid and/or minimize adverse impacts to significant and sensitive natural heritage features. This report includes the results of the characterization of existing natural features within the study area based on the results of a background review and original field surveys. The detailed characterization was used to inform an analysis of the significance and sensitivity of identified natural features, the identification of any natural feature constraints in association with land use policy designations, and the assessment of potential impacts and mitigation measures associated with details of the proposed improvements to Maple Grove Road. This information is one component of the EA which informed the selection of a preferred design alternative. Four road widening design alternatives and three cross-section design alternatives were assessed by the Project Team to determine the preferred alternative in terms of the natural, social, cultural, technical and economic environment. The preferred design alternative was selected based on these criteria and the anticipated impacts of the preferred design alternative are discussed in this report as well as appropriate mitigations.

## 1.1 Proposed Undertaking

In April 2004, the RMOW filed an Environmental Study Report for the proposed widening and reconstruction of Sportsworld Drive/Maple Grove Road from King Street to Hespeler Road in Cambridge, Ontario. Phase 1 of the reconstruction, from King Street to Cherry Blossom Road, was completed in 2007. Phase 2 of the reconstruction, from Cherry Blossom Road to Fountain Street, was completed in 2010. A new roundabout at the intersection of Fountain Street and Maple Grove Road is tentatively planned for construction in 2020 in conjunction with improvements to Fountain Street from Highway 401 to Fairway Road/Kossuth Road.

There have been many changes since the Class EA was completed in 2004 and as a result, the RMOW now requires a new Schedule “C” Class EA Study for the section of Maple Grove Road from Fountain Street to Hespeler Road. Some of the changes that have occurred since 2004 include a new Regional Transportation Master Plan (2018), a new Regional Active Transportation Master Plan (2014), new Context Sensitive Regional Corridor Design Guidelines (2013), and updated Regional warrants and guidelines for traffic control devices, including roundabouts.

The RMOW's 2018 Transportation Capital Program includes the widening and reconstruction of Maple Grove Road tentatively in three phases from Hespeler Road to Fountain Street in 2020 and 2024/2025. The staging and timing of construction will be reviewed annually and may be adjusted.

The RMOW's 2018 Regional Transportation Master Plan recommends realigning the Maple Grove Road corridor southerly from approximately Old Maple Grove Road to Hespeler Road, connecting roughly 500 to 700 m south of the existing intersection of Maple Grove Road and Hespeler Road.

# 2.0 Project Scoping

## 2.1 Study Area

For the purposes of this report, the term “study area” refers to the land where development is proposed to occur as well as adjacent lands (within 250 m), lands covered by the Natural Heritage Information Centre (1x1 km squares) natural heritage background data and the areas covered by the wildlife atlases (10x10 km squares).

## 2.2 Background Information

### 2.2.1 Collection and Review of Background Information

Existing natural heritage information was collected and reviewed to identify key natural heritage features, habitats and species that are reported from, or have the potential to occur within the study area. The following background information sources were reviewed to provide an accurate understanding of the physical and biological attributes within the study area:

- Ministry of Natural Resources and Forestry (MNRF);
- Ministry of the Environment, Conservation and Parks (MECP);
- Grand River Conservation Authority (GRCA);
- Region of Waterloo Official Plan (RMOW 2015);
- Cambridge Official Plan (City of Cambridge 2018);
- Hespeler West Subwatershed Study (City of Cambridge 2004);
- Natural Heritage Information Centre (NHIC) (MNRF 2018a);
- Department of Fisheries and Oceans (DFO) Aquatic Species at Risk Maps (DFO 2018);
- Ontario Breeding Bird Atlas (OBBA) (BSC et al. 2009);
- Ontario Reptile and Amphibian Atlas (ORAA) (Ontario Nature 2018);
- Ontario Butterfly Atlas (Macnaughton et al. 2018);
- Atlas of the Mammals of Ontario (Dobbyn 1994);
- Rare Plant Atlas (Oldham and Brinker 2009); and
- Ontario Odonata Atlas (MNRF 2018d).

Species lists were compiled to provide information on species reported from within the vicinity of the study area based on data available from the wildlife atlases listed above. These atlases provide data based on 10x10 km survey squares. Information on species from the survey

squares that overlap with the study area were compiled. These initial species lists were used to guide the scope and type of wildlife field surveys required.

Background information received from the NHIC, MNRF and GRCA on October 5, 2018, October 16, 2018, and August 12, 2019, respectively, have been included in this report. As a function of this project straddling the transition of the *Endangered Species Act*, 2007 (ESA) from MNRF to MECP, background information was not originally requested from MECP. As recommended by MNRF, the Terms of Reference (TOR) was provided to MECP for review and comment on June 17, 2020. MECP staff had no additional background information to provide or further comments on the TOR following their review as stated in their response on January 18, 2021.

### 2.2.2 Significant Species Screening

Based on the compiled species lists for the study area, a screening exercise was completed to assess the potential for reported Species at Risk (SAR) and Species of Conservation Concern (SCC) to occur in the study area. This involved cross-referencing the preferred habitat for reported SAR and SCC (MNRF 2000, Oldham and Brinker 2009, Eakins 2017, Reznicek et al. 2011) against habitats known to occur in the study area. This exercise was completed to ensure that the potential presence of all SAR and SCC within the study area was adequately assessed in this study.

Species at Risk are those listed on the SAR in Ontario List (SARO) (MNRF 2018e). These include species identified by the Committee on the Status of Species at Risk in Ontario (COSSARO) as provincially Endangered, Threatened, or Special Concern. Species listed by COSSARO as Endangered or Threatened are protected by the ESA, which includes protection of their habitat, and are referred to as regulated SAR. Species listed as Special Concern are included in the definition of SCC, which comprises the following:

- Species designated provincially as Special Concern;
- Species that have been assigned a conservation status (S-Rank) of S1 to S3 or SH by the NHIC; and
- Species that are designated federally as Threatened or Endangered by the Committee for the Status of Endangered Wildlife in Canada (COSEWIC), but not provincially by COSSARO. If these species are listed under the Species at Risk Act

(SARA) under Schedule 1 they are protected by the federal Act but not provincially by the ESA.

Based on the preliminary background review, suitable habitats for 19 SAR and 62 SCC were identified as potentially present within the study area. Full SAR/SCC screening results are provided in Appendices I and II.

### 2.2.3 Significant Wildlife Habitat Screening

A screening exercise was completed to assess the presence of Significant Wildlife Habitat (SWH) within the study area. SWH is protected under the Ontario Provincial Policy Statement (PPS) (OMMAH 2020) and is described in the MNRF Significant Wildlife Habitat Technical Guide (SWHTG) (MNRF 2000) as being comprised of four major categories of habitat:

- Seasonal concentration areas;
- Rare vegetation communities and specialized wildlife habitat;
- Habitats of species of conservation concern; and
- Animal movement corridors.

Specific criteria defining wildlife habitat significance for Ecoregion 6E are described in the SWHTG Addendum (MNRF 2015b). Individual SWH types within these four broad categories were assessed as either not present, candidate, or confirmed for the study area based on a comparison of significance criteria against information obtained from relevant background documents.

Based on the preliminary background review, 12 SWH types were identified as candidate within the study area. Full SWH screening results are provided in Appendix III.

## 2.3 Terms of Reference and Agency Input

Based on the findings described above, a Terms of Reference (TOR) was prepared by NRSI and submitted for review and comment to the GRCA on July 22, 2019, and to the MNRF and RMOW on May 28, 2020. The GRCA provided comments on the TOR on July 24, 2019 and suggested a few minor revisions which were incorporated into the background review and study approach. The MNRF provided a response on June 16, 2020 with no comments on the study approach but recommended circulating the document to MECP for input regarding the ESA and SAR. The TOR was submitted for review and comment to the MECP on June 17, 2020. The

MECP provided a response on January 18, 2021 with no comments on the study approach with regards to the ESA and SAR. To date no response from the RMOW has been received.

The Terms of Reference and comments received are appended to this report (Appendix IV).

## 2.4 Relevant Policies, Legislation and Planning Studies

Natural features identified during background review and field investigations were evaluated against relevant policies, legislation and planning studies (Table 1) to help inform suitable land-use concepts, guide the layout of development, and identify areas to be protected.

**Table 1. Relevant Policies, Legislation and Planning Studies.**

| Policy/Legislation/Planning Study | Description | Project Relevance |
|---|---|---|
| Provincial Policy Statement, 2020 | • Issued under the authority of Section 3 of the Planning Act and came into effect on May 1, 2020, replacing the 2014 PPS (OMMAH 2020).<br>• Section 2.1 of the PPS – Natural Heritage, establishes clear direction on the adoption of an ecosystem approach and the protection of resources that have been identified as 'significant'.<br>• The Natural Heritage Reference Manual (MNRF 2010) and the Significant Wildlife Habitat Technical Guide (MNRF 2000) were prepared by the MNRF to provide guidance on identifying natural features and interpretation of the Natural Heritage sections of the PPS. | • Several natural features were identified within the study area or on adjacent lands as having potential implications under the PPS:<br>  • Significant Woodland;<br>  • Significant Wetland;<br>  • Habitat for Endangered and Threatened species;<br>  • Significant Wildlife Habitat; and<br>  • Fish Habitat. |
| *Endangered Species Act*, 2007 | • The original ESA, written in 1971, underwent a year-long review which resulted in a number of changes which came into force in 2007.<br>• The ESA prohibits killing, harming, harassing or capturing Species at Risk (SAR) and protects their habitats from damage and destruction. | • Suitable breeding habitat for Eastern Meadowlark was confirmed within the study area.<br>• Candidate suitable habitats for the Species at Risk, Blanding's Turtle, Little Brown Myotis, Northern Myotis and Tri-colored Bat, are present within the study area. |
| Canadian *Fisheries Act*, 1985 | • Proposed amendments to the Fisheries Act were introduced in 2018 to restore | • East Creek, Middle Creek, West Creek and Ellis Creek provide |

| Policy/Legislation/Planning Study | Description | Project Relevance |
|---|---|---|
| | lost protections and incorporate modern safeguards. On August 28, 2019, the new, "modernized" *Fisheries Act* came into force and includes new protections for fish and fish habitat in the form of standards, codes of practice, and guidelines for projects near water.<br>• The modernized Act provides protection for all fish and fish habitat and prohibits the harmful alteration, disruption or destruction of fish habitat<br>• The Department of Fisheries and Oceans Canada's (DFO) Fish and Fish Habitat Protection Program ensures compliance with relevant provisions under both the Fisheries Act and the Species at Risk Act. The program reviews proposed works, undertaking and activities that may impact fish and fish habitat.<br>• Works that are proposed in and around certain types of waterbodies may not require DFO review. Likewise, if proponents can follow all specified measures to protect fish and fish habitat outlined by DFO, review may not be necessary. | direct fish habitat and transect the study area.<br>• In-water works that have the potential to result in the harmful alteration, disruption, or destruction of fish habitat within these watercourses will need to undergo review by DFO. This will require the submission of a Request for Review application form. |
| Grand River Conservation Authority: Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses (Ontario Regulation 150/06) | • Regulation issued under *Conservation Authorities Act,* R.S.O. 1990.<br>• Through this regulation, the GRCA has the responsibility to regulate activities in natural and hazardous areas (i.e., areas in and near rivers, streams, floodplains, wetlands, and slopes).<br>• Development, interference or alteration within a Regulated Area may be permitted where it can be demonstrated through appropriate technical studies | • A large portion of the study area is regulated by the GRCA due to the presence of several watercourses and wetlands.<br>• Permitting from the GRCA must be obtained for proposed works within their regulation areas. |

| Policy/Legislation/Planning Study | Description | Project Relevance |
|---|---|---|
| | and/or assessments, site plans and/or other plans as required by the GRCA that there are no negative effects. | |
| Region of Waterloo Regional Official Plan (RMOW 2015) | • The Region of Waterloo Official Plan (RMOW 2015) outlines current policies for the protection of natural features within the Region.<br>• The Ministry of Municipal Affairs and Housing issued a Notice of Decision to approve the Official Plan, with modifications, on December 22, 2010. Several parties subsequently appealed the Ministry's decision to the Ontario Municipal Board for adjudication. The Municipal Board issued an Oral Decision to approve the Official Plan, in part, with further modifications, on June 18, 2015. As a result, the new Official Plan came into effect on June 18, 2015. | • Several natural features were identified within the study area or on adjacent lands as having potential implications under the plan:<br>• Landscape Level Systems (Significant Valley);<br>• Core Environmental Features (PSW, habitat of endangered or threatened species, significant woodlands);<br>• Fish Habitat; and<br>• Supporting Environmental Features (Linkages). |
| City of Cambridge Official Plan (2015) | • The City of Cambridge Official Plan (2015) provides a long range, comprehensive land use strategy for areas located within the municipal boundaries of the city. This document will provide the framework for land use decisions for all development and public works projects within the City of Cambridge for the next 20 years by protecting, managing and enhancing the natural environment, directing, influencing and managing growth patterns and facilitating the vision of the city.<br>• The Region of Waterloo approved the plan, in part, with modifications on November 21, 2012. | • Several natural features were identified within the study area or on adjacent lands as having potential implications under the plan:<br>• Landscape Level Systems (Significant Valley);<br>• Core Environmental Features (PSW, habitat of endangered or threatened species, significant woodlands);<br>• Fish Habitat; and<br>• Supporting Environmental Features (Linkages). |
| A Place to Grow: Growth Plan for the Greater Golden | • To ensure the protection and effective use of finite resources, A Place to Grow | • A portion of the study area north of Maple Grove Road falls within |

| Policy/Legislation/Planning Study | Description | Project Relevance |
|---|---|---|
| Horseshoe (Ontario Regulation 311/06) | Plan, together with the Greenbelt Plan, Oak Ridges Moraine Conservation Plan, and the Niagara Escarpment Plan, builds on the PPS to establish a unique land use planning framework for the Greater Golden Horseshoe that supports the achievement of complete communities, a thriving economy, a clean and healthy environment, and social equity. | the Natural Heritage System for the Growth Plan. |

## 3.0 Field Methods

Field surveys were undertaken within the study area to characterize natural features and identify significant and sensitive natural heritage features and species that have potential to be adversely affected by the proposed development. A total of 22 field visits were completed between September 2018 and August 2019. The specific field surveys completed during these visits are described in detail below and summarized in Table 2. Surveys were undertaken in accordance with provincial and local guidance documents.

**Table 2. Field Survey Summary**

| Survey Type | Protocol | Date |
|---|---|---|
| **Vegetation** | | |
| Vegetation Community Mapping | Lee et al. 1998 | June 3, 2019 |
| | | July 8, 2019 |
| | | August 12, 2019 |
| | | September 24, 2018 |
| | | September 27, 2018 |
| Vascular Flora Inventories | Systematic area search | June 3, 2019 |
| | | July 8, 2019 |
| | | August 12, 2019 |
| Tree Inventory | Systematic area search | January 18, 2019 |
| | | April 23, 2019 |
| | | April 29, 2019 |
| **Birds** | | |
| Breeding Bird Survey | OBBA 2001 | May 30, 2019 |
| | | May 31, 2019 (stations BMB-023 to 026) |
| | | June 12, 2019 |
| | | June 17, 2019 (stations BMB-023 to 026) |
| | | July 2, 2019 |
| | | July 4, 2019 (stations BMB-023 to 026) |
| Nocturnal Bird Survey | Knight et al. 2018 | June 18, 2019 |
| | | July 11, 2019 |
| **Anurans** | | |
| Anuran Call Survey | BSC 2009 | April 25, 2019 |
| | | April 30, 2019 (stations ANR-014 to 017) |
| | | May 15, 2019 (stations ANR-014 to 017) |
| | | May 27, 2019 |
| | | June 3, 2019 (Stations ANR-002, 012, 013) |
| | | June 18, 2019 |
| | | June 25, 2019 (stations ANR-014 to 017) |

| Survey Type | Protocol | Date |
|---|---|---|
| **Mammals** | | |
| Bat Habitat Assessment | MNRF 2011, MNRF 2016a | January 18, 2019 |
| | | April 18, 2019 |
| | | April 25, 2019 |
| | | May 21, 2019 |
| **Aquatics** | | |
| Aquatic Habitat Characterization | Stanfield 2013 | October 17, 2018 |
| Fish Community Assessment | Stanfield 2013 | October 17, 2018 |

## 3.1 Terrestrial Surveys

### 3.1.1 Vegetation Surveys

Vegetation community delineation was completed using aerial photography and thorough investigations in the field. The standard Ecological Land Classification (ELC) System for southern Ontario was applied (Lee et al. 1998). Details of vegetation communities were recorded including species composition, dominance and uncommon species or features.

All observed species of vascular flora within the study area were recorded during summer, spring and fall inventories.

### 3.1.2 Tree Inventory

A comprehensive inventory of trees with the potential to be impacted by the proposed road improvements was completed by a Certified Arborist. Individual trees ≥10 cm in Diameter at Breast Height (DBH) were assessed by a Certified Arborist and surveyed using an SXBlue II GNSS GPS unit.

The following information was recorded for each tree:

- Species;
- DBH;
- Crown radius (metres);
- General health (excellent, good, fair, poor, very poor, dead);
- Potential for structural failure (improbable, possible, probable, imminent);
- Tree location (on-site, boundary, off-site); and
- General comments (i.e., Disease, aesthetic quality, development constraints, sensitivity to development).

The overall health and potential for structural failure of each tree was assessed using accepted arboricultural techniques. These include a visual examination of each tree for structural defects, scars, external indications of decay such as fungal fruiting bodies, evidence of insect attack, the condition of any visible root structures, the degree and direction of lean (if any), the general condition of the tree(s) and the surrounding site, and the current or planned proximity of property and people. None of the trees examined on the property were dissected, cored, probed, or climbed and detailed root crown examinations involving excavation were not undertaken.

### 3.1.3 Breeding Bird Surveys

Breeding bird surveys were completed between sunrise and 10:00 hrs in suitable weather conditions. Surveys consisted of 5-minute point counts at 26 locations within the study area (Map 2). All visual and auditory observations of birds at and between monitoring stations, were recorded and evidence of breeding was collected as per the standard Ontario Breeding Bird Atlas (OBBA) methodology (BSC et al. 2001).

### 3.1.4 Nocturnal Bird Surveys

Nightjar breeding bird surveys were completed to assess the potential presence of Common Nighthawk (*Chordeiles minor*) within the study area. Surveys were conducted during appropriate weather conditions following the Canadian Nightjar Survey Protocol (Knight et al. 2018). Surveys consisted of 6-minute point counts beginning 30 minutes before sunset at 7 locations within the study area (Map 2). All visual and auditory observations of nightjars were recorded.

### 3.1.5 Anuran Call Survey

Evening anuran (frog and toad) call surveys were conducted following the Marsh Monitoring Program protocol (BSC 2008) at 17 monitoring stations (Map 2). Monitoring focused on calling frogs and toads during 3-minute point counts during which call intensity and an estimated number of individuals was documented. Survey time, air and water temperature, pH, wind speed, and cloud cover were also recorded at each survey station.

### 3.1.6 Bat Habitat Assessment

A leaf-off bat habitat assessment was conducted in conjunction with the Tree Inventory within the Maple Grove Road ROW to identify trees that have the potential to provide suitable habitat for bat maternity colonies (SWH) and/or habitat for SAR bats. Habitats were assessed based

on the criteria outlined in the *Survey Protocol for Species at Risk (SAR) Bats within Treed Habitats* (MNRF 2017), and *Bats and Bat Habitats: Guidelines for Wind Power Projects* (MNRF 2011). Tree species, DBH, decay class according to Watt and Caceres (1999), and the number, height, and type (e.g., cavity, crevice, sloughing bark, etc.) of suitable roost sites was documented for each potential roost tree. All identified candidate roost trees were surveyed with a SXBlue II GNSS GPS unit.

### 3.1.7 Additional Wildlife

All observations of birds, mammals, herpetofauna and insects were documented on all field visits. This included actual direct observations of individuals, as well as signs of wildlife presence (i.e., tracks, scats, dens, nests etc.).

### 3.1.8 Significant Wildlife Habitat and Species at Risk Habitat Assessments

Significant Wildlife Habitat (SWH) types and SAR habitats identified as potentially occurring within the study area (i.e., Candidate) during the background review were further assessed for their presence in the field during all surveys.

## 3.2 Aquatic Surveys

### 3.2.1 Aquatic Habitat Assessment

NRSI aquatic biologists completed a characterization of aquatic habitats within 20 m, both upstream and downstream, of each existing watercourse crossing within the study area (Map 2). In order to characterize aquatic habitats and assess the potential suitability for significant fish species known from within the vicinity, the following information was recorded for each aquatic feature:

- Substrate type and general composition;
- Flow conditions and physical water course characteristics including approximate depth, width, bank full width, bank height etc. (where applicable);
- Water temperature;
- Dissolved oxygen and general water quality parameters (including pH, Conductivity, and Total Dissolved Solids);
- General bank stability;
- Riparian and aquatic vegetation;
- Cover type and quality; and
- Suitable habitat for critical life stages of fish (spawning, nursery, foraging, etc.).

### 3.2.2 Fish Community Sampling

Fish community sampling was completed to supplement background fish community information collected from the GRCA and Guelph District MNRF within the study area. Sampling was completed at four monitoring stations within Ellis Creek (EMS-001), East Creek (EMS-002), Middle Creek (EMS-003), and West Creek (EMS-004) (Map 2).

Fish community sampling was conducted by a two-person crew using a Smith-Root LR-20B Electrofishing Backpack following the single pass screening level assessment based on the Ontario Stream Assessment Protocol (Stanfield 2013). This method is designed to provide a qualitative assessment of fish species abundance and generally characterize the fish community in the sampling reach. All captured fish were identified, enumerated, and released. A License to Collect Fish for Scientific Purposes was obtained from Guelph District MNRF (No. 1091369) to complete the fish community sampling with the use of electrofishing equipment.

# 4.0 Existing Conditions

## 4.1 Soil, Terrain and Drainage

The study area is located within the Waterloo Hills physiographic region. The majority of the study area rests on stone-poor, sandy silt to silty sand-textured till on Paleozoic terrain while the remainder rests on glaciofluvial deposits including river deposits, delta topset facies and sandy deposits (Ontario Geological Society 2003). The southeast portion of the study area is located near the Speed River and rests on ice-contact stratified deposits consisting of sand and gravel, minor silt, clay and till. Modern alluvial deposits consisting of clay, silt, sand, gravel and possibly organic remains are present along the Ellis Creek riparian corridor (Ontario Geological Society 2003).

The general topography of the study area is characterized by a relatively level upland area north of Maple Grove Road from which the land falls away toward the floodplain of the Speed River valley. All watercourses within the study area flow in a southeast direction until they converge with the Speed River. The headwaters of one watercourse, West Creek, are located within the study area.

## 4.2 Vegetation

### 4.2.1 Vegetation Communities

A summary of major ELC communities identified within the study area is provided in Table 3 and shown on Map 3.

**Table 3. Ecological Land Classification Community Descriptions.**

| ELC Code | Community Type | Community Description |
|---|---|---|
| **Forest** | | |
| FOC3 | Fresh-Moist Hemlock Coniferous Forest | Mature upland coniferous forest communities located northeast of the intersection of Maple Grove Rd. and Speedsville Rd. Portions of the mature coniferous canopy appear to have originated from historic plantation.<br><br>Canopy: Eastern Hemlock (*Tsuga canadensis*), Eastern White Pine (*Pinus strobus*), White Spruce (*Picea glauca*)<br>Sub-canopy: White Cedar (*Thuja occidentalis*), Black Cherry (*Prunus serotina*), Balsam Poplar (*Populus balsamifera* ssp. *balsamifera*)<br>Understorey: European Buckthorn (*Rhamnus cathartica*), Alternate-leaved Dogwood (*Cornus alternifolia*), White Ash (*Fraxinus americana*)<br>Groundcover: Yellow Dog's-tooth Violet (*Erythronium americanum* ssp. *americanum*), Spinulose Wood Fern (*Dryopteris carthusiana*), Heal-all (*Prunella vulgaris* ssp. *lanceolata*) |
| FOC4-1 | Fresh-Moist White Cedar Coniferous Forest | Mid-aged mesic coniferous forest communities associated with the upper to lower sloped habitats of the Ellis Creek valley and corridor.<br><br>Canopy: White Cedar, White Elm (*Ulmus americana*), Balsam Poplar<br>Sub-canopy: White Cedar, Black Cherry, European Buckthorn<br>Understorey: Choke Cherry (*Prunus virginiana* ssp. *virginiana*), Glossy Buckthorn (*Frangula alnus*), Green Ash (*Fraxinus pennsylvanica*)<br>Groundcover: Herb-robert (*Geranium robertianum*), White Avens (*Geum canadense*), Yellowish Enchanter's Nightshade (*Circaea lutetiana* ssp. *canadensis*) |
| FOD4 | Dry-Fresh Deciduous Forest | Small deciduous forest near an existing residence east of Beaverdale Rd., with notable disturbance and resembling a cultural community.<br><br>Canopy: Black Walnut (*Juglans nigra*), Manitoba Maple (*Acer negundo*)<br>Sub-canopy: Black Walnut, White Ash, Manitoba Maple<br>Understorey: Black Raspberry (*Rubus occidentalis*), Bitter Nightshade (*Solanum dulcamara*), Choke Cherry<br>Groundcover: Kentucky Bluegrass (*Poa pratensis* ssp. *pratensis*), Orchard Grass (*Dactylis glomerata*), Canada Goldenrod (*Solidago candensis*) |
| FOM4 | Dry-Fresh White Cedar Mixed Forest | Mid-aged mesic mixed forest community associated with the upper to lower sloped habitats of the Ellis Creek valley and corridor.<br><br>Canopy: Crack Willow (*Salix fragilis*), Black Walnut, White Cedar<br>Sub-canopy: White Cedar, American Basswood (*Tilia americana*), Trembling Aspen (*Populus tremuloides*)<br>Understorey: European Buckthorn, Choke Cherry, Alternate-leaved Dogwood<br>Groundcover: Woodbine (*Parthenocissus vitacea*), Field Horsetail (*Equisetum arvense*), White Snakeroot (*Eupatorium rugosum*) |
| FOD5 | Dry-Fresh Sugar Maple Deciduous Forest | Mid-aged to mature upland deciduous forest communities located throughout the study area. |

| ELC Code | Community Type | Community Description |
|---|---|---|
| | | Canopy: Sugar Maple (*Acer saccharum* ssp. *saccharum*), American Basswood, Black Cherry<br>Sub-canopy: Sugar Maple, Ironwood (*Ostrya virginiana*), American Beech (*Fagus grandifolia*)<br>Understorey: Alternate-leaved Dogwood, Choke Cherry, European Buckthorn<br>Groundcover: Yellow Dog's-tooth Violet, False Solomon's Seal (*Maianthemum racemosum* ssp. *racemosum*), sedges (*Carex* spp.) |
| FOD7 | Fresh-Moist Lowland Deciduous Forest | Young to mid-aged deciduous forest communities located throughout the study area, representing the transition zone between terrestrial and wetland, and typically associated with disturbance and prevalence of non-native species.<br><br>Canopy: Crack Willow, Trembling Aspen, Green Ash, Manitoba Maple<br>Sub-canopy: Green Ash, Manitoba Maple, Black Walnut, European Buckthorn<br>Understorey: European Buckthorn, Glossy Buckthorn, Red-osier Dogwood (*Cornus stolonifera*), Wild Black Currant (*Ribes americanum*)<br>Groundcover: Woodbine, Calico Aster (*Symphyotrichum lateriflorum* var. *lateriflorum*), Late Goldenrod (*Solidago gigantea*), Garlic Mustard (*Alliaria petiolata*), Dame's Rocket (*Hesperis matronialis*), Fowl Meadow Grass (*Glyceria striata*)<br><br>A habitat inclusion exists within this community: Fresh-Moist Poplar Deciduous Forest (FOD8-1); dominant species include Trembling Aspen, Red-osier Dogwood, Sensitive Fern (*Onoclea sensibilis*). |
| FOD7-3 | Fresh-Moist Willow Lowland Deciduous Forest | Mid-aged lowland deciduous forest community located along the Middle Creek riparian corridor, south of Maple Grove Rd.<br><br>Canopy: Crack Willow, Green Ash, Manitoba Maple<br>Sub-canopy: Manitoba Maple, Trembling Aspen, Black Walnut, Crack Willow<br>Understorey: Glossy Buckthorn, Choke Cherry, Wild Black Currant<br>Groundcover: Yellow Avens (*Geum aleppicum*), Jack-in-the-pulpit (*Arisaema triphyllum*), Star-flowered Solomon's Seal (*Maianthemum stellatum*) |
| **Wetland** | | |
| SWM4-1 | White Cedar-Hardwood Organic Mixed Swamp | Mid-aged to mature mixed swamp communities, occurring throughout the study area in low-lying and poorly drained habitats, as well as along riverine corridors.<br><br>Canopy: White Cedar, Yellow Birch (*Betula alleghaniensis*), Freeman's Maple (*Acer* X *freemanii*), White Elm, Crack Willow<br>Sub-canopy: White Cedar, Yellow Birch, Green Ash, Trembling Aspen, Freeman's Maple, Blue Beech (*Carpinus caroliniana* ssp. *virginiana*)<br>Understorey: Glossy Buckthorn, Common Elderberry (*Sambucus canadensis*), Red-osier Dogwood, Choke Cherry<br>Groundcover: Sensitive Fern, Purple-stemmed Aster (*Symphyotrichum puniceum* var. *puniceum*), Spotted Touch-me-not (*Impatiens capensis*), Cinnamon Fern (*Osmunda cinnamomea*), Dwarf Raspberry (*Rubus pubescens*), Wood Nettle (*Laportea canadensis*), Stick-tight (*Bidens cernua*) |

| ELC Code | Community Type | Community Description |
|---|---|---|
| | | A habitat inclusion exists within this community: Mixed Shallow Aquatic (SAM1); dominant species include Lesser Duckweed (*Lemna minor*), Chara (*Chara* sp.), Frog's-bit (*Hydrocharis morsus-ranae*). |
| SWD3-3 | Swamp Maple Mineral Deciduous Swamp | Mid-aged to mature deciduous swamp communities located throughout the study area and associated with bottomland topography.<br><br>Canopy: Freeman's Maple, White Elm, Bur Oak (*Quercus macrocarpa*)<br>Sub-canopy: Freeman's Maple, Green Ash, Black Ash (*Fraxinus nigra*)<br>Understorey: Glossy Buckthorn, Red-osier Dogwood, Wild Black Currant<br>Groundcover: Sensitive Fern, Spotted Touch-me-not, Field Horsetail, Wood Nettle, Fowl Meadow Grass |
| SWD3-4 | Manitoba Maple Mineral Deciduous Swamp | Small mid-aged deciduous swamp community located northwest of the intersection of Maple Grove Rd. and Hespeler Rd.<br><br>Canopy: Manitoba Maple, Crack Willow, Trembling Aspen<br>Sub-canopy: Green Ash, Manitoba Maple, Heart-leaved Willow (*Salix eriocephala*)<br>Understorey: Glossy Buckthorn, Nannyberry (*Viburnum lentago*), Red-osier Dogwood<br>Groundcover: Sensitive fern, Ostrich fern (*Matteuccia struthiopteris* var. *pensylvanica*), Spotted Touch-me-not, Great Hairy Willow-herb (*Epilobium hirsutum*) |
| SWD4 | Mineral Deciduous Swamp | Young to mid-aged deciduous swamp communities located east of Hespeler Rd. and associated with the Ellis Creek riparian area and other low-lying habitats.<br><br>Canopy: Trembling Aspen, Peach-leaved Willow (*Salix amygdaloides*), Crack Willow, Freeman's Maple<br>Sub-canopy: Trembling Aspen, Pussy Willow (*Salix discolor*), Green Ash<br>Understorey: Heart-leaved Willow, Glossy Buckthorn, Red-osier Dogwood, Silky Dogwood (*Cornus amomum* ssp. *obliqua*)<br>Groundcover: Sensitive Fern, Rice Cut Grass (*Leersia oryzoides*), Blue Lobelia (*Lobelia siphilitica*), Fowl Meadow Grass |
| SWD4-1 | Willow Mineral Deciduous Swamp | Mid-aged deciduous swamp communities associated with riparian areas along creek corridors.<br><br>Canopy: Crack Willow, Peach-leaved Willow, White Elm, Eastern Cottonwood (*Populus deltoides* ssp. *deltoides*)<br>Sub-canopy: Green Ash, White Elm, Manitoba Maple<br>Understorey: Wild Black Currant, Glossy Buckthorn, Common Elderberry<br>Groundcover: Sensitive Fern, Dame's Rocket, American Stinging Nettle (*Urtica dioica* ssp. *gracilis*), Fringed Loosestrife (*Lysimachia ciliata*)<br><br>A habitat inclusion exists within this community: Forb Mineral Meadow Marsh (MAM2-10); dominant species include American Stinging Nettle, Marsh Marigold (*Caltha palustris*), Bulbous Cress (*Cardamine bulbosa*). |
| SWD6-1 | Red Maple Organic Deciduous Swamp | Mid-aged to mature deciduous swamp community located along East Creek. |

| ELC Code | Community Type | Community Description |
|---|---|---|
| | | The canopy consists of Red Maple (*Acer rubrum*), Yellow Birch and Freeman's Maple and the subcanopy consists of Red Maple, Green Ash, White Cedar and Black Ash (*Fraxinus nigra*). The understory is dominated by Red-osier dogwood, Glossy Buckthorn and Blue Beech (*Carpinus caroliniana ssp. virginiana*) and the groundcover consists of<br><br>Canopy: Red Maple (*Acer rubrum*), Yellow Birch, Freeman's Maple<br>Sub-canopy: Red Maple, Green Ash, White Cedar, Black Ash<br>Understorey: Red-osier Dogwood, Glossy Buckthorn, Blue Beech<br>Groundcover: Rough-leaved Goldenrod (*Solidago patula*), Sensitive Fern and Fowl Meadow Grass |
| SWD6-3 | Swamp Maple Organic Deciduous Swamp | Mature deciduous swamp communities associated with low-lying habitats of East Creek and other low-lying habitats.<br><br>Canopy/sub-canopy: Freeman's Maple, Yellow Birch, Green Ash, White Elm<br>Understorey: Common Elderberry, Red-osier Dogwood, Long-beaked Willow (*Salix bebbiana*), Glossy Buckthorn, Spicebush (*Lindera benzoin*)<br>Groundcover: Sensitive Fern, Spotted Touch-me-not, Swamp Buttercup (*Ranunculus hispidus* var. *caricetorum*), False Nettle (*Boehmeria cylindrica*), Dwarf Raspberry |
| SWT2 | Mineral Thicket Swamp | Young-aged swamp thicket communities associated with low-lying habitats of East Creek and other low-lying habitats.<br><br>Canopy: N/A<br>Sub-canopy: Green Ash, Crack Willow, Peach-leaved Willow<br>Understorey: Glossy Buckthorn, Red-osier Dogwood, Red Panicled Dogwood (*Cornus foemina* ssp. *racemosa*), Pussy Willow, Heart-leaved Willow, Nannyberry<br>Groundcover: Purple Loosestrife (*Lythrum salicaria*), Sensitive Fern, Sparse-flowered Willow-herb (*Epilobium parviflorum*), Virginia Wild Rye (*Elymus virginicus* var. *virginicus*), European Common Reed (*Phragmites australis* ssp. *australis*) |
| MAM2 | Mineral Meadow Marsh | Young-aged low-lying meadow marsh communities, typically associated with, and nearby a cultural vegetation community, with notable disturbance and prevalence of non-native species.<br><br>Canopy: N/A<br>Sub-canopy: Manitoba Maple, Trembling Asper, Green Ash, Crack Willow<br>Understorey: Red-osier Dogwood, Red Panicled Dogwood, Pussy Willow, Long-beaked Willow, Basket Willow (*Salix purpurea*)<br>Groundcover: Reed Canary Grass (*Phalaris arundinacea*), Purple Loosestrife, European Common Reed, Tall White Aster (*Symphyotrichum lanceolatum* var. *lanceolatum*), Path Rush (*Juncus tenuis*) |
| MAM2-2 | Reed-canary Grass Mineral Meadow Marsh | Young-aged meadow marsh community associated with the Ellis Creek corridor upstream of the old Fisher Mills dam. There are restoration plantings throughout this community completed through the Fisher Mills dam restoration works. Refer to the Open Water (OA) description below for further characterization of the dug ponds along the riparian area.<br><br>Canopy: N/A<br>Sub-canopy: Manitoba Maple, Basket Willow, Common Elderberry |

| ELC Code | Community Type | Community Description |
|---|---|---|
| | | Understorey: Red-osier Dogwood, Long-beaked Willow, Pussy Willow, Sandbar Willow (*Salix exigua*)<br>Groundcover: Reed Canary Grass, Tall White Aster, American Stinging Nettle |
| MAS2 | Mineral Shallow Marsh | Shallow water marsh community dominated by a variety of emergent vegetation species. Delineated through aerial imagery (2019) interpretation and based on knowledge of habitat conditions within the broader study area. This vegetation community was ground-truthed to Ecosite from the south property line. |
| MAS2-1 | Cattail Mineral Shallow Marsh | Young-aged shallow marsh community associated with the Ellis Creek corridor upstream of the old Fisher Mills dam. Cattails (*Typha* spp.) dominate the habitat. |
| OA | Open Water | Located along the upper reach of Ellis Creek, these vegetation communities have resulted from a habitat creation/restoration project associated with the old Fisher Mills dam. The vegetation communities are ponds that were constructed within the creek's eastern floodplain and are used in part for stormwater conveyance from neighboring residential properties. Some aquatic and emergent vegetation is present, but insufficiently to recognize as a Shallow Water (SA) or Marsh (MA) community. |
| **Cultural** | | |
| CUM1 | Mineral Cultural Meadow | Young-aged open meadow communities occurring throughout the study area. Typically associated with disturbance and prevalence of non-native species.<br><br>Canopy: N/A<br>Sub-canopy: European Buckthorn, Black Walnut, White Ash<br>Understorey: European Buckthorn, Choke Cherry, Sandbar Willow, Staghorn Sumac (*Rhus typhina*), Wild Red Raspberry (*Rubus idaeus* ssp. *melanolasius*), Red Panicled Dogwood, Red-osier Dogwood, Glossy Buckthorn<br>Groundcover: Canada Goldenrod, Tall Goldenrod (*Solidago altissima* var. *altissima*), Tall White Aster, New England Aster, Orchard Grass, Kentucky Bluegrass, Bird's-foot Trefoil (*Lotus corniculatus*), Quack Grass (*Elymus repens*), Awnless Brome (*Bromus inermis* ssp. *inermis*) |
| CUM2 | Bedrock Cultural Meadow | Young-aged open meadow community with shallow topsoil, located adjacent to the east side of Hespeler Rd.<br><br>Canopy: N/A<br>Sub-canopy: White Ash, Black Walnut, European Buckthorn<br>Understorey: Red Panicled Dogwood, Tartarian Honeysuckle (*Lonicera tatarica*), Ninebark (*Physocarpus opulifolius*), European Buckthorn<br>Groundcover: Awnless Brome, Brown Knapweed (*Centaurea jacea*), Daisy Fleabane (*Erigeron annuus*), White Heath Aster (*Symphyotrichum ericoides* var. *ericoides*), Path Rush, Redtop (*Agrostis gigantea*) |
| CUT1 | Mineral Cultural Thicket | Young-aged shrub thicket communities occurring throughout the study area. Typically associated with disturbance and prevalence of non-native species.<br><br>Canopy: N/A<br>Sub-canopy: Scots Pine (*Pinus sylvestris*), Domestic Apple (*Malus domestica*), Eastern Red Cedar (*Juniperus virginiana*) |

| ELC Code | Community Type | Community Description |
|---|---|---|
| | | Understorey: Red Panicled Dogwood, Sandbar Willow, Tartarian Honeysuckle, European Buckthorn, Wild Red Raspberry, Black Raspberry<br>Groundcover: Field Hawkweed (*Hieracium caespitosum* ssp. *caespitosum*), Gray Goldenrod (*Solidago nemoralis*), Horseweed (*Erigeron canadensis*), Acuminate Panic Grass (*Dichanthelium acuminatum* var. *acuminatum*) |
| CUW1 | Mineral Cultural Woodland | Young to mid-aged successional woodland communities, occurring throughout the study area. Typically associated with disturbance and prevalence of non-native species.<br><br>Canopy: Manitoba Maple, Black Walnut, White Elm, Scots Pine<br>Sub-canopy: Black Walnut, Black Locust (*Robinia pseudo-acacia*), White Ash<br>Understorey: Black Walnut, European Buckthorn, Glossy Buckthorn, Black Raspberry, Red Currant (*Ribes rubrum*), Riverbank Grape (*Vitis riparia*)<br>Groundcover: Canada Goldenrod, Orchard Grass, Kentucky Bluegrass, Arrow-leaved Aster (*Symphyotrichum urophyllum*), Variable Crown-vetch (*Coronilla varia*), Awnless Brome<br><br>A habitat inclusion exists within this community nearby the southwest corner of the Maple Grove Rd. and Speedsville Rd. intersection: Stonewort Submerged Shallow Aquatic (SAS1-3); dominant species include Chara, Narrow-leaved Cattail (*Typha angustifolia*), Eurasian Water-milfoil (*Myriophyllum spicatum*). |
| CUP3 | Coniferous Plantation | Young to mid-aged coniferous plantation communities occurring throughout the study area.<br><br>Canopy: Red Pine (*Pinus resinosa*), Scots Pine, White Spruce, Eastern White Pine<br>Sub-canopy: White Ash, Black Cherry, Alternate-leaved Dogwood<br>Understorey: European Buckthorn, Choke Cherry, White Ash<br>Groundcover: Herb-robert, Garlic Mustard, Heal-all, Dame's Rocket<br><br>Three habitat inclusions are associated with this community for the polygon west of Briardean Rd.:<br>1. Fresh-Moist Ash Lowland Deciduous Forest (FOD7-2); dominant species include Green Ash, Choke Cherry, Dame's Rocket<br>2. Green Ash Deciduous Plantation (CUP1-7); dominant species include Green Ash, Guelder Rose (*Viburnum opulus*), Wood Avens (*Geum urbanum*)<br>3. Willow Mineral Deciduous Swamp (SWD4-1); dominant species include, Crack Willow, Spotted-touch-me-not, and Sensitive Fern |
| **Hedgerow** | | |
| HD | Deciduous Hedgerow | Mature deciduous hedgerow resembling adjacent FOD5 vegetation communities. Consists of a single row of mature trees with minimal structural variation (i.e., subcanopy, understorey). |

### 4.2.2 Vascular Flora

Detailed spring, summer and fall vegetation inventories resulted in the identification of 359 vegetation species by NRSI biologists in 2018 and 2019. A complete list of all observed species and species reported from the vicinity of the study area is provided in Appendix V.

Based on available background information, 5 vegetation SAR and 70 vegetation SCC are reported from the vicinity of the study area (MNRF 2018a, MNRF 2018b, Oldham and Brinker 2009). Appendices I and II provide a summary of significant species reported from the vicinity of the study area, including their current status ranks and preferred habitats. NRSI biologists observed 1 plant SAR, 2 plant SCC and 13 regionally significant species.

Butternut (*Juglans cinerea*) is listed as Endangered both federally and provincially (MNRF 2018e, Government of Canada 2018). One naturally occurring Butternut was observed by NRSI biologists within the Fresh - Moist Lowland Deciduous Forest community (FOD7) in the northeast corner of the study area (Map 4). In addition, multiple planted Butternuts were observed within the restored Cultural Meadow (CUM1) community near the church on Beaverdale Road (Map 4).

Slender-leaved Mountain-mint (*Pycnanthemum tenuifolium*) is not designated provincially or federally as at risk (MNRF 2018e, Government of Canada 2018), but has been assigned a conservation status S-RANK of S3 by the NHIC (MNRF 2018c). A species with an S3 designation is vulnerable with a moderate risk of extirpation in the jurisdiction due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors. A population with occasional occurrence was observed by NRSI biologists within the Cultural Thicket (CUT1) community in the southeast corner of the study area (Map 4).

Black Ash (*Fraxinus nigra*) is not listed provincially, but is listed as Threatened federally and has been assigned a conservation status S-RANK of S3 by the NHIC (MNRF 2018c, MNRF 2018e, Government of Canada 2018). This species was observed throughout the Red Maple Organic Deciduous Swamp (SWD6-1) community that runs along West Creek and the Swamp Maple Mineral Deciduous Swamp (SWD3-3) community east of the intersection of Maple Grove Road and Speedsville Road.

In addition, 13 regionally rare species were observed within the study area (Map 4): Rough Sedge (*Carex scabrata*), Large-leaved Pondweed (*Potamogeton amplifolius*), Hackberry (*Celtis*

*occidentalis*), Eastern Cottonwood (*Populus deltoides*), Spreading Sedge (*Carex laxiculmis var. laxiculmis*), Golden Alexanders (*Zizia aurea*), Bulbous Cress (*Cardamine bulbosa*), Wood's Sedge (*Carex woodii*), Swamp Candles (*Lysimachia terrestris*), American Prickly-ash (*Zanthoxylum americanum*),Virginia Stickseed (*Hackelia virginiana*), Black Walnut (*Juglans nigra*) and White Spruce (*Picea glauca*). Note that some of the documented Black Walnut and White Spruce individuals were not treated as significant as they were not naturally occurring.

### 4.2.3 Tree Inventory

In total, 452 trees were inventoried, comprising 40 species. Of the trees inventoried and assessed, 265 (59%) consisted of a native species and 187 (31%) were non-native. A complete list of trees inventoried is provided in Appendix XIII and the location of each inventoried tree is shown on Map 5.

Inventoried trees were categorized as high, medium, or low priority for retention based on the assessed maturity, health, structure, and invasive tendency (Appendix XIII). The location of trees to any planned or existing infrastructure has not been considered at this stage. This information is designed to be used to prioritize the retention of as many trees as possible during the detailed design stage, and aids to inform final ROW grading, servicing, and eventual tree protection fencing locations.

## 4.3 Wildlife

### 4.3.1 Birds

A total of 124 bird species are reported from the study area or vicinity based on the OBBA, MNRF SAR List, MNRF background information and NHIC database (BSC et al. 2009, MNRF 2018a, MNRF 2018b). The data documented by the OBBA includes all species that have been observed during the breeding period or have exhibited evidence of nesting in the area (10x10 km range). Fifty-six of these species, and 2 additional species, were observed by NRSI biologists within the study area during breeding bird surveys. A complete list of all observed species and species reported from the vicinity of the study area is provided in Appendix VI.

Based on available background information, 11 bird SAR and 8 bird SCC are reported from the vicinity of the study area (BSC et al. 2009, MNRF 2018a, MNRF 2018b). Appendices I and II provide a summary of significant species reported from the vicinity of the study area, including their current status ranks and preferred habitats. NRSI biologists observed four bird SAR and

two bird SCC within the study area during surveys in 2019, each of which are described in detail below.

Bank Swallow (*Riparia riparia*) is listed as a Threatened species both provincially and federally (MNRF 2018e, Government of Canada 2018). This species requires sand, clay or gravel riverbanks or steep riverbank cliffs, lakeshore bluffs of easily crumbled sand or gravel, gravel pits or road-cuts for nesting (MNRF 2000). Foraging habitats include grassland or cultivated fields that are close to water (MNRF 2000). A total of six individuals were observed within the study area and probable breeding evidence was documented at BBM-024 during breeding bird surveys on May 31 and June 17, 2019. Results of a Bank Swallow habitat assessment suggest that no suitable Bank Swallow breeding habitat is present within the vicinity of BBM-024 where individuals were observed. However, open areas within the study area, such as CUM1 communities, may provide suitable foraging habitat for this species. The presence of individuals at BBM-024 during consecutive surveys suggests that Bank Swallows are nesting nearby, likely outside of the study area. Even though probable breeding evidence of Bank Swallow was documented at BBM-024 during breeding bird surveys, the use of habitat within the study area for breeding has not been confirmed as no suitable Bank Swallow nesting habitat is present within the study area in the vicinity of BBM-024.

Barn Swallow (*Hirundo rustica*) is listed as a Threatened species both provincially and federally (MNRF 2018e, Government of Canada 2018). In Ontario, Barn Swallows are found almost exclusively in close association with humans and use human-made structures such as open barns, bridges, wharves and road culverts for nesting (Heagy et al. 2014). Although rare, they have also been documented to nest in cliffs, caves and rock niches. This species forages in areas with high concentrations of flying insects within a wide range of open and semi-open habitats including farmland, lakeshore and riparian habitats, road right-of ways, clearings in wooded areas, open wetlands and tundra (Heagy et al. 2014). Barn Swallow was observed flying over the study area at monitoring stations BBM-006, BBM-024, and BBM-002 during breeding bird surveys on June 12, June 17, and July 2, 2019, respectively. Suitable breeding habitat may be present within the study area as there are several human-made structures, however all suitable habitats fall within private lands. The use of such habitats within the study area for breeding have therefore not been confirmed by NRSI biologists during breeding bird surveys in 2019.

Bobolink (*Dolichonyx oryzivorus*) is listed as a Threatened species both provincially and federally (MNRF 2018e, Government of Canada 2018). This species requires large, open expansive grasslands, generally greater than 50 ha in size, with dense ground cover, such as hayfields, meadows, fallow fields or marshes for breeding (MNRF 2000). Possible breeding evidence was documented at BBM-006 during the first breeding bird survey on May 30, 2019. Suitable breeding habitat is limited within the study area due to the small size of open meadow habitats. The use of habitats within the study area for breeding have not been confirmed as no other Bobolink individuals were observed by NRSI biologists during subsequent breeding bird surveys in 2019. It is likely that the individual observed at BBM-006 on May 30, 2019, was a late migrant or young male looking for suitable breeding habitat.

Eastern Meadowlark (*Sturnella magna*) is listed as a Threatened species both provincially and federally (MNRF 2018e, Government of Canada 2018). This species prefers open, grassy meadows, farmland, pastures, hayfields or grasslands with elevated singing perches (MNRF 2000). They will also use cultivated land and weedy areas with trees and old orchards with adjacent, open grassy areas. In general, they prefer suitable habitats that are greater than 10 ha in size (MNRF 2000). Possible breeding evidence was documented at BBM-001 during breeding bird surveys on May 30, June 12, and July 2, 2019. The continued presence of this species at BBM-001 during all breeding bird surveys indicates probable breeding evidence and the use of the habitat as a permanent territory. Suitable breeding habitat is present in the CUM1 vegetation community where this species was observed exhibiting probable breeding evidence. Therefore, this habitat is considered confirmed Eastern Meadowlark breeding habitat.

Eastern Wood-Pewee (*Contopus virens*) is listed as Special Concern both provincially and federally (MNRF 2018e, Government of Canada 2018). This species uses open, deciduous, mixed or coniferous forest that is predominated by oak with little understory, forest clearings, edges, farm woodlots and parks (MNRF 2000). Several individuals were observed by NRSI biologists throughout breeding bird surveys conducted on May 30, May 31, June 12, July 2 and July 4, 2019. Eastern Wood-Pewee was observed exhibiting possible breeding evidence at monitoring stations BBM-004, BBM-005, BBM-007 and BBM-025. Eastern Wood-Pewee was observed exhibiting probable breeding evidence at monitoring stations BBM-003, BBM-013, BBM-014, BBM-015, BBM-021 and BBM-026. Based on the results of breeding bird surveys, several vegetation communities within the study area, including SWD3-4, SWD3-3, FOD5, SWD6-3 and FOD7, are considered confirmed breeding habitat for Eastern Wood-Pewee (Map 4).

Wood Thrush (*Hylocichla mustelina*) is listed as Special Concern provincially and Threatened federally (MNRF 2018e, Government of Canada 2018). It is found in the Carolinian and Great Lakes-St. Lawrence forest zones in undisturbed moist mature deciduous or mixed forest with deciduous sapling growth (MNRF 2000). They are often found near ponds or swamps and also use hardwood forest edges. Forests must have some trees greater than 12 m in height (MNRF 2000). Possible breeding evidence was documented at monitoring station BBM-003 during a breeding bird survey on June 12, 2019. The use of habitats within the study area for breeding has not been confirmed as no other Wood Thrush were observed by NRSI biologists during subsequent breeding bird surveys in 2019.

NRSI biologists also observed nine regionally significant species within the study area during breeding bird surveys: Wood Duck (*Aix sponsa*), Great Blue Heron (*Ardea herodias*), Turkey Vulture (*Cathartes aura*), Belted Kingfisher (*Megaceryle alcyon*), Red-bellied Woodpecker (*Melanerpes carolinus*), Least Flycatcher (*Empidonax minimus*), Brown Creeper (*Certhia americana*), Veery (*Catharus fuscescens*) and American Redstart (*Setophaga ruticilla*). Red-bellied Woodpecker and Wood Duck were observed exhibiting probable breeding evidence within the study area.

### 4.3.2 Herpetofauna

A total of 28 herpetofauna species are reported from the study area or vicinity based on the ORAA, MNRF SAR List, MNRF background information and NHIC databases (Ontario Nature 2018, MNRF 2018a, MNRF 2018b). Seven of these species were observed by NRSI biologists within the study area during herpetofauna surveys. A complete list of all observed species and species reported from the vicinity of the study area is provided in Appendix VII.

Based on available background information, three herpetofauna SAR and six herpetofauna SCC are reported from the vicinity of the study area (Ontario Nature 2019, MNRF 2018b, MNRF 2019a). Appendices I and II provide a summary of significant species reported from the vicinity of the study area, including their current status ranks and preferred habitats. NRSI did not observe any SAR or SCC herpetofauna during field surveys in 2019.

#### Anuran Call Surveys

Five species of anurans were recorded during anuran call surveys (Table 4). Of the 17 anuran call stations monitored, 11 had calling anurans. Two of these stations meet the criteria for SWH for Amphibian Breeding Habitat (Wetland) and are considered confirmed SWH for anurans.

**Table 4. Anuran Call Survey Results**

| Anuran Call Station[1] | Species[2] | Anuran Call Survey[3] | | | Number of Species | Total Number of Individuals[4] | Confirmed Significant Wildlife Habitat? |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | | | |
| **ANR-001** | American Toad | None | | None | 1 | 2 | No |
| | Gray Treefrog | | Code 2 (2) | | | | |
| | Green Frog | | | | | | |
| | Northern Leopard Frog | | | | | | |
| | Spring Peeper | | | | | | |
| **ANR-002** | American Toad | Station dry | None | | 2 | 4 | No |
| | Gray Treefrog | | | Code 1 (1) | | | |
| | Green Frog | | | Code 2 (3) | | | |
| | Northern Leopard Frog | | | | | | |
| | Spring Peeper | | | | | | |
| **ANR-003** | American Toad | None | None | None | 0 | 0 | No |
| | Gray Treefrog | | | | | | |
| | Green Frog | | | | | | |
| | Northern Leopard Frog | | | | | | |
| | Spring Peeper | | | | | | |
| **ANR-004** | American Toad | None | None | None | 0 | 0 | No |
| | Gray Treefrog | | | | | | |
| | Green Frog | | | | | | |
| | Northern Leopard Frog | | | | | | |
| | Spring Peeper | | | | | | |
| **ANR-005** | American Toad | None | None | None | 0 | 0 | No |
| | Gray Treefrog | | | | | | |
| | Green Frog | | | | | | |
| | Northern Leopard Frog | | | | | | |
| | Spring Peeper | | | | | | |
| **ANR-006** | American Toad | None | | None | 1 | 2 | No |

| Anuran Call Station[1] | Species[2] | Anuran Call Survey[3] | | | Number of Species | Total Number of Individuals[4] | Confirmed Significant Wildlife Habitat? |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | | | |
| | Gray Treefrog | | | | | | |
| | Green Frog | | | | | | |
| | Northern Leopard Frog | | | | | | |
| | Spring Peeper | | Code 2 (2) | | | | |
| **ARN-007** | American Toad | | | | 4 | 83 | Yes - SWH (Wetland) |
| | Gray Treefrog | | Code 3 | Code 2 (12) | | | |
| | Green Frog | | Code 2 (3) | Code 2 (7) | | | |
| | Northern Leopard Frog | Code 1 (1) | | | | | |
| | Spring Peeper | Code 3 | Code 3 | | | | |
| **ANR-008** | American Toad | | None | | 2 | 4 | No |
| | Gray Treefrog | | | | | | |
| | Green Frog | | | Code 1 (1) | | | |
| | Northern Leopard Frog | | | | | | |
| | Spring Peeper | Code 1 (3) | | | | | |
| **ANR-009** | American Toad | | | | 3 | 21 | Yes - SWH (Wetland) |
| | Gray Treefrog | | | Code 1 (1) | | | |
| | Green Frog | | Code 2 (7) | Code 2 (11) | | | |
| | Northern Leopard Frog | Code 1 (2) | | | | | |
| | Spring Peeper | | | | | | |
| **ANR-010** | American Toad | | Code 1 (1) | | 3 | 7 | No |
| | Gray Treefrog | | | | | | |
| | Green Frog | | Code 1 (1) | Code 1 (1) | | | |
| | Northern Leopard Frog | | | | | | |
| | Spring Peeper | Code 1 (2) | Code 2 (2) | | | | |
| **ANR-011** | American Toad | None | Code 1 (2) | | 2 | 7 | No |
| | Gray Treefrog | | | | | | |
| | Green Frog | | | Code 2 (5) | | | |

| Anuran Call Station[1] | Species[2] | Anuran Call Survey[3] | | | Number of Species | Total Number of Individuals[4] | Confirmed Significant Wildlife Habitat? |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | | | |
| | Northern Leopard Frog | | | | | | |
| | Spring Peeper | | | | | | |
| **ARN-012** | American Toad | Station dry | None | | 1 | 7 | No |
| | Gray Treefrog | | | | | | |
| | Green Frog | | | Code 2 (7) | | | |
| | Northern Leopard Frog | | | | | | |
| | Spring Peeper | | | | | | |
| **ANR-013** | American Toad | Station not surveyed | None | None | 0 | 0 | No |
| | Gray Treefrog | | | | | | |
| | Green Frog | | | | | | |
| | Northern Leopard Frog | | | | | | |
| | Spring Peeper | | | | | | |
| **ANR-014** | American Toad | None | None | None | 0 | 0 | No |
| | Gray Treefrog | | | | | | |
| | Green Frog | | | | | | |
| | Northern Leopard Frog | | | | | | |
| | Spring Peeper | | | | | | |
| **ANR-015** | American Toad | None | None | None | 0 | 0 | No |
| | Gray Treefrog | | | | | | |
| | Green Frog | | | | | | |
| | Northern Leopard Frog | | | | | | |
| | Spring Peeper | | | | | | |
| **ANR-016** | American Toad | None | None | | 1 | 20 | No |
| | Gray Treefrog | | | Code 3 | | | |
| | Green Frog | | | | | | |
| | Northern Leopard Frog | | | | | | |
| | Spring Peeper | | | | | | |

| Anuran Call Station[1] | Species[2] | Anuran Call Survey[3] | | | Number of Species | Total Number of Individuals[4] | Confirmed Significant Wildlife Habitat? |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | | | |
| ARN-017 | American Toad | None | None | | 1 | 10 | No |
| | Gray Treefrog | | | Code 2 (10) | | | |
| | Green Frog | | | | | | |
| | Northern Leopard Frog | | | | | | |
| | Spring Peeper | | | | | | |

[1]See Map 2 for monitoring station locations.
[2]Common and scientific names of species documented during surveys: American Toad (*Anaxyrus americanus*), Gray Treefrog (*Hyla versicolor*), Green Frog (*Lithobates clamitans melanota*), Northern Leopard Frog (*Lithobates pipiens*), Spring Peeper (*Pseudacris crucifer*).
[3]Marsh Monitoring protocol (BSC 2009) anuran call code with estimated number of individuals in brackets.
[4]This assumes that a Call Code 3 is 20 or more individuals.

### 4.3.3 Mammals

A total of 45 mammal species are reported from the study area or vicinity based on the Mammal Atlas of Ontario, MNRF SAR List and NHIC database (Dobbyn 1994, MNRF 2018a, MNRF 2018b). Eight of these species were incidentally observed by NRSI biologists within the study area during field surveys in 2019. A complete list of all observed species and species reported from the vicinity of the study area is provided in Appendix VIII.

Based on available background information, five mammal SAR and one mammal SCC are reported from the vicinity of the study area (Dobbyn 1994, MNRF 2018a, MNRF 2018b). Appendices I and II provide a summary of significant species reported from the vicinity of the study area, including their current status ranks and preferred habitats. NRSI biologists did not observe any SAR or SCC mammals during field surveys in 2019.

**Bat Habitat Assessment**

Six potential bat roost trees were documented within the study area during the bat habitat assessment (Map 5). These trees contained cavities, loose bark, cracks and/or crevices that may provide suitable roosting habitat for bats. The use of these habitats by bats has not been confirmed as exit surveys were not completed. Results of the bat habitat assessment are summarized in Table 5 below.

**Table 5. Summary of Bat Habitat Assessment Results**

| Tree ID | Species | | Location (UTM Coordinates) | | DBH[1] (cm) | Height Class[2] | Decay Class[3] | Microhabitat Details |
|---|---|---|---|---|---|---|---|---|
| | Common Name | Scientific Name | Easting | Northing | | | | |
| 25 | Sugar Maple | *Acer saccharum ssp. Saccharum* | 550215 | 4808387 | 69.0 | 1 | 1 | Knot cavity |
| 182 | Norway Maple | *Acer platanoides* | 553750 | 4809300 | 100.0 | 1 | 1 | 7 knot holes, 2 cavities at various heights above ground level |
| 306 | Sugar Maple | *Acer saccharum ssp. saccharum* | 553480 | 4809010 | 78.2 | 1 | 1 | Several cavities at various heights above ground level |
| 307 | Sugar Maple | *Acer saccharum ssp. Saccharum* | 553510 | 4809019 | 106.6 | 1 | 1 | Several cracks and crevices present |
| 308 | Sugar Maple | *Acer saccharum ssp. Saccharum* | 553517 | 4809022 | 85.8 | 1 | 1 | Loose bark |
| 326 | Freeman's Maple | *Acer x freemanii* | 553659 | 4809054 | 88.6 | 1 | 1 | Major open wound with heartwood rot and exit holes; loose bark |

[1]Diameter-at-Breast Height
[2]Height Class: 1 = Dominant (above canopy); 2 = Co-dominant (canopy height); 3 = Intermediate (just below canopy); 4 = suppressed (well below canopy)
[3]Decay Class: 1 = Healthy, live tree; 2 = Declining live tree, part of canopy lost; 3 = Very recently dead, bark intact, branches intact; 4 = Recently dead, bark peeling, only branches intact; 5 = Older dead tree, 90% of bark lost, few branch stubs, broken top; 6 = Very old dead tree, advanced decay, no branches, parts of stem have rotted away

### 4.3.4 Lepidoptera

A total of 82 lepidoptera species are reported from the study area or vicinity based on the Ontario Butterfly Atlas, MNRF SAR List and NHIC database (Macnaughton et al. 2018, MNRF 2018a, MNRF 2018b). No targeted surveys for lepidoptera were completed, however, one lepidoptera species was observed by NRSI biologists within the study area during field surveys in 2019. A complete list of species reported from the vicinity of the study area is provided in Appendix IX.

Based on available background information, four lepidoptera SCC are reported from the vicinity of the study area (Macnaughton et al. 2019, MNRF 2018a, MNRF 2018b). Appendices I and II provide a summary of significant species reported from the vicinity of the study area, including their current status ranks and preferred habitats. NRSI biologists observed one butterfly SCC, Monarch (*Danaus plexippus*), during field surveys in 2019.

Monarch is listed as Special Concern both provincially and federally (MNRF 2018e, Government of Canada 2018). They are found primarily where wildflowers for nectaring occur and where their larval host food plants exist (e.g., *Asclepias* spp.). This can include abandoned farmland, roadsides and other open spaces (MNRF 2000). NRSI biologists observed several Monarch butterflies within the CUM1 vegetation communities and agricultural fields southeast of the intersection of Speedsville Road and Maple Grove Road where Common Milkweed (*Asclepias syriaca*) was present. Three Monarch caterpillars were also observed along the East Creek corridor just south of Maple Grove Road in a location where no Common Milkweed was observed. These three caterpillars were observed to be close to pupating and were likely looking for a safe spot to do so. Caterpillars do not need their larval food host plant to pupate.

### 4.3.5 Odonates

A total of 75 odonate species are reported from the study area or vicinity based on the Ontario Odonate Atlas, MNRF SAR List and NHIC database (MNRF 2018a, MNRF 2018b, MNRF 2018d). No targeted odonate surveys were completed and no odonate species were documented by NRSI biologists within the study area during field surveys in 2019. A complete list of all observed species and species reported from the vicinity of the study area is provided in Appendix X.

Based on available background information, nine odonate SCC are reported from the vicinity of the study area (MNRF 2018a, MNRF 2018b, MNRF 2018d). Appendices I and II provide a summary of significant species reported from the vicinity of the study area, including their current status ranks and preferred habitats. NRSI did not observe any odonate SAR or SCC during field surveys in 2019.

## 4.4 Aquatic Habitat

Four watercourses and one municipal drain occur within the study area: East Creek, Middle Creek, West Creek Ellis Creek, and the Hunsperger Drain. These include permanent and intermittent features that flow generally south and southeast and outlet to the Speed River. A characterization of each of these watercourse features is provided in the following sections.

### 4.4.1 East Creek

East Creek is a tributary of the Speed River and is classified as a warmwater watercourse that supports a limited forage fish community (GRCA 2020). Aquatic habitats associated with East Creek were characterized at three aquatic monitoring stations, AHP-001, AHP-002 and AHP-

009, each of which are shown on Map 2 and described in detail below. Photographs illustrating the aquatic habitat conditions at each of these stations at the time of the characterization are provided in Appendix XII.

**AHP-001**

East Creek is characterized by a relatively shallow, gently meandering, moderate-gradient channel (0.04 - 0.15 m deep) with wetted widths ranging from 1.5 - 2.5 m within the vicinity of AHP-001 (Map 2). Bank full widths were observed to range from 2.5 - 4.5 m with bank full depths ranging from 0.5 - 1.5 m. No instream vegetation was observed in this reach of East Creek. Substrates within this reach were predominantly cobble with traces of silt and sand throughout. Substrates consisting of pebble and gravel are also present near the existing Beaverdale Road crossing of the creek. The existing road crossing at Beaverdale Road consists of a 1.5 m Corrugated Steel Pipe (CSP) within loose cobble and gabion basket embankments. Banks along this reach of East Creek were observed to have moderate stability with approximately 150° slopes and areas of exposed soil, erosion and overhanging vegetation.

During the October 17, 2018 field assessment, the water temperature was 8.8°C with an air temperature of 8.0°C at 8:30 hrs. Dissolved oxygen levels were documented as 8.3 ppm with 87.2% saturation. The pH was 7.4, with a conductivity of 0.80 ms/cm and Total Dissolved Solids (TDS) of 0.40 ppt. The general water quality parameters each fall well within the recommended guidelines of water quality for the protection of aquatic life. The pH is typical of that seen in small freshwater habitats (CCME 2003). No fish or other aquatic organisms were observed during the October 17, 2018 field survey, however previous identification of fish within this reach of East Creek would indicate that this reach of East Creek presents direct fish habitat (GRCA 2020).

**AHP-002**

At the existing Maple Grove Road crossing location (Map 2), East Creek is characterized by a relatively shallow channel flowing through a densely vegetated portion of the Maple Grove Road PSW complex (0.02 - 0.07 m deep) with wetted widths ranging from 1.5 to 2.5 m. Bank full widths within East Creek were observed to range from 3.5 to 5.8 m with bank full depths ranging from 0.50 to1.50 m. Dense patches of Broadleaved Cattail (*Typha latifolia*) were observed throughout and surrounding this reach of East Creek with traces of Watercress sp. (*Nasturtium* sp.). Substrates within this reach of East Creek were predominantly sand with traces of silt and clay. The existing road crossing consists of a 1.0 m CSP within loose cobble embankments.

Banks along this reach of East Creek were observed to have moderate stability with approximately 160° slopes and areas of exposed soil, erosion and overhanging vegetation.

During the October 17, 2018 field assessment, the water temperature was 10.2°C with an air temperature of 8°C at 9:30 hrs. The dissolved oxygen levels were 4.3 ppm with 42.2% saturation. The pH was 6.8, with a conductivity of 1.11 ms/cm and a TDS of 0.50 ppt. The general water quality parameters each fall well within the recommended guidelines of water quality for the protection of aquatic life; the pH is typical of that seen in small freshwater habitats (CCME 2003). No fish or other aquatic organisms were observed during the October 17, 2018 field survey, however previous identification of fish within this reach of East Creek would indicate that this reach of East Creek presents direct fish habitat (GRCA 2020).

**AHP-009**

Immediately upstream of the confluence with the Speed River (Map 2), East Creek is characterized by a relatively shallow channel flowing through heavily forested portions of the Speed River PSW complex (0.02 - 0.05 m deep) with wetted widths ranging from 0.75 to 1.25 m. Bank full widths within East Creek were observed to range from 2.5 to 3.0 m with bank full depths ranging from 0.50 to 0.75 m. No aquatic vegetation was observed within the vicinity of monitoring station, AHP-009. Substrates within this reach of East Creek were predominantly cobble with deposits of sand and silt throughout. Banks were observed to have moderate stability with approximately 150° slopes and areas of exposed soil, erosion and overhanging vegetation.

During the October 17, 2018 field assessment, the water temperature was 8.2°C with an air temperature of 8°C at 14:30 hrs. The dissolved oxygen levels were 8.3 ppm with 78.3% saturation. The pH was 7.3, with a conductivity of 1.35 ms/cm and a TDS of 0.65 ppt. The general water quality parameters each fall well within the recommended guidelines of water quality for the protection of aquatic life; the pH is typical of that seen in small freshwater habitats (CCME 2003). No fish or other aquatic organisms were observed during the October 17, 2018 field survey, however previous identification of fish within this reach of East Creek would indicate that this reach of East Creek presents direct fish habitat (GRCA 2020).

### 4.4.2 Middle Creek and Hunsperger Drain

Middle Creek is a tributary of the Speed River and is classified by the Guelph District MNRF as a warmwater watercourse based on the Creek's documented fish species composition. The

creek originates in a Swamp Maple Mineral Deciduous Forest (SWD3-3) community north of Maple Grove Road and east of Speedsville Road where stations labelled ANR-005 and ANR-014 are shown on Map 2. Immediately south of Maple Grove Road, the Hunsperger Drain confluences with Middle Creek. Aquatic habitats associated with Middle Creek and the Hunsperger Drain were characterized at three aquatic monitoring stations, AHP-003, AHP-004, and AHP-007, each of which are shown on Map 2 and described in detail below. Photographs illustrating the aquatic habitat conditions at each of these stations at the time of the characterization are provided in Appendix XII.

**AHP-003**

At the existing Speedsville Road crossing location within the vicinity of monitoring station AHP-003 (Map 2), the Hunsperger Drain is characterized by a relatively shallow, low gradient, channelized roadside drain (0.05 - 0.15 m deep) with wetted widths ranging from 1.5 to 2.0 m. Bank full widths within this reach were observed to range from 3.5 to 5.5 m with bank full depths ranging from 0.50 to 1.50 m. Dense patches of Broadleaved Cattail were observed along the shoreline in the vicinity of AHP-003 and in the surrounding lands. Substrates within this reach were predominantly silt and organic detritus. Deposits of cobble were also present in the vicinity of the existing road crossing structures and tile drain outlets. The existing Speedsville Road crossing consists of two 1.5 m CSP within loose cobble embankments. Banks within this reach were observed to have moderate stability with bank slopes of approximately 130° and areas of exposed soil, erosion and overhanging vegetation. Evidence of drain cleaning and vegetation removal in the vicinity of AHP-003 suggests periodic drain cleanout activities.

During the October 17, 2018 field assessment, the water temperature was 9.5°C with an air temperature of 8°C at 10:00 hrs. The dissolved oxygen levels were 6.2 ppm with 59.7% saturation. The pH was 6.9, with a conductivity of 1.65 ms/cm and a TDS of 0.87 ppt. The general water quality parameters each fall well within the recommended guidelines of water quality for the protection of aquatic life; the pH is typical of that seen in small freshwater habitats (CCME 2003). No fish or other aquatic organisms were observed during the October 17, 2018 field survey, however previous identification of fish within this reach of the Hunsperger Drain and the results of electrofishing surveys conducted by NRSI biologists on October 25, 2018 confirm that this reach presents direct fish habitat (GRCA 2020).

**AHP-004**

At the existing Maple Grove Road crossing location within the vicinity of monitoring station AHP-004 (Map 2), the Hunsperger Drain is characterized by a dry, low gradient, channelized roadside drain with bank full widths ranging from 1.25 to 2.0 m with bank full depths ranging from 0.50 to 0.75 m. Dense patches of Broadleaved Cattail and European Common Reed (*Phragmites australis* ssp*. australis*) were observed within saturated soils throughout this reach. Substrates were predominantly silt and organic detritus. The existing Maple Grove Road crossing consists of a 1.5 m CSP. Banks were observed to have moderate stability with slopes of approximately 110° with very dense overhanging terrestrial vegetation, primarily consisting of terrestrial grasses and deciduous trees. The drain was dry at the time of the habitat assessment. These dry conditions combined with the observed density of terrestrial vegetation within the channel suggests the drain is exposed to long periods of dry conditions. Available background information from the GRCA indicates that this reach of the Hunsperger Drain is classified as a warmwater watercourse supporting a limited forage fish community (GRCA 2020). No fish or other aquatic organisms were observed during the October 17, 2018 field survey, however previous identification of fish and the absence of barriers to upstream movement would indicate that this reach presents direct fish habitat for at least part of the year (GRCA 2020).

**AHP-007**

At the existing Briardean Road crossing location within the vicinity of monitoring station AHP-007 (Map 2), Middle Creek is characterized by a relatively shallow, gently meandering, low gradient, channel (0.05 - 0.45 m deep) with wetted widths ranging from 2.0 to 3.75 m. Bank full widths within Middle Creek were observed to range from 6.5 to 7.5 m with bank full depths ranging from 1.00 to 2.00 m. Isolated patches of Canada Waterweed (*Elodea canadensis*) and instream terrestrial grasses were observed throughout this reach of Middle Creek. Substrates were predominantly silt and sand with small areas of organic detritus. Cobble was also present near the existing road crossing structures at AHP-007. The existing Briardean Road crossing consists of two 2x1 m open box culverts. Banks in the vicinity of AHP-007 were observed to have moderate stability with slopes of approximately 120° and areas of exposed soil, erosion and overhanging vegetation. Woody debris was observed within this reach of the Creek where it traversed treed areas of the Maple Grove Road PSW complex.

During the October 17, 2018 field assessment, the water temperature was 8.5°C with an air temperature of 8°C at 12:00 hrs. The dissolved oxygen levels were 6.2 ppm with 59.7% saturation. The pH was 7.4, with a conductivity of 0.87 ms/cm and a TDS of 0.43 ppt. The

general water quality parameters each fall well within the recommended guidelines of water quality for the protection of aquatic life; the pH is typical of that seen in small freshwater habitats (CCME 2003). No fish or other aquatic organisms were observed during the October 17, 2018 field surveys, however previous identification of fish would indicate that this reach of Middle Creek presents direct fish habitat (GRCA 2020).

### 4.4.3 West Creek

West Creek is a tributary of the Speed River and is classified by the Guelph District MNRF as a warmwater watercourse based on the documented fish species composition. Aquatic habitats associated with West Creek were characterized at two aquatic monitoring stations, AHP-005 and AHP-006, which are shown on Map 2 and described in detail below. Photographs illustrating the aquatic habitat conditions at each of these stations at the time of the characterization are provided in Appendix XII.

**AHP-005**

At the existing Maple Grove Road crossing location within the vicinity of monitoring station AHP-005 (Map 2), West Creek is characterized by a relatively shallow low gradient channelized roadside drain (0.1 to 0.25 m deep) with wetted widths ranging from 1.5 to 2.0 m with no surface channel visible on the south side of Maple Grove Road. Bank full widths within this reach of West Creek were observed to range from 4.5 to 5.5 m with bank full depths ranging from 0.75 to 2.00 m. Dense patches of Broadleaved Cattail were observed throughout West Creek in the vicinity of AHP-005 and land scraped terrestrial grasses in the vicinity of West Creek suggest periodic cleanout activities. Substrates within this reach of West Creek were predominantly silt and organic detritus with deposits of sand surrounding the existing road crossing structure in the vicinity of AHP-003. The existing Maple Grove Road crossing consists of a 1.0 m CSP within loose cobble embankments. Banks within this reach of West Creek were observed to have high stability with bank slopes approximately 140° with dense overhanging bank vegetation throughout West Creek.

During the October 17, 2018 field assessment, the water temperature was 8.0°C with an air temperature of 8.0°C at 11:00 hrs. The dissolved oxygen levels were 5.6 ppm with 62.7% saturation. The pH was 7.4, with a conductivity of 1.75 ms/cm and a TDS of 0.94 ppt. The general water quality parameters each fall well within the recommended guidelines of water quality for the protection of aquatic life; the pH is typical of that seen in small freshwater habitats (CCME 2003). No fish or other aquatic organisms were observed during either the October 17

or October 25, 2018 field survey, however, previous identification of fish would indicate that this reach of West Creek presents direct fish habitat (GRCA 2020).

**AHP-006**

Within the vicinity of the AHP-006 (Map 2) the mapped West Creek watercourse was determined to have no surface water course at Fountain Street North.

### 4.4.4 Ellis Creek

Ellis Creek is a tributary of the Speed River and is classified by the Guelph District MNRF as a warmwater watercourse based on the Creek's documented fish species composition. Aquatic habitats associated with Ellis Creek were characterized at two aquatic monitoring stations, AHP-008 and AHP-010, which are shown on Map 2 and described in detail below. Photographs illustrating the aquatic habitat conditions at each of these stations at the time of the characterization are provided in Appendix XII.

**AHP-008**

At the existing Maple Grove Road crossing location within the vicinity of monitoring station AHP-008 (Map 2), Ellis Creek is characterized by a fairly shallow meandering low gradient channel (0.10 to 0.50 m deep) with wetted widths ranging from 4.5 to 5.5 m. Bank full widths within this reach of Ellis Creek were observed to range from 6.5 to 10.5 m with bank full depths ranging from 1.50 to 2.00 m. No instream vegetation was observed throughout this reach of Ellis Creek in the vicinity of AHP-008, however encrusting algae was observed on boulders throughout Ellis Creek. Substrates within this reach of Ellis Creek were predominantly cobble and gravel with patches of boulder and traces of silt throughout. The existing road crossing in the vicinity of AHP-008 consists of a raised concrete spanned bridge. Banks within this reach of Ellis Creek were observed to have moderate stability with bank slopes of approximately 160° with signs of exposed soil and areas of bank erosion and overhanging bank vegetation.

During the October 17, 2018 field assessment, the water temperature was 9.5°C with an air temperature of 8.0°C at 13:00 hrs. The dissolved oxygen levels were 9.3 ppm with 94.2% saturation. The pH was 7.1, with a conductivity of 0.65 ms/cm and a TDS of 0.34 ppt. The general water quality parameters each fall well within the recommended guidelines of water quality for the protection of aquatic life; the pH is typical of that seen in small freshwater habitats (CCME 2003). No fish or other aquatic organisms were observed during the October 17, 2018 field survey, however, previous identification of fish within this reach of Ellis Creek and the

results of electrofishing surveys conducted by NRSI biologists on October 25, 2018 confirm that this reach of Ellis Creek presents direct fish habitat (GRCA 2020).

**AHP-010**

Immediately upstream of the confluence of Ellis Creek and the Speed River and within the vicinity of monitoring station AHP-010 (Map 2), Ellis Creek is characterized by a moderately shallow meandering low gradient channel (0.20 to 1.05 m deep) with wetted widths ranging from 8.5 to 10.5 m. Bank full widths within Ellis Creek were observed to range from 10.5 to 15.5 m with bank full depths ranging from 1.50 to 2.00 m. No instream vegetation was observed throughout this reach of Ellis Creek, however encrusting algae was observed on boulders throughout Ellis Creek. Substrates were predominantly cobble and gravel with patches of boulder and traces of silt throughout. Banks were observed to have low stability with bank slopes of approximately 90° with signs of exposed soil and areas of bank erosion and overhanging bank vegetation. Dense patches of detritus and woody debris were also observed.

During the October 17, 2018 field assessment, the water temperature was 8.2°C with an air temperature of 8.0°C at 14:45 hrs. The dissolved oxygen levels were 8.3 ppm with 79.2% saturation. The pH was 7.4, with a conductivity of 0.70 ms/cm and a TDS of 0.38 ppt. The general water quality parameters each fall well within the recommended guidelines of water quality for the protection of aquatic life; the pH is typical of that seen in small freshwater habitats (CCME 2003). No fish or other aquatic organisms were observed during the October 17, 2018 field survey, however previous identification of fish would indicate that this reach of Ellis Creek presents direct fish habitat (GRCA 2020).

## 4.5 Fish and Freshwater Mussel Communities

A total of 24 fish species and 2 mussel species are reported from the study area or vicinity based on DFO SAR Mapping, MNRF SAR List, MNRF background information, GRCA background information and NHIC database (DFO 2019, MNRF 2018a, Buck pers. comm. 2018/2019, Zammit pers. comm. 2019, MNRF2019a). Fourteen of these fish species and 4 additional species were observed by NRSI biologists within the study area during field surveys in 2019. No mussel species were observed. A complete list of all observed species and species reported from the vicinity of the study area is provided in Appendix XI.

Based on available background information, two SAR fish, one SAR mussel and one SCC mussel species are reported from the vicinity of the study area (DFO 2019, MNRF 2018a,

MNRF 2019a). Appendices I and II provide a summary of significant species reported from the vicinity of the study area, including their current status ranks and preferred habitats. NRSI biologists did not observe any aquatic SAR or SCC during field surveys in 2019.

### 4.5.1 Fish Community Sampling

Fish community sampling within Ellis Creek (EMS-001) documented the presence of 13 fish species, 3 of which were not previously reported from Ellis Creek: Central Stoneroller (*Campostoma anomalum*), Northern Hog Sucker (*Hypentelium nigricans*), and Stonecat (*Noturus flavus*). Fish sampling within Middle Creek and Hunsperger Drain (EMS-003) documented eight fish species, including four species not previously reported: Fathead Minnow (*Pimephales promelas*), Northern Red Belly Dace (*Chrosomus eos*), Pumpkinseed (*Lepomis gibbosus*), and White Sucker (*Catostomus commersonii*). No fish were captured during fish community sampling within West Creek (EMS-004) or East Creek (EMS-002). A detailed summary of the fish community sampling results is provided in Table 6.

Prior to conducting electrofishing, water quality measurements, including water temperature and conductivity, were recorded to assist with the selection of appropriate effective electrofishing settings. The observed electrofishing conditions, settings and total sampling time are included in Table 6 for each sampling site.

## Table 6. Summary of Fish Community Sampling Results

| Electrofishing Site Conditions | | Electrofishing Sampling Site | | | |
|---|---|---|---|---|---|
| | | Ellis Creek | East Creek | Middle Creek and Hunsperger Drain | West Creek |
| | | EMS-001 | EMS-002 | EMS-003 | EMS-004 |
| Air temperature (°C) | | 4 | 5 | 5 | 5 |
| Water temperature (°C) | | 5 | 5 | 6 | 5 |
| Time water temp. taken | | 0900 hrs | 1030 hrs | 1100 hrs | 1230 hrs |
| Conductivity (Millisiemens/centimetre) | | 0.85 mS/cm | 1.23 mS/cm | 0.90 mS/cm | 2.21 mS/cm |
| Number of Netters | | 1 | 1 | 1 | 1 |
| Voltage (V) | | 200 | 150 | 200 | 150 |
| Pulsating Frequency (Hz) | | 90 | 90 | 90 | 90 |
| Shocking time (sec.) | | 1016 | 489 | 603 | 452 |
| **Species and Capture Results** | | | | | |
| **Common Name** | **Scientific Name** | **EMS-001** | **EMS-002** | **EMS-003** | **EMS-004** |
| Blacknose Dace | *Rhinichthys atratulus* | 11 | 0 | 24 | 0 |
| Brook Stickleback | *Culaea inconstans* | 0 | 0 | 37 | 0 |
| Central Mudminnow | *Umbra limi* | 0 | 0 | 30 | 0 |
| Central Stoneroller | *Campostoma anomalum* | 1 | 0 | 0 | 0 |
| Common Shiner | *Luxilus cornutus* | 4 | 0 | 0 | 0 |
| Creek Chub | *Semotilus atromaculatus* | 4 | 0 | 9 | 0 |
| Fantail Darter | *Etheostoma flabellare* | 4 | 0 | 0 | 0 |
| Fathead Minnow | *Pimephales promelas* | 0 | 0 | 13 | 0 |
| Hornyhead Chub | *Nocomis biguttatus* | 4 | 0 | 0 | 0 |
| Johnny Darter | *Etheostoma nigrum* | 1 | 0 | 0 | 0 |
| Longnose Dace | *Rhinichthys cataractae* | 10 | 0 | 0 | 0 |
| Northern Hog Sucker | *Hypentelium nigricans* | 2 | 0 | 0 | 0 |
| Northern Red Belly Dace | *Chrosomus eos* | 0 | 0 | 8 | 0 |
| Pumpkinseed | *Lepomis gibbosus* | 0 | 0 | 8 | 0 |
| Rainbow Darter | *Etheostoma caeruleum* | 8 | 0 | 0 | 0 |
| Smallmouth Bass | *Ambloplites rupestris* | 8 | 0 | 0 | 0 |
| Stonecat | *Micropterus dolomieu* | 1 | 0 | 0 | 0 |
| White Sucker | *Noturus flavus* | 1 | 0 | 7 | 0 |
| **Total No. of Captures** | | **59** | **0** | **136** | **0** |

Based on available background information and the results of the 2019 field investigations, the Ellis Creek fish community within the study area is typical of a warm-coolwater watercourse. That is, fish species documented within the Creek include a variety of cool and warmwater species ranging in tolerance to environmental disturbance from highly tolerant to intermediately tolerant species, with two intolerant species recorded within the study area: Rainbow Darter and Fantail Darter (Barbour et al. 1999).

The West Creek and East Creek fish communities are typical of a coolwater watercourse. Fish species within West Creek are coolwater species and considered to be common and intermediately tolerant to environmental disturbance (Barbour et al. 1999). The East Creek fish species assemblage consists of coolwater species ranging in tolerance from highly tolerant to intermediately tolerant species.

The Middle Creek and Hunsperger Drain fish community within the study area is typical of a warm-coolwater watercourse. Fish species within Middle Creek and Hunsperger Drain are predominantly coolwater species ranging in tolerance to environmental disturbance from highly tolerant to intermediately tolerant species (Barbour et al. 1999), however, two warmwater species not previously recorded, Pumpkinseed and Fathead Minnow, were documented during 2019 field investigations.

## 5.0 Natural Feature Significance and Sensitivity Analysis

An analysis of the significance and sensitivity of existing natural features within the study area was completed to identify those features and habitats that are sensitive to disturbance. This analysis is based on the rarity or significance of features and/or associated functions/processes and/or current policies, legislation, or planning related studies. Such features and functions identified as sensitive to disturbance are further identified as 'constraints' to development, prohibiting or constraining aspects of any proposed development around or within them. The analysis is also used to identify 'opportunity' areas that have been previously disturbed or contain no natural features where potential for habitat rehabilitation or enhancement exists. Results of this analysis are provided in the following sections to inform the evaluation of proposed alternatives and assist in the selection of an alternative that will avoid and reduce impacts to natural features and their ecological functions.

### 5.1 Wetlands

Wetlands are important for many reasons including collecting and storing surface water and groundwater and providing habitat for plants, wildlife, and fish. Wetlands operate on a water budget, where the hydrologic character of the wetland is determined by the combination of water inflow/outflow, topography, and groundwater conditions (Mitsch and Gosselink 1993). Wetlands receive water through precipitation, surface inflow, groundwater inflow, and lose water through evapotranspiration, surface and groundwater outflow. In the Region of Waterloo, wetlands are typically identified as PSW (evaluated and identified to be of provincial significance) or locally significant (evaluated and identified to be of non-provincial significance or unevaluated).

Several PSWs are present within the study area including the Ellis Creek, Speed River and Maple Grove Road Wetland Complexes (Map 1). The PPS states that development and site alteration shall not be permitted in significant wetlands (PSW) and development and site alteration shall not be permitted on adjacent lands to significant wetlands unless the ecological function of the adjacent lands has been evaluated and it has been demonstrated that there will be no negative impacts on the natural features or on their ecological functions. The Region of Waterloo Official Plan (RMOW 2015) designates PSWs as a Core Environmental Feature.

A non-PSW wetland is present to the south of the intersection of Maple Grove Road and Boxwood Drive (Map 1). This wetland community was identified by NRSI biologists as a Maple Mineral Deciduous Swamp (SWD3-3) community (Map 3). The portion of this community that is

east of Boxwood Drive is designated as a Core Environmental Feature by the Region of Waterloo (RMOW 2015).

Two small unevaluated wetlands are present to the north of Maple Grove Road within the study area (Map 1). One is located west of Beaverdale Road and one is located east of Hespeler Road, in the northeast corner of the study area.

All wetlands and their associated areas of interference are regulated by GRCA. The area of interference for PSWs and wetlands greater than or equal to 2 ha in size is defined as all lands within 120 m of the wetland feature. The area of interference for non-PSWs and wetlands less than 2 ha in size is defined as all lands within 30 m of the wetland feature. Any development within a wetland or within the area of interference of a wetland requires a permit from the GRCA.

## 5.2 Significant Woodlands

The Natural Heritage Reference Manual (MNRF 2010) provides guidance for assessing the ecological function of woodlands. It outlines criteria for determining the significance of woodlands within Ontario considering four broad categories: woodland size, ecological function, uncommon characteristics, and economic and social values. Woodlands identified as 'significant' according to the criteria outlined in the Natural Heritage Reference Manual are considered within the PPS (MMAH 2014). The PPS states that development and site alteration shall not be permitted in significant woodlands and development and site alteration shall not be permitted on adjacent lands to significant woodlands unless the ecological function of the adjacent lands has been evaluated and it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions. The Natural Heritage Reference Manual and the policies of the PPS can also be used by municipalities to further refine local policies, objectives, and evaluation criteria for woodlands.

According to the Region of Waterloo Official Plan (RMOW 2015) policies, Significant Woodlands are defined as all woodlands that are (a) greater than four hectares in size, excluding any adjoining hedgerows; (b) consisting primarily of native species of trees; and (c) meet the criteria of a woodland in accordance with the provisions of the Regional Woodland Conservation By-law. Based on these criteria, there are several areas of Significant Woodland that are identified within the study area. These areas are generally mapped as the non-wetland components of the Core Environmental Features shown on Map 1.

## 5.3 Habitat of Threatened and Endangered Species

### 5.3.1 Confirmed Habitats

Based on the results of wildlife-specific field surveys detailed in Section 3.0, habitat for one Threatened species was confirmed to be present within the study area (Map 4).

**Eastern Meadowlark**

Breeding habitat for Eastern Meadowlark was identified within the study area based on the results of breeding bird surveys. This species receives general habitat protection under the ESA. Category 1 habitat is defined as the nest and the area within 10 m of the nest which are highly sensitive features supporting the species reproduction life cycle and have the lowest tolerance to alteration (MNRF 2013a). Category 2 habitat is the area between 10 m and 100 m of the nest or centre of the approximated defended territory. This habitat is considered to have a moderate level of tolerance to alteration and includes the species' defended territory, which is depended on for courtship, mating, rearing of young, feeding, resting and bathing. Category 3 habitat is the area of continuous suitable habitat between 100 m and 300 m of a nest or centre of approximated defended territory. This habitat has a high level of tolerance to alteration. Eastern Meadowlarks depend on this area for feeding, rearing or young, resting, dispersal and concealment from predators. No confirmed nests were identified in the study area, however the habitat for Eastern Meadowlark was identified within the study area based on the anticipated defended territory (Map 4). Considerations for impacts to general habitat will need to be considered during detailed design and permitting.

### 5.3.2 Candidate Habitats

Suitable habitat for the following species has been identified within the study area, however targeted surveys to assess the use of these habitats by these species have not been completed. Identified habitats for these species therefore remain as candidate within the study area.

**Blanding's Turtle**

Blanding's Turtle (*Emydoidea blandingii*) is listed as Threatened both provincially and federally (MNRF 2018e, Government of Canada 2018). This species receives general habitat protection under the ESA. Potential overwintering, thermoregulation, nesting and movement/travel corridor habitat has the potential to be present within the study area. This species was not observed within the study area by NRSI in 2019, but no targeted turtle surveys were completed. Candidate overwintering and thermoregulation habitat may be present within the SAS1-3

vegetation community located at ANR-002, the MAS2 vegetation community located at ANR-007 and within the MAM2-2 and OA vegetation communities associated with Ellis Creek, north of Maple Grove Road. Candidate nesting habitat is present within all agricultural fields, or other areas of soft substrates near water or wetland features, within the study area. Category 1 habitat for Blanding's Turtle is defined as a nest or overwintering site and includes the area within 30 m of the nest or overwintering site. Category 1 habitat is considered to have the lowest tolerance to alteration. Category 2 habitat is the wetland complex (i.e., all suitable wetlands or waterbodies within 500 m of each other) that extends up to 2 km from an occurrence, and the area within 30 m around those suitable wetlands or waterbodies. Category 2 habitat is considered to have a moderate level of tolerance to alteration. Category 3 habitat is the area between 30 m and 250 m around suitable wetlands/waterbodies identified as Category 2 habitat, within 2 km of an occurrence and is considered to have the highest tolerance to alteration. Candidate Category 1, 2 and 3 Blanding's Turtle habitats are present within the study area. Considerations for impacts to general habitat were considered in the development of alternatives. An analysis of potential impacts to general habitat based on the proposed preferred alternative is provided in Section 7.0 below. Potential mitigation measures for any anticipated impacts are also described.

**Little Brown Myotis**

Little Brown Myotis (*Myotis lucifugus*) is listed as Endangered both provincially and federally (MNRF 2018e, Government of Canada 2018). This species was not observed within the study area by NRSI in 2019, but no targeted bat surveys were completed. Six candidate roost trees were identified within the study area which may provide suitable roosting habitat for this species (Map 5). All identified candidate roost trees are isolated trees and are not within woodland features. No additional studies are currently required by the MECP to assess the use of isolated trees by bats (McAllister pers. comm. 2020). This is assuming that any required tree removals or alterations will occur during the appropriate timing window (October 1 – March 31) to avoid harassment and/or harm to bat SAR. It is recommended to consult with MECP to confirm this approach well in advance of any tree removals or alterations.

No bat habitat surveys were completed beyond the trees assessed as part of the tree inventory. Suitable roosting habitat for this species may therefore also be present in all treed vegetation communities within the study area. Suitable foraging habitat may be present within open and semi-open vegetation communities, including wetlands, and along the edges of all treed

vegetation communities within the study area. Considerations for impacts to general habitat are recommended to be considered during detailed design.

**Northern Myotis**

Northern Myotis (*Myotis septentrionalis*) is listed as Endangered both provincially and federally (MNRF 2018e, Government of Canada 2018). This species was not observed within the study area by NRSI in 2019, but no targeted bat surveys were completed. Six candidate roost trees were identified within the study area which may provide suitable roosting habitat for this species (Map 5). All identified candidate roost trees are isolated trees and are not within woodland features. No additional studies are currently required by the MECP to assess the use of isolated trees by bats (McAllister pers. comm. 2020). This is assuming that any required tree removals or alterations will occur during the appropriate timing window (October 1 – March 31) to avoid harassment and/or harm to bat SAR. It is recommended to consult with MECP to confirm this approach well in advance of any tree removals or alterations.

No bat habitat surveys were completed beyond the trees assessed as part of the tree inventory. Suitable roosting and foraging habitat for this species may therefore also be present in all treed vegetation communities within the study area. Considerations for impacts to general habitat are recommended to be considered during detailed design.

**Tri-colored Bat**

Tri-colored Bat (*Perimyotis subflavus*) is listed as Endangered both provincially and federally (MNRF 2018e, Government of Canada 2018). This species was not observed within the study area by NRSI in 2019, but no targeted bat or Tri-colored Bat habitat surveys were completed. Suitable roosting habitat for this species may be present in the deciduous forest communities within the study area. Suitable foraging habitat may be present within open and semi-open vegetation communities, including wetland features and along watercourses, and along the edges of all treed vegetation communities within the study area. Considerations for impacts to general habitat are recommended to be considered during detailed design.

## 5.4 Significant Wildlife Habitat

Based on background information review, desktop analyses, and field studies, three SWH types were confirmed for the study area, six were maintained as candidate SWH, and all other candidate SWH types were ruled out as occurring in the study area. Confirmed and candidate habitats are discussed in detail in the following sections. Confirmed SWH types are shown on

Map 4. Development or site alteration within SWH is not permitted under the PPS unless it has been demonstrated that there will be no negative impacts on the habitat or its ecological functions (OMMAH 2020).

### 5.4.1 Confirmed SWH

**Specialized Wildlife**

Seeps and Springs

Seeps and springs are areas where ground water comes to the surface. They are typical of headwater areas within forested habitats and are often at the source of coldwater streams. Seeps and springs provide valuable wildlife habitat, especially in the winter as they typically do not freeze and therefore provide a source of drinking water and access to winter greens and seeds. In the spring, they are also one of the first areas where vegetation grows and as a result, provide a food source at a critical time of year when other food sources are depleted. Seeps and springs may also contribute to fish habitat.

Several seepage areas have been confirmed in the SWT2 and SWD6-1 vegetation communities associated with East Creek and in the SWM4-1 vegetation community associated with Ellis Creek (Map 4). The area of the ELC forest ecosite containing the seeps/springs is defined as the SWH for seepage areas. The SWT2, SWD6-1 and SWM4-1 vegetation communities are therefore confirmed SWH for seeps and springs (Map 4). The source of the seep and/or spring, including the slope on which the seep/spring occurs and any recharge areas, need to be considered in the protection of this SWH type.

Amphibian Breeding Habitat (Wetland)

These habitats are extremely important to amphibian biodiversity within a landscape and often represent the only breeding habitat for local amphibian populations. Wetlands greater than 500 $m^2$ in size that support high species diversity are significant. The presence of shrubs and logs increases the significance of a pond for some amphibian species because of available structure for calling, foraging, escape and concealment from predators. This habitat is considered significant if the presence of a breeding population of one or more of the listed newt/salamander species, or two or more of the listed frog/toad species and with at least 20 individuals (adults or eggs masses), or two or more of the listed frog/toad species with Call Level Codes of 3, is confirmed. This habitat is also considered significant based on the confirmed breeding of Bullfrog. Anuran call surveys confirmed SWH for Amphibian Breeding Habitat (Wetland) within

the MAS2 vegetation community at monitoring station ANR-007 and within the OA vegetation community at ANR-009 (Map 4).

**Habitat for Species of Conservation Concern**

Special Concern and Rare Wildlife Species

These species are quite rare or have experienced significant population declines in Ontario. To inventory a site for the identified special concern or rare species, studies need to be completed during the time of year when the species is present or easily identifiable. The area of the habitat to the finest ELC scale that protects the habitat form and function is the SWH and is delineated through field studies. The habitat needs to be easily mapped and cover an important life stage component for a species such as specific nesting habitat or foraging habitat. Based on the results of wildlife field surveys, one species, Eastern Wood-Pewee, was confirmed using habitats within the study area for an important life stage component. Vascular flora inventories also confirmed the presence of a rare vegetation species, Slender-leaved Mountain-mint, within the study area.

Eastern Wood-pewee was confirmed to be using habitats within the study area for breeding. Based on the results of breeding bird surveys, the SWD3-4, SWD3-3, FOD5, SWD6-3 and FOD7 vegetation communities are confirmed Special Concern and Rare Wildlife SWH for Eastern Wood-pewee (Map 4).

A population of Slender-leaved Mountain-mint with occasional occurrence was observed by NRSI biologists within the CUT1 vegetation community in the southeast corner of the study area (Map 4). This vegetation community is therefore confirmed SWH for Slender-leaved Mountain-mint.

Monarch was also confirmed using habitats within the subject property during summer field surveys in 2019. NHIC's species conservation status ranks estimate the risk of a species going extinct or being extirpated. NHIC has assigned Monarch an S-RANK of "S2N, S4B" which indicates that the breeding population is apparently secure and the non-breeding population (i.e., migrating population) is imperiled. Because the breeding population is apparently secure, critical habitats for Monarch are currently only protected under the SWH type, Migratory Butterfly Stopover Areas, which is not present within the subject property.

### 5.4.2 Candidate SWH

It is not practical to assess all candidate SWH in one, three-season, field study. Therefore, for the purposes of this study, the following candidate SWH are assumed to be present and suitable mitigation measures will be identified. If recommended mitigation measures cannot be implemented (i.e., alternatives are proposed within a candidate SWH), additional fieldwork may be completed at detailed design to confirm the presence or absence of the SWH within the study area in order to assess the potential for impacts.

**Seasonal Concentration**

Bat Maternity Colonies

Known locations of bat maternity colonies are extremely rare in forested vegetation communities across Ontario. This SWH type is confirmed based on the presence of either a Big Brown Bat or Silver-haired Bat maternity colony. Traditionally, Big Brown Bats formed maternity colonies beneath loose bark and in small cavities of various tree species. Common maternity roosts today for this species are found in buildings, barns and bridges, however, these anthropogenic structures are not considered to be SWH. Silver-haired Bats prefer older mixed or deciduous forest and form maternity colonies in tree cavities and small hollows. Older forest areas with at least 21 snags per hectare are preferred by Silver-haired Bats (MNRF 2000).

Forest communities within the study area may provide suitable maternity roosting habitat for either Big Brown Bat or Silver-haired Bat, however bat habitat assessments, acoustic or capture surveys have not been completed within these forest communities to confirm the presence or absence of maternity colonies within the study area. All FOD, FOM, SWD and SWM vegetation communities within the study area are therefore considered candidate SWH for bat maternity colonies.

Turtle Wintering Area

Generally, turtle overwintering sites are the only known sites in the area. Sites with the highest number of individuals are the most significant. For most turtle species, wintering areas are in the same general area as their core habitat and water has to be deep enough not to freeze and have soft mud substrates. Over-wintering sites are permanent water bodies, large wetlands, and bogs or fens with adequate Dissolved Oxygen levels. Man-made ponds such as sewage lagoons or storm water ponds should not be considered SWH. For a site to be considered significant, the presence of a minimum of five over-wintering Midland Painted Turtles or one Northern Map Turtle or Snapping Turtle must be confirmed. Suitable habitat for turtle overwintering was documented in the SAS1-3 vegetation community located at ANR-002, the

MAS2 vegetation community located at ANR-007, and within the MAM2-2 and OA vegetation communities associated with Ellis Creek, north of Maple Grove Road. No targeted turtle emergence surveys were conducted within the study area by NRSI biologists in 2019. These wetland communities therefore remain as candidate SWH for turtle wintering areas.

Reptile Hibernaculum

The ability of reptiles to overwinter successfully in cold climates can have a large impact on population persistence (MNRF 2014). For snakes, hibernation takes place in sites located below the frost line. Access to such sites may be through fissures in rock, along tree roots, or through mammal burrows. The access to these subterranean sites is much more important than the surrounding vegetation communities. For a number of species, the necessary characteristics for hibernacula are not well known and it is therefore not possible to predict with any accuracy where snakes will overwinter (MNRF 2014). All vegetation communities within the study area therefore have the potential to provide overwintering sites for reptiles. The seeps documented within the SWT2, SWD6-1 and SWM4-1 vegetation communities may potentially be important hibernation sites for some snakes such as the Eastern Ribbonsnake (*Thamnophis sauritus septentrionalis*). No targeted spring emergence or fall congregation surveys were completed as part of this study. All suitable areas within the study area are therefore considered candidate SWH for reptile hibernacula.

**Specialized Wildlife**

Amphibian Breeding Habitat (Woodland)

These habitats are extremely important to amphibian biodiversity within a landscape and often represent the only breeding habitat for local amphibian populations. Wetlands, ponds or woodland pools (including vernal pools) > 500m$^2$ within or adjacent to a woodland may provide breeding habitat for amphibians. Woodlands with permanent ponds or those containing water in most years until mid-July are more likely to be used as breeding habitat. Breeding pools within the woodland or the shortest distance from forest habitat are more significant because they are more likely to be used due to reduced risk to migrating amphibians. These habitats are considered significant if the presence of a breeding population of one or more of the listed newt/salamander species, or two or more of the listed frog species with at least 20 individuals (adults or eggs masses), or two or more of the listed frog species with Call Level Codes of 3. Targeted anuran call surveys confirmed the absence of SWH for amphibian breeding habitat (woodland) for anurans, but targeted salamander surveys were not completed as part of this study. Candidate salamander breeding habitat was identified within the SWD3-3 and FOD5

vegetation communities located south of the intersection of Maple Grove Road and Boxwood Drive, within the FOC3, SWM4-1 and SWD3-3 vegetation communities located northeast of the intersection of Maple Grove Road and Speedsville Road, and in the SWD6-3 vegetation community located north of Maple Grove Road along East Creek. All potential suitable breeding habitats within these communities and surrounding 230 m of woodland are candidate SWH for amphibian breeding habitat (woodland).

Amphibian Breeding Habitat (Wetland)

These habitats are extremely important to amphibian biodiversity within a landscape and often represent the only breeding habitat for local amphibian populations. Wetlands greater than 500 $m^2$ in size that support high species diversity are significant. The presence of shrubs and logs increases the significance of a pond for some amphibian species because of available structure for calling, foraging, escape and concealment from predators. This habitat is considered significant if the presence of a breeding population of one or more of the listed newt/salamander species, or two or more of the listed frog/toad species and with at least 20 individuals (adults or eggs masses), or two or more of the listed frog/toad species with Call Level Codes of 3 is confirmed. This habitat is also considered significant based on the confirmed breeding of Bullfrog. Targeted anuran call surveys confirmed the presence of SWH for amphibian breeding habitat (woodland) for anurans, but targeted salamander surveys were not completed as part of this study. Candidate salamander breeding habitat may occur within all SW, MA, OA and SA communities within the study area. Therefore, any communities not already confirmed as Amphibian Breeding Habitat (Wetland) SWH, remain as candidate SWH for amphibian breeding habitat (wetland).

Amphibian Movement Corridors

Movement corridors for amphibians moving from their terrestrial habitat to breeding habitat can be extremely important for local populations (MNRF 2015). Amphibian breeding habitat (wetland) is confirmed within the study area; therefore, amphibian movement corridors must be considered within the study area. Corridors may be found in all ecosites associated with water and should consist of native vegetation, with several layers of vegetation (i.e., groundcover, understorey, sub-canopy, etc.). Those that are unbroken by roads, watercourses or bodies, and within undeveloped areas are the most significant. Corridors should have at least 15 m of vegetation on both sides of watercourses or be up to 200 m wide of woodland habitat with gaps <20 m. Shorter corridors are more significant than longer corridors, however amphibians must be able to get to and from their summer and breeding habitat. Targeted amphibian movement

studies were not completed as part of this study. An assessment of amphibian movement corridors associated with the two confirmed amphibian wetland breeding habitats (Map 4) is recommended to be completed if any proposed alternatives may result in adverse impacts to lands between these breeding habitats and any potential summer habitats.

## 5.5 Fish Habitat

Fish habitat as defined in the *Fisheries Act*, means spawning grounds and any other areas, including nursery, rearing, food supply, and migration areas on which fish depend directly or indirectly in order to carry out their life processes.

All watercourses that overlap with the study area provide direct habitat for fish during all or part of the year. Development or site alteration within fish habitat is not permitted under the PPS except in accordance with legislation and policies administered by the provincial and federal governments for the purpose of fisheries protection (including fish and fish habitat), and related, scientifically established standards such as water quality criteria for protecting lake trout populations (OMMAH 2020). Specifically, development and site alteration within watercourses and their associated fish habitat are prohibited unless permitted by the GRCA and DFO. Limiting works in and around water will limit the potential need for project Authorization under the federal *Fisheries Act*.

## 5.6 Linkages

Maintaining connectivity among natural features across the landscape is important to allow for the dispersal of otherwise isolated populations, as well as to allow for the movement of species which require access to multiple habitat types to carry out their life processes. Watercourses such as Middle Creek, Hunsperger Drain, East Creek and Ellis Creek, and their associated riparian habitats can provide a corridor and/or linkage for plant and animal movement between natural features, contributing to the overall ecological integrity, connectivity and long-term sustainability of the natural heritage system. Under the PPS and the RMOW Official Plan, the location of these corridors and the maintenance of the connectivity among natural heritage features across the landscape must be considered in the development review process of any proposed development or site alteration (OMMAH 2020, Regional Municipality of Waterloo 2015). The Ellis Creek riparian corridor provides a connection between natural heritage features located to the north and south of the study area, such as between the Kossuth wetland complex and the Speed River riparian corridor. East Creek and Middle Creek also provide connections between natural features to the north and south of the study area, including

between the Maple Grove Road wetland complex and the Speed River riparian corridor. Middle Creek has specifically been identified to provide a regional corridor function between the Grand River corridor to the north and the Speed River corridor to the south (City of Cambridge 2004).

Due to the urbanization of the study area, Ellis Creek, East Creek and Middle Creek, and their associated riparian habitats likely provide the only potential natural heritage linkages between natural features to the north and south of the study area. Maintaining, restoring and/or enhancing any potential plant and animal movement corridors and/or linkages associated with these watercourses should be considered in the development of alternatives for the proposed undertaking. Considerations for maximizing the size of culverts at the Maple Grove Road crossings of these creeks should be considered during detailed design to improve corridor function and the potential for use of the culverts by wildlife. The design should also consider the benefits associated with the use of wildlife fencing and/or funneling techniques.

## 5.7 Natural Heritage System

A Natural Heritage System (NHS) for the Growth Plan for the Greater Golden Horseshoe has been mapped by the Province to support a comprehensive, integrated, and long-term approach to planning for the protection of the region's natural heritage and biodiversity. Habitat loss and fragmentation are key concerns in the Greater Golden Horseshoe. To address these concerns, the Growth Plan NHS was mapped as a mosaic of natural heritage features connected by natural corridors with the aim to maintain biological and geological diversity, ecosystems, natural functions, and viable populations of native species.

A portion of the study area north of Maple Grove Road falls within the Growth Plan NHS (Map 1). Within the NHS for the Growth Plan, new development or site alteration, including the optimization of existing infrastructure corridors, must demonstrate that:

- there are no negative impacts on key natural heritage features or key hydrologic features or their functions;
- connectivity along the system and between key natural heritage features and key hydrologic features located within 240 m of each other will be maintained or, where possible, enhanced for the movement of native plants and animals across the landscape; and
- the removal of other natural features not identified as key natural heritage features or key hydrologic features is avoided, where possible. Such features should be

incorporated into the planning and design of the proposed development, wherever possible.

To address these policies, it is recommended that the design of the preferred alternative for the proposed undertaking avoid the Growth Plan NHS, to the extent possible.

The Growth Plan NHS extends to within the study area along both Ellis and East Creek. As discussed previously, these two watercourses likely provide a linkage function between the Speed River riparian corridor and natural features to the north of Maple Grove Road. Where possible, maintaining, restoring and/or enhancing these natural corridors to minimize habitat fragmentation and provide support to the Growth Plan NHS should be considered during detailed design.

## 5.8 Buffers

Buffers are typically required for natural heritage features such as woodlands, wetlands, significant wildlife habitats, and watercourses to protect them from impacts during development and to provide long-term protection to their form and function. Woodland buffers are prescribed based on protecting the trees and their root zones as well as providing associated open habitats required by forest species or for movement. Wetland and watercourse buffers are required to protect the form and function of these features and the species that inhabit them. Significant woodlands, PSWs, non-PSWs, unevaluated wetlands, SWH, and watercourses which provide direct fish habitat, are present within the study area. The Greenspace Management Strategy outlined in the Hespeler West Subwatershed Study (SWS) provides recommended buffers for these features within the study area (City of Cambridge 2004). The SWS recommends a standard buffer of 30 m to be applied to Core Environmental Features, including Significant Woodlands and PSWs as well as to all other wetland features and confirmed Significant Wildlife Habitats. A minimum buffer of 15 m from the top of bank is also recommended to be applied to all watercourses by the SWS. With the exception of watercourse buffers, the SWS does not recommend any buffers to extend to within the Maple Grove Road ROW. It is recommended that these standard buffer widths be considered during detailed design for the proposed undertaking.

Please note that woodland dripline and wetland boundaries have not yet been delineated or confirmed/reviewed in the field. This is recommended to be completed at the design detail stage and prior to the initiation of any construction activities.

## 5.9 Summary of Natural Feature Constraints

Table 7 provides a summary of natural features identified as a constraint to the proposed development and site alteration within the study area.

**Table 7. Summary of Study Area Constraints**

| Natural Feature Constraint | Regulatory and Permitting Considerations | Project Considerations |
|---|---|---|
| Wetlands | • Provincial Policy Statement (OMMAH 2020)<br>• Regional Municipality of Waterloo Official Plan (2015)<br>• City of Cambridge Official Plan (2015)<br>• GRCA Ont. Reg. 150/06<br>• Growth Plan for the Greater Golden Horseshoe (2019) | • The PPS states that development and site alteration shall not be permitted in PSWs.<br>• RMOW and City of Cambridge designate PSWs as Core Environmental Features.<br>• All wetlands and associated areas of interference are regulated by GRCA. Any development or interference within wetlands or development in areas of interference requires permission from the GRCA.<br>• Development and site alteration within 120 m of wetlands 2 ha or larger and all PSWs is prohibited unless permitted by the GRCA.<br>• Development and site alteration within 30 m of non-PSWs less than 2 ha in size is prohibited unless permitted by the GRCA.<br>• Precise boundaries of wetlands within approximately 50 m of the preferred alternative should be delineated in the field with GRCA prior to detailed design.<br>• A setback of 30 m is recommended from all wetland features.<br>• The impact assessment associated with the preferred alternative must demonstrate that the proposed development will not negatively impact the wetland or its ecological functions. |
| Significant Woodlands | • Provincial Policy Statement (OMMAH 2020)<br>• Regional Municipality of Waterloo Official Plan (2015)<br>• City of Cambridge Official Plan (2015)<br>• Growth Plan for the Greater Golden Horseshoe (2019) | • The PPS states that development and site alteration shall not be permitted in significant woodlands.<br>• RMOW and City of Cambridge designate significant woodlands as a Core Environmental Feature.<br>• The impact assessment associated with the preferred alternative must demonstrate that the proposed development will not negatively impact the significant woodland or its ecological functions.<br>• Woodland dripline boundaries within approximately 30 m of the preferred alternative should be accurately delineated during detailed design.<br>• A setback of 30 m is recommended from Significant Woodlands. |
| Watercourses and Floodplains | • GRCA Ont. Reg. 150/06 | • Development and site alteration within watercourses and their associated floodplain areas are prohibited unless permitted by the GRCA (refer to the regulations for specifics).<br>• A minimum setback of 15 m from the top of bank is recommended to be applied to watercourse features.<br>• The GRCA must be consulted at the outset of detailed design to understand permitting requirements. |

| Natural Feature Constraint | Regulatory and Permitting Considerations | Project Considerations |
|---|---|---|
| Habitat of Endangered or Threatened Species | • Endangered Species Act, 2007<br>• Species at Risk Act<br>• Regional Municipality of Waterloo Official Plan (2015)<br>• City of Cambridge Official Plan (2015)<br>• Growth Plan for the Greater Golden Horseshoe (2019) | • Habitat for Eastern Meadowlark has been confirmed within the study area.<br>• Candidate habitat for the following SAR were identified within the study area:<br>  • Blanding's Turtle;<br>  • Little Brown Myotis;<br>  • Northern Myotis; and<br>  • Tri-colored Bat.<br>• Section 9 of the ESA prohibits activities which result in direct impacts to SAR such as killing, harming, harassing, etc.<br>• Section 10 of the ESA prohibits damage or destruction of habitat for SAR.<br>• Potential impacts to SAR will need to be dealt with in consultation with MECP during detailed design and permitting. Specific mitigation plans and/or permitting under the ESA may be required. |
| Significant Wildlife Habitat | • Provincial Policy Statement (OMMAH 2020)<br>• RMOW Official Plan (2015)<br>• City of Cambridge Official Plan (2015)<br>• Growth Plan for the Greater Golden Horseshoe (2019) | • The following SWH types have been confirmed within the study area:<br>  • Seeps and Springs;<br>  • Amphibian Breeding Habitat (Wetland); and<br>  • Special Concern and Rare Wildlife Species.<br>• The PPS states that development and site alteration shall not be permitted in SWH. Development and site alteration shall not be permitted on adjacent lands to SWH unless the ecological function of the adjacent lands has been evaluated and it has been demonstrated that there will be no negative impacts on the SWH or on its ecological functions.<br>• A setback of 30 m is recommended from confirmed SWH. |
| Fish Habitat | • Provincial Policy Statement (OMMAH 2020)<br>• Federal Fisheries Act (1985)<br>• Regional Municipality of Waterloo Official Plan (2015)<br>• City of Cambridge Official Plan (2018)<br>• Growth Plan for the Greater Golden Horseshoe (2019) | • Development and site alteration within watercourses and their associated fish habitat is prohibited unless permitted by the GRCA and DFO.<br>• Strict timing windows are required to be adhered to for any in-water works.<br>• Limiting works in and around the high-water mark will limit the potential need for a *Fisheries Act* Authorization.<br>• The GRCA and DFO must be consulted at the outset of detailed design to understand permitting requirements. |
| Linkages | • Provincial Policy Statement (OMMAH 2020)<br>• Regional Municipality of Waterloo Official Plan (2015)<br>• City of Cambridge Official Plan (2018) | • The location of linkages and the maintenance of the connectivity among natural heritage features across the landscape must be considered in the development review process of any proposed development or site alteration (OMMAH 2020, Regional Municipality of Waterloo 2015).<br>• The watercourses, Ellis, West, Middle and East Creeks provide a linkage between natural features to the north and south of Maple Grove Road. Considerations for maximizing the size of culverts at the Maple Grove Road crossings of these watercourses should be considered during detailed design to improve corridor function. |

| Natural Feature Constraint | Regulatory and Permitting Considerations | Project Considerations |
|---|---|---|
| Natural Heritage System | • Growth Plan for the Greater Golden Horseshoe (2019) | • The impact assessment associated with the preferred alternative must demonstrate that the proposed development will not negatively impact the Growth Plan Natural Heritage System or its ecological functions. |

## 6.0 Evaluation of Alternatives

The evaluation of the proposed alternative solutions has been broken down into two components: 1) evaluation of road widening alignment alternatives, and 2) evaluation of road cross-section design alternatives. A preferred road widening alignment and cross-section design have been identified through the evaluation process as discussed in detail in the following sections.

The following guidelines and considerations were used to identify the preliminary list of alternatives:

- Provide flexibility in construction techniques to minimize construction costs;
- Minimize impacts on urban areas and conflicts with existing infrastructure;
- Minimize impacts on sensitive species and natural features;
- Minimize impacts to cultural heritage and/or archaeological sites;
- Utilize existing road alignments and publicly owned rights-of-way, where possible;
- Minimize required maintenance and operating costs;
- Minimize future traffic congestion;
- Avoid operational impacts (i.e., noise/odour) to adjacent land uses;
- Enhanced opportunities for active transportation (i.e., cycling facilities and pedestrian space); and
- Improve available transit service and access to transit stops.

### 6.1 Road Widening Alternatives

Additional details with regards to the selection of the proposed road widening alignment is provided in the main report (IBI 2021). A total of five alternatives were evaluated for the widening of Maple Grove Road from two to four lanes (Maps 6a – f):

- Do Nothing: this alternative would include reconstructing the road in its current 2-lane rural cross-section with no active transportation facilities;
- Concept 1 (Centreline): Balanced widening about the existing road corridor centreline from Vondrau Drive to Hespeler Road;
- Concept 2 (North): Balanced widening about the existing road corridor centreline from Vondrau Drive to east of Boxwood Drive. Widening to the north from east of Boxwood to Beaverdale Road. Balanced widening from Beaverdale Road to Hespeler Road;

- Concept 3 (South): Balanced widening about the existing road corridor centreline from Vondrau Drive to east of Boxwood Drive. Widening to the south from east of Boxwood to Beaverdale Road. Balanced widening from Beaverdale Road to Hespeler Road; and
- Concept 4 (Hybrid): Balanced widening from Vondrau Drive to east of Boxwood Drive. Widening to the north from east of Boxwood Drive to east of Middle Creek. Balanced widening from east of Middle Creek to Hespeler Road (Hybrid Alternative).

The Do Nothing alternative was screened out by the Project Team because it does not meet the Region's objectives for the corridor as identified in the 2018 Regional Transportation Plan Update. Specifically, the need to widen the roadway to accommodate future traffic growth and forecasted intersection operational deficiencies, as well as adding active transportation and transit facilities, are not addressed by the Do Nothing alternative.

Table 8 provides a summary of the potential direct impacts of the remaining four proposed alignments to inform the evaluation of alternatives. This includes the approximate extent of habitat potentially impacted for each identified natural feature along each proposed alignment.

All of the options presented have the potential to impact various natural features, however, based on this assessment, Concept 3 is identified as having the least amount of direct impacts to natural features (Table 8). Concept 3 does require encroaching to within sensitive natural features that function as SWH as well as confirmed and candidate SAR habitats and will require mitigation and monitoring. It is anticipated that site-specific construction mitigation could be implemented to avoid adverse impacts to these areas.

This analysis from a natural heritage perspective is one component of the evaluation that was considered by the Project Team for the design of the road widening alignment. Other components of the evaluation included technical feasibility, potential impacts to the local community (i.e., social and economic impacts), transportation needs, and cost. The overall evaluation of the proposed alternatives resulted in the selection of Concept 4 as the preferred alternative. The details of the evaluation of alternatives are provided in the main report (IBI 2021). Similar to Concept 3, Concept 4 also requires encroachment to within sensitive natural features that function as SWH as well as confirmed and candidate SAR habitats and will require mitigation and monitoring. It is also anticipated that site-specific construction mitigation could be implemented to avoid adverse impacts to these areas. Concept 4 was therefore carried forward

as the preferred road widening alignment alternative by the Project Team. The anticipated impacts of the preferred alternative and recommended mitigation measures are discussed in Section 7.0 below.

## Table 8. Evaluation of Road Widening Alignment Alternatives

| Natural Feature | Approximate Extent of Affected Natural Feature | | | | | | | | Preferred Alternative | Overall Preferred Alternative |
|---|---|---|---|---|---|---|---|---|---|---|
| | Concept 1 Widening Equally About Existing Centreline | | Concept 2 Widening to the North | | Concept 3 Widening to the South | | Concept 4 Modified Hybrid Widening to Minimize Overall Impacts | | | |
| | Temporary Construction Footprint | Permanent Footprint | Temporary Construction Footprint | Permanent Footprint | Temporary Construction Footprint | Permanent Footprint | Temporary Construction Footprint | Permanent Footprint | | |
| Provincially Significant Wetlands[1] | 0.0958 ha | 0.0000 ha | 0.1956 ha | 0.0000 ha | 0.0420 ha | 0.0000 ha | 0.1900 ha | 0.0000 ha | Concept 3 | Concept 3 |
| Other Wetlands[1] | 0.0272 ha | 0.0000 ha | 0.1956 ha | 0.0000 ha | 0.0420 ha | 0.0000 ha | 0.0359 ha | 0.0000 ha | Concept 1 | |
| Significant Woodlands | 0.0019 ha | 0.0000 ha | 0.0021 ha | 0.0000 ha | 0.0019 ha | 0.0000 ha | 0.1026 ha | 0.0000 ha | Concept 1 or 3 | |
| Watercourses | 1318.13 m | 185.26 m | 1317.94 m | 178.00 m | 1295.20 m | 238.39 m | 1316.26 m | 177.73 m | Concept 3 or 4 | |
| Habitat of Endangered or Threatened Species (Eastern Meadowlark) | 0.1783 ha | 0.0000 ha | 0.1824 ha | 0.0002 ha | 0.1783 ha | 0.0000 ha | 0.1783 ha | 0.0000 ha | Concept 1, 3 or 4 | |
| Habitat of Endangered or Threatened Species (Blanding's Turtle) | 3.1844 ha | 1.4533 ha | 3.1573 ha | 1.4447 ha | 3.1114 ha | 1.4398 ha | 3.2242 ha | 1.4177 ha | Concept 3 | |
| Significant Wildlife Habitat (Special Concern and Rare Wildlife Species) | 0.2785 | 0.0007 | 0.3765 | 0.0188 | 0.1862 | 0.0000 | 0.2856 | 0.0134 | Concept 3 | |
| Significant Wildlife Habitat (Seeps and Springs) | 0.0141 | 0.0000 | 0.0071 | 0.0000 | 0.0234 | 0.0000 | 0.0141 | 0.0000 | Concept 2 | |
| Cultural Vegetation | 1.8366 | 0.0159 | 1.7428 | 0.0151 | 2.0539 | 0.0189 | 1.2507 | 0.0151 | Concept 4 | |

[1]Precise boundaries of wetlands within 50 m of the preferred alternative should be delineated in the field with GRCA prior to detailed design.

## 6.2 Road Cross-section Design Alternatives

Beyond the footprint of the proposed road corridor improvements (i.e., road widening alternatives), alternatives for the design of the cross-section of the road which satisfied the Region's objectives for improvements were also evaluated by the Project Team and included the following:

- Do Nothing
  - Reconstruct the road in its current 2-lane rural cross-section with no active transportation facilities;
- Alternative A
  - Widen the road to 4-lanes with a 5.0m wide raised centre median;
  - 3.0m wide asphalt multi-use paths along both sides of the road;
  - Curb and gutter and a storm drainage system; and
  - Additional street lighting.
- Alternative B
  - Widen the road to 4-lanes with a 5.0m wide raised centre median;
  - 1.8m wide concrete sidewalks along both sides of the road;
  - 1.7m wide asphalt roadside bike lanes separated with rollover curb;
  - Curb and gutter and storm drainage system; and
  - Additional street lighting.

Similar to the road widening alternatives, the Do Nothing alternative was screened out by the Project Team because it does not meet the Region's objectives for the corridor as identified in the 2018 Regional Transportation Plan Update.

Of the remaining two proposed design alternatives, Alternative A is identified as having both the least amount of indirect and induced impacts from a natural heritage perspective. The total area of impervious materials (i.e., pavement) required for Alternative A (6.0$m^2$/m of roadway) is less than the requirements for Alternative B (7.0$m^2$/m of roadway), resulting in an increase in the potential for greater infiltration rates and reduced runoff. Reduced infiltration rates can contribute to sedimentation and erosion and a reduction in water quality of adjacent waterbodies. The reduction in the area of paved surfaces under Alternative A will also require less winter maintenance and de-icing materials (i.e., salt), which can adversely impact water quality and vegetation health in adjacent natural features.

When considered all other components of the evaluation, including the technical feasibility, potential impacts to the local community (i.e., social and economic impacts), transportation needs, and cost, the overall evaluation of the proposed road cross-section design alternatives also resulted in the selection of Alternative A as the preferred alternative. The details of the evaluation of alternatives are provided in the main report (IBI 2021). Alternative A was therefore carried forward as the preferred cross-section design alternative by the Project Team. The anticipated impacts of the preferred alternative and recommended mitigation measures are discussed in Section 7.0 below.

# 7.0 Impact Analysis of the Preferred Alternative

## 7.1 Approach to Impact Analysis

Potential impacts arising from the proposed preferred road widening alignment (Concept 4) and cross-section design (Alternative A) were determined by comparing the details of the preferred alternatives with the characteristics of the existing natural features and their functions. Where the limits of the preferred alternatives overlap with the natural features or indirectly affect their functions, impacts may arise. The following is a description of the types of impacts which will be discussed.

- Direct impacts to the natural features within the study area associated with disruption or displacement caused by the footprint of the preferred road widening alignment alternative, including impacts caused by site grading and the installation of site servicing features.
- Indirect impacts associated with changes in site conditions such as drainage, water balance and water quantity/quality, and effects of construction on adjacent natural features.
- Induced impacts associated with post-construction use of the area within which the proposed road improvements occurred, such as disturbance or degradation of adjacent natural features and species habitats as a result of increased human habitation/use of the area and vicinity.

## 7.2 Direct Impacts

### 7.2.1 Vegetation

All existing vegetation and trees will be removed within the proposed construction footprint of the preferred alternative (Hybrid Alternative Temporary Footprint, Maps 6a – f). The proposed road upgrades have been designed to reduce direct impacts to significant natural features within the study area by routing the widening of the road around natural features and to within cultural vegetation communities and active agricultural row-crop fields, which are already disturbed and of low ecological value, where possible. Vegetation removals are restricted to the edge of vegetation communities adjacent to the existing road corridor and will not result in further fragmentation or destruction of interior habitats. The approximate area of each ELC community proposed for removal to accommodate the proposed road widening is shown in Table 9.

**Table 9. Approximate Area of Ecological Land Classification (ELC) Vegetation Communities Proposed for Removal Within the Study Area**

| ELC Vegetation Community | Area Proposed for Removal (ha)[1] |
|---|---|
| Agriculture (Row Crop) | 0.1477 |
| Mineral Cultural Meadow Ecosite (CUM1) | 1.1001 |
| Coniferous Plantation (CUP3) | 0.0452 |
| Mineral Cultural Woodland Ecosite (CUW1) | 0.0008 |
| Dry – Fresh Sugar Maple Deciduous Forest Ecosite (FOD5) | 0.0294 |
| Fresh – Moist Lowland Deciduous Forest Ecosite (FOD7) | 0.1007 |
| Hedgerow (H) | 0.3440 |
| Mineral Meadow Marsh Ecosite (MAM2) | 0.1140 |
| Reed-canary Grass Mineral Meadow Marsh Type (MAM2-2) | 0.0359 |
| Mixed Shallow Aquatic Ecosite (SAM1) | 0.0114 |
| Swamp Maple Mineral Deciduous Swamp Type (SWD3-3) | 0.1847 |
| Willow Mineral Deciduous Swamp Ecosite (SWD4-1) | 0.0305 |
| Swamp Maple Organic Deciduous Swamp Type (SWD6-3) | 0.0705 |
| White Cedar Mineral Mixed Swamp Ecosite (SWM1-1) | 0.1399 |
| White Cedar – Hardwood Organic Mixed Swamp Type (SWM4-1) | 0.0177 |
| Mineral Thicket Swamp Ecosite (SWT2) | 0.0141 |
| **TOTAL** | **2.3873** |

[1]Total area of vegetation community that falls within the proposed temporary construction footprint

The cultural vegetation communities, including cultural meadow, thicket, hedgerow, plantation, and woodland communities, proposed to be removed as part of the road improvements are highly disturbed and characterized by early successional and regenerating species, with non-native and invasive species dominating. No federally or provincially significant vegetation species were observed within these cultural vegetation communities. Several individuals of the regionally rare species, Black Walnut, fall within cultural vegetation communities and the proposed construction footprint and will be removed, however, these individuals are not treated as significant as they are not naturally occurring.

The proposed construction footprint for the preferred alternative will require the removal of approximately 0.62 ha of wetland communities, including 0.19 ha of PSW and 0.04 ha of non-PSW. The exact area of wetland communities that will be directly impacted by the development will be determined following the delineation and surveying of wetland boundaries in the study area at the detailed design stage. It is recommended to avoid encroachment to within wetland features to the extent possible. Development within wetlands or in their areas of interference will require permission from the GRCA. At a minimum, construction activities within and

adjacent to wetland communities should be scheduled outside times of high runoff volumes (spring and fall). Wetland hydrology should be maintained at pre-construction conditions both during and after construction through ensuring inflow or outflow surface, sub-surface or groundwater and hydroperiods are unaltered. Further recommendations with regards to mitigating impacts to wetland hydrology is provided as part of the assessment of Indirect Impacts below.

Approximately 0.10 ha of Regionally Significant Woodland will be removed to accommodate the proposed construction footprint. The exact area of Significant Woodland features that will be directly impacted by the development will be determined following the delineation and surveying of woodland driplines in the study area at the detailed design stage. It is recommended to avoid encroachment to within woodland features to the extent possible as new woodland edge creation has the potential to increase the risk of windthrow and sunscald of vegetation. Recommendations for mitigating these impacts as well as other potential impacts to individual trees, whether isolated or within a treed feature (e.g., woodland), are provided in the Tree Inventory and Preservation Plan (TIPP). Where encroachment/removals in treed vegetation communities will occur, it is recommended to complete a detailed tree inventory to inform the TIPP. Although tree compensation is not required for municipal activities, it is recommended based on the Region's intent to preserve and enhance the urban forest or tree cover in its jurisdiction, as outlined in the Regional Official Plan (RMOW 2015). Recommendations for compensation are outlined in the TIPP.

Potential impacts to vegetation communities as a result of the proposed removals are anticipated to be minimal as they are restricted to the edge of these communities where they are currently exposed to and immediately adjacent to human disturbance (i.e., existing Maple Grove Road corridor). The proposed road widening will require the removal of a relatively small portion of the communities with the majority of each vegetation community being retained within the study area. To offset the potential impacts of vegetation removal, it is recommended to identify appropriate opportunities for creating, restoring and/or enhancing vegetation communities and wildlife habitats within the study area. Further details are provided below in the Restoration and Enhancement section of this report.

### 7.2.2 Impacts to Wildlife and their Habitats

**Significant Wildlife Habitat**

Seeps and Springs

The proposed construction footprint overlaps with and will require the removal of 0.01 ha of confirmed Special Concern and Rare Wildlife Species SWH for Seeps and Springs. The encroachment to within this SWH type will be restricted to the edge of the habitat, immediately adjacent to the existing road corridor. As this SWH type is delineated as the entire ELC vegetation community within which seeps and/or springs are documented, it is recommended to delineate and survey the boundary of the ELC vegetation communities identified as Seeps and Springs SWH at the detailed design stage to determine the exact area of habitat to be removed to inform appropriate mitigation. Several seepage areas were documented throughout each of the delineated Seeps and Springs SWH areas in the study area. As the majority of this habitat will remain intact and of suitable size within the study area, it is not anticipated that the proposed road improvements will significantly impact the habitat. However, this should be confirmed in consultation with a hydrogeologist.

The source of any seepage areas, including the slope on which the seepage area occurs and any recharge areas must be protected, where possible. As the proposed road improvements are located upstream of the identified SWH, stormwater management facilities should be designed to capture any excessive nutrients, sediments and other contaminants from road surface water runoff. The need to complete a feature-based hydrogeological study should be considered in consultation with a hydrogeologist to ensure this SWH type is protected from any potential adverse impacts resulting from the proposed road improvements, including any potential changes to infiltration rates and sub-surface or groundwater drainage patterns.

It is recommended that all areas of encroachment to within this SWH type be restored to existing conditions or enhanced to further support this habitat within the study area. All proposed restoration and/or enhancements should be designed in consultation with a hydrogeologist.

Amphibian Breeding Habitat (Wetland)

The proposed temporary and permanent footprints for the preferred alternative is located outside of the ELC polygon with confirmed Amphibian Breeding Habitat SWH. No direct impacts to this habitat or the species are therefore anticipated as a result of the proposed road improvements.

Special Concern and Rare Wildlife Species

The proposed construction footprint overlaps with 0.29 ha of confirmed Special Concern and Rare Wildlife Species SWH for Eastern Wood-pewee and will therefore require removal of a relatively small portion of the available breeding habitat for this species. The proposed permanent footprint overlaps with 0.01 ha of this SWH type. As the majority of this habitat will remain intact and of suitable size within the study area, it is not expected that the proposed road improvements will significantly impact Eastern Wood-pewee. To ensure potential impacts are avoided, vegetation removals should not be conducted within the nesting period for migratory birds (April 1 – August 31) and construction activities should not occur within 10 m of any confirmed nests during the nesting period. Potential direct impacts to the habitat itself (i.e., woodland features) will be mitigated through the implementation of recommendations outlined in the TPP. Where possible, it is recommended to restore woodland habitats beyond the permanent footprint and within areas of the construction footprint where this SWH type was removed.

The proposed temporary and permanent footprints for the preferred alternatives are located outside of the ELC polygons with confirmed Special Concern and Rare Wildlife Species SWH for Slender-leaved Mountain-mint. No direct impacts to this habitat or the species are therefore anticipated as a result of the proposed road improvements.

Candidate Significant Wildlife Habitat

All FOD, FOM, SWD and SWM vegetation communities within the study area may provide suitable Bat Maternity Colony SWH. The proposed road improvements will require encroaching to within the edge of several treed vegetation communities. The exact area of candidate SWH that will be directly impacted by the development will be determined following the delineation and surveying of woodland driplines in the study area at the detailed design stage. It is recommended to avoid encroachment to within woodland features to the extent possible. As the majority of these features will remain intact and of suitable size within the study area, it is not expected that the proposed road improvements will significantly impact this habitat and/or its ecological functions. Direct impacts to Big Brown Bat and/or Silver-haired Bat individuals can be avoided by scheduling all tree removals to occur outside of the bat active period (April 1 – September 30).

The proposed temporary and permanent footprints for the preferred alternative are located outside of the ELC polygons identified as candidate Turtle Wintering Area SWH. No direct impacts to this habitat or turtle species that may be using this habitat are therefore anticipated

as a result of the proposed road improvements. It is recommended to consider the maintenance of the hydrology of these habitats throughout the turtle overwintering period (October 15 – April 15) to ensure impacts to the habitat and species are avoided. All vegetation communities within the study area are identified as having the potential to provide Reptile Hibernaculum SWH. For a number of species, the necessary characteristics of hibernacula are not well known and it is therefore not possible to predict with any accuracy where snakes will overwinter (MNRF 2014). Potential impacts to the snake population within the study area will be mitigated through the use of wildlife exclusion fencing combined with a targeted snake salvage within the construction area prior to the commencement of any construction activities. Where possible, ground disturbance should be avoided, or the extent of ground disturbance minimized, during the snake hibernation period (October 15 – April 15) in order to mitigate potential direct impacts to overwintering snakes.

Two vegetation communities that fall within the proposed construction footprint for the preferred alternative were identified as candidate Amphibian Breeding SWH (Woodland) for salamanders. Specifically, the SWD3-3 vegetation community located northeast of the intersection of Maple Grove Road and Speedsville Road, and the SWD6-3 vegetation community located north of Maple Grove Road along East Creek. Anuran call surveys completed by NRSI biologists confirmed the absence of this SWH type for anurans. The area of habitat proposed for removal has been minimized to the extent possible and restricted to the edge of the feature. The habitat does not fall within the proposed permanent footprint and it is recommended that any areas of this habitat type that is removed within the construction footprint be restored post-construction. As the majority of these two features will remain intact and of suitable size within the study area, it is not expected that the proposed road improvements will significantly impact the habitat and/or its ecological functions. Potential adverse impacts to the feature will be mitigated through the implementation of recommended mitigation measures for the protection of the PSW within which these habitats also fall within. This will include the maintenance of the quality and quantity of water in any candidate breeding habitats. It is further recommended to schedule construction activities within and/or immediately adjacent to these candidate habitats to avoid the peak amphibian breeding season (April 1 – June 30). All other vegetation communities identified as candidate Amphibian Breeding SWH (Woodland) for salamanders within the study area are located beyond the limits of the construction footprint and no direct impacts to these features and/or their ecological functions are therefore anticipated.

Due to the presence of confirmed Amphibian Breeding SWH (Wetland) within the study area, a review of aerial imagery and ELC mapping of the study area was completed to identify candidate Amphibian Movement Corridor SWHs between confirmed breeding habitats and summer habitats and any potential conflicts with the preferred alternative. Both of the ELC vegetation communities with confirmed Amphibian Breeding SWH (Wetland) are located to the north of the Maple Grove Road corridor (Map 4). Suitable summer habitats for each of these two features are also present to the north of the existing road corridor. Candidate Amphibian Movement Corridor SWH is therefore not immediately adjacent to or require the crossing of the Maple Grove Road corridor. No direct impacts to this candidate habitat or its ecological functions are therefore anticipated as a result of the proposed road improvements.

**Habitat of Endangered and Threatened Species**

Eastern Meadowlark

Regulated Category 2 Eastern Meadowlark habitat is present in a Cultural Meadow vegetation community that falls within the proposed preferred alternative construction footprint (Maps 6a, b). The Cultural Meadow vegetation community includes an area of active agriculture as well as the footprint of a building, which is assumed to have been removed/demolished sometime between July 2018 and June 2019 based on a review of historical aerial imagery. The proposed road widening will result in the removal of 0.18 ha of Category 2 habitat.

Ontario Regulation (O. Reg.) 242/08 of the ESA identifies specific protection, mitigation, and habitat compensation requirements for Eastern Meadowlark as exemptions to permitting that would otherwise be required under Section 17(2)(c) of the ESA. The exemptions under the ESA require registration of the activity (i.e., habitat removal), habitat compensation (i.e., creation and maintenance of grassland breeding bird habitat), and monitoring of created habitat. Activities that may damage or destroy Eastern Meadowlark breeding habitat must not occur between May 1 and July 31 of any given year. The creation of compensation habitat must be initiated within 12 months of the removal of confirmed breeding habitat. It is recommended to consult with MECP to determine appropriate mitigation and to ensure ESA compliance.

Blanding's Turtle

Regulated Category 3 Blanding's Turtle habitat is present within the proposed construction (3.22 ha) and permanent footprints (1.42 ha) of the preferred alternative. This area of habitat includes the existing road and adjacent road shoulder. Blanding's Turtles depend on Category 3 habitats as movement corridors between wetlands, which are essential for carrying out life processes

associated with Category 1 and 2 habitats. The active season for this species in southern Ontario is typically late March to late October. Adults and hatchlings will utilize movement corridors to migrate/disperse throughout the active season. Based on the mapping of Category 3 habitats within the study area, there is potential for individuals of the species to attempt to cross the Maple Grove Road corridor during the active season. To ensure compliance with the ESA, consultation with MECP is recommended to be initiated as early as possible to determine if any additional studies and/or permitting is required prior to any alteration or destruction of regulated Blanding's Turtle habitat within the study area.

To mitigate potential impacts to the species, it is recommended to install exclusion fencing around the perimeter of the construction footprint prior to the initiation of construction activities in order to exclude the species from the construction zone. Fencing should follow guidelines outlined in the documents, *Reptile and Amphibian Exclusion Fencing* (MNRF 2013) and *Best Management Practices for Mitigating the Effects of Roads on Amphibian and Reptile Species at Risk in Ontario* (MNRF 2016). Targeted salvages by a qualified biologist should also be completed to capture and relocate any trapped individuals within the fenced construction zone prior to initiating any construction activities.

The Ellis Creek riparian corridor is identified as a natural corridor for wildlife movements, falls within the identified Category 3 habitat for the species, and therefore likely supports a movement corridor for Blanding's Turtle through the study area. If construction activities are planned to occur within the Blanding's Turtle active season, it is further recommended to support movements by the species during the construction phase of the project by maintaining the Ellis Creek riparian corridor throughout the active season and by directing individuals via directional fencing to cross under the road along this riparian corridor.

Species at Risk Bats

None of the identified candidate roost trees for Little Brown Myotis and Northern Myotis fall within the proposed construction or permanent road widening footprints. No direct impacts to these candidate roost trees are therefore anticipated as a result of the proposed widening of the Maple Grove Road corridor.

All treed communities within the study area may provide suitable roosting habitat for bat SAR, including for Little Brown Myotis, Northern Myotis and Tri-colored Bat. The proposed widening of Maple Grove Road will require the removal of trees along the edge of seven treed vegetation

communities (CUP3, CUW1, FOD5, FOD7, SWD3-3, SWD4-1 and SWD6-3). It is recommended that MECP consultation and review of the project is initiated as early as possible due to the lengthy review process and potential need for additional studies and/or permitting prior to any tree removals. In order to fully understand potential impacts to bat SAR habitats, the exact extent of tree removals will be determined at detailed design through the delineation and surveying of woodland driplines. It is recommended to avoid encroachment to within treed vegetation communities to the extent possible. To avoid harm and/or harassment of individuals, tree removals are recommended to occur outside of the bat active period (April 1 – September 30). For any encroachment/removal of treed vegetation communities that occur as a result of the proposed road widening, it is recommended to compensate for tree removals through the restoration of woodland habitats, where possible.

**Fish Habitat**

The preferred road widening alternative will include the widening or replacement of culverts to accommodate existing watercourse crossings at four major locations:

- Middle Creek at Maple Grove Road east of Boxwood Drive;
- Middle Creek at Maple Grove Road east of Speedsville Road;
- Hunsperger Drain at Speedsville Road; and
- East Creek at Maple Grove Road.

The high-level bridge crossing of Ellis Creek is to remain in place under the preferred alternative. In addition to the four major crossings listed above, there will be an additional three culvert extensions required to accommodate local drainage at non-watercourse locations along Maple Grove Road. In consideration of all seven culverts, widening is anticipated to result in extensions amounting to 111 m overall.

Direct fish habitat is present for at least some portions of the year in Middle Creek, the Hunsperger Drain, and East Creek where culvert widening is proposed. Loss of fish habitat will occur due to the necessary enclosure of portions of each watercourse within culverts at the four crossing locations. The majority of impacts to fish habitat are expected to be temporary, and are associated with the proposed temporary footprint for the preferred alternative as shown on Maps 6a – f (Hybrid Alternative). During the construction phase of the project, areas of aquatic habitat on either side of Maple Grove Road may require temporary removal for grading at the four main crossing locations. However, following the completion of all grading and construction,

the proposed permanent footprint is anticipated to result in minimal changes to the amount of open channel aquatic habitat. Should the final footprint of the Ellis Creek bridge crossing require the placement of fill or material below the high-water mark, consideration of impacts to direct fish habitat in this watercourse will require consideration as well.

Road grading will also require the temporary realignment of the Hunsperger Drain between its crossing at Maple Grove Road east of Boxwood Drive and its confluence with Middle Creek (Maps 6a – f). Post-construction, it is understood that the Drain will continue to flow within the road right-of-way in this area. Opportunities for enhancing the Drain as part of the overall road widening project should be considered at the detailed design stage; the incorporation of natural channel design concepts during detailed design is encouraged.

Since the preferred road widening alternative will require the temporary and long-term removal and realignment of direct fish habitat, the project will require review by the DFO's Fish and Fish Habitat Protection Program. Depending on the final detailed design of the road and resulting loss of fish habitat, the project may require an Authorization under the federal *Fisheries Act*. It is recommended that DFO review of the project be initiated as early as possible due to the lengthy review process and the potential for an Authorization to be required.

To avoid causing the death of fish during construction, a fish salvage completed by a qualified Biologist will be necessary. Additional measures to mitigate impacts to watercourses during construction will also be required, including using appropriate sediment and erosion control measures, isolating in-water work areas, and avoiding the timing window for spring-spawning warmwater species between March 15 and July 15.

**Wildlife Movement Corridors**

Several of the watercourse features that cross the existing Maple Grove Road corridor have been identified by the Region, City of Cambridge and the Growth Plan NHS as providing a linkage function for wildlife movement between natural features to the north and south of the study area. Construction activities therefore have the potential to directly impact small/medium wildlife species that may cross through the development area toward adjacent suitable habitats (e.g., snakes, turtles, small mammals). Mitigation measures for Blanding's Turtle, as outlined above, are also appropriate for mitigating direct impacts to wildlife movement corridors and include the installation of exclusion fencing around construction limits and the completion of a wildlife salvage within fenced areas prior to the initiation of any construction activities. Such

mitigation measures are recommended to be implemented at all watercourse crossings throughout the construction footprint and where natural features are present to the north and south of the road corridor. Maintaining watercourse crossings during construction in conjunction with the use of directional fencing to funnel wildlife to these crossings will assist in maintaining wildlife movement corridors and reducing potential wildlife mortalities throughout the construction period. Exclusion fencing should remain in place throughout the active construction period and be regularly inspected to ensure that it is functioning properly. Any gaps in the fencing should be immediately repaired or replaced.

The widening of the existing road corridor also has the potential to directly impact the connectivity among natural features across the landscape within the study area. However, the proposed road improvements provide an opportunity to restore and/or enhance the function of these natural corridors to minimize road mortality and habitat fragmentation and support the overall ecological integrity, connectivity and long-term sustainability of the natural heritage system. Where possible, it is recommended to consider the maintenance, restoration and/or enhancement of riparian corridors post-construction.

**Other Wildlife**

Vegetation clearing has the potential to directly impact breeding bird activity through damage and destruction of nests, eggs and young, or avoidance of the area by breeding adults. Vegetation clearing should therefore occur outside the breeding and nesting season for migratory birds as established by the Canadian Wildlife Service (April 1 - August 31) so as to limit disturbances to nesting activities of birds and to avoid destruction of active nests. The destruction of migratory birds and their nests is prohibited under the federal *Migratory Birds Convention Act*.

Vegetation clearing and site construction also has the potential to directly impact small/medium wildlife species that may cross through the development area toward adjacent suitable habitats (e.g., snakes, turtles). Mitigation measures for Blanding's Turtle and Wildlife Movement Corridors, as outlined above, include the installation of exclusion fencing around construction limits and the completion of a wildlife salvage within fenced areas prior to the initiation of any construction activities. Such mitigation measures will also mitigate potential impacts to other small wildlife species throughout the construction footprint.

## 7.3 Indirect Impacts

Construction of the proposed improvements to the Maple Grove Road corridor has the potential to cause indirect impacts to adjacent natural features and functions if not mitigated appropriately. Recommended mitigation measures are provided for each identified potential indirect impact below.

### 7.3.1 Disturbance to Adjacent Natural Features and Wildlife Habitats

Vegetation clearing and other construction activities have the potential to inadvertently destroy, damage and degrade existing vegetation along the development limits unless the development limit boundaries are clearly marked. For example, construction activities can cause scarring and decreased health of adjacent trees whose branches or root systems have been damaged by machinery or affected by construction-related dust and sedimentation. Damage to trees and other vegetation can also be a result of soil compaction within tree root zones along any new woodland/forest edges created at the development limits.

Direct damage and indirect disturbances can stress natural features and weaken their ecological integrity. In these states, natural features are more prone to establishment and proliferation of invasive, non-native species such as Common Buckthorn (*Rhamnus cathartica*). Proliferation of invasive, non-native species within natural communities decreases their ecological value, such as by suppressing native species, diminishing biodiversity and reducing habitat suitability.

To limit ecological impacts during construction, clearly defined construction limits should be established to avoid unnecessary vegetation removal. Tree protection fencing should be installed and conform to the recommendations outlined in the TIPP in terms of fencing type, signage requirements, etc. Where trees are located along the natural feature edges to be retained, protective tree fencing should be installed at least 1 m from dripline where possible to adequately protect the root zone from soil compaction and other disturbances. All tree protection fencing must be installed prior to site alteration and construction activities, and inspected by a certified arborist or environmental inspector. Where tree protection fencing is not required along construction area limits, other forms of boundary demarcation should be used which may include silt fencing for erosion and sediment control purposes or brightly-coloured snow fencing.

Designated areas for construction lay-down, vehicle access and parking, equipment storage, materials stockpiling, and any on-site construction offices should be located entirely outside the retained natural features.

Due to the potential for wildlife presence in the area, it is recommended that exclusion fencing be installed around the limits of the construction footprint to eliminate access of amphibians, reptiles and other small wildlife to these areas. Following installation of the fencing, a qualified biologist should conduct a sweep to capture and relocate any small wildlife from within the construction zone prior to the initiation of construction activities. The exclusion fencing should remain in place throughout the active construction period and be regularly inspected to ensure that it is functioning properly. Any gaps in the fencing should be immediately repaired or replaced.

General wildlife impacts can be mitigated by restricting the daily timing of construction activities to between 07:00 hrs and 19:00 hrs. This timing restriction should also apply to the use of generators or pumps insofar as possible. Any artificial lighting used for construction purposes should be turned off or directed away from the adjacent natural features following the completion of daily construction activities.

Potential impacts resulting from noise, vibrations, human presence, dust and artificial lighting are expected to be temporary, minimal and localized during the construction of the proposed road improvements. Due to the current land use and existing road corridor, significant effects on wildlife are not anticipated and it is expected that any displaced wildlife species will return to the vicinity of the study area following construction.

### 7.3.2 Sedimentation and Erosion

During vegetation removal and site grading activities, areas of bare soil will be exposed which have the potential to erode during rainfall events and impact adjacent natural features. The removal of vegetation in combination with the presence of exposed soils during construction activities may also increase the potential for stormwater flow to down-slope areas if not appropriately mitigated. Increased stormwater surface flow and erosion processes may cause the deposition of sediments onto down-slope vegetation and receiving water bodies, ultimately causing vegetation die-back or impaired health.

Soil compaction also has potential to occur as a result of heavy machinery in the area of construction activities. Soil compaction can greatly reduce the permeability of soils and affect

their ability to retain water during rain/snow melt events. This will result in an increase in surface water run-off which will ultimately increase the erosion potential and the amount of sediment being transported into adjacent natural features.

In order to protect adjacent natural features, including wetlands, from potential impacts due to sediment, an Erosion and Sediment Control (ESC) Plan must be developed prior to any construction activities on-site. The primary principles associated with sedimentation and erosion protection measures are to: (1) minimize the duration of soil exposure, (2) retain existing vegetation, where feasible, (3) encourage re-vegetation, (4) divert runoff away from exposed soils, (5) keep runoff velocities low, and (6) trap sediment as close to the source as possible.

The following general recommendations should be implemented to mitigate erosion and sedimentation impacts:

- Installation of silt fencing along the construction limits in all locations where run-off will discharge to adjacent lands or natural features and buffers.
- ESC measures must be regularly inspected and repaired or replaced in a timely manner. Accumulated sediment must be removed immediately.
- Placement of topsoil and seeding of all graded areas not subject to active construction within 30 days. A native seed mix, appropriate to the site conditions, should be applied in areas adjacent to existing natural features.

It is also recommended that topsoil stockpiles be located away from adjacent natural features and that silt fencing be installed around stockpiles to prevent off-site migration of water-borne sediments.

The impact resulting from soil compaction can be mitigated by minimizing the use of construction vehicles and equipment within buffers except where required, and by locating material stockpile and equipment storage locations away from natural features.

### 7.3.3 Impacts to Drainage and Surface Water Resources

A stormwater management plan has not yet been prepared for the proposed development and will be prepared as part of detailed design. Engineering designs for the preferred alternative should strive to maintain existing drainage patterns, flow rates and volumes relative to existing conditions.

Development within or in the area of interference of a wetland feature has the potential to impact the feature through changes in hydrology. The sensitivity of wetland features to changes in hydrology depend on the vegetation community type. The majority of the wetland vegetation communities that will be impacted by the proposed road improvements (i.e., MAM2-2, SWM1-1, SWD3-3, SWD4-1, SWD6-3, SWT2, and MAM2) are identified as having low-medium sensitivity to hydrological changes (TRCA 2017). One wetland vegetation community, SWM4-1, that will be exposed to direct impacts through vegetation removal is considered to have a high sensitivity to hydrological changes (TRCA 2017). The wetland hydrology of all wetland features, but especially the SWM4-1 wetland community, should be maintained at pre-construction conditions both during and after construction through ensuring inflow or outflow surface, sub-surface or groundwater and hydroperiods are unaltered. The need to complete a feature-based hydrogeological study should be considered in consultation with a hydrogeologist to ensure significant wetland features, including the SWM4-1 wetland community, are protected from any potential adverse impacts resulting from the proposed road improvements.

### 7.3.4 Water Quality

The greatest potential for water quality impacts associated with the proposed undertaking relate to contamination of adjacent watercourses (e.g., Ellis Creek) and wetland features (e.g., Maple Grove Road PSW) which drain surface water from the study area to the Speed River. Water quality mitigation measures should be designed with a focus to protect these features and downstream aquatic habitats. Recommended water quality mitigation measures, including road salt controls, are to be determined based on the outcome of detailed design.

In general, indirect water quality impacts may occur through faulty construction equipment. Machinery should arrive on site in clean condition and is to be checked and maintained free of fluid leaks. Machinery must be refueled, washed and serviced a minimum of 30 m from the drainage features and wetlands so as to prevent contamination by deleterious substances. Fuel and other construction related materials should also be located away from drainage features and wetlands. A Spill Response Plan (SRP) must be developed prior to commencement of construction. This SRP should provide a detailed response system to deal with events such as the release of petroleum, oils and lubricants or other hazardous liquids and chemicals. A spill kit must also be kept on site at all times and on-site workers must be trained in the use of this kit and be fully aware of the SRP.

## 7.4 Induced Impacts

Induced impacts are described as those that are not directly related to the construction or operation of the facilities in question, but rather arise from the use of natural areas as a result of the development. The simplest example is an increase in the use of natural areas adjacent to a residential development by residents, feral domestic wildlife, and unauthorized trail/pathway construction. Natural areas and wildlife are affected by people and how they use and access areas. Effects can include vegetation trampling, plant removal, dumping of refuse, creation of unauthorized trails, tree damage, introduction of non-native, invasive plant species and wildlife predation and harassment by domestic pets.

Given the proposed development involves the widening of an existing road corridor, any additional induced impacts, to those that adjacent natural features and wildlife are already exposed to, are anticipated to be minimal. The widening of the road from two lanes to four lanes as well as the addition of active transportation facilities will increase the use of the road corridor and the potential for habitat degradation through littering and roadside dumping of garbage into natural features. Installing road signage, such as “No Dumping” and “No Littering”, along the Maple Grove Road corridor can mitigate this potential induced impact.

As mentioned above, increased wildlife road mortalities may occur where the road crosses any of the natural corridors identified within the study area. It is recommended that post-construction amphibian, reptile and small wildlife eco-passages be incorporated into the design of any proposed updates to watercourse crossings within the preferred alternative construction footprint. It is also recommended to consider incorporating eco-passages into the design of any other culverts to be installed along the road for maintaining water balance. The design should also consider the benefits associated with the use of wildlife fencing and/or funneling techniques in conjunction with eco-passages.

## 7.5 Summary of Impact Analysis

**Table 10. Summary of Potential Impacts on Natural Features within the Study Area**

| Potential Impact | Mitigation | Extent of Affected Habitat[1] |
|---|---|---|
| **Direct Impacts** | | |
| Vegetation | • Delineate and survey woodland driplines and wetland boundaries that fall within 50 m of the construction footprint;<br>• Complete a detailed tree inventory woodland areas proposed for removal to inform the TIPP;<br>• Limit unnecessary vegetation removal and degradation by clearly demarcating the boundaries of construction zones;<br>• Install tree protection fencing following the recommendations outlined in the TIPP; and<br>• Offset potential impacts of vegetation removal through identifying appropriate opportunities for creating, restoring and/or enhancing vegetation communities and wildlife habitats within the study area. | • 1.25 ha of cultural vegetation communities<br>• 0.15 ha of agricultural row crops<br>• 0.99 ha of natural vegetation communities |
| Significant Wildlife Habitat | • Delineate and survey Seeps and Springs SWH boundaries that fall within 50 m of the construction footprint;<br>• Consult with hydrogeologist to determine the need to complete a feature-based hydrogeological study to ensure confirmed Seeps and Springs SWH and candidate Amphibian Breeding (Woodland) SWH are protected from any potential adverse impacts resulting from the proposed road improvements;<br>• Vegetation removal should avoid the nesting period for migratory birds (April 1 – August 31);<br>• Construction activities should not occur within 10 m of any confirmed nests during the nesting period;<br>• All tree removals from within treed vegetation communities (e.g., forest, swamp) should occur outside of the bat active period (April 1 – September 30);<br>• Where possible, ground disturbance should be avoided, or the extent of ground disturbance minimized, during the snake hibernation period (October 15 – April 15);<br>• Timing of construction activities should avoid the peak amphibian breeding season (April 1 – June 30); and | • 0.01 ha confirmed Seeps and Springs SWH<br>• 0.29 ha confirmed Special Concern and Rare Wildlife Species SWH (Eastern Wood-pewee)<br>• 0.10 ha candidate Bat Maternity Colony SWH<br>• 0.19 ha candidate Amphibian Breeding (Woodland) SWH for salamanders<br>• 2.24 ha candidate Snake Hibernacula SWH |

| Potential Impact | Mitigation | Extent of Affected Habitat[1] |
|---|---|---|
| | • Install wildlife exclusion fencing around construction footprint and complete wildlife salvage prior to any construction activities. | |
| Habitat of Endangered and Threatened Species | • Consultation with MECP is recommended to determine appropriate mitigation and ESA compliance with regards to Eastern Meadowlark prior to the initiation of any construction activities;<br>• Activities that may damage or destroy Eastern Meadowlark breeding habitat must not occur between May 1 and July 31;<br>• MECP consultation is recommended to determine the need for any further field surveys or permitting that may be required for Blanding's Turtle prior to initiating construction activities within regulated Category 3 habitat;<br>• Install exclusion fencing around construction footprint to exclude Blanding's Turtle from the construction zone and complete wildlife salvage prior to any construction activities;<br>• Maintain Ellis Creek riparian corridor and associated potential Blanding's Turtle movement corridor during construction; design exclusion fencing to funnel Blanding's Turtle individuals to Ellis Creek riparian corridor;<br>• MECP consultation is recommended to determine appropriate mitigation and ESA compliance for Little Brown Myotis, Northern Myotis and Tri-colored Bat prior to tree removal activities; and<br>• Tree removals should occur outside of the bat active period (April 1 – September 30). | • 0.18 ha Category 2 Eastern Meadowlark breeding habitat<br>• 3.22 ha Category 3 Blanding's Turtle movement/travel corridor habitat<br>• 0.10 ha candidate Little Brown Myotis, Northern Myotis and Tri-colored Bat general habitat |
| Fish Habitat | • The project will require review by the DFO's Fish and Fish Habitat Protection Program due to the proposed temporary and permanent removal and realignment of direct fish habitat along the Maple Grove Road corridor;<br>• DFO review of the project is recommended to be initiated as early as possible due to the lengthy review process and the potential for an Authorization to be required;<br>• Fish salvages are recommended to be completed by a qualified biologist prior to activities that may damage, destroy and/or isolate fish habitats; and | • 2634 m Direct Fish Habitat |

| Potential Impact | Mitigation | Extent of Affected Habitat[1] |
|---|---|---|
| | • Activities that may result in harmful alteration, damage or destruction of fish habitat should avoid the timing window for spring-spawning warmwater species (March 15 – July 15). | |
| Wildlife Movement Corridors | • Install exclusion fencing around construction footprint to exclude small wildlife species from the construction zone and complete wildlife salvage prior to any construction activities; and<br>• Exclusion fencing should remain in place throughout the active construction period and be regularly inspected to ensure that it is functioning properly. Any gaps in the fencing should be immediately repaired or replaced. | • 2634 m of wildlife movement corridors associated with the West Creek, Middle Creek/Hunsperger Drain, East Creek and Ellis Creek watercourse crossings of the Maple Grove Road corridor. |
| **Indirect Impacts** | | |
| Disturbance to Adjacent Natural Features and Wildlife | • Limit unnecessary vegetation removal and degradation by clearly demarcating the boundaries of the construction zone;<br>• Detailed design of the proposed road improvements should consider maximizing the physical separation between the expanded road corridor and adjacent natural features;<br>• Tree protection fencing should be installed in accordance with recommendations outlined in the TIPP prior to the initiation of construction activities;<br>• Designated areas for parking, storage, stockpiling, etc., should be located outside retained natural features;<br>• Wildlife exclusion fencing should be installed and maintained throughout the construction period. A wildlife salvage should be completed prior to the initiation of any construction activities;<br>• Construction activities should be limited to occur during daylight hours between 07:00 hrs and 19:00 hrs; and<br>• The use of artificial lighting should be avoided, but in areas where it is necessary, it should be turned off or directed away from natural features each evening during construction. | • All natural features within and adjacent to construction footprint |
| Sedimentation and Erosion | • An Erosion and Sediment Control (ESC) Plan must be developed prior to initiation of any construction activities;<br>• The ESC plan must incorporate measures to avoid sedimentation in adjacent natural features; | • All natural features and watercourses within and adjacent to construction footprint |

| Potential Impact | Mitigation | Extent of Affected Habitat[1] |
|---|---|---|
| | • ESC measures must be regularly inspected and repaired or replaced in a timely manner; and<br>• Seeding of graded areas not subject to active construction within 30 days with a suitable native seed mix. | |
| Drainage and Surface Water Resources | • Engineering designs for the proposed road alignment should strive to maintain existing drainage patterns, flow rates and volumes relative to existing conditions; and<br>• Consult with hydrogeologist to determine the need to complete a feature-based hydrogeological study to ensure significant wetland features, including the SWM4-1 wetland community, are protected from any potential adverse impacts resulting from the proposed road improvements. | • All wetland features and watercourses within and adjacent to construction footprint |
| Water Quality | • Water quality mitigation measures, including road salt controls, are to be determined based on the outcome of detailed design;<br>• Machinery must be well maintained and refueled, washed and serviced a minimum of 30 m from watercourse and wetland features; and<br>• A Spill Response Plan (SRP) must be developed prior to commencement of construction. | • All wetland and watercourse features within and adjacent to construction footprint |
| **Induced Impacts** | | |
| Habitat Degradation | • Garbage, leaf litter, and other debris should not be deposited within adjacent natural features and buffer areas; Installation of “No Dumping” and “No Littering” signage can mitigate this potential induced impact;<br>• The use of lawn or garden chemical should be avoided in natural feature buffers and reduced or eliminated within any proposed grass boulevards;<br>• Any landscape plantings should use native species to avoid the proliferation of non-native species within adjacent natural features;<br>• No vegetation clearing should occur within adjacent natural features or buffer areas with the exception of non-native species removal; and<br>• All recommended buffers to adjacent natural features should be maintained in a natural state. | • All natural features adjacent to construction footprint |

| Potential Impact | Mitigation | Extent of Affected Habitat[1] |
|---|---|---|
| Road Mortality | • Wildlife eco-passages should be incorporated into the design of all proposed improvements/alterations to watercourse crossings;<br>• Wildlife eco-passages should be incorporated into the design of any culverts to be installed for maintaining water balance along the Maple Grove Road corridor; and<br>• The use of wildlife fencing and/or funneling techniques should be considered where eco-passages are installed. | • All wildlife movement corridors associated with the West Creek, Middle Creek/Hunsperger Drain, East Creek and Ellis Creek watercourse crossings of the Maple Grove Road corridor.<br>• All areas of the road corridor where natural features are present to the north and south of the road |

[1]Approximated from aerial imagery.

## 8.0 Restoration and Enhancement

The proposed road improvements provide an opportunity to support the overall ecological integrity, connectivity and long-term sustainability of the natural heritage system through the restoration and/or enhancement of natural features and habitat functions present within and adjacent to the Maple Grove Road corridor. Recommended restoration and enhancement activities for consideration at detailed design are summarized in Table 11.

**Table 11. Recommended Restoration and Enhancement Activities**

| Recommended Restoration and/or Enhancement | Location(s) | Details | Purpose |
|---|---|---|---|
| Fish Habitat Enhancement | Hunsperger Drain | Restoration of aquatic habitats should be completed immediately following completion of construction activities.<br><br>The incorporation of natural channel design concepts is recommended to be considered in consultation with MNRF and DFO at detailed design for the proposed realignment and restoration of the Drain. This can include planting of native aquatic vegetation, placement of suitable substrates, restoration of pool/riffle habitats, placement of shoreline woody debris, and restoration and/or enhancement of bank stability. | To improve existing fish habitat conditions and support the long-term sustainability of fish communities within the study area. |
| Wildlife Corridor Enhancement | Middle Creek/Hunsperger Drain Wildlife Corridor<br><br>East Creek Wildlife Corridor<br><br>Ellis Creek Wildlife Corridor | Enhancement and provision of wildlife corridors between existing natural features of the Maple Grove Road PSW Complex, Ellis Creek PSW Complex and the Speed River PSW complex.<br><br>The extent to which corridors are used by animals is influenced by a number of interrelated factors including the width, length, vegetation type, suitability of habitat in the area surrounding the corridor, impacts of edge effects such as windthrow, and species- | To improve the function of existing wildlife corridors through providing wildlife access to a wide range of habitats throughout the study area, facilitating seasonal migrations, providing security to species which are sensitive to human activities, and by maintaining genetic diversity of wildlife populations. The enhancement of the corridor will also support the maintenance of the diversity of plant species in the area. |

| Recommended Restoration and/or Enhancement | Location(s) | Details | Purpose |
|---|---|---|---|
| | | specific preferences (Wilkinson 2001). The restoration and enhancement of wildlife corridors should therefore consider such factors in the design of any corridors. | |
| Natural Feature and Buffer Restoration and Enhancement | All identified natural feature buffers within the temporary construction footprint | All disturbed natural features and buffers within the temporary construction footprint should be restored immediately following the completion of construction activities to minimize establishment of non-native, invasive species.<br><br>Restoration and enhancement of natural features and buffers should include the seeding and/or planting of locally sourced, native species. Following the establishment of vegetated buffers, no vegetation clearing or maintenance activities should occur within buffers with the exception of non-native species removal. All buffers should be maintained in a natural state. | To restore areas of natural features that were removed during the construction phase of the project.<br><br>To provide long-term protection to the form and function of retained natural features and sensitive wildlife habitats from potential induced impacts such as the proliferation of non-native species within sensitive natural features. |

## 9.0 Monitoring

Pre-, during-, and post-construction monitoring is required as a means to ensure that adjacent natural features are not adversely impacted throughout all stages of the proposed road improvements. Recommended monitoring is summarized in the following sections and includes required monitoring for the study area as outlined in the Hespeler West SWS (City of Cambridge 2004). The details of this monitoring plan will be refined during the detailed design stage of the development application process in conjunction with the City, Region and GRCA staff as well as any other appropriate agencies (e.g., DFO, MECP).

## 9.1 Pre-Construction Monitoring

As outlined in the Hespeler West SWS, the following pre-construction monitoring is recommended to confirm baseline conditions prior to the initiation of any construction activities:

- Monitoring of the existing conditions of all watercourse features that may be impacted by the proposed road improvements, including monitoring of surface water and groundwater, riparian buffers, and if required by agency staff, fish and benthic invertebrate communities. Monitoring must be completed for a minimum of two years prior to construction;
- Delineate and survey the boundary of all significant natural features, including PSWs and Significant Woodlands, and determine appropriate buffers and setbacks. The existing condition of natural features and buffers should be assessed prior to construction to document baseline conditions for which any future monitoring can be compared against, to determine the conditions which must be maintained during and post-construction, and to inform post-construction restoration and enhancement activities.
- Assess existing conditions of all natural corridors and linkages to document baseline conditions for which any future monitoring can be compared against, to determine the conditions which must be maintained during and post-construction, and to inform post-construction restoration and enhancement activities.

In addition, on-site inspections of the following should be undertaken to ensure proper installation prior to construction:

- Sediment and erosion control measures (e.g., silt fencing) as confirmed by an environmental inspector;

- Tree and natural area protection measures, including proper installation of tree protection fencing as confirmed by a certified arborist or environmental inspector; and
- Wildlife exclusion fencing, as confirmed by a qualified biologist.

Following wildlife exclusion fence installation and prior to initiation of any construction activities, a wildlife salvage should be completed within the fenced area to salvage and re-locate small wildlife species (e.g., snakes, turtles) to suitable adjacent natural features.

## 9.2 Construction-Stage Monitoring

Construction monitoring is the responsibility of the proponent and is tied to the specific undertaking. Generally, construction monitoring must occur to ensure compliance with the conditions of various permits, the Erosion and Sediment Control Plan and the Spill Response Plan.

At a minimum, the following measures are recommended during construction and will be the responsibility of the Environmental Inspector, unless otherwise indicated:

- Pruning of any limbs or roots (of trees to be retained) disrupted during construction, as completed by a certified arborist;
- Maintaining, and where necessary, repairing or replacing silt fencing, other ESC measures, tree protection fencing, and wildlife exclusion fencing;
- Monitoring compliance of construction personnel toward adherence of required restrictions/limitations on personnel and vehicle access in natural features, machinery fueling locations and equipment/stockpile locations away from natural features;
- Monitoring wetlands and watercourse features to ensure hydroperiod, water quality and quantity is maintained at pre-construction conditions;
- Monitoring natural corridors and linkages to ensure the continued function (i.e., connectivity) of the corridor is maintained; and
- Increase frequency of all monitoring activities prior to and following storm events.

## 9.3 Post-Construction Monitoring

The post-construction period is assumed to begin once the construction associated with the road improvements is completed. A post-construction monitoring plan is recommended to be

developed in consultation with appropriate agency staff and should include, but not be limited to, the following:

- Inspections of tree compensation plantings to ensure proper establishment and succession toward the intended vegetation community composition as determined at detailed design.
- Inspections of any buffer enhancement or restoration plantings to ensure proper establishment and succession toward the intended vegetation community composition.
- Wetland boundary delineation and woodland dripline at 3 and 5 years following the completion of road upgrades to assess the potential disturbance impact of the development on wetland limits and woodland communities.
- Aquatic habitat characterization of Hunsperger Drain to ensure that the original function of the feature is being maintained following realignment and restoration. The characterization should follow methods outlined in this report to allow for comparable data. This should include an assessment of any riparian vegetation plantings to ensure proper establishment and succession toward the intended vegetation community composition.
- Breeding bird surveys within the vicinity of the proposed road improvements to assess the potential disturbance impact of the road on existing Eastern Wood-Pewee SWH. Methods outlined in this report should be followed for these surveys to allow for comparable data.
- Road mortality surveys should be completed within the vicinity of identified wildlife movement corridors and where natural features are present to the north and south of the road corridor to assess the potential direct impacts of the road on wildlife movements. Surveys should document all taxa; however, methodologies should be developed at a minimum to focus on herpetofauna as outlined in MNRF (2016).
- Monitoring of the use of any installed wildlife eco-passages along the Maple Grove Road corridor is recommended. Monitoring should include a combination of wildlife cameras as well as wildlife track/scat area searches to document movement within the vicinity of the eco-passages. A minimum of two wildlife cameras should be installed at each eco-passage, one at each end of the eco-passage.

In addition, the Hespeler West SWS (City Cambridge 2004) recommends:

- Monitoring of the performance of installed stormwater management facilities;
- Continued monitoring of all watercourse features where pre-construction monitoring was completed, including monitoring of surface water and groundwater, riparian buffers, and if required by agency staff, fish and benthic invertebrate communities.
- Continued monitoring of the conditions of adjacent significant natural features, including PSWs and Significant Woodlands, including any evidence of encroachment, non-native species, erosion, sedimentation, and/or alteration in hydrology.
- Continued monitoring of the conditions of natural corridors and linkages that cross the Maple Grove Road corridor, including any evidence of a loss in connectivity (e.g., vegetative cover).

## 10.0 Conclusions

Natural Resource Solutions Inc. (NRSI) was retained in September 2018 by the Regional Municipality of Waterloo (RMOW) as part of a team to complete environmental studies to support the Maple Grove Road Improvements Class EA in the City of Cambridge and RMOW. This report summarizes background information on natural heritage features, as well as the methods and results of a comprehensive field program within the study area.

The detailed characterization of existing natural features was used to inform an analysis of the significance and sensitivity of natural features within the study area and identify constraints to development. This information was used to evaluate several alternative Maple Grove Road widening alignments and cross-section designs from a natural heritage perspective. Based on this preliminary analysis, Concept 3 is the preferred road widening alignment option, followed by Concepts 1, 4, and 2. Concept 2 is considered the least desirable alternative from a natural heritage perspective. The overall preferred alternative as determined by the project team was Concept 4. The preferred road cross-section design from a natural heritage perspective is Alternative A, followed by Alternative B. The overall preferred alternative determined by the project team was also Alternative A.

Based on the preferred alternatives, recommendations for mitigation measures have been proposed to offset negative impacts on the natural environment and species occupying the study area. Potential enhancements or compensation measures that can be achieved will be developed through detailed design and permitting. Please refer to the main report (IBI 2021) for details on other criteria.

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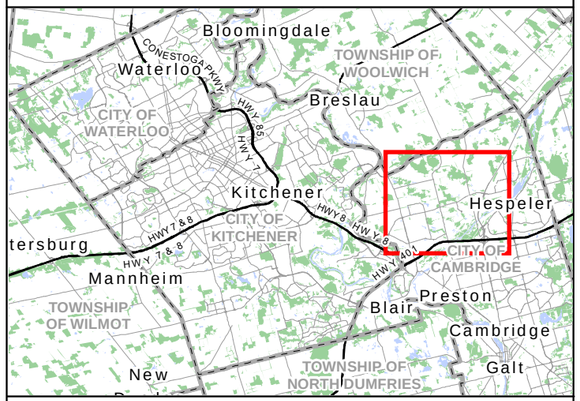
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## Maps

**Map 1**

# Maple Grove Rd Class EA

## Study Area and Natural Features




**Legend**

- Study Area
- Utility Line
- Railway
- Highway
- Primary Road
- Secondary Road
- Alleyway / Laneway
- Permanent Watercourse
- Intermittent Watercourse
- Water Body
- Wooded Area
- Other Wetland (Non-PSW)
- Provincially Significant Wetland (PSW)
- Unevaluated Wetland
- Regulation Limit
- Floodplain
- ANSI, Earth Science
- Region of Waterloo Core Environmental Feature (Region of Waterloo 2015)
- Natural Heritage System (Growth Plan for the Greater Golden Horseshoe 2019)


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Date: July 20, 2021

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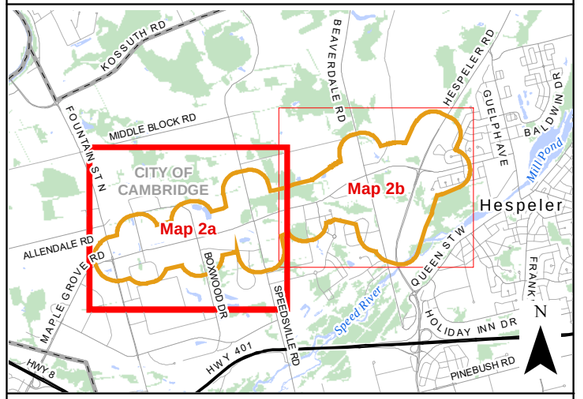
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# Map 2a

# Maple Grove Rd Class EA

## Monitoring Stations




**Legend**

- Study Area
- Anuran Monitoring
- Breeding Bird Monitoring
- Nocturnal Bird Monitoring
- Aquatic Habitat Point
- Electrofishing Sampling Site
- Utility Line
- Natural
- Modified


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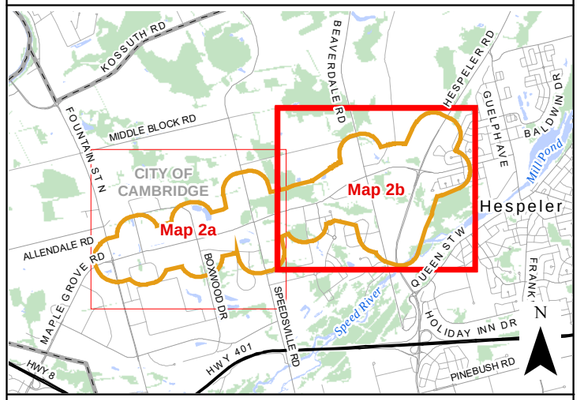
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**Map 2b**

# Maple Grove Rd Class EA

## Monitoring Stations




**Legend**

- Study Area
- Anuran Monitoring
- Breeding Bird Monitoring
- Nocturnal Bird Monitoring
- Aquatic Habitat Point
- Electrofishing Sampling Site
- Utility Line
- Railway
- Natural
- Modified


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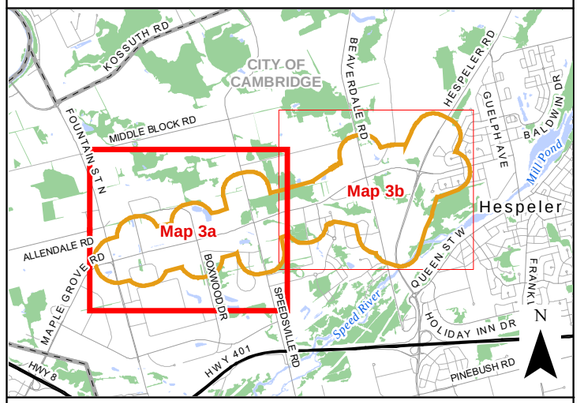
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# Map 3a

# Maple Grove Rd Class EA

## Vegetation Communities







## Legend

- Study Area
- Ecological Land Classification
- (Ag) Agriculture
- (CUM1) Mineral Cultural Meadow Ecosite
- (CUP3) Coniferous Plantations
- (CUT1) Mineral Cultural Thicket Ecosite
- (CUW1) Mineral Cultural Woodland Ecosite
- (FOC3) Fresh - Moist Hemlock Coniferous Forest Ecosite
- (FOD5) Dry - Fresh Sugar Maple Deciduous Forest Ecosite
- (FOD7) Fresh - Moist Lowland Deciduous Forest Ecosite
- (FOD7-3) Fresh-Moist Willow Lowland Deciduous Forest Type
- (H) Hedgerow
- (MAM2) Mineral Meadow Marsh Ecosite
- (MAM2-10) Forb Mineral Meadow Marsh Type
- (MAM2-2) Reed-canary Grass Mineral Meadow Marsh Type
- (Res) Residential
- (SAS1-3) Stonewort Submerged Shallow Aquatic Type
- (SWD3-3) Swamp Maple Mineral Deciduous Swamp Type
- (SWD4-1) Willow Mineral Deciduous Swamp Type
- (SWD6-3) Swamp Maple Organic Deciduous Swamp Type
- (SWM1-1) White Cedar Mineral Mixed Swamp Ecosite
- (SWM4-1) White Cedar-Hardwood Organic Mixed Swamp Type
- Utility Line
- Natural
- Modified


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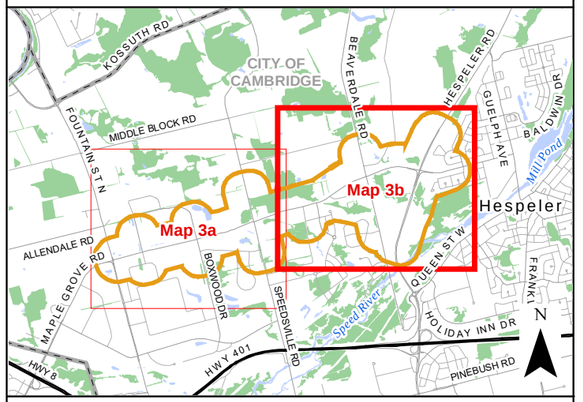
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# Map 3b

# Maple Grove Rd Class EA

## Vegetation Communities




## Legend

- Study Area
- Ecological Land Classification
- (Ag) Agriculture
- (CUM1) Mineral Cultural Meadow Ecosite
- (CUM2) Bedrock Cultural Meadow Type
- (CUP1-7) Green Ash Deciduous Plantation Type
- (CUP3) Coniferous Plantations
- (CUT1) Mineral Cultural Thicket Ecosite
- (CUW1) Mineral Cultural Woodland Ecosite
- (DH) Deciduous Hedgerow
- (FOC4-1) Fresh - Moist White Cedar Coniferous Forest Type
- (FOD4) Dry - Fresh Deciduous Forest Ecosite
- (FOD5) Dry - Fresh Sugar Maple Deciduous Forest Ecosite
- (FOD7) Fresh - Moist Lowland Deciduous Forest Ecosite
- (FOD7-2) Fresh - Moist Ash Lowland Deciduous Forest Type
- (FOD7-3) Fresh-Moist Willow Lowland Deciduous Forest Type
- (FOD8-1) Fresh - Moist Poplar Deciduous Forest Type
- (FOM4) Dry - Fresh White Cedar Mixed Forest Ecosite
- (H) Hedgerow
- (MAM2) Mineral Meadow Marsh Ecosite
- (MAM2-10) Forb Mineral Meadow Marsh Type
- (MAM2-2) Reed-canary Grass Mineral Meadow Marsh Type
- (MAM2-9) Jewelweed Mineral Meadow Marsh Type
- (MAS2) Mineral Shallow Marsh Ecosite
- (MAS2-1) Cattail Mineral Shallow Marsh Type
- (OA) Open Water
- (Res) Residential
- (SAM1) Mixed Shallow Aquatic Ecosite
- (SWD) Deciduous Swamp
- (SWD3-3) Swamp Maple Mineral Deciduous Swamp Type
- (SWD3-4) Manitoba Maple Mineral Deciduous Swamp Type
- (SWD4) Mineral Deciduous Swamp Ecosite
- (SWD4-1) Willow Mineral Deciduous Swamp Type
- (SWD6-1) Red Maple Organic Deciduous Swamp Type
- (SWD6-3) Swamp Maple Organic Deciduous Swamp Type
- (SWM4-1) White Cedar-Hardwood Organic Mixed Swamp Type
- (SWT2) Mineral Thicket Swamp Ecosite
- Utility Line
- Railway
- Natural
- Modified


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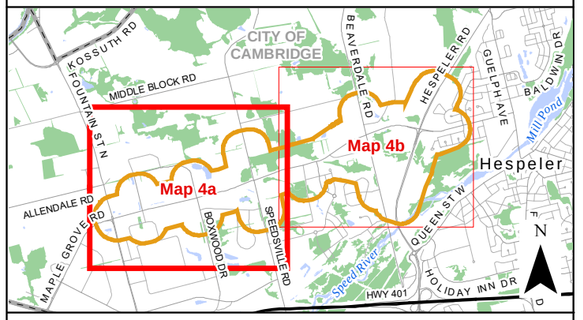
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# Map 4a

# Maple Grove Rd Class EA

## Confirmed Significant Species and Wildlife Habitats







## Legend

- 12 Black Walnut *(Juglans nigra)**
- 13 Common Hackberry *(Celtis occidentalis)*
- 15 White Spruce *(Picea glauca)**

**Regionally Significant Plant Observations**

- 11 Wood's Sedge *(Carex woodii)*
- Study Area
- Utility Line
- Natural
- Modified

**Confirmed Significant Wildlife Habitat**

- Special Concern and Rare Wildlife Species (Eastern Wood-pewee)

**Confirmed Habitat of Threatened and Endangered Species**

**Eastern Meadowlark**

- Category 2 Habitat**

** Roadside; not in natural habitat*
*** Federally and provincially listed*

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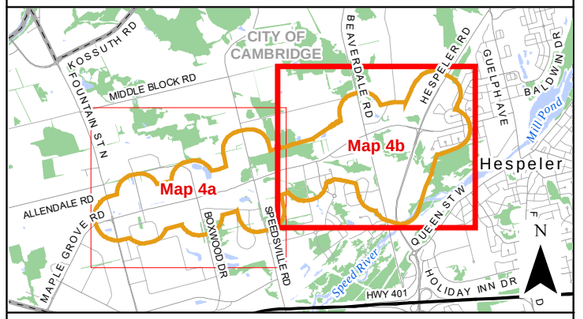
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Map 4b

# Maple Grove Rd Class EA

## Confirmed Significant Species and Wildlife Habitats




### Legend

- Study Area
- Utility Line
- Railway
- Natural
- Modified

**Regionally Significant Plant Observations**

1. American Prickly-ash *(Zanthoxylum americanum)*
2. Bulbous Cress *(Cardamine bulbosa)*
3. Eastern Cottonwood *(Populus deltoides)*
4. Golden Alexanders *(Zizia aurea)*
5. Hackberry *(Celtis occidentalis)*
6. Large-leaved Pondweed *(Potamogeton amplifolius)*
7. Rough Sedge *(Carex scabrata)*
8. Spreading Sedge *(Carex laxiculmis var. laxiculmis)*
9. Swamp Candles *(Lysimachia terrestris)*
10. Virginia Stickseed *(Hackelia virginiana)*
11. Wood's Sedge *(Carex woodii)*
12. Black Walnut *(Juglans nigra)**
14. Eastern Cottonwood *(Populus deltoides)*

**Confirmed Habitat of Threatened and Endangered Species**

- B — Butternut *(Juglans cinerea)***
- Butternut *(Juglans cinerea)***

**Confirmed Significant Wildlife Habitat**

- Special Concern and Rare Wildlife Species (Eastern Wood-pewee)
- Special Concern and Rare Wildlife Species (Slender-leaved Mountain-mint)
- Amphibian Breeding Habitat (Wetland)
- Seeps and Springs

* *Roadside; not in natural habitat*
** *Federally and provincially listed*


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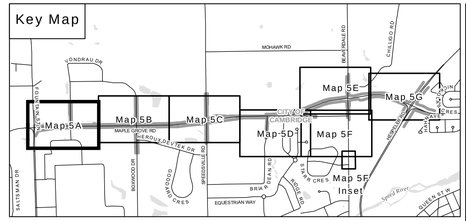
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**Map 5A**

# Maple Grove Rd Class EA

## Tree Inventory

**Key Map**




**Legend**

- Subject Property
- Existing Conditions
- Servicing
- Fence
- Watercourse / Waters Edge
- Bottom of Slope
- Top of Sope
- Primary Road
- Secondary Road
- Inventoried Tree (Crown to Scale)
- ★ Bat Habitat Tree

**Priority for Retention**

- High Priority
- Medium Priority
- Low Priority

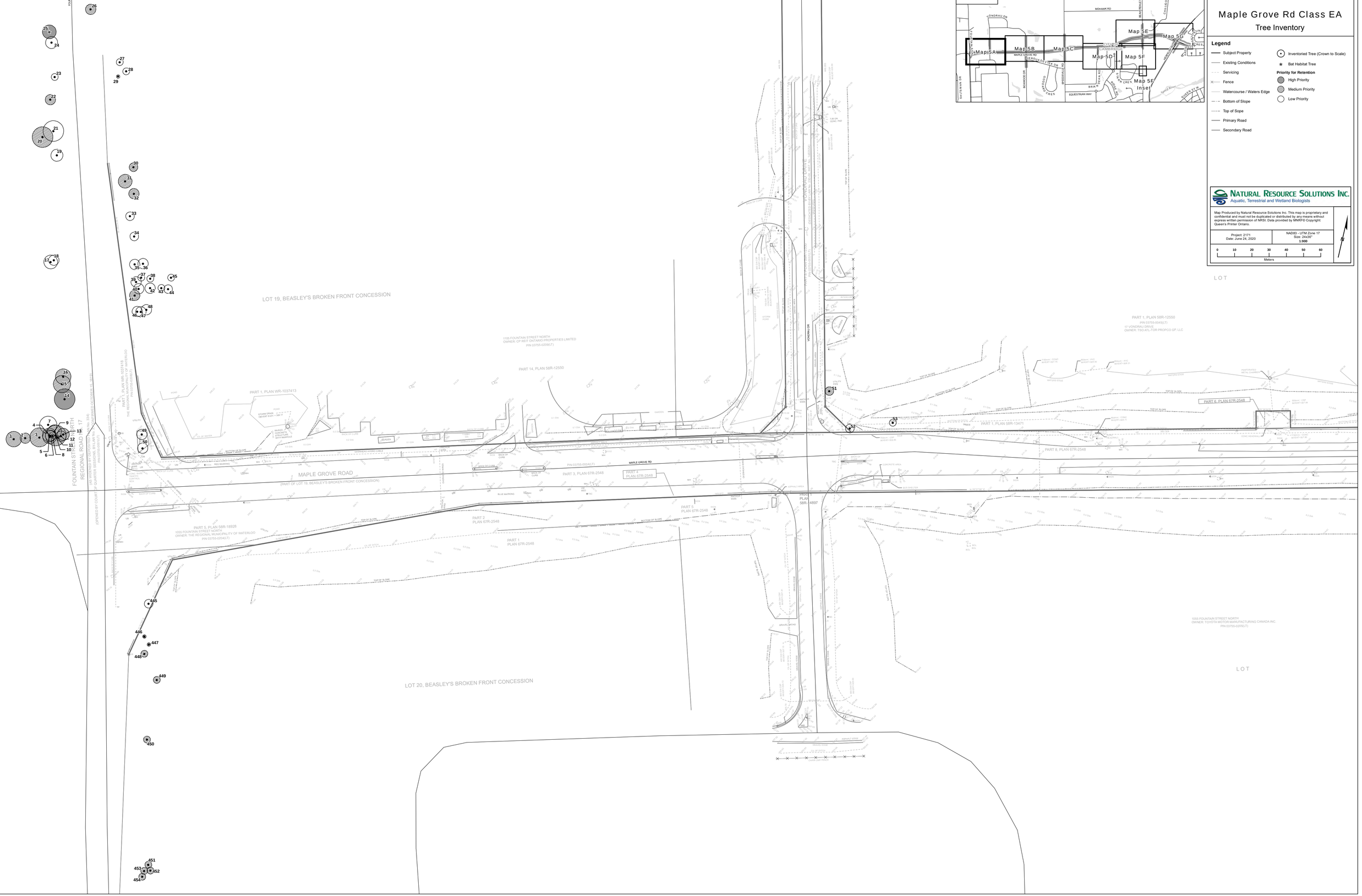

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| Project: 2171<br>Date: June 24, 2020 | NAD83 - UTM Zone: 17<br>Size: 24x36"<br>1:900 |
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0 10 20 30 40 50 60
Meters



**Map 5B**

# Maple Grove Rd Class EA

## Tree Inventory

**Legend**

- Subject Property
- Existing Conditions
- Servicing
- Fence
- Watercourse / Waters Edge
- Bottom of Slope
- Top of Sope
- Primary Road
- Secondary Road
- Inventoried Tree (Crown to Scale)
- ★ Bat Habitat Tree

**Priority for Retention**

- High Priority
- Medium Priority
- Low Priority

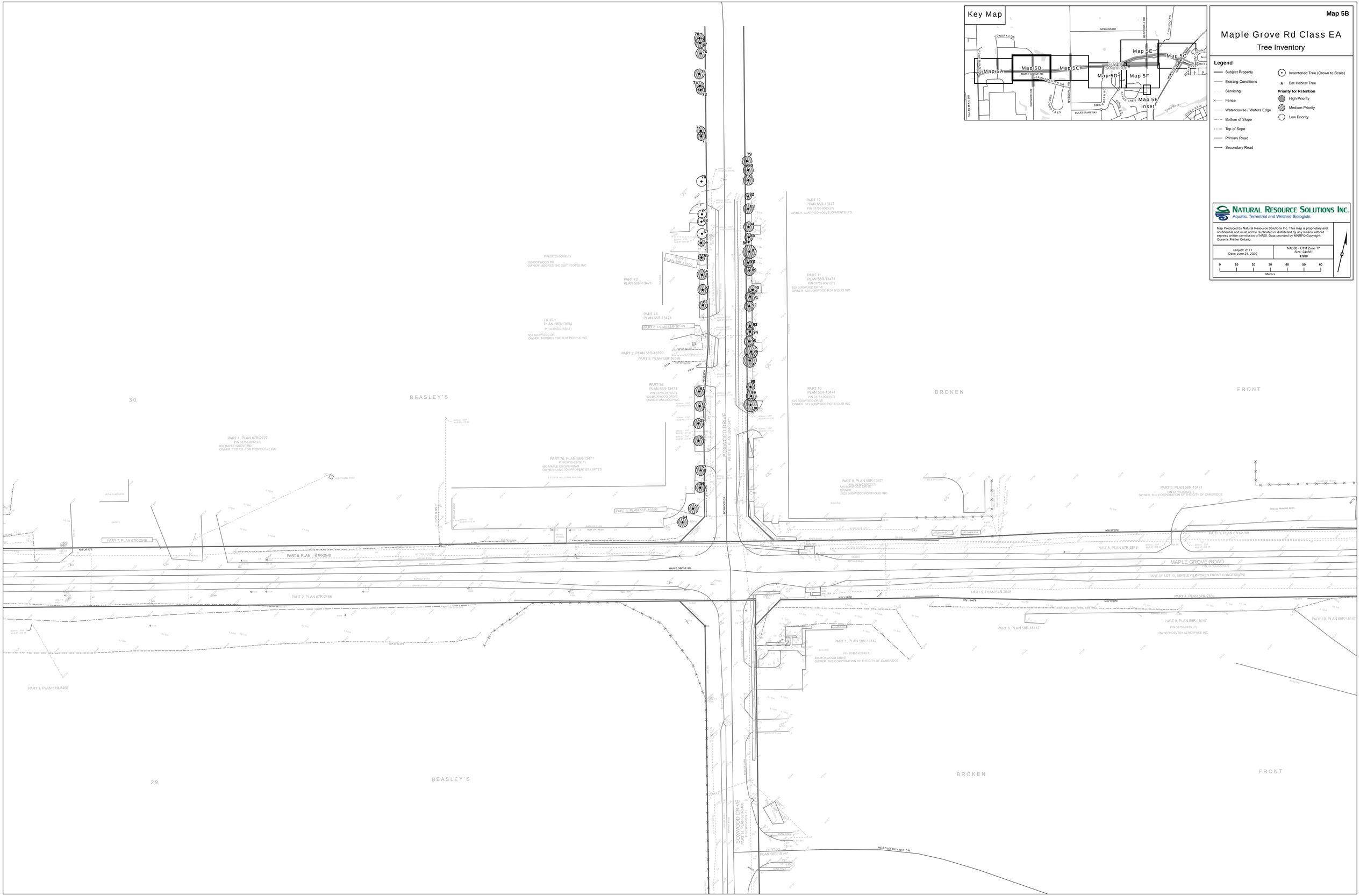
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Date: June 24, 2020

NAD83 - UTM Zone: 17
Size: 24x36"
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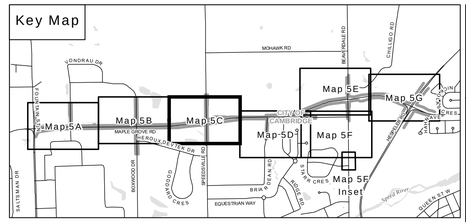
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Meters



**Map 5C**

# Maple Grove Rd Class EA

## Tree Inventory




**Legend**

- Subject Property
- Existing Conditions
- Servicing
- Fence
- Watercourse / Waters Edge
- Bottom of Slope
- Top of Sope
- Primary Road
- Secondary Road
- Inventoried Tree (Crown to Scale)
- ★ Bat Habitat Tree

**Priority for Retention**

- High Priority
- Medium Priority
- Low Priority


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Project: 2171
Date: June 24, 2020

NAD83 - UTM Zone: 17
Size: 24x36"
**1:900**

0 10 20 30 40 50 60
Meters

CONCESSION

PART 1, PLAN 58R-16730
PIN 03755-0078(LT)
OWNER:
HER MAJESTY THE QUEEN IN RIGHT OF ONTARIO AS REPRESENTED BY THE MINISTER OF INFRASTRUCTURE.

PIN 03755-0077(LT)

SPEEDSVILLE ROAD

PART 1, PLAN 58R-16726
PIN 03756-0041(LT)
1755 SPEEDSVILLE RD
OWNER: BASHAM, DEREK BRUCE AND BASHAM, CAROLYN LOUISE

PART 1, PLAN 58R-11534
PIN 03756-0163(LT)
1370 MAPLE GROVE RD
OWNER: SPAATUM HOLDINGS INC.

PART 14 PLAN 67R-2769

PART 12 PLAN 67R-2769

PART 13, PLAN 67R-2769

PART 15 PLAN 67R-2769

PART 10, PLAN 67R-2769

PART 18 PLAN 67R-2769

PART 9 PLAN 67R-2769

PART 8 PLAN 58R-19233
PROVIDED INFORMATION

PART 7, PLAN 67R-2769

PART 8, PLAN 67R-2769
PIN 03755-0015(LT)

PART 6, PLAN 67R-2769

PART 5 PLAN 67R-2769

PART 2 PLAN 67R-2769

PART 1, PLAN 58R-16727

PART 3, PLAN 58R-19233

PART 1, PLAN 58R-18147
120 GODDARD CRESCENT
OWNER: THE CORPORATION OF THE CITY OF CAMBRIDGE
PIN 03755-0052(LT)

PART 'A' PLAN 58R-16727

PART OF LOT 19, BEASLEY'S BROKEN FRONT CONCESSION

PART'S PLAN 67R-2769

MAPLE GROVE RD

PIN 03755-0005(LT)
800 BRIARDEAN RD
OWNER: BESZETNIK, CASIMIR JOHN GEORGE; BESZETNIK, MARTIN STANLEY PATRICK - ESTATE; HUNT CLUB VALLEY (REZ) INC.; DAY, ANGELA; JULIAN, MARTIN; JULIAN, MICHAEL

CONCESSION

101 102 103 104 105 106 107 108 109 110 111 112 442 443 444 424

Map 5D

# Maple Grove Rd Class EA

## Tree Inventory

**Legend**

- Subject Property
- Existing Conditions
- Servicing
- Fence
- Watercourse / Waters Edge
- Bottom of Slope
- Top of Sope
- Primary Road
- Secondary Road
- Inventoried Tree (Crown to Scale)
- Bat Habitat Tree

**Priority for Retention**

- High Priority
- Medium Priority
- Low Priority

Key Map

Map 5A | Map 5B | Map 5C | Map 5D | Map 5E | Map 5F | Map 5G | Map 5E Inset

MAPLE GROVE ROAD (PART OF LOT 19, BEASLEY'S BROKEN FRONT CONCESSION)

PART 16, PLAN 67R-2769

PART 1, PLAN 67R-3155

BLOCK 190
REGISTERED PLAN 58M-604

BLOCK 187
REGISTERED PLAN 58M-604
OWNER: THE CORPORATION OF THE CITY OF CAMBRIDGE

LOT 11, CONCESSION 1, B.L.B.

BRARDEAN RD

COMPASS TRAIL

POINTER ST

EQUESTRIAN WAY

MOHAWK RD

BEAUMONT RD

CHELSEA RD

MAPLE GROVE RD

SAUSBURY DR

WOODCOCK DR

CHAMBERLAIN CRES

BRANT CRES

QUEEN'S LN

SHIRLEY DR

KESTREL CRT

HANSFORD CRES

Richmond Hill

PIN 03756-0057(LT)
OWNER: HUNT CLUB VALLEY INC.

PIN 03756-0037(LT)
915 BRARDEAN RD
OWNER: SHUKLA, SURYA NARAYAN

PIN 03756-0004(LT)

PIN 03756-0075(LT)

... JACOBS, ALEXANDRA; RESZETNIK, CASIMIR; RESZETNIK, MARTIN - ESTATE; RESZETNIK, T


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| Project: 2171 | NAD83 - UTM Zone: 17 |
|---|---|
| Date: June 24, 2020 | Size: 24x36" |
| | 1:900 |

0 10 20 30 40 50 60
Meters

**Map 5E**

# Maple Grove Rd Class EA

## Tree Inventory

### Key Map




### Legend

- Subject Property
- Existing Conditions
- Servicing
- Fence
- Watercourse / Waters Edge
- Bottom of Slope
- Top of Sope
- Primary Road
- Secondary Road
- Inventoried Tree (Crown to Scale)
- ★ Bat Habitat Tree

**Priority for Retention**

- High Priority
- Medium Priority
- Low Priority

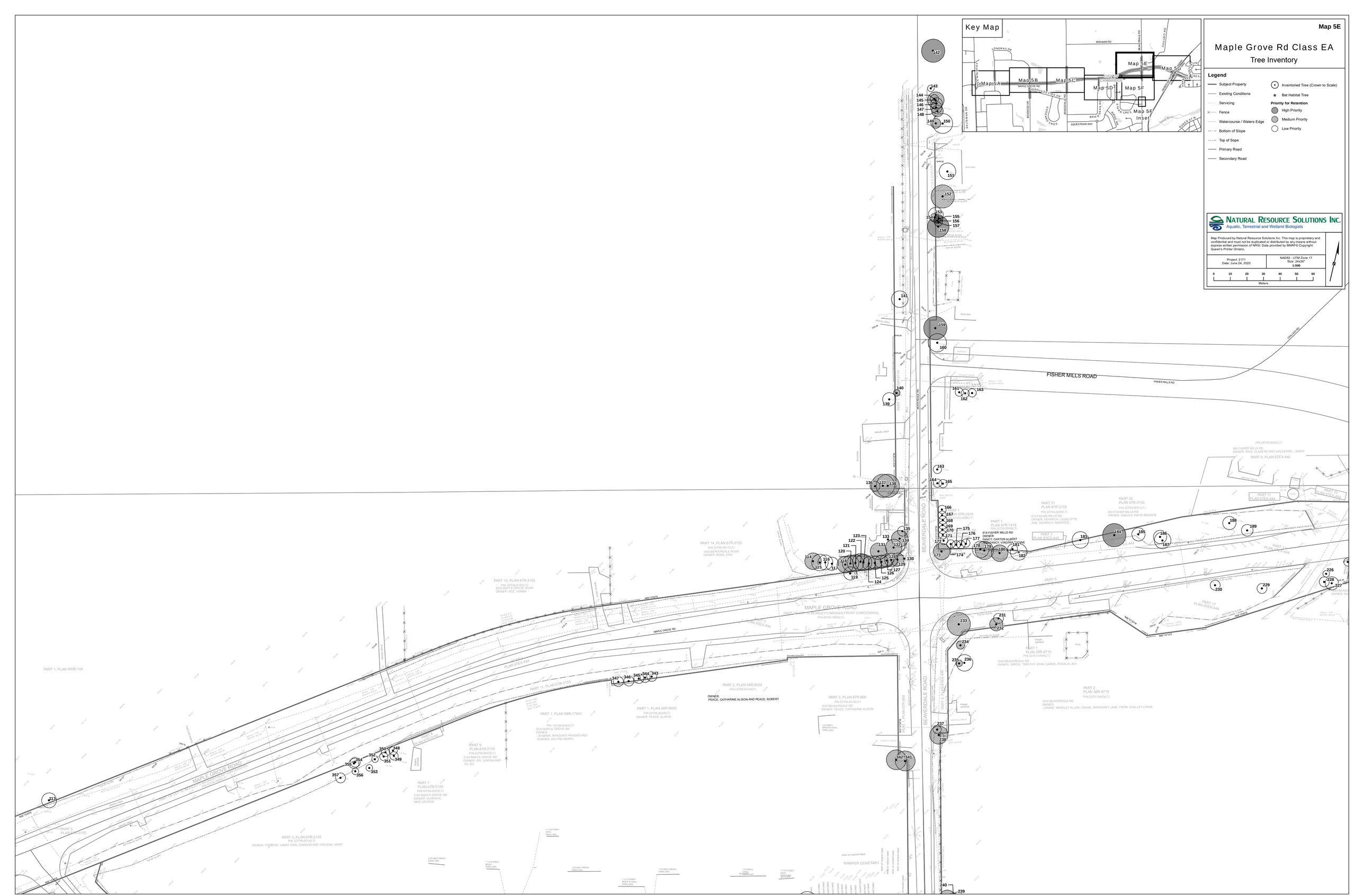
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Project: 2171
Date: June 24, 2020

NAD83 - UTM Zone: 17
Size: 24x36"
1:900

0 10 20 30 40 50 60
Meters


MAPLE GROVE ROAD
(PART OF LOT 1, BEASLEY'S BROKEN FRONT CONCESSION)
PIN 03755-0004(LT)
FISHER MILLS ROAD
BEAVERDALE ROAD
PART 13, PLAN 67R-3155
PIN 03756-0182(LT)
3030 MAPLE GROVE ROAD
OWNER: AZIZ, USMAN
PART 14, PLAN 67R-3155
PIN 03756-0070(LT)
1905 BEAVERDALE ROAD
OWNER: ROSA, ERIC
PART 11, PLAN 67R-3155
PART 1, PLAN 58R-17041
PIN 03756-0344(LT)
2220 MAPLE GROVE RD
OWNER:
:SHARMA, BHAGWATI PRASAD AND
SHARMA, KALPNA INDIRA
PART 2, PLAN 58R-9520
PIN 03756-0017(LT)
OWNER:
PEACE, CATHARINE ALISON AND PEACE, ROBERT
PART 1, PLAN 58R-9520
PIN 03756-0020(LT)
OWNER: PEACE, ALISON
PART 2, PLAN 67R-868
PIN 03756-0018(LT)
1823 BEAVERDALE RD
OWNER: PEACE, CATHARINE ALISON
PART 9
PLAN 67R-3155
PIN 03756-0022(LT)
2140 MAPLE GROVE RD
OWNER: WU, JUNYAN AND
XU, BO
PART 7
PLAN 67R-3155
PIN 03756-0023(LT)
2120 MAPLE GROVE RD
OWNER: ULIASOVIC,
MIKE GEORGE
PART 3, PLAN 67R-3155
PIN 03756-0015(LT)
OWNER: STEVENS, LARRY EARL GORDON AND STEVENS, MARY
PART 5
PLAN 67R-3155
PART 1, PLAN WDR-104
PART 1
PLAN 67R-1479
PIN 22739-0090(LT)
616 FISHER MILLS RD
OWNER:
FRANCY, CARTER ALBERT
AND MCVEY, VIRGINIA LOUISE
PART 21
PLAN 67R-3155
PIN 22739-0090(LT)
610 FISHER MILLS RD
OWNER: HEINRICH LIESELOTTE
AND HEINRICH, MANFRED
PART 22
PLAN 67R-3155
PIN 22739-0091(LT)
600 FISHER MILLS RD
OWNER: SABOLA, DAVID ANDREW
PART 1
PLAN 58R-8715
PIN 03757-0404(LT)
1840 BEAVERDALE RD
OWNER: GARDE, TIMOTHY JOHN; GARDE, ROSALIE JOY;
PART 2
PLAN 58R-8715
PIN 03757-0405(LT)
1820 BEAVERDALE RD
OWNER:
:CRANE, BRADLEY ALLEN; CRANE, MARGARET JANE; FROM, SHELLEY LYNNE;
PART 9, PLAN 67EX-444
PART 11
PLAN 67EX-444
PART 17
PLAN 67EX-444
PART 6
PLAN 67EX-444
PART 7
PLAN 67EX-444
PART 8
PLAN 67EX-444
WANNER CEMETERY
ROW OF HEADSTONES
1 STOREY BRICK & VINYL DWELLING
1 1/2 STOREY BRICK & VINYL DWELLING
2 STOREY BRICK DWELLING
1 STOREY BRICK DWELLING
1 STOREY BUNGALOW
1 1/2 STOREY BRICK DWELLING
1 STOREY BRICK DWELLING
1 1/2 STOREY BRICK & VINYL DWELLING
1 1/2 STOREY BRICK DWELLING
1 STOREY BRICK DWELLING
1 STOREY BRICK & VINYL DWELLING
1 STOREY BRICK DWELLING
1 1/2 STOREY BRICK DWELLING
1 STOREY BRICK DWELLING
1 STOREY BRICK DWELLING
1

PART 5, PLAN 67R-3155

PART 3, PLAN 67R-3155
PIN 03756-0015(LT)
OWNER: STEVENS, LARRY EARL GORDON AND STEVENS, MARY

PIN 03756-0195(LT)
THE CORPORATION OF THE COUNTY OF OXFORD

OLD MAPLE GROVE ROAD

MAPLE GROVE RD

WANNER CEMETERY

WANNER MENNONITE CHURCH

BEAVERDALE RD

RATCLIFFE DR.

RATCLIFF DRIVE

BURNHAM CRES

ACADEMY CRES

MOHAWK RD

CITY OF CAMBRIDGE

GONDRAU Dr

SALTERMAN DR

REQUA ALTURA DR

ROSEWOOD DR

BRESSENDALE DR

EQUESTRIAN WAY

BRANT RD

CHELSEA RD

Map 5A

Map 5B

Map 5C

Map 5D

Map 5E

Map 5F

Map 5G

Map 5F Inset

## Key Map

**Map 5F**

# Maple Grove Rd Class EA

## Tree Inventory

### Legend

- Subject Property
- Existing Conditions
- Servicing
- Fence
- Watercourse / Waters Edge
- Bottom of Slope
- Top of Sope
- Primary Road
- Secondary Road
- Inventoried Tree (Crown to Scale)
- Bat Habitat Tree

**Priority for Retention**

- High Priority
- Medium Priority
- Low Priority


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Project: 2171
Date: June 24, 2020

NAD83 - UTM Zone: 17
Size: 24x36"
1:900

0 10 20 30 40 50 60
Meters

See Inset for Extent
Continued South

Inset - Southern Extent

**Map 5G**

# Maple Grove Rd Class EA

## Tree Inventory

Key Map




**Legend**

- Subject Property
- Existing Conditions
- Servicing
- Fence
- Watercourse / Waters Edge
- Bottom of Slope
- Top of Sope
- Primary Road
- Secondary Road
- Inventoried Tree (Crown to Scale)
- ★ Bat Habitat Tree

**Priority for Retention**

- High Priority
- Medium Priority
- Low Priority


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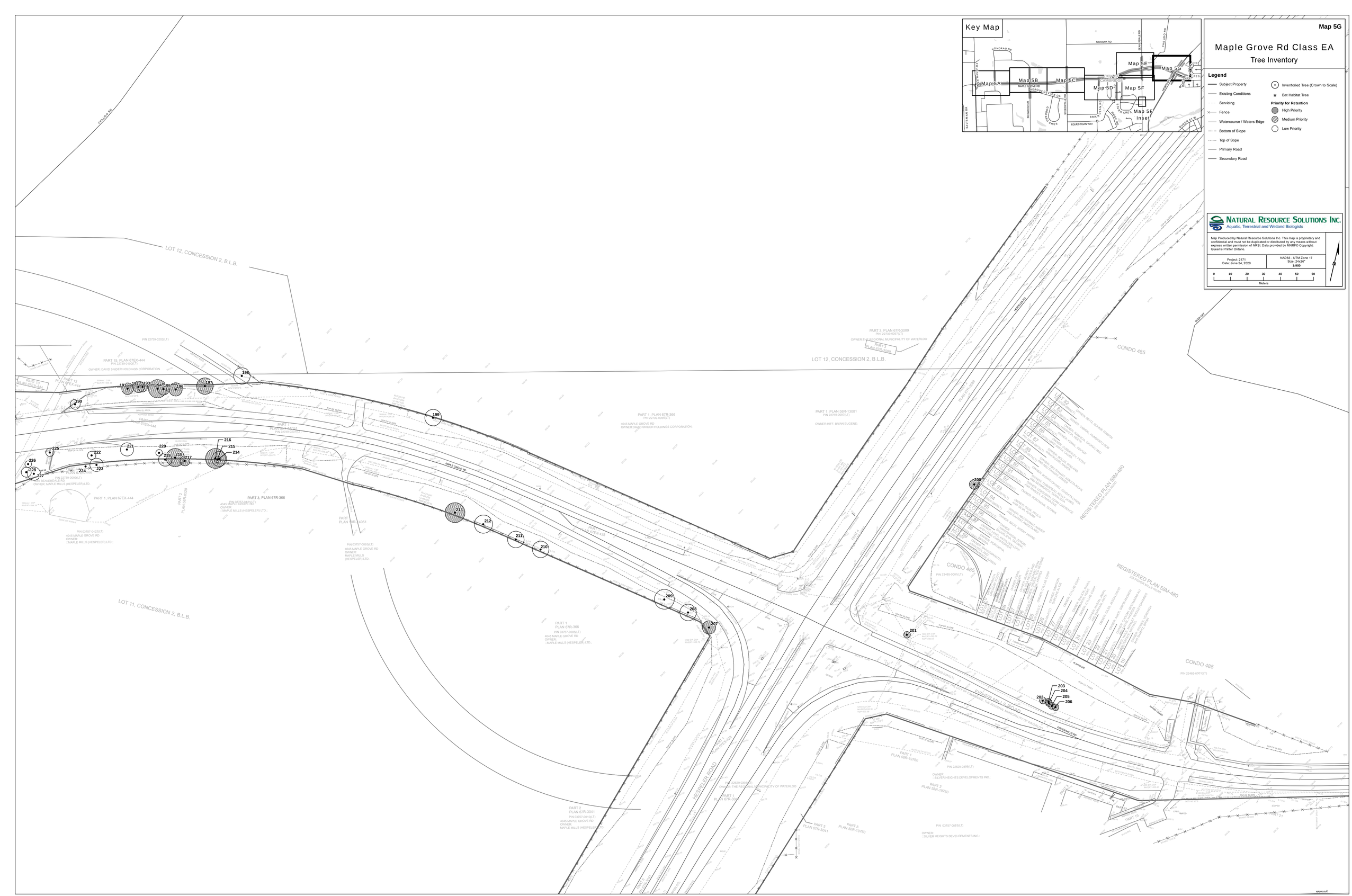


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Project: 2171
Date: June 24, 2020

NAD83 - UTM Zone: 17
Size: 24x36"
1:900

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Meters



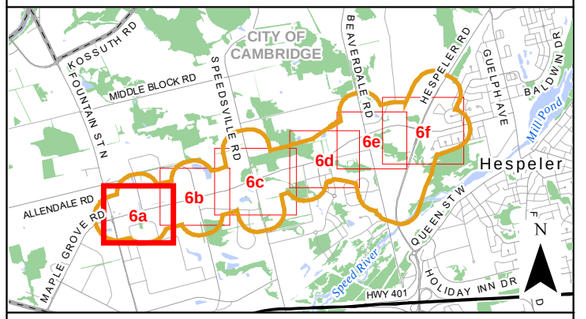



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**Map 6a**

# Maple Grove Rd Class EA

## Proposed Development Alternatives




### Legend

- Study Area
- Utility Line

**Ecological Land Classification CU Community Series**

- Cultural Vegetation Communities

**Regionally Significant Plant Observations**

- 12 Black Walnut *(Juglans nigra)**
- 13 Common Hackberry *(Celtis occidentalis)*

**Species at Risk Regulated Habitat**

Eastern Meadowlark

- Category 2

**Proposed Temporary Footprint**

- Grading Limit (Hybrid Alternative)
- Grading Limit (North Alternative)
- Grading Limit (South Alternative)
- Grading Limit (Center Line Alternative)

**Proposed Permanent Footprint**

- Road Alignment (Hybrid Alternative)
- Road Alignment (North Alternative)
- Road Alignment (South Alternative)
- Road Alignment (Center Line Alternative)

* *Roadside; not in natural habitat*


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Project: 2171
Date: March 17, 2021

NAD83 - UTM Zone 17
Size: 11x17"
**1:3,000**

0 50 100 150 200 Metres

N

551000 551200 551400 551600 551800

4808800 4808600 4808400 4808200

BOXWOOD DR

Middle Creek

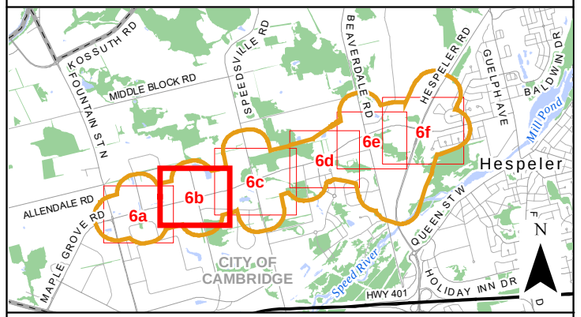
MAPLE GROVE RD

Heroux Devtek Dr

# Map 6b

# Maple Grove Rd Class EA

## Proposed Development Alternatives




### Legend

- Study Area
- Utility Line

**Watercouse (GRCA)**
- Natural

**Wetlands**
- Other Wetland

**Ecological Land Classification FO Community Series**
- Forest

**Ecological Land Classification CU Community Series**
- Cultural Vegetation Communities

**Species at Risk Regulated Habitat**

Blanding's Turtle
- Category 3

Eastern Meadowlark
- Category 2

**Proposed Temporary Footprint**
- Grading Limit (Hybrid Alternative)
- Grading Limit (North Alternative)
- Grading Limit (South Alternative)
- Grading Limit (Center Line Alternative)

**Proposed Permanent Footprint**
- Road Alignment (Hybrid Alternative)
- Road Alignment (North Alternative)
- Road Alignment (South Alternative)
- Road Alignment (Center Line Alternative)

* *Roadside; not in natural habitat*

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Project: 2171
Date: March 17, 2021

NAD83 - UTM Zone 17
Size: 11x17"
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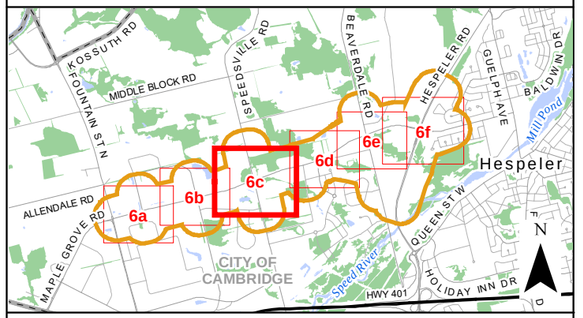
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Map 6c

# Maple Grove Rd Class EA

## Proposed Development Alternatives




### Legend

- Study Area
- Utility Line

**Watercouse (GRCA)**
- Natural
- Modified

**Wetlands**
- Provincially Significant Wetland (PSW)
- Other Wetland

**Ecological Land Classification FO Community Series**
- Forest

**Ecological Land Classification CU Community Series**
- Cultural Vegetation Communities

**Regionally Significant Plant Observations**
- 11 Wood's Sedge *(Carex woodii)*
- 12 Black Walnut *(Juglans nigra)**
- 15 White Spruce *(Picea glauca)**

**Species at Risk Regulated Habitat**
- Blanding's Turtle
  - Category 3

**Confirmed Significant Wildlife Habitat**
- Special Concern and Rare Wildlife Species (Eastern Wood-Pewee)

**Proposed Temporary Footprint**
- Grading Limit (Hybrid Alternative)
- Grading Limit (North Alternative)
- Grading Limit (South Alternative)
- Grading Limit (Center Line Alternative)

**Proposed Permanent Footprint**
- Road Alignment (Hybrid Alternative)
- Road Alignment (North Alternative)
- Road Alignment (South Alternative)
- Road Alignment (Center Line Alternative)

* *Roadside; not in natural habitat*

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Project: 2171
Date: March 17, 2021

NAD83 - UTM Zone 17
Size: 11x17"
**1:3,500**

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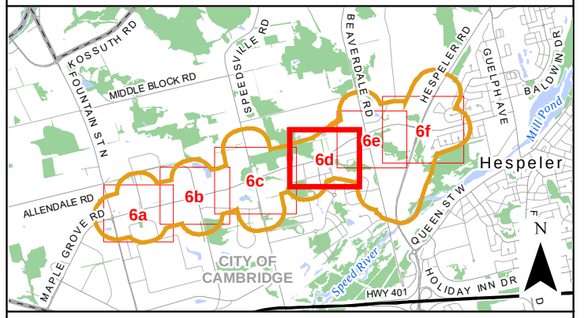



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**Map 6d**

# Maple Grove Rd Class EA

## Proposed Development Alternatives




### Legend

- Study Area

**Watercouse (GRCA)**
- Natural

**Wetlands**
- Provincially Significant Wetland (PSW)
- Other Wetland
- Wetland Boundary (Verified by GRCA on July 19, 2019)

**Ecological Land Classification FO Community Series**
- Forest

**Ecological Land Classification CU Community Series**
- Cultural Vegetation Communities

**Regionally Significant Plant Observations**
- 2 Bulbous Cress *(Cardamine bulbosa)*
- 7 Rough Sedge *(Carex scabrata)*
- 12 Black Walnut *(Juglans nigra)**

**Species at Risk Regulated Habitat**
- Butternut *(Juglans cinerea)*
- Blanding's Turtle
  - Category 3

**Confirmed Significant Wildlife Habitat**
- Special Concern and Rare Wildlife Species (Eastern Wood-Pewee)
- Amphibian Breeding (Wetland)
- Seeps and Springs

**Proposed Temporary Footprint**
- Grading Limit (Hybrid Alternative)
- Grading Limit (North Alternative)
- Grading Limit (South Alternative)
- Grading Limit (Center Line Alternative)

**Proposed Permanent Footprint**
- Road Alignment (Hybrid Alternative)
- Road Alignment (North Alternative)
- Road Alignment (South Alternative)
- Road Alignment (Center Line Alternative)

** Roadside; not in natural habitat*


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Project: 2171
Date: March 17, 2021

NAD83 - UTM Zone 17
Size: 11x17"
**1:3,000**

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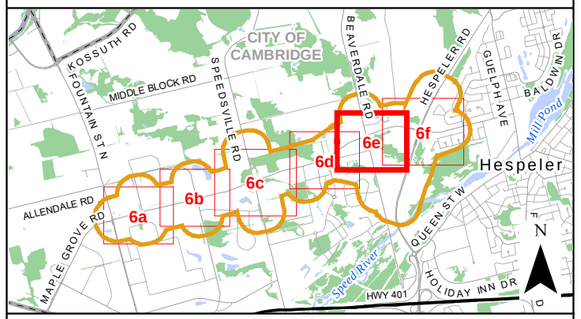
N




# Map 6e

## Maple Grove Rd Class EA

## Proposed Development Alternatives




### Legend

Study Area

**Watercouse (GRCA)**
- Natural

**Wetlands**
- Provincially Significant Wetland (PSW)
- Other Wetland

**Ecological Land Classification FO Community Series**
- Forest

**Ecological Land Classification CU Community Series**
- Cultural Vegetation Communities

**Regionally Significant Plant Observations**
- 1 American Prickly-ash *(Zanthoxylum americanum)*
- 3 Eastern Cottonwood *(Populus deltoides)*
- 5 Hackberry *(Celtis occidentalis)*
- 6 Large-leaved Pondweed *(Potamogeton amplifolius)*
- 7 Rough Sedge *(Carex scabrata)*
- 10 Virginia Stickseed *(Hackelia virginiana)*
- 12 Black Walnut *(Juglans nigra)**

**Species at Risk Regulated Habitat**
- Butternut *(Juglans cinerea)*

Blanding's Turtle
- Category 2
- Category 3

**Confirmed Significant Wildlife Habitat**
- Special Concern and Rare Wildlife Species (Eastern Wood-Pewee)
- Amphibian Breeding (Wetland)
- Seeps and Springs

**Proposed Temporary Footprint**
- Grading Limit (Hybrid Alternative)
- Grading Limit (North Alternative)
- Grading Limit (South Alternative)
- Grading Limit (Center Line Alternative)

**Proposed Permanent Footprint**
- Road Alignment (Hybrid Alternative)
- Road Alignment (North Alternative)
- Road Alignment (South Alternative)
- Road Alignment (Center Line Alternative)

* *Roadside; not in natural habitat*


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Project: 2171
Date: March 17, 2021

NAD83 - UTM Zone 17
Size: 11x17"
**1:3,000**

0 50 100 150 200 Metres

N

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554000 554200 554400 554600 554800 555000

4809600 4809400 4809200 4809000

CHILLIGO RD
DYER CRT
SACHA RD
NORA CRT
SCOTT RD
NICKOLAS CRES
MAPLE GROVE RD
HESPELER RD
FISHER MILLS RD
HAHN AVE
STROME AVE
PINO PL
VALERIE CRT
RUDI CRT
Ellis Creek

3 5 14 12 12 12 14 10 1 10 5 8

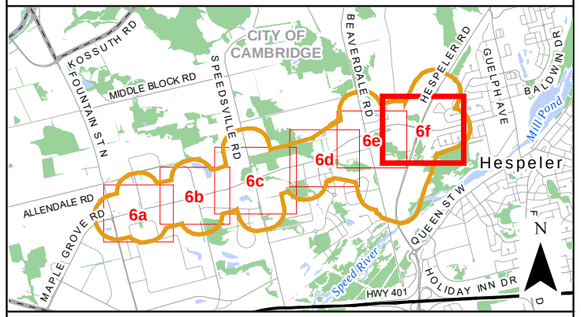
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# Map 6f

# Maple Grove Rd Class EA

## Proposed Development Alternatives




### Legend

- Study Area
- Utility Line

**Watercourse (GRCA)**
- Natural

**Wetlands**
- Provincially Significant Wetland (PSW)
- Other Wetland

**Ecological Land Classification FO Community Series**
- Forest

**Ecological Land Classification CU Community Series**
- Cultural Vegetation Communities

**Regionally Significant Plant Observations**
- 1 American Prickly-ash *(Zanthoxylum americanum)*
- 3 Eastern Cottonwood *(Populus deltoides)*
- 5 Hackberry *(Celtis occidentalis)*
- 8 Spreading Sedge *(Carex laxiculmis var. laxiculmis)*
- 10 Virginia Stickseed *(Hackelia virginiana)*
- 12 Black Walnut *(Juglans nigra)**
- 14 Eastern Cottonwood *(Populus deltoides)*

**Species at Risk Regulated Habitat**
Blanding's Turtle
- Category 2
- Category 3

**Confirmed Significant Wildlife Habitat**
- Special Concern and Rare Wildlife Species (Eastern Wood-Pewee)
- Seeps and Springs

**Proposed Temporary Footprint**
- Grading Limit (Hybrid Alternative)
- Grading Limit (North Alternative)
- Grading Limit (South Alternative)
- Grading Limit (Center Line Alternative)

**Proposed Permanent Footprint**
- Road Alignment (Hybrid Alternative)
- Road Alignment (North Alternative)
- Road Alignment (South Alternative)
- Road Alignment (Center Line Alternative)

* *Roadside; not in natural habitat*

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Project: 2171
Date: March 17, 2021

NAD83 - UTM Zone 17
Size: 11x17"
**1:3,500**

0 50 100 150 200 Metres

N

## Appendix I
## Species at Risk Screening Table

| Scientific Name | Common Name | S-RANK[1] | ESA/ COSSARO[2] | COSEWIC[3] | SARA[3] | Background Source | Habitat Preference[4,5,6,7] | Suitable Habitats within Study Area | Rationale | NRSI Observed |
|---|---|---|---|---|---|---|---|---|---|---|
| **Birds** | | | | | | | | | | |
| *Riparia riparia* | Bank Swallow | S4B | THR | T | | BSC et al. 2009, MNRF 2018a | Sand, clay or gravel river banks or steep riverbank cliffs; lakeshore bluffs of easily crumbled sand or gravel; gravel pits, road-cuts, grassland or cultivated fields that are close to water; nesting sites are limiting factor for species presence | Yes (foraging only) | Cultivated fields located close to ponds and streams are providing suitable foraging habitat. Breeding was not confirmed within the study area during breeding bird surveys. | Yes |
| *Tyto alba* | Barn Owl | S1 | END | E | Schedule 1 | BSC et al. 2009, MNRF 2018a | Open areas such as fields, agricultural lands with scattered woodlots, buildings and/or orchards; grasslands, sedge meadows, marshes; snow-cover limits ability to catch prey; species has intolerance to severe cold; nests in hollow trees and live trees >46 cm dbh; also nests in barns, abandoned buildings | Yes | Fields and agricultural lands with scattered woodlots are present throughout the study area where hollow trees and rural buildings may provide suitable nesting habitat. However, this species has not been documented recently within the area (eBird 2019). | No |
| *Hirundo rustica* | Barn Swallow | S4B | THR | T | | BSC et al. 2009, MNRF 2018a, MNRF 2018b, MNRF 2018c | Farmlands or rural areas; cliffs, caves, rock niches; buildings or other man-made structures for nesting; open country near body of water | Yes | Farmland and associated rural buildings may provide suitable nesting habitat within the study area. Breeding was not confirmed within the study area during breeding bird surveys. | Yes |
| *Dolichonyx oryzivorus* | Bobolink | S4B | THR | T | No Schedule | BSC et al. 2009, MNRF 2018a, MNRF 2018b, MNRF 2018c | Large, open expansive grasslands with dense ground cover; hayfields, meadows or fallow fields; marshes; requires tracts of grassland >50 ha | No | Tracts of grassland habitat within the study area are less than 50 ha in size. Breeding not confirmed within the study area during breeding bird surveys. | Yes |
| *Chaetura pelagica* | Chimney Swift | S4B, S4N | THR | T | Schedule 1 | BSC et al. 2009, MNRF 2018a, MNRF 2018b | Commonly found in urban areas near buildings; nests in hollow trees, crevices of rock cliffs, chimneys; highly gregarious; feeds over open water | Yes | Chimneys and hollow trees that may provide suitable nesting habitat may be present throughout the study area. | No |
| *Sturnella magna* | Eastern Meadowlark | S4B | THR | T | No Schedule | BSC et al. 2009, MNRF 2018a, MNRF 2018b | Open, grassy meadows, farmland, pastures, hayfields or grasslands with elevated singing perches; cultivated land and weedy areas with trees; old orchards with adjacent, open grassy areas >10 ha in size | Yes | Open, grassy meadows greater than 10 ha in size are present within the study area. Breeding habitat was confirmed within the study area during breeding bird surveys. | Yes |
| *Caprimulgus vociferus* | Eastern Whip-poor-will | S4B | THR | T | Schedule 1 | MNRF 2018a, MNRF 2018b | Dry, open, deciduous woodlands of small to medium trees; oak or beech with lots of clearings and shaded leaflitter; wooded edges, forest clearings with little herbaceous growth; pine plantations; associated with >100 ha forests; may require 500 to 1000 ha to maintain population | No | Forests within the study area are less than 100 ha in size. | No |

| Scientific Name | Common Name | S-RANK[1] | ESA/ COSSARO[2] | COSEWIC[3] | SARA[3] | Background Source | Habitat Preference[4,5,6,7] | Suitable Habitats within Study Area | Rationale | NRSI Observed |
|---|---|---|---|---|---|---|---|---|---|---|
| *Ixobrychus exilis* | Least Bittern | S4B | THR | T | Schedule 1 | MNRF 2018a, MNRF 2018b | Deep marshes, swamps, bogs; marshy borders of lakes, ponds, streams, ditches; dense emergent vegetation of cattail, bulrush, sedge; nests in cattails; intolerant of loss of habitat and human disturbance | Yes | Marshes, swamps, streams and ditches with dense emergent vegetation that may provide suitable nesting habitat are present within the study area. | No |
| *Parkesia motacilla* | Louisiana Waterthrush | S3B | THR | SC | Schedule 1 | MNRF 2018a, MNRF 2018b | Prefers wooded ravines with running streams; also woodlands swamps; large tracts of mature deciduous or mixed forests; canopy cover is essential; has strong affinity to nest sites; nests on ground | Yes | Woodland swamps, mature deciduous and mixed forests with running streams are present within the study area. | No |
| *Colinus virginianus* | Northern Bobwhite | S1 | END | E | Schedule 1 | MNRF 2018a, MNRF 2018b | Grassland, prairie or hay fields with woody cover in form of thickets, tangles of vines, shrubs; fence rows or woodland edges; cropland growing corn, soybeans or small grains and clover or grass; well-drained sandy or loamy soil; pond edges | Yes | Cropland is present within the study area. However, the most recent record of this species in the region is from 1975 (eBird 2019) | No |
| *Icteria virens* | Yellow-breasted Chat | S2B | END | E | Schedule 1 | MNRF 2018a, MNRF 2018b | Thickets, tall tangles of shrubbery beside streams, ponds; overgrown bushy clearings with deciduous thickets; nests above ground in bush, vines etc. | Yes | Shrubbery near streams and overgrown clearings that may provide suitable nesting habitat are present within the study area. | No |
| **Herpetofauna** | | | | | | | | | | |
| *Emydoidea blandingii* | Blanding's Turtle (Great Lakes/St Lawrence population) | S3 | THR | T | Schedule 1 | MNRF 2018b, Ontario Nature 2018 | Shallow water marshes, bogs, ponds or swamps, or coves in larger lakes with soft muddy bottoms and aquatic vegetation; basks on logs, stumps or banks; surrounding natural habitat is important in summer as they frequently move from aquatic habitat to terrestrial habitats; hibernates in bogs; not readily observed. | Yes | Shallow water marshes and ponds with aquatic vegetation as well as swamps are present within the study area. No targeted turtle surveys were completed. | No |
| *Ambystoma jeffersonianum* | Jefferson Salamander | S2 | END | E | Schedule 1 | Ontario Nature 2018 | Damp shady deciduous forest, swamps, moist pasture, lakeshores; temporary woodland pools for breeding; hides under leaf litter, stones or in decomposing logs | Yes | Damp deciduous forests and swamps are present throughout the study area. Note: study area is outside of the known range of the species in Ontario (Linton et al. 2018) | No |
| *Regina septemvittata* | Queensnake | S2 | END | E | Schedule 1 | MNRF 2018b, Ontario Nature 2018 | Margins of streams with slow currents and gravel bottoms; shorelines with rocks and debris; old quarries; canals; aquatic habitat with overhanging trees, particularly willows | No | Ellis Creek immediately downstream of Maple Grove Road presents gravel substrates and overhanging bank vegetation, however, study area is outside of known Grand River watershed distribution. | No |

| Scientific Name | Common Name | S-RANK[1] | ESA/ COSSARO[2] | COSEWIC[3] | SARA[3] | Background Source | Habitat Preference[4,5,6,7] | Suitable Habitats within Study Area | Rationale | NRSI Observed |
|---|---|---|---|---|---|---|---|---|---|---|
| **Mammals** | | | | | | | | | | |
| *Taxidea taxus jacksoni* | American Badger *(jacksoni subspecies)* | S2 | END | E | Schedule 1 | Dobbyn 1994 | Open grasslands and oak savannahs; dens in new hole or enlarged existing hole; sometimes makes food caches | Yes | Cultural meadow is present within the study area. | No |
| *Myotis leibii* | Eastern Small-footed Myotis | S2S3 | END | | | MNRF 2018b, Dobbyn 1994 | Hibernates in cool caves and abandoned mines; roosts in rocky habitats including talus slopes and open rock barrens. May also roost in man-made structures, however, very rarely; foraging habitat poorly understood in Ontario. Within the United States of America, it feeds primarily in forests, but also over waterbodies, within riparian forests, and occasionally open fields. | Yes (foraging only) | Forested habitats are present throughout the study area that may provide foraging habitat. Some rural structures are also present that may provide roosting habitat. No targeted bat surveys were conducted. | No |
| *Myotis lucifungus* | Little Brown Myotis | S5 | END | E | Schedule 1 | MNRF 2018b, Dobbyn 1994 | Uses caves, quarries, tunnels, hollow trees or buildings for roosting; winters in humid caves; maternity sites in dark warm areas such as attics and barns; feeds primarily in wetlands, forest edges | Yes | Forested habitats are present throughout the study area that may provide foraging habitat. Some rural structures are also present that may provide roosting habitat. No targeted bat surveys were conducted. | No |
| *Myotis septentrionalis* | Northern Myotis | S3 | END | E | Schedule 1 | MNRF 2018b, Dobbyn 1994 | Hibernates during winter in mines or caves; during summer males roost alone and females form maternity colonies of up to 60 adults; roosts in houses, man-made structures but prefers hollow trees or under loose bark; hunts within forest, below canopy | Yes | Forested habitats are present throughout the study area that may provide foraging habitat. Some rural structures are also present that may provide roosting habitat. No targeted bat surveys were conducted. | No |
| *Perimyotis subflavus* | Tri-colored Bat | S3? | END | E | Schedule 1 | MNRF 2018b, Dobbyn 1994 | Variety of forested habitats. Older forests and occasionally in barns or other structures may be used for roosts. They forage over water and along streams in the forest. | Yes | Forested habitats are present throughout the study area that may provide foraging habitat. Some rural structures are also present that may provide roosting habitat. No targeted bat surveys were conducted. | No |
| **Fishes and Mussels** | | | | | | | | | | |
| *Moxostoma duquesnei* | Black Redhorse | S2 | THR | T | No Schedule | MNRF 2018b | Lives in pools and riffle areas of medium-sized rivers and streams that are usually less than two metres deep. These rivers usually have few aquatic plants, a moderate to fast current, and a sandy or gravel bottom. In the spring, it migrates to breeding habitat where eggs are laid on gravel in fast water. The winter is spent in deeper pools. Adults feed on crustaceans and aquatic insects, while the young fish feed on plankton. | No | Black Redhorse is not known from the area. Ellis Creek, downstream of the existing flood control dams, has insufficient water depth for suitable habitat. | No |

| Scientific Name | Common Name | S-RANK[1] | ESA/ COSSARO[2] | COSEWIC[3] | SARA[3] | Background Source | Habitat Preference[4,5,6,7] | Suitable Habitats within Study Area | Rationale | NRSI Observed |
|---|---|---|---|---|---|---|---|---|---|---|
| **Molluscs** | | | | | | | | | | |
| *Lampsilis fasciola* | Wavy-rayed Lampmussel | S1 | THR | SC | Schedule 1 | MNRF 2018b | Found in small to medium rivers with clear water. It lives in shallow riffle areas with clean gravel or sand bottoms. Like all mussels, this species filters water to find food, such as bacteria and algae. Mussel larvae are parasitic and must attach to a fish host, where they consume nutrients from the fish body until they transform into juvenile mussels and drop off. The Wavy-rayed lampmussel's fish hosts are the Largemouth bass and Smallmouth bass. | No | There is potentially suitable habitat within Ellis Creek, however Wavy-rayed Lampmussel has never been recorded from the Speed River Watershed. No mussel shells were observed within the habitat reaches assessed. | No |
| **Vascular Plants** | | | | | | | | | | |
| *Castanea dentata* | American Chestnut | S2 | END | E | Schedule 1 | Oldham & Brinker 2009 | Moist to well drained forests on sand, occasionally heavy soils. | Yes | Forested areas are present within the study area. | No |
| *Frasera caroliniensis* | American Columbo | S2 | END | E | Schedule 1 | Oldham & Brinker 2009 | Woodlands on sandy and clay soils. | Yes | Woodlands are present within the study area. | No |
| *Panax quinquefolius* | American Ginseng | S3 | END | E | Schedule 1 | MNRF 2018a, MNRF 2018b, Oldham & Brinker 2009 | Deep leaf litter in rich, moist deciduous woods, especially on rocky, shaded cool slopes in sweet soil | Yes | Moist deciduous forest is present within study area. | No |
| *Juglans cinerea* | Butternut | S3? | END | E | Schedule 1 | MNRF 2018a, MNRF 2018b, Oldham & Brinker 2009 | Stream banks, swamps, and upland beech-maple, oak-hickory, and mixed hardwood stands. | Yes | Stream banks, swamps and hardwood forests are present within study area. Several individual trees were observed by NRSI in 2019. | Yes |
| *Carex lupuliformis* | Hop-like Sedge | S1 | END | E | Schedule 1 | Oldham & Brinker 2009 | Riverine swamps and marshes, and around temporary forest ponds. It prefers open areas and areas under forest canopy openings, with lots of sunlight. | Yes | Forested areas, swamps and marshes are present within the study area. | No |

[1]MNRF 2018f, [2]MNRF 2018e, [3]Government of Canada 2019, [4]Oldham and Brinker 2009, [5]MNRF 2000, [6]Michigan Flora Online 2011, [7]Riley 1989

## Appendix II
## Species of Conservation Concern Screening Table

| Scientific Name | Common Name | S-RANK[1] | ESA/ COSSARO[2] | COSEWIC[3] | SARA[3] | Background Source | Habitat Preference[4,5,6,7] | Suitable Habitats within Study Area | Rationale | NRSI Observed |
|---|---|---|---|---|---|---|---|---|---|---|
| **Birds** | | | | | | | | | | |
| *Haliaeetus leucocephalus* | Bald Eagle | S2N, S4B | SC | NAR | | MNRF 2018a, MNRF 2018b | Require large continuous area of deciduous or mixed woods around large lakes, rivers; require area of 255 ha for nesting, shelter, feeding, roosting; prefer open woods with 30 to 50% canopy cover; nest in tall trees 50 to 200 m from shore; require tall, dead, partially dead trees within 400 m of nest for perching; sensitive to toxic chemicals | Yes | Study area contains patches of deciduous and mixed woods that are less than 255 ha in size. No large lakes are present. However, there is candidate nesting and perching habitat within the study area along the Speed River and its associated riparian corridor. | No |
| *Chlidonias niger* | Black Tern | S3B | SC | NAR | | MNRF 2018a, MNRF 2018b | Wetlands, coastal or inland marshes; large cattail marshes, marshy edges of rivers, lakes or ponds, wet open fens, wet meadows; returns to same area to nest each year in loose colonies; must have shallow (0.5 to 1 m deep) water and areas of open water near nests; requires marshes >20 ha in size; feeds over adjacent grasslands for insects; also feeds on fish, crayfish and frogs | No | Marshes within the study area are less than 20 ha in size. | No |
| *Cardellina canadensis* | Canada Warbler | S4B | SC | T | Schedule 1 | BSC et al. 2009, MNRF 2018a, MNRF 2018b | Interior forest habitats with a dense, well-developed shrub and vegetation understory; along riparian zones or wet bottomland habitat; require tracts of land which are >30ha | Yes | Several forested habitats that may provide suitable habitat are present within the study area . | No |
| *Chordeiles minor* | Common Nighthawk | S4B | SC | T | Schedule 1 | BSC et al. 2009, MNRF 2018a, MNRF 2018b | Open ground; clearings in dense forests; ploughed fields; gravel beaches or barren areas with rocky soils; open woodlands; flat gravel roofs | Yes | No natural habitats occur, however ploughed fields and flat roofs within the study area may provide suitable nesting habitat. | No |
| *Contopus virens* | Eastern Wood-Pewee | S4B | SC | SC | | BSC et al. 2009, MNRF 2018a | Open, deciduous, mixed or coniferous forest; predominated by oak with little understory; forest clearings, edges; farm woodlots, parks | Yes | Deciduous, mixed and coniferous forests are present throughout the study area. Breeding was confirmed within the study area during breeding bird surveys. | Yes |
| *Vermivora chrysoptera* | Golden-winged Warbler | S3B | SC | T | Schedule 1 | BSC et al. 2009, MNRF 2018a, MNRF 2018b | Early successional habitat; shrubby, grassy abandoned fields with small deciduous trees bordered by low woodland and wooded swamps; alder bogs; deciduous, damp woods; shrubbery clearings in deciduous woods with saplings and grasses; brier-woodland edges; requires >10 ha | Yes | Early successional habitat and deciduous woods greater than 10 ha in size are present within the study area. | No |
| *Melanerpes erythrocephalus* | Red-headed Woodpecker | S4B | SC | T | Schedule 1 | MNRF 2018a, MNRF 2018b | Open, deciduous forest with little understory; fields or pasture lands with scattered large trees; wooded swamps; orchards, small woodlots or forest edges; groves of dead or dying trees; feeds on insects and stores nuts or acorns for winter; loss of habitat is limiting factor; requires cavity trees with at least 40 cm dbh; require about 4 ha for a territory | Yes | Wooded swamps, small woodlots and forest edges that may contain cavity trees are present within the study area. | No |
| *Hylocichla mustelina* | Wood Thrush | S4B | SC | T | | BSC et al. 2009, MNRF 2018a, MNRF 2018b | Carolinian and Great Lakes-St. Lawrence forest zones; undisturbed moist mature deciduous or mixed forest with deciduous sapling growth; near pond or swamp; hardwood forest edges; must have some trees higher than 12 m | Yes | Moist deciduous forest is present within the study area. Breeding was not confirmed within the study area during breeding bird surveys. | Yes |

| Scientific Name | Common Name | S-RANK[1] | ESA/ COSSARO[2] | COSEWIC[3] | SARA[3] | Background Source | Habitat Preference[4,5,6,7] | Suitable Habitats within Study Area | Rationale | NRSI Observed |
|---|---|---|---|---|---|---|---|---|---|---|
| **Herpetofauna** | | | | | | | | | | |
| *Chelydra serpentina serpentina* | Common Snapping Turtle | S2B | SC | SC | Schedule 1 | MNRF 2018b, MNRF 2018c, Ontario Nature 2018 | Permanent or semi-permanent fresh water; marshes, swamps or bogs; rivers and streams with soft muddybanks or bottoms. The species often uses soft soil or clean dry sand on south-facing slopes for nest sites and may nest at some distance from water. | Yes | Marshes, swamps and streams are present within the study area. | No |
| *Thamnophis sauritus septentrionalis* | Eastern Ribbonsnake | S3 | SC | SC | Schedule 1 | MNRF 2018b, Ontario Nature 2018 | Sunny grassy areas with low dense vegetation near bodies of shallow permanent quiet water; wet meadows grassy marshes or sphagnum bogs; borders of ponds, lakes or streams; hibernates in groups | Yes | Grassy areas with dense vegetation cover near ponds, as well as streams, are present within the study area. | No |
| Ambystoma sp. | Jefferson/Blue-spotted Salamander Complex | S2 | | | | MNRF 2018b, Ontario Nature 2018 | Damp shady deciduous forest, swamps, moist pasture, lakeshores; temporary woodland pools for breeding; hides under leaf litter, stones or in decomposing logs | Yes | Damp deciduous forests and swamps are present throughout the study area. Note: study area is outside of the known range of the species in Ontario (Linton et al. 2018). | No |
| *Graptemys geographica* | Northern Map Turtle | S3B | SC | SC | Schedule 1 | MNRF 2018b | Large bodies of water with soft bottoms, and aquatic vegetation; basks on logs or rocks or on beaches and grassy edges, will bask in groups; uses soft soil or clean dry sand for nest sites; may nest at some distance from water. | No | No large bodies of water are present within the study area. | No |
| *Pseudacris triseriata* pop. 2 | Western Chorus Frog *(Great Lakes/St. Lawrence - Canadian Shield Population)* | S3 | NAR | T | Schedule 1 | Ontario Nature 2018 | Roadside ditches or temporary ponds in fields; swamps or wet meadows; woodland or open country with cover and moisture; small ponds and temporary pools ponds and temporary pools | Yes | Roadside ditches, swamps, wet meadows and small ponds are all present within the study area. | No |
| **Mammals** | | | | | | | | | | |
| *Microtus pinetorum* | Woodland Vole | | SC | SC | Schedule 1 | Dobbyn 1994 | Mature deciduous forest in the Carolinian forest zone, with loose sandy soil and deep humus; grasslands, meadows and orchards with groundcover of duff or grass | No | Study area is not within the Carolinian forest zone. | No |
| **Insects** | | | | | | | | | | |
| *Danaus plexippus* | Monarch | S2N, S4B | SC | SC | Schedule 1 | MNRF 2018b, Macnaughton et al. 2018 | Exist primarily wherever milkweed and wildflowers exist; abandoned farmland, along roadsides, and other open spaces | Yes | Common milkweed was observed in cultural meadows during vegetation inventories. | Yes |
| *Euphyes conspicua* | Black Dash | S3 | | | | Macnaughton et al. 2018 | Wet sedge meadows; also, open shrubby or partially-wooded wetlands with red maple | Yes | Wetlands are present withn the study area. | No |
| *Asterocampa clyton* | Tawny Emperor | S2S3 | | | | Macnaughton et al. 2018 | Mesic hardwood or hardwood-northern conifer-mixed forests on rich soils, including hardwood swamps. An important feature is plentiful suppply of the foodplants, generally toothworts | No | Toothworts were not observed during vegetation inventories. | No |
| *Lestes eurinus* | Amber-winged Spreadwing | S3 | | | | MNRF 2018d | Ponds (often temporary ones), bogs, lakes without fish. | Yes | Ponds are present within the study area. | No |
| *Enallagma anna* | River Bluet | S2 | | | | MNRF 2018d | Wetlands (inland), Artificial/Aquatic & Marine | Yes | Wetlands are present withn the study area. | No |
| *Epiaeschna heros* | Swamp Darner | S2S3 | | | | MNRF 2018d | Heavily wooded ponds, streams and ox-bows including ephemeral pools and ponds | Yes | Wooded streams are present within the study area. | No |
| *Rhionaeschna mutata* | Spatterdock Darner | S1 | | | | MNRF 2018d | Wetlands (inland), Forest | Yes | Wetlands are present withn the study area. | No |
| *Arigomphus furcifer* | Lilypad Clubtail | S3 | | | | MNRF 2018d | Lakes, ponds (including bog ponds), and slow streams, usually with much aquatic vegetation and commonly with water lilies (Nymphaea and Nuphar). Larvae burrow in mud. | Yes | Ponds are present within the study area. | No |
| *Arigomphus villosipes* | Unicorn Clubtail | S2S3 | | | | MNRF 2018d | Ponds, lakes, and slow streams with muddy bottoms and little submerged vegetation. | Yes | Ponds are present within the study area. | No |
| *Phanogomphus descriptus* | Harpoon Clubtail | S3 | | | | MNRF 2018d | Clear, small to medium-sized sandy streams and rivers with good current. Larvae burrow in bottom substrates. | Yes | Sandy streams are present within the study area. | No |
| *Phanogomphus graslinellus* | Pronghorn Clubtail | S3 | | | | MNRF 2018d | Lakes, ponds and large or small slow streams. | Yes | Ponds are present within the study area. | No |

| Scientific Name | Common Name | S-RANK[1] | ESA/ COSSARO[2] | COSEWIC[3] | SARA[3] | Background Source | Habitat Preference[4,5,6,7] | Suitable Habitats within Study Area | Rationale | NRSI Observed |
|---|---|---|---|---|---|---|---|---|---|---|
| *Somatochlora incurvata* | Incurvate Emerald | S1 | | | | MNRF 2018d | Swamps | Yes | Swamps are present within the study area. | No |
| *Pieris virginiensis* | West Virginia White | S3 | SC | SC | | MNRF 2018b | Mesic hardwood or hardwood-northern conifer-mixed forests on rich soils, including hardwood swamps. An important feature is plentiful supply of the foodplants, generally toothworts | Yes | Hardwood swamps are present within the study area but the foodplant of this species was not observed during vascular flora inventories. | No |
| **Fishes** | | | | | | | | | | |
| *Notropis photogenis* | Silver Shiner | S2S3 | SC | SC | Schedule 3 | MNRF 2018b | Silver shiners prefer moderate to large size streams with swift currents that are free of weeds and have clean gravel or boulder bottoms. | No | No suitable habitat present within the study area. This species is only known from the confluence of the Speed and Grand Rivers. | No |
| **Molluscs** | | | | | | | | | | |
| *Villosa iris* | Rainbow | S2S3 | SC | E | Schedule 1 | MNRF 2018b | Most abundant in shallow, well oxygenated reaches of small- to medium-sized rivers and sometimes lakes, on substrates of cobble, gravel, sand and occasionally mud. | Yes | There is potentially suitable habitat within Ellis Creek, however Rainbow has never been recorded from the Speed River Watershed. No mussel shells were observed within the habitat reaches assessed. | No |
| **Vascular Plants** | | | | | | | | | | |
| *Lithospermum latifolium* | American Gromwell | S3 | | | | Oldham & Brinker 2009 | Floodplain woods. | Yes | Floodplain forests are present within the study area. | No |
| *Eleocharis rostellata* | Beaked Spike-rush | S3 | | | | Oldham & Brinker 2009 | Fens and calcareous shores and meadows. | Yes | Meadows are present within the study area. | No |
| *Fraxinus nigra* | Black Ash | S5 | | T | | NRSI 2019 | Commonly found in swampy woodlands | Yes | Swamps are present within the study area. | Yes |
| *Cimicifuga racemosa* | Black Cohosh | S2 | | | | Oldham & Brinker 2009 | Rich woods and slopes in the Carolinian Zone. | No | Study area is not within the Carolinian forest zone. | No |
| *Polygala sanguinea* | Blood-red Milkwort | S3 | | | | Oldham & Brinker 2009 | Damp open meadows and fields, prairies. | Yes | Damp meadows and fields are present within the study area. | No |
| *Botrychium oneidense* | Blunt-lobed Grape Fern | S3? | | | | Oldham & Brinker 2009 | Rich moist woods. | Yes | Moist deciduous forest is present within the study area. | No |
| *Polystichum braunii* | Braun's Holly Fern | S3 | | | | Oldham & Brinker 2009 | Primarily in deciduous or mixed rocky woods near Lake Superior, but also at a few isolated southern Ontario sites. | Yes | Deciduous forest present within the study area. | No |
| *Phegopteris hexagonoptera* | Broadbeech Fern | S3 | SC | SC | Schedule 3 | Oldham & Brinker 2009 | Rich deciduous woods in southern Ontario. | Yes | Moist deciduous forests are present within the study area. | No |
| *Euonymus atropurpurea var. atropurpurea* | Burning Bush | S3 | | | | Oldham & Brinker 2009 | Moist to mesic woodlands, shaded to partially shaded riverbanks, woodland borders, wooded slopes, small openings in wooded areas, and thickets. This species is typically found in Maple-Basswood, Maple-Beech, and similar deciduous woodlands. | Yes | Moist deciduous forests with Maple species are present within the study area. | No |
| *Carex careyana* | Carey's Sedge | S2 | | | | Oldham & Brinker 2009 | Moist lower portions of rich forested north-facing slopes and moist forested bottomlands along small streams. | Yes | Moist forested bottomlands are present along the several water courses within the study area. | No |
| *Vicia caroliniana* | Carolina Vetch | S2 | | | | Oldham & Brinker 2009 | Dry oak woods, thickets, prairies. | No | Dry oak woods or prairies are present within the study area. | No |

| Scientific Name | Common Name | S-RANK[1] | ESA/ COSSARO[2] | COSEWIC[3] | SARA[3] | Background Source | Habitat Preference[4,5,6,7] | Suitable Habitats within Study Area | Rationale | NRSI Observed |
|---|---|---|---|---|---|---|---|---|---|---|
| *Conioselinum chinense* | Chinese Hemlock-parsley | S2 | | | | Oldham & Brinker 2009 | Calcareous seepages, river margins, and White Cedar swamps. | Yes | River margins and White Cedar swamps are present within the study area. | No |
| *Liatris cylindracea* | Cylindric Blazing Star | S3 | | | | Oldham & Brinker 2009 | Alvars, moist sandy meadows. | No | No alvars are present within the study area | No |
| *Aureolaria virginica* | Downy Yellow False Foxglove | S1 | | END | | Oldham & Brinker 2009 | Dry open woods with oak, jack pine and aspen often present, forest borders and clearings | No | Dry woods with the listed species are not present within the study area. | No |
| *Quercus prinoides* | Dwarf Chinquapin Oak | S2 | | | | Oldham & Brinker 2009 | Dry, open sandy woods and open areas. | No | Very sandy soils are not present within the study area. | No |
| *Vulpia octoflora* | Eight-flowered Fescue | S2 | | | | Oldham & Brinker 2009 | Sandy or rocky woods and open areas. | No | Very sandy soil is not present within the study area. | No |
| *Digitaria cognata* | Fall Witch Grass | S1 | | | | Oldham & Brinker 2009 | Apparently native in dry sandy open ground in southwestern Ontario, but also adventive along roadsides and railways. | Yes | Dry ground and roadsides are present within the study area. | No |
| *Aureolaria pedicularia* | Fern-leaved False Foxglove | S2? | | T | | Oldham & Brinker 2009 | Dry open woods and savannas. | No | Savanna habitat is not present within the study area. | No |
| *Cuscuta campestris* | Field Dodder | S2 | | | | Oldham & Brinker 2009 | Banks of rivers, fields, croplands, neglected flower gardens, and waste areas | Yes | Riverbanks, fields and croplands area present within the study area. | No |
| *Cirsium discolor* | Field Thistle | S3 | | | | Oldham & Brinker 2009 | Moist to dry prairies, openings in woodland areas, moist meadows near rivers, limestone glades, pastures and abandoned fields, open areas along railroads and roadsides, and waste areas. | Yes | Open areas along roadsides, woodland openings and moist meadows are present within the study area. | No |
| *Oenothera pilosella ssp. pilosella* | Finely-pilose Evening-primrose | S2 | | | | Oldham & Brinker 2009 | Woodland edges; open disturbed ground. | Yes | Woodland edges and disturbed areas are present within the study area. | No |
| *Hypericum ascyron* | Great St. John's-wort | S3? | | | | Oldham & Brinker 2009 | Variable habitat preferences including woodland openings, wooded slopes, banks of rivers and streams, moist thickets and meadows, river-bottom prairies, and fens. | Yes | Woodland openings, river banks, thickets and meadows are present within the study area. | No |
| *Arisaema dracontium* | Green Dragon | S3 | SC | SC | Schedule 3 | Oldham & Brinker 2009 | Rich floodplain woods in the Carolinian Zone. | No | Study area is not within the Carolinian forest zone. | No |
| *Hybanthus concolor* | Green Violet | S2 | | | | Oldham & Brinker 2009 | Rich moist floodplain woods. | Yes | Floodplain forests are present within the study area. | No |
| *Hieracium gronovii* | Gronovius' Hawkweed | S3? | | | | Oldham & Brinker 2009 | Wooded dunes, prairies, dry sandy woods. | No | Dunes or prairies not present within study area. | No |
| *Carex trichocarpa* | Hairy-fruited Sedge | S3 | | | | Oldham & Brinker 2009 | Floodplains and riverbanks where it can form extensive colonies. | Yes | Floodplains and riverbanks are present within the study area. | No |
| *Erigenia bulbosa* | Harbinger-of-spring | S3? | | | | Oldham & Brinker 2009 | Rich mesic woodlands with deciduous trees, wooded areas at the base of bluffs, rocky bluffs, wooded bottomland of rocky canyons, gentle wooded slopes along rivers, and areas along woodland paths. | Yes | Moist deciduous forest is present within the study area. | No |
| *Crataegus dissona* | Hawthorn | S3 | | | | Oldham & Brinker 2009 | Predominantly in the Niagara Peninsula. Anthropogenic (man-made or disturbed habitats), forest edges, forests, meadows and fields. | Yes | Disturbed habitats, forest edges, forests, meadows and fields are present thoughout the study area. | No |
| *Ranunculus hispidus var. hispidus* | Hispid Buttercup | S3 | | | | Oldham & Brinker 2009 | Dry, open deciduous woods. | Yes | Dry deciduous woods are present within the study area. | No |
| *Lithospermum canescens* | Hoary Puccoon | S3 | | | | Oldham & Brinker 2009 | Dry prairies and open woods, often on sandy soil. | No | Prairies are not present within the study area. | No |

| Scientific Name | Common Name | S-RANK[1] | ESA/ COSSARO[2] | COSEWIC[3] | SARA[3] | Background Source | Habitat Preference[4,5,6,7] | Suitable Habitats within Study Area | Rationale | NRSI Observed |
|---|---|---|---|---|---|---|---|---|---|---|
| *Saururus cernuus* | Lizard's-tail | S3 | | | | Oldham & Brinker 2009 | Edges of streams and rivers; low wet woods. | Yes | Stream banks within wooded areas are present within the study area. | No |
| *Helianthemum canadense* | Long-branched Frostweed | S3 | | | | Oldham & Brinker 2009 | Dry open or partly open, often sandy ground. | No | Sandy soils or prairies not present within study area. | No |
| *Sanicula canadensis var. grandis* | Long-styled Canada Snakeroot | S2 | | | | Oldham & Brinker 2009 | Deciduous forests and thickets. | Yes | Deciduous forest is present within the study area. | No |
| *Scleria verticillata* | Low Nut-rush | S3 | | | | Oldham & Brinker 2009 | Wet meadows and fens usually on or near the Great Lakes shoreline. | No | Great Lakes Shoreline is not within study area. | No |
| *Phlox subulata ssp. subulata* | Moss Phlox | S1? | | | | Oldham & Brinker 2009 | Dry, sandy, open woods and open ground. Frequently cultivated in gardens and cemeteries. | No | Very sandy soil is not present within the study area. | No |
| *Mimulus moschatus* | Musk-flower | S2? | | | | Oldham & Brinker 2009 | Anthropogenic (man-made or disturbed habitats), floodplain (river or stream floodplains), shores of rivers or lakes, wetland margins (edges of wetlands) | Yes | Disturbed habitats, floodplains and wetlands are present thoughout the study area. | No |
| *Astragalus neglectus* | Neglected Milkvetch | S3 | | | | Oldham & Brinker 2009 | Sunny areas with moist to dry calcareous soil; river banks, shores, thickets, and rocky clearings. | Yes | River banks and thicket habitats are present within the study area. | No |
| *Quercus ellipsoidalis* | Northern Pin Oak | S3 | | | | Oldham & Brinker 2009 | Dry, sandy or rocky woods, roadsides, fencerows. | No | Very sandy or rocky soils are not present within the study area. | No |
| *Aesculus glabra var. glabra* | Ohio Buckeye | S1 | | | | Oldham & Brinker 2009 | Moist to mesic deciduous woodlands, wooded valleys along rivers, and rocky wooded slopes in sheltered areas. Ohio Buckeye is sometimes cultivated as a landscape tree. | Yes | Moist deciduous forest is present within the study area. | No |
| *Monarda didyma* | Oswego-tea | S3 | | | | Oldham & Brinker 2009 | Moist open woodlands, woodland borders, thickets, meadows in floodplain areas, and waste areas. | Yes | Moist woodlands, thickets and meadows are present within the study area. | No |
| *Asimina triloba* | Paw Paw | S3 | | | | Oldham & Brinker 2009 | Moist to mesic deciduous woodlands and small woodland openings. | Yes | Moist deciduous forest is present within the study area. | No |
| *Carya glabra* | Pignut Hickory | S3 | | | | Oldham & Brinker 2009 | Upland hardwood forests. | Yes | Upland hardwood forests are present within the study area. | No |
| *Ceratophyllum echinatum* | Prickly Coontail | S3? | | | | Oldham & Brinker 2009 | Widespread in southern and central Ontario usually in acidic and nutrient poor sites. | Yes | There may be nutrient poor sites within the study area. | No |
| *Aplectrum hyemale* | Putty-root | S2 | | | | Oldham & Brinker 2009 | Rich, moist deciduous woods. | Yes | Moist deciduous forest is present within the study area. | No |
| *Cypripedium arietinum* | Ram's-head Lady's Slipper | S3 | | | | Oldham & Brinker 2009 | Moist coniferous swamps, dry, sandy woods, and limestone barrens. | Yes | Moist coniferous swamps and dry forests are present within the study area. | No |
| *Hieracium venosum var. nudicaule* | Rattlesnake-weed | S2 | | | | Oldham & Brinker 2009 | Wooded dunes, prairies, dry sandy woods. | No | Dunes or sandy woods not present within study area. | No |
| *Carex tetanica* | Rigid Sedge | S3 | | | | Oldham & Brinker 2009 | Seepages, fens, wet meadows, shorelines, moist prairies. | Yes | Wet meadows are present within the study area. | No |
| *Thalictrum thalictroides* | Rue-anemone | S3 | | | | Oldham & Brinker 2009 | Dry, open deciduous woods. | Yes | Dry deciduous woods are present within the study area. | No |
| *Botrychium rugulosum* | Rugulose Grape Fern | S2 | | | | Oldham & Brinker 2009 | Grows in low, moist habitats in brushy or grassy areas and in open forested areas. | Yes | Moist habitats in grassy and forested areas are present within the study area. | No |
| *Eurybia schreberi* | Schreber's Aster | S2S3 | | | | Oldham & Brinker 2009 | Woodlands. | Yes | Woodlands are present throughout the study area. | No |

| Scientific Name | Common Name | S-RANK[1] | ESA/ COSSARO[2] | COSEWIC[3] | SARA[3] | Background Source | Habitat Preference[4,5,6,7] | Suitable Habitats within Study Area | Rationale | NRSI Observed |
|---|---|---|---|---|---|---|---|---|---|---|
| *Carex schweinitzii* | Schweinitz's Sedge | S3 | | | | Oldham & Brinker 2009 | Seepages, river banks, wooded swamps. | Yes | River banks and wooded swamps are present within the study area. | No |
| *Sphenopholis nitida* | Slender Eaton's Grass | S1 | | | | Oldham & Brinker 2009 | Rich woods. | Yes | Mature forests are present within the study area. | No |
| *Muhlenbergia tenuiflora var. tenuiflora* | Slender Satin Grass | S2 | | | | Oldham & Brinker 2009 | Rocky or sandy woods. | No | Rocky or very sandy soils are not present within the study area. | No |
| *Pycnanthemum tenuifolium* | Slender-leaved Mountain-mint | S3 | | | | NRSI 2019 | Moist to slightly dry black soil prairies, moist meadows and gravelly areas along rivers, openings in woodlands, moist thickets, acid gravel seeps, limestone glades, and abandoned fields. | Yes | Moist meadows and woodland openings are present within the study area. | Yes |
| *Schoenoplectiella smithii* | Smith's Club-rush | S3 | | | | Oldham & Brinker 2009 | Moist sandy or muddy shorelines. | Yes | Shorelines present within the study area. | No |
| *Desmodium marilandicum* | Smooth Small-leaved Tick-trefoil | SX | | | | Oldham & Brinker 2009 | Dry woods and thickets. | Yes | Dry forests are present within the study area. | No |
| *Aureolaria flava* | Smooth Yellow False Foxglove | S2? | | | | Oldham & Brinker 2009 | Dry open woods and savannas. | No | Savanna habitat is not present within the study area. | No |
| *Onosmodium molle ssp. hispidissimum* | Soft Hairy False Gromwell | S2 | | | | Oldham & Brinker 2009 | Woods, fields, thickets, alvars; often on floodplains. | Yes | Floodplain woodlands, thickets and fields are present within the study area. | No |
| *Dichanthelium dichotomum var. dichotomum* | Spreading Panic Grass | S2 | | | | Oldham & Brinker 2009 | Dry, sandy or rocky oak or oak-pine woods. | Yes | Dry coniferous plantations are present within the study area. | No |
| *Gentianella quinquefolia ssp. occidentalis* | Stiff Gentian | S2 | | | | Oldham & Brinker 2009 | Hill prairies, upland savannas, thinly wooded slopes, rocky meadows, banks of streams in wooded areas, calcareous seeps, and edges of cliffs. | Yes | Stream banks within wooded areas are present within the study area. | No |
| *Valeriana uliginosa* | Swamp Valerian | S2 | | | | Oldham & Brinker 2009 | Fens, wet meadows, swamps, ditches | Yes | Wet meadows and swamps are present within the study area. | No |
| *Valeriana edulis ssp. ciliata* | Taprooted Valerian | S1 | | | | Oldham & Brinker 2009 | Wet prairies, swampy river flats and meadows. | Yes | Prairie habitats are not present within the study area but meadows are. | No |
| *Desmodium cuspidatum* | Toothed Tick-trefoil | S3 | | | | Oldham & Brinker 2009 | Dry, sandy or rocky woods. | Yes | Dry forests are present within the study area. | No |
| *Poa saltuensis ssp. languida* | Two-rayed Poa | S3 | | | | Oldham & Brinker 2009 | Cliffs, balds, or ledges, forests, meadows and fields, ridges or ledges, swamps, woodlands | Yes | Forests, meadows, fields and swamps are present within the study area. | No |
| *Mertensia virginica* | Virginia Bluebells | S3 | | | | Oldham & Brinker 2009 | Moist deciduous woods and thickets, usually on floodplains. Sometimes cultivated and some populations may have originated as garden escapes. | Yes | Floodplain forests are present within the study area. | No |
| *Allium burdickii* | Wild Leek | S1? | | | | Oldham & Brinker 2009 | Rich moist deciduous forests, often associated with other spring ephemerals | Yes | Moist deciduous forest is present within the study area. | No |
| *Glycyrrhiza lepidota* | Wild Licorice | S3 | | | | Oldham & Brinker 2009, MNRF 2018a | River banks, lakeshores, and woodland edges in areas of northwestern Ontario | Yes | River banks and woodland edges are present within the study area. | No |
| *Lupinus perennis ssp. perennis* | Wild Lupine | S3 | | | | Oldham & Brinker 2009 | Prairies, oak savannas, dry sandy woods. | No | Prairies, oak savannas are not present within the study area. | No |
| *Linum virginianum* | Wild Yellow Flax | S2 | | | | Oldham & Brinker 2009 | Dry, open woods and fields. | Yes | Dry open woods and fields are present within the study area. | No |
| *Lythrum alatum* | Wing-angled Loosestrife | S3 | | | | Oldham & Brinker 2009 | Prairies, meadows, open woods and thickets. | No | Prairies are not present within the study area. | No |

[1]MNRF 2018f, [2]MNRF 2018e, [3]Government of Canada 2019, [4]Oldham and Brinker 2009, [5]MNRF 2000, [6]Michigan Flora Online 2011, [7]Riley 1989

## Appendix III
## Significant Wildlife Habitat Screening Table

**Significant Wildlife Habitat Assessment Tables**

**Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.**

| | Wildlife Species[1] | Candidate SWH | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | | ELC Ecosite Codes[1] | Habitat Criteria and Information Sources[1] | Defining Criteria[1] | Assessment Details |
| **Wildlife Habitat: Waterfowl Stopover and Staging Areas (Terrestrial)** | | | | | |
| Rationale:<br>Habitat important to migrating waterfowl. | American Black Duck<br>Wood Duck<br>Green-winged Teal<br>Blue-winged Teal<br>Mallard<br>Northern Pintail<br>Northern Shoveler<br>American Wigeon<br>Gadwall | CUM1<br>CUT1<br>- Plus evidence of annual spring flooding from melt water or run-off within these Ecosites. | Fields with sheet water during Spring (mid March to May).<br>• Fields flooding during spring melt and run-off provide important invertebrate foraging habitat for migrating waterfowl.<br>• Agricultural fields with waste grains are commonly used by waterfowl, these are not considered SWH unless they have spring sheet water available[cxlviii].<br><br>Information Sources<br>• Anecdotal information from the landowner, adjacent landowners or local naturalist clubs may be good information in determining occurrence.<br>• Reports and other information available from Conservation Authorities (CAs)<br>• Sites documented through waterfowl planning processes (eg. EHJV implementation plan)<br>• Field Naturalist Clubs<br>• Ducks Unlimited Canada<br>• Natural Heritage Information Centre (NHIC) Waterfowl Concentration Area | Studies carried out and verified presence of an annual concentration of any listed species, evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi]<br>• Any mixed species aggregations of 100 or more individuals required.<br>• The area of the flooded field ecosite habitat plus a 100-300m radius buffer dependent on local site conditions and adjacent land use is the significant wildlife habitat[cxlviii].<br>• Annual use of habitat is documented from information sources or field studies (annual use can be based on studies or determined by past surveys with species numbers and dates).<br>• SWHMiST[cxlix] Index #7 provides development effects and mitigation measures. | CUM1 vegetation communities are present within the study area. A review of historical aerial images suggest that there are no large areas of sheet water present annually.<br><br>Wood Duck, Mallard, Green-winged Teal and Blue-winged Teal have been documented within the vicinity of the study area (BSC et al. 2009). No migratory bird surveys have been completed within the study area.<br><br>**Not SWH** |

**Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.**

| | Wildlife Species[1] | Candidate SWH | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | | ELC Ecosite Codes[1] | Habitat Criteria and Information Sources[1] | Defining Criteria[1] | Assessment Details |
| **Wildlife Habitat: Waterfowl Stopover and Staging Areas (Aquatic)** | | | | | |
| Rationale:<br>Important for local and migrant waterfowl populations during the spring or fall migration or both periods combined. Sites identified are usually only one of a few in the eco-district. | Canada Goose<br>Cackling Goose<br>Snow Goose<br>American Black Duck<br>Northern Pintail<br>Northern Shoveler<br>American Wigeon<br>Gadwall<br>Green-winged Teal<br>Blue-winged Teal<br>Hooded Merganser<br>Common Merganser<br>Lesser Scaup<br>Greater Scaup<br>Long-tailed Duck<br>Surf Scoter<br>White-winged Scoter<br>Black Scoter<br>Ring-necked Duck<br>Common Goldeneye<br>Bufflehead<br>Redhead<br>Ruddy Duck<br>Red-breasted Merganser<br>Brant<br>Canvasback | MAS1<br>MAS2<br>MAS3<br>SAS1<br>SAM1<br>SAF1<br>SWD1<br>SWD2<br>SWD3<br>SWD4<br>SWD5<br>SWD6<br>SWD7 | • Ponds, marshes, lakes, bays, coastal inlets, and watercourses used during migration. Sewage treatment ponds and storm water ponds do not qualify as a SWH, however a reservoir managed as a large wetland or pond/lake does qualify.<br>• These habitats have an abundant food supply (mostly aquatic invertebrates and vegetation in shallow water).<br><br>Information Sources<br>• Environment Canada<br>• Naturalist clubs often are aware of staging/stopover areas.<br>• OMNRF Wetland Evaluations indicate presence of locally and regionally significant waterfowl staging.<br>• Sites documented through waterfowl planning processes (eg. EHJV implementation plan)<br>• Ducks Unlimited projects<br>• Element occurrence specification by Nature Serve: http://www.natureserve.org<br>• Natural Heritage Information Centre (NHIC) Waterfowl Concentration Area | Studies carried out and verified presence of:<br>• Aggregations of 100[l] or more of listed species for 7 days[l], results in > 700 waterfowl use days.<br>• Areas with annual staging of ruddy ducks, canvasbacks, and redheads are SWH[cxlix]<br>• The combined area of the ELC ecosites and a 100m radius area is the SWH[cxlviii]<br>• Wetland area and shorelines associated with sites identified within the SWHTG[cxlviii] Appendix K[cxlix] are significant wildlife habitat.<br>• Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[cclxi]<br>• Annual Use of Habitat is Documented from Information Sources or Field Studies (Annual can be based on completed studies or determined from past surveys with species numbers and dates recorded).<br>• SWHMiST[cxlix] Index #7 provides development effects and mitigation measures. | MAS2, SAM1, SAS1, SWD3, SWD4, and SWD6 vegetation communities present within the study area.<br><br>Suitable habitats that are not SWM ponds and would support aggregations >100 are not present within the study area.<br><br>Canada Goose, Green-winged Teal, Blue-winged Teal, Hooded Merganser, Common Merganser, have been documented within the vicinity of the study area (BSC et al. 2009). No migratory bird surveys have been completed within the study area.<br><br>**Not SWH** |

**Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.**

| | Wildlife Species[1] | Candidate SWH | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | | ELC Ecosite Codes[1] | Habitat Criteria and Information Sources[1] | Defining Criteria[1] | Assessment Details |
| **Wildlife Habitat: Shorebird Migratory Stopover Area** | | | | | |
| Rationale:<br>High quality shorebird stopover habitat is extremely rare and typically has a long history of use. | Greater Yellowlegs<br>Lesser Yellowlegs<br>Marbled Godwit<br>Hudsonian Godwit<br>Black-bellied Plover<br>American Golden-Plover<br>Semipalmated Plover<br>Solitary Sandpiper<br>Spotted Sandpiper<br>Semipalmated Sandpiper<br>Pectoral Sandpiper<br>White-rumped Sandpiper<br>Baird's Sandpiper<br>Least Sandpiper<br>Purple Sandpiper<br>Stilt Sandpiper<br>Short-billed Dowitcher<br>Red-necked Phalarope Whimbrel<br>Ruddy Turnstone<br>Sanderling<br>Dunlin<br>Whimbrel | BBO1<br>BBO2<br>BBS1<br>BBS2<br>BBT1<br>BBT2<br>SDO1<br>SDS2<br>SDT1<br>MAM1<br>MAM2<br>MAM3<br>MAM4<br>MAM5 | Shorelines of lakes, rivers and wetlands, including beach areas, bars and seasonally flooded, muddy and un-vegetated shoreline habitats. Great Lakes coastal shorelines, including groynes and other forms of armour rock lakeshores, are extremely important for migratory shorebirds in May to mid-June and early July to October. Sewage treatment ponds and storm water ponds do not qualify as a SWH.<br><br>Information Sources<br>• Western hemisphere shorebird reserve network.<br>• Canadian Wildlife Service (CWS) Ontario Shorebird Survey.<br>• Bird Studies Canada<br>• Ontario Nature<br>• Local birders and naturalist clubs<br>• Natural Heritage Information Center (NHIC) Shorebird Migratory Concentration Area | Studies confirming:<br>• Presence of 3 or more of listed species and > 1000 shorebird use days during spring or fall migration period. (shorebird use days are the accumulated number of shorebirds counted per day over the course of the fall or spring migration period)<br>• Whimbrel stop briefly (<24hrs) during spring migration, any site with >100 Whimbrel used for 3 years or more is significant.<br>• The area of significant shorebird habitat includes the mapped ELC shoreline ecosites plus a 100m radius area[cxlviii]<br>• Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[cxcxi]<br>• SWHMiST[cxlix] Index #8 provides development effects and mitigation measures. | MAM2 vegetation communities are present within the study area however they are small and generally not conducive for shorebird foraging.<br><br>Spotted Sandpiper has been documented within the vicinity of the study area (BSC et al. 2009). None of the listed species were detected during breeding bird surveys on May 30 and June 12th.<br><br>**Not SWH** |

**Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.**

| | Wildlife Species[1] | Candidate SWH | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | | ELC Ecosite Codes[1] | Habitat Criteria and Information Sources[1] | Defining Criteria[1] | Assessment Details |
| **Wildlife Habitat: Raptor Wintering Area** | | | | | |
| Rational:<br>Sites used by multiple species, a high number of individuals and used annually are most significant | Rough-legged Hawk<br>Red-tailed Hawk<br>Northern Harrier<br>American Kestrel<br>Snowy Owl<br><br>Special Concern:<br>Short-eared Owl<br>Bald Eagle | Hawks/Owls:<br>Combination of ELC Community Series; need to have present one Community Series from each land class:<br>Forest:<br>FOD, FOM, FOC<br><br>Upland:<br>CUM, CUT, CUS, CUW | The habitat provides a combination of fields and woodlands that provide roosting, foraging and resting habitats for wintering raptors.<br><br>Raptor wintering sites need to be > 20 ha[cxlviii, cxlix] with a combination of forest and upland.[xvi, xvii, xviii, xix, xx, xxi].<br>Least disturbed sites, idle/fallow or lightly grazed field/meadow (>15ha) with adjacent woodlands[cxlix]<br><br>Field area of the habitat is to be wind swept with limited snow depth or accumulation.<br><br>Eagle sites have open water, large trees and snags available for roosting<br><br>Information Sources<br>• OMNRF Ecologist or Biologist<br>• Field Natural Clubs<br>• Natural Heritage Information Center (NHIC) Raptor Winter Concentration Area<br>• Data from Bird Studies Canada<br>• Reports and other information available from Conservation Authorities CAs. | Studies confirm the use of these habitats by:<br>• One or more Short-eared Owls or; One or more Bald Eagles or; At least 10 individuals and two listed hawk/owl species<br>• To be significant a site must be used regularly (3 in 5 years)[cxlix] for a minimum of 20 days by the above number of birds<br>• The habitat area for an Eagle winter site is the shoreline forest ecosites directly adjacent to the prime hunting area<br>• Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi]<br>• SWHMiST[cxlix] Index #10 and #11 provides development effects and mitigation measures. | CUM, CUW, FOD and FOC vegetation communities are present within the study area but upland habitats are not of suitable size.<br><br>Red-tailed Hawk, American Kestrel and Bald Eagle have been documented within the vicinity of the study area (BSC et al. 2009). No targeted winter bird surveys have been completed within the study area.<br><br>**Not SWH** |

**Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.**

| | Wildlife Species[1] | Candidate SWH | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | | ELC Ecosite Codes[1] | Habitat Criteria and Information Sources[1] | Defining Criteria[1] | Assessment Details |
| **Wildlife Habitat: Bat Hibernacula** | | | | | |
| Rationale<br>Bat hibernacula are rare habitats in Ontario landscapes. | Big Brown Bat<br>Tri-coloured Bat | Bat Hibernacula may be found in these ecosites:<br>CCR1<br>CCR2<br>CCA1<br>CCA2<br>(Note: buildings are not considered to be SWH) | • Hibernacula may be found in caves, mine shafts, underground foundations and Karsts.<br>• Active mine sites should not be considered as SWH<br>• The locations of bat hibernacula are relatively poorly known.<br><br>Information Sources<br>• OMNRF for possible locations and contact for local experts<br>• Natural Heritage Information Center (NHIC) Bat Hibernaculum<br>• Ministry of Northern Development and Mines for location of mine shafts.<br>• Clubs that explore caves (eg. Sierra Club)<br>• University Biology Departments with bat experts. | • All sites with confirmed hibernating bats are SWH.<br>• The habitat area includes a 200m radius around the entrance of the hibernaculum[cxlviii, ccvii] for most.<br>• Studies are to be conducted during the peak swarming period (Aug. – Sept.). Surveys should be conducted following methods outlined in the "Bats and Bat Habitats: Guidelines for Wind Power Projects"[ccv]<br>• SWHMiST[cxlix] Index #1 provides development effects and mitigation measures. | None of the listed ecosites or required habitat features are present within the study area.<br><br>**Not SWH** |

**Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.**

| | Wildlife Species[1] | Candidate SWH | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | | ELC Ecosite Codes[1] | Habitat Criteria and Information Sources[1] | Defining Criteria[1] | Assessment Details |
| **Wildlife Habitat: Bat Maternity Colonies** | | | | | |
| Rationale:<br>Known locations of forested bat maternity colonies is extremely rare in all Ontario landscapes. | Big Brown Bat<br>Silver-haired Bat | Maternity colonies considered SWH are found in forested Ecosites.<br><br>All ELC Ecosites in ELC Community Series:<br>FOD<br>FOM<br>SWD<br>SWM | Maternity colonies can be found in tree cavities, vegetation and often in buildings[xxii, xxv, xxvi, xxvii, xxxi] (buildings are not considered to be SWH).<br>• Maternity roosts are not found in caves and mines in Ontario[xxii]<br>• Maternity colonies located in Mature deciduous or mixed forest stands[ccix, ccx] with >10/ha large diameter (>25cm dbh) wildlife trees[ccvii]<br>• Female Bats prefer wildlife tree (snags) in early stages of decay, class 1-3[ccxiv] or class 1 or 2[ccxii]<br>• Silver-haired Bats prefer older mixed or deciduous forest and form maternity colonies in tree cavities and small hollows. Older forest areas with at least 21 snags/ha are preferred[ccx]<br><br>Information Sources<br>• OMNRF for possible locations and contact for local experts<br>• University Biology Departments with bat experts. | • Maternity Colonies with confirmed use by:<br>• >10 Big Brown Bats<br>• >5 Adult Female Silver-haired Bats<br>• The area of the habitat includes the entire woodland or a forest stand ELC Ecosite or an Ecoelement containing the maternity colonies.<br>• Evaluation methods for maternity colonies should be conducted following methods outlined in the "Bats and Bat Habitats: Guidelines for wind Power Projects[ccv]<br>• SWHMiS T[cxiix] Index #12 provides development effects and mitigation measures. | FOM, FOD, SWD and SWM vegetation communities are present within the study area and may contain suitable habitat for maternity colonies.<br><br>Big Brown Bat and Silver-haired Bat have been documented within the vicinity of the study area (Dobbyn 1994). No targeted bat surveys have been completed within the study area.<br><br>**Candidate SWH** |

**Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.**

| | Wildlife Species[1] | Candidate SWH | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | | ELC Ecosite Codes[1] | Habitat Criteria and Information Sources[1] | Defining Criteria[1] | Assessment Details |
| **Wildlife Habitat: Turtle Wintering Area** | | | | | |
| Rationale:<br>Generally sites are the only known sites in the area. Sites with the highest number of individuals are most significant | Midland Painted Turtle<br><br>Special Concern:<br>Northern Map Turtle<br>Snapping Turtle | Snapping and Midland Painted Turtles -<br>ELC Community Classes: SW, MA, OA and SA;<br>ELC Community Series: FEO and BOO<br><br>Northern Map Turtle - Open Water areas such as deeper rivers or streams and lakes with current can also be used as over-wintering habitat. | For most turtles, wintering areas are in the same general area as their core habitat. Water has to be deep enough not to freeze and have soft mud substrates.<br>• Over-wintering sites are permanent water bodies, large wetlands, and bogs or fens with adequate Dissolved Oxygen[cix, cx, cxi, cxviii].<br>• Man-made ponds such as sewage lagoons or storm water ponds should not be considered SWH.<br>Information Sources<br>• EIS studies carried out by Conservation Authorities.<br>• Local field naturalists and experts, as well as university herpetologists may also know where to find some of these sites.<br>• OMNRF ecologist or biologist<br>• Natural Heritage Information Center (NHIC) | • Presence of 5 over-wintering Midland Painted Turtles is significant.<br>• One or more Northern Map Turtle or Snapping Turtle over-wintering within a wetland is significant.<br>• The mapped ELC ecosite area with the over wintering turtles is the SWH. If the hibernation site is within a stream or river, the deep-water pool where the turtles are over wintering is the SWH.<br>• Over wintering areas may be identified by searching for congregations (Basking Areas) of turtles on warm, sunny days during the fall (Sept. – Oct.) or spring (Mar. – May)[cvii]<br>• Congregation of turtles is more common where wintering areas are limited and therefore significant[cix, cx, cxi, cxii].<br>• SWHMiST[cxlix] Index #28 provides development effects and mitigation measures for turtle wintering habitat. | SW, MA, OA and SA vegetation classes with suitable overwintering habitat are present within the study area.<br><br>Snapping Turtle, Northern Map Turtle and Midland Painted Turtle have been documented within the vicinity of the study area (Ontario Nature 2018, MNRF 2018b, MNRF 2018c). No targeted turtle surveys have been completed within the study area.<br><br>**Candidate SWH** |

**Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.**

| | Wildlife Species[1] | Candidate SWH | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | | ELC Ecosite Codes[1] | Habitat Criteria and Information Sources[1] | Defining Criteria[1] | Assessment Details |
| **Wildlife Habitat: Snake Hibernaculum** | | | | | |
| Rationale:<br>Generally sites are the only known sites in the area. Sites with the highest number of individuals are most significant | Snakes:<br>Eastern Gartersnake<br>Northern Watersnake<br>Northern Red-bellied Snake<br>Northern Brownsnake<br>Smooth Green Snake<br>Northern Ring-necked Snake<br><br>Special Concern:<br>Milksnake<br>Eastern Ribbonsnake<br><br>Lizard:<br>Special Concern (Southern Shield population):<br>Five-lined Skink | For all snakes, habitat may be found in any ecosite other than very wet ones. Talus, Rock Barren, Crevice and Cave, and Alvar sites may be directly related to these habitats.<br><br>Observations of congregations of snakes on sunny warm days in the spring or fall is a good indicator.<br><br>For Five-lined Skink, ELC Community Series of FOD and FOM and Ecosites:<br>FOC1<br>FOC3 | • For snakes, hibernation takes place in sites located below frost lines in burrows, rock crevices and other natural locations. The existence of features that go below the frost line; such as rock piles or slopes, old stone fences, and abandoned crumbling foundations assist in identifying candidate SWH.<br>• Areas of broken and fissured rock are particularly valuable since they provide access to subterranean sites below the frost line[xliv, l, li, liii, cxii.]<br>• Wetlands can also be important over-wintering habitat in conifer or shrub swamps and swales, poor fens, or depressions in bedrock terrain with sparse trees or shrubs with sphagnum moss or sedge hummock ground cover.<br>• Five-lined skink prefer mixed forests with rock outcrop openings providing cover rock overlaying granite bedrock with fissures cciii.<br><br>Information Sources<br>• In spring, local residents or landowners may have observed the emergence of snakes on their property (e.g. old dug wells).<br>• Reports and other information from CAs.<br>• Local Field naturalists and experts, as well as university herpetologists may also know where to find some of these sites. clubs<br>• Natural Heritage Information Center (NHIC)<br>• OMNRF ecologist or biologist may be aware of locations of wintering skinks | Studies confirming:<br>• Presence of snake hibernacula used by a minimum of five individuals of a snake sp. or; individuals of two or more snake spp.<br>• Congregations of a minimum of five individuals of a snake sp. or; individuals of two or more snake spp. near potential hibernacula (eg. foundation or rocky slope) on sunny warm days in Spring (Apr/May) and Fall (Sept/Oct).<br>• Note: If there are Special Concern Species present, then site is SWH<br>• Note: Sites for hibernation possess specific habitat parameters (e.g. temperature, humidity, etc.) and consequently are used annually, often by many of the same individuals of a local population [i.e. strong hibernation site fidelity]. Other critical life processes (e.g. mating) often take place in close proximity to hibernacula. The feature in which the hibernacula is located plus a 30m buffer is the SWH[i]<br>• SWHMiST[cxlix] Index #13 provides development effects and mitigation measures for snake hibernacula.<br>• Presence of any active hibernaculum for skink is significant.<br>• SWHMiST[cxlix] Index #37 provides development effects and mitigation measures for five-lined skink wintering habitat. | It is challenging to confirm the presence of reptile hibernacula. The study area may provide suitable habitat.<br><br>Eastern Ribbonsnake, Northern Watersnake, Northern Red-bellied Snake, Northern Brownsnake, Smooth Greensnake, Eastern Milksnake and Eastern Gartersnake have been documented within the vicinity of the study area (Ontario Nature 2018, MNRF 2018b).<br><br>Targeted snake emergence surveys have not been conducted within the study area.<br><br>**Candidate SWH** |

**Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.**

| | Wildlife Species[1] | Candidate SWH | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | | ELC Ecosite Codes[1] | Habitat Criteria and Information Sources[1] | Defining Criteria[1] | Assessment Details |
| **Wildlife Habitat: Colonially - Nesting Bird Breeding Habitat (Bank and Cliff)** | | | | | |
| Rationale:<br>Historical use and number of nests in a colony make this habitat significant. An identified colony can be very important to local populations. All swallow populations are declining in Ontario. | Cliff Swallow<br>Northern Rough-winged Swallow (this species is not colonial but can be found in Cliff Swallow colonies) | Eroding banks, sandy hills, borrow pits, steep slopes, and sand piles<br>Cliff faces, bridge abutments, silos, barns<br><br>Habitat found in the following ecosites:<br>CUM1 CUT1<br>CUS1 BLO1<br>BLS1 BLT1<br>CLO1 CLS1<br>CLT1 | • Any site or areas with exposed soil banks, undisturbed or naturally eroding that is not a licensed/permitted aggregate area.<br>• Does not include man-made structures (bridges or buildings) or recently (2 years) disturbed soil areas, such as berms, embankments, soil or aggregate stockpiles.<br>• Does not include a licensed/permitted Mineral Aggregate Operation.<br><br>Information Sources<br>• Reports and other information available from CAs<br>• Ontario Breeding Bird Atlas [ccv]<br>• Bird Studies Canada; *NatureCounts* http://www.birdscanada.org/birdmon/<br>• Field Naturalist clubs | Studies confirming:<br>• Presence of 1 or more nesting sites with 8[cxlvix] or more cliff swallow pairs and/or rough-winged swallow pairs during the breeding season.<br>• A colony identified as SWH will include a 50m radius habitat area from the peripheral nests[ccvii]<br>• Field surveys to observe and count swallow nests are to be completed during the breeding season Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi]<br>• SWHMiST[cxlix] Index #4 provides development effects and mitigation measures | Exposed soil banks, undisturbed or naturally eroding areas not observed within the study area. CUM vegetation communities are present within the study area. Bridge/culvert structures are also present within study area, however, bridges are not considered SWH. A large pile of topsoil is present, likely a result of construction activities, but recently disturbed soil areas are not considered SWH.<br><br>Cliff Swallow and Northern Rough-winged Swallow documented within the vicinity of the study area (BSC et al. 2009). These species were not observed during breeding bird surveys.<br><br>**Not SWH** |

**Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.**

| | Wildlife Species[1] | Candidate SWH | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | | ELC Ecosite Codes[1] | Habitat Criteria and Information Sources[1] | Defining Criteria[1] | Assessment Details |
| **Wildlife Habitat: Colonially - Nesting Bird Breeding Habitat (Tree/Shrubs)** | | | | | |
| Rationale:<br>Large Colonies are important to local bird population, typically sites are only known colony in area and are used annually. | Great Blue Heron<br>Black-crowned Night-heron<br>Great Egret<br>Green Heron | SWM2 SWM3<br>SWM5 SWM6<br>SWD1 SWD2<br>SWD3 SWD4<br>SWD5 SWD6<br>SWD7 FET1 | • Nests in live or dead standing trees in wetlands, lakes, islands, and peninsulas. Shrubs and occasionally emergent vegetation may also be used.<br>• Most nests in trees are 11 to 15m from ground, near the top of the tree.<br><br>Information Sources<br>• Ontario Breeding Bird Atlas[ccv], colonial nest records.<br>• Ontario Heronry Inventory 1991 available from Bird Studies Canada or NHIC (OMNR).<br>• NHIC Mixed Wader Nesting Colony<br>• Aerial photographs can help identify large heronries<br>• Reports and other information available from CAs<br>• MNRF District Offices<br>• Local naturalist clubs | Studies confirming:<br>• Presence of 5[1] or more active nests of Great Blue Heron or other listed species.<br>• The habitat extends from the edge of the colony and a minimum 300m radius or extent of the Forest Ecosite containing the colony or any island <15.0ha with a colony is the SWH [cc, ccvii]<br>• Confirmation of active heronries are to be achieved through site visits conducted during the nesting season (April to August) or by evidence such as the presence of fresh guano, dead young and/or eggshells<br>• SWHMiST[cxlix] Index #5 provides development effects and mitigation measures. | SWD3, SWD4, SWD6 vegetation communities are present within the study area. These swamps could provide suitable nesting habitat.<br><br>Great Blue Heron and Green Heron have been documented within the vicinity of the study area (BSC et al 2009). No heronries were detected during breeding bird surveys.<br><br>**Not SWH** |

**Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.**

| | Wildlife Species[1] | Candidate SWH | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | | ELC Ecosite Codes[1] | Habitat Criteria and Information Sources[1] | Defining Criteria[1] | Assessment Details |
| **Wildlife Habitat: Colonially - Nesting Bird Breeding Habitat (Ground)** | | | | | |
| Rationale:<br>Colonies are important to local bird populations, typically sites are only known colony in area and are used annually. | Herring Gull<br>Great Black-backed Gull<br>Little Gull<br>Ring-billed Gull<br>Common Tern<br>Caspian Tern<br>Brewer's Blackbird | Any rocky island or peninsula (natural or artificial) within a lake or large river (two-lined on a 1:50,000 NTS map).<br><br>Close proximity to watercourses in open fields or pastures with scattered trees or shrubs (Brewer's Blackbird)<br><br>MAM1 – 6<br>MAS1 – 3<br>CUM<br>CUT<br>CUS | • Nesting colonies of gulls and terns are on islands or peninsulas associated with open water or in marshy areas.<br>• Brewers Blackbird colonies are found loosely on the ground in or in low bushes in close proximity to streams and irrigation ditches within farmlands.<br><br>Information Sources<br>• Ontario Breeding Bird Atlas[ccv], rare/colonial species records.<br>• Canadian Wildlife Service<br>• Reports and other information available from CAs<br>• Natural Heritage Information Center (NHIC) Colonial Waterbird Nesting Area<br>• MNRF District Offices<br>• Field naturalist clubs | Studies confirming:<br>• Presence of >25 active nests for Herring Gulls or Ring-billed Gulls, >5 active nests for Common Tern or >2 active nests for Caspian Tern[í].<br>• Presence of 5 or more pairs for Brewer's Blackbird.<br>• Any active nesting colony of one or more Little Gull, and Great Black-backed Gull is significant.<br>• The edge of the colony and a minimum 150m area of habitat, or the extent of the ELC ecosites containing the colony or any island <3.0ha with a colony is the SWH[cc, ccvii]<br>• Studies would be done during May/June when actively nesting. Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi]<br>• SWHMiST[cxlix] Index #6 provides development effects and mitigation measures. | No rocky island or peninsula within a lake or large river present within study area.<br><br>**Not SWH** |

**Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.**

| | Wildlife Species[1] | Candidate SWH | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | | ELC Ecosite Codes[1] | Habitat Criteria and Information Sources[1] | Defining Criteria[1] | Assessment Details |
| **Wildlife Habitat: Migratory Butterfly Stopover Areas** | | | | | |
| Rationale:<br>Butterfly stopovers areas are extremely rare habitats and are biologically important for butterfly species that migrate south for the winter. | Painted Lady<br>Red Admiral<br><br>Special Concern:<br>Monarch | Combination of ELC Community Series:<br>Need to have present one Community Series from each landclass:<br><br>Field:<br>CUM CUS<br>CUT<br><br>Forest:<br>FOC FOM<br>FOD CUP<br><br>Anecdotally, a candidate sight for butterfly stopover will have a history of butterflies being observed. | A butterfly stopover area will be a minimum of 10 ha in size with a combination of field and forest habitat present, and will be located within 5 km of Lake Ontario[cxlix].<br>• The habitat is typically a combination of field and forest, and provides the butterflies with a location to rest prior to their long migration south[xxxii, xxxiii, xxxiv, xxxv, xxxvi.]<br>• The habitat should not be disturbed, fields/meadows with an abundance of preferred nectar plants and woodland edge providing shelter are requirements for this habitat cxlviii, cxlix.<br>• Staging areas usually provide protection from the elements and are often spits of land or areas with the shortest distance to cross the Great Lakes[xxxvii, xxxviii, xxxix, xl, xli.]<br><br>Information Sources<br>• OMNRF (NHIC)<br>• Agriculture Canada in Ottawa may have list of butterfly experts.<br>• Field Naturalist Clubs<br>• Toronto Entomologists Association<br>• Conservation Authorities | Studies confirm:<br>• The presence of Monarch Use Days (MUD) during fall migration (Aug/Oct)[xliii]. MUD is based on the number of days a site is used by Monarchs, multiplied by the number of individuals using the site. Numbers of butterflies can range from 100-500/day[xxxvii], significant variation can occur between years and multiple years of sampling should occur [xl, xliii].<br>• Observational studies are to be completed and need to be done frequently during the migration period to estimate MUD<br>• MUD of >5000 or >3000 with the presence of Painted Ladies or Red Admiral's is to be considered significant.<br>• SWHMiST[cxlix] Index #16 provides development effects and mitigation measures. | Study area is greater than 5 km from Lake Ontario.<br><br>**Not SWH** |

**Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.**

| | Wildlife Species[1] | Candidate SWH | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | | ELC Ecosite Codes[1] | Habitat Criteria and Information Sources[1] | Defining Criteria[1] | Assessment Details |
| **Wildlife Habitat: Landbird Migratory Stopover Areas** | | | | | |
| Rationale:<br>Sites with a high diversity of species as well as high number are most significant | All migratory songbirds.<br><br>Canadian Wildlife Service Ontario website:<br>http://www.on.ec.gc.ca/wildlife_e.html<br><br>All migrant raptors species:<br><br>Ontario Ministry of Natural Resources:<br>Fish and Wildlife Conservation Act, 1997. Schedule 7: Specially Protected Birds (Raptors) | All Ecosites associated with these ELC Community Series:<br>FOC<br>FOM<br>FOD<br>SWC<br>SWM<br>SWD | Woodlots need to be >10 ha[i] in size and within 5km [iv, v, vi, vii, viii, ix, x, xi, xii, xiii, xiv, xv] of Lake Ontario.<br>• If multiple woodlands are located along the shoreline, those woodlands <2km from Lake Ontario are more significant[cxlix]<br>• Sites have a variety of habitats; forest, grassland and wetland complexes[cxlix].<br>• The largest sites are more significant[cxlix]<br>• Woodlots and forest fragments are important habitats to migrating birds[ccxviii], these features located along the shore and located within 5km of Lake Ontario are Candidate SWH[cxlviii].<br><br>Information Sources<br>• Bird Studies Canada<br>• Ontario Nature<br>• Local birders and naturalist club<br>• Ontario Important Bird Areas (IBA) Program | Studies confirm:<br>• Use of the woodlot by >200 birds/day and with >35 spp. with at least 10 bird spp. recorded on at least 5 different survey dates. This abundance and diversity of migrant bird species is considered above average and significant.<br>• Studies should be completed during spring (Apr/May) and fall (Aug/Oct) migration using standardized assessment techniques. Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi]<br>• SWHMiST[cxlix] Index #9 provides development effects and mitigation measures. | Study area is greater than 5 km from Lake Ontario.<br><br>**Not SWH** |

**Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.**

| | Wildlife Species[1] | Candidate SWH | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | | ELC Ecosite Codes[1] | Habitat Criteria and Information Sources[1] | Defining Criteria[1] | Assessment Details |
| **Wildlife Habitat: Deer Yarding Areas** | | | | | |
| Rationale:<br>Winter habitat for deer is considered to be the main factor for northern deer populations. In winter, deer congregate in "yards" to survive severe winter conditions. Deer yards typically have a long history of annual use by deer, yards typically represent 10-15% of an areas summer range. | White-tailed Deer | Note: OMNRF to determine this habitat.<br><br>ELC Community Series providing a thermal cover component for a deer yard would include:<br>FOM, FOC, SWM and SWC.<br><br>Or these ELC Ecosites:<br>CUP2 CUP3<br>FOD3 CUT | • Deer yarding areas or winter concentration areas (yards) are areas deer move to in response to the onset of winter snow and cold. This is a behavioural response and deer will establish traditional use areas. The yard is composed of two areas referred to as Stratum I and Stratum II. Stratum II covers the entire winter yard area and is usually a mixed or deciduous forest with plenty of browse available for food. Agricultural lands can also be included in this area. Deer move to these areas in early winter and generally, when snow depths reach 20cm, most of the deer will have moved here. If the snow is light and fluffy, deer may continue to use this area until 30cm snow depth. In mild winters, deer may remain in the Stratum II area the entire winter.<br>• The Core of a deer yard (Stratum I) is located within the Stratum II area and is critical for deer survival in areas where winters become severe. It is primarily composed of coniferous trees (pine, hemlock, cedar, spruce) with a canopy cover of more than 60%[cxciv].<br>• OMNRF determines deer yards following methods outlined in "Selected Wildlife and Habitat Features: Inventory Manual"[cxcv]<br>• Woodlots with high densities of deer due to artificial feeding are not significant. | No Studies Required:<br>• Snow depth and temperature are the greatest influence on deer use of winter yards. Snow depths > 40cm for more than 60 days in a typically winter are minimum criteria for a deer yard to be considered as SWH[lvi, lvii, lviii, lix, lx, Í].<br>• Deer Yards are mapped by OMNRF District offices. Locations of Core or Stratum 1 and Stratum 2 Deer yards considered significant by OMNRF will be available at local MNRF offices or via Land Information Ontario (LIO).<br>• Field investigations that record deer tracks in winter are done to confirm use (best done from an aircraft). Preferably, this is done over a series of winters to establish the boundary of the Stratum I and Stratum II yard in an "average" winter. MNRF will complete these field investigations[cxcv].<br>• If a SWH is determined for Deer Wintering Area or if a proposed development is within Stratum II yarding area then Movement Corridors are to be considered as outlined in Table 1.4.1 of this Schedule.<br>• SWHMiST[cxlix] Index #2 provides development effects and mitigation measures. | No Deer Yarding Areas have been mapped by the OMNRF in the study area.<br><br>**Not SWH** |

**Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.**

| | Wildlife Species[1] | Candidate SWH | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | | ELC Ecosite Codes[1] | Habitat Criteria and Information Sources[1] | Defining Criteria[1] | Assessment Details |
| **Wildlife Habitat: Deer Winter Congregation Areas** | | | | | |
| Rationale:<br>Deer movement during winter in the southern areas of Ecoregion 6E are not constrained by snow depth, however deer will annually congregate in large numbers in suitable woodlands to reduce or avoid the impacts of winter conditions[cxlviii] | White-tailed Deer | All Forested Ecosites with these ELC Community Series:<br>FOC<br>FOM<br>FOD<br>SWC<br>SWM<br>SWD<br><br>Conifer plantations much smaller than 50ha may also be used. | • Woodlots will typically be >100 ha in size. Woodlots <100ha may be considered as significant based on MNRF studies or assessment.<br>• Deer movement during winter in the southern areas of Eco-region 6E are not constrained by snow depth, however deer will annually congregate in large numbers in suitable woodlands[cxlviii].<br>• If deer are constrained by snow depth refer to the Deer Yarding Area habitat within Table 1.1 of this Schedule.<br>• Large woodlots > 100ha and up to 1500 ha are known to be used annually by densities of deer that range from 0.1-1.5 deer/ha[ccxxiv].<br>• Woodlots with high densities of deer due to artificial feeding are not significant.<br><br>Information Sources<br>• MNRF District Offices<br>• LIO/NRVIS | Studies confirm:<br>• Deer management is an MNRF responsibility, deer winter congregation areas considered significant will be mapped by MNRF[cxlviii].<br>• Use of the woodlot by white-tailed deer will be determined by MNRF, all woodlots exceeding the area criteria are significant, unless determined not to be significant by MNR[i].<br>• Studies should be completed during winter (Jan/Feb) when >20cm of snow is on the ground using aerial survey techniques[ccxxiv] , ground or road surveys, or a pellet count deer density survey[ccxxv].<br>• If a SWH is determined for Deer Wintering Area of if a proposed development is within Stratum II yarding area then Movement Corridors are to be considered as outlined in Table 1.4.1 of this Schedule.<br>• SWHMiST[cxlix] Index #2 provides development effects and mitigation measures. | Deer Winter Congregation Areas have not been mapped by the OMNRF in the study area.<br><br>**Not SWH** |

**Significant Wildlife Habitat Assessment Tables**

**Table 2. Characteristics of Rare Vegetation Communities for Ecoregion 6E.**

| Rare Vegetation Community[1] | Candidate SWH | | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | ELC Ecosite Codes[1] | Habitat Description[1] | Detailed Information and Sources[1] | Defining Criteria[1] | Assessment Details |
| **Cliff and Talus Slopes** | | | | | |
| Rationale:<br>Cliffs and Talus Slopes are extremely rare habitats in Ontario. | Any ELC Ecosite within Community Series:<br><br>TAO CLO<br>TAS CLS<br>TAT CLT | A Cliff is vertical to near vertical bedrock >3m in height.<br><br>A Talus Slope is rock rubble at the base of a cliff made up of coarse rocky debris. | Most cliff and talus slopes occur along the Niagara Escarpment.<br><br>Information Sources<br>• The Niagara Escarpment Commission has detailed information on location of these habitats.<br>• OMNRF District<br>• Natural Heritage Information Center (NHIC) has location information on their website<br>• Local naturalist clubs<br>• Conservation Authorities | • Confirm any ELC Vegetation Type for Cliffs or Talus Slopes[lxxviii]<br>• SWHMiST[cxlix] Index #21 provides development effects and mitigation measures. | None of the listed ELC vegetation communities are present within the study area.<br><br>**Not SWH** |

**Table 2. Characteristics of Rare Vegetation Communities for Ecoregion 6E.**

| Rare Vegetation Community[1] | Candidate SWH | | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | ELC Ecosite Codes[1] | Habitat Description[1] | Detailed Information and Sources[1] | Defining Criteria[1] | Assessment Details |
| **Sand Barrens** | | | | | |
| Rationale:<br>Sand barrens are rare in Ontario and support rare species. Most Sand Barrens have been lost due to cottage development and forestry. | ELC Ecosites:<br>SBO1<br>SBS1<br>SBT1<br><br>Vegetation cover varies from patchy and barren to continuous meadow (SBO1), thicket-like (SBS1), or more closed and treed (SBT1). Tree cover always <60%. | Sand Barrens typically are exposed sand, generally sparsely vegetated and caused by lack of moisture, periodic fires and erosion. They have little or no soil and the underlying rock protrudes through the surface. Usually located within other types of natural habitat such as forest or savannah. Vegetation can vary from patchy and barren to tree covered but less than 60%. | Any sand barren area, >0.5ha in size.<br><br>Information Sources<br>• OMNRF Districts.<br>• Natural Heritage Information Center (NHIC) has location information on their website<br>• Field naturalist clubs<br>• Conservation Authorities | • Confirm any ELC Vegetation Type for Sand Barrens[lxxviii]<br>• Site must not be dominated by exotic or introduced species (<50% vegetative cover exotics)[i].<br>• SWHMiST[cxlix] Index #20 provides development effects and mitigation measures. | None of the listed ELC vegetation communities are present within the study area.<br><br>**Not SWH** |

**Table 2. Characteristics of Rare Vegetation Communities for Ecoregion 6E.**

| Rare Vegetation Community[1] | Candidate SWH | | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | ELC Ecosite Codes[1] | Habitat Description[1] | Detailed Information and Sources[1] | Defining Criteria[1] | Assessment Details |
| **Alvar** | | | | | |
| Rationale:<br>Alvars are extremely rare habitats in Ecoregion 6E. Most alvars in Ontario are in Ecoregion 6E and 7E. Alvars in 6E are small and highly localized just north of the Palaeozoic-Precambrian contact. | ALO1<br>ALS1<br>ALT1<br>FOC1<br>FOC2<br>CUM2<br>CUS2<br>CUT2-1<br>CUW2<br><br>Five Alvar<br><br>Indicator Species:<br>1) Carex crawei<br>2) Panicum philadelphicum<br>3) Eleochairs compressa<br>4) Scutellaria parvula<br>5) Trichostema branchiatum<br><br>These indicator species are very specific to Alvars within Ecoregion 6E | An alvar is typically a level, mostly unfractured calcareous bedrock feature with a mosaic of rock pavements and bedrock overlain by a thin veneer of soil. The hydrology of alvars is complex, with alternating periods of inundation and drought. Vegetation cover varies from sparse lichen-moss associations to grasslands and shrublands and comprising a number of characteristic or indicator plant. Undisturbed alvars can be phyto- and zoo geographically diverse, supporting many uncommon or are relict plant and animals species. Vegetation cover varies from patchy to barren with a less than 60% tree cover[lxxviii]. | An Alvar site > 0.5 ha in size[lxxv].<br><br>Information Sources<br>• Alvars of Ontario (2000), Federation of Ontario Naturalists[lxxvi].<br>• Ontario Nature – Conserving Great Lakes Alvars[ccviii].<br>• Natural Heritage Information Center (NHIC) has location information on their website<br>• Field Naturalist clubs<br>• Conservation Authorities | Field studies identify four of the five Alvar indicator species[lxxv, cxlix] at a Candidate Alvar site is Significant.<br><br>• Site must not be dominated by exotic or introduced species (<50% vegetative cover are exotics sp.).<br>• The alvar must be in excellent condition and fit in with surrounding landscape with few conflicting land uses[lxxv].<br>• SWHMiST[cxlix] Index #17 provides development effects and mitigation measures. | None of the listed ELC vegetation communities are present within the study area.<br><br>**Not SWH** |

**Table 2. Characteristics of Rare Vegetation Communities for Ecoregion 6E.**

| Rare Vegetation Community[1] | Candidate SWH | | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | ELC Ecosite Codes[1] | Habitat Description[1] | Detailed Information and Sources[1] | Defining Criteria[1] | Assessment Details |
| **Old Growth Forest** | | | | | |
| Rationale:<br>Due to historic logging practices, extensive old growth forest is rare in the Ecoregion. Interior habitat provided by old growth forests is required by many wildlife species. | Forest Community Series:<br>FOD<br>FOC<br>FOM<br>SWD<br>SWC<br>SWM | Old Growth forests are characterized by heavy mortality or turnover of over-storey trees resulting in a mosaic of gaps that encourage development of a multi-layered canopy and an abundance of snags and downed woody debris. | Woodland Stands areas 30ha or greater in size or with at least 10 ha interior habitat assuming 100m buffer at edge of forest Í.<br><br>Information Sources<br>• OMNRF Forest Resource Inventory mapping<br>• OMNRF Forester, Ecologist or Biologist<br>• Field Local naturalist clubs<br>• Conservation Authorities<br>• Sustainable Forestry License (SFL) companies will possibly know locations through field operations.<br>• Municipal forestry departments | Field Studies will determine:<br>• If dominant trees species of the ecosite are >140 years old, then stand is Significant Wildlife Habitat[cxlviii]<br>• The stand will have experienced no recognizable forestry activities[cxlviii]<br>• The area of Forest Ecosites combined to make up the stand is the SWH.<br>• Determine ELC Vegetation Type for forest stand[lxxviii]<br>• SWHDSS[cxlix] Index #23 provides development effects and mitigation measures. | Forest habitat is present within the study area. No old growth forest is present; all treed ecosites consist of recently disturbed cultural woodlands.<br><br>**Not SWH** |

**Table 2. Characteristics of Rare Vegetation Communities for Ecoregion 6E.**

| Rare Vegetation Community[1] | Candidate SWH | | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | ELC Ecosite Codes[1] | Habitat Description[1] | Detailed Information and Sources[1] | Defining Criteria[1] | Assessment Details |
| **Savannah** | | | | | |
| Rationale:<br>Savannahs are extremely rare habitats in Ontario. | TPS1<br>TPS2<br>TPW1<br>TPW2<br>CUS2 | A Savannah is a tallgrass prairie habitat that has tree cover between 25 – 60%. | • No minimum size to site<br>Site must be restored or a natural site. Remnant sites such as railway right of ways are not considered to be SWH.<br><br>Information Sources<br>• Natural Heritage Information Center (NHIC) has location information on their website<br>• OMNRF Ecologists<br>• Field naturalists clubs<br>• Conservation Authorities | Field studies confirm one or more of the Savannah indicator species listed in[lxxv] Appendix N should be present. Note: Savannah plant spp. list from Ecoregion 6E should be used[cxlviii].<br><br>• Area of the ELC Ecosite is the SWH.<br>• Site must not be dominated by exotic or introduced species (<50% vegetative cover exotics sp.).<br>• SWHMiST[cxlix] Index #18 provides development effects and mitigation measures. | None of the listed ELC vegetation communities are present within the study area.<br><br>**Not SWH** |

**Table 2. Characteristics of Rare Vegetation Communities for Ecoregion 6E.**

| Rare Vegetation Community[1] | Candidate SWH | | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | ELC Ecosite Codes[1] | Habitat Description[1] | Detailed Information and Sources[1] | Defining Criteria[1] | Assessment Details |
| **Tallgrass Prairie** | | | | | |
| Rationale:<br>Tallgrass Prairies are extremely rare habitats in Ontario. | TPO1<br>TPO2 | A Tallgrass Prairie has ground cover dominated by prairie grasses. An open Tallgrass Prairie habitat has < 25% tree cover. | • No minimum size to site<br>Site must be restored or a natural site. Remnant sites such as railway right of ways are not considered to be SWH.<br><br>Information Sources<br>• OMNR Districts<br>• Natural Heritage Information Center (NHIC) has location information available on their website<br>• Field naturalists clubs<br>• Conservation Authorities | Field studies confirm one or more of the Prairie indicator species listed in[lxxv] Appendix N should be present. Note: Prairie plant spp. list from Ecoregion 6E should be used[cxlviii].<br>• Area of the ELC Ecosite is the SWH<br>• Site must not be dominated by exotic or introduced species (<50% vegetative cover exotics).<br>• SWHMiST[cxlix] Index #19 provides development effects and mitigation measures. | None of the listed ELC vegetation communities are present within the study area.<br><br>**Not SWH** |

**Table 2. Characteristics of Rare Vegetation Communities for Ecoregion 6E.**

| Rare Vegetation Community[1] | Candidate SWH | | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | ELC Ecosite Codes[1] | Habitat Description[1] | Detailed Information and Sources[1] | Defining Criteria[1] | Assessment Details |
| **Other Rare Vegetation Communities** | | | | | |
| Rationale:<br>Plant communities that often contain rare species which depend on the habitat for survival. | Provincially Rare S1, S2 and S3 vegetation communities are listed in Appendix M of the SWHTG[cxlviii]. Any ELC Ecosite Code that has a possible ELC Vegetation Type that is Provincially Rare is Candidate SWH. | Rare Vegetation Communities may include beaches, fens, forest, marsh, barrens, dunes and swamps. | ELC Ecosite codes that have the potential to be a rare ELC Vegetation Type as outlined in appendix M[cxlviii]<br><br>The OMNR/NHIC will have up to date listing for rare vegetation communities.<br><br>Information Sources<br>• Natural Heritage Information Center (NHIC) has location information available on their website<br>• OMNRF Districts<br>• Field naturalists clubs<br>• Conservation Authorities | Field studies should confirm if an ELC Vegetation Type is a rare vegetation community based on listing within Appendix M of SWHTG[cxlviii].<br><br>• Area of the ELC Vegetation Type polygon is the SWH.<br>• SWHMiST[cxlix] Index #37 provides development effects and mitigation measures. | No other rare vegetation communities are present within the study area.<br><br>**Not SWH** |

**Significant Wildlife Habitat Assessment Tables**

**Table 3. Characteristics of Specialized Wildlife Habitat for Ecoregion 6E.**

| | Wildlife Species[1] | Candidate SWH | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | | ELC Ecosite Codes[1] | Habitat Criteria and Information Sources[1] | Defining Criteria[1] | Assessment Details |
| **Wildlife Habitat: Waterfowl Nesting Area** | | | | | |
| Rationale:<br>Important to local waterfowl populations, sites with greatest number of species and highest number of individuals are significant. | American Black Duck<br>Northern Pintail<br>Northern Shoveler<br>Gadwall<br>Blue-winged Teal<br>Green-winged Teal<br>Wood Duck<br>Hooded Merganser<br>Mallard | All upland habitats located adjacent to these wetland ELC Ecosites are Candidate SWH:<br>MAS1 MAS2<br>MAS3 SAS1<br>SAM1 SAF1<br>MAM1 MAM2<br>MAM3 MAM4<br>MAM5 MAM6<br>SWT1 SWT2<br>SWD1 SWD2<br>SWD3 SWD4<br><br>Note: includes adjacency to Provincially Significant Wetlands | A waterfowl nesting area extends 120m[cxlix] from a wetland (> 0.5 ha) or a wetland (>0.5ha) and any small wetlands (0.5ha) within 120m or a cluster of 3 or more small (<0.5 ha) wetlands within 120m of each individual wetland where waterfowl nesting is known to occur[cxlix].<br>• Upland areas should be at least 120m wide so that predators such as raccoons, skunks, and foxes have difficulty finding nests.<br>• Wood Ducks and Hooded Mergansers utilize large diameter trees (>40cm dbh) in woodlands for cavity nest sites.<br><br>Information Sources<br>• Ducks Unlimited staff may know the locations of particularly productive nesting sites.<br>• OMNRF Wetland Evaluations for indication of significant waterfowl nesting habitat.<br>• Reports and other information available from CAs | Studies confirmed:<br>• Presence of 3 or more nesting pairs for listed species excluding Mallards, or<br>• Presence of 10 or more nesting pairs for listed species including Mallards.<br>• Any active nesting site of an American Black Duck is considered significant.<br>• Nesting studies should be completed during the spring breeding season (April - June). Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi]<br>• A field study confirming waterfowl nesting habitat will determine the boundary of the waterfowl nesting habitat for the SWH, this may be greater or less than 120m[cxlviii] from the wetland and will provide enough habitat for waterfowl to successfully nest.<br>• SWHMiST[cxlix] Index #25 provides development effects and mitigation measures. | Several of the listed vegetation communities are present within the study area. Suitable nesting habitat in adjacent upland habitat may be present.<br><br>Wood Duck, Blue-winged Teal, Green-winged Teal, Hooded Merganser and Mallard documented within the vicinity of the study area (BSC et al. 2009). Only Mallards were documented during breeding bird surveys within the study area.<br><br>**Not SWH** |

**Table 3. Characteristics of Specialized Wildlife Habitat for Ecoregion 6E.**

| | Wildlife Species[1] | Candidate SWH | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | | ELC Ecosite Codes[1] | Habitat Criteria and Information Sources[1] | Defining Criteria[1] | Assessment Details |
| **Wildlife Habitat: Bald Eagle and Osprey Nesting, Foraging and Perching Habitat** | | | | | |
| Rationale:<br>Nest sites are fairly uncommon in Eco-region 6E are used annually by these species. Many suitable nesting locations may be lost due to increasing shoreline development pressures and scarcity of habitat. | Osprey<br><br>Special Concern:<br>Bald Eagle | ELC Forest Community Series: FOD, FOM, FOC, SWD, SWM and SWC directly adjacent to riparian areas – rivers, lakes, ponds and wetlands | • Nests are associated with lakes, ponds, rivers or wetlands along forested shorelines, islands, or on structures over water.<br>• Osprey nests are usually at the top of a tree whereas Bald Eagle nests are typically in super canopy trees in a notch within the tree's canopy.<br>• Nests located on man-made objects are not to be included as SWH (e.g. telephone poles and constructed nesting platforms).<br><br>Information Sources<br>• Natural Heritage Information Center (NHIC) compiles all known nesting sites for Bald Eagles in Ontario.<br>• MNRF values information (LIO/NRVIS) will list known nesting locations. Note: data from NRVIS is provided as a point and does not represent all the habitat.<br>• Nature Counts, Ontario Nest Records Scheme data.<br>• OMNRF Districts<br>• Sustainable Forestry License (SFL) companies will identify additional nesting locations through field operations.<br>• Check the Ontario Breeding Bird Atlas[ccv] or Rare Breeding Birds in Ontario for species documented<br>• Reports and other information available from CAs.<br>• Field naturalists clubs | Studies confirm the use of these nests by:<br>• One or more active Osprey or Bald Eagle nests in an area[cxlviii].<br>• Some species have more than one nest in a given area and priority is given to the primary nest with alternate nests included within the area of the SWH.<br>• For an Osprey, the active nest and a 300m radius around the nest or the contiguous woodland stand is the SWHccvii, maintaining undisturbed shorelines with large trees within this area is important[cxlviii].<br>• For a Bald Eagle the active nest and a 400-800m radius around the nest is the SWH[cvi], ccvii. Area of the habitat from 400-800m is dependent on site lines from the nest to the development and inclusion of perching and foraging habitat[cvi].<br>• To be significant a site must be used annually. When found inactive, the site must be known to be inactive for >3 years or suspected of not being used for >5 years before being considered not significant[ccvii]<br>• Observational studies to determine nest site use, perching sites and foraging areas need to be done from mid March to mid August.<br>• Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi]<br>• SWHMiST[cxlix] Index #26 provides development effects and mitigation measures | FOD, FOD, SWM and SWM vegetation communities adjacent to wetland habitats are present within the study area.<br><br>Bald Eagle and Osprey have been documented within the vicinity of the study area (BSC et al. 2009, MNRF 2018b). No nest sites were documented or target species observed during the breeding bird surveys.<br><br>**Not SWH** |

**Table 3. Characteristics of Specialized Wildlife Habitat for Ecoregion 6E.**

| | Wildlife Species[1] | Candidate SWH | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | | ELC Ecosite Codes[1] | Habitat Criteria and Information Sources[1] | Defining Criteria[1] | Assessment Details |
| **Wildlife Habitat: Woodland Raptor Nesting Habitat** | | | | | |
| Rationale:<br>Nests sites for these species are rarely identified; these area sensitive habitats and are often used annually by these species. | Northern Goshawk<br>Cooper's Hawk<br>Sharp-shinned Hawk<br>Red-shouldered Hawk<br>Barred Owl<br>Broad-winged Hawk | May be found in all forested ELC Ecosites.<br><br>May also be found in SWC, SWM, SWD and CUP3. | All natural or conifer plantation woodland/forest stands >30ha with >10ha of interior habitat[lxxxviii, lxxxix, xc, xci, xciii, xciv, xcv, xcvi, cxxxiii]. Interior habitat determined with a 200m buffer[cxlviii].<br>• Stick nests found in a variety of intermediate-aged to mature conifer, deciduous or mixed forests within tops or crotches of trees. Species such as Cooper's hawk nest along forest edges sometimes on peninsulas or small off-shore islands.<br>• In disturbed sites, nests may be used again, or a new nest will be in close proximity to old nest.<br><br>Information Sources<br>• OMNRF<br>• Check the Ontario Breeding Bird Atlas[ccv] or Rare Breeding Birds in Ontario for species documented.<br>• Check data from Bird Studies Canada<br>• Reports and other information available from CAs | Studies confirm:<br>• Presence of 1 or more active nests from species list is considered significant[cxlviii].<br>• Red-shouldered Hawk and Northern Goshawk – a 400m radius around the nest or 28ha area of habitat is the SWH[ccvii].<br>• Barred Owl – a 200m radius around the nest is the SWH[ccvii].<br>• Broad-winged Hawk and Coopers Hawk – a 100m radius around the nest is the SWH[ccvii].<br>• Sharp-shinned Hawk – a 50m radius around the nest is the SWH[ccvii].<br>• Conduct field investigations from mid-March to end of May. The use of call broadcasts can help in locating territorial (courting/nesting) raptors and facilitate the discovery of nests by narrowing down the search area.<br>• SWHMiST[cxlix] Index #27 provides development effects and mitigation measures. | Several forested ecosites are present within the study area, however, none are of a sufficient size to support woodland raptor nesting habitat.<br><br>Sharp-shinned Hawk and Cooper's Hawk have been documented within the vicinity of the study area (BSC et al. 2009). No nests or target species were observed during breeding bird surveys.<br><br>**Not SWH** |

**Table 3. Characteristics of Specialized Wildlife Habitat for Ecoregion 6E.**

| | Wildlife Species[1] | Candidate SWH | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | | ELC Ecosite Codes[1] | Habitat Criteria and Information Sources[1] | Defining Criteria[1] | Assessment Details |
| **Wildlife Habitat: Turtle Nesting Area** | | | | | |
| Rationale:<br>These habitats are rare and when identified will often be the only breeding site for local populations of turtles | Midland Painted Turtle<br><br>Special Concern:<br>Northern Map Turtle<br>Snapping Turtle | Exposed mineral soil (sand or gravel) areas adjacent (<100m)[cxlviii] or within the following ELC Ecosites:<br>MAS1<br>MAS2<br>MAS3<br>SAS1<br>SAM1<br>SAF1<br>BOO1<br>FEO1 | • Best nesting habitat for turtles are close to water and away from roads and sites less prone to loss of eggs by predation from skunks, raccoons or other animals.<br>• For an area to function as a turtle-nesting area, it must provide sand and gravel that turtles are able to dig in and are located in open, sunny areas. Nesting areas on the sides of municipal or provincial road embankments and shoulders are not SWH.<br>• Sand and gravel beaches adjacent to undisturbed shallow weedy areas of marshes, lakes, and rivers are most frequently used.<br><br>Information Sources<br>• Use Ontario Soil Survey reports and maps to help find suitable substrate for nesting turtles (well-drained sands and fine gravels).<br>• Check the Ontario Herpetofaunal Summary Atlas records or other similar atlases for uncommon turtles; location information may help to find potential nesting habitat for them.<br>• Natural Heritage Information Center (NHIC) | Studies confirm:<br>• Presence of 5 or more nesting Midland Painted Turtles<br>• One or more Northern Map Turtle or Snapping Turtle nesting is a SWH[i]<br>• The area or collection of sites within an area of exposed mineral soils where the turtles nest, plus a radius of 30-100m around the nesting area dependent on slope, riparian vegetation and adjacent land use is the SWH[cxlviii].<br>• Travel routes from wetland to nesting area are to be considered within the SWH[cxlix].<br>• Field investigations should be conducted in prime nesting season typically late spring to early summer. Observational studies observing the turtles nesting is a recommended method.<br>• SWHMiST[cxlix] Index #28 provides development effects and mitigation measures for turtle nesting habitat. | MAS2, SAS1 and SAM1 vegetation communities are present within the study area. Suitable nesting substrates (e.g. sandy soils) have been documented in some agricultural fields adjacent to wetland areas.<br><br>Midland Painted Turtle, Northern Map Turtle and Snapping Turtle have been documented within the vicinity of the study area (Ontario Nature 2018, MNRF 2018b, MNRF 2018c). No targeted turtle surveys have been completed within the study area.<br><br>**Candidate SWH** |

**Table 3. Characteristics of Specialized Wildlife Habitat for Ecoregion 6E.**

| | Wildlife Species[1] | Candidate SWH | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | | ELC Ecosite Codes[1] | Habitat Criteria and Information Sources[1] | Defining Criteria[1] | Assessment Details |
| **Wildlife Habitat: Seeps and Springs** | | | | | |
| Rationale:<br>Seeps/Springs are typical of headwater areas and are often at the source of coldwater streams. | Wild Turkey<br>Ruffed Grouse<br>Spruce Grouse<br>White-tailed Deer<br>Salamander spp. | Seeps/Springs are areas where ground water comes to the surface. Often they are found within headwater areas within forested habitats. Any forested Ecosite within the headwater areas of a stream could have seeps/springs. | Any forested area (with <25% meadow/field/pasture) within the headwaters of a stream or river system[cxvii, cxlix].<br>• Seeps and springs are important feeding and drinking areas especially in the winter will typically support a variety of plant and animal species[cxix, cxx, cxxi, cxxii, cxiii, cxiv]<br><br>Information Sources<br>• Topographical Map<br>• Thermography<br>• Hydrological surveys conducted by CAs and MOE<br>• Field naturalists clubs and landowners<br>• Municipalities and Conservation Authorities may have drainage maps and headwater areas mapped. | Field Studies confirm:<br>• Presence of a site with 2 or more seeps/springs should be considered SWH.<br>• The area of a ELC forest ecosite containing the seeps/springs is the SWH. The protection of the recharge area considering the slope, vegetation, height of trees and groundwater condition need to be considered in delineation the habitat[cxlviii]<br>• SWHMiST[cxlix] Index #30 provides development effects and mitigation measures | Forested areas are present within study area. Seepage areas are present in several communities within the study area.<br><br>White-tailed Deer and Salamander spp. have been documented within the vicinity of the study area (BSC et al. 2009, Dobbyn 1994, Ontario Nature 2018).<br><br>**Confirmed SWH** |

**Table 3. Characteristics of Specialized Wildlife Habitat for Ecoregion 6E.**

| | Wildlife Species[1] | Candidate SWH | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | | ELC Ecosite Codes[1] | Habitat Criteria and Information Sources[1] | Defining Criteria[1] | Assessment Details |
| **Wildlife Habitat: Amphibian Breeding Habitat (Woodland)** | | | | | |
| Rationale:<br>These habitats are extremely important to amphibian biodiversity within a landscape and often represent the only breeding habitat for local amphibian populations. | Eastern Newt<br>Blue-spotted Salamander<br>Spotted Salamander<br>Gray Treefrog<br>Spring Peeper<br>Western Chorus Frog<br>Wood Frog | All Ecosites associated with these ELC Community Series:<br>FOC<br>FOM<br>FOD<br>SWC<br>SWM<br>SWD<br><br>Breeding pools within the woodland or the shortest distance from forest habitat are more significant because they are more likely to be used due to reduced risk to migrating amphibians. | • Presence of a wetland, pond or woodland pool (including vernal pools) >500m$^2$ (about 25m diameter) [ccvii] within or adjacent (within 120m) to a woodland (no minimum size)[clxxxii, lxiii, lxv, lxvi, lxvii, lxviii, lxix, lxx] Some small wetlands may not be mapped and may be important breeding pools for amphibians.<br>• Woodlands with permanent ponds or those containing water in most years until mid-July are more likely to be used as breeding habitat[cxlviii]<br><br>Information Sources<br>• Ontario Herpetofaunal Summary Atlas (or other similar atlases) for records<br>• Local landowners may also provide assistance as they may hear spring-time choruses of amphibians on their property.<br>• OMNRF District<br>• OMNRF wetland evaluations<br>• Field naturalist clubs<br>• Canadian Wildlife Service Amphibian Road Call Survey<br>• Ontario Vernal Pool Association: http://www.ontariovernalpools.org | Studies confirm:<br>• Presence of breeding population of 1 or more of the listed newt/salamander species or 2 or more of the listed frog species with at least 20 individuals (adults or eggs masses)[lxxi] or 2 or more of the listed frog species with Call Level Codes of 3.<br>• A combination of observational study and call count surveys[cviii] will be required during the spring March-June when amphibians are concentrated around suitable breeding habitat within or near the woodland/wetlands.<br>• The habitat is the woodland area plus a 230m radius of woodland area[lxiii,lxv, lxvi, lxvii, lxviii, lxix, lxx, lxxi] if a wetland area is adjacent to a woodland, a travel corridor connecting the wetland to the woodland is the be included in the habitat.<br>• SWHMiST[cxlix] Index #14 provides development effects and mitigation measures. | FOC, FOD, SWM and SWD vegetation communities are present within the study area. Anuran call surveys indicate that none of the woodland pools are SWH.<br><br>Spotted Salamander, Blue-spotted Salamander, Eastern Newt, Spring Peeper, Wood Frog, Gray Treefrog and Western Chorus Frog have been documented within the vicinity of the study area (Ontario Nature 2018, MNRF 2018b). No targetted salamander trapping has been completed.<br><br>**Candidate SWH (Salamanders)** |

**Table 3. Characteristics of Specialized Wildlife Habitat for Ecoregion 6E.**

| | Wildlife Species[1] | Candidate SWH | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | | ELC Ecosite Codes[1] | Habitat Criteria and Information Sources[1] | Defining Criteria[1] | Assessment Details |
| **Wildlife Habitat: Amphibian Breeding Habitat (Wetland)** | | | | | |
| Rationale:<br>These habitats are extremely important to amphibian biodiversity within a landscape and often represent the only breeding habitat for local amphibian populations | Eastern Newt<br>American Toad<br>Spotted Salamander<br>Four-toed Salamander<br>Blue-spotted Salamander<br>Gray Tree frog<br>Western Chorus Frog<br>Northern Leopard Frog<br>Pickerel Frog<br>Green Frog<br>Mink Frog<br>Bullfrog | ELC Community Classes SW, MA, FE, BO, OA and SA.<br><br>Typically these wetland ecosites will be isolated (>120m) from woodland ecosites, however larger wetlands containing predominantly aquatic species (e.g. Bull Frog) may be adjacent to woodlands. | • Wetlands >500m2 (about 25m diameter)[ccvii] supporting high species diversity are significant; some small or ephemeral habitats may not be identified on MNRF mapping and could be important amphibian breeding habitats[clxxxiv].<br>• Presence of shrubs and logs increase significance of pond for some amphibian species because of available structure for calling, foraging, escape and concealment from predators.<br>• Bullfrogs require permanent water bodies with abundant emergent vegetation.<br><br>Information Sources<br>• Ontario Herpetofaunal Summary Atlas (or other similar atlases)<br>• Canadian Wildlife Service Amphibian Road Surveys and Backyard Amphibian Call Count.<br>• OMNRF Districts and wetland evaluations<br>• Reports and other information available from CAs. | Studies confirm:<br>• Presence of breeding population of 1 or more of the listed newt/salamander species or 2 or more of the listed frog/toad species and with at least 20 individuals (adults or eggs masses)[lxxi, lxxiii], or 2 or more of the listed frog/toad species with Call Level Codes of 3. or; Wetland with confirmed breeding Bullfrogs are significant.<br>• The ELC ecosite wetland area and the shoreline are the SWH.<br>• A combination of observational study and call count surveys[cviii] will be required during spring March to June) when amphibians are concentrated around suitable breeding habitat within or near the wetlands.<br>• If a SWH is determined for Amphibian Breeding Habitat (Wetlands) then Movement Corridors are to be considered as outlined in Table 1.4.1 of this Schedule.<br>• SWHMiST[cxlix] Index #15 provides development effects and mitigation measures. | SW, MA, SA and OA vegetation communities are present within the study area. Anuran call surveys indicate that the wetland at ANR-007 and ANR-009 is confirmed SWH for anuran breeding.<br><br>Eastern Newt, American Toad, Spotted Salamander, Four-toed Salamander, Blue-spotted Salamander, Gray Tree Frog, Western Chorus Frog, Northern Leopard Frog, Pickerel Frog, Green Frog, and Bullfrog have been documented within the vicinity of the study area (Ontario Nature 2018, MNRF 2018b). No targetted salamnder trapping has been completed.<br><br>**Confirmed SWH (Anurans)**<br>**Candidate SWH (Salamanders)** |

**Table 3. Characteristics of Specialized Wildlife Habitat for Ecoregion 6E.**

| | Wildlife Species[1] | Candidate SWH | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | | ELC Ecosite Codes[1] | Habitat Criteria and Information Sources[1] | Defining Criteria[1] | Assessment Details |
| **Woodland Area-Sensitive Bird Breeding Habitat** | | | | | |
| Rationale:<br>Large, natural blocks of mature woodland habitat within the settled areas of Southern Ontario are important habitats for area sensitive interior forest song birds. | Yellow-Bellied Sapsucker<br>Red-breasted Nuthatch<br>Veery<br>Blue-headed Vireo<br>Northern Parula<br>Black-throated Green Warbler<br>Blackburnian Warbler<br>Black-throated Blue Warbler<br>Ovenbird<br>Scarlet Tanager<br>Winter Wren<br><br>Special Concern:<br>Cerulean Warbler<br>Canada Warbler | All Ecosites associated with these ELC Community Series:<br>FOC<br>FOM<br>FOD<br>SWC<br>SWM<br>SWD | • Habitats where interior forest breeding birds are breeding, typically large mature (>60 yrs old) forest stands or woodlots >30 ha.[cv, cxxxi, cxxxii, cxxxiii, cxxxiv, cxxv, cxxvi, cxxxvii, cxxxviii, cxxxix, cxl, cxli, cxlii, cxliii, cxliv, cxlv, cxlvi, cl, cli, clii, cliii, cliv, clv, clvii, clviii, clix]<br>• Interior forest habitats are at least 200m from forest edge habitat.<br><br>Information Sources<br>• Local bird clubs<br>• Canadian Wildlife Service (CWS) for the location of forest bird monitoring.<br>• Bird studies Canada conducted a 3-year study of 287 woodlands to determine the effects of forest fragmentation on forest birds and to greatest value to interior species<br>• Reports and other information available from CAs. | • Presence of nesting or breeding pairs of 3 or more of the listed wildlife species.<br>• Note: any site with breeding Cerulean Warblers or Canada Warblers is to be considered SWH.<br>• Conduct field investigations in spring and early summer when birds are singing and defending their territories.<br>• Evaluation methods to follow “Bird and Bird Habitats:<br>Guidelines for Wind Power Projects”[ccxi]<br>• SWHMiST[cxlix] Index #34 provides development effects and mitigation measures. | FOC, FOD, SWM and SWD vegetation communities are present within the study area. Vegetation communities may be > 30 ha in size when considering contiugous areas beyond the study area, however, no interior habitat is present based on the criteria for it to be at least 200 m from the forest edge.<br><br>Red-breasted Nuthatch, Veery, Black-throated Green Warbler, Ovenbird, Canada Warbler, Scarlet Tanager and Winter Wren have been documented within the vicinity of the study area (BSC et al. 2009). Only a single Veery and a single Blue-headed Vireo were documented during breeding bird surveys.<br><br>**Not SWH** |

**Significant Wildlife Habitat Assessment Tables**

**Table 4. Characteristics of Habitat for Species of Conservation Concern for Ecoregion 6E.**

| | Wildlife Species[1] | Candidate SWH | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | | ELC Ecosite Codes[1] | Habitat Criteria and Information Sources[1] | Defining Criteria[1] | Assessment Details |
| **Wildlife Habitat: Marsh Bird Breeding Habitat** | | | | | |
| Rationale:<br>Wetlands for these bird species are typically productive and fairly rare in Southern Ontario landscapes. | American Bittern<br>Virginia Rail<br>Sora<br>Common Gallinule<br>American Coot<br>Pied-billed Grebe<br>Marsh Wren<br>Sedge Wren<br>Common Loon<br>Sandhill Crane<br>Green Heron<br>Trumpeter Swan<br><br>Special Concern:<br>Black Tern<br>Yellow Rail | MAM1<br>MAM2<br>MAM3<br>MAM4<br>MAM5<br>MAM6<br>SAS1<br>SAM1<br>SAF1<br>FEO1<br>BOO1<br><br>For Green Heron:<br>All SW, MA and CUM1 sites. | • Nesting occurs in wetlands<br>• All wetland habitat is to be considered as long as there is shallow water with emergent aquatic vegetation present[cxxiv].<br>• For Green Heron, habitat is at the edge of water such as sluggish streams, ponds and marshes sheltered by shrubs and trees. Less frequently, it may be found in upland shrubs or forest a considerable distance from water.<br><br>Information Sources<br>• Contact OMNRF, wetland evaluations are a good source of information.<br>• Field naturalist clubs<br>• Natural Heritage Information Center (NHIC) Records<br>• Reports and other information available from CAs.<br>• Ontario Breeding Bird Atlas[ccv] | Studies confirm:<br>• Presence of 5 or more nesting pairs of Sedge Wren or Marsh Wren or 1 pair of Sandhill Cranes; or breeding by any combination of 5 or more of the listed species[i].<br>• Note: any wetland with breeding of 1 or more Black Terns, Trumpeter Swan, Green Heron or Yellow Rail is SWH[i].<br>• Area of the ELC ecosite is the SWH<br>• Breeding surveys should be done in May/June when these species are actively nesting in wetland habitats.<br>• Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi].<br>• SWHMiST[cxlix] Index #35 provides development effects and mitigation | MAM, SAS, and SAM vegetation communities are present within the study area.<br><br>Virginia Rail, Sora, American Coot, Pied-billed Grebe, Marsh Wren, Sandhill Crane, Green Heron, Trumpeter Swan and Black Tern have been documented within the vicinity of the study area (BSC et al 2006). No listed species were documented during breeding bird surveys.<br><br>**Not SWH** |

**Table 4. Characteristics of Habitat for Species of Conservation Concern for Ecoregion 6E.**

| | Wildlife Species[1] | Candidate SWH | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | | ELC Ecosite Codes[1] | Habitat Criteria and Information Sources[1] | Defining Criteria[1] | Assessment Details |
| **Wildlife Habitat: Open Country Bird Breeding Habitat** | | | | | |
| Rationale:<br>This wildlife habitat is declining throughout Ontario and North America. Species such as the Upland Sandpiper have declined significantly the past 40 years based on CWS (2004) trend records. | Upland Sandpiper<br>Grasshopper Sparrow<br>Vesper Sparrow<br>Northern Harrier<br>Savannah Sparrow<br><br>Special Concern:<br>Short-eared Owl | CUM1<br>CUM2 | Large grassland areas (includes natural and cultural fields and meadows) >30 ha [clx, clxi, clxii, clxiii, clxiv, clxv, clxvi, clxvii, clxviii, clxix]. Grasslands not Class 1 or 2 agricultural lands, and not being actively used for farming (i.e. no row cropping or intensive hay or livestock pasturing in the last 5 years)[i].<br><br>Grassland sites considered significant should have a history of longevity, either abandoned fields, mature hayfields and pasturelands that are at least 5 years or older.<br><br>The Indicator bird species are area sensitive requiring larger grassland areas than the common grassland species.<br><br>Information Sources<br>• Agricultural land classification maps, Ministry of Agriculture.<br>• Ask local birders<br>• Ontario Breeding Bird Atlas[ccv]<br>• Reports and other information available from CAs. | Field Studies confirm:<br>• Presence of nesting or breeding of 2 or more of the listed species.<br>• A field with 1 or more breeding Short-eared Owl is to be considered SWH.<br>• The area of SWH is the contiguous ELC ecosite field areas.<br>• Conduct field investigations of the most likely areas in spring and early summer when birds are singing and defending their territories.<br>• Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi].<br>• SWHMiST[cxlix] Index #32 provides development effects and mitigation measures. | CUM1 and CUM2 vegetation communities are present within the study area. However, contiguous grassland that is not being actively used for farming is less than 30 ha in size.<br><br>Vesper Sparrow and Savannah Sparrow have been documented within the vicinity of the study area (eBird 2018). Only Savannah Sparrows documented during breeding bird surveys.<br><br>**Not SWH** |

**Table 4. Characteristics of Habitat for Species of Conservation Concern for Ecoregion 6E.**

| | Wildlife Species[1] | Candidate SWH | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | | ELC Ecosite Codes[1] | Habitat Criteria and Information Sources[1] | Defining Criteria[1] | Assessment Details |
| **Wildlife Habitat: Shrub/Early Successional Bird Breeding Habitat** | | | | | |
| Rationale:<br>This wildlife habitat is declining throughout Ontario and North America. The Brown Thrasher has declined significantly over the past 40 years based on CWS (2004) trend records cxcix. | Indicator spp.:<br>Brown Thrasher<br>Clay-coloured Sparrow<br><br>Common spp.:<br>Field Sparrow<br>Black-billed Cuckoo<br>Eastern Towhee<br>Willow Flycatcher<br><br>Special Concern:<br>Yellow-breasted Chat<br>Golden-winged Warbler | CUT1<br>CUT2<br>CUS1<br>CUS2<br>CUW1<br>CUW2<br><br>Patches of shrub ecosites can be complexed into a larger habitat for some bird species. | Large field areas succeeding to shrub and thicket habitats>10ha[cbxiv] in size.<br>• Shrub land or early successional fields, not class 1 or 2 agricultural lands, not being actively used for farming (i.e. no row-cropping, haying or live-stock pasturing in the last 5 years)[j].<br><br>Shrub thicket habitats (>10 ha) are most likely to support and sustain a diversity of these species [cbxiii].<br><br>Shrub and thicket habitat sites considered significant should have a history of longevity, either abandoned fields or pasturelands.<br><br>Information Sources<br>• Agricultural land classification maps Ministry of Agriculture<br>Local bird clubs<br>• Ontario Breeding Bird Atlas[ccv]<br>• Reports and other information available from CAs | Field Studies confirm:<br>• Presence of nesting or breeding of 1 of the indicator species and at least 2 of the common species[j].<br>• A field with breeding Yellow-breasted Chat or Golden-winged Warbler is to be considered as Significant Wildlife Habitat.<br>• The area of the SWH is the contiguous ELC ecosite field/thicket area.<br>• Conduct field investigations of the most likely areas in spring and early summer when birds are singing and defending their territories<br>• Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi]<br>• SWHMiST[cxlix] Index #33 provides development effects and mitigation measures. | CUW1 vegetation communitiy is present within the study area. However, these habitats do not contain shrub or thicket areas greater than 10 ha in size.<br><br>Brown Thrasher, Clay-coloured Sparrow, Field Sparrow, Black-billed Cuckoo, Eastern Towhee, Willow Flycatcher, Yellow-breasted Chat and Golden-winged Warbler have been documented within the vicinity of the study area (BSC et al. 2009). No Indicator species and only Field Sparrow and Willow Flycatcher of the Common species were documented during breeding bird surveys.<br><br>**Not SWH** |

**Table 4. Characteristics of Habitat for Species of Conservation Concern for Ecoregion 6E.**

| | Wildlife Species[1] | Candidate SWH | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | | ELC Ecosite Codes[1] | Habitat Criteria and Information Sources[1] | Defining Criteria[1] | Assessment Details |
| **Wildlife Habitat: Terrestrial Crayfish** | | | | | |
| Rationale:<br>Terrestrial Crayfish are only found within SW Ontario in Canada and their habitats are very rare. [ccii] | Chimney or Digger Crayfish: (*Fallicambarus fodiens*)<br><br>Devil Crawfish or Meadow Crayfish: (*Cambarus Diogenes*) | MAM1<br>MAM2<br>MAM3<br>MAM4<br>MAM5<br>MAM6<br>MAS1<br>MAS2<br>MAS3<br>SWD<br>SWT<br>SWM | Wet meadow and edges of shallow marshes (no minimum size) identified should be surveyed for terrestrial crayfish.<br>• Constructs burrows in marshes, mudflats, meadows, the ground can't be too moist. Can often be found far from water.<br>• Both species are a semi-terrestrial burrower which spends most of its life within burrows consisting of a network of tunnels. Usually the soil is not too moist so that the tunnel is well formed.<br><br>Information Sources<br>• Information sources from "Conservation Status of Freshwater Crayfishes" by Dr. Premek Hamr for the WWF and CNF March 1998 | Studies Confirm:<br>• Presence of 1 or more individuals of species listed or their chimneys (burrows) in suitable marsh meadow or terrestrial sites[cci]<br>• Area of ELC Ecosite or an ecoelement area of meadow marsh or swamp within the larger ecosite area is the SWH<br>• Surveys should be done April to August during in temporary or permanent water<br>Note the presence of burrows or chemistry are often the only indicator of presence, observance or collection of individuals is very difficult[cci]<br>• SWHMiST[cxlix] Index #36 provides development effects and mitigation measures. | MAM2, MAS2, SWD and SWM vegetation communities are present within the study area.<br><br>No terrestrial crayfish chimneys were observed in the study area.<br><br>**Not SWH** |

**Table 4. Characteristics of Habitat for Species of Conservation Concern for Ecoregion 6E.**

| | Wildlife Species[1] | Candidate SWH | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | | ELC Ecosite Codes[1] | Habitat Criteria and Information Sources[1] | Defining Criteria[1] | Assessment Details |
| **Wildlife Habitat: Special Concern and Rare Wildlife Species** | | | | | |
| Rationale:<br>These species are quite rare or have experienced significant population declines in Ontario. | All Special Concern and Provincially Rare (S1-S3, SH) plant and animal species. Lists of these species are tracked by the Natural Heritage Information Centre. | All plant and animal element occurrences (EO) within a 1 or 10km grid.<br><br>Older element occurrences were recorded prior to GPS being available, therefore location information may lack accuracy. | When an element occurrence is identified within a 1 or 10 km grid for a Special Concern or provincially Rare species; linking candidate habitat on the site needs to be completed to ELC Ecosites[lxxviii].<br><br>Information Sources<br>• Natural Heritage Information Centre (NHIC) will have the Special Concern and Provincially Rare (S1-S3, SH) species lists with element occurrences data.<br>• NHIC Website: "Get Information": http://nhic.mnr.gov.on.ca<br>• Ontario Breeding Bird Atlas[ccv]<br>• Expert advice should be sought as many of the rare spp. have little information available about their requirements. | Studies Confirm:<br>• Assessment/inventory of the site for the identified special concern or rare species needs to be completed during the time of year when the species is present or easily identifiable.<br><br>• The area of the habitat to the finest ELC scale that protects the habitat form and function is the SWH, this must be delineated through detailed field studies. The habitat needs to be easily mapped and cover an important life stage component for a species e.g. specific nesting habitat or foraging habitat.<br>• SWHMiST[cxlix] Index #37 provides development effects and mitigation measures. | Several Special Concern and Provincially Rare species have been documented within the vicinity of the study area. Refer to Species of Conservation Concern Screening for details (Appendix II).<br><br>**Confirmed SWH** |

**Significant Wildlife Habitat Assessment Tables**

**Table 5. Characteristics of Animal Movement Corridors for Ecoregion 6E.**

| | Wildlife Species[1] | Candidate SWH | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | | ELC Ecosite Codes[1] | Habitat Criteria and Information Sources[1] | Defining Criteria[1] | Assessment Details |
| **Wildlife Habitat: Amphibian Movement Corridors** | | | | | |
| **Rationale:**<br>Movement corridors for amphibians moving from their terrestrial habitat to breeding habitat can be extremely important for local populations. | Eastern Newt<br>Blue-spotted Salamander<br>Spotted Salamander<br>Gray Treefrog<br>Spring Peeper<br>Western Chorus Frog<br>Northern Leopard Frog<br>Pickerel Frog<br>Green Frog<br>Mink Frog<br>Bullfrog | Corridors may be found in all ecosites associated with water.<br>• Corridors will be determined based on identifying the significant breeding habitat for these species in Table 1.1. | Movement corridors between breeding habitat and summer habitat [clxxiv, clxxv, clxxvi, clxxvii, clxxviii, clxxix, clxxx, clxxxi].<br><br>Movement corridors must be determined when Amphibian breeding habitat is confirmed as SWH from Table 1.2.2 (Amphibian Breeding Habitat – Wetland) of this Schedule[i].<br><br>Information Sources<br>• MNRF District Office<br>• Natural Heritage Information Center NHIC<br>• Reports and other information available from CAs<br>• Field Naturalist Clubs | • Field Studies must be conducted at the time of year when species are expected to be migrating or entering breeding sites.<br>• Corridors should consist of native vegetation, with several layers of vegetation. Cooridors unbroken by roads, waterways or bodies, and undeveloped areas are most significant[cxlix].<br>• Corridors should have at least 15m of vegetation on both sides of waterway [cxlix] or be up to 200m wide[cxlix] of woodland habitat and with gaps <20m [cxlix].<br>• Shorter corridors are more significant than longer corridors, however amphibians must be able to get to and from their summer and breeding habitat[cxlix].<br>• SWHMiST[cxlix] Index #40 provides development effects and mitigation measures. | Confirmed amphibian breeding SWH (for anurans) was identified as present within the study area. Candidate amphibian breeding SWH (for salamanders) is also present. Several watercourses within the study area may provide a movement corridor.<br><br>Eastern Newt, Blue-spotted Salamander, Spotted Salamander, Gray Treefrog, Spring Peeper, Western Chorus Frog, Northern Leopard Frog, Green Frog, Pickerel Frog, and Bullfrog have been documented within the vicinity of the study area (Ontario Nature 2018).<br><br>**Candidate SWH** |

**Table 5. Characteristics of Animal Movement Corridors for Ecoregion 6E.**

| | Wildlife Species[1] | Candidate SWH | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|
| | | ELC Ecosite Codes[1] | Habitat Criteria and Information Sources[1] | Defining Criteria[1] | Assessment Details |
| **Wildlife Habitat: Deer Movement Corridors** | | | | | |
| Rationale:<br>Corridors important for all species to be able to access seasonally important life-cycle habitats or to access new habitat for dispersing individuals by minimizing their vulnerability while travelling. | White-tailed Deer | Corridors may be found in all forested ecosites.<br><br>A Project Proposal in Stratum II Deer Wintering Area has potential to contain corridors. | Movement corridor must be determined when Deer Wintering Habitat is confirmed as SWH from Table 1.1 of this schedule[i].<br>• A deer wintering habitat identified by the OMNRF as SWH in Table 1.1 of this Schedule will have corridors that the deer use during fall migration and spring dispersion [clxxii, clxxiii, cxlix, cxciv].<br>• Corridors typically follow riparian areas, woodlots, areas of physical geography (ravines, or ridges).<br><br>Information Sources<br>• MNRF District Office<br>• Natural Heritage Information Center (NHIC)<br>• Reports and other information available from CAs<br>• Field Naturalist Clubs | • Studies must be conducted at the time of year when deer are migrating or moving to and from winter concentration areas.<br>• Corridors that lead to a deer wintering yard should be unbroken by roads and residential areas.<br>• Corridors should be at least 200m wide[cxlix] with gaps <20m[cxlix] and if following riparian area with at least 15m of vegetation on both sides of waterway[cxlix]. Shorter corridors are more significant than longer corridors[cxlix]<br>• SWHMiST[cxlix] Index #39 provides development effects and mitigation measures. | Deer wintering habitat is not present within the study area.<br><br>White-tailed Deer are documented in the vicinity of the study area (Dobbyn 1994). No targeted mammal surveys were completed within the study area.<br><br>**Not SWH** |

**Significant Wildlife Habitat Assessment Tables**

**Table 6. Exceptions for Ecodistricts within Ecoregion 6E.**

| | Wildlife Habitat and Species | Candidate SWH | | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|---|
| | | Ecosites | Habitat Description | Habitat Criteria and Information Sources[1] | Defining Criteria[1] | Assessment Details |
| **EcoDistrict: 6E-14** | | | | | | |
| Rationale:<br>The Bruce Peninsula has an isolated and distinct population of black bears. Maintenance of large woodland tracks with mast producing tree species is important for bears. clxxxvi, ccxvii | **Mast Producing Areas**<br><br>Black Bear | All Forested habitat represented by ELC Community Series: FOM FOD | • Black bears require forested habitat that provides cover, winter hibernation sites, and mast producing tree species. clxxxv, clxxxvii, clxxxviii, clxxxix, cxc, cxci, cxcii, cxciii, ccxvii<br><br>• Forested habitats need to be large enough to provide cover and protection for black bears ccxvii. | Woodland ecosites >30ha with mast-producing tree species, either soft (cherry) or hard (oak and beech), Information Sources Important forest habitat for black bears may be identified by OMNRF. | • All woodlands > 30 ha with a 50% composition of these ELC Vegetation Types are considered significant:<br>FOM1-1<br>FOM2-1<br>FOM3-1<br>FOD1-1<br>FOD1-2<br>FOD2-1<br>FOD2-2<br>FOD2-3<br>FOD2-4<br>FOD4-1<br>FOD5-2<br>FOD5-3<br>FOD5-7<br>FOD6-5<br><br>• SWHMiST cxlix Index #3 provides development effects and mitigation measures. | Study area not within the Bruce Peninsula.<br><br>**Not SWH** |

**Table 6. Exceptions for Ecodistricts within Ecoregion 6E.**

| | Wildlife Habitat and Species | Candidate SWH | | | Confirmed SWH | Study Area |
|---|---|---|---|---|---|---|
| | | Ecosites | Habitat Description | Habitat Criteria and Information Sources[1] | Defining Criteria[1] | Assessment Details |
| **EcoDistrict: 6E-17** | | | | | | |
| Rationale:<br>Sharp-tailed grouse only occur on Manitoulin Island in Ecoregion 6E, Leks are an important habitat to maintain their population | **Lek**<br><br>Sharp-tailed Grouse | CUM<br>CUS<br>CUT | • The lek or dancing ground consists of bare, grassy or sparse shrubland. There is often a hill or rise in topographyccxix.<br>• Leks are typically a grassy field/meadow >15h with adjacent shrublands and >30ha with adjacent deciduous woodland. Conifer trees within 500m are not tolerated. ccxix | Grasslands (field/meadow) are to be >15ha when adjacent to shrubland and >30ha when adjacent to deciduous woodland[ccxix].<br>• Grasslands are to be undisturbed with low intensities of agriculture (light grazing or late haying)<br>• Leks will be used annually if not destroyed by cultivation or invasion by woody plants or tree planting[ccxix] Information Sources<br>• OMNRF district office<br>• Bird watching clubs<br>• Local landowners<br>• Ontario Breeding Bird Atlas | Studies confirming lek habitat are to be completed from late March to June.<br>• Any site confirmed with sharp-tailed grouse courtship activities is considered significant<br>• The field/meadow ELC ecosites plus a 200 m radius area with shrub or deciduous woodland is the lek habitat<br>• SWHMiST [cxlix] Index #32 provides development effects and mitigation measures | Study area not on Manitoulin Island.<br><br>**Not SWH** |

# Appendix IV
# Terms of Reference

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

December 5, 2018 Project No. 2171

John Bayley
IBI Group
410 Albert Street, Suite 101
Waterloo, ON
N2L 3V3

Dear Mr. Bayley,

**Re: Maple Grove Road Improvements**
**Class Environmental Assessment Terms of Reference**

On behalf of Natural Resource Solutions Inc. (NRSI), I am pleased to provide the following Terms of Reference (TOR) for the completion of environmental studies to support the Class Environmental Assessment for improvements to Maple Grove Road.

NRSI's primary role in this project will be to complete an Environmental Impact Study (EIS) to inform the Environmental Screening Report, including the evaluation of alternatives. NRSI will be providing input and expertise in regards to the following components of the Project:

1. Natural Environment, including field investigations to characterize the existing conditions, identify potential impacts, and to identify appropriate mitigation;
2. Selection of the preferred alternative design (from the natural heritage perspective only);
3. Communications with regard to permitting requirements by the Grand River Conservation Authority (GRCA), Ontario Ministry of Natural Resources and Forestry (MNRF) and Fisheries and Oceans Canada (DFO).

The study area includes all lands within 250 m of the Maple Grove Road Right-of-Way (ROW) between Fountain Street and Hespeler Road in the City of Cambridge (Map 1). The entire study area falls within Ecoregion 6E and is located within the Grand River Watershed.

Please do not hesitate to contact me if you have any questions or comments regarding the content of the following proposed TOR. Note that due to the timing of the project award and seasonal survey periods, a number of the proposed field studies have been completed.

Sincerely,
Natural Resource Solutions Inc.



Brett Woodman, M.E.S.
Senior Manager

**Maple Grove Road Improvements**
**Class Environmental Assessment Terms of Reference**
December 5, 2018

## 1.0 Introduction

An Environmental Study Report was filed by the Regional Municipality of Waterloo (RMOW) in 2004 for the proposed widening and reconstruction of Sportsworld Drive/Maple Grove Road from King Street to Hespeler Road. Phase I and II construction of Sportsworld Drive/Maple Grove Road between King Street and Fountain Street was completed in 2007 and 2010, respectively. Due to several changes since the Class Environmental Assessment was completed in 2004, the Region has commissioned a new Class EA for improvements to Maple Grove Road between Fountain Street and Hespeler Road. Such proposed improvements include, but are not limited to, re-alignment, widening, intersection improvements (i.e. roundabouts, traffic control signals), enhanced pedestrian and cycling facilities, and the rehabilitation and widening of the Ellis Creek bridge. The new project study area includes all lands within 250 m of the Maple Grove Road Right-of-Way (ROW) between Fountain Street and Hespeler Road in the City of Cambridge (Map 1).

Several significant natural features are present within the study area. Watercourses include Ellis Creek, East Creek and Middle Creek. Wetlands include the Ellis Creek Wetland Complex, Speed River Wetland Complex and Maple Grove Road Wetland Complex which are all Provincially Significant Wetlands (PSW). The West Creek Wetland Complex, a non-PSW wetland, is also present (MNRF 2014). Several Significant Woodlands that are designated as Core Environmental Features are present throughout the study area (MNRF 2014, RMOW 2015). A portion of the Speed River Significant Valley, (RMOW 2015), occurs within the study area. North of Maple Grove Road, the study area falls within the natural heritage system governed by the Growth Plan for the Greater Golden Horseshoe (MNRF 2014).

The following identifies the scope of work required to complete the Class Environmental Assessment for the Maple Grove Road Improvements Class EA. The identified scope of work is being submitted as a draft TOR to the GRCA, MNRF, City of Cambridge, and the RMOW for review and approval. The review will ensure that a suitable level of field effort is being executed to appropriately identify existing habitat and species within the study area. This may involve a follow-up meeting, as well as email correspondence and teleconference(s) as required. This TOR will ensure all reviewing agencies are satisfied with the proposed level of work.

## 2.0 Project Approach

The approach has been divided into six components:

1. Characterization of existing natural heritage features and functions within the study area;
2. Identification of opportunities and constraints in relation to existing natural heritage features;
3. Evaluation of alternatives, including natural environment input to the identification of a preferred alternative based on the sensitivity and significance of existing natural heritage features;
4. Impact analysis, including the identification of potential impacts from the proposed development and recommendation of mitigative measures to address potential impacts;
5. Reporting, including existing conditions characterization, identification of opportunities and constraints, evaluation of alternatives, impact analysis and recommended mitigation measures as well as opportunities for enhancement and restoration within the study area; and
6. Identification of natural environment permit requirements. Based on the outcome of the assessment of potential impacts of the preferred alternative, NRSI will identify potential permit requirements under the *Endangered Species Act*, 2007 (ESA) and *Fisheries Act*, 1985.

## 3.0 Natural Environment Characterization

### 3.1 Background Information Collection and Review

All available existing background natural environment information for the study area and adjacent lands will be collected and reviewed. This will include data from the GRCA, City of Cambridge, RMOW, MNRF, Natural Heritage Information Centre (NHIC), as well as associated databases, reports, and websites. This information will be compiled and assessed for data gaps. Field study methods will be refined to ensure that any identified data gaps are addressed. This review will provide further detail on the identified natural areas as well as on Species at Risk (SAR) and Species of Conservation Concern (SCC) that have the potential to occur within the study area. A preliminary SAR and SCC screening exercise (Appendices I and II) identified potential habitat for 21 SAR and 62 SCC within the study area. A preliminary Significant Wildlife Habitat (SWH) screening exercise (Appendix III) identified 17 candidate SWH types in the study area.

NRSI has submitted background information requests to the GRCA and MNRF, and a response from the MNRF has been received.

### 3.2 Field Investigations

The following field studies will be completed to characterize the existing natural features within the study area. Note that certain field studies were completed in the fall of 2018 in order to meet appropriate seasonal survey periods.

*Terrestrial Field Surveys*

- Vegetation community classification and delineation. Communities were mapped and described to vegetation community type on September 24 and September 27, 2018, in accordance with the Ecological Land Classification (ELC) for Southern Ontario Protocol 2nd Edition (Lee et al. 1998). No significant vegetation communities were documented within the study area.

- A three-season vegetation inventory of vascular flora species within each vegetation community. A fall survey was completed on September 24 and September 27, 2018 in which five (5) regionally rare species were documented. Spring and summer surveys will be completed in 2019.
- Delineation and mapping of any woodland driplines and wetland boundaries within and adjacent to the road ROW, and verification with review agency staff, will be completed in the summer of 2019.
- All trees ≥ 10 cm diameter at breast height (DBH) that may potentially be impacted by the road improvement design (i.e. where trees are located within the potential construction limits) will be inventoried by Certified Arborists and assessed for health condition and potential for structural failure in the fall of 2018.
- Bat cavity tree habitat assessments will be completed during the winter of 2018/19 within the leaf-off period (approx. end of October – April) to determine the potential presence of SAR bat habitat.
- Three breeding bird surveys will be conducted during the peak breeding season (end of May – early July of 2019). Evidence of breeding will be collected as per the standard Ontario Breeding Bird Atlas (OBBA) methodology (BCS 2001).
- Two crepuscular (nighttime) bird surveys will be conducted during the peak breeding season (end of May – early July of 2019) in accordance with draft Canadian Nightjar Survey Protocol (Knight 2018).
- Three anuran call surveys, which will involve point count surveys at several wetland locations within the study area to record auditory observations, will be conducted throughout the amphibian breeding season (late March/early April, May, and June of 2019) following the Marsh Monitoring Program Protocol (BSC. 2009).
- Candidate SWH and habitats for SAR identified during the desktop screening exercise will be further examined in the field. The form, attributes, and function of each habitat will be described in detail and photographic records will be taken. These surveys will occur concurrently with other field surveys.
- Incidental observations of all wildlife species will be recorded. This will include direct observations, as well as indirect observations such as tracks, scat, vocalizations, etc.

*Aquatic Field Surveys*

- Existing aquatic habitat features within 20 m upstream and downstream of each watercourse crossing of Maple Grove Road, within the study area, as well as additional 40 m reaches between the watercourse crossings of Maple Grove Road and the Speed River were characterized on October 18, 2018. The following physical parameters were documented during the survey:
    - Substrate type;
    - Channel depth, width, bankfull width, etc.;
    - Water temperature;
    - Dissolved oxygen;
    - pH, conductivity and total dissolved solids;
    - General bank stability;
    - Riparian and aquatic vegetation;
    - Cover type and quality; and
    - Flow conditions.
- Electrofishing surveys were completed on October 25, 2018 to characterize the fish community within 20 m upstream and downstream of each watercourse crossing of Maple Grove Road within the study area.

### 3.3 Natural Environment Technical Report

A Natural Environment Technical Report will be prepared to summarize the findings of the background information review and natural environment fieldwork described above. This report will provide a characterization of the natural features within the study area and identify natural environment constraints, such as significant habitat features and habitat for significant species.

The Natural Environment Technical Report will include mapping to show the accurate location of all inventoried trees overlaid onto a base map of the existing road infrastructure within the study area. A table summarizing the tree inventory results, which will include species, tree ID, DBH (cm), health condition and potential for structural failure will be provided, along with a map identifying trees that should be considered for protection and retention during development.

## 4.0 Environmental Impact Study Report and Tree Protection Plan

The EIS report will be prepared based on details of the preferred preliminary or detailed design, which will form the basis of NRSI's impact assessment. The impact assessment will identify areas where the preferred road design conflicts with existing natural features or habitats such that negative impacts may occur. Recommendations will be provided to avoid, or otherwise minimize or mitigate anticipated impacts.

The EIS will include a Tree Protection Plan, which will include mapping that overlays the tree inventory results onto details of the preferred or detailed design to identify and quantify tree removal requirements and possible compensation. The report will provide recommendations for tree retention within the ROW as well as measures to mitigate construction damage to adjacent retained trees.

Maps will be prepared that identify natural feature constraints and recommended setbacks, as well as trees that are to be retained, removed, or likely to incur damage, including their dripline. A Tree Protection Plan map will also be prepared that identifies the location and type of mitigation measures to be implemented prior to and during construction (tree protection fencing).

## 5.0 Endangered Species Act Compliance

All SAR encountered during field work will be brought to the project team's attention. If additional measures or targeted field surveys are required to assess SAR, such as may be required based on field findings or consultation with MNRF, this is considered outside the scope of this work plan.

## 6.0 DFO Self-Assessment

The *Fisheries Act* requires that projects avoid causing serious harm to fish unless authorized by the Minister of Fisheries and Oceans Canada. This applies to work being conducted in or near water bodies that support fish that are part of or that support a commercial, recreational or Aboriginal fishery. As a component of the EIS, NRSI will determine potential impacts that could contravene the *Fisheries Act* and will identify permitting steps or requirements that would need to be addressed following Detailed Design.

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**Subject:** RE: Maple Grove Rd Improvements Class EA Terms of Reference
**From:** John Brum <jbrum@grandriver.ca>
**Date:** 7/24/2019, 11:06 AM
**To:** Heather Fotherby <hfotherby@nrsi.on.ca>
**CC:** Brett Woodman <bwoodman@nrsi.on.ca>, Tony Zammit <tzammit@grandriver.ca>, Beth Brown <bbrown@grandriver.ca>, "Delton Zehr (DZehr@regionofwaterloo.ca)" <DZehr@regionofwaterloo.ca>, 'John Bayley' <john.bayley@ibigroup.com>

Hi Heather:

As we discussed, Tony Zammit of our office has reviewed the terms of reference and offers the following comments for your review and consideration:

*The terms of reference prepared by NRSI (dated December 5, 2018) are generally acceptable.*

1. *The second bullet on page 4 states:*

*"Delineation and mapping of any woodland driplines and wetland boundaries within and adjacent to the road ROW, and verification with review agency staff, will be completed in the summer of 2019."*

*For added clarification, we suggest that this task can be scoped down depending on the validity of the existing mapping and the results of the vegetation inventory work. It is requested that any wetland mapping errors be highlighted and that these wetland areas be reviewed in the field and approved by the GRCA's ecologist. Wetland boundaries will need to be delineated more precisely and surveyed during the detailed design stage.*

2. *It is further requested that wetland boundaries be delineated in accordance with the most current version of the Ontario Wetland Evaluation System.*

3. *The GRCA's online mapping tool should be consulted for background information and mapping related to natural hazards, including wetlands, watercourses, and floodplain areas.*

Please also note that the Hespeler West Subwateshed Study (2004) has recommendations related to Natural Heritage features that should be reviewed and considered, as part of the background to NRSI's work.

Further, I would request that once the Notice of Study Commencement is complete that a copy be forwarded to our office for a formal response to the Region of Waterloo. As I noted, the GRCA has numerous areas of interest related to this project, including GRCA properties that are located within the study area.

I trust this of assistance on this matter. If you have further questions or require clarification, please let me know.

Regards,




**John Brum** | Resource Planner
Grand River Conservation Authority
400 Clyde Road, PO Box 729, Cambridge, Ontario N1R 5W6
Tel: 519-621-2763 x2233 | Fax: 519-621-4945 | Toll free: 1-866-900-4722
jbrum@grandriver.ca

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**From:** Heather Fotherby <hfotherby@nrsi.on.ca>
**Sent:** Monday, July 22, 2019 2:36 PM

**Subject:** RE: Maple Grove Rd Improvements Class EA Terms of Reference
**From:** "Cerniavskaja, Karina (MNRF)" <Karina.Cerniavskaja@ontario.ca>
**Date:** 6/16/2020, 2:54 PM
**To:** Heather Fotherby <hfotherby@nrsi.on.ca>
**CC:** "john.bayley@ibigroup.com" <john.bayley@ibigroup.com>, "bwoodman@nrsi.on.ca" <bwoodman@nrsi.on.ca>, "Thornton, Ian (MNRF)" <ian.thornton@ontario.ca>

Good afternoon Heather,

Thank you for circulating the Terms of Reference for the Maple Grove Road Improvements Class Environmental Assessment project in the City of Cambridge and Regional Municipality of Waterloo to the Ministry of Natural Resources and Forestry (MNRF).

Please note, the Ministry of the Environment, Conservation and Parks (MECP) has now assumed responsibility for the *Endangered Species Act* (ESA), including species at risk (SAR) in Ontario. MNRF recommends circulating the document to MECP at SAROntario@ontario.ca for input regarding ESA and SAR.

MNRF staff have reviewed the document and don't have any comments to provide at this time. The MNRF would appreciate the opportunity to review the detailed design document, as well as any reporting completed in support of the project when it becomes available.

Please let me know if you have any questions.

Thanks again,
Karina

**Karina Černiavskaja, District Planner**
Ministry of Natural Resources and Forestry, Aylmer District
615 John St. N. Aylmer, ON N5H 2S8
Email: karina.cerniavskaja@ontario.ca

*As part of providing accessible customer service, please let me know if you have any accommodation needs or require communication supports or alternate formats.*

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**From:** Heather Fotherby <hfotherby@nrsi.on.ca>
**Sent:** May-28-20 2:53 PM
**To:** Cerniavskaja, Karina (MNRF) <Karina.Cerniavskaja@ontario.ca>; Thornton, Ian (MNRF) <ian.thornton@ontario.ca>
**Cc:** john.bayley@ibigroup.com; bwoodman@nrsi.on.ca
**Subject:** Maple Grove Rd Improvements Class EA Terms of Reference

**CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.**

Hi Karina and Ian,

Please find attached a Terms of Reference (TOR) to complete environmental studies to support the Maple Grove Road Improvements Class Environmental Assessment in the City of Cambridge and Regional Municipality of Waterloo.

NRSI was retained by IBI Group in the fall of 2018 to complete an Environmental Impact Study to inform the Environmental Screening Report for the Class EA. The attached TOR was drafted in 2018, however was not submitted to agency staff for review and approval as the Notice of Commencement for the project had not yet been filed. There were several subsequent delays, but we did proceed with the field program outlined in the attached TOR in 2018 and 2019 and it is now complete with the exception of the following task:

- Delineation and mapping of any woodland driplines and wetland boundaries within and adjacent to the road ROW, and verification with review agency staff, will be completed in the summer of 2019.

The above task will be completed at the detailed design stage of the project as recommended by GRCA staff on July 24, 2019.

Please advise if you have any comments or require any additional studies following your review of the attached TOR.

Thank you in advance,

Heather

--

Heather Fotherby M.Sc. P.Biol.
Terrestrial and Wetland Biologist
**Natural Resource Solutions Inc.**
415 Phillip Street, Unit C
Waterloo, ON N2L 3X2
(p) 519-725-2227 Ext. 222 (f) 519-725-2575
(w) www.nrsi.on.ca (e) hfotherby@nrsi.on.ca
@nrsinews

**To:** John Brum <jbrum@grandriver.ca>
**Cc:** Brett Woodman <bwoodman@nrsi.on.ca>
**Subject:** Re: Maple Grove Rd Improvements Class EA Terms of Reference

Hi John,

Yes, this Class EA has officially started. We initiated some aquatic work in the fall of 2018 and have been completing additional field studies in 2019. I don't have a copy of the Public Notice, but, I'll ask either the Region or our contact at IBI Group to forward it along.

Regards,

Heather

Heather Fotherby M.Sc.
Terrestrial and Wetland Biologist
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@nrsinews

On 7/22/2019 1:50 PM, John Brum wrote:

> Thanks Heather. I'll forward these to Tony Zammit. Has this Class EA officially started? If so, and if you have a copy of the Public Notice, could you please forward a copy of the Study Commencement Notice? I don't recall seeing it and I can't find it on the Region's website. If you don't have it, could you please ask the Region or PM to forward me a copy?
>
> Thanks,
>
> cid:image001.png@01CD3424.6281
>
> **John Brum** | Resource Planner
> Grand River Conservation Authority
> 400 Clyde Road, PO Box 729, Cambridge, Ontario N1R 5W6
> Tel: 519-621-2763 x2233 | Fax: 519-621-4945 | Toll free: 1-866-900-4722
> jbrum@grandriver.ca
>
> ---
>
> **From:** Heather Fotherby <hfotherby@nrsi.on.ca>
> **Sent:** Monday, July 22, 2019 10:04 AM
> **To:** John Brum <jbrum@grandriver.ca>
> **Cc:** Beth Brown <bbrown@grandriver.ca>; Brett Woodman <bwoodman@nrsi.on.ca>
> **Subject:** Maple Grove Rd Improvements Class EA Terms of Reference
>
> Hi John,
>
> Last week I mentioned that I would send you additional details regarding the Maple Grove Road Improvements Class EA. I would just like to apologize again for any miscommunication in the

initial stages of this project.

NRSI was retained by IBI Group on behalf of the Regional Municipality of Waterloo in the fall of 2018 to complete environmental studies to support a Class EA for improvements to Maple Grove Road between Fountain Street and Hespeler Road. NRSI's specific role is to complete an Environmental Impact Study to inform the Environmental Screening Report for the Class EA.

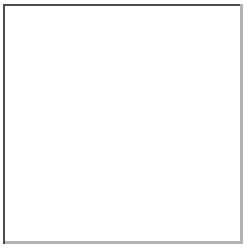
Assuming you have not received our Terms of Reference, please find attached our Terms of Reference for your review and approval.

Please advise if you have any questions or comments.

Thank you in advance,

Heather

--



Heather Fotherby M.Sc.
Terrestrial and Wetland Biologist
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(w) www.nrsi.on.ca (e) hfotherby@nrsi.on.ca
@nrsinews

## Appendix V
## Vascular Flora Species Reported from the Study Area

**Vascular Plant Species Reported From the Study Area**

| Scientific Name | Common Name | SRANK[1] | COSSARO[2] | COSEWIC[3] | SARA Schedule[3] | Waterloo Region[4] | NHIC Data[5] | MNRF SAR List[6] | Rare Plant Atlas[7] | NRSI Observed |
|---|---|---|---|---|---|---|---|---|---|---|
| **Pteridophytes** | **Ferns & Allies** | | | | | | | | | |
| **Dryopteridaceae** | **Wood Fern Family** | | | | | | | | | |
| *Athyrium filix-femina var. angustum* | Northern Lady Fern | S5 | | | | | | | | X |
| *Cystopteris bulbifera* | Bulblet Fern | S5 | | | | | | | | X |
| *Dryopteris carthusiana* | Spinulose Wood Fern | S5 | | | | | | | | X |
| *Dryopteris clintoniana* | Clinton's Wood Fern | S4 | | | | | | | | X |
| *Gymnocarpium dryopteris* | Oak Fern | S5 | | | | | | | | X |
| *Matteuccia struthiopteris var. pensylvanica* | Ostrich Fern | S5 | | | | | | | | X |
| *Onoclea sensibilis* | Sensitive Fern | S5 | | | | | | | | X |
| *Polystichum acrostichoides* | Christmas Fern | S5 | | | | | | | | X |
| *Polystichum braunii* | Braun's Holly Fern | S3 | | | | R | | | X | |
| | | | | | | | | | | |
| **Equisetaceae** | **Horsetail Family** | | | | | | | | | |
| *Equisetum arvense* | Field Horsetail | S5 | | | | | | | | X |
| *Equisetum hyemale ssp. affine* | Scouring-rush | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Ophioglossaceae** | **Adder's Tongue Family** | | | | | | | | | |
| *Botrychium oneidense* | Blunt-lobed Grape Fern | S3? | | | | R | | | X | |
| *Botrychium rugulosum* | Rugulose Grape Fern | S2 | | | | R | | | X | |
| | | | | | | | | | | |
| **Osmundaceae** | **Royal Fern Family** | | | | | | | | | |
| *Osmunda cinnamomea* | Cinnamon Fern | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Thelypteridaceae** | **Beech Fern Family** | | | | | | | | | |
| *Phegopteris hexagonoptera* | Broadbeech Fern | S3 | SC | SC | Schedule 3 | | | | X | |
| *Thelypteris palustris var. pubescens* | Marsh Fern | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Gymnosperms** | **Conifers** | | | | | | | | | |
| **Cupressaceae** | **Cypress Family** | | | | | | | | | |
| *Juniperus virginiana* | Eastern Red Cedar | S5 | | | | | | | | X |
| *Thuja occidentalis* | White Cedar | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Pinaceae** | **Pine Family** | | | | | | | | | |
| *Larix decidua* | European Larch | SE2 | | | | | | | | X |
| *Larix laricina* | Tamarack | S5 | | | | | | | | X |
| *Picea abies* | Norway Spruce | SE3 | | | | | | | | X |
| *Picea glauca* | White Spruce | S5 | | | | R+ | | | | X |
| *Picea pungens* | Colorado Spruce | SE1 | | | | | | | | X |
| *Pinus nigra* | Austrian Pine | SE2 | | | | | | | | X |
| *Pinus resinosa* | Red Pine | S5 | | | | | | | | X |
| *Pinus strobus* | Eastern White Pine | S5 | | | | | | | | X |
| *Pinus sylvestris* | Scots Pine | SE5 | | | | | | | | X |
| *Tsuga canadensis* | Eastern Hemlock | S5 | | | | | | | | X |
| | | | | | | | | | | |

| Scientific Name | Common Name | SRANK[1] | COSSARO[2] | COSEWIC[3] | SARA Schedule[3] | Waterloo Region[4] | NHIC Data[5] | MNRF SAR List[6] | Rare Plant Atlas[7] | NRSI Observed |
|---|---|---|---|---|---|---|---|---|---|---|
| **Dicotyledons** | **Dicots** | | | | | | | | | |
| **Aceraceae** | **Maple Family** | | | | | | | | | |
| *Acer negundo* | Manitoba Maple | S5 | | | | | | | | X |
| *Acer platanoides* | Norway Maple | SE5 | | | | | | | | X |
| *Acer rubrum* | Red Maple | S5 | | | | | | | | X |
| *Acer saccharinum* | Silver Maple | S5 | | | | | | | | X |
| *Acer saccharum ssp. saccharum* | Sugar Maple | S5 | | | | | | | | X |
| *Acer saccharum ssp. nigrum* | Black Maple | S4? | | | | | | | | X |
| *Acer X freemanii* | Freeman's Maple | | | | | | | | | X |
| | | | | | | | | | | |
| **Anacardiaceae** | **Sumac or Cashew Family** | | | | | | | | | |
| *Rhus typhina* | Staghorn Sumac | S5 | | | | | | | | X |
| *Toxicodendron rydbergii* | Poison-ivy | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Annonaceae** | **Custard-apple Family** | | | | | | | | | |
| *Asimina triloba* | Paw Paw | S3 | | | | R+ | | | X | |
| | | | | | | | | | | |
| **Apiaceae** | **Carrot or Parsley Family** | | | | | | | | | |
| *Angelica atropurpurea* | Dark-purple Alexanders | S5 | | | | | | | | X |
| *Cicuta bulbifera* | Bulb-bearing Water-hemlock | S5 | | | | | | | | X |
| *Cicuta maculata* | Spotted Water-hemlock | S5 | | | | | | | | X |
| *Conioselinum chinense* | Chinese Hemlock-parsley | S2 | | | | R | | | X | |
| *Cryptotaenia canadensis* | Honewort | S5 | | | | | | | | X |
| *Daucus carota* | Wild Carrot | SE5 | | | | | | | | X |
| *Erigenia bulbosa* | Harbinger-of-spring | S3? | | | | R | | | X | |
| *Hydrocotyle americana* | American Marsh-pennywort | S5 | | | | | | | | X |
| *Sanicula canadensis var. grandis* | Long-styled Canada Snakeroot | S2 | | | | R | | | X | |
| *Zizia aurea* | Golden Alexanders | S5 | | | | R | | | | X |
| | | | | | | | | | | |
| **Apocynaceae** | **Dogbane Family** | | | | | | | | | |
| *Vinca minor* | Periwinkle | SE5 | | | | | | | | X |
| | | | | | | | | | | |
| **Araliaceae** | **Ginseng Family** | | | | | | | | | |
| *Aralia nudicaulis* | Wild Sarsaparilla | S5 | | | | | | | | X |
| *Panax quinquefolius* | Ginseng | S3 | END | E | Schedule 1 | R | | X | X | |
| | | | | | | | | | | |
| **Asclepiadaceae** | **Milkweed Family** | | | | | | | | | |
| *Asclepias incarnata ssp. incarnata* | Swamp Milkweed | S5 | | | | | | | | X |
| *Asclepias syriaca* | Common Milkweed | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Asteraceae** | **Composite or Aster Family** | | | | | | | | | |
| *Achillea millefolium ssp. millefolium* | Common Yarrow | SE? | | | | | | | | X |
| *Anaphalis margaritacea* | Pearly Everlasting | S5 | | | | | | | | X |
| *Artemisia vulgaris* | Common Mugwort | SE5 | | | | | | | | X |
| *Bidens cernua* | Stick-tight | S5 | | | | | | | | X |
| *Bidens frondosa* | Devil's Beggar-ticks | S5 | | | | | | | | X |

| Scientific Name | Common Name | SRANK[1] | COSSARO[2] | COSEWIC[3] | SARA Schedule[3] | Waterloo Region[4] | NHIC Data[5] | MNRF SAR List[6] | Rare Plant Atlas[7] | NRSI Observed |
|---|---|---|---|---|---|---|---|---|---|---|
| *Centaurea jacea* | Brown Knapweed | SE5 | | | | | | | | X |
| *Centaurea maculosa* | Spotted Knapweed | SE5 | | | | | | | | X |
| *Cirsium discolor* | Field Thistle | S3 | | | | R | | | X | |
| *Cirsium vulgare* | Bull Thistle | SE5 | | | | | | | | X |
| *Erigeron canadensis* | Horseweed | S5 | | | | | | | | X |
| *Erigeron annuus* | Daisy Fleabane | S5 | | | | | | | | X |
| *Erigeron philadelphicus ssp. philadelphicus* | Philadelphia Fleabane | S5 | | | | | | | | X |
| *Erigeron strigosus* | Daisy Fleabane | S5 | | | | | | | | X |
| *Eupatorium perfoliatum* | Perfoliate Thoroughwort | S5 | | | | | | | | X |
| *Eupatorium rugosum* | White Snakeroot | S5 | | | | | | | | X |
| *Eupatorium maculatum ssp. maculatum* | Spotted Joe-pye-weed | S5 | | | | | | | | X |
| *Eurybia macrophylla* | Large-leaved Aster | S5 | | | | | | | | X |
| *Eurybia schreberi* | Schreber's Aster | S2S3 | | | | R | | | X | |
| *Euthamia graminifolia* | Flat-topped Bushy Goldenrod | S5 | | | | | | | | X |
| *Helianthus tuberosus* | Jerusalem Artichoke | SE5 | | | | | | | | X |
| *Hieracium caespitosum ssp. caespitosum* | Field Hawkweed | SE5 | | | | | | | | X |
| *Hieracium gronovii* | Gronovius' Hawkweed | S3? | | | | R | | | X | |
| *Hieracium lachenalii* | Lachenal's Hawkweed | SE2? | | | | | | | | X |
| *Hieracium pilosella* | Mouse-ear Hawkweed | SE5 | | | | | | | | X |
| *Hieracium piloselloides* | Glaucous King Devil | SE5 | | | | | | | | X |
| *Hieracium venosum var. nudicaule* | Rattlesnake-weed | S2 | | | | R | | | X | |
| *Lactuca biennis* | Biennial Lettuce | S5 | | | | | | | | X |
| *Lapsana communis* | Nipplewort | SE5 | | | | | | | | X |
| *Liatris cylindracea* | Cylindric Blazing Star | S3 | | | | R | | | X | |
| *Matricaria discoidea* | Pineapple-weed | SE5 | | | | | | | | X |
| *Packera aureus* | Golden Groundsel | S5 | | | | | | | | X |
| *Rudbeckia hirta* | Black-eyed Susan | S5 | | | | | | | | X |
| *Solidago altissima var. altissima* | Tall Goldenrod | S5 | | | | | | | | X |
| *Solidago caesia* | Blue-stem Goldenrod | S5 | | | | | | | | X |
| *Solidago canadensis* | Canada Goldenrod | S5 | | | | | | | | X |
| *Solidago flexicaulis* | Zig-zag Goldenrod | S5 | | | | | | | | X |
| *Solidago gigantea* | Giant Goldenrod | S5 | | | | | | | | X |
| *Solidago nemoralis ssp. nemoralis* | Gray Goldenrod | S5 | | | | | | | | X |
| *Solidago patula* | Rough-leaved Goldenrod | S5 | | | | | | | | X |
| *Solidago rugosa ssp. rugosa* | Rough Goldenrod | S5 | | | | | | | | X |
| *Sonchus arvensis ssp. arvensis* | Field Sow-thistle | SE5 | | | | | | | | X |
| *Symphyotrichum ericoides var. ericoides* | White Heath Aster | S5 | | | | | | | | X |
| *Symphyotrichum lanceolatum var. lanceolatum* | Tall White Aster | S5 | | | | | | | | X |
| *Symphyotrichum lateriflorum var. lateriflorum* | Calico Aster | S5 | | | | | | | | X |
| *Symphyotrichum novae-angliae* | New England Aster | S5 | | | | | | | | X |
| *Symphyotrichum pilosum var. pilosum* | Hairy Aster | S5 | | | | | | | | X |
| *Symphyotrichum puniceum var. puniceum* | Purple-stemmed Aster | S5 | | | | | | | | X |
| *Symphyotrichum urophyllum* | Arrow-leaved Aster | S4 | | | | | | | | X |
| *Tanacetum vulgare* | Common Tansy | SE5 | | | | | | | | X |
| *Tragopogon dubius* | Doubtful Goat's-beard | SE5 | | | | | | | | X |
| *Tussilago farfara* | Coltsfoot | SE5 | | | | | | | | X |

| Scientific Name | Common Name | SRANK[1] | COSSARO[2] | COSEWIC[3] | SARA Schedule[3] | Waterloo Region[4] | NHIC Data[5] | MNRF SAR List[6] | Rare Plant Atlas[7] | NRSI Observed |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| **Balsaminaceae** | **Touch-me-not Family** | | | | | | | | | |
| *Impatiens capensis* | Spotted Touch-me-not | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Berberidaceae** | **Barberry Family** | | | | | | | | | |
| *Berberis vulgaris* | Common Barberry | SE5 | | | | | | | | X |
| *Caulophyllum giganteum* | Blue Cohosh | S5 | | | | | | | | X |
| *Podophyllum peltatum* | May-apple | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Betulaceae** | **Birch Family** | | | | | | | | | |
| *Alnus glutinosa* | European Black Alder | SE4 | | | | | | | | X |
| *Betula alleghaniensis* | Yellow Birch | S5 | | | | | | | | X |
| *Carpinus caroliniana ssp. virginiana* | Blue Beech | S5 | | | | | | | | X |
| *Ostrya virginiana* | Hop Hornbeam | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Boraginaceae** | **Borage Family** | | | | | | | | | |
| *Echium vulgare* | Blueweed | SE5 | | | | | | | | X |
| *Hackelia virginiana* | Virginia Stickseed | S5 | | | | R* | | | | X |
| *Lithospermum canescens* | Hoary Puccoon | S3 | | | | R | | | X | |
| *Lithospermum latifolium* | American Gromwell | S3 | | | | R | | | X | |
| *Mertensia virginica* | Virginia Bluebells | S3 | | | | R | | | X | |
| *Myosotis laxa* | Smaller Forget-me-not | S5 | | | | | | | | X |
| *Myosotis scorpioides* | Mouse-ear Scorpion-grass | SNA | | | | | | | | X |
| *Onosmodium molle ssp. hispidissimum* | Soft Hairy False Gromwell | S2 | | | | R | | | X | |
| | | | | | | | | | | |
| **Brassicaceae** | **Mustard Family** | | | | | | | | | |
| *Alliaria petiolata* | Garlic Mustard | SE5 | | | | | | | | X |
| *Berteroa incana* | Hoary Alyssum | SE5 | | | | | | | | X |
| *Cardamine bulbosa* | Bulbous Cress | S4 | | | | R | | | | X |
| *Cardamine diphylla* | Two-leaved Toothwort | S5 | | | | | | | | X |
| *Erysimum cheiranthoides ssp. cheiranthoides* | Wormseed Mustard | SE5 | | | | | | | | X |
| *Nasturtium microphyllum* | Small-leaved Water-cress | SE5 | | | | | | | | X |
| | | | | | | | | | | |
| **Campanulaceae** | **Bellflower Family** | | | | | | | | | |
| *Lobelia inflata* | Indian Tobacco | S5 | | | | | | | | X |
| *Lobelia siphilitica* | Great Lobelia | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Caprifoliaceae** | **Honeysuckle Family** | | | | | | | | | |
| *Lonicera tatarica* | Tartarian Honeysuckle | SE5 | | | | | | | | X |
| *Sambucus canadensis* | Common Elderberry | S5 | | | | | | | | X |
| *Sambucus racemosa ssp. pubens* | Red-berried Elderberry | S5 | | | | | | | | X |
| *Viburnum lantana* | Bending Wayfaring-tree | SE2 | | | | | | | | X |
| *Viburnum lentago* | Nannyberry | S5 | | | | | | | | X |
| *Viburnum opulus* | Guelder Rose | SE4 | | | | | | | | X |
| | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|
| **Caryophyllaceae** | **Pink Family** | | | | | | | | | |
| *Dianthus armeria* | Deptford Pink | SE5 | | | | | | | | X |
| *Silene latifolia* | Bladder Campion | SE5 | | | | | | | | X |
| | | | | | | | | | | |
| **Celastraceae** | **Staff-tree Family** | | | | | | | | | |
| *Euonymus atropurpurea var. atropurpurea* | Burning Bush | S3 | | | | R | | | X | |
| *Euonymus obovata* | Running Strawberry-bush | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Ceratophyllaceae** | **Hornwort Family** | | | | | | | | | |
| *Ceratophyllum demersum* | Common Coontail | S5 | | | | | | | | X |
| *Ceratophyllum echinatum* | Prickly Coontail | S3? | | | | R | | | X | |
| | | | | | | | | | | |
| **Cistaceae** | **Rock-rose Family** | | | | | | | | | |
| *Helianthemum canadense* | Long-branched Frostweed | S3 | | | | R | | | X | |
| | | | | | | | | | | |
| **Convolvulaceae** | **Morning-glory Family** | | | | | | | | | |
| *Calystegia sepium* | Hedge Bindweed | S5 | | | | | | | | X |
| *Convolvulus arvensis* | Field Bindweed | SE5 | | | | | | | | X |
| *Cuscuta campestris* | Field Dodder | S2 | | | | | | | X | |
| *Cuscuta gronovii* | Gronovius' Dodder | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Cornaceae** | **Dogwood Family** | | | | | | | | | |
| *Cornus alternifolia* | Alternate-leaved Dogwood | S5 | | | | | | | | X |
| *Cornus amomum ssp. obliqua* | Silky Dogwood | S5 | | | | | | | | X |
| *Cornus foemina ssp. racemosa* | Red Panicled Dogwood | S5 | | | | | | | | X |
| *Cornus stolonifera* | Red-osier Dogwood | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Crassulaceae** | **Stonecrop Family** | | | | | | | | | |
| *Sedum acre* | Mossy Stonecrop | SE5 | | | | | | | | X |
| | | | | | | | | | | |
| **Cucurbitaceae** | **Gourd Family** | | | | | | | | | |
| *Echinocystis lobata* | Prickly Cucumber | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Dipsacaceae** | **Teasel Family** | | | | | | | | | |
| *Dipsacus fullonum ssp. sylvestris* | Wild Teasel | SE5 | | | | | | | | X |
| | | | | | | | | | | |
| **Elaeagnaceae** | **Oleaster Family** | | | | | | | | | |
| *Elaeagnus angustifolia* | Russian Olive | SE3 | | | | | | | | X |
| *Elaeagnus umbellata* | Autumn Olive | SE3 | | | | | | | | X |
| | | | | | | | | | | |
| **Euphorbiaceae** | **Spurge Family** | | | | | | | | | |
| *Euphorbia cyparissias* | Cypress Spurge | SE5 | | | | | | | | X |
| | | | | | | | | | | |
| **Fabaceae** | **Pea Family** | | | | | | | | | |
| *Amphicarpaea bracteata* | Hog Peanut | S5 | | | | | | | | X |
| *Astragalus neglectus* | Neglected Milkvetch | S3 | | | | R | | | X | |

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|---|---|---|---|---|---|---|---|---|---|---|
| *Coronilla varia* | Variable Crown-vetch | SE5 | | | | | | | | X |
| *Desmodium cuspidatum* | Toothed Tick-trefoil | S3 | | | | | | | X | |
| *Desmodium marilandicum* | Smooth Small-leaved Tick-trefoil | SX | | | | R | | | X | |
| *Gleditsia triacanthos var. inermis* | Honey Locust | | | | | | | | | X |
| *Glycyrrhiza lepidota* | Wild Licorice | S3 | | | | R | X | | X | |
| *Lotus corniculatus* | Bird's-foot Trefoil | SE5 | | | | | | | | X |
| *Lupinus perennis ssp. perennis* | Wild Lupine | S3 | | | | R | | | X | |
| *Medicago sativa ssp. sativa* | Alfalfa | SE5 | | | | | | | | X |
| *Robinia pseudo-acacia* | Black Locust | SE5 | | | | | | | | X |
| *Vicia caroliniana* | Carolina Vetch | S2 | | | | R | | | X | |
| | | | | | | | | | | |
| **Fagaceae** | **Beech Family** | | | | | | | | | |
| *Castanea dentata* | American Chestnut | S2 | END | E | Schedule 1 | R | | | X | |
| *Fagus grandifolia* | American Beech | S5 | | | | | | | | X |
| *Fagus sylvatica* | European Beech | | | | | | | | | X |
| *Quercus alba* | White Oak | S5 | | | | | | | | X |
| *Quercus ellipsoidalis* | Northern Pin Oak | S3 | | | | R | | | X | |
| *Quercus macrocarpa* | Bur Oak | S5 | | | | | | | | X |
| *Quercus prinoides* | Dwarf Chinquapin Oak | S2 | | | | R | | | X | |
| *Quercus rubra* | Red Oak | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Gentianaceae** | **Gentian Family** | | | | | | | | | |
| *Frasera caroliniensis* | American Columbo | S2 | END | E | Schedule 1 | R | | | X | |
| *Gentianella quinquefolia ssp. occidentalis* | Stiff Gentian | S2 | | | | | | | X | |
| | | | | | | | | | | |
| **Geraniaceae** | **Geranium Family** | | | | | | | | | |
| *Geranium robertianum* | Herb Robert | SE5 | | | | | | | | X |
| | | | | | | | | | | |
| **Grossulariaceae** | **Currant Family** | | | | | | | | | |
| *Ribes americanum* | Wild Black Currant | S5 | | | | | | | | X |
| *Ribes cynosbati* | Prickly Gooseberry | S5 | | | | | | | | X |
| *Ribes rubrum* | Red Currant | SE5 | | | | | | | | X |
| | | | | | | | | | | |
| **Guttiferae** | **St. John's-wort Family** | | | | | | | | | |
| *Hypericum ascyron* | Great St. John's-wort | S3? | | | | R | | | X | |
| | | | | | | | | | | |
| **Haloragaceae** | **Water-milfoil Family** | | | | | | | | | |
| *Myriophyllum spicatum* | Eurasian Water-milfoil | SE5 | | | | | | | | X |
| | | | | | | | | | | |
| **Hippocastanaceae** | **Buckeye Family** | | | | | | | | | |
| *Aesculus glabra var. glabra* | Ohio Buckeye | S1 | | | | | | | X | |
| *Aesculus hippocastanum* | Horse Chestnut | SE2 | | | | | | | | X |
| | | | | | | | | | | |
| **Juglandaceae** | **Walnut Family** | | | | | | | | | |
| *Carya glabra* | Pignut Hickory | S3 | | | | R* | | | X | |
| *Juglans cinerea* | Butternut | S2? | END | E | Schedule 1 | | | X | X | X |

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|---|---|---|---|---|---|---|---|---|---|---|
| *Juglans nigra* | Black Walnut | S4 | | | | R+* | | | | X |
| | | | | | | | | | | |
| **Lamiaceae** | **Mint Family** | | | | | | | | | |
| *Clinopodium vulgare* | Wild Basil | S5 | | | | | | | | X |
| *Glechoma hederacea* | Creeping Charlie | SE5 | | | | | | | | X |
| *Leonurus cardiaca ssp. cardiaca* | Common Motherwort | SE5 | | | | | | | | X |
| *Lycopus americanus* | Cut-leaved Water-horehound | S5 | | | | | | | | X |
| *Lycopus europaeus* | European Water-horehound | SE5 | | | | | | | | X |
| *Lycopus uniflorus* | Northern Water-horehound | S5 | | | | | | | | X |
| *Mentha arvensis ssp. borealis* | American Wild Mint | S5 | | | | | | | | X |
| *Mentha spicata* | Spear Mint | SE4 | | | | | | | | X |
| *Monarda didyma* | Oswego-tea | S3 | | | | R+ | | | X | |
| *Origanum vulgare* | Wild Marjarom | SE5 | | | | | | | | X |
| *Prunella vulgaris ssp. lanceolata* | Heal-all | S5 | | | | | | | | X |
| *Pycnanthemum tenuifolium* | Slender-leaved Mountain-mint | S3 | | | | | | | | X |
| *Scutellaria galericulata* | Hooded Skullcap | S5 | | | | | | | | X |
| *Scutellaria lateriflora* | Mad-dog Skullcap | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Lauraceae** | **Laurel Family** | | | | | | | | | |
| *Lindera benzoin* | Spicebush | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Linaceae** | **Flax Family** | | | | | | | | | |
| *Linum virginianum* | Wild Yellow Flax | S2 | | | | R | | | X | |
| | | | | | | | | | | |
| **Lythraceae** | **Loosestrife Family** | | | | | | | | | |
| *Lythrum alatum* | Wing-angled Loosestrife | S3 | | | | R | | | X | |
| *Lythrum salicaria* | Purple Loosestrife | SE5 | | | | | | | | X |
| | | | | | | | | | | |
| **Moraceae** | **Mulberry Family** | | | | | | | | | |
| *Morus alba* | White Mulberry | SE5 | | | | | | | | X |
| | | | | | | | | | | |
| **Oleaceae** | **Olive Family** | | | | | | | | | |
| *Fraxinus americana* | White Ash | S5 | | | | | | | | X |
| *Fraxinus nigra* | Black Ash | S5 | | T | | | | | | X |
| *Fraxinus pennsylvanica* | Green Ash | S5 | | | | | | | | X |
| *Syringa vulgaris* | Common Lilac | SE5 | | | | | | | | X |
| | | | | | | | | | | |
| **Onagraceae** | **Evening-primrose Family** | | | | | | | | | |
| *Circaea alpina* | Smaller Enchanter's Nightshade | S5 | | | | | | | | X |
| *Circaea lutetiana ssp. canadensis* | Yellowish Enchanter's Nightshade | S5 | | | | | | | | X |
| *Epilobium coloratum* | Purple-veined Willow-herb | S5 | | | | | | | | X |
| *Epilobium hirsutum* | Great Hairy Willow-herb | SE5 | | | | | | | | X |
| *Epilobium leptophyllum* | Narrow-leaved Willow-herb | S5 | | | | | | | | X |
| *Epilobium parviflorum* | Sparse-flowered Willow-herb | SE4 | | | | | | | | X |
| *Ludwigia palustris* | Marsh Purslane | S5 | | | | | | | | X |
| *Oenothera pilosella ssp. pilosella* | Finely-pilose Evening-primrose | S2 | | | | R+ | | | X | |

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|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| **Oxalidaceae** | **Wood Sorrel Family** | | | | | | | | | |
| *Oxalis stricta* | Upright Yellow Wood-sorrel | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Papaveraceae** | **Poppy Family** | | | | | | | | | |
| *Sanguinaria canadensis* | Bloodroot | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Phrymaceae** | **Lopseed Family** | | | | | | | | | |
| *Phryma leptostachya* | Lopseed | S4S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Plantaginaceae** | **Plantain Family** | | | | | | | | | |
| *Plantago lanceolata* | Ribgrass | SE5 | | | | | | | | X |
| *Plantago rugelii* | Rugel's Plantain | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Polemoniaceae** | **Phlox Family** | | | | | | | | | |
| *Phlox subulata ssp. subulata* | Moss Phlox | S1? | | | | | | | X | |
| | | | | | | | | | | |
| **Polygalaceae** | **Milkwort Family** | | | | | | | | | |
| *Polygala sanguinea* | Blood-red Milkwort | S3 | | | | R | | | X | |
| | | | | | | | | | | |
| **Polygonaceae** | **Smartweed Family** | | | | | | | | | |
| *Persicaria hydropiper* | Water-pepper | SE5 | | | | | | | | X |
| *Polygonum aviculare* | Prostrate Knotweed | SNA | | | | | | | | X |
| *Rumex crispus* | Curly-leaf Dock | SE5 | | | | | | | | X |
| | | | | | | | | | | |
| **Primulaceae** | **Primrose Family** | | | | | | | | | |
| *Anagallis arvensis* | Scarlet Pimpernel | SE4 | | | | | | | | X |
| *Lysimachia ciliata* | Fringed Loosestrife | S5 | | | | | | | | X |
| *Lysimachia nummularia* | Moneywort | SE5 | | | | | | | | X |
| *Lysimachia terrestris* | Swamp Candles | S5 | | | | R | | | | X |
| *Lysimachia thyrsiflora* | Tufted Loosestrife | S5 | | | | | | | | X |
| *Trientalis borealis ssp. borealis* | Star-flower | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Ranunculaceae** | **Buttercup Family** | | | | | | | | | |
| *Actaea pachypoda* | White Baneberry | S5 | | | | | | | | X |
| *Actaea rubra* | Red Baneberry | S5 | | | | | | | | X |
| *Anemone canadensis* | Canada Anemone | S5 | | | | | | | | X |
| *Anemone virginiana var. virginiana* | Thimbleweed | S5 | | | | | | | | X |
| *Aquilegia canadensis* | Wild Columbine | S5 | | | | | | | | X |
| *Caltha palustris* | Marsh-marigold | S5 | | | | | | | | X |
| *Cimicifuga racemosa* | Black Cohosh | S2 | | | | R | | | X | |
| *Clematis virginiana* | Virgin's-bower | S5 | | | | | | | | X |
| *Coptis trifolia* | Gold-thread | S5 | | | | | | | | X |
| *Ranunculus abortivus* | Kidney-leaf Buttercup | S5 | | | | | | | | X |
| *Ranunculus hispidus var. hispidus* | Hispid Buttercup | S3 | | | | R | | | X | |
| *Ranunculus hispidus var. caricetorum* | Swamp Buttercup | S5 | | | | | | | | X |

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|---|---|---|---|---|---|---|---|---|---|---|
| *Ranunculus recurvatus var. recurvatus* | Hooked Buttercup | S5 | | | | | | | | X |
| *Ranunculus repens* | Creeping Buttercup | SE5 | | | | | | | | X |
| *Ranunculus sceleratus var. sceleratus* | Cursed Buttercup | S5 | | | | | | | | X |
| *Thalictrum dioicum* | Early Meadow-rue | S5 | | | | | | | | X |
| *Thalictrum pubescens* | Tall Meadow-rue | S5 | | | | | | | | X |
| *Thalictrum thalictroides* | Rue-anemone | S3 | | | | R | | | X | |
| | | | | | | | | | | |
| **Rhamnaceae** | **Buckthorn Family** | | | | | | | | | |
| *Rhamnus cathartica* | European Buckthorn | SE5 | | | | | | | | X |
| *Frangula alnus* | Glossy Buckthorn | SE5 | | | | | | | | X |
| | | | | | | | | | | |
| **Rosaceae** | **Rose Family** | | | | | | | | | |
| *Agrimonia gryposepala* | Tall Hairy Agrimony | S5 | | | | | | | | X |
| *Crataegus dissona* | Hawthorn | S3 | | | | R | | | X | |
| *Fragaria virginiana* | Wild Strawberry | S5 | | | | | | | | X |
| *Geum aleppicum* | Yellow Avens | S5 | | | | | | | | X |
| *Geum canadense* | White Avens | S5 | | | | | | | | X |
| *Geum urbanum* | Wood Avens | SE2 | | | | | | | | X |
| *Malus domestica* | Apple | | | | | | | | | X |
| *Physocarpus opulifolius* | Ninebark | S5 | | | | | | | | X |
| *Potentilla argentea* | Silvery Cinquefoil | SE5 | | | | | | | | X |
| *Prunus serotina* | Black Cherry | S5 | | | | | | | | X |
| *Prunus virginiana ssp. virginiana* | Choke Cherry | S5 | | | | | | | | X |
| *Rubus allegheniensis* | Alleghany Blackberry | S5 | | | | | | | | X |
| *Rubus idaeus ssp. melanolasius* | Wild Red Raspberry | S5 | | | | | | | | X |
| *Rubus occidentalis* | Black Raspberry | S5 | | | | | | | | X |
| *Rubus pubescens* | Dwarf Raspberry | S5 | | | | | | | | X |
| *Waldsteinia fragarioides* | Barren Strawberry | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Rubiaceae** | **Madder Family** | | | | | | | | | |
| *Galium aparine* | Cleavers | S5 | | | | | | | | X |
| *Galium asprellum* | Rough Bedstraw | S5 | | | | | | | | X |
| *Galium mollugo* | White Bedstraw | SE5 | | | | | | | | X |
| *Galium odoratum* | Sweet Woodruff | SE1 | | | | | | | | X |
| *Galium palustre* | Marsh Bedstraw | S5 | | | | | | | | X |
| *Galium triflorum* | Sweet-scented Bedstraw | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Rutaceae** | **Rue Family** | | | | | | | | | |
| *Zanthoxylum americanum* | American Prickly-ash | S5 | | | | R* | | | | X |
| | | | | | | | | | | |
| **Salicaceae** | **Willow Family** | | | | | | | | | |
| *Populus balsamifera ssp. balsamifera* | Balsam Poplar | S5 | | | | | | | | X |
| *Populus deltoides ssp. deltoides* | Eastern Cottonwood | S5 | | | | R+ | | | | X |
| *Populus tremuloides* | Trembling Aspen | S5 | | | | | | | | X |
| *Salix alba var. alba* | White Willow | SE4 | | | | | | | | X |
| *Salix alba var. vitellina* | Weeping Willow | SU | | | | | | | | X |

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|---|---|---|---|---|---|---|---|---|---|---|
| *Salix amygdaloides* | Peach-leaved Willow | S5 | | | | | | | | X |
| *Salix bebbiana* | Long-beaked Willow | S5 | | | | | | | | X |
| *Salix discolor* | Pussy Willow | S5 | | | | | | | | X |
| *Salix eriocephala* | Heart-leaved Willow | S5 | | | | | | | | X |
| *Salix exigua* | Sandbar Willow | S5 | | | | | | | | X |
| *Salix fragilis* | Crack Willow | SE5 | | | | | | | | X |
| *Salix nigra* | Black Willow | S4? | | | | | | | | X |
| *Salix purpurea* | Basket Willow | SE4 | | | | | | | | X |
| | | | | | | | | | | |
| **Saururaceae** | **Lizard's-tail Family** | | | | | | | | | |
| *Saururus cernuus* | Lizard's-tail | S3 | | | | R | | | X | |
| | | | | | | | | | | |
| **Saxifragaceae** | **Saxifrage Family** | | | | | | | | | |
| *Chrysosplenium americanum* | Golden Saxifrage | S5 | | | | | | | | X |
| *Mitella nuda* | Naked Mitrewort | S5 | | | | | | | | X |
| *Tiarella cordifolia* | False Mitrewort | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Scrophulariaceae** | **Figwort Family** | | | | | | | | | |
| *Aureolaria flava* | Smooth Yellow False Foxglove | S2? | | | | R | | | X | |
| *Aureolaria pedicularia* | Fern-leaved False Foxglove | S2? | | T | | R | | | X | |
| *Aureolaria virginica* | Downy Yellow False Foxglove | S1 | | END | | R | | | X | |
| *Chelone glabra* | Turtlehead | S5 | | | | | | | | X |
| *Linaria vulgaris* | Butter-and-eggs | SE5 | | | | | | | | X |
| *Mimulus moschatus* | Musk-flower | S2? | | | | R+* | | | X | |
| *Mimulus ringens* | Square-stemmed Monkey-flower | S5 | | | | | | | | X |
| *Penstemon digitalis* | Foxglove Beard-tongue | S4S5 | | | | | | | | X |
| *Veronica anagallis-aquatica* | Water Speedwell | SE5 | | | | | | | | X |
| | | | | | | | | | | |
| **Solanaceae** | **Nightshade Family** | | | | | | | | | |
| *Physalis heterophylla* | Clammy Ground-cherry | S4 | | | | | | | | X |
| *Solanum dulcamara* | Bitter Nightshade | SE5 | | | | | | | | X |
| *Solanum ptychanthum* | Eastern Black Nightshade | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Thymelaeaceae** | **Mezereum Family** | | | | | | | | | |
| *Dirca palustris* | Leatherwood | S4? | | | | | | | | X |
| | | | | | | | | | | |
| **Tiliaceae** | **Linden Family** | | | | | | | | | |
| *Tilia americana* | American Basswood | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Ulmaceae** | **Elm Family** | | | | | | | | | |
| *Celtis occidentalis* | Common Hackberry | S4 | | | | R* | | | | X |
| *Ulmus americana* | White Elm | S5 | | | | | | | | X |
| *Ulmus pumila* | Siberian Elm | SE3 | | | | | | | | X |
| | | | | | | | | | | |
| **Urticaceae** | **Nettle Family** | | | | | | | | | |
| *Boehmeria cylindrica* | False Nettle | S5 | | | | | | | | X |

| Scientific Name | Common Name | SRANK[1] | COSSARO[2] | COSEWIC[3] | SARA Schedule[3] | Waterloo Region[4] | NHIC Data[5] | MNRF SAR List[6] | Rare Plant Atlas[7] | NRSI Observed |
|---|---|---|---|---|---|---|---|---|---|---|
| *Laportea canadensis* | Wood Nettle | S5 | | | | | | | | X |
| *Pilea pumila* | Dwarf Clearweed | S5 | | | | | | | | X |
| *Urtica dioica ssp. gracilis* | American Stinging Nettle | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Valerianaceae** | **Valerian Family** | | | | | | | | | |
| *Valeriana edulis ssp. ciliata* | Taprooted Valerian | S1 | | | | R | | | X | |
| *Valeriana officinalis* | Common Valerian | SE3 | | | | | | | | X |
| *Valeriana uliginosa* | Swamp Valerian | S2 | | | | R | | | X | |
| | | | | | | | | | | |
| **Verbenaceae** | **Vervain Family** | | | | | | | | | |
| *Verbena hastata* | Blue Vervain | S5 | | | | | | | | X |
| *Verbena urticifolia* | White Vervain | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Violaceae** | **Violet Family** | | | | | | | | | |
| *Hybanthus concolor* | Green Violet | S2 | | | | R | | | X | |
| *Viola blanda* | Sweet White Violet | S4S5 | | | | | | | | X |
| *Viola labradorica* | Alpine Violet | S4S5 | | | | | | | | X |
| *Viola pubescens* | Downy Yellow Violet | S5 | | | | | | | | X |
| *Viola rostrata* | Long-spurred Violet | S5 | | | | | | | | X |
| *Viola sororia* | Woolly Blue Violet | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Vitaceae** | **Grape Family** | | | | | | | | | |
| *Parthenocissus vitacea* | Woodbine | S5 | | | | | | | | X |
| *Vitis riparia* | Riverbank Grape | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Monocotyledons** | **Monocots** | | | | | | | | | |
| **Alismataceae** | **Water-plantain Family** | | | | | | | | | |
| *Sagittaria latifolia* | Broad-leaved Arrowhead | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Araceae** | **Arum Family** | | | | | | | | | |
| *Arisaema dracontium* | Green Dragon | S3 | SC | SC | Schedule 3 | R | | | X | |
| *Arisaema triphyllum* | Jack-in-the-pulpit | S5 | | | | | | | | X |
| *Symplocarpus foetidus* | Skunk-cabbage | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Cyperaceae** | **Sedge Family** | | | | | | | | | |
| *Carex albursina* | White Bear Sedge | S5 | | | | | | | | X |
| *Carex arctata* | Drooping Wood Sedge | S5 | | | | | | | | X |
| *Carex blanda* | Woodland Sedge | S5 | | | | | | | | X |
| *Carex bromoides* | Bromelike Sedge | S5 | | | | | | | | X |
| *Carex careyana* | Carey's Sedge | S2 | | | | R | | | X | |
| *Carex communis* | Fibrous Rooted Sedge | S5 | | | | | | | | X |
| *Carex crinita* | Fringed Sedge | S5 | | | | | | | | X |
| *Carex flava* | Yellow Sedge | S5 | | | | | | | | X |
| *Carex gracillima* | Graceful Sedge | S5 | | | | | | | | X |
| *Carex hitchcockiana* | Hitchcock's Sedge | S5 | | | | | | | | X |
| *Carex intumescens* | Bladder Sedge | S5 | | | | | | | | X |

| Scientific Name | Common Name | SRANK[1] | COSSARO[2] | COSEWIC[3] | SARA Schedule[3] | Waterloo Region[4] | NHIC Data[5] | MNRF SAR List[6] | Rare Plant Atlas[7] | NRSI Observed |
|---|---|---|---|---|---|---|---|---|---|---|
| *Carex laxiculmis var. laxiculmis* | Spreading Sedge | S4 | | | | R | | | | X |
| *Carex laxiflora* | Loose-flowered Sedge | S5 | | | | | | | | X |
| *Carex leptonervia* | Finely-nerved Sedge | S5 | | | | | | | | X |
| *Carex lupuliformis* | Hop-like Sedge | S1 | END | E | Schedule 1 | R | | | X | |
| *Carex peckii* | Peck's Sedge | S5 | | | | | | | | X |
| *Carex pedunculata* | Long-stalked Sedge | S5 | | | | | | | | X |
| *Carex pensylvanica* | Pennsylvania Sedge | S5 | | | | | | | | X |
| *Carex plantaginea* | Plantain-leaved Sedge | S5 | | | | | | | | X |
| *Carex scabrata* | Rough Sedge | S5 | | | | R | | | | X |
| *Carex schweinitzii* | Schweinitz's Sedge | S3 | | | | R | | | X | |
| *Carex stipata* | Awl-fruited Sedge | S5 | | | | | | | | X |
| *Carex stricta* | Tussock Sedge | S5 | | | | | | | | X |
| *Carex tenera* | Straw Sedge | S5 | | | | | | | | X |
| *Carex tetanica* | Rigid Sedge | S3 | | | | R | | | X | |
| *Carex trichocarpa* | Hairy-fruited Sedge | S3 | | | | R | | | X | |
| *Carex woodii* | Wood's Sedge | S4 | | | | R* | | | | X |
| *Eleocharis erythropoda* | Red-footed Spike-rush | S5 | | | | | | | | X |
| *Eleocharis rostellata* | Beaked Spike-rush | S3 | | | | R | | | X | |
| *Schoenoplectiella smithii* | Smith's Club-rush | S3 | | | | R | | | X | |
| *Schoenoplectus tabernaemontani* | American Great Bulrush | S5 | | | | | | | | X |
| *Scirpus atrovirens* | Dark-green Bulrush | S5 | | | | | | | | X |
| *Scirpus cyperinus* | Wool-grass | S5 | | | | | | | | X |
| *Scirpus pendulus* | Lined Bulrush | S5 | | | | | | | | X |
| *Scleria verticillata* | Low Nut-rush | S3 | | | | R | | | X | |
| | | | | | | | | | | |
| **Hydrocharitaceae** | **Frog's-bit Family** | | | | | | | | | |
| *Hydrocharis morsus-ranae* | Frog's-bit | SE5 | | | | | | | | X |
| | | | | | | | | | | |
| **Iridaceae** | **Iris Family** | | | | | | | | | |
| *Iris pseudacorus* | Yellow Iris | SE3 | | | | | | | | X |
| | | | | | | | | | | |
| **Juncaceae** | **Rush Family** | | | | | | | | | |
| *Juncus articulatus* | Jointed Rush | S5 | | | | | | | | X |
| *Juncus tenuis* | Path Rush | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Lemnaceae** | **Duckweed Family** | | | | | | | | | |
| *Lemna minor* | Lesser Duckweed | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Liliaceae** | **Lily Family** | | | | | | | | | |
| *Allium burdickii* | Wild Leek | S1? | | | | R | | | X | |
| *Allium tricoccum* | Wild Leek | S5 | | | | | | | | X |
| *Asparagus officinalis* | Garden Asparagus | SE5 | | | | | | | | X |
| *Convallaria majalis* | Lily-of-the-valley | SE5 | | | | | | | | X |
| *Erythronium americanum ssp. americanum* | Yellow Dog's-tooth Violet | S5 | | | | | | | | X |
| *Lilium michiganense* | Michigan Lily | S5 | | | | | | | | X |
| *Maianthemum canadense* | Wild Lily-of-the-valley | S5 | | | | | | | | X |

| Scientific Name | Common Name | SRANK[1] | COSSARO[2] | COSEWIC[3] | SARA Schedule[3] | Waterloo Region[4] | NHIC Data[5] | MNRF SAR List[6] | Rare Plant Atlas[7] | NRSI Observed |
|---|---|---|---|---|---|---|---|---|---|---|
| *Maianthemum racemosum ssp. racemosum* | False Solomon's Seal | S5 | | | | | | | | X |
| *Maianthemum stellatum* | Star-flowered Solomon's Seal | S5 | | | | | | | | X |
| *Polygonatum biflorum* | Giant Solomon's Seal | S4 | | | | | | | | X |
| *Polygonatum pubescens* | Hairy Solomon's Seal | S5 | | | | | | | | X |
| *Trillium erectum* | Purple Trillium | S5 | | | | | | | | X |
| *Trillium grandiflorum* | White Trillium | S5 | | | | | | | | X |
| *Uvularia grandiflora* | Large-flowered Bellwort | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Najadaceae** | **Naiad Family** | | | | | | | | | |
| *Najas flexilis* | Slender Najas | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Orchidaceae** | **Orchid Family** | | | | | | | | | |
| *Aplectrum hyemale* | Putty-root | S2 | | | | R | | | X | |
| *Cypripedium arietinum* | Ram's-head Lady's Slipper | S3 | | | | R | | | X | |
| *Cypripedium calceolus var. parviflorum* | Small Yellow Lady's Slipper | S5 | | | | | | | | X |
| *Epipactis helleborine* | Common Helleborine | SE5 | | | | | | | | X |
| | | | | | | | | | | |
| **Poaceae** | **Grass Family** | | | | | | | | | |
| *Agrostis gigantea* | Redtop | SE5 | | | | | | | | X |
| *Agrostis stolonifera* | Redtop | S5 | | | | | | | | X |
| *Bromus ciliatus* | Fringed Brome | S5 | | | | | | | | X |
| *Bromus inermis ssp. inermis* | Awnless Brome | SE5 | | | | | | | | X |
| *Bromus tectorum* | Downy Chess | SE5 | | | | | | | | X |
| *Calamagrostis canadensis* | Blue-joint Grass | S5 | | | | | | | | X |
| *Cinna latifolia* | Broad-leaved Reed Grass | S5 | | | | | | | | X |
| *Dactylis glomerata* | Orchard Grass | SE5 | | | | | | | | X |
| *Dichanthelium acuminatum var. acuminatum* | Acuminate Panic Grass | S5 | | | | | | | | X |
| *Dichanthelium dichotomum var. dichotomum* | Spreading Panic Grass | S2 | | | | R | | | X | |
| *Digitaria cognata* | Fall Witch Grass | S1 | | | | | | | X | |
| *Digitaria sanguinalis* | Large Crabgrass | SE5 | | | | | | | | X |
| *Echinochloa crusgalli* | Common Barnyard Grass | SE5 | | | | | | | | X |
| *Elymus hystrix* | Bottle-brush Grass | S5 | | | | | | | | X |
| *Elymus repens* | Quack Grass | SE5 | | | | | | | | X |
| *Elymus virginicus var. virginicus* | Virginia Wild Rye | S5 | | | | | | | | X |
| *Eragrostis minor* | Low Love Grass | SE5 | | | | | | | | X |
| *Festuca pratensis* | Meadow Fescue | SE5 | | | | | | | | X |
| *Glyceria grandis* | Tall Manna Grass | S4S5 | | | | | | | | X |
| *Glyceria striata* | Fowl Meadow Grass | S5 | | | | | | | | X |
| *Hordeum jubatum ssp. jubatum* | Squirrel-tail Grass | SE5 | | | | | | | | X |
| *Leersia oryzoides* | Rice Cut Grass | S5 | | | | | | | | X |
| *Muhlenbergia mexicana var. mexicana* | Mexican Satin Grass | S5 | | | | | | | | X |
| *Muhlenbergia tenuiflora var. tenuiflora* | Slender Satin Grass | S2 | | | | R | | | X | |
| *Panicum capillare* | Witch Grass | S5 | | | | | | | | X |
| *Phalaris arundinacea* | Reed Canary Grass | S5 | | | | | | | | X |
| *Phragmites australis ssp. australis* | European Common Reed | SNA | | | | | | | | X |
| *Poa palustris* | Fowl Meadow Grass | S5 | | | | | | | | X |

| Scientific Name | Common Name | SRANK[1] | COSSARO[2] | COSEWIC[3] | SARA Schedule[3] | Waterloo Region[4] | NHIC Data[5] | MNRF SAR List[6] | Rare Plant Atlas[7] | NRSI Observed |
|---|---|---|---|---|---|---|---|---|---|---|
| *Poa pratensis ssp. pratensis* | Kentucky Bluegrass | S5 | | | | | | | | X |
| *Poa saltuensis ssp. languida* | Two-rayed Poa | S3 | | | | R | | | X | |
| *Setaria pumila* | Yellow Foxtail | SE5 | | | | | | | | X |
| *Sphenopholis nitida* | Slender Eaton's Grass | S1 | | | | | | | X | |
| *Vulpia octoflora* | Eight-flowered Fescue | S2 | | | | R | | | X | |
| | | | | | | | | | | |
| **Potamogetonaceae** | **Pondweed Family** | | | | | | | | | |
| *Potamogeton amplifolius* | Large-leaved Pondweed | S5 | | | | R | | | | X |
| *Potamogeton pectinatus* | Fennel-leaved Pondweed | S5 | | | | | | | | X |
| | | | | | | | | | | |
| **Smilacaceae** | **Catbrier Family** | | | | | | | | | |
| *Smilax tamnoides* | Bristly Greenbrier | S4 | | | | | | | | X |
| | | | | | | | | | | |
| **Typhaceae** | **Cattail Family** | | | | | | | | | |
| *Typha angustifolia* | Narrow-leaved Cattail | S5 | | | | | | | | X |
| *Typha latifolia* | Broad-leaved Cattail | S5 | | | | | | | | X |
| | | | | | | **Total** | **33** | **2** | **73** | **358** |

[1]MNRF 2018f, [2]MNRF 2018e, [3]Government of Canada 2018, [4]Richardson and Martin 1999, [5]MNRF 2018a, [6]MNRF 2018b, [7]Oldham and Brinker 2009

| **SRANK** | **Regional Rarity** |
|---|---|
| S1 Critically Imperiled | R Native, Present and Rare |
| S2 Imperiled | R* Native, Present and Rare with the exception that additional research may prove otherwise |
| S3 Vulnerable | R+ Native, Present and Rare if demonstrably indigenous - most populations in Waterloo Region are thought to be of non-indigenous origin |
| S4 Apparently Secure | **COSEWIC** |
| S5 Secure | E Endangered |
| SU Unrankable | T Threatened |
| SNA Unranked | SC Special Concern |
| SX Presumed Extirpated | **COSSARO** |
| S#? Rank Uncertain | END Endangered |
| **SARA Schedule** | SC Special Concern |
| Schedule 1 Officially Protected under SARA | |
| Schedule 3 Special concern; may be reassessed for consideration for inclusion to Schedule 1 | |

## Appendix VI
## Bird Species Reported from the Study Area

**Bird Species Reported from the Study Area**

| Scientific Name | Common Name | SRANK[1] | SARO[2] | COSEWIC[3] | SARA Schedule[3] | Region of Waterloo Status[4] | OBBA[5] | NHIC Data[6] | MNRF SAR List[7] | NRSI Observed (Highest Breeding Evidence) | NRSI Observed by Breeding Bird Monitoring Station Location | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 |
| **Anatidae** | **Ducks, Geese & Swans** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Branta canadensis* | Canada Goose | S5 | | | | | CO | | | PR | | PR | | | | | | | | | | | | | | | | X | | | | | | | |
| *Cygnus buccinator* | Trumpeter Swan | S4 | NAR | NAR | | | CO | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Aix sponsa* | Wood Duck | S5 | | | | √* | CO | | | PR | | | | | | | | | | | | | | | | | | | | | | | | PR | |
| *Anas platyrhynchos* | Mallard | S5 | | | | | CO | | | PR | | | | | | | | | | | PO | | | | | | | PR | | | | | | | |
| *Anas discors* | Blue-winged Teal | S4 | | | | | PR | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Anas crecca* | Green-winged Teal | S4 | | | | √ | PR | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Lophodytes cucullatus* | Hooded Merganser | S5B, S5N | | | | √ | PO | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Mergus merganser* | Common Merganser | S5B, S5N | | | | √ | PR | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Odontophoridae** | **New World Quails** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Colinus virginianus* | Northern Bobwhite | S1 | END | E | Schedule 1 | √ | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Phasianidae** | **Partridges, Grouse & Turkeys** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Bonasa umbellus* | Ruffed Grouse | S4 | | | | | CO | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Meleagris gallopavo* | Wild Turkey | S5 | | | | | CO | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Podicipediformes** | **Grebes** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Podilymbus podiceps* | Pied-billed Grebe | S4B, S4N | | | | √ | CO | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Columbidae** | **Pigeons & Doves** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Columba livia* | Rock Pigeon | SNA | | | | | CO | | | PR | | | | | | PO | | | PR | PR | | | | | | | | | | | | | | | |
| *Zenaida macroura* | Mourning Dove | S5 | | | | | CO | | | PO | PO | PO | | | | | | PO | PR | | PO | PO | | | | | | PO | | | PO | | | | |
| **Cuculiformes** | **Cuckoos & Anis** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Coccyzus americanus* | Yellow-billed Cuckoo | S4B | | | | √ | CO | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Coccyzus erythropthalmus* | Black-billed Cuckoo | S5B | | | | √ | CO | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Caprimulgidae** | **Goatsuckers** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Chordeiles minor* | Common Nighthawk | S4B | SC | SC | Schedule 1 | √* | PR | | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Caprimulgus vociferus* | Eastern Whip-poor-will | S4B | THR | T | Schedule 1 | √ | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Apodidae** | **Swifts** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Chaetura pelagica* | Chimney Swift | S4B, S4N | THR | T | Schedule 1 | | CO | | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Trochilidae** | **Hummingbirds** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Archilochus colubris* | Ruby-throated Hummingbird | S5B | | | | √ | PR | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Rallidae** | **Railes, Gallinules & Coots** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Rallus limicola* | Virginia Rail | S5B | | | | √ | PR | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Porzana carolina* | Sora | S4B | | | | √ | PR | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Fulica americana* | American Coot | S4B | NAR | NAR | | √ | PR | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Gruidae** | **Cranes** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Grus canadensis* | Sandhill Crane | S5B | | | | √ | CO | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Charadriidae** | **Plovers** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Charadrius vociferus* | Killdeer | S5B, S5N | | | | | CO | | | PR | PR | | | | | | | | | | | | | | | | | | | | PO | PR | PR | PO | |
| **Scolopacidae** | **Waders** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Scolopax minor* | American Woodcock | S4B | | | | | CO | | | PO | PO | | | | | | | | | | | | | | | | | | | | | | | | |
| *Actitis macularia* | Spotted Sandpiper | S5 | | | | | CO | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Laridae** | **Gulls, Terns & Skimmers** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Larus delawarensis* | Ring-billed Gull | S5B, S4N | | | | | | | | X | | | | | | | | | | | | | | | | | | | | X | | | | | |
| *Chlidonias niger* | Black Tern | S3B | SC | NAR | | √ | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Ardeidae** | **Herons & Bitterns** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Ixobrychus exilis* | Least Bittern | S4B | THR | T | Schedule 1 | √ | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Ardea herodias* | Great Blue Heron | S4B | | | | √ | CO | | | PO | X | PO | | | | | | | | | | | | | | | | PO | | | PO | | X | | X |
| *Butorides virescens* | Green Heron | S4B | | | | √ | CO | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Cathartidae** | **Vultures** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Cathartes aura* | Turkey Vulture | S5B | | | | √ | PO | | | X | | | | | | | | | | | | | | | | | | | | | X | | | | |
| **Accipitridae** | **Hawks, Kites, Eagles & Allies** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Pandion haliaetus* | Osprey | S5B | | | | √ | PR | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Haliaeetus leucocephalus* | Bald Eagle | S2N, S4B | SC | NAR | | √ | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Accipiter striatus* | Sharp-shinned Hawk | S5 | NAR | | | √ | CO | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Accipiter cooperii* | Cooper's Hawk | S4 | NAR | NAR | | √ | CO | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Buteo jamaicensis* | Red-tailed Hawk | S5 | NAR | NAR | | | CO | | | PO | | | | | | | | | | | | | PO | | | | | | | | | | | | |
| **Tytonidae** | **Barn Owls** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Tyto alba* | Barn Owl | S1 | END | E | Schedule 1 | √ | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Strigidae** | **Typical Owls** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Megascops asio* | Eastern Screech-Owl | S4 | NAR | NAR | | | CO | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Bubo virginianus* | Great Horned Owl | S4 | | | | | CO | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Aegolius acadicus* | Northern Saw-whet Owl | S4 | | | | √ | PR | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Alcedinidae** | **Kingfishers** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Megaceryle alcyon* | Belted Kingfisher | S4B | | | | √ | CO | | | X | | | | | | | | | | | | | | | | | | | | | | | | X | |
| **Picidae** | **Woodpeckers** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Melanerpes erythrocephalus* | Red-headed Woodpecker | S4B | SC | END | Schedule 1 | √ | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Melanerpes carolinus* | Red-bellied Woodpecker | S4 | | | | √ | CO | | | PR | | | | | | | | | | | | | | | | | | | PO | | | | | | PR |
| *Picoides pubescens* | Downy Woodpecker | S5 | | | | | CO | | | PO | | | PO | | | | | | | | | | | | | | | | | PO | | | | | PO |
| *Picoides villosus* | Hairy Woodpecker | S5 | | | | | CO | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Colaptes auratus* | Northern Flicker | S4B | | | | | CO | | | PR | | | | | | | | | | | PO | | | | | | PO | | | | | PO | | PR | |
| *Dryocopus pileatus* | Pileated Woodpecker | S5 | | | | √ | CO | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Falconidae** | **Caracaras & Falcons** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Falco sparverius* | American Kestrel | S4 | | | | | CO | | | PR | PR | | | | | | | | | | | | | | | | | | | | | | | | |
| **Tyrannidae** | **Tyrant Flycatchers** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Contopus sordidulus* | Western Wood-pewee | SNA | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Contopus virens* | Eastern Wood-Pewee | S4B | SC | SC | | | CO | X | | PR | | | PR | PO | PO | | PO | | | | | | PR | PR | PR | | | | | PR | | | PO | PR |
| *Empidonax alnorum* | Alder Flycatcher | S5B | | | | √ | PR | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Empidonax traillii* | Willow Flycatcher | S5B | | | | | CO | | | PO | | PO | | | | | | | PO | | | | | | | | PO | | | | | PO | | | |
| *Empidonax minimus* | Least Flycatcher | S4B | | | | √ | PR | | | PO | | | | | | | | | | | | | | PO | | | | | | | | | | | |
| *Sayornis phoebe* | Eastern Phoebe | S5B | | | | | CO | | | PO | | | | PO | | | | | | | | | | | | | | | | | | | | | |
| *Myiarchus crinitus* | Great Crested Flycatcher | S4B | | | | | PR | | | PR | | | | | | | PO | | | PO | | | PR | | | PO | | | | PO | | | | | PR |
| *Tyrannus tyrannus* | Eastern Kingbird | S4B | | | | | CO | | | PO | | | | | | | | | | | | | | | | | | | | | | | PO | | |
| **Vireonidae** | **Vireos** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Vireo solitarius* | Blue-headed Vireo | S5B | | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | PO | |
| *Vireo gilvis* | Warbling Vireo | S5B | | | | | CO | | | PR | | | | | | | | | PO | | PO | | | | | | | | | | | | PR | |
| *Vireo olivaceus* | Red-eyed Vireo | S5B | | | | | CO | | | PR | | | | | PO | | | | | | | | PO | PR | PR | | | | PO | | PO | | PR | PO |
| **Corvidae** | **Crows & Jays** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Cyanocitta cristata* | Blue Jay | S5 | | | | | CO | | | CO | | | | PO | PO | PR | PO | | | | PR | PO | PO | PR | | | PR | | | PO | | PO | | PO | CO |
| *Corvus brachyrhynchos* | American Crow | S5B | | | | | CO | | | PO | | | | | PO | | | | | | | | PO | | | PO | PO | | X | | | PO | PO | PO | PO |
| **Alaudidae** | **Larks** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Eremophila alpestris* | Horned Lark | S5B | | | | | CO | | | PO | | | | | | | | | | | | | | | | | | | | | | | | | PO | |
| **Hirundinidae** | **Swallows** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Progne subis* | Purple Martin | S4B | | | | √* | PO | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Tachycineta bicolor* | Tree Swallow | S4B | | | | | CO | | | PO | | | | | | | | | | | PO | | | | | | | | | | | | | | |
| *Stelgidopteryx serripennis* | Northern Rough-winged Swallow | S4B | | | | | CO | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Riparia riparia* | Bank Swallow | S4B | THR | T | | | CO | | X | PR | | | | | | | | | | | | | | | | | | | | | | | PR | | X |
| *Petrochelidon pyrrhonota* | Cliff Swallow | S4B | | | | √* | CO | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Hirundo rustica* | Barn Swallow | S4B | THR | T | | | CO | X | X | X | | X | | | | X | | | | | | | | | | | | | | | X | | X | | |

| Scientific Name | Common Name | SRANK[1] | SARO[2] | COSEWIC[3] | SARA Schedule[3] | Region of Waterloo Status[4] | OBBA[5] | NHIC Data[6] | MNRF SAR List[7] | NRSI Observed (Highest Breeding Evidence) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Paridae** | **Chickadees & Titmice** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Poecile atricapillus* | Black-capped Chickadee | S5 | | | | | CO | | | CO | | | | | PR | PR | PR | | | PO | | PO | | | | PO | PO | PO | PO | | PR | | CO | | PO | PO |
| **Sittidae** | **Nuthatches** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Sitta canadensis* | Red-breasted Nuthatch | S5 | | | | √ | PO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Sitta carolinensis* | White-breasted Nuthatch | S5 | | | | | CO | | | PO | | | | | | | | | | | | | | | | | | | | | | | | | | PO |
| **Certhiidae** | **Creepers** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Certhia americana* | Brown Creeper | S5B | | | | √ | CO | | | PO | | | | | | | | | | | | | | | | | PO | | | | | | | | | |
| **Troglodytidae** | **Wrens** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Troglodytes aedon* | House Wren | S5B | | | | | CO | | | PR | | | | | PR | | PR | PR | | | | PR | | PO | | | | | PR | | PR | | PO | X | PR | PO |
| *Troglodytes hiemalis* | Winter Wren | S5B | | | | √ | PR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Cistothorus palustris* | Marsh Wren | S4B | | | | √ | PR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Thryothorus ludovicianus* | Carolina Wren | S4 | | | | √ | PR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Regulidae** | **Kinglets** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Regulus satrapa* | Golden-crowned Kinglet | S5B | | | | √ | CO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Turdidae** | **Thrushes** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Sialia sialis* | Eastern Bluebird | S5B | NAR | NAR | | √ | CO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Catharus fuscescens* | Veery | S4B | | | | √ | PR | | | PO | | | | | | | | | | | | | | | | | | | PO | | | | | | | |
| *Hylocichla mustelina* | Wood Thrush | S4B | SC | T | | | PR | | X | PO | | | PO | | | | | | | | | | | | | | | | | | | | | | | |
| *Turdus migratorius* | American Robin | S5B | | | | | CO | | | PR | | PO | PR | PO | PR | PR | PR | PR | PR | PR | PR | PR | PO | PR | PR | PO | | PO | | PO | PR | PO | | | PR | PR |
| **Mimidae** | **Mockingbirds, Thrashers & Allies** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Dumetella carolinensis* | Gray Catbird | S4B | | | | | CO | | | PR | | | | PO | | | PR | PO | | | | PO | | | | | | | PO | | | | PO | PO | | |
| *Toxostoma rufum* | Brown Thrasher | S4B | | | | √ | PR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Sturnidae** | **Starlings** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Sturnus vulgaris* | European Starling | SNA | | | | | CO | | | PR | PO | PR | | | PO | | | | | | PO | PO | | | | | | PR | | | PO | PR | | PO | | PO |
| **Bombycillidae** | **Waxwings** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Bombycilla cedrorum* | Cedar Waxwing | S5B | | | | | CO | | | PR | | | | PO | PO | PO | | PR | PR | PO | PR | PO | | | | | | | PO | | | PR | PO | | PO |
| **Passeridae** | **Old World Sparrows** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Passer domesticus* | House Sparrow | SNA | | | | | CO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Fringillidae** | **Finches & Allies** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Carpodacus mexicanus* | House Finch | SNA | | | | | CO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Spinus tristis* | American Goldfinch | S5B | | | | | CO | | | PR | | PR | PO | PO | PR | PR | PR | PR | PR | PR | | PR | PR | | | PR | | PR | PR | | PO | PR | PR | PO | PO |
| **Parulidae** | **Wood Warblers** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Seiurus aurocapillus* | Ovenbird | S4B | | | | √ | CO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Parkesia motacilla* | Louisiana Waterthrush | S3B | THR | SC | Schedule 1 | √ | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Parkesia noveboracensis* | Northern Waterthrush | S5B | | | | √ | PR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Vermivora chrysoptera* | Golden-winged Warbler | S4B | SC | T | Schedule 1 | √ | PO | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Vermivora cyanoptera* | Blue-winged Warbler | S4B | | | | √ | CO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Mniotilta varia* | Black-and-white Warbler | S5B | | | | √ | PO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Geothlypis philadelphia* | Mourning Warbler | S4B | | | | √ | PR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Geothlypis trichas* | Common Yellowthroat | S5B | | | | | CO | | | PR | | PO | | | | | | PO | | | PO | PO | PO | PR | | | | | | | | | | PO | | |
| *Setophaga ruticilla* | American Redstart | S5B | | | | √ | CO | | | PO | | | | | | | | | | | | | | | | | | | | | | | | PO | | |
| *Setophaga magnolia* | Magnolia Warbler | S5B | | | | √ | PR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Setophaga petechia* | Yellow Warbler | S5B | | | | | CO | | | PR | | PO | | | | | | | | PR | | PO | PR | | | PO | | | | | PR | | | PR | | |
| *Setophaga pensylvanica* | Chestnut-sided Warbler | S5B | | | | √ | PR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Setophaga pinus* | Pine Warbler | S5B | | | | √ | CO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Setophaga coronata* | Yellow-rumped Warbler | S5B | | | | √ | PO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Setophaga virens* | Black-throated Green Warbler | S5B | | | | √ | PR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Cardellina canadensis* | Canada Warbler | S4B | SC | T | Schedule 1 | √ | PR | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Icteria virens* | Yellow-breasted Chat | S2B | END | E | Schedule 1 | √ | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Emberizidae** | **New World Sparrows & Allies** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Pipilo erythrophthalmus* | Eastern Towhee | S4B | | | | | PR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Spizella passerina* | Chipping Sparrow | S5B | | | | | CO | | | PR | | | | | | | PO | PO | PO | PR | | | | | | PO | | | | | | PO | | | PO | |
| *Spizella pallida* | Clay-colored Sparrow | S4B | | | | √ | PR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Spizella pusilla* | Field Sparrow | S4B | | | | | CO | | | PO | | | | | PO | PO | | | | | | | | | | | | PO | | | | | | | | |
| *Pooecetes gramineus* | Vesper Sparrow | S4B | | | | √ | CO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Passerculus sandwichensis* | Savannah Sparrow | S4B | | | | | CO | | | PR | PO | PO | | | | | | PO | | | | | | | | | | | | | | | PR | PR | | |
| *Melospiza melodia* | Song Sparrow | S5B | | | | | CO | | | CO | PO | PR | PR | PR | PR | PR | PR | CO | PR | PR | PR | PO | | | PO | PR | | PO | | PR | PR | PO | PR | PR | PR | PR |
| *Melospiza georgiana* | Swamp Sparrow | S5B | | | | | CO | | | PO | | | | | | | | | | | | | | | | | | | | | | | | PO | | X |
| *Zonotrichia albicollis* | White-throated Sparrow | S5B | | | | √ | PR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Cardinalidae** | **Cardinals, Grosbeaks & Allies** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Piranga olivacea* | Scarlet Tanager | S4B | | | | √ | PR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Cardinalis cardinalis* | Northern Cardinal | S5 | | | | | CO | | | CO | | | | PO | | | PR | PR | PO | PO | | PO | PO | | PO | | | PO | | PR | PO | CO | | PO | PR | PR | PR |
| *Pheucticus ludovicianus* | Rose-breasted Grosbeak | S4B | | | | | CO | | | PO | | | PO | PO | | | | | | | | PO | | | | | | | | | PO | | | | | PO |
| *Passerina cyanea* | Indigo Bunting | S4B | | | | | CO | | | PR | | | PO | | PO | | | | | | | | | PO | PO | | PO | | | PO | | | PO | | | PR |
| **Icteridae** | **Blackbirds** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Dolichonyx oryzivorus* | Bobolink | S4B | THR | T | No Schedule | | CO | | X | PO | | | | | | PO | | | | | | | | | | | | | | | | | | | | |
| *Agelaius phoeniceus* | Red-winged Blackbird | S4 | | | | | CO | | | PR | PR | PR | PR | PR | PO | PR | PR | PR | PR | PR | PR | PR | PR | | | PR | PR | PR | PR | PO | PR | PR | PO | PR | PR | PR | |
| *Sturnella magna* | Eastern Meadowlark | S4B | THR | T | No Schedule | | CO | X | X | PR | PR | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Quiscalus quiscula* | Common Grackle | S5B | | | | | CO | | | PR | | | | | | PO | | | | | | PO | PO | | | | | | PO | | PR | PR | PO | | X | | |
| *Molothrus ater* | Brown-headed Cowbird | S4B | | | | | CO | | | PR | | PR | | | | | | PO | | | | | | | | | PR | | | | PO | PR | PO | | PO | |
| *Icterus spurius* | Orchard Oriole | S4B | | | | √ | CO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Icterus galbula* | Baltimore Oriole | S4B | | | | | CO | | | PR | | PO | PO | | | | | | | | | | | | | | | PO | | | PO | PO | | | PR | |
| | | | | | | **Total** | **115** | **3** | **19** | **59** | **10** | **15** | **10** | **11** | **14** | **13** | **13** | **12** | **13** | **12** | **16** | **14** | **9** | **8** | **5** | **9** | **9** | **14** | **11** | **12** | **13** | **13** | **16** | **20** | **21** | **21** |

[1]MNRF 2018f; [2]MNRF 2018e; [3]Government of Canada 2018; [4]Martin 1996; [5]Bird Studies Canada et al. 2008; [6]MNRF 2018a; [7]MNRF 2018b

| SRANK | COSSARO |
|---|---|
| S1 Critically Imperiled | END Endangered |
| S2 Imperiled | THR Threatened |
| S3 Vulnerable | SC Special Concern |
| S4 Apparently Secure | NAR Not at Risk |
| S5 Secure | **COSEWIC** |
| SNA Unranked | E Endangered |
| S#? Rank Uncertain | T Threatened |
| **SARA Schedule** | SC Special Concern |
| Schedule 1 Officially Protected under SARA | NAR Not at Risk |
| | **Waterloo Region** |
| | √ Regionally Significant |
| | √* Significant when nesting in natural circumstances |

## Appendix VII
## Herpetofauna Species Reported from the Study Area

**Reptile and Amphibian Species Reported from the Study Area**

| Scientific Name | Common Name | SRANK[1] | SARO[2] | COSEWIC[3] | SARA Schedule[3] | Region of Waterloo Status[4] | Ontario Reptile and Amphibian Atlas[5] | NHIC Data[6] | MNRF SAR List[7] | NRSI Observed |
|---|---|---|---|---|---|---|---|---|---|---|
| **Turtles** | | | | | | | | | | |
| *Chelydra serpentina serpentina* | Snapping Turtle | S3 | SC | SC | Schedule 1 | C | X | | X | |
| *Chrysemys picta marginata* | Midland Painted Turtle | S5 | | SC | | C | X | | | |
| *Emydoidea blandingii* | Blanding's Turtle (*Great Lakes/St Lawrence population*) | S3 | THR | T | Schedule 1 | √ | X | | X | |
| *Graptemys geographica* | Northern Map Turtle | S3 | SC | SC | Schedule 1 | | | | X | |
| **Snakes** | | | | | | | | | | |
| *Lampropeltis triangulum* | Eastern Milksnake | S4 | NAR | SC | Schedule 1 | √ | X | | | |
| *Opheodrys vernalis* | Smooth Greensnake | S4 | | | | √ | X | | | |
| *Nerodia sipedon sipedon* | Northern Watersnake | S5 | NAR | NAR | | √ | X | | | |
| *Regina septemvittata* | Queensnake | S2 | END | E | Schedule 1 | √ | X | | X | |
| *Storeria dekayi dekayi* | Northern Brownsnake | S5 | NAR | NAR | | C* | X | | | X |
| *Storeria occipitomaculata occipitoma* | Northern Red-bellied Snake | S5 | | | | C* | X | | | |
| *Thamnophis sauritus septentrionalis* | Eastern Ribbonsnake | S3 | SC | SC | Schedule 1 | √ | X | | X | |
| *Thamnophis sirtalis sirtalis* | Eastern Gartersnake | S5 | | | | C | X | | | X |
| **Salamanders** | | | | | | | | | | |
| *Ambystoma jeffersonianum* | Jefferson Salamander | S2 | END | E | Schedule 1 | √ | X | | | |
| Ambystoma sp. | Jefferson/Blue-spotted Salamander Comp | S2 | | | | √ | X | | X | |
| *Ambystoma laterale* | Blue-spotted Salamander | S4 | | | | C | X | | | |
| *Ambystoma maculatum* | Spotted Salamander | S4 | | | | √ | X | | | |
| *Hemidactylium scutatum* | Four-toed Salamander | S4 | NAR | NAR | | | X | | | |
| *Notophthalmus viridescens viridesce* | Red-spotted Newt | S5 | | | | √ | X | | | |
| *Plethodon cinereus* | Eastern Red-backed Salamander | S5 | | | | C | X | | | |
| **Toads and Frogs** | | | | | | | | | | |
| *Anaxyrus americanus* | American Toad | S5 | | | | C | X | | | X |
| *Hyla versicolor* | Tetraploid Gray Treefrog | S5 | | | | C | X | | | X |
| *Pseudacris triseriata* pop. 2 | Western Chorus Frog *(Great Lakes/St. Lawrence - Canadian Shield Population)* | S3 | NAR | T | Schedule 1 | | X | | | |
| *Pseudacris crucifer* | Spring Peeper | S5 | | | | C | X | | | X |
| *Lithobates catesbeiana* | American Bullfrog | S4 | | | | √ | X | | | |
| *Lithobates clamitans melanota* | Northern Green Frog | S5 | | | | C | X | | | X |
| *Lithobates palustris* | Pickerel Frog | S4 | NAR | NAR | | √ | X | | | |
| *Lithobates pipiens* | Northern Leopard Frog | S5 | NAR | NAR | | C | X | | | X |
| *Lithobates sylvaticus* | Wood Frog | S5 | | | | C | X | | | |
| | | | | | **Total** | **30** | **27** | **0** | **6** | **7** |

[1]MNRF 2018f; [2]MNRF 2018e; [3]Government of Canada 2018; [4]Regional Municipality of Waterloo 1985; [5]Ontario Nature 2019; [6]MNRF 2018a; [7]MNRF 2018b

| **SRANK** | **COSEWIC** |
|---|---|
| S1 Critically Imperiled | E Endangered |
| S2 Imperiled | T Threatened |
| S3 Vulnerable | SC Special Concern |
| S4 Apparently Secure | NAR Not at Risk |
| S5 Secure | **SARA Schedule** |
| S#? Rank Uncertain | Schedule 1 Officially Protected under SARA |
| **COSSARO** | **Region of Waterloo Status** |
| END Endangered | C Common |
| THR Threatened | C* Thought to be common; however, difficult to find |
| SC Special Concern | √ Significant |
| NAR Not at Risk | |

## Appendix VIII
## Mammal Species Reported from the Study Area

**Mammal Species Reported from the Study Area**

| Scientific Name | Common Name | SRANK[1] | SARO[2] | COSEWIC[3] | SARA Schedule[3] | Region of Waterloo Status[4] | Ontario Mammal Atlas[5] | NHIC Data[6] | MNRF SAR List[7] | NRSI Observed |
|---|---|---|---|---|---|---|---|---|---|---|
| **Didelphimorphia** | **Opossums** | | | | | | | | | |
| *Didelphis virginiana* | Virginia Opossum | S4 | | | | R | X | | | |
| **Insectivora** | **Shrews and Moles** | | | | | | | | | |
| *Blarina brevicauda* | Northern Short-tailed Shrew | S5 | | | | | X | | | |
| *Condylura cristata* | Star-nosed Mole | S5 | | | | | X | | | |
| *Parascalops breweri* | Hairy-tailed Mole | S4 | | | | R | X | | | |
| *Sorex cinereus* | Masked Shrew | S5 | | | | G | X | | | |
| *Sorex fumeus* | Smoky Shrew | S5 | | | | R | X | | | |
| *Sorex palustris* | Water Shrew | S5 | | | | R | X | | | |
| **Chiroptera** | **Bats** | | | | | | | | | |
| *Eptesicus fuscus* | Big Brown Bat | S4 | | | | | X | | | |
| *Lasionycteris noctivagans* | Silver-haired Bat | S4 | | | | | X | | | |
| *Lasiurus borealis* | Eastern Red Bat | S4 | | | | | X | | | |
| *Lasiurus cinereus* | Hoary Bat | S4 | | | | | X | | | |
| *Myotis leibii* | Eastern Small-footed Myotis | S2S3 | END | | | | X | | X | |
| *Myotis lucifugus* | Little Brown Myotis | S4 | END | E | Schedule 1 | | X | | X | |
| *Myotis septentrionalis* | Northern Myotis | S3 | END | E | Schedule 1 | | X | | X | |
| *Perimyotis subflavus* | Tri-colored Bat | S3? | END | E | Schedule 1 | | X | | X | |
| **Lagomorpha** | **Rabbits and Hares** | | | | | | | | | |
| *Lepus americanus* | Snowshoe Hare | S5 | | | | S | X | | | |
| *Lepus europaeus* | European Hare | SNA | | | | | X | | | |
| *Sylvilagus floridanus* | Eastern Cottontail | S5 | | | | | X | | | X |
| **Rodentia** | **Rodents** | | | | | | | | | |
| *Castor canadensis* | Beaver | S5 | | | | S | X | | | X |
| *Erethizon dorsatum* | Porcupine | S5 | | | | S | X | | | |
| *Glaucomys sabrinus* | Northern Flying Squirrel | S5 | | | | R | X | | | |
| *Glaucomys volans* | Southern Flying Squirrel | S4 | NAR | NAR | | | X | | | |
| *Marmota monax* | Woodchuck | S5 | | | | | X | | | |
| *Microtus pennsylvanicus* | Meadow Vole | S5 | | | | | X | | | |
| *Microtus pinetorum* | Woodland Vole | S3? | SC | SC | Schedule 1 | | X | | | |
| *Mus musculus* | House Mouse | SNA | | | | | X | | | |
| *Napaeozapus insignis* | Woodland Jumping Mouse | S5 | | | | | X | | | |
| *Ondatra zibethicus* | Muskrat | S5 | | | | | X | | | X |
| *Peromyscus leucopus* | White-footed Mouse | S5 | | | | | X | | | |
| *Peromyscus maniculatus* | Deer Mouse | S5 | | | | | X | | | |
| *Rattus norvegicus* | Norway Rat | SNA | | | | | X | | | |
| *Sciurus carolinensis* | Eastern Gray Squirrel | S5 | | | | | X | | | X |
| *Synaptomys cooperi* | Southern Bog Lemming | S4 | | | | R | X | | | |
| *Tamiasciurus hudsonicus* | Red Squirrel | S5 | | | | | X | | | |
| *Tamias striatus* | Eastern Chipmunk | S5 | | | | | X | | | X |

| Scientific Name | Common Name | SRANK[1] | SARO[2] | COSEWIC[3] | SARA Schedule[3] | Region of Waterloo Status[4] | Ontario Mammal Atlas[5] | NHIC Data[6] | MNRF SAR List[7] | NRSI Observed |
|---|---|---|---|---|---|---|---|---|---|---|
| *Zapus hudsonius* | Meadow Jumping Mouse | S5 | | | | | X | | | |
| **Carnivora** | **Carnivores** | | | | | | | | | |
| *Canis latrans* | Coyote | S5 | | | | S | X | | | X |
| *Mephitis mephitis* | Striped Skunk | S5 | | | | | X | | | |
| *Mustela erminea* | Ermine | S5 | | | | | X | | | |
| *Mustela frenata* | Long-tailed Weasel | S4 | | | | S | X | | | |
| *Mustela vison* | American Mink | S4 | | | | S | X | | | |
| *Procyon lotor* | Northern Raccoon | S5 | | | | | X | | | X |
| *Taxidea taxus jacksoni* | American Badger | S2 | END | E | Schedule 1 | | X | | | |
| *Vulpes vulpes* | Red Fox | S5 | | | | | X | | | |
| **Artiodactyla** | **Deer and Bison** | | | | | | | | | |
| *Odocoileus virginianus* | White-tailed Deer | S5 | | | | | X | | | X |
| | | | | | **Total** | **16** | **45** | **0** | **4** | **8** |

[1]MNRF 2018f; [2]MNRF 2018e; [3]Government of Canada 2018; [4]Regional Municipality of Waterloo 1985; [5]Dobbyn 1994, [6]MNRF 2018a; [7]MNRF 2018b

| **SRANK** | **COSEWIC** |
|---|---|
| S1 Critically Imperiled | NAR Not at Risk |
| S2 Imperiled | SC Special Concern |
| S3 Vulnerable | T Threatened |
| S4 Apparently Secure | E Endangered |
| S5 Secure | **SARA Schedule** |
| SNA Unranked | Schedule 1 Officially Protected under SARA |
| SH Possibly Extirpated | **Region of Waterloo Status** |
| S#? Rank Uncertain | C Common |
| **COSSARO** | G General |
| NAR Not at Risk | O Occasional |
| SC Special Concern | S Scarce |
| THR Threatened | R Rare |
| END Endangered | |

## Appendix IX
## Lepidoptera Species Reported from the Study Area

**Butterfly Species Reported From the Study Area**

| Scientific Name | Common Name | SRANK[1] | SARO[2] | COSEWIC[3] | SARA Schedule3 | Region of Waterloo Status[4] | TEA Atlas[5] | NHIC Data[6] | MNRF SAR List[7] | NRSI Observed |
|---|---|---|---|---|---|---|---|---|---|---|
| **Hesperiidae** | **Skippers** | | | | | | | | | |
| *Anatrytone logan* | Delaware Skipper | S4 | | | | C | X | | | |
| *Ancyloxypha numitor* | Least Skipper | S5 | | | | UC | X | | | |
| *Atalopedes campestris* | Sachem | SNA | | | | | X | | | |
| *Carterocephalus palaemon* | Arctic Skipper | S5 | | | | R | X | | | |
| *Epargyreus clarus* | Silver-spotted Skipper | S4 | | | | UC | X | | | |
| *Erynnis baptisiae* | Wild Indigo Duskywing | S4 | | | | UK | X | | | |
| *Erynnis icelus* | Dreamy Duskywing | S5 | | | | R | X | | | |
| *Erynnis juvenalis* | Juvenal's Duskywing | S5 | | | | R | X | | | |
| *Erynnis lucilius* | Columbine Duskywing | S4 | | | | R | X | | | |
| *Euphyes conspicua* | Black Dash | S3 | | | | UC | X | | | |
| *Euphyes dion* | Dion Skipper | S4 | | | | R | X | | | |
| *Euphyes vestris* | Dun Skipper | S5 | | | | VC | X | | | |
| *Hesperia leonardus* | Leonard's Skipper | S4 | | | | | X | | | |
| *Panoquina ocola* | Ocola Skipper | SNA | | | | | X | | | |
| *Pholisora catullus* | Common Sootywing | S4 | | | | R | X | | | |
| *Poanes hobomok* | Hobomok Skipper | S5 | | | | C | X | | | |
| *Poanes massasoit* | Mulberry Wing | S4 | | | | R | X | | | |
| *Poanes viator* | Broad-winged Skipper | S4 | | | | C | X | | | |
| *Polites mystic* | Long Dash Skipper | S5 | | | | UC | X | | | |
| *Polites origenes* | Crossline Skipper | S4 | | | | R | X | | | |
| *Polites peckius* | Peck's Skipper | S5 | | | | VC | X | | | |
| *Polites themistocles* | Tawny-edged Skipper | S5 | | | | C | X | | | |
| *Pompeius verna* | Little Glassywing | S4 | | | | UC | X | | | |
| *Thorybes pylades* | Northern Cloudywing | S5 | | | | R | X | | | |
| *Thymelicus lineola* | European Skipper | SNA | | | | VC | X | | | |
| *Wallengrenia egeremet* | Northern Broken Dash | S5 | | | | C | X | | | |
| **Papilionidae** | **Swallowtails** | | | | | | | | | |
| *Papilio cresphontes* | Giant Swallowtail | S4 | | | | UC | X | | | |
| *Papilio glaucus* | Eastern Tiger Swallowtail | S5 | | | | VC | X | | | |
| *Papilio polyxenes* | Black Swallowtail | S5 | | | | VC | X | | | |
| *Papilio troilus* | Spicebush Swallowtail | S4 | | | | | X | | | |
| **Pieridae** | **Whites and Sulphurs** | | | | | | | | | |
| *Colias eurytheme* | Orange Sulphur | S5 | | | | VC | X | | | |
| *Colias philodice* | Clouded Sulphur | S5 | | | | | X | | | |
| *Pieris oleracea* | Mustard White | S4 | | | | PE | X | | | |
| *Pieris rapae* | Cabbage White | SNA | | | | VC | X | | | |
| *Pieris virginiensis* | West Virginia White | S3 | | SC | | | | | X | |
| *Pontia protodice* | Checkered White | SNA | | | | R | X | | | |
| *Pyrisitia lisa* | Little Yellow | SNA | | | | R | X | | | |
| **Lycaenidae** | **Harvesters, Coppers, Hairstreaks, Blues** | | | | | | | | | |
| *Callophrys niphon* | Eastern Pine Elfin | S5 | | | | R | X | | | |
| *Celastrina lucia* | Northern Spring Azure | S5 | | | | | X | | | |

| Scientific Name | Common Name | SRANK[1] | SARO[2] | COSEWIC[3] | SARA Schedule3 | Region of Waterloo Status[4] | TEA Atlas[5] | NHIC Data[6] | MNRF SAR List[7] | NRSI Observed |
|---|---|---|---|---|---|---|---|---|---|---|
| *Celastrina neglecta* | Summer Azure | S5 | | | | VC | X | | | |
| *Cupido comyntas* | Eastern Tailed Blue | S5 | | | | UC | X | | | |
| *Feniseca tarquinius* | Harvester | S4 | | | | R | X | | | |
| *Glaucopsyche lygdamus* | Silvery Blue | S5 | | | | | X | | | |
| *Lycaena hyllus* | Bronze Copper | S5 | | | | VC | X | | | |
| *Satyrium acadica* | Acadian Hairstreak | S4 | | | | UC | X | | | |
| *Satyrium calanus* | Banded Hairstreak | S4 | | | | UC | X | | | |
| *Satyrium caryaevorus* | Hickory Hairstreak | S4 | | | | R | X | | | |
| *Satyrium edwardsii* | Edwards' Hairstreak | S4 | | | | R | X | | | |
| *Satyrium liparops* | Striped Hairstreak | S5 | | | | UC | X | | | |
| *Satyrium titus* | Coral Hairstreak | S5 | | | | UC | X | | | |
| **Nymphalidae** | **Brush-footed Butterflies** | | | | | | | | | |
| *Aglais milberti* | Milbert's Tortoiseshell | S5 | | | | UC | X | | | |
| *Asterocampa clyton* | Tawny Emperor | S2S3 | | | | UC | X | | | |
| *Boloria bellona* | Meadow Fritillary | S5 | | | | VC | X | | | |
| *Boloria selene* | Silver-bordered Fritillary | S5 | | | | R | X | | | |
| *Cercyonis pegala* | Common Wood-Nymph | S5 | | | | VC | X | | | |
| *Chlosyne nycteis* | Silvery Checkerspot | S5 | | | | R | X | | | |
| *Coenonympha tullia* | Common Ringlet | S5 | | | | C | X | | | |
| *Danaus plexippus* | Monarch | S2N, S4B | SC | END | Schedule 1 | VC | X | | X | X |
| *Euphydryas phaeton* | Baltimore Checkerspot | S4 | | | | R | X | | | |
| *Euptoieta claudia* | Variegated Fritillary | SNA | | | | R | X | | | |
| *Junonia coenia* | Common Buckeye | SNA | | | | UC | X | | | |
| *Lethe anthedon* | Northern Pearly-Eye | S5 | | | | C | X | | | |
| *Lethe appalachia* | Appalachian Brown | S4 | | | | UC | X | | | |
| *Lethe eurydice* | Eyed Brown / Northern Eyed | S5 | | | | VC | X | | | |
| *Libytheana carinenta* | American Snout | SNA | | | | R | X | | | |
| *Limenitis archippus* | Viceroy | S5 | | | | VC | X | | | |
| *Limenitis arthemis arthemis* | White Admiral/Banded Purple | S5 | | | | C | X | | | |
| *Limenitis arthemis astyanax* | Red-spotted Purple | S5 | | | | C | X | | | |
| *Megisto cymela* | Little Wood-Satyr | S5 | | | | VC | X | | | |
| *Nymphalis antiopa* | Mourning Cloak | S5 | | | | VC | X | | | |
| *Nymphalis l-album* | Compton Tortoiseshell | S5 | | | | UC | X | | | |
| *Phyciodes cocyta* | Northern Crescent | S5 | | | | UC | X | | | |
| *Phyciodes tharos* | Pearl Crescent | S4 | | | | C | X | | | |
| *Polygonia comma* | Eastern Comma | S5 | | | | VC | X | | | |
| *Polygonia comma* | Eastern Comma/Hop Merchant | S5 | | | | | X | | | |
| *Polygonia interrogationis* | Question Mark | S5 | | | | VC | X | | | |
| *Polygonia progne* | Grey Comma | S5 | | | | UC | X | | | |

| Scientific Name | Common Name | SRANK[1] | SARO[2] | COSEWIC[3] | SARA Schedule3 | Region of Waterloo Status[4] | TEA Atlas[5] | NHIC Data[6] | MNRF SAR List[7] | NRSI Observed |
|---|---|---|---|---|---|---|---|---|---|---|
| *Speyeria aphrodite* | Aphrodite Fritillary | S5 | | | | R | X | | | |
| *Speyeria cybele* | Great Spangled Fritillary | S5 | | | | VC | X | | | |
| *Vanessa atalanta* | Red Admiral | S5 | | | | VC | X | | | |
| *Vanessa cardui* | Painted Lady | S5 | | | | C | X | | | |
| *Vanessa virginiensis* | American Lady | S5 | | | | C | X | | | |
| | | | | | | **Total** | **81** | **0** | **2** | **1** |

[1]MNRF 2018f; [2]MNRF 2018e; [3]Government of Canada 2018; [4]Regional Municipality of Waterloo 1985; [5]MacNaughton et al. 2019; [6]MNRF 2018a; [7]MNRF 2018b

| **SRANK** |
|---|
| S1 Critically Imperiled |
| S2 Imperiled |
| S3 Vulnerable |
| S4 Apparently Secure |
| S5 Secure |
| SNA Unranked |
| SH Possibly Extirpated (Historical) |
| S#? Rank Uncertain |
| **COSSARO** |
| SC Special Concern |
| THR Threatened |
| END Endangered |
| **COSEWIC** |
| SC Special Concern |
| T Threatened |
| E Endangered |

| **SARA Schedule** |
|---|
| Schedule 1 Officially Protected under SARA |
| **Region of Waterloo Status** |
| G General |
| O Occasional |
| S Scarce |
| √ Significant |
| NRA No Rank Assigned (<5 records and records over 40 years old) |
| VC Very Common |
| C Common |
| UC Uncommon |
| R Rare |
| UK Unknown |
| PE Possibly Extirpated |

## Appendix X
## Odonate Species Reported from the Study Area

**Dragonfly and Damselfly Species Reported from the Study Area**

| Scientific Name | Common Name | SRANK[1] | SARO[2] | COSEWIC[3] | SARA Schedule3 | Waterloo Status[4] | NHIC Data | Odonate Atlas[5] | MNRF SAR List[6] |
|---|---|---|---|---|---|---|---|---|---|
| **Calopterygidae** | **Broadwinged Damselflies** | | | | | | | | |
| *Calopteryx aequabilis* | River Jewelwing | S5 | | | | X | | X | |
| *Calopteryx maculata* | Ebony Jewelwing | S5 | | | | X | | X | |
| *Hetaerina americana* | American Rubyspot | S4 | | | | X | | X | |
| **Lestidae** | **Spreadwings** | | | | | | | | |
| *Lestes congener* | Spotted Spreadwing | S5 | | | | Expected | | X | |
| *Lestes disjunctus* | Common Spreadwing | S5 | | | | Expected | | X | |
| *Lestes dryas* | Emerald Spreadwing | S5 | | | | X | | X | |
| *Lestes eurinus* | Amber-winged Spreadwing | S3 | | | | Expected | | X | |
| *Lestes forcipatus* | Sweetflag Spreadwing | S4 | | | | X | | X | |
| *Lestes inaequalis* | Elegant Spreadwing | S4 | | | | Expected | | X | |
| *Lestes rectangularis* | Slender Spreadwing | S5 | | | | X | | X | |
| *Lestes unguiculatus* | Lyre-tipped Spreadwing | S5 | | | | X | | X | |
| *Lestes vigilax* | Swamp Spreadwing | S5 | | | | X | | X | |
| **Coenagrionidae** | **Narrow-winged Damselflies** | | | | | | | | |
| *Amphiagrion saucium* | Eastern Red Damsel | S4 | | | | X | | X | |
| *Argia apicalis* | Blue-fronted Dancer | S4 | | | | X | | X | |
| *Argia fumipennis violacea* | Violet Dancer | S5 | | | | X | | X | |
| *Argia moesta* | Powdered Dancer | S5 | | | | X | | X | |
| *Chromagrion conditum* | Aurora Damsel | S5 | | | | X | | X | |
| *Enallagma anna* | River Bluet | S2 | | | | X | | X | |
| *Enallagma annexum* | Northern Bluet | S4 | | | | Expected | | X | |
| *Enallagma antennatum* | Rainbow Bluet | S4 | | | | X | | X | |
| *Enallagma boreale* | Boreal Bluet | S5 | | | | X | | X | |
| *Enallagma carunculatum* | Tule Bluet | S5 | | | | X | | X | |
| *Enallagma civile* | Familiar Bluet | S5 | | | | X | | X | |
| *Enallagma ebrium* | Marsh Bluet | S5 | | | | X | | X | |
| *Enallagma exsulans* | Stream Bluet | S5 | | | | X | | X | |
| *Enallagma geminatum* | Skimming Bluet | S4 | | | | X | | X | |
| *Enallagma hageni* | Hagen's Bluet | S5 | | | | X | | X | |
| *Enallagma signatum* | Orange Bluet | S4 | | | | X | | X | |
| *Enallagma vesperum* | Vesper Bluet | S4 | | | | Expected | | X | |
| *Ischnura posita* | Fragile Forktail | S4 | | | | X | | X | |
| *Ischnura verticalis* | Eastern Forktail | S5 | | | | X | | X | |
| *Nehalennia irene* | Sedge Sprite | S5 | | | | X | | X | |
| **Aeshnidae** | **Darners** | | | | | | | | |
| *Aeshna canadensis* | Canada Darner | S5 | | | | X | | X | |
| *Aeshna umbrosa* | Shadow Darner | S5 | | | | X | | X | |
| *Anax junius* | Common Green Darner | S5 | | | | X | | X | |
| *Basiaeschna janata* | Springtime Darner | S5 | | | | Expected | | X | |
| *Boyeria vinosa* | Fawn Darner | S5 | | | | Expected | | X | |
| *Epiaeschna heros* | Swamp Darner | S2S3 | | | | X | | X | |
| *Rhionaeschna mutata* | Spatterdock Darner | S1 | | | | X | | X | |
| **Gomphidae** | **Clubtails** | | | | | | | | |
| *Arigomphus furcifer* | Lilypad Clubtail | S3 | | | | Possible | | X | |
| *Arigomphus villosipes* | Unicorn Clubtail | S2S3 | | | | X | | X | |
| *Phanogomphus descriptus* | Harpoon Clubtail | S3 | | | | Possible | | X | |

| Scientific Name | Common Name | SRANK[1] | SARO[2] | COSEWIC[3] | SARA Schedule3 | Waterloo Status[4] | NHIC Data | Odonate Atlas[5] | MNRF SAR List[6] |
|---|---|---|---|---|---|---|---|---|---|
| *Phanogomphus exilis* | Lancet Clubtail | S5 | | | | X | | X | |
| *Phanogomphus graslinellus* | Pronghorn Clubtail | S3 | | | | Expected | | X | |
| *Phanogomphus lividus* | Ashy Clubtail | S4 | | | | Expected | | X | |
| *Phanogomphus spicatus* | Dusky Clubtail | S5 | | | | X | | X | |
| *Ophiogomphus rupinsulensis* | Rusty Snaketail | S4 | | | | X | | X | |
| *Stylurus scudderi* | Zebra Clubtail | S4 | | | | Possible | | X | |
| **Cordulegasteridae** | **Spiketails** | | | | | | | | |
| *Cordulegaster diastatops* | Delta-spotted Spiketail | S4 | | | | Possible | | X | |
| *Cordulegaster maculata* | Twin-spotted Spiketail | S4 | | | | X | | X | |
| **Corduliidae** | **Emeralds** | | | | | | | | |
| *Epitheca cynosura* | Common Baskettail | S5 | | | | X | | X | |
| *Epitheca pinceps* | Prince Baskettail | S5 | | | | X | | X | |
| *Epitheca spinigera* | Spiny Baskettail | S5 | | | | X | | X | |
| *Somatochlora incurvata* | Incurvate Emerald | S1 | | | | | | X | |
| *Somatochlora walshii* | Brush-tipped Emerald | S4 | | | | X | | X | |
| **Libellulidae** | **Skimmers** | | | | | | | | |
| *Celithemis elisa* | Calico Pennant | S5 | | | | Expected | | X | |
| *Celithemis eponina* | Halloween Pennant | S4 | | | | X | | X | |
| *Erythemis simplicicollis* | Eastern Pondhawk | S5 | | | | X | | X | |
| *Ladona julia* | Chalk-fronted Corporal | S5 | | | | X | | X | |
| *Leucorrhinia frigida* | Frosted Whiteface | S5 | | | | X | | X | |
| *Leucorrhinia intacta* | Dot-tailed Whiteface | S5 | | | | X | | X | |
| *Leucorrhinia proxima* | Red-waisted (Belted) Whiteface | S5 | | | | X | | X | |
| *Libellula luctuosa* | Widow Skimmer | S5 | | | | X | | X | |
| *Libellula pulchella* | Twelve-spotted Skimmer | S5 | | | | X | | X | |
| *Libellula quadrimaculata* | Four-spotted Skimmer | S5 | | | | X | | X | |
| *Nannothemis bella* | Elfin Skimmer | S4 | | | | X | | X | |
| *Pachydiplax longipennis* | Blue Dasher | S5 | | | | X | | X | |
| *Perithemis tenera* | Eastern Amberwing | S4 | | | | Expected | | X | |
| *Plathemis lydia* | Common Whitetail | S5 | | | | X | | X | |
| *Sympetrum internum* | Cherry-faced Meadowhawk | S5 | | | | X | | X | |
| *Sympetrum obtrusum* | White-faced Meadowhawk | S5 | | | | X | | X | |
| *Sympetrum rubicundulum* | Ruby Meadowhawk | S5 | | | | X | | X | |
| *Sympetrum semicinctum* | Band-winged Meadowhawk | S4 | | | | X | | X | |
| *Sympetrum vicinum* | Yellow-legged (Banded) Meadowhawk | S5 | | | | X | | X | |
| *Tramea lacerata* | Black Saddlebags | S4 | | | | X | | X | |
| | | | | | | **Total** | **0** | **75** | **0** |

[1]MNRF 2018f; [2]MNRF 2018e; [3]Government of Canada 2018; [4]Regional Municipality of Waterloo 1985; [5]Ontario Odonate Atlas 2019; [6]MNRF 2018a; [7]MNRF 2018b

| SRANK | |
|---|---|
| S1 | Critically Imperiled |
| S2 | Imperiled |
| S3 | Vulnerable |
| S4 | Apparently Secure |
| S5 | Secure |

## Appendix XI
## Fish and Freshwater Mussel Species Reported from the Study Area

**Fish Species Reported from the Study Area**

| Scientific Name | Common Name | SRANK[1] | SARO[2] | COSEWIC[3] | SARA Schedule[3] | NHIC Data[4] | MNRF SAR List[5] | Ellis Creek | | | West Creek | | | Middle Creek | | | East Creek | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | MNRF | GRCA | NRSI Observed | MNRF | GRCA | NRSI Observed | MNRF | GRCA | NRSI Observed | MNRF | GRCA | NRSI Observed |
| **Cyprinidae** | **Carps and Minnows** | | | | | | | | | | | | | | | | | | |
| *Campostoma anomalum* | Central Stoneroller | S4 | | NAR (April 1998) | | | | | | X | | | | | | | | | |
| *Chrosomus eos* | Northern Redbelly Dace | S5 | | | | | | | | | | | | | | X | X | X | |
| *Luxilus cornutus* | Common Shiner | S5 | | | | | | X | | X | | | | | | | | | |
| *Nocomis biguttatus* | Hornyhead Chub | S4 | NAR | NAR (April 1988) | | | | X | X | X | | | | | | | | | |
| *Notropis photogenis* | Silver Shiner | S2S3 | THR | T (May 2011) | Schedule 3 | | X | | | | | | | | | | | | |
| *Pimephales notatus* | Bluntnose Minnow | S5 | NAR | NAR (April 1998) | | | | X | | | | | | | | | | | |
| *Pimephales promelas* | Fathead Minnow | S5 | | | | | | | | | | | | | | X | | | |
| *Rhinichthys atratulus* | Blacknose Dace | SNR | | | | | | X | | X | | X | | X | X | X | X | X | |
| *Rhinichthys cataractae* | Longnose Dace | S5 | | | | | | X | | X | | | | | | | | | |
| *Semotilus atromaculatus* | Creek Chub | S5 | | | | | | X | X | X | | X | | X | X | X | X | X | |
| **Catostomidae** | **Suckers** | | | | | | | | | | | | | | | | | | |
| *Catostomus commersonii* | White Sucker | S5 | | | | | | X | X | X | | | | | | X | X | X | |
| *Hypentelium nigricans* | Northern Hog Sucker | S4 | | | | | | | | X | | | | | | | | | |
| *Moxostoma duquesnei* | Black Redhorse | S2 | THR | T (May 2005) | | | X | | | | | | | | | | | | |
| **Ictaluridae** | **North American Catfishes** | | | | | | | | | | | | | | | | | | |
| *Ameiurus nebulosus* | Brown Bullhead | S5 | | | | | | | X | | | | | | | | | | |
| *Noturus flavus* | Stonecat | S4 | | | | | | | | X | | | | | | | | | |
| **Esocidae** | **Pikes** | | | | | | | | | | | | | | | | | | |
| *Esox lucius* | Northern Pike | S5 | | | | | | | X | | | | | X | | | X | | |
| | | | | | | | | | | | | | | | | | | | |
| **Umbridae** | **Mudminnows** | | | | | | | | | | | | | | | | | | |
| *Umbra limi* | Central Mudminnow | S5 | | | | | | | | | | | | X | X | X | | | |
| **Gasterosteidae** | **Sticklebacks** | | | | | | | | | | | | | | | | | | |
| *Culaea inconstans* | Brook Stickleback | S5 | | | | | | | | | | | | X | X | X | X | X | |
| **Centrarchidae** | **Sunfishes and Basses** | | | | | | | | | | | | | | | | | | |
| *Ambloplites rupestris* | Rock Bass | S5 | | | | | | X | X | | | | | | | | | | |
| *Lepomis gibbosus* | Pumpkinseed | S5 | | | | | | X | X | | | | | | | X | | | |
| *Micropterus dolomieu* | Smallmouth Bass | S5 | | | | | | X | | X | | | | | | | | | |
| **Percidae** | **Perches and Darters** | | | | | | | | | | | | | | | | | | |
| *Etheostoma blennioides* | Greenside Darter | S4 | NAR | NAR (Nov 2006) | Schedule 3 | | | X | | | | | | | | | | | |
| *Etheostoma caeruleum* | Rainbow Darter | S4 | | | | | | X | | X | | | | | | | | | |
| *Etheostoma flabellare* | Fantail Darter | S4 | | | | | | X | | X | | | | | | | | | |
| *Etheostoma nigrum* | Johnny Darter | S5 | | | | | | X | | X | | | | | | | | | |
| *Percina maculata* | Blackside Darter | S4 | | | | | | X | | | | | | | | | | | |
| | | | | | **Total** | **0** | **2** | **15** | **9** | **13** | **0** | **2** | **0** | **5** | **4** | **8** | **6** | **5** | **0** |

[1]MNRF 2018f, [2]MNRF 2018e, [3]Government of Canada 2019, [4]MNRF 2018a, [5]MNRF 2018b

| **SRANK** | **COSSARO** |
|---|---|
| S1 Critically Imperiled | NAR Not at Risk |
| S2 Imperiled | SC Special Concern |
| S3 Vulnerable | THR Threatened |
| S4 Apparently Secure | END Endangered |
| S5 Secure | **COSEWIC** |
| SNA Unranked | NAR Not at Risk |
| S#? Rank Uncertain | SC Special Concern |
| **SARA Schedule** | T Threatened |
| Schedule 3 Special concern; may be reassessed for consideration for inclusion to Schedule 1 | E Endangered |

**Freshwater Mussel Species Reported from the Study Area**

| Scientific Name | Common Name | SRANK[1] | SARO[2] | COSEWIC[3] | SARA SCHEDULE[3] | NHIC Data[4] | MNRF SAR List[5] | NRSI Observed |
|---|---|---|---|---|---|---|---|---|
| **Lampsilinae** | | | | | | | | |
| *Lampsilis fasciola* | Wavy-rayed Lampmussel | S1 | THR | SC | Schedule 1 | | X | |
| *Villosa iris* | Rainbow | S2S3 | SC | SC | Schedule 1 | | X | |
| | | | | | **Total** | **0** | **2** | **0** |

[1]MNRF 2018f; [2]MNRF 2018e; [3]Government of Canada 2018; [4]MNRF 2018a; [5]MNRF 2018b

| **SRANK** | **COSEWIC** |
|---|---|
| S1 Critically Imperiled | E Endangered |
| S2 Imperiled | T Threatened |
| S3 Vulnerable | SC Special Concern |
| S4 Apparently Secure | **SARA Schedule** |
| S5 Secure | Schedule 1 Officially Protected under SARA |
| **COSSARO** | |
| END Endangered | |
| THR Threatened | |
| SC Special Concern | |

## Appendix XII
## Aquatic Habitat Characterization Photographic Inventory

Aquatic Habitat Photographic Inventory

**Ellis Creek Subwatershed**

| Drainage Feature | Water Body Point | Description | Photographs |
|---|---|---|---|
| Ellis Creek | AHP-008 | Facing Upstream |  |
| | | Facing Downstream |  |
| | AHP-010 | Facing Upstream |  |
| | | Facing Downstream |  |

**Hespeler West Subwatershed**

| Drainage Feature | Water Body Point | Description | Photographs |
|---|---|---|---|
| East Creek | AHP-001 | Facing Upstream |  |
| | | Facing Downstream |  |
| | AHP-002 | Facing Upstream |  |
| | | Facing Downstream |  |

| Drainage Feature | Water Body Point | Description | Photographs |
|---|---|---|---|
| East Creek | AHP-009 | Facing Upstream |  |
| | | Facing Downstream |  |
| Middle Creek | AHP-003 | Facing Upstream |  |
| | | Facing Downstream |  |

| Drainage Feature | Water Body Point | Description | Photographs |
|---|---|---|---|
| Middle Creek | AHP-004 | Facing Upstream |   |
| | | Facing Downstream |  |
| | AHP-007 | Facing Upstream |  |
| | | Facing Downstream |  |

| Drainage Feature | Water Body Point | Description | Photographs |
|---|---|---|---|
| West Creek | AHP-005 | Facing Upstream |  |
| | | Facing Downstream |  |
| | AHP-006 | Vicinity |  |

## Appendix XIII
## Tree Inventory and Preservation Plan

| Tree Number | Common Name | Scientific Name | Native/ Non-native | Stem Count | DBH (cm) | Crown Radius (m) | Potential for Structural Failure Rating | Overall Condition | Assessed Priority | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Black Walnut | *Juglans nigra* | Native | 1 | 42.6 | 4.5 | Possible | Fair | Medium | Demolition under root zone; cracking bark; poor vigor. |
| 2 | Black Walnut | *Juglans nigra* | Native | 1 | 32.5 | 3.0 | Improbable | Fair | Medium | Demolition under root zone; minor dieback. |
| 3 | Black Walnut | *Juglans nigra* | Native | 1 | 54.3 | 5.5 | Improbable | Fair | Medium | Debris under root zone; minor dieback. |
| 4 | Common Hackberry | *Celtis occidentalis* | Native | 1 | 30.6 | 4.0 | Improbable | Fair | Medium | 3 hackberries growing closely; minor dieback. |
| 5 | Common Hackberry | *Celtis occidentalis* | Native | 1 | 26.8 | 4.0 | Improbable | Fair | Medium | 3 hackberries growing closely; minor dieback. |
| 6 | Common Hackberry | *Celtis occidentalis* | Native | 1 | 32.8 | 3.0 | Improbable | Fair | Medium | 3 hackberries growing closely; minor dieback. |
| 7 | Serviceberry species | *Amelanchier sp.* | Native | 3 | 54+28.7+15.2 | 5.0 | Possible | Poor | Low | Rot in main stems; successful water sprouts replacing; dead branches; codominant leaders. |
| 8 | White Oak | *Quercus alba* | Native | 1 | 28.8 | 1.0 | Improbable | Fair | Medium | Light pruning; crown dieback; small dead branches. |
| 9 | Norway Spruce | *Picea abies* | Non-Native | 1 | 53.5 | 4.0 | Improbable | Fair | Medium | Light pruning; crown dieback; hooks embedded in stem. |
| 10 | Common Hackberry | *Celtis occidentalis* | Native | 1 | 43.4 | 6.0 | Improbable | Good | Medium | Asymmetrical crown to south; codominant leaders; included bark; branch rub; slightly suppressed. |
| 11 | Common Hackberry | *Celtis occidentalis* | Native | 1 | 20.3 | 1.0 | Improbable | Good | Medium | Asymmetrical crown to south; slightly suppressed; branch rub; codominant leaders. |
| 12 | Bur Oak | *Quercus macrocarpa* | Native | 1 | 27.9 | 3.0 | Improbable | Fair | Medium | Asymmetrical crown southeast; minor dieback. |
| 13 | Norway Spruce | *Picea abies* | Non-Native | 1 | 50.4 | 3.5 | Improbable | Fair | Medium | Crown toward internation; light pruning. |
| 14 | Sugar Maple | *Acer saccharum ssp. saccharum* | Native | 1 | 89.5 | 6.0 | Improbable | Fair | High | Recent work in root zone; minor dieback codominant leaders; healthy crown. |
| 15 | Norway Spruce | *Picea abies* | Non-Native | 1 | 41.3 | 5.0 | Improbable | Fair | Medium | Asymmetrical crown to east; plastic fence attached to stem; light pruning. |
| 16 | Norway Spruce | *Picea abies* | Non-Native | 1 | 50.6 | 4.5 | Improbable | Good | Medium | Dieback; minor dieback. |
| 17 | Black Walnut | *Juglans nigra* | Native | 2 | 15.6+13.5 | 4.0 | Improbable | Fair | Low | Poor union; cankers. |
| 18 | Black Walnut | *Juglans nigra* | Native | 2 | 25.2+21.1 | 3.0 | Improbable | Fair | Low | Asymmetrical crown to north; included bark; chain link fence abuts stem. |
| 19 | Norway Maple | *Acer platanoides* | Non-Native | 1 | 35 | 3.5 | Improbable | Good | Low | Private property; healthy crown. |
| 20 | Black Walnut | *Juglans nigra* | Native | 1 | 60 | 6.0 | Improbable | Fair | Medium | Asymmetrical crown to east; included bark; branch rub. |
| 21 | Norway Maple | *Acer platanoides* | Non-Native | 1 | 50 | 6.0 | Improbable | Fair | Low | Large open crown; minor dead branches. |
| 22 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 18 | 3.0 | Improbable | Fair | Medium | Codominant leaders; old wound. |
| 23 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 20 | 2.0 | Improbable | Poor | Low | Wound on lower stem failed to compartmentalize; rot; one leader pruned. |
| 24 | Sugar Maple | *Acer saccharum ssp. saccharum* | Native | 1 | 80 | 3.5 | Possible | Poor | Low | Major rot; topped; significantly reduced crown. |
| 25 | Sugar Maple | *Acer saccharum ssp. saccharum* | Native | 1 | 69 | 4.0 | Improbable | Fair | High | Staining; large wound in upper stem, failed to compartmentalize; some rot; woodpecker damage; knot cavity. |
| 26 | Honey Locust | *Gleditsia triacanthos* | Native | 1 | 34.4 | 3.0 | Improbable | Good | Medium | Included bark; branch rub; erosion downslope. |
| 27 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 23.6 | 2.0 | Improbable | Good | Low | Manicured; mulched. |
| 28 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 22.1 | 2.0 | Improbable | Good | Low | Manicured; mulched. |
| 29 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 23.2 | 1.0 | Improbable | Good | Low | Light pruning; improper prune cuts; mulched base. |
| 29 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 13.6 | 3.0 | Improbable | Fair | Medium | Major infill at base; minor epicormic growth. |
| 30 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 26 | 2.5 | Improbable | Fair | Medium | Sloped; open wound; reaction wood; healthy crown. |
| 31 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 29.4 | 4.0 | Improbable | Good | Medium | Small girdling rot; erosion downslope; included bark. |
| 32 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 29.2 | 3.0 | Improbable | Good | Medium | Sloped; mulched; slightly exposed roots; healthy crown. |
| 33 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 23.5 | 2.5 | Improbable | Good | Low | Lower branches pruned. |
| 34 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 24.3 | 2.5 | Improbable | Good | Low | |
| 35 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 21 | 3.0 | Improbable | Good | Low | Light pruning. |
| 36 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 22 | 3.0 | Improbable | Good | Low | Light pruning. |
| 37 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 24 | 2.0 | Improbable | Good | Low | Light pruning, slightly suppressed. |
| 38 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 23 | 2.0 | Improbable | Good | Low | Light pruning, slightly suppressed. |
| 39 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 20 | 3.0 | Improbable | Good | Low | Light pruning. |
| 40 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 20 | 3.0 | Improbable | Good | Low | Light pruning. |
| 41 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 23.5 | 3.0 | Improbable | Good | Medium | Mower damage to root. |
| 42 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 20 | 3.0 | Improbable | Good | Low | Light pruning. |
| 43 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 26 | 2.0 | Improbable | Fair | Low | Light pruning, crown dieback; snow piled at base. |
| 44 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 24 | 2.5 | Improbable | Fair | Low | Light pruning, crown dieback; snow piled at base. |
| 45 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 22 | 2.0 | Improbable | Fair | Low | Light pruning, crown dieback. |
| 46 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 20 | 3.0 | Improbable | Good | Low | Light pruning. |
| 47 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 20 | 3.0 | Improbable | Good | Low | Light pruning. |
| 48 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 20 | 3.0 | Improbable | Good | Low | Light pruning. |
| 49 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 25 | 3.0 | Improbable | Good | Low | Light pruning. |
| 50 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 25 | 3.0 | Improbable | Good | Low | Light pruning. |
| 51 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 12.5 | 2.5 | Improbable | Good | Medium | Minor dieback. |
| 52 | Siberian Elm | *Ulmus pumila* | Non-Native | 2 | 13.1+12.5 | 2.5 | Possible | Poor | Low | Dieback; vines; epicormic growth. |
| 53 | Black Locust | *Robinia pseudoacacia* | Non-Native | 1 | 13.4 | 2.0 | Possible | Poor | Low | Dead branches; epicormic growth; broken branches. |
| 54 | Thornless Honey Locust | *Gleditsia triacanthos var. inermis* | Non-Native | 1 | 11.9 | 3.0 | Improbable | Fair | Medium | Infill; minor dieback. |
| 55 | Thornless Honey Locust | *Gleditsia triacanthos var. inermis* | Non-Native | 1 | 12.1 | 3.0 | Improbable | Fair | Medium | Infill; minor dieback. |
| 56 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 19.2 | 3.0 | Improbable | Fair | Medium | Major infill at base; minor epicormic growth. |
| 57 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 20.9 | 3.0 | Improbable | Fair | Medium | Major infill at base; minor epicormic growth. |
| 58 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 20.1 | 3.0 | Improbable | Fair | Medium | Major infill at base; minor epicormic growth. |
| 60 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 20.1 | 3.0 | Improbable | Fair | Medium | Major infill at base; epicormic growth. |
| 61 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 17.9 | 3.0 | Improbable | Fair | Medium | Major infill at base; no signs of decline yet. |
| 62 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 12.5 | 2.5 | Improbable | Good | Medium | Exposed roots. |
| 63 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 18.1 | 3.0 | Improbable | Good | Medium | Exposed roots. |
| 64 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 19.6 | 3.0 | Improbable | Good | Medium | Exposed roots. |
| 65 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 16.4 | 2.0 | Improbable | Excellent | Medium | No apparent problems. |
| 66 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 11.4 | 2.0 | Improbable | Excellent | Medium | No apparent problems. |
| 67 | Green Ash | *Fraxinus pennsylvanica* | Native | 1 | 13.4 | 3.0 | Possible | Poor | Low | Exfoliating bark; exit holes; water sprouts; dead branches. |
| 68 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 15 | 2.5 | Possible | Good | Low | Infill; healthy crown. |
| 69 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 15 | 2.5 | Possible | Good | Low | Infill; healthy crown. |
| 70 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 16 | 3.0 | Improbable | Fair | Low | Infill; healthy crown. |
| 71 | Norway Spruce | *Picea abies* | Non-Native | 1 | 11.5 | 2.5 | Improbable | Fair | Medium | Minor dieback. |
| 72 | Norway Spruce | *Picea abies* | Non-Native | 1 | 11.5 | 2.5 | Improbable | Fair | Medium | Minor dieback. |
| 73 | Norway Spruce | *Picea abies* | Non-Native | 1 | 15 | 2.5 | Improbable | Good | Medium | Minor dieback. |
| 74 | Norway Spruce | *Picea abies* | Non-Native | 1 | 17 | 2.5 | Improbable | Good | Medium | Minor dieback. |
| 75 | Freeman's Maple | *Acer X freemanii* | Native | 2 | 12.8+10 | 3.0 | Improbable | Fair | Medium | Codominant leaders; included bark. |
| 76 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 12.9 | 3.0 | Improbable | Fair | Medium | Codominant leaders; included bark. |

| Tree Number | Common Name | Scientific Name | Native/ Non-native | Stem Count | DBH (cm) | Crown Radius (m) | Potential for Structural Failure Rating | Overall Condition | Assessed Priority | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| 77 | Norway Spruce | *Picea abies* | Non-Native | 1 | 18 | 3.0 | Improbable | Fair | Medium | Minor dieback; girdling roots. |
| 78 | Norway Spruce | *Picea abies* | Non-Native | 1 | 18 | 3.0 | Improbable | Fair | Medium | Minor dieback; girdling roots. |
| 79 | Freeman's Maple | *Acer X freemanii* | Native | 3 | 14.3+14.2+11.2 | 3.0 | Improbable | Fair | Medium | Codominant leaders; included bark. |
| 80 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 11.9 | 3.0 | Improbable | Fair | Medium | Codominant leaders; included bark. |
| 81 | Freeman's Maple | *Acer X freemanii* | Native | 2 | 12.6+11.9 | 3.0 | Improbable | Fair | Medium | Codominant leaders; included bark. |
| 82 | White Spruce | *Picea glauca* | Native | 1 | 11.6 | 2.0 | Improbable | Good | Medium | Minor dieback. |
| 83 | Freeman's Maple | *Acer X freemanii* | Native | 2 | 13.8+13.5 | 3.0 | Improbable | Good | Medium | Codominant leaders; included bark. |
| 84 | Freeman's Maple | *Acer X freemanii* | Native | 2 | 15.7+13.7 | 3.0 | Improbable | Good | Medium | Codominant leaders; included bark. |
| 85 | White Spruce | *Picea glauca* | Native | 1 | 15 | 2.5 | Improbable | Good | Medium | Minor dieback. |
| 86 | White Spruce | *Picea glauca* | Native | 1 | 15 |  | Improbable | Good | Medium | Minor dieback. |
| 87 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 12.8+11.6+11.2 | 4.0 | Improbable | Fair | Medium | Codominant leaders; included bark. |
| 88 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 13.3 | 3.0 | Improbable | Fair | Medium | Codominant leaders; included bark. |
| 89 | Freeman's Maple | *Acer X freemanii* | Native | 3 | 15+12.1+13.9 | 3.0 | Improbable | Fair | Medium | Codominant leaders; included bark. |
| 90 | White Spruce | *Picea glauca* | Native | 1 | 13 | 2.5 | Improbable | Good | Medium | Minor dieback. |
| 91 | Freeman's Maple | *Acer X freemanii* | Native | 2 | 14.7+10.3 | 3.0 | Improbable | Good | Medium | Codominant leaders; included bark. |
| 92 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 12 | 3.0 | Improbable | Good | Medium | Codominant leaders; included bark. |
| 93 | White Spruce | *Picea glauca* | Native | 1 | 14 | 2.5 | Improbable | Excellent | Medium | No apparent problems. |
| 94 | White Spruce | *Picea glauca* | Native | 1 | 14 | 2.5 | Improbable | Excellent | Medium | No apparent problems. |
| 95 | Freeman's Maple | *Acer X freemanii* | Native | 2 | 14.9+10.2 | 3.0 | Improbable | Fair | Medium | Codominant leaders; included bar. |
| 96 | Freeman's Maple | *Acer X freemanii* | Native | 3 | 15.3+14.7+11.2 | 4.0 | Improbable | Fair | Medium | Mulch infill; codominant leaders. |
| 97 | Freeman's Maple | *Acer X freemanii* | Native | 4 | 12.9+12.8+12 | 4.0 | Improbable | Fair | Medium | Codominant leaders; mulch infill; included bark. |
| 98 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 12.8 | 2.5 | Improbable | Fair | Medium | Garden bed; minor damage to main stem. |
| 99 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 12.4 | 3.0 | Improbable | Fair | Medium | Codominant leaders; minor branch rub; healthy crown. |
| 100 | Freeman's Maple | *Acer X freemanii* | Native | 3 | 15+13.6+12.1 | 4.0 | Improbable | Good | Medium | Codominant leaders; in garden bed; healthy crown. |
| 101 | Black Willow | *Salix nigra* | Native | 1 | 60 | 5.0 | Possible | Fair | Medium | Broken and dead branches; epicormic growth. |
| 102 | Black Willow | *Salix nigra* | Native | 2 | 65+22 | 6.0 | Possible | Fair | Medium | Dead and broken branches; large crown; epicormic growth. |
| 103 | Freeman's Maple | *Acer X freemanii* | Native | 2 | 18.7+18.6 | 3.0 | Improbable | Good | Medium | Codominant leaders; minor included bark. |
| 104 | Norway Spruce | *Picea abies* | Non-Native | 1 | 55.8 | 4.0 | Improbable | Good | Medium | Old wound down stem; minor dieback. |
| 105 | Norway Spruce | *Picea abies* | Non-Native | 1 | 46.3 | 4.0 | Improbable | Fair | Medium | Crown toward road; dieback. |
| 106 | Norway Spruce | *Picea abies* | Non-Native | 1 | 68.6 | 4.5 | Improbable | Fair | Medium | Minor dieback. |
| 107 | Sugar Maple | *Acer saccharum ssp. saccharum* | Native | 1 | 60.1 | 6.0 | Improbable | Good | High | Good reaction wood; good form; minor dieback. |
| 108 | Sugar Maple | *Acer saccharum ssp. saccharum* | Native | 1 | 61.6 | 6.0 | Improbable | Good | High | Healthy crown; minor mower damage to roots. |
| 109 | Sugar Maple | *Acer saccharum ssp. saccharum* | Native | 1 | 51.8 | 5.0 | Possible | Fair | High | Small broken branches; minor dieback. |
| 110 | Norway Maple | *Acer platanoides* | Non-Native | 1 | 28.6 | 3.5 | Improbable | Fair | Low | Minor damage to stem. |
| 111 | Northern Pin Oak | *Quercus ellipsoidalis* | Native | 1 | 31.8 | 4.0 | Improbable | Good | Medium | Minor dieback. |
| 112 | Eastern White Cedar | *Thuja occidentalis* | Native | 1 | 45 | 4.0 | Improbable | Excellent | Medium | Dense healthy crown. |
| 113 | Green Ash | *Fraxinus pennsylvanica* | Native | 1 | 34.6 | 4.5 | Possible | Poor | Low | Exit holes; exfoliating bark; poor vigor. |
| 114 | Norway Spruce | *Picea abies* | Non-Native | 1 | 30 | 5.0 | Improbable | Fair | Medium | Closely planted; minor dieback. |
| 115 | Norway Spruce | *Picea abies* | Non-Native | 1 | 35 | 5.0 | Possible | Poor | Low | Closely planted; dieback. |
| 116 | Norway Spruce | *Picea abies* | Non-Native | 1 | 35 | 4.5 | Possible | Poor | Low | Closely planted; dieback. |
| 117 | Norway Spruce | *Picea abies* | Non-Native | 1 | 30 | 4.0 | Probable | Dead | Low | Closely planted; minor dieback. |
| 118 | Norway Spruce | *Picea abies* | Non-Native | 1 | 40 | 5.0 | Improbable | Fair | Medium | Closely planted; minor dieback. |
| 119 | Black Walnut | *Juglans nigra* | Native | 1 | 18.8 | 4.0 | Improbable | Fair | Low | Adjacent to sewer grate; cankers. |
| 120 | Norway Spruce | *Picea abies* | Non-Native | 1 | 30 | 5.0 | Improbable | Fair | Medium | Closely planted; minor dieback. |
| 121 | Norway Spruce | *Picea abies* | Non-Native | 1 | 30 | 5.0 | Improbable | Fair | Medium | Closely planted; minor dieback. |
| 122 | Norway Spruce | *Picea abies* | Non-Native | 1 | 30 | 5.0 | Improbable | Fair | Medium | Closely planted; minor dieback. |
| 123 | Norway Spruce | *Picea abies* | Non-Native | 1 | 30 | 5.0 | Improbable | Fair | Medium | Closely planted; minor dieback. |
| 124 | Norway Spruce | *Picea abies* | Non-Native | 1 | 30 | 4.0 | Improbable | Fair | Medium | Closely planted; minor dieback. |
| 125 | White Spruce | *Picea glauca* | Native | 1 | 25 | 4.0 | Improbable | Fair | Medium | Closely planted; minor dieback. |
| 126 | White Spruce | *Picea glauca* | Native | 1 | 25 | 4.0 | Improbable | Fair | Medium | Closely planted; minor dieback. |
| 127 | White Spruce | *Picea glauca* | Native | 1 | 25 | 4.0 | Improbable | Fair | Medium | Closely planted; minor dieback. |
| 128 | White Spruce | *Picea glauca* | Native | 1 | 25 | 4.0 | Improbable | Fair | Medium | Closely planted; minor dieback. |
| 129 | White Spruce | *Picea glauca* | Native | 1 | 25 | 4.0 | Improbable | Fair | Medium | Closely planted; minor dieback. |
| 131 | Norway Spruce | *Picea abies* | Non-Native | 1 | 25 | 5.0 | Improbable | Fair | Medium | Closely planted; minor dieback. |
| 132 | Norway Spruce | *Picea abies* | Non-Native | 1 | 25 | 5.0 | Improbable | Fair | Medium | Closely planted; minor dieback. |
| 134 | Norway Spruce | *Picea abies* | Non-Native | 1 | 35 | 5.0 | Improbable | Good | Medium | Closely planted; minor dieback. |
| 135 | Common Apple | *Malus domestica* | Non-Native | 1 | 15 | 3.0 | Possible | Poor | Low | Water sprouts; dieback; dead branches. |
| 136 | Black Walnut | *Juglans nigra* | Native | 1 | 36.4 | 3.0 | Improbable | Fair | Medium | Dead branches; small crown. |
| 137 | Black Walnut | *Juglans nigra* | Native | 1 | 72.9 | 7.0 | Improbable | Fair | Medium | Minor dieback; dead branches; minor epicormic growth. |

# Appendix G – Tree Preservation Plan (NRSI)

September 2023



# Maple Grove Road Improvements Class Environmental Assessment

Tree Preservation Plan

Prepared for:

IBI Group
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410 Albert Street, Suite 101
Waterloo, ON
N2L 3V3

Project No. 2171 | July 2021

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

**Maple Grove Road Improvements Class Environmental Assessment**

**Tree Preservation Plan**

## Project Team

| | |
|---|---|
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## 1.0 Introduction

Natural Resource Solutions Inc. (NRSI) was retained in September 2018 by the Regional Municipality of Waterloo (RMOW) as part of a team to complete environmental studies to support the Maple Grove Road Improvements Class Environmental Assessment (EA) in the City of Cambridge and RMOW.

In 2004, an Environmental Study Report was filed by the RMOW for the proposed widening and reconstruction of Sportsworld Drive/Maple Grove Road from King Street to Hespeler Road. Phase I and II of the reconstruction of Sportsworld Drive/Maple Grove Road between King Street and Fountain Street was completed in 2007 and 2010, respectively. Due to several changes since the Class EA was completed in 2004, the RMOW has commissioned a new Class EA for additional improvements to Maple Grove Road between Fountain Street and Hespeler Road. Such proposed improvements include, but are not limited to, re-alignment, widening, intersection improvements (i.e. roundabouts, traffic control signals), enhanced pedestrian and cycling facilities, and the rehabilitation and widening of the Ellis Creek bridge. The new project study area includes all lands within 250 m of the Maple Grove Road Right-of-Way (ROW) between Fountain Street and Hespeler Road (Map 1).

As the undertaking is completed for the public sector, it is exempt from the City of Cambridge Trees Bylaw 71-06 and/or By-law (City of Cambridge 2018); however, a Tree Preservation Plan (TPP) has been prepared based on the construction plans provided by IBI Group (March 17, 2021). The provided construction plans represent the preferred design that was selected by the Project Team, from a selection of four road widening design alternatives and three cross-section design alternatives.

The TPP herein addresses tree retention, removal and/or injury, tree protection, mitigation and recommended compensation measures.

## 2.0 Tree Inventory and Methodology

A comprehensive inventory and assessment of trees on and within approximately 5m of the subject property was completed by a Certified Arborist on January 18, April 23, and April 29, 2019. Individual trees ≥10cm Diameter at Breast Height (DBH) were assigned a numeric identifier, and their locations were surveyed using an SXBlue II GNSS GPS unit, providing mapping grade, sub-metre accuracy. Inventoried trees are shown on Map 2 and a complete list of assessed trees and their overall health and potential for structural failure is included in Appendix I.

The following information was recorded for each tree:

- Species,
- Numeric identifier,
- DBH (centimetres) per stem >10cm,
- Number of stems,
- Approximate crown radius (metres),
- General health (excellent, good, fair, poor, very poor, dead),
- Potential for structural failure (improbable, possible, probable, imminent),
- Tree location,
- Potential bat habitat features, and
- General comments (i.e. disease, aesthetic quality, development constraints, sensitivity to development, etc.).

The overall health and potential for structural failure of each tree was assessed based on the criteria outlined in Appendix II (Dunster 2009) (Dunster et al. 2013). The assessments have been made using accepted arboricultural techniques. These include a visual examination of each tree for structural defects, scars, external indications of decay such as fungal fruiting bodies, evidence of insect attack, the condition of any visible root structures, the degree and direction of lean (if any), the general condition of the tree(s) and the surrounding site, and the current or planned proximity of property and people. None of the trees examined on the property were dissected, cored, probed, or climbed and detailed root crown examinations involving excavation were not undertaken. The conditions for this assessment, including restrictions, professional responsibility, and third-party liability can be found in Appendix III.

## 3.0 Summary of Tree Inventory Findings

In total, 452 trees were inventoried ranging in size from 10.1cm to 106.6cm DBH. A complete list of inventoried trees is provided in Appendix I and tree locations are shown on Map 2. Appendix IV includes both a list of tree species inventoried, whether they are native or non-native, their overall health, as well as a summary of the overall health of the trees inventoried and their potential for structural failure.

## 4.0 Tree Retention Analysis

The tree retention analysis was based on the extent of proposed site grading: The location of the trees was compared to the location of the proposed limit of grading, as shown on Map 2. Trees that are located outside of the extent of grading are not recommended for removal at this time.

Of the 452 trees inventoried, 89 are anticipated to be removed. This includes 2 trees that are dead.

The remaining 87 trees require removal based on the extent of the proposed site grading. Most of these trees are in fair health with an improbable potential for structural failure, and range in size from 12.2cm DBH to 72.9cm DBH.

Removal of any boundary, off-site, or private trees will require the permission of all owners involved. If the main stem of any tree is located on multiple properties, all owners of those properties must be consulted before any tree removal occurs.

## 5.0 Tree Protection Measures and Recommended Mitigation

At the detailed design stage, and prior to the removal of trees, tree protection fencing (TPF) should be installed at the dripline of trees to be retained, plus 1m or farther wherever possible. Further details and locations can be provided at that time.

## 5.1 Migratory Birds Convention Act

The removal of trees has the potential to disrupt nesting birds. The schedule of on-site work must consider the Migratory Birds Convention Act (MBCA) (Government of Canada 1994) construction window. All tree removal should occur outside of the core nesting period for migratory birds as established by the Canadian Wildlife Service (CWS 2012). This period extends from April 1 – August 31. All developers/consultants/contractors, etc. are legally obligated to carry out due diligence to protect migratory birds from harm during all construction projects. For any tree or vegetation removal which occurs during the core nesting period, nest surveys may be conducted by a qualified biologist within small, simple habitat areas (i.e. individual isolated trees as found within the area of disturbance and 12m buffer) just prior to the removal activity (less than 48hrs prior to) to ensure that nesting birds are not present. In the event a nest survey is conducted, a clearance memo will be prepared for your records. The memo will indicate that a qualified biologist undertook the surveys as proof of due diligence. It is not necessary to submit nest search results unless asked by the CWS.

## 5.2 Species at Risk Bat Habitat

The destruction of Species At Risk (SAR) bats and their habitat is prohibited under the Species At Risk Act (SARA) (Government of Canada 2002). All trees with the potential to provide bat habitat have been recommended for removal, and therefore no mitigation for SAR bats is required.

## 5.3 Compensation

Trees proposed for removal should be replaced at a 2:1 ratio. At this time, 89 trees are proposed for removal, but 2 are dead. This would require 174 trees to be planted (ie compensation for 87 trees).

It is recommended that the following criteria be followed during the development of detailed planting plans:

- The plan should be developed by, or reviewed by a Certified Arborist;
- The plan should include hardy, native tree species, where feasible, that are known to occur in the Region of Waterloo and the City of Cambridge;
- The plan should include a diversity of trees from several genera to increase disease and pest tolerance and discourage monocultures (no more than 30% from a single genus, 15% from a single species);
- The plan should include a watering and monitoring plan for 2 years following planting, and
- Trees should be replaced if they are documented to have died within the 2-year monitoring plan.

## 6.0 References

Canadian Wildlife Service (CWS). 2012. Explanation for the Core Nesting Period Table. July 2012. https://www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=4F39A78F-1#_06

Dunster, J.A. 2009. Tree Risk Assessment in Urban Areas and the Urban/Rural Interface: Course Manual. Silverton, Oregon: Pacific Northwest Chapter, International Society of Arboriculture.

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Government of Canada. 1994. Migratory Birds Convention Act, 1994. http://laws-lois.justice.gc.ca/eng/acts/M-7.01/

Government of Canada. 2002. Species at Risk Act. S.C. 2002, c.29.

**APPENDIX I** Tree Inventory Data

**Maple Grove Road Improvements Class EA**
**Tree Inventory Data**

| Tree Number | Common Name | Scientific Name | Native/ Non-native | Stem Count | DBH (cm) | Crown Radius (m) | Potential for Structural Failure Rating | Overall Condition | Proposed Action | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Black Walnut | *Juglans nigra* | Native | 1 | 43 | 4.5 | Possible | Fair | Retain | Demolition under root zone; cracking bark; poor vigor. |
| 2 | Black Walnut | *Juglans nigra* | Native | 1 | 33 | 3.0 | Improbable | Fair | Retain | Demolition under root zone; minor dieback. |
| 3 | Black Walnut | *Juglans nigra* | Native | 1 | 54 | 5.5 | Improbable | Fair | Retain | Debris under root zone; minor dieback. |
| 4 | Common Hackberry | *Celtis occidentalis* | Native | 1 | 31 | 4.0 | Improbable | Fair | Retain | 3 hackberries growing closely; minor dieback. |
| 5 | Common Hackberry | *Celtis occidentalis* | Native | 1 | 27 | 4.0 | Improbable | Fair | Retain | 3 hackberries growing closely; minor dieback. |
| 6 | Common Hackberry | *Celtis occidentalis* | Native | 1 | 33 | 3.0 | Improbable | Fair | Retain | 3 hackberries growing closely; minor dieback. |
| 7 | Serviceberry species | *Amelanchier sp.* | Native | 3 | 54+28.7+15.2 | 5.0 | Possible | Poor | Retain | Rot in main stems; successful water sprouts replacing; dead branches; codominant leaders. |
| 8 | White Oak | *Quercus alba* | Native | 1 | 29 | 1.0 | Improbable | Fair | Retain | Light pruning; crown dieback; small dead branches. |
| 9 | Norway Spruce | *Picea abies* | Non-Native | 1 | 54 | 4.0 | Improbable | Fair | Retain | Light pruning; crown dieback; hooks embedded in stem. |
| 10 | Common Hackberry | *Celtis occidentalis* | Native | 1 | 43 | 6.0 | Improbable | Good | Retain | Asymmetrical crown to south; codominant leaders; included bark; branch rub; slightly suppressed. |
| 11 | Common Hackberry | *Celtis occidentalis* | Native | 1 | 20 | 1.0 | Improbable | Good | Retain | Asymmetrical crown to south; slightly suppressed; branch rub; codominant leaders. |
| 12 | Bur Oak | *Quercus macrocarpa* | Native | 1 | 28 | 3.0 | Improbable | Fair | Retain | Asymmetrical crown southeast; minor dieback. |
| 13 | Norway Spruce | *Picea abies* | Non-Native | 1 | 50 | 3.5 | Improbable | Fair | Retain | Crown toward internation; light pruning. |
| 14 | Sugar Maple | *Acer saccharum ssp. saccharum* | Native | 1 | 90 | 6.0 | Improbable | Fair | Retain | Recent work in root zone; minor dieback codominant leaders; healthy crown. |
| 15 | Norway Spruce | *Picea abies* | Non-Native | 1 | 41 | 5.0 | Improbable | Fair | Retain | Asymmetrical crown to east; plastic fence attached to stem; light pruning. |
| 16 | Norway Spruce | *Picea abies* | Non-Native | 1 | 51 | 4.5 | Improbable | Good | Retain | Dieback; minor dieback. |
| 17 | Black Walnut | *Juglans nigra* | Native | 2 | 15.6+13.5 | 4.0 | Improbable | Fair | Retain | Poor union; cankers. |
| 18 | Black Walnut | *Juglans nigra* | Native | 2 | 25.2+21.1 | 3.0 | Improbable | Fair | Retain | Asymmetrical crown to north; included bark; chain link fence abuts stem. |
| 19 | Norway Maple | *Acer platanoides* | Non-Native | 1 | 35 | 3.5 | Improbable | Good | Retain | Private property; healthy crown. |
| 20 | Black Walnut | *Juglans nigra* | Native | 1 | 60 | 6.0 | Improbable | Fair | Retain | Asymmetrical crown to east; included bark; branch rub. |
| 21 | Norway Maple | *Acer platanoides* | Non-Native | 1 | 50 | 6.0 | Improbable | Fair | Retain | Large open crown; minor dead branches. |
| 22 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 18 | 3.0 | Improbable | Fair | Retain | Codominant leaders; old wound. |
| 23 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 20 | 2.0 | Improbable | Poor | Retain | Wound on lower stem failed to compartmentalize; rot; one leader pruned. |
| 24 | Sugar Maple | *Acer saccharum ssp. saccharum* | Native | 1 | 80 | 3.5 | Possible | Poor | Retain | Major rot; topped; significantly reduced crown. |
| 25 | Sugar Maple | *Acer saccharum ssp. saccharum* | Native | 1 | 69 | 4.0 | Improbable | Fair | Retain | Staining; large wound in upper stem, failed to compartmentalize; some rot; woodpecker damage; knot cavity. |
| 26 | Honey Locust | *Gleditsia triacanthos* | Native | 1 | 34 | 3.0 | Improbable | Good | Retain | Included bark; branch rub; erosion downslope. |
| 27 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 24 | 2.0 | Improbable | Good | Retain | Manicured; mulched. |
| 28 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 22 | 2.0 | Improbable | Good | Retain | Manicured; mulched. |
| 29 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 23 | 1.0 | Improbable | Good | Retain | Light pruning; improper prune cuts; mulched base. |
| 29 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 14 | 3.0 | Improbable | Fair | Retain | Major infill at base; minor epicormic growth. |
| 30 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 26 | 2.5 | Improbable | Fair | Retain | Sloped; open wound; reaction wood; healthy crown. |
| 31 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 29 | 4.0 | Improbable | Good | Retain | Small girdling rot; erosion downslope; included bark. |
| 32 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 29 | 3.0 | Improbable | Good | Retain | Sloped; mulched; slightly exposed roots; healthy crown. |
| 33 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 24 | 2.5 | Improbable | Good | Retain | Lower branches pruned. |
| 34 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 24 | 2.5 | Improbable | Good | Retain | |
| 35 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 21 | 3.0 | Improbable | Good | Retain | Light pruning. |
| 36 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 22 | 3.0 | Improbable | Good | Retain | Light pruning. |
| 37 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 24 | 2.0 | Improbable | Good | Retain | Light pruning, slightly suppressed. |
| 38 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 23 | 2.0 | Improbable | Good | Retain | Light pruning, slightly suppressed. |
| 39 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 20 | 3.0 | Improbable | Good | Retain | Light pruning. |
| 40 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 20 | 3.0 | Improbable | Good | Retain | Light pruning. |
| 41 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 24 | 3.0 | Improbable | Good | Retain | Mower damage to root. |
| 42 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 20 | 3.0 | Improbable | Good | Retain | Light pruning. |
| 43 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 26 | 2.0 | Improbable | Fair | Retain | Light pruning, crown dieback; snow piled at base. |
| 44 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 24 | 2.5 | Improbable | Fair | Retain | Light pruning, crown dieback; snow piled at base. |
| 45 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 22 | 2.0 | Improbable | Fair | Retain | Light pruning, crown dieback. |
| 46 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 20 | 3.0 | Improbable | Good | Retain | Light pruning. |
| 47 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 20 | 3.0 | Improbable | Good | Retain | Light pruning. |
| 48 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 20 | 3.0 | Improbable | Good | Retain | Light pruning. |
| 49 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 25 | 3.0 | Improbable | Good | Retain | Light pruning. |
| 50 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 25 | 3.0 | Improbable | Good | Retain | Light pruning. |
| 51 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 13 | 2.5 | Improbable | Good | Retain | Minor dieback. |
| 52 | Siberian Elm | *Ulmus pumila* | Non-Native | 2 | 13.1+12.5 | 2.5 | Possible | Poor | Remove | Dieback; vines; epicormic growth. |
| 53 | Black Locust | *Robinia pseudoacacia* | Non-Native | 1 | 13 | 2.0 | Possible | Poor | Remove | Dead branches; epicormic growth; broken branches. |
| 54 | Thornless Honey Locust | *Gleditsia triacanthos var. inermis* | Non-Native | 1 | 12 | 3.0 | Improbable | Fair | Retain | Infill; minor dieback. |

**Maple Grove Road Improvements Class EA**
**Tree Inventory Data**

| Tree Number | Common Name | Scientific Name | Native/ Non-native | Stem Count | DBH (cm) | Crown Radius (m) | Potential for Structural Failure Rating | Overall Condition | Proposed Action | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| 55 | Thornless Honey Locust | *Gleditsia triacanthos var. inermis* | Non-Native | 1 | 12 | 3.0 | Improbable | Fair | Retain | Infill; minor dieback. |
| 56 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 19 | 3.0 | Improbable | Fair | Retain | Major infill at base; minor epicormic growth. |
| 57 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 21 | 3.0 | Improbable | Fair | Retain | Major infill at base; minor epicormic growth. |
| 58 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 20 | 3.0 | Improbable | Fair | Retain | Major infill at base; minor epicormic growth. |
| 60 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 20 | 3.0 | Improbable | Fair | Retain | Major infill at base; epicormic growth. |
| 61 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 18 | 3.0 | Improbable | Fair | Retain | Major infill at base; no signs of decline yet. |
| 62 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 13 | 2.5 | Improbable | Good | Retain | Exposed roots. |
| 63 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 18 | 3.0 | Improbable | Good | Retain | Exposed roots. |
| 64 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 20 | 3.0 | Improbable | Good | Retain | Exposed roots. |
| 65 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 16 | 2.0 | Improbable | Excellent | Retain | No apparent problems. |
| 66 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 11 | 2.0 | Improbable | Excellent | Medium | No apparent problems. |
| 67 | Green Ash | *Fraxinus pennsylvanica* | Native | 1 | 13 | 3.0 | Possible | Poor | Low | Exfoliating bark; exit holes; water sprouts; dead branches. |
| 68 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 15 | 2.5 | Possible | Good | Low | Infill; healthy crown. |
| 69 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 15 | 2.5 | Possible | Good | Low | Infill; healthy crown. |
| 70 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 16 | 3.0 | Improbable | Fair | Low | Infill; healthy crown. |
| 71 | Norway Spruce | *Picea abies* | Non-Native | 1 | 12 | 2.5 | Improbable | Fair | Medium | Minor dieback. |
| 72 | Norway Spruce | *Picea abies* | Non-Native | 1 | 12 | 2.5 | Improbable | Fair | Medium | Minor dieback. |
| 73 | Norway Spruce | *Picea abies* | Non-Native | 1 | 15 | 2.5 | Improbable | Good | Medium | Minor dieback. |
| 74 | Norway Spruce | *Picea abies* | Non-Native | 1 | 17 | 2.5 | Improbable | Good | Medium | Minor dieback. |
| 75 | Freeman's Maple | *Acer X freemanii* | Native | 2 | 12.8+10 | 3.0 | Improbable | Fair | Medium | Codominant leaders; included bark. |
| 76 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 13 | 3.0 | Improbable | Fair | Medium | Codominant leaders; included bark. |
| 77 | Norway Spruce | *Picea abies* | Non-Native | 1 | 18 | 3.0 | Improbable | Fair | Medium | Minor dieback; girdling roots. |
| 78 | Norway Spruce | *Picea abies* | Non-Native | 1 | 18 | 3.0 | Improbable | Fair | Medium | Minor dieback; girdling roots. |
| 79 | Freeman's Maple | *Acer X freemanii* | Native | 3 | 14.3+14.2+11.2 | 3.0 | Improbable | Fair | Medium | Codominant leaders; included bark. |
| 80 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 12 | 3.0 | Improbable | Fair | Medium | Codominant leaders; included bark. |
| 81 | Freeman's Maple | *Acer X freemanii* | Native | 2 | 12.6+11.9 | 3.0 | Improbable | Fair | Medium | Codominant leaders; included bark. |
| 82 | White Spruce | *Picea glauca* | Native | 1 | 12 | 2.0 | Improbable | Good | Medium | Minor dieback. |
| 83 | Freeman's Maple | *Acer X freemanii* | Native | 2 | 13.8+13.5 | 3.0 | Improbable | Good | Medium | Codominant leaders; included bark. |
| 84 | Freeman's Maple | *Acer X freemanii* | Native | 2 | 15.7+13.7 | 3.0 | Improbable | Good | Medium | Codominant leaders; included bark. |
| 85 | White Spruce | *Picea glauca* | Native | 1 | 15 | 2.5 | Improbable | Good | Medium | Minor dieback. |
| 86 | White Spruce | *Picea glauca* | Native | 1 | 15 |  | Improbable | Good | Medium | Minor dieback. |
| 87 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 12.8+11.6+11.2 | 4.0 | Improbable | Fair | Medium | Codominant leaders; included bark. |
| 88 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 13 | 3.0 | Improbable | Fair | Medium | Codominant leaders; included bark. |
| 89 | Freeman's Maple | *Acer X freemanii* | Native | 3 | 15+12.1+13.9 | 3.0 | Improbable | Fair | Medium | Codominant leaders; included bark. |
| 90 | White Spruce | *Picea glauca* | Native | 1 | 13 | 2.5 | Improbable | Good | Medium | Minor dieback. |
| 91 | Freeman's Maple | *Acer X freemanii* | Native | 2 | 14.7+10.3 | 3.0 | Improbable | Good | Medium | Codominant leaders; included bark. |
| 92 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 12 | 3.0 | Improbable | Good | Medium | Codominant leaders; included bark. |
| 93 | White Spruce | *Picea glauca* | Native | 1 | 14 | 2.5 | Improbable | Excellent | Medium | No apparent problems. |
| 94 | White Spruce | *Picea glauca* | Native | 1 | 14 | 2.5 | Improbable | Excellent | Medium | No apparent problems. |
| 95 | Freeman's Maple | *Acer X freemanii* | Native | 2 | 14.9+10.2 | 3.0 | Improbable | Fair | Medium | Codominant leaders; included bar. |
| 96 | Freeman's Maple | *Acer X freemanii* | Native | 3 | 15.3+14.7+11.2 | 4.0 | Improbable | Fair | Medium | Mulch infill; codominant leaders. |
| 97 | Freeman's Maple | *Acer X freemanii* | Native | 4 | 12.9+12.8+12 | 4.0 | Improbable | Fair | Medium | Codominant leaders; mulch infill; included bark. |
| 98 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 13 | 2.5 | Improbable | Fair | Medium | Garden bed; minor damage to main stem. |
| 99 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 12 | 3.0 | Improbable | Fair | Medium | Codominant leaders; minor branch rub; healthy crown. |
| 100 | Freeman's Maple | *Acer X freemanii* | Native | 3 | 15+13.6+12.1 | 4.0 | Improbable | Good | Medium | Codominant leaders; in garden bed; healthy crown. |
| 101 | Black Willow | *Salix nigra* | Native | 1 | 60 | 5.0 | Possible | Fair | Medium | Broken and dead branches; epicormic growth. |
| 102 | Black Willow | *Salix nigra* | Native | 2 | 65+22 | 6.0 | Possible | Fair | Medium | Dead and broken branches; large crown; epicormic growth. |
| 103 | Freeman's Maple | *Acer X freemanii* | Native | 2 | 18.7+18.6 | 3.0 | Improbable | Good | Medium | Codominant leaders; minor included bark. |
| 104 | Norway Spruce | *Picea abies* | Non-Native | 1 | 56 | 4.0 | Improbable | Good | Medium | Old wound down stem; minor dieback. |
| 105 | Norway Spruce | *Picea abies* | Non-Native | 1 | 46 | 4.0 | Improbable | Fair | Medium | Crown toward road; dieback. |
| 106 | Norway Spruce | *Picea abies* | Non-Native | 1 | 69 | 4.5 | Improbable | Fair | Medium | Minor dieback. |
| 107 | Sugar Maple | *Acer saccharum ssp. saccharum* | Native | 1 | 60 | 6.0 | Improbable | Good | High | Good reaction wood; good form; minor dieback. |
| 108 | Sugar Maple | *Acer saccharum ssp. saccharum* | Native | 1 | 62 | 6.0 | Improbable | Good | High | Healthy crown; minor mower damage to roots. |
| 109 | Sugar Maple | *Acer saccharum ssp. saccharum* | Native | 1 | 52 | 5.0 | Possible | Fair | High | Small broken branches; minor dieback. |
| 110 | Norway Maple | *Acer platanoides* | Non-Native | 1 | 29 | 3.5 | Improbable | Fair | Low | Minor damage to stem. |
| 111 | Northern Pin Oak | *Quercus ellipsoidalis* | Native | 1 | 32 | 4.0 | Improbable | Good | Medium | Minor dieback. |
| 112 | Eastern White Cedar | *Thuja occidentalis* | Native | 1 | 45 | 4.0 | Improbable | Excellent | Medium | Dense healthy crown. |
| 113 | Green Ash | *Fraxinus pennsylvanica* | Native | 1 | 35 | 4.5 | Possible | Poor | Low | Exit holes; exfoliating bark; poor vigor. |
| 114 | Norway Spruce | *Picea abies* | Non-Native | 1 | 30 | 5.0 | Improbable | Fair | Medium | Closely planted; minor dieback. |

**Maple Grove Road Improvements Class EA**
**Tree Inventory Data**

| Tree Number | Common Name | Scientific Name | Native/ Non-native | Stem Count | DBH (cm) | Crown Radius (m) | Potential for Structural Failure Rating | Overall Condition | Proposed Action | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| 115 | Norway Spruce | *Picea abies* | Non-Native | 1 | 35 | 5.0 | Possible | Poor | Low | Closely planted; dieback. |
| 116 | Norway Spruce | *Picea abies* | Non-Native | 1 | 35 | 4.5 | Possible | Poor | Low | Closely planted; dieback. |
| 117 | Norway Spruce | *Picea abies* | Non-Native | 1 | 30 | 4.0 | Probable | Dead | Low | Closely planted; minor dieback. |
| 118 | Norway Spruce | *Picea abies* | Non-Native | 1 | 40 | 5.0 | Improbable | Fair | Medium | Closely planted; minor dieback. |
| 119 | Black Walnut | *Juglans nigra* | Native | 1 | 19 | 4.0 | Improbable | Fair | Low | Adjacent to sewer grate; cankers. |
| 120 | Norway Spruce | *Picea abies* | Non-Native | 1 | 30 | 5.0 | Improbable | Fair | Medium | Closely planted; minor dieback. |
| 121 | Norway Spruce | *Picea abies* | Non-Native | 1 | 30 | 5.0 | Improbable | Fair | Medium | Closely planted; minor dieback. |
| 122 | Norway Spruce | *Picea abies* | Non-Native | 1 | 30 | 5.0 | Improbable | Fair | Medium | Closely planted; minor dieback. |
| 123 | Norway Spruce | *Picea abies* | Non-Native | 1 | 30 | 5.0 | Improbable | Fair | Medium | Closely planted; minor dieback. |
| 124 | Norway Spruce | *Picea abies* | Non-Native | 1 | 30 | 4.0 | Improbable | Fair | Medium | Closely planted; minor dieback. |
| 125 | White Spruce | *Picea glauca* | Native | 1 | 25 | 4.0 | Improbable | Fair | Medium | Closely planted; minor dieback. |
| 126 | White Spruce | *Picea glauca* | Native | 1 | 25 | 4.0 | Improbable | Fair | Medium | Closely planted; minor dieback. |
| 127 | White Spruce | *Picea glauca* | Native | 1 | 25 | 4.0 | Improbable | Fair | Medium | Closely planted; minor dieback. |
| 128 | White Spruce | *Picea glauca* | Native | 1 | 25 | 4.0 | Improbable | Fair | Medium | Closely planted; minor dieback. |
| 129 | White Spruce | *Picea glauca* | Native | 1 | 25 | 4.0 | Improbable | Fair | Medium | Closely planted; minor dieback. |
| 131 | Norway Spruce | *Picea abies* | Non-Native | 1 | 25 | 5.0 | Improbable | Fair | Medium | Closely planted; minor dieback. |
| 132 | Norway Spruce | *Picea abies* | Non-Native | 1 | 25 | 5.0 | Improbable | Fair | Medium | Closely planted; minor dieback. |
| 134 | Norway Spruce | *Picea abies* | Non-Native | 1 | 35 | 5.0 | Improbable | Good | Medium | Closely planted; minor dieback. |
| 135 | Common Apple | *Malus domestica* | Non-Native | 1 | 15 | 3.0 | Possible | Poor | Low | Water sprouts; dieback; dead branches. |
| 136 | Black Walnut | *Juglans nigra* | Native | 1 | 36 | 3.0 | Improbable | Fair | Medium | Dead branches; small crown. |
| 137 | Black Walnut | *Juglans nigra* | Native | 1 | 73 | 7.0 | Improbable | Fair | Medium | Minor dieback; dead branches; minor epicormic growth. |
| 138 | Black Walnut | *Juglans nigra* | Native | 1 | 57 | 7.0 | Improbable | Fair | Medium | Minor dieback. |
| 139 | Common Apple | *Malus domestica* | Non-Native | 2 | 21+17 | 4.0 | Possible | Poor | Low | Wounds and heart rot at base; water sprouts. |
| 140 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 48 | 2.0 | Improbable | Fair | Medium | Tall but tight crown; dead branches. |
| 141 | Black Walnut | *Juglans nigra* | Native | 1 | 25 | 5.0 | Improbable | Fair | Low | Cankers. |
| 142 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 77 | 7.0 | Improbable | Good | High | Good form; proper pruning cuts; minor dieback. |
| 143 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 15 | 2.0 | Improbable | Fair | Low | Guy wire should be removed; dieback. |
| 144 | Eastern White Cedar | *Thuja occidentalis* | Native | 1 | 12 | 2.5 | Improbable | Fair | Medium | Hedgerow end running perpendicular to road; minor dieback; slightly suppressed. |
| 145 | Norway Spruce | *Picea abies* | Non-Native | 1 | 40 | 5.0 | Improbable | Fair | Medium | Other side of fence; minor dieback. |
| 146 | Norway Spruce | *Picea abies* | Non-Native | 1 | 25 | 3.5 | Improbable | Good | Medium | Other side of fence; minor dieback. |
| 147 | Norway Spruce | *Picea abies* | Non-Native | 1 | 25 | 3.5 | Improbable | Good | Medium | Other side of fence; minor dieback. |
| 148 | Norway Spruce | *Picea abies* | Non-Native | 1 | 25 | 3.5 | Improbable | Good | Medium | Other side of fence; minor dieback. |
| 149 | Norway Spruce | *Picea abies* | Non-Native | 1 | 25 | 3.0 | Improbable | Fair | Medium | Dieback. |
| 150 | Norway Maple | *Acer platanoides* | Non-Native | 1 | 55 | 6.0 | Improbable | Fair | Low | Small dead branches. |
| 151 | Norway Maple | *Acer platanoides* | Non-Native | 1 | 55 | 5.0 | Improbable | Fair | Low | Minor staining and rot in isolated areas. |
| 152 | Black Locust | *Robinia pseudoacacia* | Non-Native | 1 | 79 | 7.0 | Possible | Fair | Medium | Small dead branches; dieback; tall crown. |
| 153 | Staghorn Sumac | *Rhus typhina* | Native | 1 | 13 | 4.5 | Possible | Poor | Low | Major dieback; unbalanced. |
| 154 | Scots Pine | *Pinus sylvestris* | Non-Native | 1 | 15 | 2.5 | Improbable | Fair | Medium | Vines; dieback. |
| 155 | Norway Spruce | *Picea abies* | Non-Native | 1 | 21 | 2.5 | Improbable | Fair | Medium | Vines; dieback. |
| 156 | Norway Spruce | *Picea abies* | Non-Native | 1 | 11 | 2.0 | Improbable | Fair | Medium | Vines; dieback. |
| 157 | Norway Spruce | *Picea abies* | Non-Native | 1 | 19 | 2.5 | Improbable | Fair | Medium | Vines; dieback. |
| 158 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 55 | 6.5 | Improbable | Fair | High | Vines; small dead branches. |
| 159 | Freeman's Maple | *Acer X freemanii* | Native | 6 | 58.6+46.5+45.5+39.9+38.6+35.8 | 7.0 | Improbable | Fair | High | Codominant leaders at base; small dead and broken branches. |
| 160 | Norway Maple | *Acer platanoides* | Non-Native | 1 | 39.3+30.8 | 5.5 | Improbable | Fair | Low | Minor staining and vertical seams. |
| 161 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 14 | 2.5 | Improbable | Good | Low | Minor dieback. |
| 162 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 22 | 2.5 | Improbable | Excellent | Low | No apparent problems. |
| 163 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 15 | 2.5 | Improbable | Good | Low | Minor dieback. |
| 163 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 16 | 2.5 | Improbable | Excellent | Low | No apparent problems. |
| 164 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 15 | 2.5 | Improbable | Excellent | Low | No apparent problems. |
| 165 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 15 | 2.5 | Improbable | Excellent | Low | No apparent problems. |
| 166 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 16 | 2.5 | Improbable | Excellent | Low | Healthy hedgerow. |
| 167 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 16 | 2.5 | Improbable | Excellent | Low | Healthy hedgerow. |
| 168 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 16 | 2.5 | Improbable | Excellent | Low | Healthy hedgerow. |
| 169 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 18 | 2.5 | Improbable | Excellent | Low | Healthy hedgerow. |
| 170 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 16 | 2.5 | Improbable | Excellent | Low | Healthy hedgerow. |
| 171 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 18 | 2.5 | Improbable | Excellent | Low | Healthy hedgerow. |
| 172 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 16 | 2.5 | Improbable | Excellent | Low | Healthy hedgerow. |
| 173 | Common Apple | *Malus domestica* | Non-Native | 1 | 22 | 5.0 | Improbable | Fair | Medium | Dieback; water sprouts. |
| 174 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 19 | 2.5 | Improbable | Excellent | Low | Healthy hedgerow. |
| 175 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 18 | 2.5 | Improbable | Excellent | Low | Healthy hedgerow. |
| 176 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 17 | 2.5 | Improbable | Excellent | Low | Healthy hedgerow. |
| 177 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 13 | 2.5 | Improbable | Excellent | Low | Healthy hedgerow. |

**Maple Grove Road Improvements Class EA**
**Tree Inventory Data**

| Tree Number | Common Name | Scientific Name | Native/ Non-native | Stem Count | DBH (cm) | Crown Radius (m) | Potential for Structural Failure Rating | Overall Condition | Proposed Action | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| 178 | Norway Maple | *Acer platanoides* | Non-Native | 1 | 42 | 5.0 | Improbable | Fair | Low | Minor staining; minor deadwood. |
| 179 | Black Walnut | *Juglans nigra* | Native | 1 | 41 | 5.5 | Improbable | Good | Medium | Minor mower damage to roots; minor dieback. |
| 180 | European Larch | *Larix decidua* | Non-Native | 1 | 42 | 5.0 | Improbable | Good | Medium | Minor dieback. |
| 181 | White Ash | *Fraxinus americana* | Native | 1 | 16 | 3.0 | Possible | Very Poor | Low | Exfoliating bark; exit holes; dead branches. |
| 182 | Norway Maple | *Acer platanoides* | Non-Native | 1 | 100 | 5.0 | Improbable | Fair | Low | Several cavities; codominant leaders; poor union; large water sprouts with poor form; minor dieback. |
| 183 | Norway Maple | *Acer platanoides* | Non-Native | 1 | 45 | 5.0 | Improbable | Fair | Low | Dead branches; low vigor; lacking leader. |
| 184 | Red Oak | *Quercus rubra* | Native | 1 | 70 | 7.0 | Improbable | Good | High | Minor deadwood; open crown; minor epicormic growth. |
| 185 | Black Walnut | *Juglans nigra* | Native | 1 | 15 | 4.0 | Possible | Fair | Low | Slightly unbalanced; growing on steep slope; minor vines; broken branch. |
| 186 | Black Walnut | *Juglans nigra* | Native | 1 | 20 | 4.0 | Improbable | Fair | Low | Minor cankers; minor epicormic growth; minor dieback. |
| 187 | Black Walnut | *Juglans nigra* | Native | 1 | 24 | 5.0 | Improbable | Fair | Low | Minor cankers; minor vines. |
| 188 | Black Walnut | *Juglans nigra* | Native | 1 | 26 | 4.0 | Improbable | Fair | Low | Minor dieback. |
| 189 | Black Walnut | *Juglans nigra* | Native | 1 | 25 | 3.5 | Improbable | Fair | Low | Dieback. |
| 190 | Manitoba Maple | *Acer negundo* | Native | 3 | 14.2+14.4+12.3 | 3.0 | Possible | Fair | Low | Codominant leaders;; growing into wall; dieback. |
| 191 | Black Willow | *Salix nigra* | Native | 1 | 24 | 3.5 | Possible | Fair | Medium | Dead branches; epicormic growth. |
| 192 | Black Willow | *Salix nigra* | Native | 1 | 23 | 3.5 | Possible | Fair | Medium | Dead branches; epicormic growth. |
| 193 | Black Willow | *Salix nigra* | Native | 1 | 12 | 3.0 | Possible | Fair | Medium | Dead branches; epicormic growth. |
| 194 | Black Willow | *Salix nigra* | Native | 3 | 44.5+22+21 | 5.5 | Possible | Fair | Medium | Dead branches; epicormic growth. |
| 195 | Black Willow | *Salix nigra* | Native | 2 | 23.6+13 | 3.5 | Possible | Fair | Medium | Dead branches; epicormic growth. |
| 196 | Black Willow | *Salix nigra* | Native | 1 | 38 | 4.0 | Possible | Fair | Medium | Dead branches; epicormic growth. |
| 197 | Black Willow | *Salix nigra* | Native | 1 | 47 | 5.0 | Possible | Fair | Medium | Dead branches; epicormic growth, large branch failure. |
| 198 | Norway Maple | *Acer platanoides* | Non-Native | 3 | 36+23+14 | 5.0 | Improbable | Fair | Low | Large exposed roots; small dead branches. |
| 199 | Manitoba Maple | *Acer negundo* | Native | 1 | 23 | 5.0 | Probable | Very Poor | Low | Leaning toward road; stem failure; water sprouts dieback. |
| 200 | Eastern Cottonwood | *Populus deltoides* | Native | 1 | 15 | 3.0 | Improbable | Good | Medium | Small galls. |
| 201 | Eastern Cottonwood | *Populus deltoides* | Native | 1 | 13 | 2.0 | Improbable | Fair | Medium | Dieback; galls. |
| 202 | Trembling Aspen | *Populus tremuloides* | Native | 1 | 11 | 2.0 | Improbable | Fair | Medium | Minor dieback; wound with sapwood rot. |
| 203 | Trembling Aspen | *Populus tremuloides* | Native | 1 | 11 | 2.0 | Improbable | Fair | Medium | Minor dieback. |
| 204 | Trembling Aspen | *Populus tremuloides* | Native | 1 | 13 | 2.0 | Improbable | Fair | Medium | Minor dieback. |
| 205 | Trembling Aspen | *Populus tremuloides* | Native | 1 | 10 | 2.0 | Improbable | Fair | Medium | Minor dieback. |
| 206 | Trembling Aspen | *Populus tremuloides* | Native | 1 | 11 | 2.0 | Improbable | Fair | Medium | Minor dieback. |
| 207 | Eastern Cottonwood | *Populus deltoides* | Native | 1 | 33 | 4.0 | Improbable | Fair | Medium | Large sprouts around base; minor dieback. |
| 208 | Manitoba Maple | *Acer negundo* | Native | 3 | 30.4+27.9+19 | 5.0 | Possible | Poor | Low | Codominant leaders; dieback; included bark. |
| 209 | Manitoba Maple | *Acer negundo* | Native | 2 | 29.9+26.7 | 6.0 | Probable | Very Poor | Low | Cracked at stem union; dieback; epicormic growth. |
| 210 | Manitoba Maple | *Acer negundo* | Native | 4 | 16+15+13 | 5.0 | Possible | Poor | Low | Codominant leaders; sprawling crown; epicormic growth. |
| 211 | Manitoba Maple | *Acer negundo* | Native | 3 | 20+19.6+13.4 | 5.0 | Possible | Fair | Low | Codominant leaders; epicormic growth; dieback. |
| 212 | Manitoba Maple | *Acer negundo* | Native | 1 | 42 | 5.5 | Possible | Fair | Low | Slightly unbalanced; lower branches touching ground. |
| 213 | Black Willow | *Salix nigra* | Native | 1 | 45 | 6.0 | Possible | Fair | Medium | Dead and broken branches; epicormic growth. |
| 214 | Black Willow | *Salix nigra* | Native | 2 | 55+28 | 4.5 | Possible | Poor | Low | Dead and broken branches; deadwood. |
| 215 | White Elm | *Ulmus americana* | Native | 1 | 21 | 2.0 | Improbable | Fair | Medium | Slightly suppressed; epicormic growth; small crown. |
| 216 | Black Willow | *Salix nigra* | Native | 4 | 45+36+19 | 6.0 | Possible | Fair | Medium | Dead branches; dieback; codominant leaders; poor unions. |
| 217 | White Elm | *Ulmus americana* | Native | 1 | 17 | 3.0 | Improbable | Fair | Medium | Healthy crown good form; minor epicormic growth. |
| 218 | Black Willow | *Salix nigra* | Native | 2 | 34.7+26.2 | 5.5 | Possible | Fair | Medium | |
| 219 | White Mulberry | *Morus alba* | Non-Native | 4 | 13+12+12 | 4.0 | Improbable | Fair | Low | Growing through paige fence; codominant leaders; epicormic growth. |
| 220 | Black Walnut | *Juglans nigra* | Native | 1 | 15 | 2.0 | Improbable | Good | Low | Minor epicormic growth. |
| 221 | Manitoba Maple | *Acer negundo* | Native | 1 | 37 | 4.0 | Possible | Poor | Low | Major epicormic growth; dieback. |
| 222 | Black Walnut | *Juglans nigra* | Native | 2 | 16.6+12.1 | 2.5 | Improbable | Fair | Low | Codominant leaders; minor dieback. |
| 223 | Black Walnut | *Juglans nigra* | Native | 1 | 17 | 4.0 | Improbable | Good | Low | Minor included bark. |
| 224 | Manitoba Maple | *Acer negundo* | Native | 1 | 20 | #VALUE! | Possible | Poor | Low | Dieback; major epicormic growth. |
| 225 | White Ash | *Fraxinus americana* | Native | 1 | 14 | 2.5 | Improbable | Fair | Low | Next to bridge wall; included bark minor dieback. |
| 226 | White Ash | *Fraxinus americana* | Native | 1 | 10 | 2.0 | Probable | Very Poor | Low | Exfoliating bark; exit holes; dead branches. |
| 227 | Manitoba Maple | *Acer negundo* | Native | 4 | 14+12+11.8 | 4.0 | Possible | Poor | Low | Codominant leaders; dieback; epicormic growth. |
| 228 | Black Walnut | *Juglans nigra* | Native | 1 | 12 | 3.0 | Improbable | Good | Low | Minor dieback. |
| 229 | Manitoba Maple | *Acer negundo* | Native | 1 | 14 | 3.0 | Improbable | Fair | Low | Epicormic growth. |
| 230 | Black Walnut | *Juglans nigra* | Native | 1 | 18 | 3.0 | Improbable | Fair | Low | Minor cankers; minor dieback. |
| 231 | Norway Maple | *Acer platanoides* | Non-Native | 1 | 14 | 3.0 | Improbable | Excellent | Low | No apparent problems. |
| 232 | Scots Pine | *Pinus sylvestris* | Non-Native | 1 | 45 | 4.0 | Improbable | Fair | Medium | Light pruning; minor dieback. |
| 233 | Thornless Honey Locust | *Gleditsia triacanthos var. inermis* | Non-Native | 1 | 73 | 7.0 | Improbable | Fair | Medium | Dieback; codominant leaders. |
| 234 | Sugar Maple | *Acer saccharum ssp. saccharum* | Native | 1 | 20 | 2.5 | Improbable | Fair | Medium | Vertical seams; minor epicormic growth. |
| 235 | White Spruce | *Picea glauca* | Native | 1 | 17 | 2.0 | Improbable | Fair | Medium | Dieback. |
| 236 | Manitoba Maple | *Acer negundo* | Native | 1 | 29.2+24.2 | 5.0 | Possible | Fair | Low | Leaning away from road; dieback. |
| 237 | Black Walnut | *Juglans nigra* | Native | 1 | 15 | 2.5 | Improbable | Fair | Low | Minor pruning; on slope. |

**Maple Grove Road Improvements Class EA**
**Tree Inventory Data**

| Tree Number | Common Name | Scientific Name | Native/ Non-native | Stem Count | DBH (cm) | Crown Radius (m) | Potential for Structural Failure Rating | Overall Condition | Proposed Action | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| 238 | Black Walnut | *Juglans nigra* | Native | 1 | 34 | 5.5 | Improbable | Fair | Medium | Next to fence; dead branches; topped under hydro. |
| 239 | Austrian Pine | *Pinus nigra* | Non-Native | 1 | 20 | 2.5 | Improbable | Fair | Low | Unbalanced; minor dieback. |
| 240 | Austrian Pine | *Pinus nigra* | Non-Native | 1 | 25 | 3.0 | Improbable | Fair | Low | Codominant leaders; light pruning. |
| 241 | Norway Spruce | *Picea abies* | Non-Native | 1 | 35 | 5.0 | Improbable | Fair | Medium | Minor dieback. |
| 242 | Norway Spruce | *Picea abies* | Non-Native | 1 | 18 | 3.0 | Possible | Poor | Low | Dead top; suppressed. |
| 243 | Austrian Pine | *Pinus nigra* | Non-Native | 1 | 20 | 3.0 | Improbable | Fair | Low | Codominant leaders; light pruning. |
| 244 | Austrian Pine | *Pinus nigra* | Non-Native | 1 | 20 | 4.0 | Improbable | Fair | Low | Light pruning; sapsucker holes. |
| 245 | Sugar Maple | *Acer saccharum ssp. saccharum* | Native | 1 | 50 | 7.0 | Possible | Fair | High | Small dead branches; healthy crown and form. |
| 246 | White Spruce | *Picea glauca* | Native | 1 | 23 | 3.5 | Improbable | Fair | Medium | Minor dieback; minor pruning for hydro clearance. |
| 247 | White Spruce | *Picea glauca* | Native | 1 | 19 | 3.0 | Improbable | Fair | Medium | Minor dieback. |
| 248 | Black Walnut | *Juglans nigra* | Native | 1 | 15.4+14.2 | 3.0 | Improbable | Fair | Low | Codominant leaders; broken top; cankers. |
| 249 | Norway Spruce | *Picea abies* | Non-Native | 1 | 25 | 3.5 | Improbable | Excellent | Medium | Full thick crown. |
| 250 | Black Willow | *Salix nigra* | Native | 1 | 42 | 3.0 | Possible | Poor | Low | Major dieback; water sprouts; exit holes. |
| 251 | Common Apple | *Malus domestica* | Non-Native | 1 | 64 | 4.5 | Probable | Very Poor | Low | Broken top; water sprouts; dieback; heart rot; outside hydro lines. |
| 252 | Black Walnut | *Juglans nigra* | Native | 1 | 38 | 6.0 | Probable | Very Poor | Low | 90% dieback; large dead branches; fruiting bodies. |
| 253 | Black Walnut | *Juglans nigra* | Native | 1 | 42 | 5.5 | Improbable | Fair | Medium | |
| 254 | Black Walnut | *Juglans nigra* | Native | 1 | 17 | 2.5 | Improbable | Good | Low | Small canker. |
| 255 | White Spruce | *Picea glauca* | Native | 1 | 50 | 5.0 | Improbable | Fair | Medium | Raised roots; pruned lower branches; minor dieback. |
| 256 | White Spruce | *Picea glauca* | Native | 1 | 28 | 4.0 | Improbable | Good | Medium | Minor dieback; branches to ground; large lateral branches. |
| 257 | White Spruce | *Picea glauca* | Native | 1 | 22 | 3.5 | Improbable | Good | Medium | Minor dieback; branches to ground. |
| 258 | White Spruce | *Picea glauca* | Native | 1 | 21 | 3.5 | Improbable | Good | Medium | Minor dieback; branches to ground. |
| 259 | White Spruce | *Picea glauca* | Native | 1 | 46 | 4.0 | Improbable | Fair | Medium | Minor dieback; pruned lower branches. |
| 260 | White Spruce | *Picea glauca* | Native | 1 | 40 | 4.0 | Improbable | Fair | Medium | Minor dieback; pruned lower branches. |
| 261 | White Spruce | *Picea glauca* | Native | 1 | 38 | 4.0 | Improbable | Fair | Medium | Minor dieback; pruned lower branches. |
| 262 | White Spruce | *Picea glauca* | Native | 1 | 30 | 4.0 | Improbable | Fair | Medium | Minor dieback; pruned lower branches. |
| 263 | White Spruce | *Picea glauca* | Native | 1 | 34 | 4.0 | Improbable | Fair | Medium | Minor dieback; pruned lower branches. |
| 264 | Manitoba Maple | *Acer negundo* | Native | 1 | 12 | 2.0 | Possible | Fair | Low | Pruned lower branches; water sprouts; dieback; growing just behind fence. |
| 265 | White Spruce | *Picea glauca* | Native | 1 | 35 | 4.0 | Improbable | Fair | Medium | Minor dieback; other side of fence. |
| 266 | White Spruce | *Picea glauca* | Native | 1 | 36 | 4.0 | Improbable | Fair | Medium | Minor dieback; pruned lower branches. |
| 267 | Freeman's Maple | *Acer X freemanii* | Native | 2 | 35.3+45.8 | 6.0 | Improbable | Good | Medium | Minor broken branches; good branch union. |
| 268 | White Spruce | *Picea glauca* | Native | 1 | 29 | 3.0 | Possible | Poor | Low | Exfoliating bark; exit holes; dead branches. |
| 269 | White Spruce | *Picea glauca* | Native | 1 | 33 | 3.5 | Improbable | Fair | Medium | Minor dieback; pruned lower branches. |
| 270 | White Spruce | *Picea glauca* | Native | 1 | 34 | 4.0 | Improbable | Fair | Medium | Minor dieback; pruned lower branches. |
| 271 | Manitoba Maple | *Acer negundo* | Native | 1 | 37 | 3.5 | Possible | Fair | Low | Broken branches; dieback; minor lean toward road; 2 codominant stems removed; poor compartmentalization. |
| 273 | Austrian Pine | *Pinus nigra* | Non-Native | 1 | 29 | 4.0 | Improbable | Fair | Low | Branches to ground; large crown; minor dieback. |
| 274 | Austrian Pine | *Pinus nigra* | Non-Native | 1 | 30 | 4.5 | Improbable | Fair | Low | Branches to ground; large crown; minor dieback. |
| 275 | Austrian Pine | *Pinus nigra* | Non-Native | 1 | 35 | 5.0 | Improbable | Fair | Low | Branches to ground; large crown; minor dieback. |
| 276 | Austrian Pine | *Pinus nigra* | Non-Native | 1 | 38 | 5.0 | Improbable | Fair | Low | Branches to ground; large crown; minor dieback. |
| 277 | Austrian Pine | *Pinus nigra* | Non-Native | 1 | 27 | 3.0 | Improbable | Fair | Low | Minor dieback; curling twigs; exit holes. |
| 278 | Austrian Pine | *Pinus nigra* | Non-Native | 1 | 32 | 3.0 | Improbable | Good | Low | Healthy crown, branches to ground. |
| 279 | Austrian Pine | *Pinus nigra* | Non-Native | 1 | 31 | 3.0 | Improbable | Good | Low | Healthy crown, branches to ground. |
| 280 | Austrian Pine | *Pinus nigra* | Non-Native | 4 | 23+21+19+18 | 5.0 | Improbable | Fair | Low | Codominant leaders; full crown. |
| 281 | Austrian Pine | *Pinus nigra* | Non-Native | 2 | 21.5+18.6 | 3.0 | Improbable | Fair | Low | S-bend near base; codominant leaders; minor dieback. |
| 282 | Austrian Pine | *Pinus nigra* | Non-Native | 1 | 23 | 2.5 | Possible | Poor | Low | Dead top; 4m high; dieback. |
| 283 | Norway Maple | *Acer platanoides* | Non-Native | 1 | 52 | 5.5 | Improbable | Good | Low | Healthy dense large crown. |
| 284 | Scots Pine | *Pinus sylvestris* | Non-Native | 1 | 55 | 5.5 | Improbable | Good | Medium | Dead branch; minor dieback. |
| 285 | Eastern White Pine | *Pinus strobus* | Native | 1 | 29 | 4.0 | Improbable | Good | Medium | Minor dieback. |
| 286 | Eastern White Pine | *Pinus strobus* | Native | 2 | 25.1+23.6 | 3.0 | Improbable | Good | Medium | Minor dieback; slightly included bark. |
| 287 | Eastern White Pine | *Pinus strobus* | Native | 1 | 32 | 3.5 | Improbable | Good | Medium | Minor dieback. |
| 288 | Eastern White Pine | *Pinus strobus* | Native | 1 | 33 | 3.5 | Possible | Fair | Medium | Dieback. |
| 289 | Eastern White Pine | *Pinus strobus* | Native | 1 | 24 | 3.5 | Possible | Fair | Medium | Dieback. |
| 290 | Scots Pine | *Pinus sylvestris* | Non-Native | 1 | 39 | 4.0 | Improbable | Fair | Medium | Dieback. |
| 291 | Scots Pine | *Pinus sylvestris* | Non-Native | 1 | 34 | 3.5 | Improbable | Good | Medium | Minor dieback. |
| 292 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 26 | 5.0 | Improbable | Fair | Medium | Major damage to stem; exit holes; healthy crown. |
| 293 | Silver Maple | *Acer saccharinum* | Native | 1 | 30 | 5.0 | Improbable | Fair | Medium | Major damage to stem; exit holes; healthy crown. |
| 294 | Silver Maple | *Acer saccharinum* | Native | 1 | 33 | 5.0 | Improbable | Fair | Medium | Major damage to stem; exit holes; healthy crown. |
| 295 | Silver Maple | *Acer saccharinum* | Native | 1 | 43 | 5.5 | Improbable | Fair | Medium | Minor damage to stem; healthy crown. |
| 296 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 14 | 3.0 | Improbable | Fair | Medium | Broken branches; moderate compartmentalization. |
| 297 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 15 | 3.0 | Improbable | Good | Medium | Mower damage at base. |
| 298 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 16.2+11.9+10.7 | 3.0 | Improbable | Good | Medium | Mower damage at base. |
| 299 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 12 | 3.0 | Improbable | Good | Medium | Mower damage at base. |

**Maple Grove Road Improvements Class EA**
**Tree Inventory Data**

| Tree Number | Common Name | Scientific Name | Native/ Non-native | Stem Count | DBH (cm) | Crown Radius (m) | Potential for Structural Failure Rating | Overall Condition | Proposed Action | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| 300 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 19 | 3.0 | Improbable | Good | Medium | Mower damage at base. |
| 301 | Norway Maple | *Acer platanoides* | Non-Native | 1 | 20 | 3.5 | Improbable | Fair | Low | Minor wounds on stem. |
| 302 | Norway Maple | *Acer platanoides* | Non-Native | 1 | 23 | 4.0 | Improbable | Good | Low | Minor dieback. |
| 303 | Norway Maple | *Acer platanoides* | Non-Native | 1 | 32 | 4.0 | Improbable | Good | Low | Minor dieback. |
| 304 | Norway Maple | *Acer platanoides* | Non-Native | 1 | 12 | 2.5 | Improbable | Fair | Low | Minor dieback. |
| 305 | Black Walnut | *Juglans nigra* | Native | 1 | 80 | 8.0 | Improbable | Good | Medium | Small dead branches; minor dieback; crown extends over road. |
| 306 | Sugar Maple | *Acer saccharum ssp. saccharum* | Native | 1 | 78 | 7.0 | Improbable | Good | High | Dead branches; small broken branches. |
| 307 | Sugar Maple | *Acer saccharum ssp. saccharum* | Native | 1 | 107 | 7.0 | Improbable | Fair | Medium | Many cracks and crevices; potential bat habitat; small dead branches. |
| 308 | Sugar Maple | *Acer saccharum ssp. saccharum* | Native | 1 | 86 | 7.0 | Possible | Fair | High | Codominant leaders with 1 dead top; dieback; exfoliating bark; potential bat habitat; raised from road. |
| 309 | Sugar Maple | *Acer saccharum ssp. saccharum* | Native | 1 | 53 | 6.0 | Improbable | Fair | High | Small dead branches. |
| 310 | Black Walnut | *Juglans nigra* | Native | 1 | 45 | 6.0 | Improbable | Fair | Medium | Raised from road; minor vines; tall crown. |
| 311 | Golden Weeping Willow | *Salix alba var. vitellina* | Non-Native | 1 | 20 | 3.5 | Improbable | Fair | Medium | Minor dieback; slightly raised from road. |
| 312 | Sugar Maple | *Acer saccharum ssp. saccharum* | Native | 1 | 12 | 3.0 | Improbable | Fair | Medium | Slightly suppressed. |
| 313 | Sugar Maple | *Acer saccharum ssp. saccharum* | Native | 1 | 14 | 3.0 | Improbable | Fair | Medium | Slightly suppressed. |
| 314 | Black Walnut | *Juglans nigra* | Native | 1 | 18 | 3.5 | Improbable | Fair | Low | Minor dieback. |
| 315 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 18 | 3.5 | Improbable | Poor | Low | Moderate dieback. |
| 316 | Norway Maple | *Acer platanoides* | Non-Native | 1 | 55 | 6.0 | Improbable | Fair | Low | Raised garden; minor dieback. |
| 317 | White Spruce | *Picea glauca* | Native | 1 | 20 | 3.5 | Improbable | Excellent | Medium | No apparent problems. |
| 318 | White Spruce | *Picea glauca* | Native | 1 | 20 | 3.0 | Improbable | Good | Medium | Minor dieback. |
| 319 | Thornless Honey Locust | *Gleditsia triacanthos var. inermis* | Non-Native | 1 | 38 | 5.0 | Improbable | Fair | Medium | Minor dieback; minor epicormic growth. |
| 320 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 15 | 2.5 | Improbable | Good | Low | Minor dieback. |
| 321 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 17 | 2.5 | Improbable | Excellent | Low | No apparent problems. |
| 322 | Sugar Maple | *Acer saccharum ssp. saccharum* | Native | 1 | 21 | 5.0 | Improbable | Good | Medium | Infill at base. |
| 323 | Sugar Maple | *Acer saccharum ssp. saccharum* | Native | 1 | 42 | 4.0 | Improbable | Fair | Medium | Small dead branches; slightly columnar. |
| 324 | Norway Maple | *Acer platanoides* | Non-Native | 1 | 16 | 3.0 | Improbable | Good | Low | Minor infill at base. |
| 325 | Norway Maple | *Acer platanoides* | Non-Native | 1 | 15 | 3.0 | Possible | Fair | Low | Damage to stem; rocks around base. |
| 326 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 89 | 7.5 | Improbable | Fair | High | Major open wound with heartwood rot and exit holes; potential root girdling; included bark; potential bat cavity. |
| 327 | Freeman's Maple | *Acer X freemanii* | Native | 2 | 58.2+22.9 | 7.0 | Improbable | Fair | High | Asymmetrical crown over road; minor dieback. |
| 328 | Norway Maple | *Acer platanoides* | Non-Native | 2 | 50+50 | 6.0 | Improbable | Good | Low | Included bark; crack at branch union; dieback. |
| 329 | Norway Maple | *Acer platanoides* | Non-Native | 1 | 48 | 5.5 | Improbable | Fair | Low | Small dead branches; potential root girdling. |
| 330 | Norway Maple | *Acer platanoides* | Non-Native | 1 | 63 | 6.6 | Possible | Poor | Low | Large open wound; dead branches; root girdling. |
| 331 | Scots Pine | *Pinus sylvestris* | Non-Native | 1 | 51 | 4.5 | Improbable | Good | Medium | Small dead branches; potential root issues. |
| 332 | Scots Pine | *Pinus sylvestris* | Non-Native | 1 | 39 | 4.5 | Improbable | Good | Medium | Small dead branches; potential root issues. |
| 333 | Scots Pine | *Pinus sylvestris* | Non-Native | 1 | 35 | 4.5 | Improbable | Good | Medium | Small dead branches; potential root issues. |
| 334 | Scots Pine | *Pinus sylvestris* | Non-Native | 1 | 35 | 4.5 | Improbable | Good | Medium | Small dead branches; potential root issues. |
| 335 | Scots Pine | *Pinus sylvestris* | Non-Native | 1 | 38 | 4.5 | Improbable | Good | Medium | Small dead branches; potential root issues. |
| 336 | Scots Pine | *Pinus sylvestris* | Non-Native | 1 | 36 | 4.5 | Improbable | Good | Medium | Small dead branches; potential root issues. |
| 337 | Scots Pine | *Pinus sylvestris* | Non-Native | 1 | 48 | 5.0 | Improbable | Good | Medium | Small dead branches; potential root issues. |
| 338 | Scots Pine | *Pinus sylvestris* | Non-Native | 1 | 44 | 5.0 | Improbable | Good | Medium | Small dead branches; potential root issues. |
| 339 | Scots Pine | *Pinus sylvestris* | Non-Native | 1 | 48 | 5.5 | Improbable | Good | Medium | Small dead branches; potential root issues. |
| 340 | Scots Pine | *Pinus sylvestris* | Non-Native | 1 | 63 | 5.5 | Improbable | Good | Medium | Small dead branches; potential root issues. |
| 341 | Norway Spruce | *Picea abies* | Non-Native | 1 | 59 | 6.0 | Improbable | Good | Medium | Crown extends over road; branches all above hydro pole; minor dieback. |
| 342 | Norway Spruce | *Picea abies* | Non-Native | 1 | 75 | 6.0 | Improbable | Good | Medium | Private hedgerow; minor dieback. |
| 343 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 20 | 3.0 | Improbable | Good | Low | Minor dieback. |
| 344 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 25 | 3.0 | Improbable | Good | Low | Minor dieback. |
| 345 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 25 | 3.0 | Improbable | Good | Low | Minor dieback. |
| 346 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 25 | 3.0 | Improbable | Good | Low | Slow growth; minor dieback. |
| 347 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 25 | 3.0 | Improbable | Good | Low | Slow growth. |
| 348 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 20 | 2.5 | Improbable | Excellent | Low | No apparent problems. |
| 349 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 18 | 2.5 | Improbable | Excellent | Low | No apparent problems. |
| 350 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 15 | 2.5 | Improbable | Excellent | Low | No apparent problems. |
| 351 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 15 | 2.5 | Improbable | Excellent | Low | No apparent problems. |
| 352 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 13 | 2.0 | Improbable | Good | Low | Minor dieback. |

**Maple Grove Road Improvements Class EA**
**Tree Inventory Data**

| Tree Number | Common Name | Scientific Name | Native/ Non-native | Stem Count | DBH (cm) | Crown Radius (m) | Potential for Structural Failure Rating | Overall Condition | Proposed Action | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| 353 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 18 | 2.0 | Improbable | Good | Low | Minor dieback. |
| 354 | White Mulberry | *Morus alba* | Non-Native | 1 | 26 | 3.0 | Improbable | Fair | Low | Staining; dieback. |
| 355 | White Mulberry | *Morus alba* | Non-Native | 1 | 24 | 3.0 | Improbable | Fair | Low | Staining; dieback. |
| 356 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 20 | 2.0 | Improbable | Good | Low | Moderate vigor. |
| 357 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 25 | 3.0 | Improbable | Excellent | Low | No apparent problems; located on small berm. |
| 358 | White Spruce | *Picea glauca* | Native | 1 | 35 | 4.0 | Improbable | Good | Medium | Light pruning; lower branches pruned. |
| 359 | White Spruce | *Picea glauca* | Native | 1 | 33 | 5.0 | Improbable | Fair | Medium | Light pruning. |
| 360 | White Spruce | *Picea glauca* | Native | 1 | 34 | 5.0 | Improbable | Fair | Medium | Light pruning. |
| 361 | White Spruce | *Picea glauca* | Native | 2 | 22+24 | 5.0 | Improbable | Good | Medium | Light pruning; lower branches pruned, included bark. |
| 362 | White Spruce | *Picea glauca* | Native | 1 | 33 | 5.0 | Improbable | Fair | Medium | Light pruning. |
| 363 | White Spruce | *Picea glauca* | Native | 1 | 34 | 5.0 | Improbable | Good | Medium | Light pruning; lower branches pruned. |
| 364 | White Spruce | *Picea glauca* | Native | 1 | 33 | 5.0 | Improbable | Fair | Medium | Light pruning. |
| 365 | White Spruce | *Picea glauca* | Native | 1 | 35 | 5.0 | Improbable | Fair | Medium | Light pruning. |
| 366 | White Spruce | *Picea glauca* | Native | 1 | 21 | 4.5 | Improbable | Good | Medium | Slightly suppressed; light pruning. |
| 367 | Eastern White Cedar | *Thuja occidentalis* | Native | 3 | 18.6+16.6+15.7 | 3.0 | Improbable | Fair | Medium | Codominant leaders; minor dieback. |
| 368 | White Spruce | *Picea glauca* | Native | 1 | 34 | 2.0 | Improbable | Fair | Medium | Asymmetrical crown to north; crown dieback. |
| 369 | White Spruce | *Picea glauca* | Native | 1 | 25 | 0.5 | Imminent | Dead | Low | Broken at base; leaning south in Norway Maple canopy. |
| 370 | White Spruce | *Picea glauca* | Native | 1 | 37 | 3.0 | Improbable | Poor | Low | Large open wound along stem; crown dieback; woodpecker damage. |
| 371 | Eastern Red Cedar | *Juniperus virginiana* | Native | 1 | 30 | 3.0 | Improbable | Fair | Medium | Minor dieback; included bark. |
| 372 | White Spruce | *Picea glauca* | Native | 1 | 18 | 3.0 | Improbable | Fair | Medium | Asymmetrical crown to north; slightly suppressed. |
| 373 | White Spruce | *Picea glauca* | Native | 1 | 30 | 2.5 | Improbable | Poor | Low | Damage to main stem; minor dieback. |
| 374 | White Spruce | *Picea glauca* | Native | 1 | 29 | 4.5 | Improbable | Good | Medium | Lower branches pruned; crown dieback. |
| 375 | White Spruce | *Picea glauca* | Native | 1 | 20 | 2.5 | Improbable | Fair | Medium | Minor dieback. |
| 376 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 30 | 3.0 | Improbable | Good | Low | Lower branches pruned; crown dieback; adjacent to power line. |
| 377 | White Spruce | *Picea glauca* | Native | 1 | 22 | 2.5 | Improbable | Fair | Medium | Potentially girdled roots; minor dieback. |
| 378 | White Spruce | *Picea glauca* | Native | 1 | 30 | 3.0 | Improbable | Fair | Medium | Minor dieback; pruned lower branches, minor lean east. |
| 379 | White Spruce | *Picea glauca* | Native | 1 | 22 | 3.0 | Improbable | Fair | Medium | Minor dieback; pruned lower branches. |
| 380 | White Spruce | *Picea glauca* | Native | 1 | 34 | 3.0 | Improbable | Fair | Medium | Minor dieback; pruned lower branches. |
| 381 | White Spruce | *Picea glauca* | Native | 1 | 24 | 3.0 | Improbable | Fair | Medium | Minor dieback; pruned lower branches, damage to stem. |
| 382 | White Spruce | *Picea glauca* | Native | 1 | 30 | 3.0 | Improbable | Fair | Medium | Minor dieback; pruned lower branches. |
| 383 | White Spruce | *Picea glauca* | Native | 1 | 23 | 3.0 | Improbable | Fair | Medium | Minor dieback; pruned lower branches. |
| 384 | White Spruce | *Picea glauca* | Native | 1 | 32 | 3.0 | Improbable | Fair | Medium | Minor dieback; pruned lower branches. |
| 385 | Norway Maple | *Acer platanoides* | Non-Native | 1 | 13 | 3.0 | Improbable | Good | Low | Healthy crown; slightly phototrophic. |
| 386 | White Ash | *Fraxinus americana* | Native | 2 | 50 | 5.0 | Probable | Very Poor | Low | Dead leader; major dieback; exit holes; large dead branches. |
| 387 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 70 | 6.5 | Improbable | Excellent | High | Minor dieback; healthy form. |
| 388 | Horsechestnut | *Aesculus hippocastanum* | Non-Native | 3 | 25+25+20 | 5.0 | Improbable | Fair | Medium | Codominant leaders; dieback. |
| 389 | Horsechestnut | *Aesculus hippocastanum* | Non-Native | 2 | 35+30 | 5.0 | Improbable | Fair | Medium | Codominant leaders; in garden bed. |
| 390 | Norway Spruce | *Picea abies* | Non-Native | 1 | 60 | 6.5 | Improbable | Good | Medium | Start of hedgerow; pruned lower branches; in garden bed. |
| 391 | White Ash | *Fraxinus americana* | Native | 1 | 45 | 5.0 | Possible | Very Poor | Low | Nearly dead; shedding bark; exit holes. |
| 392 | Norway Maple | *Acer platanoides* | Non-Native | 2 | 22.8+17.1 | 4.0 | Improbable | Good | Low | Included bark; codominant leaders; nail in stem. |
| 393 | White Spruce | *Picea glauca* | Native | 1 | 25 | 4.0 | Improbable | Good | Medium | Light pruning. |
| 394 | Norway Maple | *Acer platanoides* | Non-Native | 1 | 12 | 3.0 | Improbable | Fair | Low | Multi-stemmed; minor dieback. |
| 395 | Norway Maple | *Acer platanoides* | Non-Native | 1 | 29 | 2.0 | Improbable | Good | Low | Codominant leaders; included bark. |
| 396 | White Spruce | *Picea glauca* | Native | 1 | 14 | 2.5 | Improbable | Fair | Medium | Dead branches; major infill around base. |
| 397 | European Beech | *Fagus sylvatica* | Non-Native | 1 | 14 | 0.5 | Improbable | Good | Medium | Included bark; branch rub; adjacent to pole. |
| 398 | Eastern White Pine | *Pinus strobus* | Native | 1 | 43 | 3.0 | Improbable | Fair | Medium | Codominant leaders; minor dieback. |
| 399 | Eastern White Pine | *Pinus strobus* | Native | 1 | 49 | 4.0 | Improbable | Fair | Medium | Light pruning; crown dieback; branch rub; compartmentalized wound on lower stem. |
| 400 | Eastern White Pine | *Pinus strobus* | Native | 1 | 50 | 3.5 | Improbable | Fair | Medium | Dead branches in canopy; small crown. |
| 401 | Colorado Spruce | *Picea pungens* | Non-Native | 1 | 20 | 3.0 | Improbable | Good | Low | Light pruning. |
| 402 | Eastern White Pine | *Pinus strobus* | Native | 1 | 75 | 7.0 | Improbable | Good | High | Asymmetrical crown to west; light pruning. |
| 403 | Eastern White Pine | *Pinus strobus* | Native | 1 | 60 | 6.0 | Improbable | Good | High | Light pruning; minor damage to base. |
| 404 | White Mulberry | *Morus alba* | Non-Native | 1 | 12 | 1.0 | Improbable | Fair | Low | Asymmetrical crown to west; slightly suppressed. |
| 405 | White Ash | *Fraxinus americana* | Native | 1 | 60 | 5.5 | Probable | Very Poor | Low | Nearly dead; major dead branches; exfoliating bark. |
| 406 | Eastern White Pine | *Pinus strobus* | Native | 1 | 55 | 6.0 | Improbable | Fair | High | Landscaping fill around base; minor dieback. |
| 407 | Trembling Aspen | *Populus tremuloides* | Native | 1 | 30 | 6.0 | Improbable | Good | Medium | Asymmetrical crown to west; light pruning. |
| 408 | Eastern White Pine | *Pinus strobus* | Native | 1 | 45 | 6.0 | Improbable | Fair | Medium | Landscaping cuts around base; minor dieback. |
| 409 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 74 | 8.0 | Improbable | Good | High | Codominant leaders; included bark; staining; hangers. |
| 410 | Eastern White Pine | *Pinus strobus* | Native | 1 | 55 | 6.0 | Improbable | Fair | High | Potential filling around base; minor dieback. |
| 411 | Eastern White Pine | *Pinus strobus* | Native | 1 | 50 | 5.0 | Improbable | Fair | High | Potential filling around base; minor yellowing. |
| 412 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 15 | 1.0 | Improbable | Good | Medium | No visible defects. |
| 413 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 13 | 1.0 | Improbable | Good | Medium | Compartmentalized wound on lower stem. |
| 414 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 13 | 1.0 | Improbable | Good | Medium | No visible defects. |

**Maple Grove Road Improvements Class EA**
**Tree Inventory Data**

| Tree Number | Common Name | Scientific Name | Native/ Non-native | Stem Count | DBH (cm) | Crown Radius (m) | Potential for Structural Failure Rating | Overall Condition | Proposed Action | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| 415 | White Ash | *Fraxinus americana* | Native | 1 | 55 | 6.0 | Possible | Poor | Low | Dieback; epicormic growth; exfoliating bark. |
| 416 | Prunus species | *Prunus sp.* | Native | 5 | 17.5+18+20 | 4.0 | Improbable | Fair | Medium | Asymmetrical crown to south; branch rub; canker; improper prune cuts. |
| 417 | Prunus species | *Prunus sp.* | Native | 1 | 19 | 2.0 | Improbable | Fair | Medium | Branch rub; asymmetrical crown to west; small dead branches. |
| 418 | Norway Maple | *Acer platanoides* | Non-Native | 1 | 11 | 1.0 | Improbable | Good | Low | Branch rub; epicormic growth. |
| 419 | Common Apple | *Malus domestica* | Non-Native | 4 | 18+20+22 | 2.0 | Improbable | Fair | Medium | Included bark; branch rub. |
| 420 | Common Apple | *Malus domestica* | Non-Native | 1 | 15 | 2.0 | Improbable | Poor | Low | Included bark; branch rub, improper prune cuts; oystershell scale. |
| 421 | Common Apple | *Malus domestica* | Non-Native | 4 | 15+16+17 | 2.0 | Improbable | Poor | Low | Included bark; branch rub, improper prune cuts; oystershell scale; vines. |
| 422 | Black Walnut | *Juglans nigra* | Native | 5 | 15+12.5+13.1 | 4.0 | Improbable | Fair | Low | Included bark; branch rub; little canker. |
| 423 | Black Walnut | *Juglans nigra* | Native | 3 | 14.6+13.6+11.5 | 3.0 | Improbable | Fair | Low | Minor dieback; codominant leaders. |
| 424 | Black Walnut | *Juglans nigra* | Native | 1 | 18 | 3.0 | Improbable | Fair | Low | Vines; codominant leaders; canker. |
| 425 | Red Pine | *Pinus resinosa* | Native | 1 | 30 | 3.0 | Probable | Dead | Low | Some remaining branches. |
| 426 | Red Pine | *Pinus resinosa* | Native | 1 | 30 | 3.0 | Probable | Dead | Low | Some remaining branches. |
| 427 | Black Walnut | *Juglans nigra* | Native | 1 | 13 | 2.5 | Improbable | Good | Low | Included bark. |
| 428 | White Spruce | *Picea glauca* | Native | 1 | 26 | 4.0 | Improbable | Fair | Medium | Asymmetrical crown to west; light pruning. |
| 429 | Red Pine | *Pinus resinosa* | Native | 1 | 19 | 0.5 | Possible | Dead | Low | Little bark remains. |
| 430 | Red Pine | *Pinus resinosa* | Native | 1 | 25 | 2.5 | Probable | Dead | Low | Some branches remain. |
| 431 | Red Pine | *Pinus resinosa* | Native | 1 | 16 | 0.5 | Possible | Dead | Low | Little bark remains. |
| 432 | Red Pine | *Pinus resinosa* | Native | 1 | 25 | 2.5 | Probable | Dead | Low | Some branches remain. |
| 433 | Red Pine | *Pinus resinosa* | Native | 1 | 25 | 2.5 | Probable | Dead | Low | Some branches remain. |
| 434 | Red Pine | *Pinus resinosa* | Native | 1 | 21 | 0.5 | Possible | Dead | Low | Little bark remains. |
| 435 | Red Pine | *Pinus resinosa* | Native | 1 | 25 | 2.5 | Probable | Dead | Low | Some branches remain. |
| 436 | Red Pine | *Pinus resinosa* | Native | 1 | 25 | 2.5 | Probable | Dead | Low | Some branches remain. |
| 437 | Black Walnut | *Juglans nigra* | Native | 1 | 28 | 1.5 | Improbable | Good | Low | Vines; little canker. |
| 438 | Black Walnut | *Juglans nigra* | Native | 1 | 26 | 3.0 | Improbable | Good | Low | Minor dieback. |
| 439 | Sugar Maple | *Acer saccharum ssp. saccharum* | Native | 1 | 20 | 3.0 | Improbable | Fair | Medium | Dead top; healthy laterals. |
| 440 | Black Walnut | *Juglans nigra* | Native | 1 | 32 | 3.0 | Possible | Good | Medium | Vines; little canker; hanger. |
| 441 | Black Walnut | *Juglans nigra* | Native | 1 | 23 | 3.0 | Improbable | Good | Low | Vines; little canker; codominant leaders. |
| 442 | Black Walnut | *Juglans nigra* | Native | 1 | 14 | 2.0 | Improbable | Good | Low | No visible defects. |
| 443 | Siberian Elm | *Ulmus pumila* | Non-Native | 1 | 15 | 2.5 | Improbable | Fair | Low | Minor dieback; on fence line. |
| 444 | Black Walnut | *Juglans nigra* | Native | 1 | 15 | 2.0 | Improbable | Fair | Low | Vines; small dead branches. |
| 445 | Norway Maple | *Acer platanoides* | Non-Native | 1 | 16 | 2.5 | Improbable | Fair | Low | Damage to main stem. |
| 446 | Norway Spruce | *Picea abies* | Non-Native | 1 | 20 | 1.0 | Improbable | Fair | Medium | Light pruning; erosion downslope; lower branches pruned. |
| 447 | White Oak | *Quercus alba* | Native | 1 | 20 | 1.0 | Improbable | Fair | Medium | Bark staining; branch rub. |
| 448 | Douglas Fir | *Pseudotsuga menziesii* | Non-Native | 1 | 23 | 2.0 | Improbable | Good | Medium | Light pruning. |
| 449 | Horsechestnut | *Aesculus hippocastanum* | Non-Native | 1 | 12 | 2.0 | Improbable | Excellent | Medium | No apparent problems. |
| 450 | White Spruce | *Picea glauca* | Native | 1 | 13 | 2.0 | Improbable | Good | Medium | No visible defects. |
| 451 | Douglas Fir | *Pseudotsuga menziesii* | Non-Native | 1 | 14 | 2.0 | Improbable | Fair | Medium | Codominant leaders; minor dieback. |
| 452 | Douglas Fir | *Pseudotsuga menziesii* | Non-Native | 1 | 14 | 2.0 | Improbable | Fair | Medium | Minor dieback. |
| 453 | Freeman's Maple | *Acer X freemanii* | Native | 1 | 12 | 2.0 | Improbable | Fair | Medium | Mower damage to base; minor water sprouts. |
| 454 | Douglas Fir | *Pseudotsuga menziesii* | Non-Native | 1 | 20 | 2.0 | Improbable | Fair | Medium | Asymmetrical crown to east; erosion downslope; compartmentalized wound on lower stem; branch rub. |

**APPENDIX II** Tree Health & Risk Assessment Criteria

**Tree Health Assessment Criteria**

| Assessment Criteria | Definition[1] |
|---|---|
| Excellent | Represents a tree in near perfect form, health, and vigour. This tree would exhibit no deadwood, no decline, and no visible defects. |
| Good | Represents a tree ranging from a generally healthy tree to a near perfect tree in terms of health, vigour and structure. This tree exhibits a complete, balanced crown structure with little to no deadwood and minimal defects as well as a properly formed root flare. |
| Fair | Represents a tree with minor health, balance or structural issues with minimal to moderate deadwood. Branching structure shows signs of included bark or minor rot within the branch connections or trunk wood. The root flare shows minimal signs of mechanical injury, decay, poor callusing, or girdling roots. Trees in the category require minor remedial actions to improve the vigour and structure of the tree. |
| Poor | Represents a tree that exhibits a poor vigour, reduced crown size (<30% of crown typical of species caused by overcrowding or decline), extreme crown imbalance, or extensive rot in the branching and trunk wood. Fungus could be seen from these rotting areas, suggesting further decay. These trees have extensive crown die back with a large amount of deadwood, and possibly dead sections. These weakened areas can lead to a potential failure of tree sections. Rooting zones show signs of extensive root decay or damage (fruiting bodies or mechanical damage) or girdling roots. Trees in this category require more extensive actions to prevent failure. A tree identified as poor would be a candidate for removal in the near future. |
| Very Poor | Represents a tree that exhibits major health and structural defects. Quite often the defects or diseases affecting this tree will be fatal. Large quantities of fungus, large dead sections with possible cavities and bark falling off all are signs that a tree is in a major state of decline and would be identified as very poor. These trees have a probable or imminent potential for structural failure. These trees should be identified for removal. |
| Dead | Represents a tree that exhibits no sign of new growth, including buds, foliage, or shoot growth. These trees have a probable or imminent potential for structural failure. These trees should be identified for removal. |

[1](Dunster 2009)

**Tree Risk Assessment Criteria**

| Assessment Criteria* | Definition[1] |
|---|---|
| Improbable | The tree or branch is not likely to fail during normal weather conditions and may not fail in many severe weather conditions within the specified time frame. |
| Possible | Failure could occur, but it is unlikely during normal weather conditions within the specified time frame. |
| Probable | Failure may be expected under normal weather conditions within the specified time frame. |
| Imminent | Failure has started or is most likely to occur in the near future, even if there is no significant wind or increased load. This is a rare occurrence for a risk assessor to encounter, and it may require immediate action to protect people from harm. |
| *A specified time frame of 1 year will be used when assessing potential for structural failure. | |

[1]Dunster et al. 2013

**APPENDIX III** Conditions of Assessment

## Conditions of Tree Assessment

*Limitations*

This tree inventory and assessment is based on the circumstances and observations by Natural Resource Solutions Inc. (NRSI) as they existed at the time of the site inspection(s) of the Client's Property as described in this report (the "Property") and the trees situated thereon, and upon information provided by the Client to NRSI. The opinions in this assessment are given based on observations made and using generally accepted professional judgment, however, because trees are living organisms and subject to change, damage and disease, the results, observations, recommendations, and analysis as set out in this assessment are valid only at the date any such observations and analysis took place. No guarantee, warranty, representation or opinion is offered or made by NRSI as to the length of the validity of the results, observations, recommendations and analysis contained within this assessment. As a result, the Client shall not rely upon this assessment, save and except for representing the circumstances and observations at the date of site inspection(s), and the analysis and recommendations made in relation to the proposed undertaking. It is recommended that the inventoried trees discussed in this assessment should be re-assessed periodically, where required (i.e. after 2 years).

*Further Services*

Neither NRSI, nor any assessor employed or retained by NRSI (the "Assessor") for the purpose of preparing or assisting in the preparation of this assessment shall be required to provide any further consultation or services to the Client including, without limitation, acting as an expert witness or witness in any court in any jurisdiction unless the Client has first made specific arrangements with respect to such further services, including providing payment of the Assessor's regular hourly billing fees.

NRSI accepts no responsibility for the implementation of all or any part of this report, unless specifically requested to examine the implementation of such activities recommended herein. Any request for the inspection or supervision of all or part of the implementation shall be made in writing and the details agreed to in writing by both parties.

*Assumptions*

The Client is hereby notified that where any of the information set out and referenced in this assessment are based on assumptions, facts or information provided to NRSI, NRSI will in no way be responsible for the veracity or accuracy of any such information. Further, the Client acknowledges and agrees that NRSI has, for the purposes of preparing their assessment, assumed that the Property is in full compliance with all applicable federal, provincial, municipal and local statutes, regulations, by-laws, guidelines and other related laws. NRSI explicitly denies any legal liability for any and all issues with respect to non-compliance with any of the above-referenced statutes, regulations, by-laws, guidelines and laws as it may pertain to or affect the Property.

*Restriction of Assessment*

The assessment carried out was restricted to the areas as described in this report. NRSI is not legally liable for any other trees except those expressly discussed herein. The conclusions of this assessment do not apply to any areas, trees, or any other property not covered or referenced in this assessment.

*Professional Responsibility*

In carrying out this assessment, NRSI and any Assessor appointed for and on behalf of NRSI to perform and carry out the assessment has exercised a reasonable standard of care, skill and diligence. The assessment has been made using accepted arboricultural techniques. These include a visual examination of each tree for structural defects, scars, external indications of decay such as fungal fruiting bodies, evidence of insect attack, discolored foliage (during the leaf-on period), the condition of any visible root structures, the degree and direction of lean (if any), the general condition of the tree(s) and the surrounding site, and the current or planned proximity of property and people. Except where specifically noted in the assessment, none of the trees examined on the property were dissected, cored, probed, or climbed, and detailed root crown examinations involving excavation were not undertaken.

No guarantees are offered, or implied, that trees recommended for retention, or all parts of them, will remain standing. It is professionally impossible to predict with absolute certainty the behaviour of any single tree or group of trees, or all their component parts, in all given circumstances. Inevitably, a standing tree will always pose some risk. Most

trees have the potential to fall, lean, or otherwise pose a danger to property and persons in the event of extreme weather conditions, and this risk can only be eliminated if the tree is removed.

Without limiting the foregoing, no liability is assumed by NRSI or its directors, officers, employers, contractors, agents or Assessors for:

a) any legal description provided with respect to the Property;
b) issues of title and/or ownership with respect to the Property;
c) the accuracy of the Property line locations or boundaries with respect to the Property; and
d) the accuracy of any other information provided to NRSI by the Client or third parties;
e) any consequential loss, injury or damages suffered by the Client or any third parties, including but not limited to replacement costs, loss of use, earnings and business interruption; and
f) the unauthorized distribution of the assessment.

*Third Party Liability*

This assessment was prepared by NRSI for the Client. The data collected reflect NRSI's best assessment of the inventoried trees situated on the Property with the information available at the time of observation. Data analysis and the assessment of potential impacts to inventoried trees is specific to the proposed undertaking as described in this report. NRSI accepts no responsibility for any damages or loss suffered by any third party or by the Client as a result of decisions made or actions based upon the use of this assessment for purposes unrelated to the proposed undertaking.

*General*

Any plans and/or illustrations in this assessment are included only to help the Client visualize the issues in this assessment and shall not be relied upon for any other purpose.

This report shall be considered as a whole, no sections are severable, and the assessment shall be considered incomplete if any pages are missing.

**APPENDIX IV** Tree Data Summary Tables

## Summary of Inventoried Trees

| Common Name | Scientific Name | Excellent | Good | Fair | Poor | Very Poor | Dead | Total |
|---|---|---|---|---|---|---|---|---|
| **Native Species** | | | | | | | | |
| Sugar Maple | *Acer saccharum ssp. saccharum* | | 4 | 12 | 1 | | | 17 |
| Red Oak | *Quercus rubra* | | 1 | | | | | 1 |
| Freeman's Maple | *Acer X freemanii* | 3 | 23 | 28 | 1 | | | 55 |
| White Elm | *Ulmus americana* | | | 2 | | | | 2 |
| Manitoba Maple | *Acer negundo* | | | 7 | 5 | 2 | | 14 |
| White Spruce | *Picea glauca* | 3 | 15 | 36 | 3 | | 1 | 58 |
| Black Walnut | *Juglans nigra* | | 12 | 28 | | 1 | | 41 |
| Black Willow | *Salix nigra* | | | 12 | 2 | | | 14 |
| Eastern White Pine | *Pinus strobus* | | 5 | 9 | | | | 14 |
| Silver Maple | *Acer saccharinum* | | | 3 | | | | 3 |
| Eastern White Cedar | *Thuja occidentalis* | 1 | | 2 | | | | 3 |
| Red Pine | *Pinus resinosa* | | | | | | 10 | 10 |
| Green Ash | *Fraxinus pennsylvanica* | | | | 2 | | | 2 |
| Honey Locust | *Gleditsia triacanthos* | | 1 | | | | | 1 |
| White Oak | *Quercus alba* | | | 2 | | | | 2 |
| Common Hackberry | *Celtis occidentalis* | | 2 | 3 | | | | 5 |
| Trembling Aspen | *Populus tremuloides* | | 1 | 5 | | | | 6 |
| Staghorn Sumac | *Rhus typhina* | | | | 1 | | | 1 |
| Prunus species | *Prunus sp.* | | | 2 | | | | 2 |
| Serviceberry species | *Amelanchier sp.* | | | | 1 | | | 1 |
| Bur Oak | *Quercus macrocarpa* | | | 1 | | | | 1 |
| White Ash | *Fraxinus americana* | | | 1 | 1 | 5 | | 7 |
| Eastern Red Cedar | *Juniperus virginiana* | | | 1 | | | | 1 |
| Northern Pin Oak | *Quercus ellipsoidalis* | | 1 | | | | | 1 |
| Eastern Cottonwood | *Populus deltoides* | | 1 | 2 | | | | 3 |
| **Total** | | 7 | 66 | 156 | 17 | 8 | 11 | 265 |
| ***Non-Native Species*** | | | | | | | | |
| Siberian Elm | *Ulmus pumila* | | | 1 | 1 | | | 2 |
| Common Apple | *Malus domestica* | | | 2 | 4 | 1 | | 7 |
| Scots Pine | *Pinus sylvestris* | | 12 | 3 | | | | 15 |

| Common Name | Scientific Name | Excellent | Good | Fair | Poor | Very Poor | Dead | Total |
|---|---|---|---|---|---|---|---|---|
| Norway Maple | *Acer platanoides* | 1 | 10 | 16 | 1 | | | 28 |
| Norway Spruce | *Picea abies* | 1 | 11 | 25 | 3 | | 1 | 41 |
| Austrian Pine | *Pinus nigra* | | 2 | 11 | 1 | | | 14 |
| Golden Weeping Willow | *Salix alba var. vitellina* | | | 1 | | | | 1 |
| Colorado Spruce | *Picea pungens* | 21 | 32 | 6 | 1 | | | 60 |
| Thornless Honey Locust | *Gleditsia triacanthos var. inermis* | | | 4 | | | | 4 |
| Black Locust | *Robinia pseudoacacia* | | | 1 | 1 | | | 2 |
| White Mulberry | *Morus alba* | | | 4 | | | | 4 |
| European Beech | *Fagus sylvatica* | | 1 | | | | | 1 |
| Douglas Fir | *Pseudotsuga menziesii* | | 1 | 3 | | | | 4 |
| Horsechestnut | *Aesculus hippocastanum* | 1 | | 2 | | | | 3 |
| European Larch | *Larix decidua* | | 1 | | | | | 1 |
| **Total** | | 24 | 70 | 79 | 12 | 1 | 1 | 187 |
| **Overall Total** | | 31 | 136 | 235 | 29 | 9 | 12 | 452 |

**Overall Condition of Trees Inventoried**

| Potential for Structural Failure Rating | Overall Condition | | | | | | Total |
|---|---|---|---|---|---|---|---|
| | Excellent | Good | Fair | Poor | Very Poor | Dead | |
| Improbable | 31 | 133 | 208 | 6 | | | 378 |
| Possible | | 3 | 27 | 23 | 2 | 3 | 58 |
| Probable | | | | | 7 | 8 | 15 |
| Imminent | | | | | | 1 | 1 |
| **Total** | 31 | 136 | 235 | 29 | 9 | 12 | 452 |

## Maps

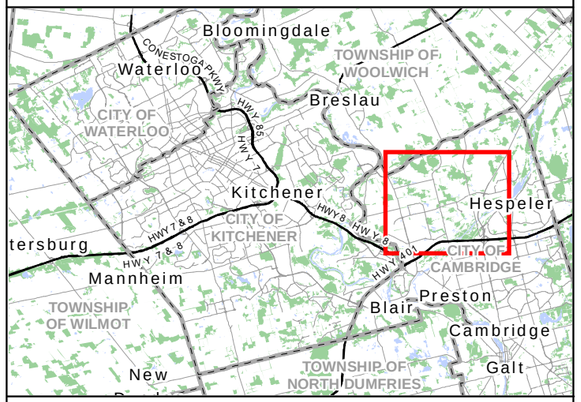
**Map 1. Study Area and Natural Features**

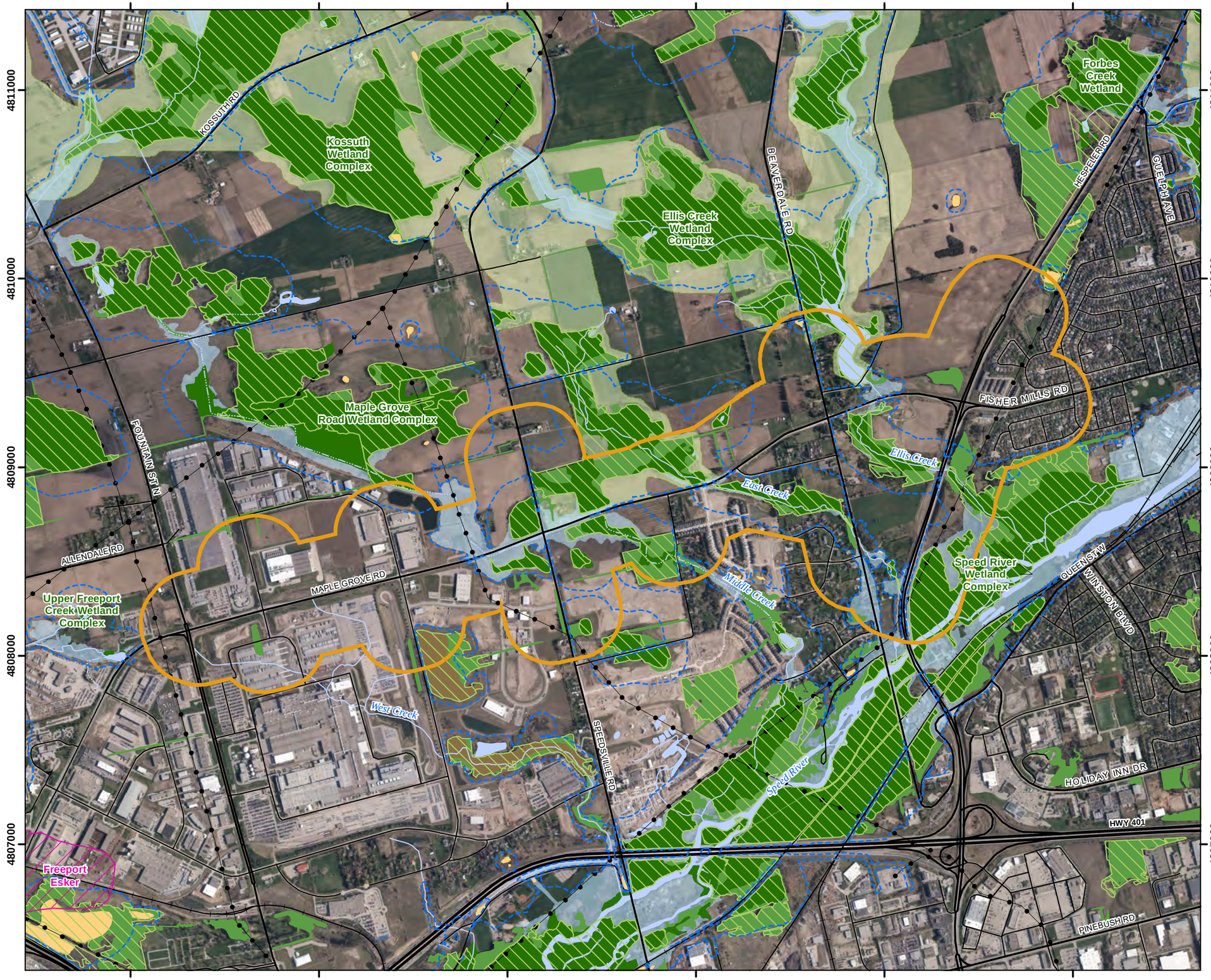
**Map 2.  Tree Inventory**

Map 1

# Maple Grove Rd Class EA

## Study Area and Natural Features




**Legend**

- Study Area
- Utility Line
- Railway
- Highway
- Primary Road
- Secondary Road
- Alleyway / Laneway
- Permanent Watercourse
- Intermittent Watercourse
- Water Body
- Wooded Area
- Other Wetland (Non-PSW)
- Provincially Significant Wetland (PSW)
- Unevaluated Wetland
- Regulation Limit
- Floodplain
- ANSI, Earth Science
- Region of Waterloo Core Environmental Feature (Region of Waterloo 2015)
- Natural Heritage System (Growth Plan for the Greater Golden Horseshoe 2019)


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Project: 2171
Date: February 25, 2020

NAD83 - UTM Zone 17
Size: 11x17"
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0 250 500 750 1,000 Metres

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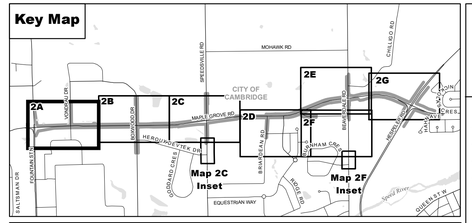
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Map 2A

# Maple Grove Rd Class EA

## Tree Inventory

**Key Map**




**Legend**

- Subject Property
- Road Alignment
- Grading Extent
- Existing Conditions
- Servicing
- Watercourse / Waters Edge
- Bottom of Slope
- Top of Sope
- Primary Road
- Secondary Road
- Inventoried Tree to be Retained (Crown to Scale)
- Inventoried Tree to be Removed (Crown to Scale)
- Bat Habitat Tree

**Migratory Birds Convention Act**

1. The destruction of migratory birds and their nests is prohibited under the federal *Migratory Birds Convention Act*, 1994, which is regulated by the Canadian Wildlife Service (CWS).
2. Vegetation clearing has the potential to directly impact bird breeding activity through damage and destruction of nests, eggs and young, or avoidance of the area by breeding adults.
3. Vegetation clearing is recommended to occur outside the bird nesting season (April 1 – August 31) so as to limit disturbances to nesting activities of birds within the proposed work zone.
4. Specific to simple habitats*, if vegetation clearing cannot be avoided during the bird nesting season, a qualified biologist will be retained to carry out a nest search ahead of clearing activities within the work zone.
5. Nest areas will be identified in the field. There shall be no construction activity in identified nesting areas until sign-off is obtained from the biologist.
6. Areas identified as having no bird nesting activity can be cleared; however, clearing must occur within 48 hours of nest searching. If vegetation clearing is not performed within 48 hours, additional nest searches must be conducted.

*Simple habitats are characterized by the CWS as habitats consisting of urban parks with isolated trees, vacant lots with few possible nest sites, a previously cleared area, or a structure such as a bridge, tower, or building, and specifically excludes meadows. More information is available at (https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/reduce-risk-migratory-birds.html).

**Species at Risk (SAR) Bat Habitat**

1. The destruction of SAR bats and their habitat is prohibited under the *Endangered Species Act (ESA)*, 2007.
2. Vegetation clearing has the potential to directly impact bat roosting habitat.
3. Tree removal should occur outside of the active roosting season (April 1 to September 30) to avoid destruction of potential bat habitat, and therefore contravention of the ESA.
4. Any vegetation removal that has the potential to impact SAR bat habitat requires prior correspondence with


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Project: 2171
Date: July 30, 2021

NAD83 - UTM Zone 17
Size: 24x36"
1:900

0 10 20 30 40 50 60
Meters

N

## Key Map




**Migratory Birds Convention Act**

1. The destruction of migratory birds and their nests is prohibited under the federal *Migratory Birds Convention Act*, 1994, which is regulated by the Canadian Wildlife Service (CWS).
2. Vegetation clearing has the potential to directly impact bird breeding activity through damage and destruction of nests, eggs and young, or avoidance of the area by breeding adults.
3. Vegetation clearing is recommended to occur outside the bird nesting season (April 1 – August 31) so as to limit disturbances to nesting activities of birds within the proposed work zone.
4. Specific to simple habitats*, if vegetation clearing cannot be avoided during the bird nesting season, a qualified biologist will be retained to carry out a nest search ahead of clearing activities within the work zone.
5. Nest areas will be identified in the field. There shall be no construction activity in identified nesting areas until sign-off is obtained from the biologist.
6. Areas identified as having no bird nesting activity can be cleared; however, clearing must occur within 48 hours of nest searching. If vegetation clearing is not performed within 48 hours, additional nest searches must be conducted.

*Simple habitats are characterized by the CWS as habitats consisting of urban parks with isolated trees, vacant lots with few possible nest sites, a previously cleared area, or a structure such as a bridge, tower, or building, and specifically excludes meadows. More information is available at (https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/reduce-risk-migratory-birds.html).

**Species at Risk (SAR) Bat Habitat**

1. The destruction of SAR bats and their habitat is prohibited under the *Endangered Species Act (ESA)*, 2007.
2. Vegetation clearing has the potential to directly impact bat roosting habitat.
3. Tree removal should occur outside of the active roosting season (April 1 to September 30) to avoid destruction of potential bat habitat, and therefore contravention of the ESA.
4. Any vegetation removal that has the potential to impact SAR bat habitat requires prior correspondence with

Map 2B

# Maple Grove Rd Class EA

## Tree Inventory

**Legend**

- Subject Property
- Road Alignment
- Grading Extent
- Existing Conditions
- Servicing
- Watercourse / Waters Edge
- Bottom of Slope
- Top of Sope
- Primary Road
- Secondary Road
- Inventoried Tree to be Retained (Crown to Scale)
- Inventoried Tree to be Removed (Crown to Scale)
- Bat Habitat Tree
- Impacted ELC Community (CUM1) Mineral Cultural Meadow Ecosite


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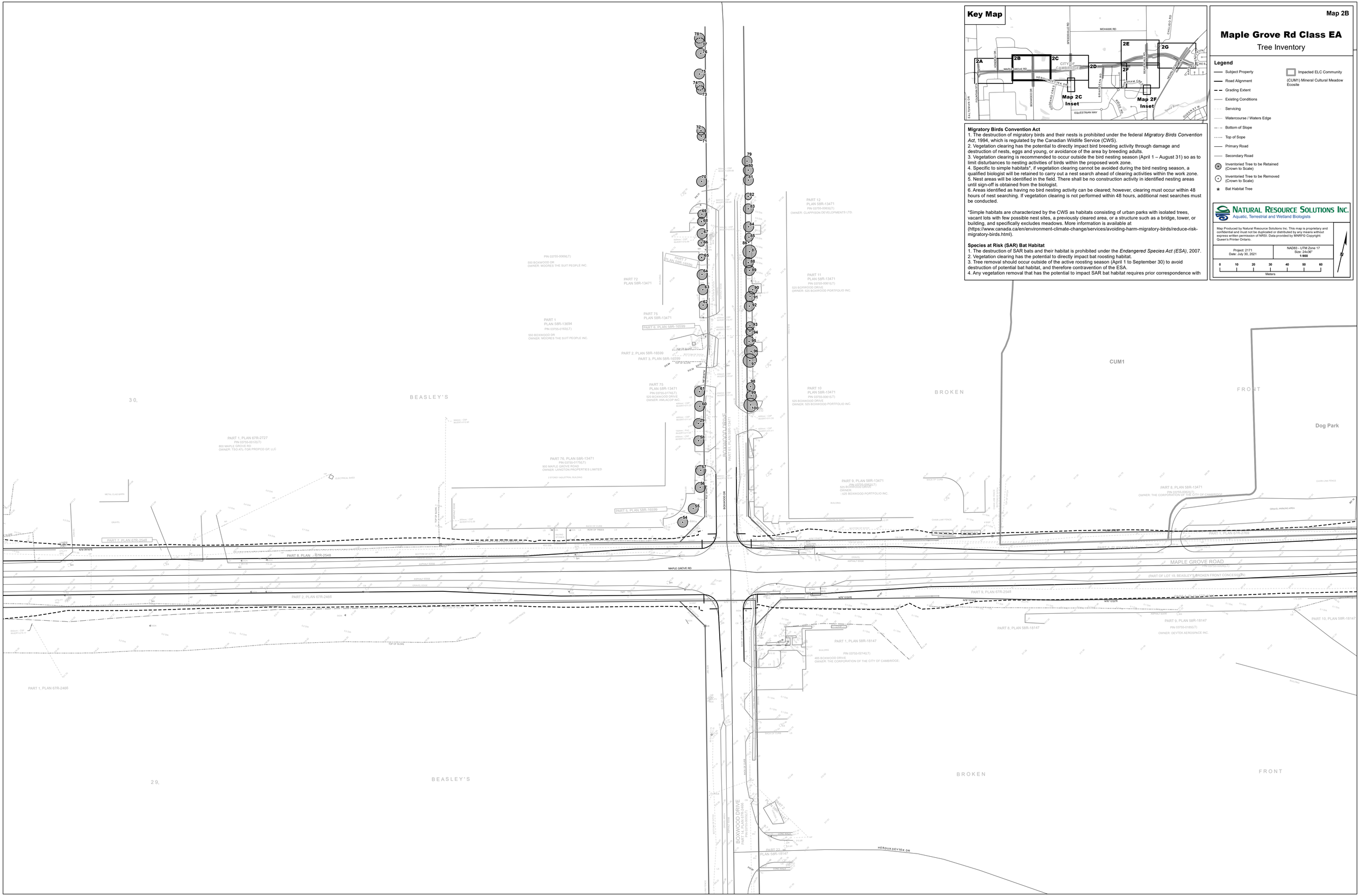
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Project: 2171
Date: July 30, 2021

NAD83 - UTM Zone 17
Size: 24x36"
1:900

0 10 20 30 40 50 60
Meters

N



## Inset 1 - Southern Extent

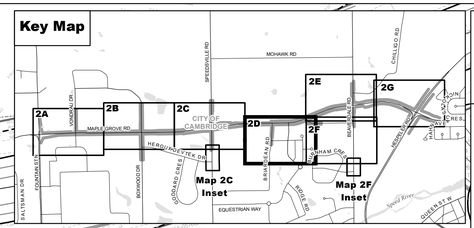


Map 2D

# Maple Grove Rd Class EA

## Tree Inventory

**Key Map**




**Legend**

- Subject Property
- Road Alignment
- Grading Extent
- Existing Conditions
- Servicing
- Watercourse / Waters Edge
- Bottom of Slope
- Top of Sope
- Primary Road
- Secondary Road
- Inventoried Tree to be Retained (Crown to Scale)
- Inventoried Tree to be Removed (Crown to Scale)
- Bat Habitat Tree
- Impacted ELC Community
- (Ag) Agriculture
- (CUM1) Mineral Cultural Meadow Ecosite
- (FOD5) Dry - Fresh Sugar Maple Deciduous Forest Ecosite
- (Res) Residential
- (SWD6-3) Swamp Maple Organic Deciduous Swamp Type
- (SWT2) Mineral Thicket Swamp Ecosite


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Project: 2171
Date: July 30, 2021

NAD83 - UTM Zone 17
Size: 24x36"
1:900

0 10 20 30 40 50 60
Meters

N

**Migratory Birds Convention Act**
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2. Vegetation clearing has the potential to directly impact bird breeding activity through damage and destruction of nests, eggs and young, or avoidance of the area by breeding adults.
3. Vegetation clearing is recommended to occur outside the bird nesting season (April 1 – August 31) so as to limit disturbances to nesting activities of birds within the proposed work zone.
4. Specific to simple habitats*, if vegetation clearing cannot be avoided during the bird nesting season, a qualified biologist will be retained to carry out a nest search ahead of clearing activities within the work zone.
5. Nest areas will be identified in the field. There shall be no construction activity in identified nesting areas until sign-off is obtained from the biologist.
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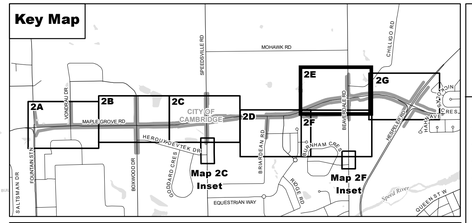
**Species at Risk (SAR) Bat Habitat**
1. The destruction of SAR bats and their habitat is prohibited under the *Endangered Species Act (ESA)*, 2007.
2. Vegetation clearing has the potential to directly impact bat roosting habitat.
3. Tree removal should occur outside of the active roosting season (April 1 to September 30) to avoid destruction of potential bat habitat, and therefore contravention of the ESA.
4. Any vegetation removal that has the potential to impact SAR bat habitat requires prior correspondence with

Map 2E

# Maple Grove Rd Class EA

## Tree Inventory

**Key Map**




**Legend**

- Subject Property
- Road Alignment
- Grading Extent
- Existing Conditions
- Servicing
- Watercourse / Waters Edge
- Bottom of Slope
- Top of Sope
- Primary Road
- Secondary Road
- Inventoried Tree to be Retained (Crown to Scale)
- Inventoried Tree to be Removed (Crown to Scale)
- Bat Habitat Tree
- Impacted ELC Community
- (CUM1) Mineral Cultural Meadow Ecosite
- (CUP3) Coniferous Plantations
- (FOD5) Dry - Fresh Sugar Maple Deciduous Forest Ecosite
- (FOD7) Fresh - Moist Lowland Deciduous Forest Ecosite
- (H) Hedgerow
- (Res) Residential
- (SAM1) Mixed Shallow Aquatic Ecosite
- (SWM4-1) White Cedar-Hardwood Organic Mixed Swamp Type

**Migratory Birds Convention Act**

1. The destruction of migratory birds and their nests is prohibited under the federal *Migratory Birds Convention Act*, 1994, which is regulated by the Canadian Wildlife Service (CWS).
2. Vegetation clearing has the potential to directly impact bird breeding activity through damage and destruction of nests, eggs and young, or avoidance of the area by breeding adults.
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Project: 2171
Date: July 30, 2021

NAD83 - UTM Zone 17
Size: 24x36"
1:900

0 10 20 30 40 50 60
Meters

N

PIN 22739-0092(LT)
566 FISHER MILLS RD
OWNER: REID, CLARENE AND VAN KESSEL, JAMES
PART 9, PLAN 67EX-444

FISHER MILLS ROAD

MAPLE GROVE ROAD
(BEASLEY'S BROKEN FRONT CONCESSION)
PIN 03755-0006(LT)

BEAVERDALE ROAD

PART 13, PLAN 67R-3155
PIN 03756-0150(LT)
3200 MAPLE GROVE ROAD
OWNER: AZIZ, USMAN

PART 14, PLAN 67R-3155
PIN 03756-0017(LT)
1905 BEAVERDALE ROAD
OWNER: ROSA, ERIC

PART 1, PLAN WDR-104

PART 5, PLAN 67R-3155

PART 3, PLAN 67R-3155
PIN 03756-0015(LT)
OWNER: STEVENS, LARRY EARL GORDON AND STEVENS, MARY

PART 9, PLAN 67R-3155
PIN 03756-0022(LT)
2140 MAPLE GROVE RD
OWNER: WU, JUNYAN AND XU, BO

PART 7, PLAN 67R-3155
PIN 03756-0023(LT)
2120 MAPLE GROVE RD
OWNER: ULIKOVIC, MIKE GEORGE

PART 4, PLAN 58R-17041
PIN 03755-0346(LT)
2220 MAPLE GROVE RD
OWNER:
SHARMA, BHAGWATI PRASAD AND SHARMA, RALPNA INDRA

PART 1, PLAN 58R-9520
PIN 03756-0020(LT)
OWNER: PEACE, ALISON

PART 2, PLAN 58R-9520
PIN 03756-0019(LT)
OWNER:
PEACE, CATHARINE ALISON AND PEACE, ROBERT

PART 2, PLAN 67R-668
PIN 03756-0021(LT)
1825 BEAVERDALE RD
OWNER: PEACE, CATHARINE ALISON

PART 1, PLAN 67R-1479
PIN 03756-0018(LT)
616 FISHER MILLS RD
OWNER:
NANCY, CARTER ALBERT
NANCY, CARTER ANNA MARIE

PART 1, PLAN 67R-2976
PIN 03756-0098(LT)

PART 21, PLAN 67R-3155
PIN 22739-0096(LT)
610 FISHER MILLS RD
OWNER: HEINRICH, LESLIE-OTTE AND HEINRICH, MANFRED

PART 22, PLAN 67R-3155
PIN 22739-0091(LT)
800 FISHER MILLS RD
OWNER: SADDLY, DAVID ANDREW

PART 1, PLAN 58R-8715
PIN 03757-0404(LT)
1840 BEAVERDALE RD
OWNER: GARDE, TIMOTHY JOHN; GARDE, ROSALIE JOY;

PART 2, PLAN 58R-8715
PIN 03757-0405(LT)
1820 BEAVERDALE RD
OWNER:
CRANE, BRADLEY ALLEN; CRANE, MARGARET JANE; FROM, SHELLEY LYNN

PART 11, PLAN 67EX-444

PART 17, PLAN 67EX-444

PART 6, PLAN 67EX-444

PART 8, PLAN 67EX-444

CUP3

CUM1

FOD5

FOD7

Residential

SWM4-1

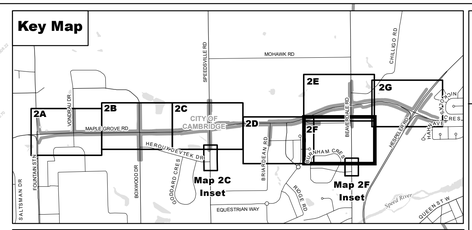
SAM1

WANNER CEMETERY

PN 22739-0092(LT)
566 FISHER MILLS RD




## Key Map




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**Map 2F**

# Maple Grove Rd Class EA

## Tree Inventory

**Legend**

- Subject Property
- Road Alignment
- Grading Extent
- Existing Conditions
- Servicing
- Watercourse / Waters Edge
- Bottom of Slope
- Top of Sope
- Primary Road
- Secondary Road
- Inventoried Tree to be Retained (Crown to Scale)
- Inventoried Tree to be Removed (Crown to Scale)
- Bat Habitat Tree
- Impacted ELC Community
- (CUM1) Mineral Cultural Meadow Ecosite
- (H) Hedgerow
- (SWM4-1) White Cedar-Hardwood Organic Mixed Swamp Type
- (SWT2) Mineral Thicket Swamp Ecosite

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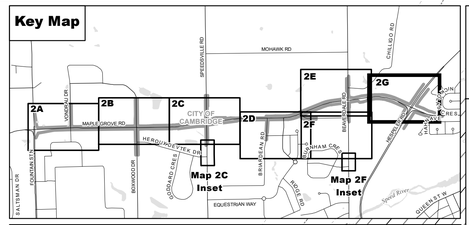
Project: 2171
Date: July 30, 2021

NAD83 - UTM Zone 17
Size: 24x36"
1:900

0 10 20 30 40 50 60
Meters

N

## Key Map




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**Map 2G**

# Maple Grove Rd Class EA

## Tree Inventory

### Legend

- Subject Property
- Road Alignment
- Grading Extent
- Existing Conditions
- Servicing
- Watercourse / Waters Edge
- Bottom of Slope
- Top of Sope
- Primary Road
- Secondary Road
- Inventoried Tree to be Retained (Crown to Scale)
- Inventoried Tree to be Removed (Crown to Scale)
- Bat Habitat Tree
- Impacted ELC Community
- (CUM1) Mineral Cultural Meadow Ecosite
- (FOD5) Dry - Fresh Sugar Maple Deciduous Forest Ecosite
- (MAM2) Mineral Meadow Marsh Ecosite
- (SAM1) Mixed Shallow Aquatic Ecosite
- (SWM4-1) White Cedar-Hardwood Organic Mixed Swamp Type


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Date: July 30, 2021

NAD83 - UTM Zone 17
Size: 24x36"
1:900

0 10 20 30 40 50 60
Meters

N

# Appendix H – Stormwater Management Report (IBI Group)

September 2023

**IBI GROUP**
101 – 410 Albert Street
Waterloo ON N2L 3V3 Canada
tel 519 585 2255
**ibigroup.com**

# FUNCTIONAL DRAINAGE AND STORMWATER MANAGEMENT REPORT
## Maple Grove Road Reconstruction Class EA
## City of Cambridge
## March 14, 2022
## IBI Group Project: 117540

## 1. INTRODUCTION

IBI Group was retained by the Region of Waterloo to prepare a Functional Drainage and Stormwater Management Report in support of a Schedule "C" Class Environmental Assessment for the proposed improvements to Maple Grove Road from Vondrau Drive to Hespeler Road in the City of Cambridge.

This Functional Design Brief summarizes the proposed stormwater management requirements to accommodate the construction of a new urban road cross-section.

### Background Information

The following background documents have been utilized in preparing this functional stormwater management design:

- Hespeler West Subwatersheds Study (HWSS), PEIL et.al., September 2004;
- City of Cambridge Stormwater Management Master Plan, AMEC, August 2011;
- Stormwater Management Planning and Design Manual, MECP, 2003;
- Geotechnical Investigation Final Report, Widening of Maple Grove Road, Fountain Street to Speedsville Road, Cambridge, Ontario, LVM, June 14, 2011;
- Draft Hydrogeological Site Assessment Proposed Maple Grove Road and Corridor Study Fountain Street to Hespeler Road Cambridge, Ontario, Peto MacCallum Ltd., July 26, 2019.

## 2. EXISTING CONDITIONS

The study area is located in the northeast part of Cambridge as shown on Figure 1. The total road corridor within the study area is 13.473ha. There are six drainage outlet locations: the existing Maple Grove storm sewer draining west, East Creek, Middle Creek, West Creek, Ellis Creek, and the Hespeler Road ditch drainage system. The road corridor areas drain primarily via ditches and outlet to existing watercourses and storm sewers. The existing catchment areas and their associated outlet locations are summarized in Table 1, and are shown on Figures 2, 3, 4, and 5. Based on the 2019 Hydrogeological Investigation, the soils and infiltration rates vary throughout the study area, and include areas of high permeability soils such as sand and gravels.

The figures include the Region of Waterloo groundwater intrinsic vulnerability levels, indicating groundwater well susceptibility to contaminants based on soil types and travel time (higher score = greater vulnerability).

### Table 1: Drainage Catchments

| CATCHMENT | OUTLET |
|---|---|
| A1 | Drains west to existing Maple Grove Road storm sewer system |
| B2 | Drains south to West Creek |
| B3 | Drains south to West Creek |
| C4 | Drains south to Middle Creek (Hunsperger Drain) |
| C5 | Drains south to Middle Creek (Hunsperger Drain) |
| C6 | Drains south to Middle Creek (Hunsperger Drain) |
| C7 | Drains south to Middle Creek (Hunsperger Drain) |
| C8 | Drains south to Middle Creek (Hunsperger Drain) |
| D9 | Drains south to East Creek |
| D10 | Drains south to East Creek |
| E11 | Drains south to Ellis Creek |
| E12 | Drains south to Ellis Creek |
| E13 | Drains south to Ellis Creek |
| F14 | Drains south to Hespeler Road ditch drainage system |

## 3. PROPOSED CONDITIONS

Under proposed conditions, the road will be widened from a two and four through traffic lane rural cross-section to a four through traffic lane urban cross-section. Intersections will include auxiliary turn lanes as necessitated by traffic turning needs. Drainage will be collected in a storm sewer system and via overland flow on the road, and runoff will continue to discharge to each existing outlet location. No new storm outlet locations are proposed for this project.

The widening of the Maple Grove Road asphalt surface (impervious surface) will result in an increase in peak flows in comparison to existing conditions. Ro address the impervious surface run-of increases, various stormwater management techniques will be utilized, including surface storage (where feasible), underground storage (possible subsurface tanks, super pipes, etc.) and Low Impact Development (LID) features throughout the developing corridor, based on favourable soil conditions for active infiltration and considering local wellhead protection requirements. The proposed drainage outlets are summarized are follows, and are shown on Figures 6, 7, 8, and 9.

**Outlet A – Catchment A1**

Area A will continue to drain west to the existing Maple Grove storm sewer system. The design will consider use of LID features for stormwater quality control, however the area is located within a Wellhead Protection Area, which would limit the use of infiltration. Underground storage will be considered for stormwater quantity control.

**Outlet B – Catchment B2 & B3**

These areas will continue to drain south to West Creek. The design will consider use of LID features for stormwater quality control, however the areas are located within a Wellhead Protection Area, which would limit the opportunity to use of infiltration. Underground storage will be considered for stormwater quantity control.

**Outlet C – Catchment C4, C5, C6, C7, C8**

These areas will continue to drain south toward Middle Creek. The design will also consider underground storage for stormwater quantity control, and the use of LID features for stormwater quality control.

**Outlet D – Catchment D9 & D10**

These areas will continue to drain south toward East Creek. The design will consider underground and surface storage for stormwater quantity control, and the use of LID features for stormwater quality control.

**Outlet E – Catchment E11, E12 & E13**

These areas will continue to drain south toward Ellis Creek. The design will consider underground storage for stormwater quantity control, and the use of LID features for stormwater quality control.

**Outlet F – Catchment F14**

These areas will continue to drain south to Hespeler Road ditch drainage system. The design will consider use of LID features for stormwater quality control.

Based on the 2019 Hydrogeological Investigation, the infiltration rates vary throughout the study area. In areas of high permeability soils such as sand and gravels, the use of Low Impact Development (LID) measures, such as infiltration facilities to maintain the local recharge rate after development is feasible. This applies only in areas where wellhead protection is not a concern and infiltration could be permitted. Groundwater depths are sufficiently deep to allow for buried infiltration facilities in locations with favourable soils.

## 4. STORMWATER MANAGEMENT

The stormwater management criteria for this project and adjacent development areas are based on the applicable requirements of the Region of Waterloo, the City of Cambridge, the Grand River Conservation Authority, and the Ministry of Environment, Conservation and Parks (MECP):

- As per the HWSS - SWM quantity requirement is to control proposed peak flows to existing levels (up to 100-year storm event);
- Stormwater management for quality control is required to a Normal Protection Level as per MECP standards.

- The majority of the road corridor areas drain directly to the watercourses, and the existing outlet locations will be maintained under proposed conditions;
- The City of Cambridge SWM Master Plan does not identify any potential SWM facilities in this area;
- Given the limited space within the road corridor to construct SWM facilities, locations of new off-site SWM facilities (ponds) to attenuate corridor runoff should be explored;
- A wellhead protection area exists west of Boxwood Drive and must be taken into account if infiltration facilities might be are proposed.

## Stormwater Quantity Control

The existing impervious area for the study area is 37.9 percent, and under proposed conditions the impervious area will increase to 52.4 percent. This will result in an increase in peak flows. The existing and proposed conditions have been modelled using Visual OTTHYMO, and the associated modelling variables are summarized in Table 2.

### Table 2: Visual OTTHYMO Modelling Variables

| CATCHMENT ID | DESCRIPTION | AREA (HA) | XIMP/TIMP | MANNING 'N' | PERVIOUS CN |
|---|---|---|---|---|---|
| **EXISTING CONDITIONS** | | | | | |
| A1 | Draining West | 0.985 | 0.696 | 0.250 | 72 |
| B2 | Draining to West Creek | 1.508 | 0.512 | 0.250 | 72 |
| B3 | Draining to Middle Creek | 0.535 | 0.459 | 0.250 | 72 |
| C4 | Draining to Middle Creek | 1.081 | 0.452 | 0.250 | 72 |
| C5 | Draining to Middle Creek | 2.030 | 0.404 | 0.250 | 72 |
| C6 | Draining to Middle Creek | 3.237 | 0.399 | 0.250 | 72 |
| C7 | Draining to Middle Creek | 0.596 | 0.304 | 0.250 | 72 |
| C8 | Draining to Middle Creek | 1.630 | 0.378 | 0.250 | 72 |
| D9 | Draining to East Creek | 1.209 | 0.424 | 0.250 | 72 |
| D10 | Draining to East Creek | 2.289 | 0.383 | 0.250 | 72 |
| E11 | Draining to Ellis Creek | 2.007 | 0.438 | 0.250 | 72 |
| E12 | Draining to Ellis Creek | 1.033 | 0.360 | 0.250 | 72 |
| E13 | Draining to Ellis Creek | 1.744 | 0.275 | 0.250 | 72 |

| CATCHMENT ID | DESCRIPTION | AREA (HA) | XIMP/TIMP | MANNING 'N' | PERVIOUS CN |
|---|---|---|---|---|---|
| F14 | Draining South | 3.545 | 0.496 | 0.250 | 72 |
| | **Total** | **13.743** | **0.379** | | |
| **PROPOSED CONDITIONS** | | | | | |
| A1 | Draining West | 0.985 | 0.876 | 0.250 | 72 |
| B2 | Draining to West Creek | 1.508 | 0.625 | 0.250 | 72 |
| B3 | Draining to Middle Creek | 0.535 | 0.775 | 0.250 | 72 |
| C4 | Draining to Middle Creek | 1.081 | 0.733 | 0.250 | 72 |
| C5 | Draining to Middle Creek | 2.030 | 0.533 | 0.250 | 72 |
| C6 | Draining to Middle Creek | 3.237 | 0.656 | 0.250 | 72 |
| C7 | Draining to Middle Creek | 0.596 | 0.428 | 0.250 | 72 |
| C8 | Draining to Middle Creek | 1.630 | 0.526 | 0.250 | 72 |
| D9 | Draining to East Creek | 1.209 | 0.539 | 0.250 | 72 |
| D10 | Draining to East Creek | 2.289 | 0.476 | 0.250 | 72 |
| E11 | Draining to Ellis Creek | 2.007 | 0.622 | 0.250 | 72 |
| E12 | Draining to Ellis Creek | 1.033 | 0.421 | 0.250 | 72 |
| E13 | Draining to Ellis Creek | 1.744 | 0.310 | 0.250 | 72 |
| F14 | Draining South | 3.545 | 0.359 | 0.250 | 72 |
| | **Total** | **13.743** | **0.524** | | |

A three-hour duration Chicago style storm derived from City of Cambridge IDF curves was used for the stormwater management modelling. The total depths of rainfall for the modelled storm is indicated in Table 3.

### Table 3: Rainfall Depths

| RETURN EVENT | STORM DURATION (HOURS) | RAINFALL DEPTH (MM) |
|---|---|---|
| 2 Year | 3 | 33.6 |
| 5-year | 3 | 46.1 |
| 10 Year | 3 | 54.6 |
| 25-year | 3 | 63.0 |
| 50-year | 3 | 72.6 |
| 100-year | 3 | 80.4 |

The existing conditions and proposed conditions peak flows (controlled) are summarized in Table 4. Since the peak flows increase under proposed conditions, storage and flow attenuation will be required.

### Table 4: Peak Flows – Middle Creek

| RETURN EVENT | EXISTING CONDITIONS | PROPOSED CONDITIONS |
|---|---|---|
| | Peak Flow ($m^3/s$) | Peak Flow ($m^3/s$) |
| **Draining West to Maple Grove Road** | | |
| 2 Year | 0.180 | 0.170 |
| 5-year | 0.242 | 0.233 |
| 10 Year | 0.283 | 0.252 |
| 25-year | 0.313 | 0.267 |
| 50-year | 0.350 | 0.285 |
| 100-year | 0.373 | 0.299 |
| **Draining to West Creek** | | |
| 2 Year | 0.492 | 0.467 |
| 5-year | 0.699 | 0.596 |
| 10 Year | 0.838 | 0.653 |
| 25-year | 0.947 | 0.762 |

| RETURN EVENT | EXISTING CONDITIONS | PROPOSED CONDITIONS |
|---|---|---|
| | Peak Flow ($m^3/s$) | Peak Flow ($m^3/s$) |
| 50-year | 1.084 | 0.942 |
| 100-year | 1.177 | 1.041 |
| **Draining to Middle Creek** | | |
| 2 Year | 0.789 | 0.750 |
| 5-year | 1.122 | 0.956 |
| 10 Year | 1.345 | 1.048 |
| 25-year | 1.520 | 1.223 |
| 50-year | 1.740 | 1.512 |
| 100-year | 1.890 | 1.671 |
| **Draining to East Creek** | | |
| 2 Year | 0.355 | 0.351 |
| 5-year | 0.499 | 0.488 |
| 10 Year | 0.599 | 0.552 |
| 25-year | 0.674 | 0.605 |
| 50-year | 0.768 | 0.664 |
| 100-year | 0.831 | 0.719 |
| **Draining to Ellis Creek** | | |
| 2 Year | 0.446 | 0.439 |
| 5-year | 0.633 | 0.595 |
| 10 Year | 0.756 | 0.708 |
| 25-year | 0.857 | 0.787 |
| 50-year | 0.981 | 0.904 |

| RETURN EVENT | EXISTING CONDITIONS | PROPOSED CONDITIONS |
|---|---|---|
| | Peak Flow ($m^3/s$) | Peak Flow ($m^3/s$) |
| 100-year | 1.065 | 0.969 |

Based on the preliminary Visual OTTHYMO modelling, the stormwater storage volumes required to achieve the proposed conditions peak flows in Table 4 for each outlet location are summarized in Table 5. Note that the imperviousness of outlet F14 will be reduced under proposed conditions, and stormwater attenuation is not required.

### Table 5: Required Stormwater Storage Volumes

| LOCATION | STORMWATER STORAGE VOLUME ($m^3$) | | | | | |
|---|---|---|---|---|---|---|
| | 2 YEAR | 5-YEAR | 10 YEAR | 25-YEAR | 50-YEAR | 100-YEAR |
| Outlet A – Maple Grove Road Catchment A1 | 32 | 46 | 54 | 64 | 78 | 89 |
| Outlet B – West Creek Catchment B2, B3 | 45 | 88 | 121 | 150 | 189 | 220 |
| Outlet C – Middle Creek Catchment C4, C5 | 70 | 135 | 185 | 230 | 288 | 334 |
| Outlet C – Middle Creek Catchment C6, C7, C8 | 120 | 250 | 349 | 443 | 516 | 553 |
| Outlet D – East Creek Catchment D9, D10 | 65 | 102 | 126 | 160 | 206 | 237 |
| Outlet E – Ellis Creek Catchment E11 | 54 | 84 | 103 | 122 | 148 | 167 |
| Outlet E – Ellis Creek Catchment E12, E13 | 26 | 49 | 72 | 93 | 114 | 137 |

Figure 1 identifies the preliminary locations and volumes of potential stormwater storage facilities. Storage within the road corridor could include underground systems, such as tanks and super pipes, and surface storage where space permits. The preliminary storage locations are summarized as follows:

**Outlet A – Maple Grove Road Catchment A1**

Storage of the required 89 $m^3$ in 50m of 1500mm diameter super pipe or in an underground tank system. Given the relatively small storage and the absence of available storage area within the corridor for this catchment, a surface storage pond would not be feasible.

**Outlet B – West Creek Catchment B2, B3**

Storage of the required 220 $m^3$ could be provided in 80m of 1800mm diameter super pipe or in an underground tank system. Given the relatively small storage and the absence of available storage area within the corridor for this catchment, a surface storage pond would not be feasible.

**Outlet C – Middle Creek Catchment C4, C5**

Storage of the required 334 $m^3$ could be provided in 130m of 1800mm diameter super pipe or in an underground tank system. Given the relatively small storage and the absence of available storage area within the corridor for this catchment, a surface storage pond would not be feasible.

**Outlet C – Middle Creek Catchment C6, C7, C8**

Storage of the required 553 $m^3$ in 110m of twin 1800mm diameter super pipe or in an underground tank system. Surface storage would not be feasible since the absence of available storage area within the corridor for this catchment, a surface storage pond would not be feasible. Storage could also potentially be provided within a surface storage pond on the north side of the road corridor at station 5+660, east of East Creek (SWM Pond 1 on Figure 7).

**Outlet D – East Creek Catchment D9, D10**

Storage of the required 237 $m^3$ in 95m of 1800mm diameter super pipe or in an underground tank system. Storage could also potentially be provided within a surface storage pond on the north side of the road corridor at station 6+430, east of East Creek (SWM Pond 2 on Figure 8).

**Outlet E – Ellis Creek Catchment E11**

Storage of the required 167 $m^3$ in 100m of 1500mm diameter super pipe or in an underground tank system. Given the relatively small storage and the absence of available storage area within the corridor for this catchment, a surface storage pond would not be feasible.

**Outlet E – Ellis Creek Catchment E12, E13**

Storage of the required 137 $m^3$ in 80m of 1500mm diameter super pipe or in an underground tank system. Given the relatively small storage, the absence of available storage area within the corridor and considering the steep terrain a surface storage pond would not be feasible.

## 4.2 Stormwater Quality Control

Stormwater quality control will be required under proposed conditions to treat runoff before it is discharged to each outlet location.

- The creeks and municipal drain are classified as warmwater systems where minimum stormwater quality control to a Normal Protection Level is required.
- Stormwater quality control could be provided using oil/grit separator units and/or LID techniques.
- OGS units can typically be used for drainage areas up to 5 ha, installed at or near the outlet of the storm sewer system.
- Use of infiltration LID techniques may be limited for the western portion of the corridor (west of Boxwood Drive) since this area is located within a Regional wellhead protection area.
- Use of infiltration LID techniques would also be limited to areas with soils that are suitable to support infiltration.

### *Enhanced Grass Swales*

Enhanced grass swales could be considered for stormwater quality control at the final design stage, where space permits. The roadway cross section will dictate the ability to use of boulevard or roadside drainage swales that would be needed but should be investigated during the detailed design phase of the project. The cross-section for Alternative 1 provides a relatively wide grass boulevard adjacent to the curb, which would allow for the construction of enhanced grass swales. Alternatives 2 to 4 would not have sufficient space to construct swales. The sizing of swales is based on general methodology outlined in the Low Impact Development Stormwater Management Planning and Design Manual (CVC/TRCA, 2010) in Section 4.8, and are specifically referred to as "Enhanced Grass Swales." The recommended design elements are summarized as follows:

- Shape: Grass swales should be designed with a trapezoidal or parabolic cross section;
- Bottom Width: Grass swales should be designed with a bottom width between 0.75 and 3.0 metres. The design width should allow for shallow flows and adequate water quality treatment, while preventing flows from concentrating and creating gullies;
- Longitudinal Slope: Slopes should be between 0.5% and 4%. Check dams should be incorporated on slopes greater than 3%;
- Flow Depth: The maximum flow depth should correspond to two-thirds the height of the vegetation. Vegetation in some grass swales may reach heights of 150 millimetres; therefore a maximum flow depth of approximately 100 millimetres is recommended during a 4 hour, 25 mm Chicago storm event;
- Grass swales must be designed for a maximum velocity of 0.5 m/s or less for the 4 hour 25 mm Chicago storm.

### *Perforated Pipes*

Perforated pipes (third pipe system) could be provided for stormwater quality control in areas with favourable soil conditions and outside the noted wellhead protection areas. The proposed configuration of perforated pipes is based on general methodology outlined in the Low Impact Development Stormwater Management Planning and Design Manual (CVC/TRCA, 2010) in Section 4.10.

Perforated pipe systems receive runoff from the road surface and allow this runoff to infiltrate into the soil layer under the roadway. The pipes will underlie the road storm sewer system, and typically have the capacity to retain and infiltrate the 25mm storm event. Based on a typical catch basin spacing of 45m, a 250mm diameter pipe is generally required (to be confirmed at detailed design). For larger storm events, the pipe would surcharge and overflow to the storm sewer system. The Region should follow their winter salting policies and guidelines to the extent possible to minimize salt-laden runoff from entering the ground.

### *Oil/Grit Separator (OGS) Units*

OGS units could be utilized as end-of-pipe solutions for stormwater quality control. The units would be sized to provide a Normal Protection Level of treatment of runoff from the corridor (70% total suspended solids removal). Each unit would be located at the downstream limit of the storm sewer system at the outlet to the receiving watercourse.

## 5. FLOODPLAIN HYDAULICS

The existing crossing capacities are as follows:

- Maple Grove Rd @ Middle Creek: 2 year (2 X 1400mm CSP culverts);
- Speedsville Rd @ Middle Creek: 25-year (2 X 1400mm CSP culverts);
- Maple Grove Road @ East Creek: 10 year (1200mm concrete culvert);
- Maple Grove Road @ Ellis (Chiligo) Creek: Regional;

The HEC-RAS modelling prepared as part of the HWSS was modified to simulate proposed crossing upgrades for Middle Creek and East Creek. Proposed crossing capacities as per Hespeler West Subwatershed Study and MTO criteria for an arterial road should accommodate the 50-year storm event:

- Maple Grove Rd @ Middle Creek: 100-year (proposed 3.8m span X 1.8m rise concrete box);
- Speedsville Rd @ Middle Creek (Hunsperger Drain): 100-year (proposed 3.8m span X 1.8m rise concrete box);
- Maple Grove Road @ East Creek: 50-year (proposed 1.8m span X 1.8m rise concrete box);
- Maple Grove Road @ Ellis (Chiligo) Creek: Regional (no changes proposed);
- Hunsperger Drain channel to the south of the corridor contains the 50-year storm under existing conditions, without spilling onto private lands to the south, requiring the existing 15m channel bottom width to be maintained;
- Hunsperger Drain channel upgrades/realignment should continue to allow for the containment of the 50-year storm event. To obtain the necessary channel configuration (depth, width), and to accommodate the new urban road cross-section elements, encroachment onto private lands to the south of the corridor would be required;
- Note that alterations to the Hunsperger Drain would likely require a *Notice of Request for Drain Improvement* under Section 78 of the Drainage Act.

## 6. SUMMARY AND CONCLUSIONS

This Report demonstrates that stormwater attenuation using underground and surface storage for the 2 year to the 100-year storm events will be required to control the proposed conditions peak flows to the required existing conditions levels for the receiving drainage outlets. Stormwater quality can be addressed by routing impervious areas through enhanced grass swales, OGS units, perforated pipes as well as directing surface runoff to an upgraded underground pipe system and conveying piped flows to surface detention facilities where adequate space is available.

The culvert crossings within the project limits have been assessed, and upsized box culverts will be required to convey the 50-year storm event without overtopping the regional roadway.

The Recommended drainage improvements identified herein include the following which shall be updated and confirmed at the time of detailed design:

## Table 6 - Summary of Recommended Drainage Improvements

| IMPROVEMENT | LOCATION | AREA | CAPACITY | COMMENTS |
|---|---|---|---|---|
| Stormwater quantity and quality control | Outlet A – Maple Grove Road Catchment A1 | 0.985 hectares | 89 $m^3$ storage volume required for 100-year storm peak flow attenuation | Underground storage for quantity control, OGS for quality control, area within wellhead protection area |
| Stormwater quantity and quality control | Outlet B – West Creek Catchment B2, B3 | 2.043 hectares | 220 $m^3$ storage volume required for 100-year storm peak flow attenuation | Underground storage for quantity control, OGS for quality control, area within wellhead protection area |
| Stormwater quantity and quality control | Outlet C – Middle Creek Catchment C4, C5 | 3.111 hectares | 334 $m^3$ storage volume required for 100-year storm peak flow attenuation | Underground storage for quantity control, LID measures and/or OGS for quality control |
| Stormwater quantity and quality control, realignment of Hunsperger Drain | Outlet C – Middle Creek Catchment C6, C7, C8 | 5.463 hectares | 553 $m^3$ storage volume required for 100-year storm peak flow attenuation | Underground storage for quantity control, LID measures and/or OGS for quality control, maintain conveyance for Hunsperger Drain |
| Stormwater quantity and quality control | Outlet D – East Creek Catchment D9, D10 | 3.498 hectares | 237 $m^3$ storage volume required for 100-year storm peak flow attenuation | Underground storage for quantity control, LID measures and/or OGS for quality control, potential for surface storage to the north of the road corridor |
| Stormwater quantity and quality control | Outlet E – Ellis Creek Catchment E11 | 2.007 hectares | 167 $m^3$ storage volume required for 100-year storm peak flow attenuation | Underground storage for quantity control, LID measures and/or OGS for quality control |
| Stormwater quantity and quality control | Outlet E – Ellis Creek Catchment E12, E13 | 2.777 hectares | 137 $m^3$ storage volume required for 100-year storm peak flow attenuation | Underground storage for quantity control, LID measures and/or OGS for quality control |
| Stormwater quality control | Outlet F – Hespeler Road drainage system | 3.545 hectares | Peak flow attenuation not required | No increase in impervious area, quantity control not required, LID measures and/or OGS for quality control |

Functional Drainage and Stormwater Management Report
Maple Grove Road Reconstruction
Region of Waterloo
March 14, 2022
IBI Group Project 117540

All of which is respectfully submitted.

**IBI GROUP**



**Andy Kroess, M.Eng., P.Eng.**
Senior Water Resources Engineer



**Michael McGann, P.Eng.**
Manager, Transportation Engineering

https://ibigroup.sharepoint.com/sites/Projects/117540/117540 - Maple Grove Road - Project Documents/6.0 Technical/6.2 CivilEngMuniTransp/6.2.3 Tech-Reports/Drainage/WTR_Functional_ SWM_Brief_2022-03-14.docx\2022-03-16\MS

True North

RANDALL DRAIN
MIDDLE CREEK
EAST CREEK
ELLIS CREEK
KLASSEN DRAIN
FREEPORT CREEK
TOYOTA DRAIN
HUNSPERGER DRAIN
WEST CREEK
MIDDLE CREEK
EAST CREEK
ELLIS CREEK

MOHAWK ROAD
BEAVERDALE ROAD (R.R.32)
CHILLIGO ROAD
HESPELER ROAD (R.R.24)
DYER COURT
NORA COURT
NICKOLAS CRESCENT
FISHER MILLS ROAD
MAPLE GROVE ROAD (R.R.38)
VALERIE COURT
HAHN AVENUE
OLD MAPLE GROVE ROAD
BURNHAM CRESCENT
BANAT ROAD
BRENDA STREET
ALLENDALE ROAD
FOUNTAIN STREET NORTH (R.R.17)
VONDRAU DRIVE
INDUSTRIAL LANDS
BOXWOOD DRIVE
SPEEDSVILLE ROAD
BRIARDEAN ROAD
COMPASS TRAIL
HEROUX DEVTEK DRIVE
GODDARD CRESCENT
MAPLE GROVE ROAD (R.R.38)
BARNES ROAD
SALTSMAN DRIVE
CHERRY BLOSSOM ROAD
17
38

## LEGEND

- WEST CREEK SUBWATERSHED
- MIDDLE CREEK SUBWATERSHED
- EAST CREEK SUBWATERSHED
- ELLIS CREEK SUBWATERSHED
- FLOODPLAIN LIMIT
- FLOW DIRECTION

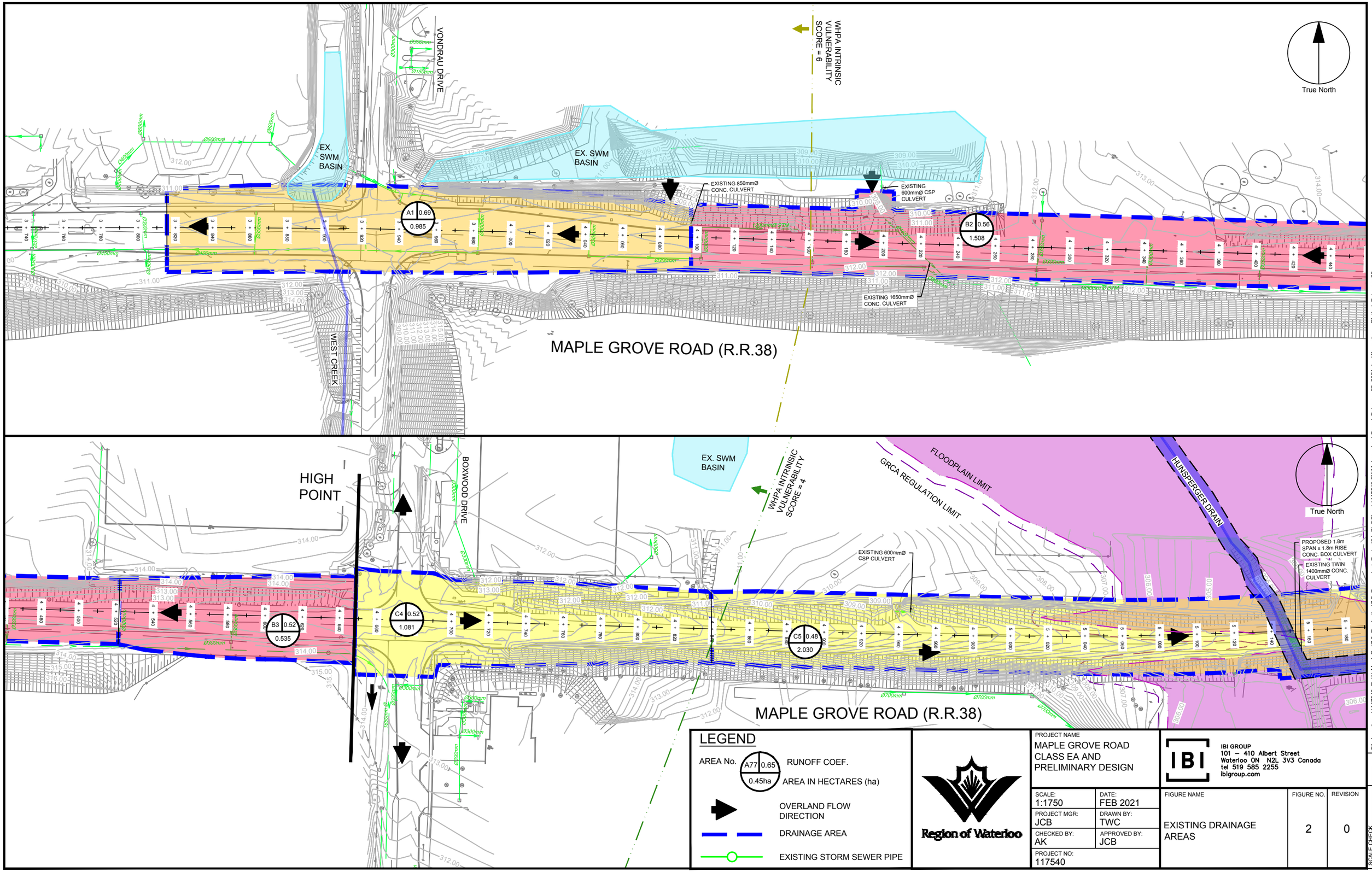
Region of Waterloo

IBI

| | |
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| PROJECT MGR: JCB | DRAWN BY: TWC |
| CHECKED BY: AK | APPROVED BY: JCB |
| PROJECT NO: 117540 | |
| FIGURE NAME | STUDY AREA DRAINAGE PLAN |
| FIGURE NO. | 1 |
| REVISION | 0 |

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## LEGEND

AREA No. A77 0.65 0.45ha — RUNOFF COEF. / AREA IN HECTARES (ha)

OVERLAND FLOW DIRECTION

DRAINAGE AREA

EXISTING STORM SEWER PIPE

Region of Waterloo

PROJECT NAME
MAPLE GROVE ROAD
CLASS EA AND
PRELIMINARY DESIGN

IBI GROUP
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Waterloo ON N2L 3V3 Canada
tel 519 585 2255
ibigroup.com

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|---|---|
| 1:1750 | FEB 2021 |
| PROJECT MGR: JCB | DRAWN BY: TWC |
| CHECKED BY: AK | APPROVED BY: JCB |
| PROJECT NO: 117540 | |

FIGURE NAME: EXISTING DRAINAGE AREAS

FIGURE NO.: 2

REVISION: 0

SCALE CHECK 1 in 10mm

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True North

LOW POINT

GRCA WETLANDS

FLOODPLAIN LIMIT

SPEEDSVILLE ROAD

FLOODPLAIN LIMIT

EXISTING 700mmØ CSP CULVERT

EXISTING 450mmØ CSP CULVERT

EXISTING 500mmØ CSP CULVERT

EXISTING 600mmØ CSP CULVERT

EXISTING 900mmØ CSP CULVERT

C6 0.48 3.237

C7 0.41 0.596

C8 0.46 1.630

HUNSPERGER DRAIN

MAPLE GROVE ROAD (R.R.38)

HUNSPERGER DRAIN

EXISTING TWIN 1400mmØ CELL CULVERT

EXISTING 700mmØ CONC. CULVERT

GRCA WETLANDS

FLOODPLAIN LIMIT

GRCA WETLANDS

MIDDLE CREEK

GRCA WETLANDS

## LEGEND

AREA No. A77 | 0.65 | 0.45ha — RUNOFF COEF. / AREA IN HECTARES (ha)

OVERLAND FLOW DIRECTION

DRAINAGE AREA

EXISTING STORM SEWER PIPE

Region of Waterloo

PROJECT NAME
MAPLE GROVE ROAD CLASS EA AND PRELIMINARY DESIGN

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| CHECKED BY: AK | APPROVED BY: JCB |
| PROJECT NO: 117540 | |

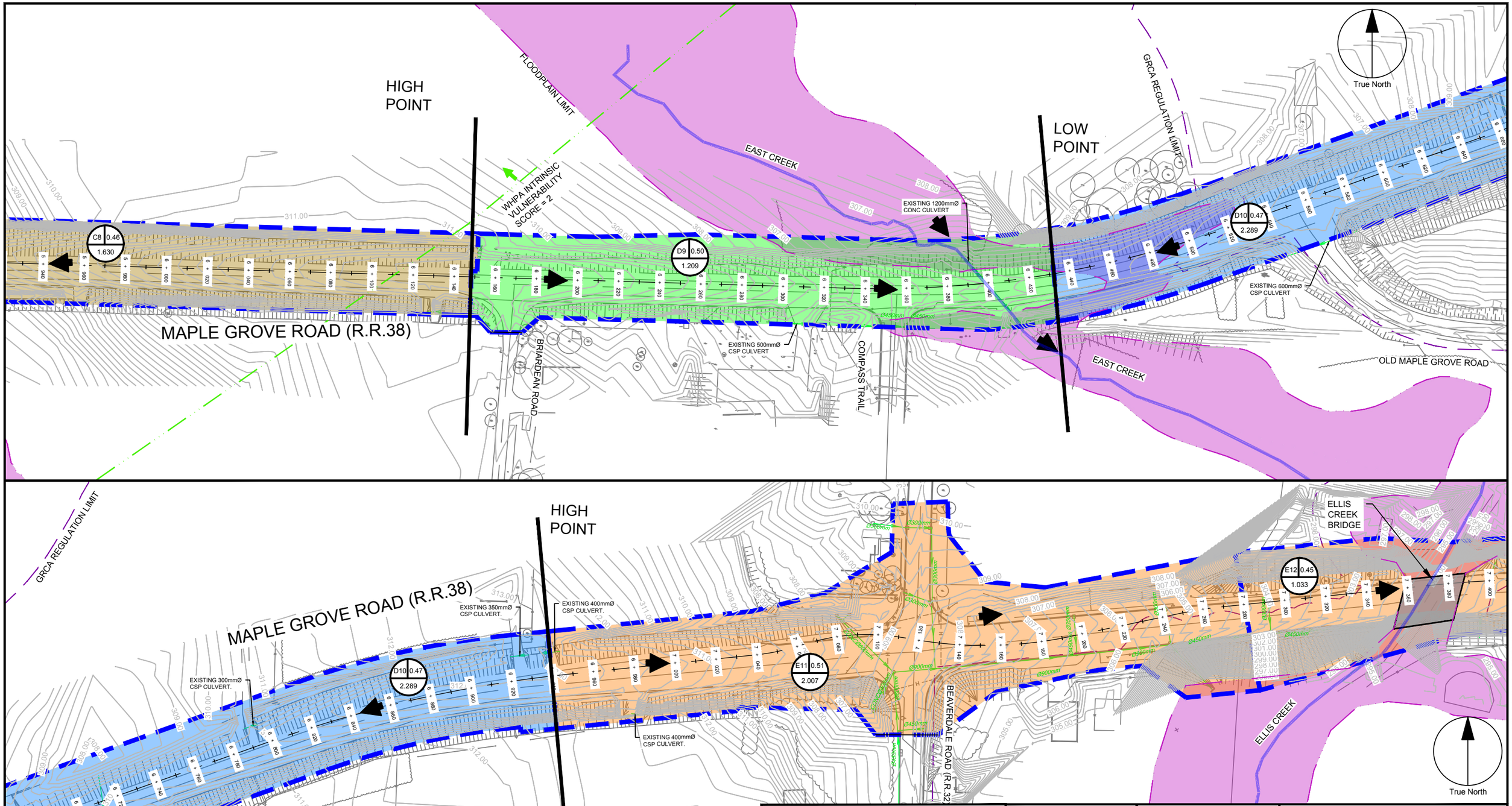
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FIGURE NO.: 3

REVISION: 0

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## LEGEND

AREA No. A77 | 0.65 RUNOFF COEF.
0.45ha AREA IN HECTARES (ha)

OVERLAND FLOW DIRECTION

DRAINAGE AREA

EXISTING STORM SEWER PIPE

Region of Waterloo

PROJECT NAME
MAPLE GROVE ROAD
CLASS EA AND
PRELIMINARY DESIGN

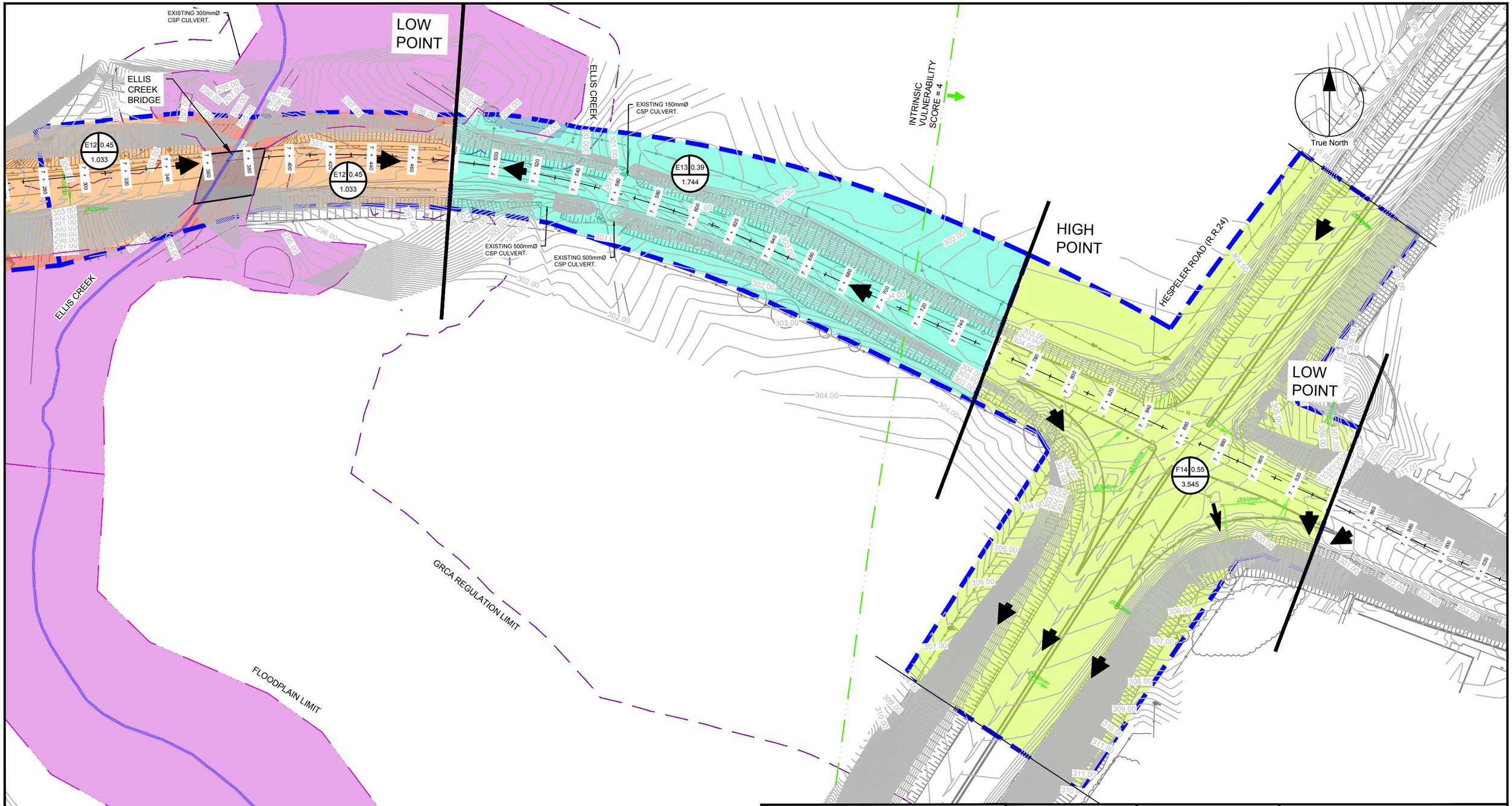
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| CHECKED BY: AK | APPROVED BY: JCB |
| PROJECT NO: 117540 | |

FIGURE NAME: EXISTING DRAINAGE AREAS
FIGURE NO.: 4
REVISION: 0

SCALE CHECK 1 in 10mm

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## LEGEND

AREA No. A77 | 0.65 RUNOFF COEF. | 0.45ha AREA IN HECTARES (ha)

OVERLAND FLOW DIRECTION

DRAINAGE AREA

EXISTING STORM SEWER PIPE

Region of Waterloo

PROJECT NAME
MAPLE GROVE ROAD CLASS EA AND PRELIMINARY DESIGN

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|---|---|
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| PROJECT MGR: JCB | DRAWN BY: TWC |
| CHECKED BY: AK | APPROVED BY: JCB |
| PROJECT NO: 117540 | |

FIGURE NAME: EXISTING DRAINAGE AREAS

FIGURE NO.: 5

REVISION: 0

SCALE CHECK 1 in 10mm

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VONDRAU DRIVE

WHPA INTRINSIC VULNERABILITY SCORE = 6

True North

EX. SWM BASIN

EX. SWM BASIN

EXISTING 850mmØ CONC. CULVERT

EXISTING 600mmØ CSP CULVERT

A1 0.81 0.985

B2 0.64 1.508

OUTLET A

STORAGE 89m³ - 50m 1500mmØ storage pipe or tank system.

OGS

EXISTING 1650mmØ CONC. CULVERT

OUTLET B

STORAGE 220m³ - 80m 1800mmØ storage pipe or tank system.

OGS

MAPLE GROVE ROAD (R.R.38)

WEST CREEK

HIGH POINT

BOXWOOD DRIVE

EX. SWM BASIN

WHPA INTRINSIC VULNERABILITY SCORE = 4

FLOODPLAIN LIMIT

GRCA REGULATION LIMIT

HUNSPERGER DRAIN

True North

EXISTING 600mmØ CSP CULVERT

PROPOSED 1.8m SPAN x 1.8m RISE CONC. BOX CULVERT

EXISTING TWIN 1400mmØ CONC. CULVERT

C4 0.71 1.081

B3 0.74 0.535

C5 0.57 2.030

MAPLE GROVE ROAD (R.R.38)

PROPOSED STORMWATER MANAGEMENT FACILITIES

- IN-PIPE STORAGE
- SWM BASIN
- OIL GRIT SEPARATOR (OGS)

## LEGEND

- AREA No. / RUNOFF COEF. (A77 0.65 / 0.45ha AREA IN HECTARES (ha))
- OVERLAND FLOW DIRECTION
- DRAINAGE AREA
- EXISTING STORM SEWER PIPE

Region of Waterloo

PROJECT NAME
MAPLE GROVE ROAD
CLASS EA AND
PRELIMINARY DESIGN

IBI GROUP
101 – 410 Albert Street
Waterloo ON N2L 3V3 Canada
tel 519 585 2255
ibigroup.com

| SCALE: | DATE: |
|---|---|
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| PROJECT MGR: JCB | DRAWN BY: TWC |
| CHECKED BY: AK | APPROVED BY: JCB |
| PROJECT NO: 117540 | |

| FIGURE NAME | FIGURE NO. | REVISION |
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| PROPOSED DRAINAGE AREAS | 6 | 0 |

SCALE CHECK 1 in 10mm

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Last Saved: February 23, 2021, by tiffany.chan

True North

GRCA WETLANDS

FLOODPLAIN LIMIT

SPEEDSVILLE ROAD

FLOODPLAIN LIMIT

POSSIBLE STORMWATER MANAGEMENT FACILITY LOCATION (720m$^2$)

LOW POINT

GRCA WETLANDS

EXISTING 600mmØ CSP CULVERT

EXISTING 900mmØ CSP CULVERT

SWM POND 1

EXISTING 700mmØ CSP CULVERT

EXISTING 500mmØ CSP CULVERT

EXISTING 450mmØ CSP CULVERT

C6 0.66 3.237

C7 0.50 0.596

C8 0.57 1.630

HUNSPERGER DRAIN

HUNSPERGER DRAIN

MAPLE GROVE ROAD (R.R.38)

OUTLET C

OGS

STORAGE 553m$^3$ - TWIN 110m 1800mmØ storage pipe or tank system.

MIDDLE CREEK

GRCA WETLANDS

TO OUTLET C

STORAGE 334m$^3$ - 130m 1800mmØ storage pipe or tank system.

EXISTING 700mmØ CONC. CULVERT

EXISTING TWIN 1400mmØ CELL CULVERT

PROPOSED 3.8m SPAN x 1.8m RISE CONC. BOX CULVERT

FLOODPLAIN LIMIT

GRCA WETLANDS

PROPOSED STORMWATER MANAGEMENT FACILITIES

- IN-PIPE STORAGE
- SWM BASIN
- OIL GRIT SEPARATOR (OGS)

## LEGEND

- AREA No. / RUNOFF COEF. / AREA IN HECTARES (ha)
- OVERLAND FLOW DIRECTION
- DRAINAGE AREA
- EXISTING STORM SEWER PIPE

Region of Waterloo

PROJECT NAME
MAPLE GROVE ROAD CLASS EA AND PRELIMINARY DESIGN

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Waterloo ON N2L 3V3 Canada
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ibigroup.com

| SCALE: | DATE: |
|---|---|
| 1:1750 | FEB 2021 |
| PROJECT MGR: | DRAWN BY: |
| JCB | TWC |
| CHECKED BY: | APPROVED BY: |
| AK | JCB |
| PROJECT NO: | |
| 117540 | |

| FIGURE NAME | FIGURE NO. | REVISION |
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| PROPOSED DRAINAGE AREAS | 7 | 0 |

SCALE CHECK 1 in 10mm

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True North

HIGH POINT

LOW POINT

FLOODPLAIN LIMIT

GRCA REGULATION LIMIT

EAST CREEK

WHPA INTRINSIC VULNERABILITY SCORE = 2

POSSIBLE STORMWATER MANAGEMENT FACILITY LOCATION (725m$^2$)

PROPOSED 1.8m SPAN x 1.8m RISE CONC. BOX CULVERT

EXISTING 1200mmØ CONC CULVERT

SWM POND 2

C8 0.57 1.630

D9 0.58 1.209

D10 0.53 2.289

MAPLE GROVE ROAD (R.R.38)

EXISTING 500mmØ CSP CULVERT

BRIARDEAN ROAD

COMPASS TRAIL

OGS

OUTLET D

STORAGE 237m$^3$ - 95m 1800mmØ storage pipe or tank system.

EXISTING 600mmØ CSP CULVERT

OLD MAPLE GROVE ROAD

EAST CREEK

GRCA REGULATION LIMIT

True North

HIGH POINT

MAPLE GROVE ROAD (R.R.38)

EXISTING 350mmØ CSP CULVERT.

EXISTING 400mmØ CSP CULVERT.

EXISTING 300mmØ CSP CULVERT.

D10 0.53 2.289

E11 0.64 2.007

E12 0.49 1.033

EXISTING 400mmØ CSP CULVERT.

BEAVERDALE ROAD (R.R.32)

ELLIS CREEK BRIDGE

ELLIS CREEK

OUTLET E

STORAGE 167m$^3$ - 100m 1500mmØ dia. storage pipe or tank system.

PROPOSED STORMWATER MANAGEMENT FACILITIES

- IN-PIPE STORAGE
- SWM BASIN
- OGS — OIL GRIT SEPARATOR (OGS)

LEGEND

- AREA No. A77 0.65 / 0.45ha — RUNOFF COEF. / AREA IN HECTARES (ha)
- OVERLAND FLOW DIRECTION
- DRAINAGE AREA
- EXISTING STORM SEWER PIPE

Region of Waterloo

PROJECT NAME
MAPLE GROVE ROAD CLASS EA AND PRELIMINARY DESIGN

IBI GROUP
101 – 410 Albert Street
Waterloo ON N2L 3V3 Canada
tel 519 585 2255
ibigroup.com

| SCALE: | DATE: |
|---|---|
| 1:1750 | FEB 2021 |
| PROJECT MGR: JCB | DRAWN BY: TWC |
| CHECKED BY: AK | APPROVED BY: JCB |
| PROJECT NO: 117540 | |

FIGURE NAME: PROPOSED DRAINAGE AREAS

FIGURE NO.: 8

REVISION: 0

File Location: J:\117540_RoW_MapleGrv\7.0_Production\7.2_Conceptual_Design\04_Civil\Sheets\117540-SWM.dwg Last Saved: February 23, 2021, by tiffany.chan Plotted: February 24, 2021 2:27:11 PM by Tiffany Chan

SCALE CHECK 10mm 1 in

EXISTING 300mmØ CSP CULVERT.

LOW POINT

STORAGE 137m$^3$ - 80m 1800mmØ storage pipe or tank system.

ELLIS CREEK BRIDGE

OUTLET E

ELLIS CREEK

EXISTING 150mmØ CSP CULVERT.

INTRINSIC VULNERABILITY SCORE = 4

E12 0.49 1.033

E12 0.49 1.033

E13 0.42 1.744

OGS

EXISTING 500mmØ CSP CULVERT.

EXISTING 500mmØ CSP CULVERT.

HIGH POINT

HESPELER ROAD (R.R.24)

OUTLET E

STORAGE 167m$^3$ - 100m 1500mmØ dia. storage pipe or tank system.

ELLIS CREEK

LOW POINT

F14 0.45 3.545

GRCA REGULATION LIMIT

FLOODPLAIN LIMIT

True North

PROPOSED STORMWATER MANAGEMENT FACILITIES

- IN-PIPE STORAGE
- SWM BASIN
- OIL GRIT SEPARATOR (OGS) — OGS

LEGEND

- AREA No. A77 | 0.65 / 0.45ha — RUNOFF COEF. / AREA IN HECTARES (ha)
- OVERLAND FLOW DIRECTION
- DRAINAGE AREA
- EXISTING STORM SEWER PIPE

Region of Waterloo

PROJECT NAME
MAPLE GROVE ROAD CLASS EA AND PRELIMINARY DESIGN

IBI GROUP
101 – 410 Albert Street
Waterloo ON N2L 3V3 Canada
tel 519 585 2255
ibigroup.com

| SCALE: | DATE: |
|---|---|
| 1:1750 | FEB 2021 |
| PROJECT MGR: JCB | DRAWN BY: TWC |
| CHECKED BY: AK | APPROVED BY: JCB |
| PROJECT NO: 117540 | |

| FIGURE NAME | FIGURE NO. | REVISION |
|---|---|---|
| PROPOSED DRAINAGE AREAS | 9 | 0 |

SCALE CHECK 1 in 10mm

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# Appendix I – Noise Study (IBI Group)

September 2023

Final

# Maple Grove Road Class EA Noise Study

ARCADIS

IBI GROUP

Prepared for Region of Waterloo
by Arcadis IBI Group

June 2023

# Document Control Page

| | |
|---|---|
| **CLIENT:** | Region of Waterloo |
| **PROJECT NAME:** | Maple Grove Road Class EA |
| **REPORT TITLE:** | Maple Grove Road Class EA<br>Noise Study |
| **ARCADIS IBI REFERENCE:** | 117540 |
| **VERSION:** | Final |
| **DIGITAL MASTER:** | [https://ibigroup.sharepoint.com/sites/Projects/117540/117540 - Maple Grove Road - Project Documents/6.0 Technical/6.2 CivilEngMuniTransp/6.2.3 Tech-Reports/Noise/CTR_Road Noise Report_2023-06-14.docx\2023-07-06\AK] |
| **ORIGINATOR:** | Andy Kroess |
| **REVIEWER:** | Michael McGann |
| **AUTHORIZATION:** | John Bayley |
| **CIRCULATION LIST:** | Client – Region of Waterloo – Justin Armstrong |
| **HISTORY:** | Draft – Rev.0 – March 2023 |
| | Final – June 2023 |

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# 1 Introduction

Arcadis IBI Group was retained by the Region of Waterloo to prepare a Preliminary Noise Study in support of a Municipal Class Environmental Assessment (EA) ("the Study") of Maple Grove Road from Fountain Street North to Hespeler Road, in the City of Cambridge. This segment of Maple Grove Road is approximately 4.4 kilometres long. The Study includes planning road improvement alternatives ranging from the "Do Nothing" option, to the most extensive option of 4-laning with median and active transportation facilities.

With improvements to the road, noise levels will potentially change. The purpose of this Preliminary Noise Study is to:

- Estimate current noise levels based on existing conditions;
- Estimate future forecasted noise levels based on the "worst-case" reconstruction and widening of Maple Grove Road under future predicted traffic volumes;
- Assess whether the future conditions, based on Region of Waterloo noise guidelines, warrant mitigation.

# 2 Background, Data, and Noise Criteria

## 2.1 Background

The subject section of Maple Grove Road between Fountain Street North and Hespeler Road exists generally as a four-lane arterial road from Fountain Street to Vondrau Drive. a two-lane arterial road from Vondrau Drive to Beaverdale Road, and a four-lane arterial road from Beaverdale Road to Hespeler Road. Adjacent land use is primarily commercial, residential, and agricultural.

It is proposed that the entire length of Maple Grove Road from Fountain Street North to Hespeler Road be widened to four lanes. There are four Alternatives being evaluated for the EA in addition to 'Do Nothing'; they are as follows:

1. Design Alternative No. 1 - Widening Equally About Existing Centreline
2. Design Alternative No. 2 - Widening to The North
3. Design Alternative No. 3 - Widening to The South
4. Design Alternative No. 4 - Modified "Hybrid Widening Concept" To Minimize Overall Impacts

The residential lands are considered sensitive to noise and are the subject of this noise assessment. The commercial areas are not considered to be sensitive uses.

It is further expected that new developments would have Noise Warning clauses on title warning residents and buyers of the potential for traffic noise to impact their properties.

## 2.2 Traffic Data

Existing (2018) and forecasted (2036 and 2041) traffic information for Maple Grove Road and Hespeler Road was provided by the Region of Waterloo and are summarized in Table 1.

**Table 1 – Traffic Data**

| Location | AADT (vehicles per day) | | | Vehicle Classification | | | Speed (km/h) |
|---|---|---|---|---|---|---|---|
| | 2018 | 2036 | 2041 | Passenger Vehicles | Medium Trucks | Heavy Trucks | Posted |
| | | No Bypass | No Bypass | | | | |
| **Maple Grove Road** | | | | | | | |
| Fountain Street N. | | | | | | | |
| | 19,950 | 32,530 | 36,250 | 92% | 1% | 7% | 70 |
| Vondrau Drive | | | | | | | |
| | 18,180 | 30,680 | 34,390 | 95% | 1% | 4% | 70 |
| Boxwood Drive | | | | | | | |
| | 18,650 | 30,490 | 34,200 | 94% | 1% | 5% | 70 |
| Speedsville Road | | | | | | | |
| | 18,850 | 26,640 | 30,190 | 94% | 1% | 5% | 70 |
| Briardean Road | | | | | | | |
| | 19,800 | 26,380 | 29,930 | 94% | 1% | 5% | 70 |
| Compass Trail | | | | | | | |
| | 20,030 | 26,430 | 29,980 | 95% | 1% | 4% | 70 |
| Old Maple Grove Road | | | | | | | |
| | 18,740 | 24,710 | 27,710 | 94% | 1% | 5% | 70 |
| Beaverdale Road | | | | | | | |
| | 19,700 | 25,220 | 28,090 | 95% | 1% | 4% | 70 |
| Hespeler Road | | | | | | | |
| **Hespeler Road** | | | | | | | |
| | | | | | | | |
| Guelph Ave. | | | | | | | |
| | 19,390 | 27,650 | 30,600 | 89.0% | 2.7% | 8.3% | 80 |
| Maple Grove Road | | | | | | | |
| | 30,750 | 39,930 | 43,330 | 87.8% | 3.1% | 9.0% | 80 |
| Beaverdale Rd./Queen St. W. | | | | | | | |

It is noted that the MECP requires Traffic volumes be forecasted 10 years into the future. We note that the Region Traffic study forecasted traffic for 2036 and 2041, which ranges from 15 years to 20 years into the future. As this forecast is greater than 10 years it is conservative and will be used for the purposes of the forecasted traffic volumes.

## 2.3 Noise Level Criteria

The Region of Waterloo has established noise level criteria for road reconstructions which is documented in their guideline entitled “Implementation Guideline for Noise Policies Part B: Existing Development Impacted by Proposed Regional Road Undertakings”, published in July 1999. This guideline recommends that noise mitigation measures are required if either of the following conditions is met:

- The future noise level, after the proposed road work is completed, exceeds 65 dBA; or
- The future noise level exceeds 60 dBA, and the difference between the current and future noise levels exceeds 5 dBA.

In addition to the Region of Waterloo guidelines, the procedures in The Ontario Ministry of Transportation (MTO) “Environmental Noise Guide” (Ontario Ministry of Transportation, (updated July 2008) (MTO Noise Guide) have been considered in the analysis as follows:

- Future sound levels with the undertaking (build) are to be compared to future sound levels without the undertaking (no-build);
- Noise level comparisons are to be completed for a timeframe of 10 years into the future;
- Specific Receivers representative of noise sensitive areas are to be identified and assessed.

Future ‘no-build’ (2036) will include the same lane configurations as under existing conditions (2018) but with increased traffic volumes as summarized in Table 1. This scenario is reflected by Option 1 since the centreline will not be moved under this option.

For the purposes of this Study, the 10 year ‘future’ scenario will be reflected by the 2036 data since construction is anticipated from 2025 to 2026. The 2041 data is also included in the analysis to determine any future mitigation measures.

For perspective, it is noted that a noise level difference of less than 3dBA is not discernable by the human ear.

Finally, for noise assessment purposes, the MECP and Region of Waterloo requires that:

- Daytime noise be assessed for the outdoor living area (OLA) and at the exterior living room wall. For a typical residential lot, an OLA is defined as an area of 56sm centred 3m from the rear of a house.

# 3 Noise Prediction Methods & Receiver Locations

The Region of Waterloo criteria states that the methodology outlined by the MECP be used to calculate noise levels. As such, MECP’s noise modeling software, STAMSON v5.04, was used to determine the noise levels generated for each scenario. This software is recognized throughout the province of Ontario.

For this study, typical sensitive residential receivers were identified along Maple Grove Road and Hespeler Road using aerial photos. The distances between the centreline of the road and the OLA, living room window, and bedroom window were measured and representative, worst case sensitive locations were selected, and noise levels modelled in STAMSON. The specific receiver locations are summarized in Table 2. A detailed summary of the receivers and distances are included in Appendix A.

**Table 2 – Receiver Locations**

| RECEIVER NUMBER | ADDRESS | ROAD LOCATION |
|---|---|---|
| 1 | 915 Briardean Rd | Briardean Road to Compass Trail |
| 2 | 2120 Maple Grove Rd | Old Maple Grove Road to Beaverdale Road |
| 3 | 2140 Maple Grove Rd | Old Maple Grove Road to Beaverdale Road |
| 4 | 2220 Maple Grove Rd | Old Maple Grove Road to Beaverdale Road |
| 5 | 1825 Beaverdale Rd | Old Maple Grove Road to Beaverdale Road |
| 6 | 1905 Beaverdale Rd | Old Maple Grove Road to Beaverdale Road |
| 7 | 1840 Beaverdale Rd | Beaverdale Road to Hespeler Road |
| 8 | 1900 Beaverdale Rd | Beaverdale Road to Hespeler Road |
| 9 | 616 Fisher Mills Rd | Beaverdale Road to Hespeler Road |
| 10 | 610 Fisher Mills Rd | Beaverdale Road to Hespeler Road |
| 11 | 600 Fisher Mills Rd | Beaverdale Road to Hespeler Road |
| 12 | 566 Fisher Mills Rd | Beaverdale Road to Hespeler Road |

# 4 Results

## 4.1 Free Field Analysis

A free field analysis is an assessment of noise impacts on receivers without assuming any structures or features to provide noise attenuation. From this analysis, the limits at which noise impacts might occur can be established.

STAMSON was utilized to predict noise levels both for the existing and forecasted scenarios based on the functional design of all alternatives. The results of this analysis are summarized in Table 3, Table 4, and Table 5 for existing conditions, 2036 conditions, and 2041 conditions, respectively.

**Table 3 – Free Field Analysis (Existing Conditions)**

| LOCATION | AADT (vpd) | 65 dBA (m) | 60 dBA (m) |
|---|---|---|---|
| **Maple Grove Road** | | | |
| Fountain Street to Vondrau Drive | 19,950 | 35 | 70 |
| Vondrau Drive to Boxwood Drive | 18,180 | 27 | 53 |
| Boxwood Drive to Speedsville Road | 18,650 | 29 | 58 |
| Speedsville Road to Briardean Road | 18,850 | 32 | 64 |
| Briardean Road to Compass Trail | 19,800 | 33 | 66 |
| Compass Trail to Old Maple Grove Road | 20,030 | 31 | 61 |
| Old Maple Grove Road to Beaverdale Road | 18,740 | 32 | 64 |
| Beaverdale Road to Hespeler Road | 19,700 | 30 | 61 |
| **Hespeler Road** | | | |
| Guelph Avenue to Maple Grove Road | 19,390 | 49 | 98 |
| Maple Grove Road to Beaverdale Rd./Queen St. W | 30,750 | 61 | 122 |

**Table 4 – Free Field Analysis (Proposed Conditions - 2036)**

| LOCATION | AADT (vpd) | 65 dBA (m) | 60 dBA (m) |
|---|---|---|---|
| **Maple Grove Road** | | | |
| Fountain Street to Vondrau Drive | 32,530 | 47 | 94 |
| Vondrau Drive to Boxwood Drive | 30,680 | 36 | 73 |
| Boxwood Drive to Speedsville Road | 30,490 | 39 | 79 |
| Speedsville Road to Briardean Road | 26,640 | 40 | 79 |
| Briardean Road to Compass Trail | 26,380 | 39 | 79 |
| Compass Trail to Old Maple Grove Road | 26,430 | 36 | 72 |
| Old Maple Grove Road to Beaverdale Road | 24,710 | 38 | 76 |
| Beaverdale Road to Hespeler Road | 25,220 | 35 | 70 |
| **Hespeler Road** | | | |
| Guelph Avenue to Maple Grove Road | 27,650 | 60 | 121 |
| Maple Grove Road to Beaverdale Rd./Queen St. W | 39,930 | 71 | 143 |

**Table 5 – Free Field Analysis (Proposed Conditions - 2041)**

| LOCATION | AADT (vpd) | 65 dBA (m) | 60 dBA (m) |
|---|---|---|---|
| **Maple Grove Road** | | | |
| Fountain Street to Vondrau Drive | 36,250 | 50 | 100 |
| Vondrau Drive to Boxwood Drive | 34,390 | 39 | 78 |
| Boxwood Drive to Speedsville Road | 34,200 | 42 | 84 |
| Speedsville Road to Briardean Road | 30,190 | 43 | 86 |
| Briardean Road to Compass Trail | 29,930 | 43 | 85 |
| Compass Trail to Old Maple Grove Road | 29,980 | 39 | 78 |
| Old Maple Grove Road to Beaverdale Road | 27,710 | 41 | 81 |
| Beaverdale Road to Hespeler Road | 28,090 | 38 | 75 |
| **Hespeler Road** | | | |
| Guelph Avenue to Maple Grove Road | 30,600 | 64 | 129 |
| Maple Grove Road to Beaverdale Rd./Queen St. W | 43,330 | 75 | 150 |

The 60 dBA and 65 dBA free-field limits for four design alternatives are presented graphically on Figures N1-1 to N1-4 (Design Alternative 1), Figures N2-1 to N2-4 (Design Alternative 2), Figures N3-1 to N3-4 (Design Alternative 3), and Figures N4-1 to N4-4 (Design Alternative 4) in Appendix A. Note, all measurements reference the centreline of the road (right-of-way).

To determine if there would be a 5 dBA increase from 2018 conditions to the 2041 conditions at the sensitive receiver locations, a receiver (Receiver A) has been included at the south side of the road between Briardean Road and Compass Trail. The location of Receiver A is shown on Figure N1-3. This segment has the greatest increase in AADT from 2018 to 2041 and therefore represents the worst-case scenario. The STAMSON model indicates that the increase in noise level from existing to future conditions is less than 2 dBA which is less than the Regional guideline of 5 dBA difference. Thus, according to the guidelines, only if the noise levels are above 65dBA in the sensitive areas will noise mitigation be required.

The results at the specific receiver locations are summarized in Table 6. Note that Option 1 also represent the future ‘no-build’ scenario.

**Table 6 – Receiver Noise Levels**

| LOCATION | dBA (2018) | dBA (2036) | dBA (2041) |
|---|---|---|---|
| **Concept 1** | | | |
| 1 | 64 | 65 | 66 |
| 2 | 60 | 61 | 62 |
| 3 | 58 | 59 | 59 |
| 4 | 58 | 59 | 59 |
| 5 | 60 | 62 | 62 |
| 6 | 65 | 66 | 67 |
| 7 | 66 | 68 | 68 |
| 8 | 58 | 59 | 59 |
| 9 | 61 | 63 | 63 |
| 10 | 60 | 61 | 62 |
| 11 | 62 | 63 | 64 |
| 12 | 63 | 64 | 65 |
| **Concept 2** | | | |
| 1 | 63 | 64 | 65 |
| 2 | 60 | 61 | 61 |
| 3 | 57 | 58 | 59 |
| 4 | 57 | 59 | 59 |
| 5 | 60 | 62 | 62 |
| 6 | 65 | 66 | 67 |
| 7 | 66 | 68 | 68 |
| 8 | 58 | 59 | 59 |
| 9 | 61 | 62 | 63 |
| 10 | 60 | 61 | 62 |
| 11 | 62 | 63 | 64 |
| 12 | 63 | 64 | 65 |
| **Concept 3** | | | |
| 1 | 64 | 66 | 66 |
| 2 | 61 | 62 | 62 |
| 3 | 58 | 59 | 60 |
| 4 | 58 | 59 | 60 |
| 5 | 61 | 62 | 62 |
| 6 | 65 | 66 | 66 |
| 7 | 67 | 68 | 68 |
| 8 | 58 | 59 | 59 |
| 9 | 61 | 62 | 63 |
| 10 | 60 | 61 | 62 |
| 11 | 62 | 63 | 64 |

| | | | |
|---|---|---|---|
| 12 | 63 | 64 | 65 |
| **Concept 4** | | | |
| 1 | 64 | 65 | 66 |
| 2 | 60 | 61 | 62 |
| 3 | 58 | 59 | 59 |
| 4 | 58 | 59 | 59 |
| 5 | 60 | 62 | 62 |
| 6 | 65 | 66 | 67 |
| 7 | 66 | 68 | 68 |
| 8 | 58 | 59 | 59 |
| 9 | 61 | 63 | 63 |
| 10- | 60 | 61 | 62 |
| 11 | 62 | 63 | 64 |
| 12 | 63 | 64 | 65 |

As shown in Figure 6, future (2036 and 2041) noise levels at Receivers 1, 6, 7, and 12 exceed 65 dBA and will warrant further analysis for mitigation.

# 5 Mitigation

In review of the various road sections, the following mitigation measures are recommended:

**Maple Grove Road from Fountain Street to Vondrau Drive**

There are no sensitive receivers within this section of road, therefore no mitigation is warranted.

**Maple Grove Road from Vondrau Drive to Boxwood Drive**

There are no sensitive receivers within this section of road, therefore no mitigation is warranted.

**Maple Grove Road from Boxwood Drive to Speedsville Road**

There are no sensitive receivers within this section of road, therefore no mitigation is warranted.

**Maple Grove Road from Speedsville Road to Briardean Road**

There are no sensitive receivers within this section of road, therefore no mitigation is warranted.

**Maple Grove Road from Briardean Road to Compass Trail**

There are existing residentials area on the south side of Maple Grove Road that are located within the 65 dBA free-field limit. These areas include rear and side yards exposed to Maple Grove Road, which would warrant the construction of noise barriers. The location and dimensions of the barriers are shown conceptually on Figure N1-3, N2-3, N3-3, and N4-3.

**Maple Grove Road from Compass Trail to Old Maple Grove Road**

Recent developments constructed in this section have provided noise mitigation barriers. Any future development proposed for lands in this section will be responsible for providing any required noise mitigation.

**Maple Grove Road from Old Maple Grove Road to Beaverdale Road**

There are existing and proposed residential area on the north and south side of Maple Grove Road that are located within the 65 dBA free-field limit. These areas include rear and side yards exposed to Maple Grove Road, which would warrant the construction of noise barriers. The locations and dimensions of the barriers are shown conceptually on Figure N1-3, N2-3, N3-3, and N4-3.

**Maple Grove Road from Beaverdale Road to Hespeler Road**

There are existing and proposed residential area on the north and south side of Maple Grove Road that are located within the 65 dBA free-field limit. These areas include rear and side yards exposed to Maple Grove Road, which would warrant the construction of noise barriers. The locations and dimensions of the barriers are shown conceptually on Figure N1-3, N2-3, N3-3, and N4-3.

**Hespeler Road from Guelph Avenue to Maple Grove Road**

Recent developments constructed in this section have provided noise mitigation barriers. Any future development proposed for lands in this section will be responsible for providing any required noise mitigation.

**Hespeler Road from Maple Grove Road to Beaverdale Road/Queen Street West**

There are no sensitive receivers within this section of road, therefore no mitigation is warranted.

## 5.1 Mitigation Summary

The specific mitigation information for noise Receivers 1, 6, 7, and 8 are summarizes in Table 7. The barrier heights shown are required to achieve a minimum 5 dBA reduction in noise levels at each receiver.

**Table 7 – Noise Mitigation Summary**

| RECEIVER NUMBER | ADDRESS | 2041 NOISE LEVEL (DBA) | MITIGATED NOISE LEVEL (DBA) | REDUCTION (DBA) | BARRIER HEIGHT (M) |
|---|---|---|---|---|---|
| **Concept 1** | | | | | |
| 1 | 915 Briardean Rd | 66 | 61 | 5 | 2.4 |
| 6 | 1905 Beaverdale Rd | 67 | 62 | 5 | 2.1 |
| 7 | 1840 Beaverdale Rd | 68 | 63 | 5 | 1.8 |
| 12 | 566 Fisher Mills Rd | 65 | 58 | 7 | 1.8 |
| **Concept 2** | | | | | |
| 1 | 915 Briardean Rd | 65 | 60 | 5 | 2.4 |
| 6 | 1905 Beaverdale Rd | 67 | 61 | 6 | 2.1 |

| | | | | | |
|---|---|---|---|---|---|
| 7 | 1840 Beaverdale Rd | 68 | 63 | 5 | 1.8 |
| 12 | 566 Fisher Mills Rd | 65 | 58 | 7 | 1.8 |
| **Concept 3** | | | | | |
| 1 | 915 Briardean Rd | 66 | 61 | 5 | 2.4 |
| 6 | 1905 Beaverdale Rd | 66 | 61 | 5 | 2.1 |
| 7 | 1840 Beaverdale Rd | 68 | 63 | 5 | 1.8 |
| 12 | 566 Fisher Mills Rd | 65 | 58 | 7 | 1.8 |
| **Concept 4** | | | | | |
| 1 | 915 Briardean Rd | 66 | 61 | 5 | 2.4 |
| 6 | 1905 Beaverdale Rd | 67 | 62 | 5 | 2.1 |
| 7 | 1840 Beaverdale Rd | 68 | 63 | 5 | 1.8 |
| 12 | 566 Fisher Mills Rd | 65 | 58 | 7 | 1.8 |

To provide the most benefit in noise attenuation, it is proposed to include a continuous 1.8m high noise barrier (where feasible) in addition to the barriers summarized in Table 7 at the locations shown on the Figures included in Appendix A.

# 6 Construction Noise

Construction noise is expected to be produced from on-site diesel-powered and pneumatic equipment (loaders, excavators, trucks, generators, pavement rollers, pavement-breaking equipment, etc.).

The Contractor will be required to ensure that factory recommended mufflers are maintained on all construction equipment. Sound emissions from all construction equipment should comply with MECP Guideline NPC-115 Sound Levels from Construction Equipment. The sound emission standards for specific construction equipment shall meet the levels summarized in Tables 115-1 to 115-4 of the NPC-115 Publication.

An exemption should be obtained from the City of Cambridge if nighttime work or work on Sunday is required.

# 7 Conclusions and Recommendations

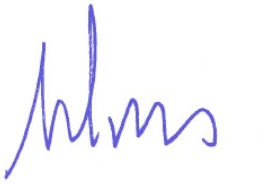
Based on the Region of Waterloo and Provincial noise guidelines for road improvements and based on the results of the noise modelling and analysis, noise mitigation is warranted at several residential noise sensitive areas as a result of the proposed road improvements as described in Section 5.

It is recommended that during final design of the road improvements, that the assumptions, analysis, and findings of this noise study be confirmed to ensure this Study reflects the final design of the road.

The final design should include additional details on noise barrier locations, materials, and heights. Additional investigations for utility conflicts and a Geotechnical Investigation will be required.

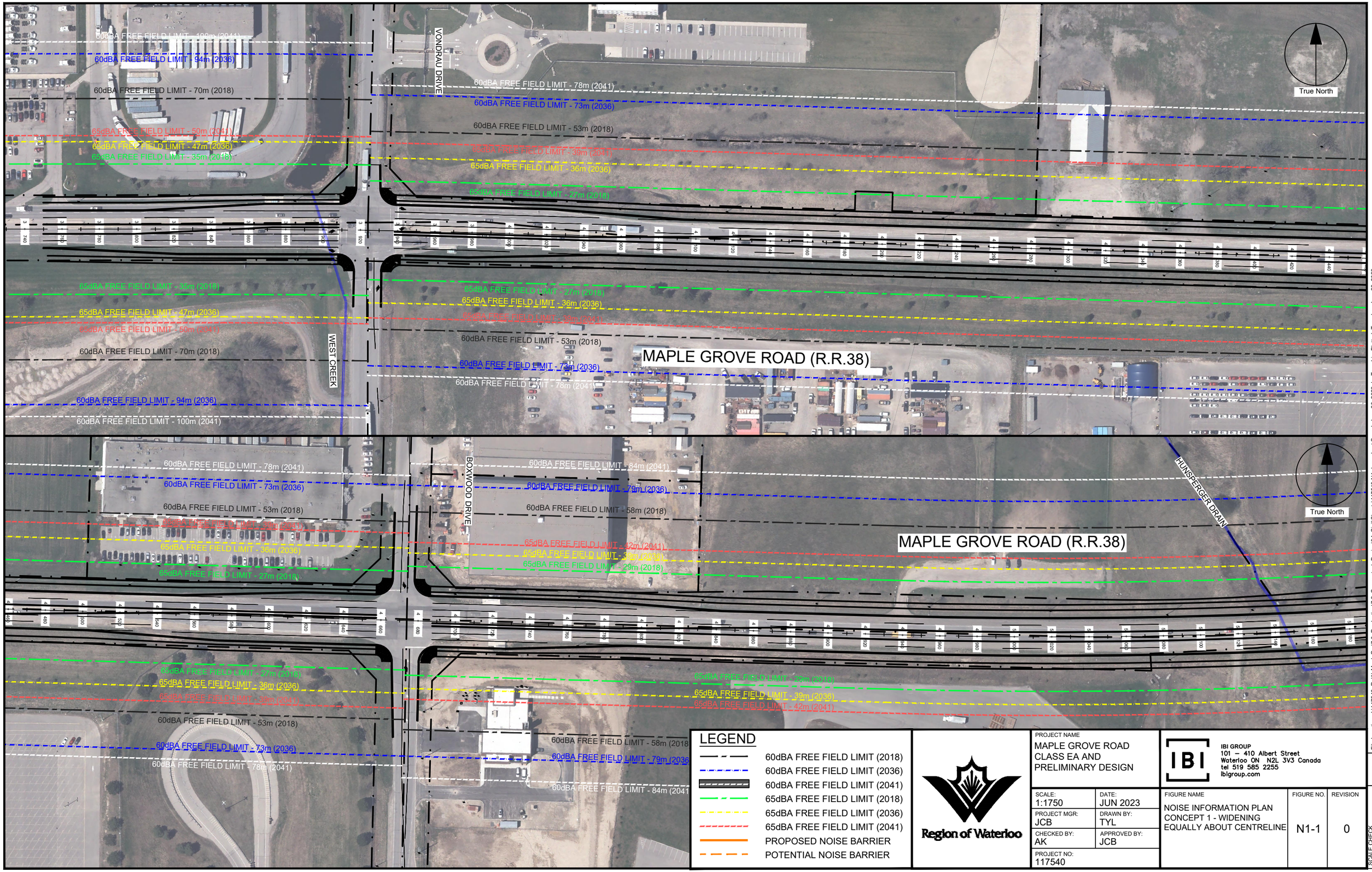
All of which is respectfully submitted.

**ARCADIS IBI GROUP**



Andy Kroess, M.Eng., P.Eng.

# Appendix A – Noise Information Plans




## LEGEND

- 60dBA FREE FIELD LIMIT (2018)
- 60dBA FREE FIELD LIMIT (2036)
- 60dBA FREE FIELD LIMIT (2041)
- 65dBA FREE FIELD LIMIT (2018)
- 65dBA FREE FIELD LIMIT (2036)
- 65dBA FREE FIELD LIMIT (2041)
- PROPOSED NOISE BARRIER
- POTENTIAL NOISE BARRIER

Region of Waterloo

PROJECT NAME
MAPLE GROVE ROAD
CLASS EA AND
PRELIMINARY DESIGN

IBI GROUP
101 – 410 Albert Street
Waterloo ON N2L 3V3 Canada
tel 519 585 2255
ibigroup.com

| SCALE: | DATE: |
|---|---|
| 1:1750 | JUN 2023 |
| PROJECT MGR: JCB | DRAWN BY: TYL |
| CHECKED BY: AK | APPROVED BY: JCB |
| PROJECT NO: 117540 | |

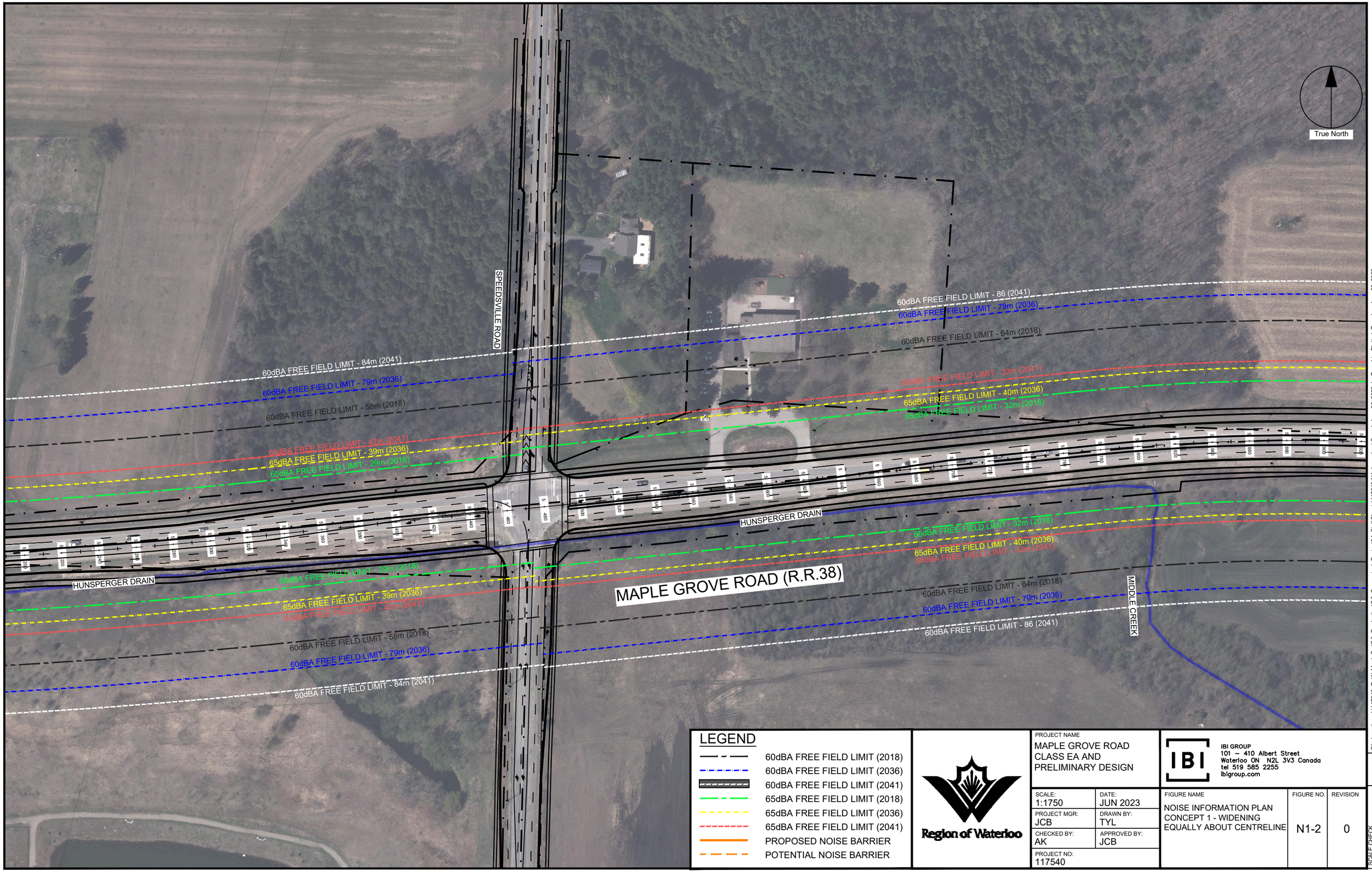
FIGURE NAME: NOISE INFORMATION PLAN
CONCEPT 1 - WIDENING
EQUALLY ABOUT CENTRELINE

FIGURE NO.: N1-1

REVISION: 0

SCALE CHECK 1 in 10mm

File Location: J:\117540_RoW_MapleGrv\7.0_Production\7.2_Conceptual_Design\04_CivilSheets\117540-N1.dwg Last Saved: June 20, 2023, by Tony.Li Plotted: Tuesday, June 20, 2023 2:59:49 PM by Tony Li




## LEGEND

- 60dBA FREE FIELD LIMIT (2018)
- 60dBA FREE FIELD LIMIT (2036)
- 60dBA FREE FIELD LIMIT (2041)
- 65dBA FREE FIELD LIMIT (2018)
- 65dBA FREE FIELD LIMIT (2036)
- 65dBA FREE FIELD LIMIT (2041)
- PROPOSED NOISE BARRIER
- POTENTIAL NOISE BARRIER

Region of Waterloo

PROJECT NAME
MAPLE GROVE ROAD
CLASS EA AND
PRELIMINARY DESIGN

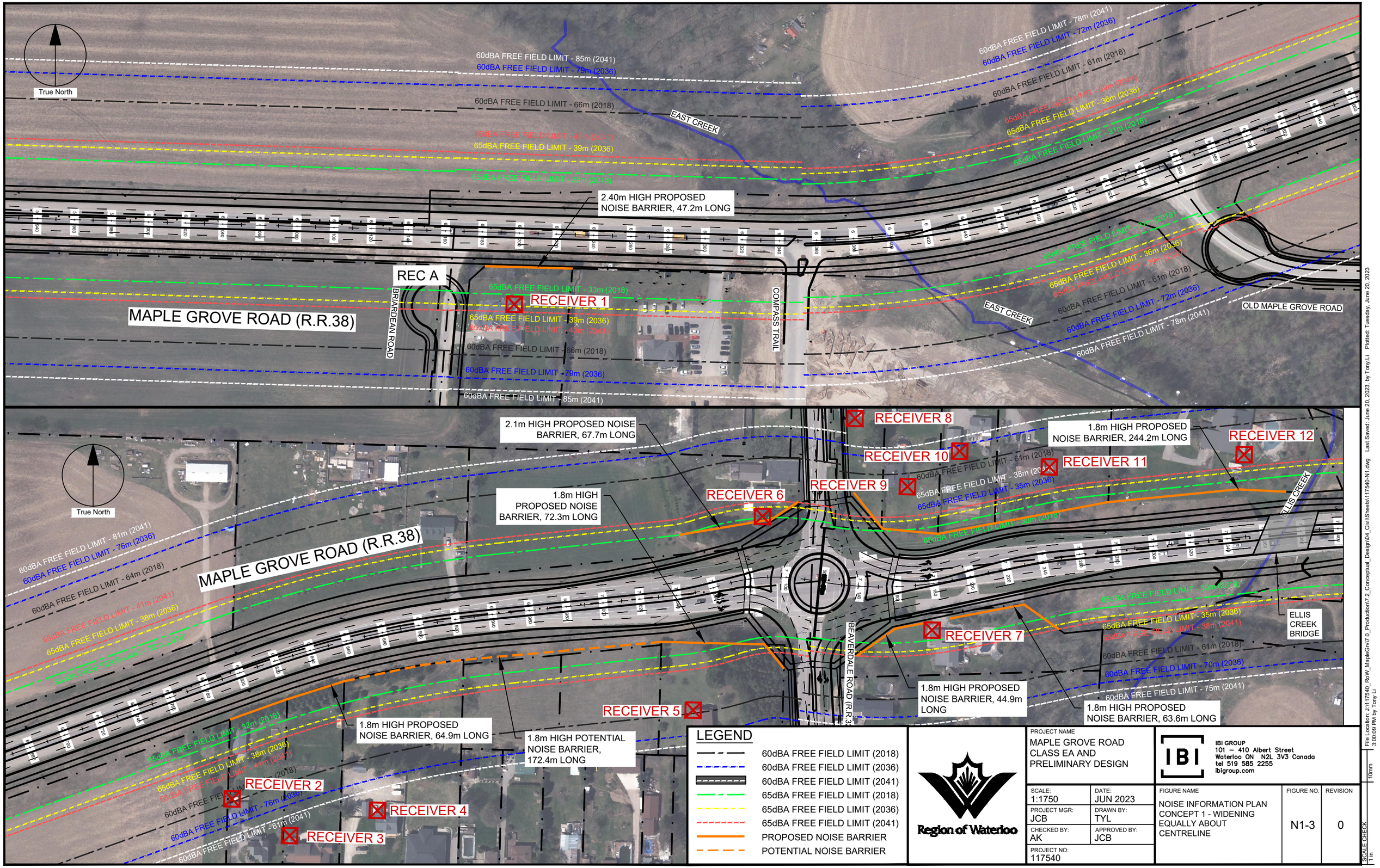
IBI GROUP
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| SCALE: | DATE: |
|---|---|
| 1:1750 | JUN 2023 |
| PROJECT MGR: JCB | DRAWN BY: TYL |
| CHECKED BY: AK | APPROVED BY: JCB |
| PROJECT NO: 117540 | |

| FIGURE NAME | FIGURE NO. | REVISION |
|---|---|---|
| NOISE INFORMATION PLAN<br>CONCEPT 1 - WIDENING<br>EQUALLY ABOUT CENTRELINE | N1-2 | 0 |

SCALE CHECK 1 in 10mm

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## LEGEND

- 60dBA FREE FIELD LIMIT (2018)
- 60dBA FREE FIELD LIMIT (2036)
- 60dBA FREE FIELD LIMIT (2041)
- 65dBA FREE FIELD LIMIT (2018)
- 65dBA FREE FIELD LIMIT (2036)
- 65dBA FREE FIELD LIMIT (2041)
- PROPOSED NOISE BARRIER
- POTENTIAL NOISE BARRIER

Region of Waterloo

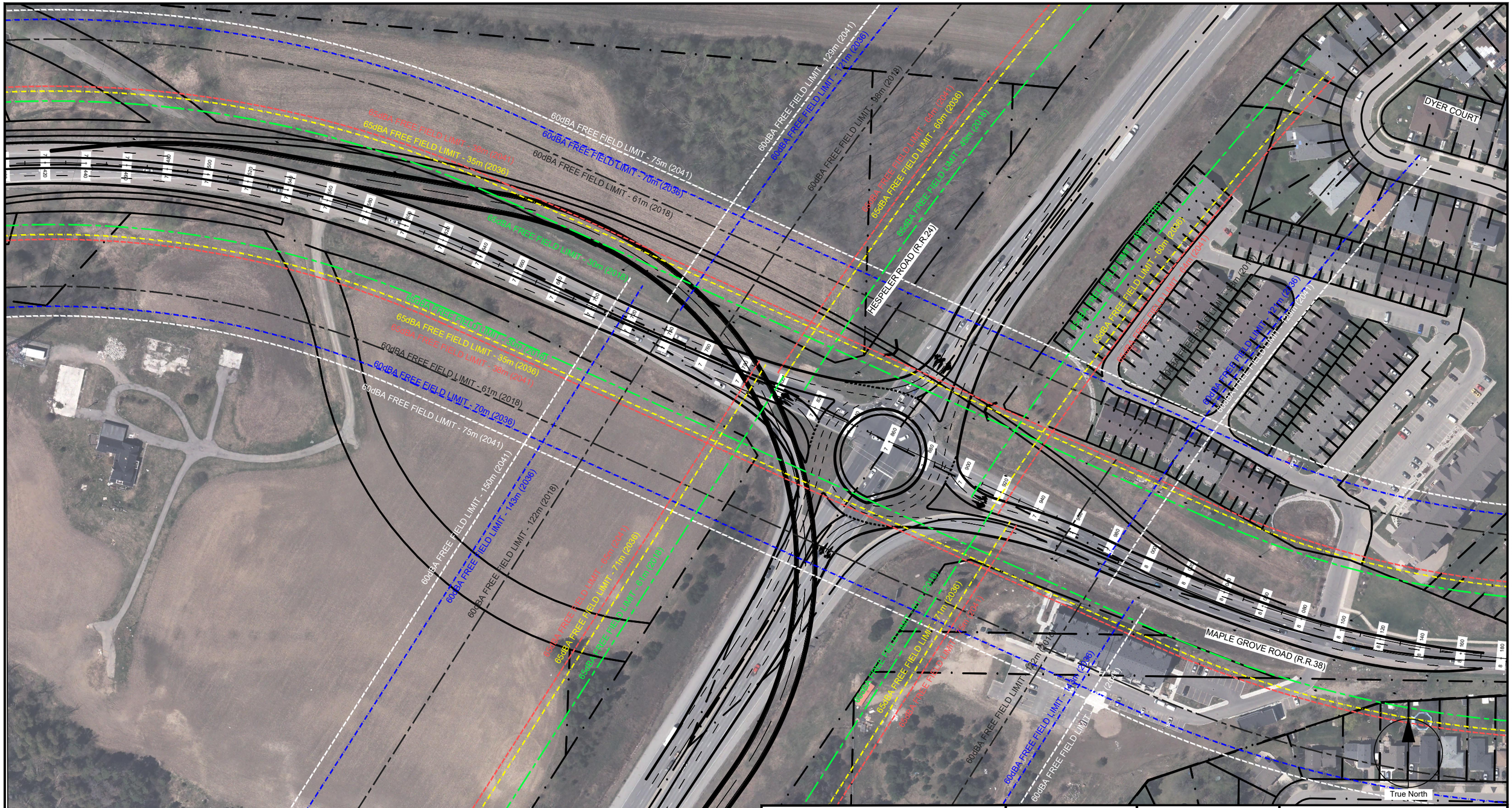
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| PROJECT NAME | MAPLE GROVE ROAD CLASS EA AND PRELIMINARY DESIGN |
| SCALE: 1:1750 | DATE: JUN 2023 |
| PROJECT MGR: JCB | DRAWN BY: TYL |
| CHECKED BY: AK | APPROVED BY: JCB |
| PROJECT NO: 117540 | |

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| FIGURE NAME | FIGURE NO. | REVISION |
|---|---|---|
| NOISE INFORMATION PLAN CONCEPT 1 - WIDENING EQUALLY ABOUT CENTRELINE | N1-3 | 0 |

SCALE CHECK 1 in 10mm

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## LEGEND

- 60dBA FREE FIELD LIMIT (2018)
- 60dBA FREE FIELD LIMIT (2036)
- 60dBA FREE FIELD LIMIT (2041)
- 65dBA FREE FIELD LIMIT (2018)
- 65dBA FREE FIELD LIMIT (2036)
- 65dBA FREE FIELD LIMIT (2041)
- PROPOSED NOISE BARRIER
- POTENTIAL NOISE BARRIER

Region of Waterloo

PROJECT NAME
MAPLE GROVE ROAD
CLASS EA AND
PRELIMINARY DESIGN

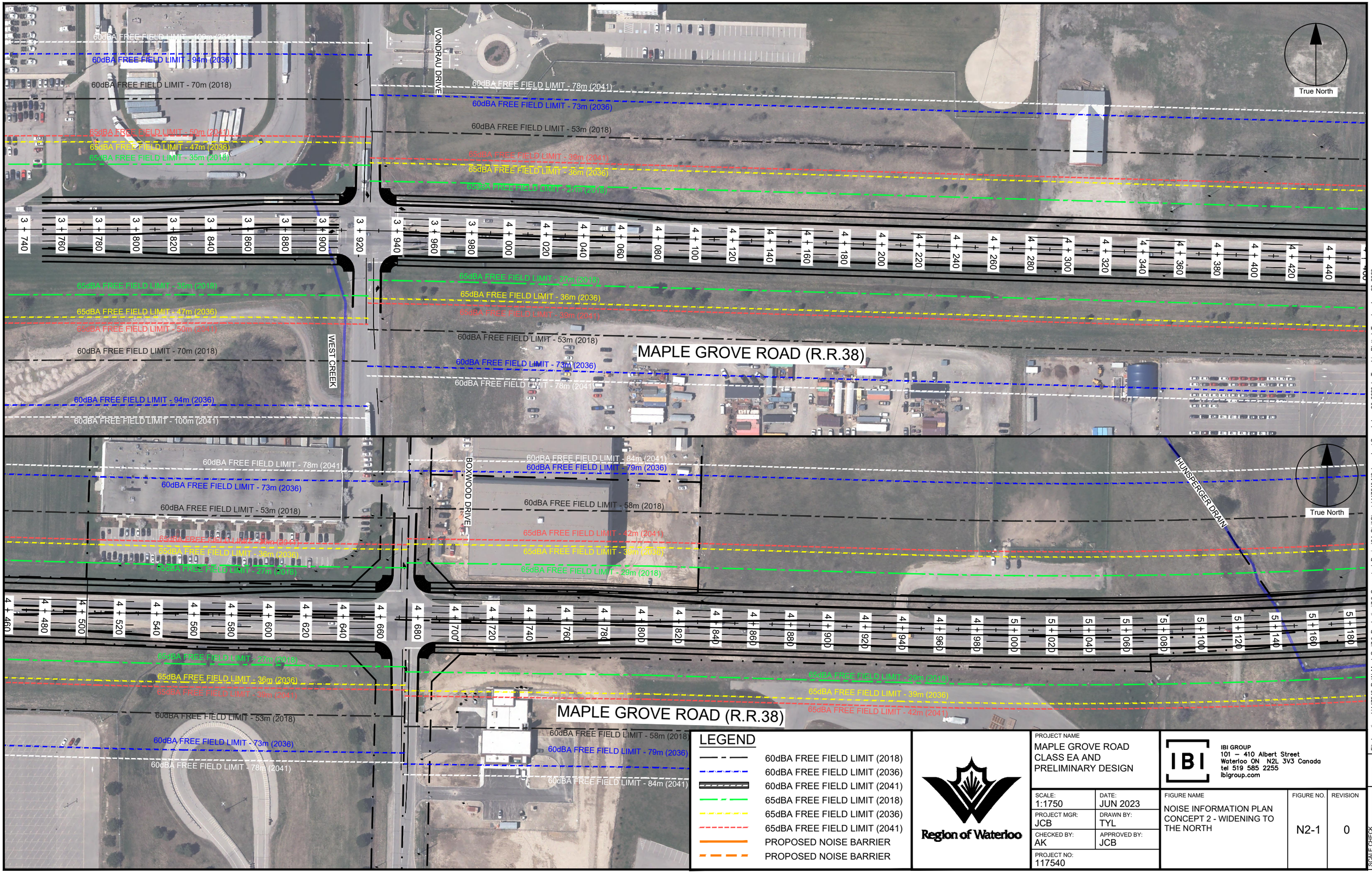
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| 1:1750 | JUN 2023 |
| PROJECT MGR: JCB | DRAWN BY: TYL |
| CHECKED BY: AK | APPROVED BY: JCB |
| PROJECT NO: 117540 | |

| FIGURE NAME | FIGURE NO. | REVISION |
|---|---|---|
| NOISE INFORMATION PLAN<br>CONCEPT 1 - WIDENING<br>EQUALLY ABOUT CENTRELINE | N1-4 | 0 |

SCALE CHECK
1 in 10mm

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## LEGEND

- 60dBA FREE FIELD LIMIT (2018)
- 60dBA FREE FIELD LIMIT (2036)
- 60dBA FREE FIELD LIMIT (2041)
- 65dBA FREE FIELD LIMIT (2018)
- 65dBA FREE FIELD LIMIT (2036)
- 65dBA FREE FIELD LIMIT (2041)
- PROPOSED NOISE BARRIER
- PROPOSED NOISE BARRIER

Region of Waterloo

PROJECT NAME
MAPLE GROVE ROAD
CLASS EA AND
PRELIMINARY DESIGN

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|---|---|
| 1:1750 | JUN 2023 |
| PROJECT MGR: JCB | DRAWN BY: TYL |
| CHECKED BY: AK | APPROVED BY: JCB |
| PROJECT NO: 117540 | |

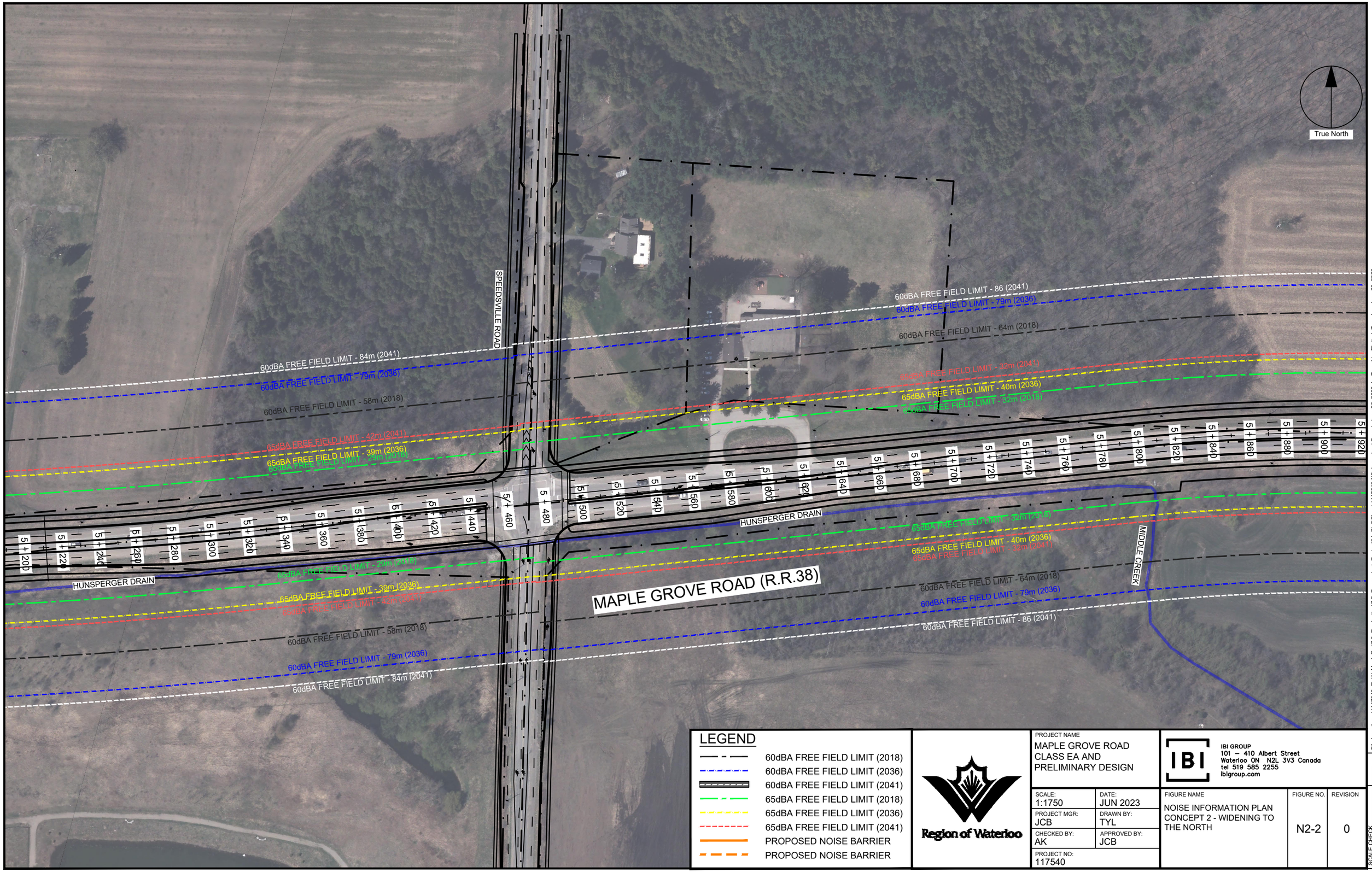
FIGURE NAME: NOISE INFORMATION PLAN CONCEPT 2 - WIDENING TO THE NORTH

FIGURE NO.: N2-1

REVISION: 0

SCALE CHECK 1 in 10mm

File Location: J:\117540_RoW_MapleGrv\7.0_Production\7.2_Conceptual_Design\04_CivilSheets\117540-N2.dwg Last Saved: June 20, 2023, by Tony.Li Plotted: Tuesday, June 20, 2023 3:05:34 PM by Tony Li




## LEGEND

- 60dBA FREE FIELD LIMIT (2018)
- 60dBA FREE FIELD LIMIT (2036)
- 60dBA FREE FIELD LIMIT (2041)
- 65dBA FREE FIELD LIMIT (2018)
- 65dBA FREE FIELD LIMIT (2036)
- 65dBA FREE FIELD LIMIT (2041)
- PROPOSED NOISE BARRIER
- PROPOSED NOISE BARRIER

Region of Waterloo

PROJECT NAME
MAPLE GROVE ROAD
CLASS EA AND
PRELIMINARY DESIGN

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| SCALE: | DATE: |
|---|---|
| 1:1750 | JUN 2023 |
| PROJECT MGR: | DRAWN BY: |
| JCB | TYL |
| CHECKED BY: | APPROVED BY: |
| AK | JCB |
| PROJECT NO: | |
| 117540 | |

| FIGURE NAME | FIGURE NO. | REVISION |
|---|---|---|
| NOISE INFORMATION PLAN CONCEPT 2 - WIDENING TO THE NORTH | N2-2 | 0 |

SCALE CHECK 10mm 1 in

File Location: J:\117540_RoW_MapleGrv\7.0_Production\7.2_Conceptual_Design\04_Civil\Sheets\117540-N2.dwg Last Saved: June 20, 2023 3:05:41 PM by Tony Li Plotted: Tuesday, June 20, 2023

True North

60dBA FREE FIELD LIMIT - 85m (2041)
60dBA FREE FIELD LIMIT - 79m (2036)
60dBA FREE FIELD LIMIT - 66m (2018)
65dBA FREE FIELD LIMIT - 43m (2041)
65dBA FREE FIELD LIMIT - 39m (2036)
65dBA FREE FIELD LIMIT - 33m (2018)

2.40m HIGH PROPOSED NOISE BARRIER, 47.2m LONG

REC A

RECEIVER 1

MAPLE GROVE ROAD (R.R.38)

JRHARDEAN ROAD

COMPASS TRAIL

EAST CREEK

OLD MAPLE GROVE ROAD

5+940 5+960 5+980 6+000 6+020 6+040 6+060 6+080 6+100 6+120 6+140 6+160 6+180 6+200 6+220 6+240 6+260 6+280 6+300 6+320 6+340 6+360 6+380 6+400 6+420 6+440 6+460 6+480 6+500 6+520 6+540 6+560 6+580 6+600 6+620 6+640 6+660

60dBA FREE FIELD LIMIT - 78m (2041)
60dBA FREE FIELD LIMIT - 72m (2036)
60dBA FREE FIELD LIMIT - 61m (2018)
65dBA FREE FIELD LIMIT - 39m (2041)
65dBA FREE FIELD LIMIT - 36m (2036)
65dBA FREE FIELD LIMIT - 33m (2018)

2.1m HIGH PROPOSED NOISE BARRIER, 67.7m LONG

RECEIVER 8
RECEIVER 10
RECEIVER 11
RECEIVER 12
RECEIVER 9
RECEIVER 6

1.8m HIGH PROPOSED NOISE BARRIER, 244.2m LONG

1.8m HIGH PROPOSED NOISE BARRIER, 71.8m LONG

True North

60dBA FREE FIELD LIMIT - 81m (2041)
60dBA FREE FIELD LIMIT - 76m (2036)
60dBA FREE FIELD LIMIT - 64m (2018)
65dBA FREE FIELD LIMIT - 41m (2041)
65dBA FREE FIELD LIMIT - 38m (2036)
65dBA FREE FIELD LIMIT - 32m (2018)

MAPLE GROVE ROAD (R.R.38)

6+680 6+700 6+720 6+740 6+760 6+780 6+800 6+820 6+840 6+860 6+880 6+900 6+920 6+940 6+960 6+980 7+000 7+020 7+040 7+060 7+080 7+100 7+120 7+140 7+160 7+180 7+200 7+220 7+240 7+260 7+280 7+300 7+320 7+340 7+360 7+380 7+400

BEAVERDALE ROAD (R.R.38)

ELLIS CREEK

ELLIS CREEK BRIDGE

RECEIVER 7

1.8m HIGH PROPOSED NOISE BARRIER, 44.9m LONG

1.8m HIGH PROPOSED NOISE BARRIER, 65.3m LONG

RECEIVER 5

1.8m HIGH PROPOSED NOISE BARRIER, 64.9m LONG

1.8m HIGH POTENTIAL NOISE BARRIER, 172.4m LONG

RECEIVER 2
RECEIVER 4
RECEIVER 3

## LEGEND

- 60dBA FREE FIELD LIMIT (2018)
- 60dBA FREE FIELD LIMIT (2036)
- 60dBA FREE FIELD LIMIT (2041)
- 65dBA FREE FIELD LIMIT (2018)
- 65dBA FREE FIELD LIMIT (2036)
- 65dBA FREE FIELD LIMIT (2041)
- PROPOSED NOISE BARRIER
- PROPOSED NOISE BARRIER

Region of Waterloo

PROJECT NAME
MAPLE GROVE ROAD
CLASS EA AND
PRELIMINARY DESIGN

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|---|---|
| 1:1750 | JUN 2023 |
| PROJECT MGR: | DRAWN BY: |
| JCB | TYL |
| CHECKED BY: | APPROVED BY: |
| AK | JCB |
| PROJECT NO: | |
| 117540 | |

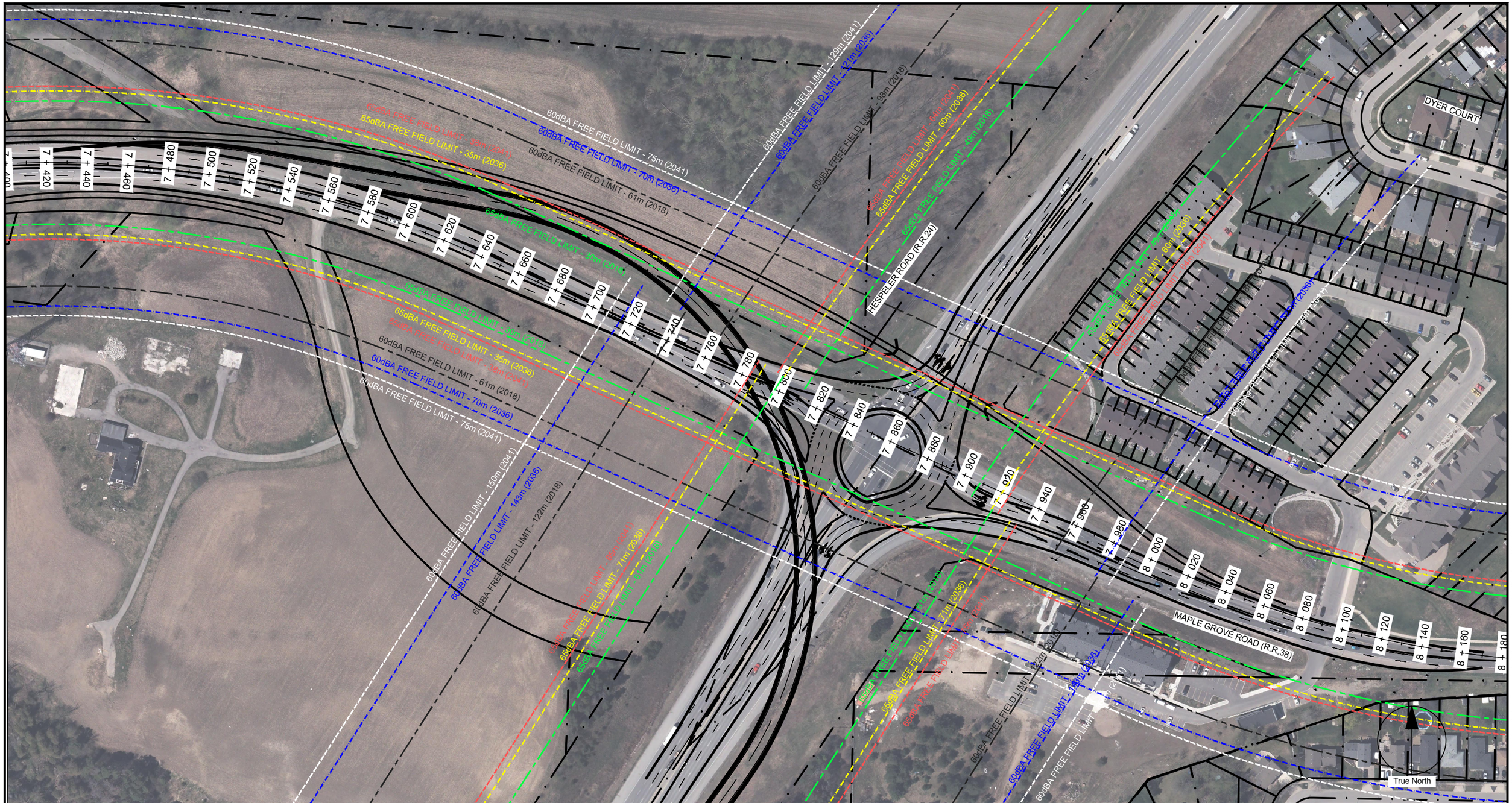
FIGURE NAME
NOISE INFORMATION PLAN
CONCEPT 2 - WIDENING TO
THE NORTH

FIGURE NO. N2-3

REVISION 0

SCALE CHECK 1 in 10mm

File Location: J:\117540_RoW_MapleGrv\7.0_Production\7.2_Conceptual_Design\04_Civil\Sheets\117540-N2.dwg Last Saved: June 20, 2023 3:05:53 PM by Tony LI Plotted: Tuesday, June 20, 2023 by Tony LI




## LEGEND

- 60dBA FREE FIELD LIMIT (2018)
- 60dBA FREE FIELD LIMIT (2036)
- 60dBA FREE FIELD LIMIT (2041)
- 65dBA FREE FIELD LIMIT (2018)
- 65dBA FREE FIELD LIMIT (2036)
- 65dBA FREE FIELD LIMIT (2041)
- PROPOSED NOISE BARRIER
- PROPOSED NOISE BARRIER

Region of Waterloo

PROJECT NAME
MAPLE GROVE ROAD
CLASS EA AND
PRELIMINARY DESIGN

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| | |
|---|---|
| SCALE: 1:1750 | DATE: JUN 2023 |
| PROJECT MGR: JCB | DRAWN BY: TYL |
| CHECKED BY: AK | APPROVED BY: JCB |
| PROJECT NO: 117540 | |

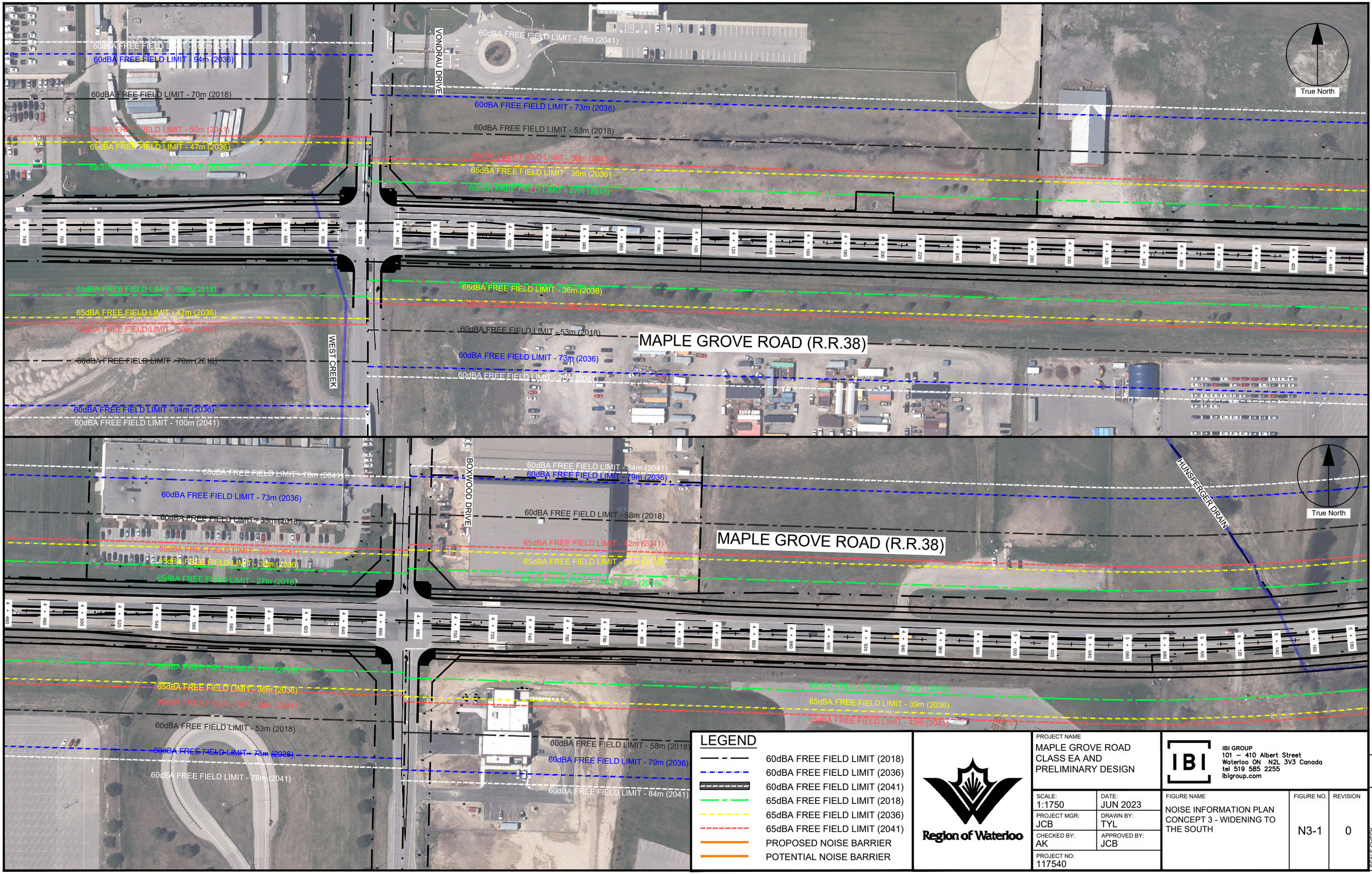
FIGURE NAME
NOISE INFORMATION PLAN
CONCEPT 2 - WIDENING TO
THE NORTH

FIGURE NO. N2-4

REVISION 0

SCALE CHECK 1 in 10mm

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Region of Waterloo

PROJECT NAME
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PRELIMINARY DESIGN

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| 1:1750 | JUN 2023 |
| PROJECT MGR: JCB | DRAWN BY: TYL |
| CHECKED BY: AK | APPROVED BY: JCB |
| PROJECT NO: 117540 | |

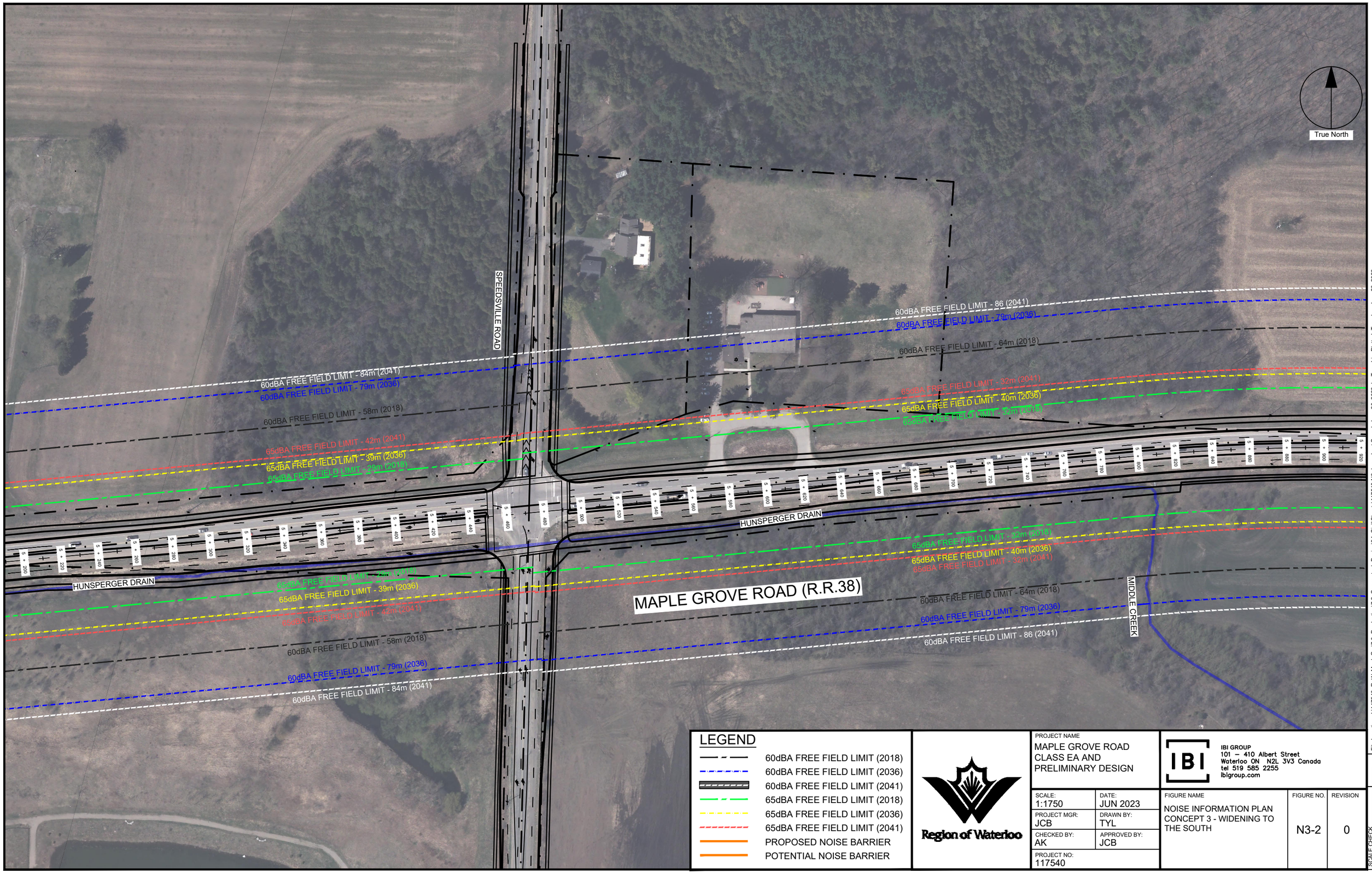
FIGURE NAME: NOISE INFORMATION PLAN CONCEPT 3 - WIDENING TO THE SOUTH

FIGURE NO.: N3-1

REVISION: 0

SCALE CHECK 1 in 10mm

File Location: J:\117540_RoW_MapleGrv\7.0_Production\7.2_Conceptual_Design\04_CivilSheets\117540-N3.dwg Last Saved: June 20, 2023, by Tony Li Plotted: Tuesday, June 20, 2023 2:56:54 PM by Tony Li




## LEGEND

- 60dBA FREE FIELD LIMIT (2018)
- 60dBA FREE FIELD LIMIT (2036)
- 60dBA FREE FIELD LIMIT (2041)
- 65dBA FREE FIELD LIMIT (2018)
- 65dBA FREE FIELD LIMIT (2036)
- 65dBA FREE FIELD LIMIT (2041)
- PROPOSED NOISE BARRIER
- POTENTIAL NOISE BARRIER

Region of Waterloo

PROJECT NAME
MAPLE GROVE ROAD
CLASS EA AND
PRELIMINARY DESIGN

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| SCALE: | DATE: |
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| 1:1750 | JUN 2023 |
| PROJECT MGR: JCB | DRAWN BY: TYL |
| CHECKED BY: AK | APPROVED BY: JCB |
| PROJECT NO: 117540 | |

FIGURE NAME: NOISE INFORMATION PLAN CONCEPT 3 - WIDENING TO THE SOUTH

FIGURE NO.: N3-2

REVISION: 0

SCALE CHECK: 1 in / 10mm

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True North

60dBA FREE FIELD LIMIT - 85m (2041)
60dBA FREE FIELD LIMIT - 79m (2036)
60dBA FREE FIELD LIMIT - 66m (2018)
65dBA FREE FIELD LIMIT - 43m (2041)
65dBA FREE FIELD LIMIT - 39m (2036)
65dBA FREE FIELD LIMIT - 33m (2018)

EAST CREEK

2.40m HIGH PROPOSED NOISE BARRIER, 47.2m LONG

MAPLE GROVE ROAD (R.R.38)

REC A

BRIARDEAN ROAD

RECEIVER 1

COMPASS TRAIL

60dBA FREE FIELD LIMIT - 78m (2041)
60dBA FREE FIELD LIMIT - 72m (2036)
60dBA FREE FIELD LIMIT - 61m (2018)
65dBA FREE FIELD LIMIT - 39m (2041)
65dBA FREE FIELD LIMIT - 36m (2036)
65dBA FREE FIELD LIMIT - 30m (2018)

EAST CREEK

OLD MAPLE GROVE ROAD

2.1m HIGH PROPOSED NOISE BARRIER, 67.2m LONG

1.8m HIGH PROPOSED NOISE BARRIER, 71.8m LONG

RECEIVER 6

RECEIVER 8

RECEIVER 10

RECEIVER 9

RECEIVER 11

1.8m HIGH PROPOSED NOISE BARRIER, 244.2m LONG

RECEIVER 12

ELLIS CREEK

True North

60dBA FREE FIELD LIMIT - 81m (2041)
60dBA FREE FIELD LIMIT - 76m (2036)
60dBA FREE FIELD LIMIT - 64m (2018)
65dBA FREE FIELD LIMIT - 41m (2041)
65dBA FREE FIELD LIMIT - 38m (2036)
65dBA FREE FIELD LIMIT - 32m (2018)

MAPLE GROVE ROAD (R.R.38)

BEAVERDALE ROAD (R.R.3

RECEIVER 7

1.8m HIGH PROPOSED NOISE BARRIER, 46.1m LONG

1.8m HIGH PROPOSED NOISE BARRIER, 65.4m LONG

ELLIS CREEK BRIDGE

60dBA FREE FIELD LIMIT - 61m (2018)
60dBA FREE FIELD LIMIT - 70m (2036)
60dBA FREE FIELD LIMIT - 75m (2041)

RECEIVER 5

1.8m HIGH PROPOSED NOISE BARRIER, 64.9m LONG

1.8m HIGH POTENTIAL NOISE BARRIER, 172.4m LONG

RECEIVER 2

RECEIVER 4

RECEIVER 3

## LEGEND

- 60dBA FREE FIELD LIMIT (2018)
- 60dBA FREE FIELD LIMIT (2036)
- 60dBA FREE FIELD LIMIT (2041)
- 65dBA FREE FIELD LIMIT (2018)
- 65dBA FREE FIELD LIMIT (2036)
- 65dBA FREE FIELD LIMIT (2041)
- PROPOSED NOISE BARRIER
- POTENTIAL NOISE BARRIER

Region of Waterloo

PROJECT NAME
MAPLE GROVE ROAD
CLASS EA AND
PRELIMINARY DESIGN

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|---|---|
| 1:1750 | JUN 2023 |
| PROJECT MGR: | DRAWN BY: |
| JCB | TYL |
| CHECKED BY: | APPROVED BY: |
| AK | JCB |
| PROJECT NO: | |
| 117540 | |

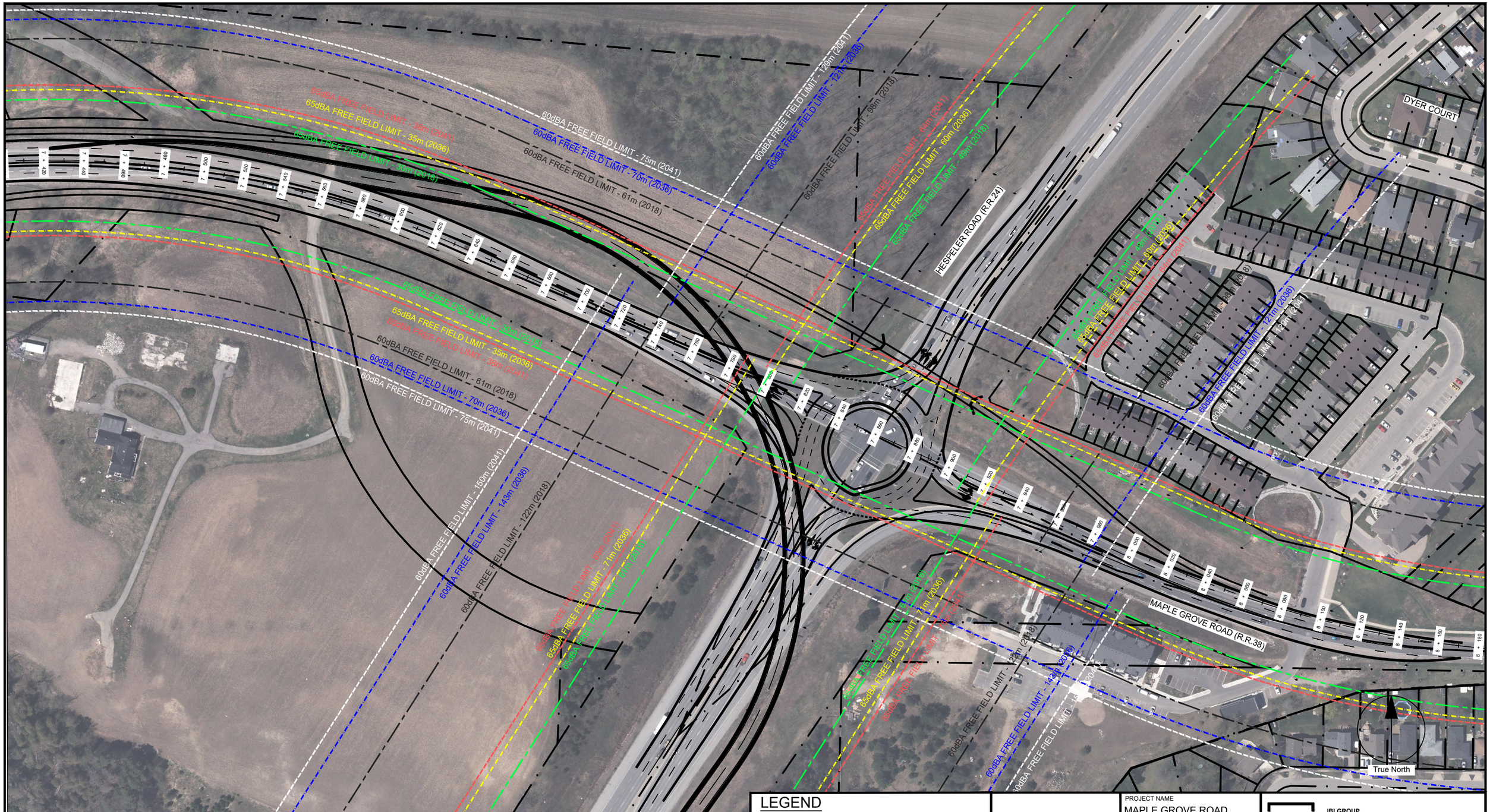
FIGURE NAME
NOISE INFORMATION PLAN
CONCEPT 3 - WIDENING TO
THE SOUTH

FIGURE NO. N3-3

REVISION 0

SCALE CHECK 1 in 10mm

File Location: J:\117540_RoW_MapleGrv\7.0_Production\7.2_Conceptual_Design\04_Civil\Sheets\117540-N3.dwg Last Saved: June 20, 2023 2:57:17 PM by Tony Li Plotted: Tuesday, June 20, 2023




## LEGEND

- 60dBA FREE FIELD LIMIT (2018)
- 60dBA FREE FIELD LIMIT (2036)
- 60dBA FREE FIELD LIMIT (2041)
- 65dBA FREE FIELD LIMIT (2018)
- 65dBA FREE FIELD LIMIT (2036)
- 65dBA FREE FIELD LIMIT (2041)
- PROPOSED NOISE BARRIER
- POTENTIAL NOISE BARRIER

Region of Waterloo

PROJECT NAME
MAPLE GROVE ROAD
CLASS EA AND
PRELIMINARY DESIGN

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Waterloo ON N2L 3V3 Canada
tel 519 585 2255
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| SCALE: | DATE: |
|---|---|
| 1:1750 | JUN 2023 |
| PROJECT MGR: JCB | DRAWN BY: TYL |
| CHECKED BY: AK | APPROVED BY: JCB |
| PROJECT NO: 117540 | |

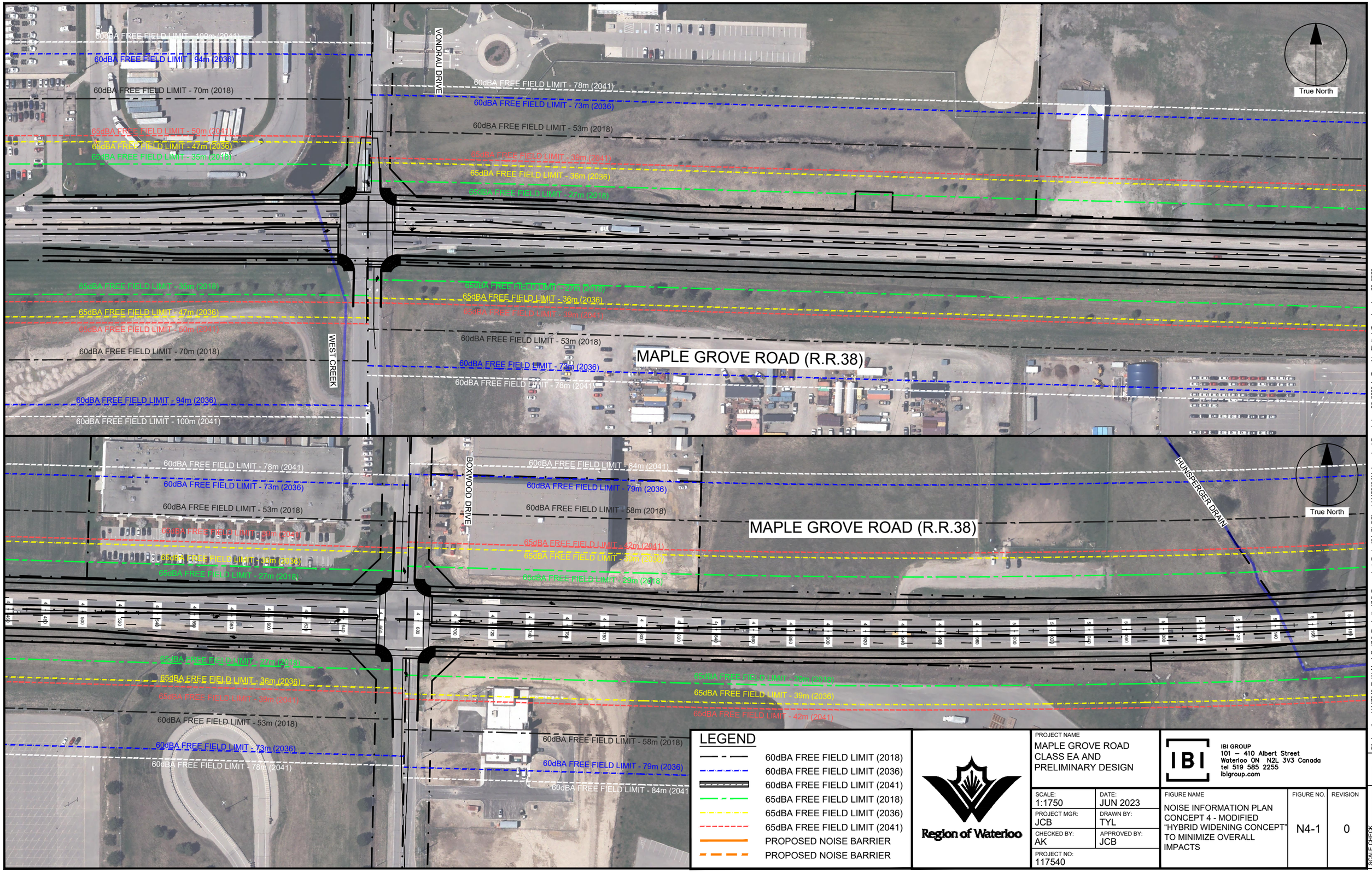
FIGURE NAME: NOISE INFORMATION PLAN CONCEPT 3 - WIDENING TO THE SOUTH

FIGURE NO.: N3-4

REVISION: 0

SCALE CHECK 1 in 10mm

File Location: J:\117540_RoW_MapleGrv\7.0_Production\7.2_Conceptual_Design\04_CivilSheets\117540-N3.dwg Last Saved: June 20, 2023, by Tony.Li Plotted: Tuesday, June 20, 2023 2:57:25 PM by Tony Li




## LEGEND

- 60dBA FREE FIELD LIMIT (2018)
- 60dBA FREE FIELD LIMIT (2036)
- 60dBA FREE FIELD LIMIT (2041)
- 65dBA FREE FIELD LIMIT (2018)
- 65dBA FREE FIELD LIMIT (2036)
- 65dBA FREE FIELD LIMIT (2041)
- PROPOSED NOISE BARRIER
- PROPOSED NOISE BARRIER

Region of Waterloo

PROJECT NAME
MAPLE GROVE ROAD
CLASS EA AND
PRELIMINARY DESIGN

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Waterloo ON N2L 3V3 Canada
tel 519 585 2255
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| SCALE: | DATE: |
|---|---|
| 1:1750 | JUN 2023 |
| PROJECT MGR: JCB | DRAWN BY: TYL |
| CHECKED BY: AK | APPROVED BY: JCB |
| PROJECT NO: 117540 | |

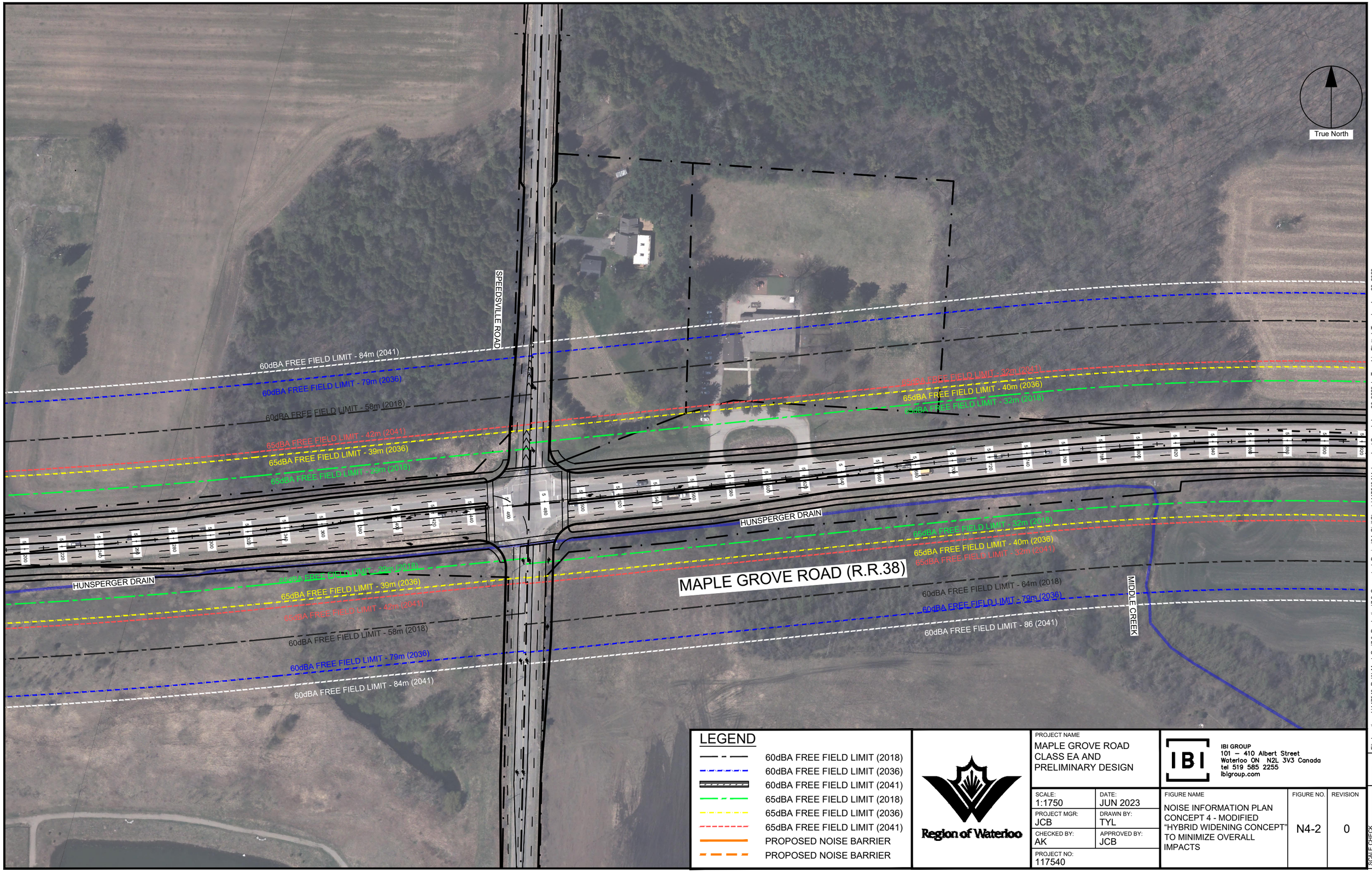
FIGURE NAME: NOISE INFORMATION PLAN CONCEPT 4 - MODIFIED "HYBRID WIDENING CONCEPT" TO MINIMIZE OVERALL IMPACTS

FIGURE NO.: N4-1

REVISION: 0

SCALE CHECK 1 in 10mm

File Location: J:\117540_RoW_MapleGrv\7.0_Production\7.2_Conceptual_Design\04_CivilSheets\117540-N4.dwg Last Saved: June 20, 2023, by Tony.Li Plotted: Tuesday, June 20, 2023 3:11:53 PM by Tony Li




## LEGEND

- 60dBA FREE FIELD LIMIT (2018)
- 60dBA FREE FIELD LIMIT (2036)
- 60dBA FREE FIELD LIMIT (2041)
- 65dBA FREE FIELD LIMIT (2018)
- 65dBA FREE FIELD LIMIT (2036)
- 65dBA FREE FIELD LIMIT (2041)
- PROPOSED NOISE BARRIER
- PROPOSED NOISE BARRIER

Region of Waterloo

PROJECT NAME
MAPLE GROVE ROAD
CLASS EA AND
PRELIMINARY DESIGN

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tel 519 585 2255
ibigroup.com

| SCALE: | DATE: |
|---|---|
| 1:1750 | JUN 2023 |
| PROJECT MGR: | DRAWN BY: |
| JCB | TYL |
| CHECKED BY: | APPROVED BY: |
| AK | JCB |
| PROJECT NO: | |
| 117540 | |

| FIGURE NAME | FIGURE NO. | REVISION |
|---|---|---|
| NOISE INFORMATION PLAN CONCEPT 4 - MODIFIED "HYBRID WIDENING CONCEPT" TO MINIMIZE OVERALL IMPACTS | N4-2 | 0 |

SCALE CHECK 1 in 10mm

File Location: J:\117540_RoW_MapleGrv\7.0_Production\7.2_Conceptual_Design\04_CivilSheets\117540-N4.dwg Last Saved: June 20, 2023 3:12:04 PM by Tony Li Plotted: Tuesday, June 20, 2023

True North

60dBA FREE FIELD LIMIT - 85m (2041)
60dBA FREE FIELD LIMIT - 79m (2036)
60dBA FREE FIELD LIMIT - 66m (2018)
65dBA FREE FIELD LIMIT - 43m (2041)
65dBA FREE FIELD LIMIT - 39m (2036)
65dBA FREE FIELD LIMIT - 33m (2018)

EAST CREEK

2.40m HIGH PROPOSED NOISE BARRIER, 47.2m LONG

MAPLE GROVE ROAD (R.R.38)

REC A

BRIARDEAN ROAD

RECEIVER 1

COMPASS TRAIL

60dBA FREE FIELD LIMIT - 78m (2041)
60dBA FREE FIELD LIMIT - 72m (2036)
60dBA FREE FIELD LIMIT - 61m (2018)
65dBA FREE FIELD LIMIT - 39m (2041)
65dBA FREE FIELD LIMIT - 36m (2036)
65dBA FREE FIELD LIMIT - 31m (2018)

EAST CREEK

OLD MAPLE GROVE ROAD

True North

60dBA FREE FIELD LIMIT - 81m (2041)
60dBA FREE FIELD LIMIT - 76m (2036)
60dBA FREE FIELD LIMIT - 64m (2018)
65dBA FREE FIELD LIMIT - 41m (2041)
65dBA FREE FIELD LIMIT - 38m (2036)
65dBA FREE FIELD LIMIT - 32m (2018)

2.1m HIGH PROPOSED NOISE BARRIER, 72.6m LONG

1.8m HIGH PROPOSED NOISE BARRIER, 71.8m LONG

MAPLE GROVE ROAD (R.R.38)

RECEIVER 6

RECEIVER 8

RECEIVER 10

RECEIVER 9

RECEIVER 11

1.8m HIGH PROPOSED NOISE BARRIER, 245.2m LONG

RECEIVER 12

ELLIS CREEK

60dBA FREE FIELD LIMIT - 61m (2018)
65dBA FREE FIELD LIMIT - 35m (2036)

ELLIS CREEK BRIDGE

BEAVERDALE ROAD (R.R.3

RECEIVER 7

1.8m HIGH PROPOSED NOISE BARRIER, 43.0m LONG

60dBA FREE FIELD LIMIT - 70m (2036)
60dBA FREE FIELD LIMIT - 75m (2041)

1.8m HIGH PROPOSED NOISE BARRIER, 64.6m LONG

RECEIVER 5

1.8m HIGH PROPOSED NOISE BARRIER, 64.9m LONG

1.8m HIGH POTENTIAL NOISE BARRIER, 172.4m LONG

RECEIVER 2

RECEIVER 4

RECEIVER 3

## LEGEND

- 60dBA FREE FIELD LIMIT (2018)
- 60dBA FREE FIELD LIMIT (2036)
- 60dBA FREE FIELD LIMIT (2041)
- 65dBA FREE FIELD LIMIT (2018)
- 65dBA FREE FIELD LIMIT (2036)
- 65dBA FREE FIELD LIMIT (2041)
- PROPOSED NOISE BARRIER
- PROPOSED NOISE BARRIER

Region of Waterloo

PROJECT NAME
MAPLE GROVE ROAD
CLASS EA AND
PRELIMINARY DESIGN

IBI GROUP
101 – 410 Albert Street
Waterloo ON N2L 3V3 Canada
tel 519 585 2255
ibigroup.com

| SCALE: | DATE: |
|---|---|
| 1:1750 | JUN 2023 |
| PROJECT MGR: | DRAWN BY: |
| JCB | TYL |
| CHECKED BY: | APPROVED BY: |
| AK | JCB |
| PROJECT NO: | |
| 117540 | |

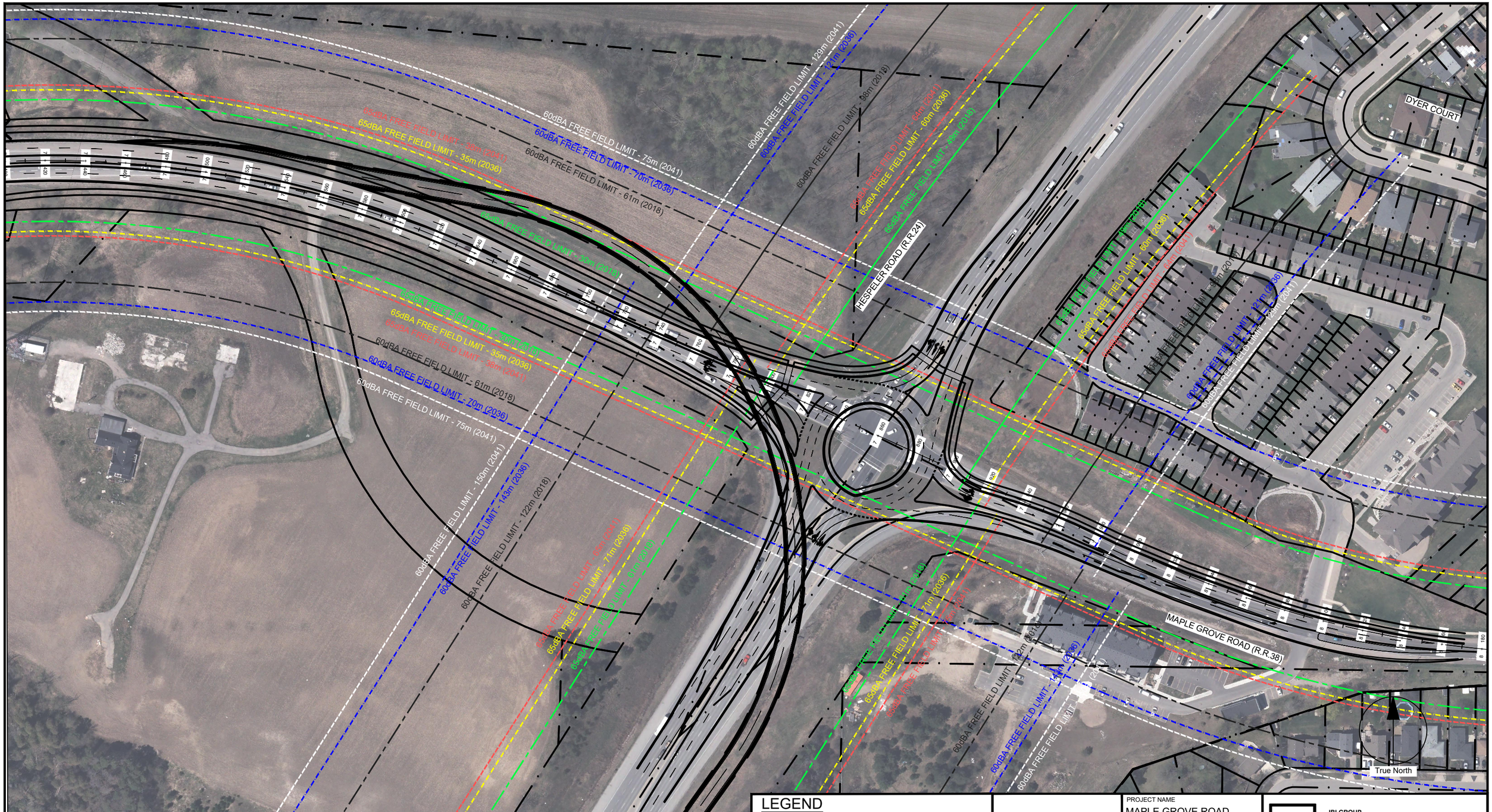
FIGURE NAME
NOISE INFORMATION PLAN
CONCEPT 4 - MODIFIED
"HYBRID WIDENING
CONCEPT" TO MINIMIZE
OVERALL IMPACTS

FIGURE NO. N4-3

REVISION 0

SCALE CHECK 1 in 10mm

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## LEGEND

- 60dBA FREE FIELD LIMIT (2018)
- 60dBA FREE FIELD LIMIT (2036)
- 60dBA FREE FIELD LIMIT (2041)
- 65dBA FREE FIELD LIMIT (2018)
- 65dBA FREE FIELD LIMIT (2036)
- 65dBA FREE FIELD LIMIT (2041)
- PROPOSED NOISE BARRIER
- PROPOSED NOISE BARRIER

Region of Waterloo

PROJECT NAME
MAPLE GROVE ROAD
CLASS EA AND
PRELIMINARY DESIGN

IBI GROUP
101 – 410 Albert Street
Waterloo ON N2L 3V3 Canada
tel 519 585 2255
ibigroup.com

| SCALE: | DATE: |
|---|---|
| 1:1750 | JUN 2023 |
| PROJECT MGR: JCB | DRAWN BY: TYL |
| CHECKED BY: AK | APPROVED BY: JCB |
| PROJECT NO: 117540 | |

FIGURE NAME
NOISE INFORMATION PLAN
CONCEPT 4 - MODIFIED
"HYBRID WIDENING CONCEPT"
TO MINIMIZE OVERALL
IMPACTS

FIGURE NO. N4-4

REVISION 0

SCALE CHECK 1 in 10mm

File Location: J:\117540_RoW_MapleGrv\7.0_Production\7.2_Conceptual_Design\04_CivilSheets\117540-N4.dwg Last Saved: June 20, 2023, by Tony.Li Plotted: Tuesday, June 20, 2023 3:12:25 PM by Tony Li

# Appendix B – STAMSON Output

# STAMSON OUTPUT

Note: Option 4 road geometry and distances are identical to Option 1 and STAMSON output has not been replicated for Option 4.

# 2018 Free Field Analysis

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:13:01**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: ex1.te Time Period: Day/Night 16/8 hours**
**Description: 2018 Fountain to Vondrau Day 65 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 16519/1835 veh/TimePeriod *
Medium truck volume : 180/20 veh/TimePeriod *
Heavy truck volume : 1257/140 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 19950
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 7.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 34.98 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.63 m

ROAD (0.00 + 65.00 + 0.00) = 65.00 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.66 72.54 0.00 -6.09 -1.45 0.00 0.00 0.00 65.00
---

Segment Leq : 65.00 dBA

Total Leq All Segments: 65.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.63 m

ROAD (0.00 + 64.72 + 0.00) = 64.72 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 66.01 0.00 0.00 -1.30 0.00 0.00 0.00 64.72
---

Segment Leq : 64.72 dBA

Total Leq All Segments: 64.72 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.00
(NIGHT): 64.72

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:13:40**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: ex1.te Time Period: Day/Night 16/8 hours**
**Description: 2018 Fountain to Vondrau Day 60 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 16519/1835 veh/TimePeriod *
Medium truck volume : 180/20 veh/TimePeriod *
Heavy truck volume : 1257/140 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 19950
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 7.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 70.06 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.63 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.66 | 72.54 | 0.00 | -11.09 | -1.45 | 0.00 | 0.00 | 0.00 | 60.00 |

Segment Leq : 60.00 dBA

Total Leq All Segments: 60.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.63 m

ROAD (0.00 + 64.72 + 0.00) = 64.72 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 66.01 | 0.00 | 0.00 | -1.30 | 0.00 | 0.00 | 0.00 | 64.72 |

Segment Leq : 64.72 dBA

Total Leq All Segments: 64.72 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.00
(NIGHT): 64.72

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:18:52**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: ex2.te Time Period: Day/Night 16/8 hours**
**Description: 2018 Vondrau to Boxwood Day 65 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 15544/1727 veh/TimePeriod *
Medium truck volume : 164/18 veh/TimePeriod *
Heavy truck volume : 654/73 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 18180
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 26.52 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 65.00 + 0.00) = 65.00 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.66 70.56 0.00 -4.11 -1.46 0.00 0.00 0.00 65.00
---

Segment Leq : 65.00 dBA

Total Leq All Segments: 65.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.42 m

ROAD (0.00 + 62.73 + 0.00) = 62.73 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 64.04 0.00 0.00 -1.31 0.00 0.00 0.00 62.73
---

Segment Leq : 62.73 dBA

Total Leq All Segments: 62.73 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.00
(NIGHT): 62.73

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:20:16**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: ex2.te Time Period: Day/Night 16/8 hours**
**Description: 2018 Vondrau to Boxwood Day 60 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 15544/1727 veh/TimePeriod *
Medium truck volume : 164/18 veh/TimePeriod *
Heavy truck volume : 654/73 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 18180
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 53.07 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.66 | 70.56 | 0.00 | -9.11 | -1.46 | 0.00 | 0.00 | 0.00 | 60.00 |

Segment Leq : 60.00 dBA

Total Leq All Segments: 60.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.42 m

ROAD (0.00 + 62.73 + 0.00) = 62.73 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 64.04 | 0.00 | 0.00 | -1.31 | 0.00 | 0.00 | 0.00 | 62.73 |

Segment Leq : 62.73 dBA

Total Leq All Segments: 62.73 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.00
(NIGHT): 62.73

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:25:33**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: ex3.te Time Period: Day/Night 16/8 hours**
**Description: 2018 Boxwood to Speedsville Day 65 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 15778/1753 veh/TimePeriod *
Medium truck volume : 168/19 veh/TimePeriod *
Heavy truck volume : 839/93 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 1 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 18650
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 29.21 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 65.00 + 0.00) = 65.00 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.66 71.26 0.00 -4.80 -1.46 0.00 0.00 0.00 65.00
---

Segment Leq : 65.00 dBA

Total Leq All Segments: 65.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.49 m

ROAD (0.00 + 63.43 + 0.00) = 63.43 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 64.73 0.00 0.00 -1.30 0.00 0.00 0.00 63.43
---

Segment Leq : 63.43 dBA

Total Leq All Segments: 63.43 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.00
(NIGHT): 63.43

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:25:54**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: ex3.te Time Period: Day/Night 16/8 hours**
**Description: 2018 Boxwood to Speedsville Day 60 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 15778/1753 veh/TimePeriod *
Medium truck volume : 168/19 veh/TimePeriod *
Heavy truck volume : 839/93 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 1 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 18650
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 58.46 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.66 71.26 0.00 -9.81 -1.46 0.00 0.00 0.00 60.00
---

Segment Leq : 60.00 dBA

Total Leq All Segments: 60.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.49 m

ROAD (0.00 + 63.43 + 0.00) = 63.43 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 64.73 0.00 0.00 -1.30 0.00 0.00 0.00 63.43
---

Segment Leq : 63.43 dBA

Total Leq All Segments: 63.43 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.00
(NIGHT): 63.43

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:32:18**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: ex4.te Time Period: Day/Night 16/8 hours**
**Description: 2018 Speedsville to Briardeen Day 65 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 15947/1772 veh/TimePeriod *
Medium truck volume : 170/19 veh/TimePeriod *
Heavy truck volume : 848/94 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 18850
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 32.20 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 65.00 + 0.00) = 65.00 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.66 | 71.96 | 0.00 | -5.51 | -1.46 | 0.00 | 0.00 | 0.00 | 65.00 |

Segment Leq : 65.00 dBA

Total Leq All Segments: 65.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.49 m

ROAD (0.00 + 64.12 + 0.00) = 64.12 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 65.43 | 0.00 | 0.00 | -1.30 | 0.00 | 0.00 | 0.00 | 64.12 |

Segment Leq : 64.12 dBA

Total Leq All Segments: 64.12 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.00
(NIGHT): 64.12

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:32:36**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: ex4.te Time Period: Day/Night 16/8 hours**
**Description: 2018 Speedsville to Briardeen Day 60 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 15947/1772 veh/TimePeriod *
Medium truck volume : 170/19 veh/TimePeriod *
Heavy truck volume : 848/94 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 18850
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 64.44 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.66 | 71.96 | 0.00 | -10.51 | -1.46 | 0.00 | 0.00 | 0.00 | 60.00 |

Segment Leq : 60.00 dBA

Total Leq All Segments: 60.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.49 m

ROAD (0.00 + 64.12 + 0.00) = 64.12 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 65.43 | 0.00 | 0.00 | -1.30 | 0.00 | 0.00 | 0.00 | 64.12 |

Segment Leq : 64.12 dBA

Total Leq All Segments: 64.12 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.00
(NIGHT): 64.12

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:40:19**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: ex5.te Time Period: Day/Night 16/8 hours**
**Description: 2018 Briardeen to Compass Trail Day 65 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 16751/1861 veh/TimePeriod *
Medium truck volume : 178/20 veh/TimePeriod *
Heavy truck volume : 891/99 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 19800
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 33.18 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 65.00 + 0.00) = 65.00 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.66 | 72.18 | 0.00 | -5.72 | -1.46 | 0.00 | 0.00 | 0.00 | 65.00 |

Segment Leq : 65.00 dBA

Total Leq All Segments: 65.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 64.35 + 0.00) = 64.35 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 65.65 | 0.00 | 0.00 | -1.30 | 0.00 | 0.00 | 0.00 | 64.35 |

Segment Leq : 64.35 dBA

Total Leq All Segments: 64.35 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.00
(NIGHT): 64.35

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:40:00**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: ex5.te Time Period: Day/Night 16/8 hours**
**Description: 2018 Briardeen to Compass Trail Day 60 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 16751/1861 veh/TimePeriod *
Medium truck volume : 178/20 veh/TimePeriod *
Heavy truck volume : 891/99 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 19800
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 66.39 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.66 | 72.18 | 0.00 | -10.72 | -1.46 | 0.00 | 0.00 | 0.00 | 60.00 |

Segment Leq : 60.00 dBA

Total Leq All Segments: 60.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 64.35 + 0.00) = 64.35 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 65.65 | 0.00 | 0.00 | -1.30 | 0.00 | 0.00 | 0.00 | 64.35 |

Segment Leq : 64.35 dBA

Total Leq All Segments: 64.35 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.00
(NIGHT): 64.35

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:45:36**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: ex6.te Time Period: Day/Night 16/8 hours**
**Description: 2018 Compass Trail to Old Maple Grove Day 65 Free**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 17126/1903 veh/TimePeriod *
Medium truck volume : 180/20 veh/TimePeriod *
Heavy truck volume : 721/80 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 20030
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 30.57 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 65.00 + 0.00) = 65.00 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.66 71.59 0.00 -5.13 -1.46 0.00 0.00 0.00 65.00
---

Segment Leq : 65.00 dBA

Total Leq All Segments: 65.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 63.75 + 0.00) = 63.75 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 65.05 0.00 0.00 -1.31 0.00 0.00 0.00 63.75
---

Segment Leq : 63.75 dBA

Total Leq All Segments: 63.75 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.00
(NIGHT): 63.75

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:46:07**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: ex6.te Time Period: Day/Night 16/8 hours**
**Description: 2018 Compass Trail to Old Maple Grove Day 60 Free**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 17126/1903 veh/TimePeriod *
Medium truck volume : 180/20 veh/TimePeriod *
Heavy truck volume : 721/80 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 20030
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 61.18 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.66 | 71.59 | 0.00 | -10.13 | -1.46 | 0.00 | 0.00 | 0.00 | 60.00 |

Segment Leq : 60.00 dBA

Total Leq All Segments: 60.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 63.75 + 0.00) = 63.75 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 65.05 | 0.00 | 0.00 | -1.31 | 0.00 | 0.00 | 0.00 | 63.75 |

Segment Leq : 63.75 dBA

Total Leq All Segments: 63.75 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.00
(NIGHT): 63.75

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:49:19**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: ex7.te Time Period: Day/Night 16/8 hours**
**Description: 2018 Old Maple Grove to Beaverdale Day 65 Free**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 15854/1762 veh/TimePeriod *
Medium truck volume : 169/19 veh/TimePeriod *
Heavy truck volume : 843/94 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 18740
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 32.11 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 65.00 + 0.00) = 65.00 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.66 | 71.94 | 0.00 | -5.49 | -1.46 | 0.00 | 0.00 | 0.00 | 65.00 |

Segment Leq : 65.00 dBA

Total Leq All Segments: 65.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 64.12 + 0.00) = 64.12 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 65.42 | 0.00 | 0.00 | -1.30 | 0.00 | 0.00 | 0.00 | 64.12 |

Segment Leq : 64.12 dBA

Total Leq All Segments: 64.12 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.00
(NIGHT): 64.12

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:49:43**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: ex7.te Time Period: Day/Night 16/8 hours**
**Description: 2018 Old Maple Grove to Beaverdale Day 60 Free**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 15854/1762 veh/TimePeriod *
Medium truck volume : 169/19 veh/TimePeriod *
Heavy truck volume : 843/94 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 18740
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 64.20 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.66 | 71.94 | 0.00 | -10.48 | -1.46 | 0.00 | 0.00 | 0.00 | 60.00 |

Segment Leq : 60.00 dBA

Total Leq All Segments: 60.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 64.12 + 0.00) = 64.12 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 65.42 | 0.00 | 0.00 | -1.30 | 0.00 | 0.00 | 0.00 | 64.12 |

Segment Leq : 64.12 dBA

Total Leq All Segments: 64.12 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.00
(NIGHT): 64.12

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:54:18**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: ex8.te Time Period: Day/Night 16/8 hours**
**Description: 2018 Beaverdale to Hespeler Day 65 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 16844/1872 veh/TimePeriod *
Medium truck volume : 177/20 veh/TimePeriod *
Heavy truck volume : 709/79 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 19700
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 30.27 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 65.00 + 0.00) = 65.00 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.66 | 71.52 | 0.00 | -5.06 | -1.46 | 0.00 | 0.00 | 0.00 | 65.00 |

Segment Leq : 65.00 dBA

Total Leq All Segments: 65.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 63.69 + 0.00) = 63.69 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 64.99 | 0.00 | 0.00 | -1.31 | 0.00 | 0.00 | 0.00 | 63.69 |

Segment Leq : 63.69 dBA

Total Leq All Segments: 63.69 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.00
(NIGHT): 63.69

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 21:10:40**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: ex10.te Time Period: Day/Night 16/8 hours**
**Description: 2018 Maple Grove to Queen Day 60 Free Field**

Road data, segment # 1: Hespeler (day/night)
---
Car traffic volume : 24326/2703 veh/TimePeriod *
Medium truck volume : 858/95 veh/TimePeriod *
Heavy truck volume : 2491/277 veh/TimePeriod *
Posted speed limit : 80 km/h
Road gradient : 1 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 30750
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 3.10
Heavy Truck % of Total Volume : 9.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Hespeler (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 122.04 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Hespeler (day)
---

Source height = 1.73 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 76.49 0.00 -15.05 -1.44 0.00 0.00 0.00 60.00
---

Segment Leq : 60.00 dBA

Total Leq All Segments: 60.00 dBA

Results segment # 1: Hespeler (night)
---

Source height = 1.73 m

ROAD (0.00 + 68.67 + 0.00) = 68.67 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 69.96 0.00 0.00 -1.29 0.00 0.00 0.00 0.00 68.67
---

Segment Leq : 68.67 dBA

Total Leq All Segments: 68.67 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.00
(NIGHT): 68.67

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 16844/1872 veh/TimePeriod *
Medium truck volume : 177/20 veh/TimePeriod *
Heavy truck volume : 709/79 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 19700
Percentage of Annual Growth : 0.00

Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

TOTAL Leq FROM ALL SOURCES (DAY): 60.00
(NIGHT): 63.69

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 60.53 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.66 | 71.52 | 0.00 | -10.06 | -1.46 | 0.00 | 0.00 | 0.00 | 60.00 |

Segment Leq : 60.00 dBA

Total Leq All Segments: 60.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 63.69 + 0.00) = 63.69 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 64.99 | 0.00 | 0.00 | -1.31 | 0.00 | 0.00 | 0.00 | 63.69 |

Segment Leq : 63.69 dBA

Total Leq All Segments: 63.69 dBA

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 21:03:07**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: ex9.te Time Period: Day/Night 16/8 hours**
**Description: 2018 Guelph to Maple Grove Day 65 Free Field**

Road data, segment # 1: Hespeler (day/night)
---
Car traffic volume : 15531/1726 veh/TimePeriod *
Medium truck volume : 471/52 veh/TimePeriod *
Heavy truck volume : 1448/161 veh/TimePeriod *
Posted speed limit : 80 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 19390
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 2.70
Heavy Truck % of Total Volume : 8.30
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Hespeler (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 48.63 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Hespeler (day)
---

Source height = 1.70 m

ROAD (0.00 + 65.00 + 0.00) = 65.00 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 74.89 0.00 -8.45 -1.45 0.00 0.00 0.00 65.00
---

Segment Leq : 65.00 dBA

Total Leq All Segments: 65.00 dBA

Results segment # 1: Hespeler (night)
---

Source height = 1.70 m

ROAD (0.00 + 67.07 + 0.00) = 67.07 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 68.36 0.00 0.00 -1.29 0.00 0.00 0.00 67.07
---

Segment Leq : 67.07 dBA

Total Leq All Segments: 67.07 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.00
(NIGHT): 67.07

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 21:02:38**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: ex9.te Time Period: Day/Night 16/8 hours**
**Description: 2018 Guelph to Maple Grove Day 60 Free Field**

Road data, segment # 1: Hespeler (day/night)
---
Car traffic volume : 15531/1726 veh/TimePeriod *
Medium truck volume : 471/52 veh/TimePeriod *
Heavy truck volume : 1448/161 veh/TimePeriod *
Posted speed limit : 80 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 19390
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 2.70
Heavy Truck % of Total Volume : 8.30
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Hespeler (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 97.53 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Hespeler (day)
---

Source height = 1.70 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 74.89 0.00 -13.45 -1.45 0.00 0.00 0.00 60.00
---

Segment Leq : 60.00 dBA

Total Leq All Segments: 60.00 dBA

Results segment # 1: Hespeler (night)
---

Source height = 1.70 m

ROAD (0.00 + 67.07 + 0.00) = 67.07 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 68.36 0.00 0.00 -1.29 0.00 0.00 0.00 67.07
---

Segment Leq : 67.07 dBA

Total Leq All Segments: 67.07 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.00
(NIGHT): 67.07

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 21:09:56**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: ex10.te Time Period: Day/Night 16/8 hours**
**Description: 2018 Maple Grove to Queen Day 60 Free Field**

Road data, segment # 1: Hespeler (day/night)
---
Car traffic volume : 24326/2703 veh/TimePeriod *
Medium truck volume : 858/95 veh/TimePeriod *
Heavy truck volume : 2491/277 veh/TimePeriod *
Posted speed limit : 80 km/h
Road gradient : 1 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 30750
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 3.10
Heavy Truck % of Total Volume : 9.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Hespeler (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 60.76 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Hespeler (day)
---

Source height = 1.73 m

ROAD (0.00 + 65.00 + 0.00) = 65.00 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 76.49 0.00 -10.04 -1.44 0.00 0.00 0.00 65.00
---

Segment Leq : 65.00 dBA

Total Leq All Segments: 65.00 dBA

Results segment # 1: Hespeler (night)
---

Source height = 1.73 m

ROAD (0.00 + 68.67 + 0.00) = 68.67 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 69.96 0.00 0.00 -1.29 0.00 0.00 0.00 68.67
---

Segment Leq : 68.67 dBA

Total Leq All Segments: 68.67 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.00
(NIGHT): 68.67

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 21:10:40**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: ex10.te Time Period: Day/Night 16/8 hours**
**Description: 2018 Maple Grove to Queen Day 60 Free Field**

Road data, segment # 1: Hespeler (day/night)
---
Car traffic volume : 24326/2703 veh/TimePeriod *
Medium truck volume : 858/95 veh/TimePeriod *
Heavy truck volume : 2491/277 veh/TimePeriod *
Posted speed limit : 80 km/h
Road gradient : 1 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 30750
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 3.10
Heavy Truck % of Total Volume : 9.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Hespeler (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 122.04 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Hespeler (day)
---

Source height = 1.73 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 76.49 0.00 -15.05 -1.44 0.00 0.00 0.00 0.00 60.00
---

Segment Leq : 60.00 dBA

Total Leq All Segments: 60.00 dBA

Results segment # 1: Hespeler (night)
---

Source height = 1.73 m

ROAD (0.00 + 68.67 + 0.00) = 68.67 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 69.96 0.00 0.00 -1.29 0.00 0.00 0.00 0.00 68.67
---

Segment Leq : 68.67 dBA

Total Leq All Segments: 68.67 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.00
(NIGHT): 68.67

# 2036 FREE FIELD ANALYSIS

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:15:07**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2036_1.te Time Period: Day/Night 16/8 hours**
**Description: 2036 Fountain to Vondrau Day 65 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 26935/2993 veh/TimePeriod *
Medium truck volume : 293/33 veh/TimePeriod *
Heavy truck volume : 2049/228 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 32530
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 7.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 15.00 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.63 m

ROAD (0.00 + 73.21 + 0.00) = 73.21 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.66 | 74.66 | 0.00 | 0.00 | -1.45 | 0.00 | 0.00 | 0.00 | 73.21 |

Segment Leq : 73.21 dBA

Total Leq All Segments: 73.21 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.63 m

ROAD (0.00 + 66.84 + 0.00) = 66.84 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 68.14 | 0.00 | 0.00 | -1.30 | 0.00 | 0.00 | 0.00 | 66.84 |

Segment Leq : 66.84 dBA

Total Leq All Segments: 66.84 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 73.21
(NIGHT): 66.84

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:16:08**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2036_1.te Time Period: Day/Night 16/8 hours**
**Description: 2036 Fountain to Vondrau Day 60 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 26935/2993 veh/TimePeriod *
Medium truck volume : 293/33 veh/TimePeriod *
Heavy truck volume : 2049/228 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 32530
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 7.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 94.10 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.63 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.66 | 74.66 | 0.00 | -13.21 | -1.45 | 0.00 | 0.00 | 0.00 | 60.00 |

Segment Leq : 60.00 dBA

Total Leq All Segments: 60.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.63 m

ROAD (0.00 + 66.84 + 0.00) = 66.84 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 68.14 | 0.00 | 0.00 | -1.30 | 0.00 | 0.00 | 0.00 | 66.84 |

Segment Leq : 66.84 dBA

Total Leq All Segments: 66.84 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.00
(NIGHT): 66.84

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:21:18**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2036_2.te Time Period: Day/Night 16/8 hours**
**Description: 2036 Vondrau to Boxwood Day 65 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 26231/2915 veh/TimePeriod *
Medium truck volume : 276/31 veh/TimePeriod *
Heavy truck volume : 1104/123 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 30680
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 36.34 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 65.00 + 0.00) = 65.00 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.66 | 72.84 | 0.00 | -6.38 | -1.46 | 0.00 | 0.00 | 0.00 | 65.00 |

Segment Leq : 65.00 dBA

Total Leq All Segments: 65.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 65.01 + 0.00) = 65.01 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 66.31 | 0.00 | 0.00 | -1.31 | 0.00 | 0.00 | 0.00 | 65.01 |

Segment Leq : 65.01 dBA

Total Leq All Segments: 65.01 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.00
(NIGHT): 65.01

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:21:38**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2036_2.te Time Period: Day/Night 16/8 hours**
**Description: 2036 Vondrau to Boxwood Day 60 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 26231/2915 veh/TimePeriod *
Medium truck volume : 276/31 veh/TimePeriod *
Heavy truck volume : 1104/123 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 30680
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 72.66 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 60.01 + 0.00) = 60.01 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.66 72.84 0.00 -11.37 -1.46 0.00 0.00 0.00 60.01
---

Segment Leq : 60.01 dBA

Total Leq All Segments: 60.01 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 65.01 + 0.00) = 65.01 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 66.31 0.00 0.00 -1.31 0.00 0.00 0.00 65.01
---

Segment Leq : 65.01 dBA

Total Leq All Segments: 65.01 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.01
(NIGHT): 65.01

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:29:22**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2036_3.te Time Period: Day/Night 16/8 hours**
**Description: 2036 Boxwood to Speedsville Day 65 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 25795/2866 veh/TimePeriod *
Medium truck volume : 274/30 veh/TimePeriod *
Heavy truck volume : 1372/152 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 1 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 30490
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 39.27 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 65.00 + 0.00) = 65.00 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.66 | 73.40 | 0.00 | -6.94 | -1.46 | 0.00 | 0.00 | 0.00 | 65.00 |

Segment Leq : 65.00 dBA

Total Leq All Segments: 65.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.49 m

ROAD (0.00 + 65.55 + 0.00) = 65.55 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 66.86 | 0.00 | 0.00 | -1.30 | 0.00 | 0.00 | 0.00 | 65.55 |

Segment Leq : 65.55 dBA

Total Leq All Segments: 65.55 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.00
(NIGHT): 65.55

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:28:47**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2036_3.te Time Period: Day/Night 16/8 hours**
**Description: 2036 Boxwood to Speedsville Day 60 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 25795/2866 veh/TimePeriod *
Medium truck volume : 274/30 veh/TimePeriod *
Heavy truck volume : 1372/152 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 1 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 30490
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 78.59 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.66 73.40 0.00 -11.94 -1.46 0.00 0.00 0.00 60.00
---

Segment Leq : 60.00 dBA

Total Leq All Segments: 60.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.49 m

ROAD (0.00 + 65.55 + 0.00) = 65.55 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 66.86 0.00 0.00 -1.30 0.00 0.00 0.00 65.55
---

Segment Leq : 65.55 dBA

Total Leq All Segments: 65.55 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.00
(NIGHT): 65.55

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:34:35**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2036_4.te Time Period: Day/Night 16/8 hours**
**Description: 2036 Speedsville to Briardeen Day 65 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 22537/2504 veh/TimePeriod *
Medium truck volume : 240/27 veh/TimePeriod *
Heavy truck volume : 1199/133 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 26640
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 39.69 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 65.00 + 0.00) = 65.00 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.66 | 73.47 | 0.00 | -7.01 | -1.46 | 0.00 | 0.00 | 0.00 | 65.00 |

Segment Leq : 65.00 dBA

Total Leq All Segments: 65.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.49 m

ROAD (0.00 + 65.63 + 0.00) = 65.63 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 66.93 | 0.00 | 0.00 | -1.30 | 0.00 | 0.00 | 0.00 | 65.63 |

Segment Leq : 65.63 dBA

Total Leq All Segments: 65.63 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.00
(NIGHT): 65.63

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:34:53**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2036_4.te Time Period: Day/Night 16/8 hours**
**Description: 2036 Speedsville to Briardeen Day 60 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 22537/2504 veh/TimePeriod *
Medium truck volume : 240/27 veh/TimePeriod *
Heavy truck volume : 1199/133 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 26640
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 39.69 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 65.00 + 0.00) = 65.00 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.66 | 73.47 | 0.00 | -7.01 | -1.46 | 0.00 | 0.00 | 0.00 | 65.00 |

Segment Leq : 65.00 dBA

Total Leq All Segments: 65.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.49 m

ROAD (0.00 + 65.63 + 0.00) = 65.63 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 66.93 | 0.00 | 0.00 | -1.30 | 0.00 | 0.00 | 0.00 | 65.63 |

Segment Leq : 65.63 dBA

Total Leq All Segments: 65.63 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.00
(NIGHT): 65.63

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:41:04**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2036_5.te Time Period: Day/Night 16/8 hours**
**Description: 2036 Briardeen to Compass Trail Day 65 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 22317/2480 veh/TimePeriod *
Medium truck volume : 237/26 veh/TimePeriod *
Heavy truck volume : 1187/132 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 26380
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 39.45 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 65.00 + 0.00) = 65.00 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.66 | 73.42 | 0.00 | -6.97 | -1.46 | 0.00 | 0.00 | 0.00 | 65.00 |

Segment Leq : 65.00 dBA

Total Leq All Segments: 65.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 65.59 + 0.00) = 65.59 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 66.89 | 0.00 | 0.00 | -1.30 | 0.00 | 0.00 | 0.00 | 65.59 |

Segment Leq : 65.59 dBA

Total Leq All Segments: 65.59 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.00
(NIGHT): 65.59

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:41:30**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2036_5.te Time Period: Day/Night 16/8 hours**
**Description: 2036 Briardeen to Compass Trail Day 60 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 22317/2480 veh/TimePeriod *
Medium truck volume : 237/26 veh/TimePeriod *
Heavy truck volume : 1187/132 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 26380
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 78.94 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.66 | 73.42 | 0.00 | -11.97 | -1.46 | 0.00 | 0.00 | 0.00 | 60.00 |

Segment Leq : 60.00 dBA

Total Leq All Segments: 60.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 65.59 + 0.00) = 65.59 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 66.89 | 0.00 | 0.00 | -1.30 | 0.00 | 0.00 | 0.00 | 65.59 |

Segment Leq : 65.59 dBA

Total Leq All Segments: 65.59 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.00
(NIGHT): 65.59

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:46:48**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2036_6.te Time Period: Day/Night 16/8 hours**
**Description: 2036 Compass Trail to Old Maple Grove Day 65 Free**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 22598/2511 veh/TimePeriod *
Medium truck volume : 238/26 veh/TimePeriod *
Heavy truck volume : 951/106 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 26430
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 36.14 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 65.00 + 0.00) = 65.00 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.66 | 72.79 | 0.00 | -6.34 | -1.46 | 0.00 | 0.00 | 0.00 | 65.00 |

Segment Leq : 65.00 dBA

Total Leq All Segments: 65.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.42 m

ROAD (0.00 + 64.96 + 0.00) = 64.96 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 66.27 | 0.00 | 0.00 | -1.31 | 0.00 | 0.00 | 0.00 | 64.96 |

Segment Leq : 64.96 dBA

Total Leq All Segments: 64.96 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.00
(NIGHT): 64.96

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:47:04**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2036_6.te Time Period: Day/Night 16/8 hours**
**Description: 2036 Compass Trail to Old Maple Grove Day 60 Free**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 22598/2511 veh/TimePeriod *
Medium truck volume : 238/26 veh/TimePeriod *
Heavy truck volume : 951/106 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 26430
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 72.31 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.66 | 72.79 | 0.00 | -11.34 | -1.46 | 0.00 | 0.00 | 0.00 | 60.00 |

Segment Leq : 60.00 dBA

Total Leq All Segments: 60.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.42 m

ROAD (0.00 + 64.96 + 0.00) = 64.96 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 66.27 | 0.00 | 0.00 | -1.31 | 0.00 | 0.00 | 0.00 | 64.96 |

Segment Leq : 64.96 dBA

Total Leq All Segments: 64.96 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.00
(NIGHT): 64.96

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:50:23**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2036_7.te Time Period: Day/Night 16/8 hours**
**Description: 2036 Old Maple Grove to Beaverdale Day 65 Free**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 20905/2323 veh/TimePeriod *
Medium truck volume : 222/25 veh/TimePeriod *
Heavy truck volume : 1112/124 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 24710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 37.91 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 65.00 + 0.00) = 65.00 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.66 | 73.14 | 0.00 | -6.68 | -1.46 | 0.00 | 0.00 | 0.00 | 65.00 |

Segment Leq : 65.00 dBA

Total Leq All Segments: 65.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 65.32 + 0.00) = 65.32 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 66.62 | 0.00 | 0.00 | -1.30 | 0.00 | 0.00 | 0.00 | 65.32 |

Segment Leq : 65.32 dBA

Total Leq All Segments: 65.32 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.00
(NIGHT): 65.32

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:50:42**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2036_7.te Time Period: Day/Night 16/8 hours**
**Description: 2036 Old Maple Grove to Beaverdale Day 60 Free**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 20905/2323 veh/TimePeriod *
Medium truck volume : 222/25 veh/TimePeriod *
Heavy truck volume : 1112/124 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 24710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 75.86 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.66 73.14 0.00 -11.69 -1.46 0.00 0.00 0.00 60.00
---

Segment Leq : 60.00 dBA

Total Leq All Segments: 60.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 65.32 + 0.00) = 65.32 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 66.62 0.00 0.00 -1.30 0.00 0.00 0.00 65.32
---

Segment Leq : 65.32 dBA

Total Leq All Segments: 65.32 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.00
(NIGHT): 65.32

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:56:25**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2036_8.te Time Period: Day/Night 16/8 hours**
**Description: 2036 Beaverdale to Hespeler Day 65 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 21563/2396 veh/TimePeriod *
Medium truck volume : 227/25 veh/TimePeriod *
Heavy truck volume : 908/101 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 25220
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 35.13 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 65.00 + 0.00) = 65.00 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.66 72.59 0.00 -6.14 -1.46 0.00 0.00 0.00 65.00
---

Segment Leq : 65.00 dBA

Total Leq All Segments: 65.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 64.75 + 0.00) = 64.75 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 66.06 0.00 0.00 -1.31 0.00 0.00 0.00 64.75
---

Segment Leq : 64.75 dBA

Total Leq All Segments: 64.75 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.00
(NIGHT): 64.75

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:57:10**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2036_8.te Time Period: Day/Night 16/8 hours**
**Description: 2036 Beaverdale to Hespeler Day 60 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 21563/2396 veh/TimePeriod *
Medium truck volume : 227/25 veh/TimePeriod *
Heavy truck volume : 908/101 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 25220
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 70.30 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.66 72.59 0.00 -11.14 -1.46 0.00 0.00 0.00 60.00
---

Segment Leq : 60.00 dBA

Total Leq All Segments: 60.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 64.75 + 0.00) = 64.75 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 66.06 0.00 0.00 -1.31 0.00 0.00 0.00 64.75
---

Segment Leq : 64.75 dBA

Total Leq All Segments: 64.75 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.00
(NIGHT): 64.75

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 21:04:02**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2036_9.te Time Period: Day/Night 16/8 hours**
**Description: 2036 Guelph to Maple Grove Day 65 Free Field**

Road data, segment # 1: Hespeler (day/night)
---
Car traffic volume : 22148/2461 veh/TimePeriod *
Medium truck volume : 672/75 veh/TimePeriod *
Heavy truck volume : 2065/229 veh/TimePeriod *
Posted speed limit : 80 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 27650
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 2.70
Heavy Truck % of Total Volume : 8.30
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Hespeler (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 60.23 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Hespeler (day)
---

Source height = 1.70 m

ROAD (0.00 + 65.00 + 0.00) = 65.00 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 76.44 0.00 -9.99 -1.45 0.00 0.00 0.00 0.00 65.00
---

Segment Leq : 65.00 dBA

Total Leq All Segments: 65.00 dBA

Results segment # 1: Hespeler (night)
---

Source height = 1.70 m

ROAD (0.00 + 68.61 + 0.00) = 68.61 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 69.90 0.00 0.00 -1.29 0.00 0.00 0.00 0.00 68.61
---

Segment Leq : 68.61 dBA

Total Leq All Segments: 68.61 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.00
(NIGHT): 68.61

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 21:04:36**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2036_9.te Time Period: Day/Night 16/8 hours**
**Description: 2036 Guelph to Maple Grove Day 60 Free Field**

Road data, segment # 1: Hespeler (day/night)
---
Car traffic volume : 22148/2461 veh/TimePeriod *
Medium truck volume : 672/75 veh/TimePeriod *
Heavy truck volume : 2065/229 veh/TimePeriod *
Posted speed limit : 80 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 27650
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 2.70
Heavy Truck % of Total Volume : 8.30
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Hespeler (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 120.86 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Hespeler (day)
---

Source height = 1.70 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 76.44 0.00 -14.99 -1.45 0.00 0.00 0.00 60.00
---

Segment Leq : 60.00 dBA

Total Leq All Segments: 60.00 dBA

Results segment # 1: Hespeler (night)
---

Source height = 1.70 m

ROAD (0.00 + 68.61 + 0.00) = 68.61 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 69.90 0.00 0.00 -1.29 0.00 0.00 0.00 68.61
---

Segment Leq : 68.61 dBA

Total Leq All Segments: 68.61 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.00
(NIGHT): 68.61

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 21:11:15**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2036_10.te Time Period: Day/Night 16/8 hours**
**Description: 2036 Maple Grove to Queen Day 65 Free Field**

Road data, segment # 1: Hespeler (day/night)
---
Car traffic volume : 31589/3510 veh/TimePeriod *
Medium truck volume : 1114/124 veh/TimePeriod *
Heavy truck volume : 3234/359 veh/TimePeriod *
Posted speed limit : 80 km/h
Road gradient : 1 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 39930
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 3.10
Heavy Truck % of Total Volume : 9.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Hespeler (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 71.18 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Hespeler (day)
---

Source height = 1.73 m

ROAD (0.00 + 65.00 + 0.00) = 65.00 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 77.62 0.00 -11.18 -1.44 0.00 0.00 0.00 65.00
---

Segment Leq : 65.00 dBA

Total Leq All Segments: 65.00 dBA

Results segment # 1: Hespeler (night)
---

Source height = 1.73 m

ROAD (0.00 + 69.80 + 0.00) = 69.80 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 71.09 0.00 0.00 -1.29 0.00 0.00 0.00 69.80
---

Segment Leq : 69.80 dBA

Total Leq All Segments: 69.80 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.00
(NIGHT): 69.80

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 21:11:36**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2036_10.te Time Period: Day/Night 16/8 hours**
**Description: 2036 Maple Grove to Queen Day 60 Free Field**

Road data, segment # 1: Hespeler (day/night)
---
Car traffic volume : 31589/3510 veh/TimePeriod *
Medium truck volume : 1114/124 veh/TimePeriod *
Heavy truck volume : 3234/359 veh/TimePeriod *
Posted speed limit : 80 km/h
Road gradient : 1 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 39930
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 3.10
Heavy Truck % of Total Volume : 9.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Hespeler (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 142.88 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Hespeler (day)
---

Source height = 1.73 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 77.62 0.00 -16.18 -1.44 0.00 0.00 0.00 60.00
---

Segment Leq : 60.00 dBA

Total Leq All Segments: 60.00 dBA

Results segment # 1: Hespeler (night)
---

Source height = 1.73 m

ROAD (0.00 + 69.80 + 0.00) = 69.80 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 71.09 0.00 0.00 -1.29 0.00 0.00 0.00 69.80
---

Segment Leq : 69.80 dBA

Total Leq All Segments: 69.80 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.00
(NIGHT): 69.80

# 2041 FREE FIELD ANALYSIS

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:16:49**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2041_1.te Time Period: Day/Night 16/8 hours**
**Description: 2041 Fountain to Vondrau Day 65 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 30015/3335 veh/TimePeriod *
Medium truck volume : 326/36 veh/TimePeriod *
Heavy truck volume : 2284/254 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 36250
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 7.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 50.17 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.63 m

ROAD (0.00 + 65.00 + 0.00) = 65.00 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.66 75.13 0.00 -8.68 -1.45 0.00 0.00 0.00 65.00
---

Segment Leq : 65.00 dBA

Total Leq All Segments: 65.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.63 m

ROAD (0.00 + 67.31 + 0.00) = 67.31 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 68.60 0.00 0.00 -1.30 0.00 0.00 0.00 67.31
---

Segment Leq : 67.31 dBA

Total Leq All Segments: 67.31 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.00
(NIGHT): 67.31

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:17:20**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2041_1.te Time Period: Day/Night 16/8 hours**
**Description: 2041 Fountain to Vondrau Day 60 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 30015/3335 veh/TimePeriod *
Medium truck volume : 326/36 veh/TimePeriod *
Heavy truck volume : 2284/254 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 36250
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 7.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 100.49 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.63 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.66 | 75.13 | 0.00 | -13.68 | -1.45 | 0.00 | 0.00 | 0.00 | 60.00 |

Segment Leq : 60.00 dBA

Total Leq All Segments: 60.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.63 m

ROAD (0.00 + 67.31 + 0.00) = 67.31 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 68.60 | 0.00 | 0.00 | -1.30 | 0.00 | 0.00 | 0.00 | 67.31 |

Segment Leq : 67.31 dBA

Total Leq All Segments: 67.31 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.00
(NIGHT): 67.31

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:22:18**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2041_2.te Time Period: Day/Night 16/8 hours**
**Description: 2041 Vondrau to Boxwood Day 65 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 29403/3267 veh/TimePeriod *
Medium truck volume : 310/34 veh/TimePeriod *
Heavy truck volume : 1238/138 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 34390
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 38.92 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 65.00 + 0.00) = 65.00 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.66 | 73.33 | 0.00 | -6.87 | -1.46 | 0.00 | 0.00 | 0.00 | 65.00 |

Segment Leq : 65.00 dBA

Total Leq All Segments: 65.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.42 m

ROAD (0.00 + 65.50 + 0.00) = 65.50 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 66.81 | 0.00 | 0.00 | -1.31 | 0.00 | 0.00 | 0.00 | 65.50 |

Segment Leq : 65.50 dBA

Total Leq All Segments: 65.50 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.00
(NIGHT): 65.50

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:22:41**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2041_2.te Time Period: Day/Night 16/8 hours**
**Description: 2041 Vondrau to Boxwood Day 60 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 29403/3267 veh/TimePeriod *
Medium truck volume : 310/34 veh/TimePeriod *
Heavy truck volume : 1238/138 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 34390
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 77.87 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.66 | 73.33 | 0.00 | -11.87 | -1.46 | 0.00 | 0.00 | 0.00 | 60.00 |

Segment Leq : 60.00 dBA

Total Leq All Segments: 60.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.42 m

ROAD (0.00 + 65.50 + 0.00) = 65.50 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 66.81 | 0.00 | 0.00 | -1.31 | 0.00 | 0.00 | 0.00 | 65.50 |

Segment Leq : 65.50 dBA

Total Leq All Segments: 65.50 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.00
(NIGHT): 65.50

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:30:33**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2041_3.te Time Period: Day/Night 16/8 hours**
**Description: 2041 Boxwood to Speedsville Day 65 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 28933/3215 veh/TimePeriod *
Medium truck volume : 308/34 veh/TimePeriod *
Heavy truck volume : 1539/171 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 1 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 34200
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 42.12 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 65.00 + 0.00) = 65.00 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.66 | 73.90 | 0.00 | -7.44 | -1.46 | 0.00 | 0.00 | 0.00 | 65.00 |

Segment Leq : 65.00 dBA

Total Leq All Segments: 65.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 66.06 + 0.00) = 66.06 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 67.37 | 0.00 | 0.00 | -1.30 | 0.00 | 0.00 | 0.00 | 66.06 |

Segment Leq : 66.06 dBA

Total Leq All Segments: 66.06 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.00
(NIGHT): 66.06

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:30:56**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2041_3.te Time Period: Day/Night 16/8 hours**
**Description: 2041 Boxwood to Speedsville Day 60 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 28933/3215 veh/TimePeriod *
Medium truck volume : 308/34 veh/TimePeriod *
Heavy truck volume : 1539/171 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 1 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 34200
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 84.27 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.66 73.90 0.00 -12.44 -1.46 0.00 0.00 0.00 60.00
---
Segment Leq : 60.00 dBA

Total Leq All Segments: 60.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 66.06 + 0.00) = 66.06 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 67.37 0.00 0.00 -1.30 0.00 0.00 0.00 0.00 66.06
---
Segment Leq : 66.06 dBA

Total Leq All Segments: 66.06 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.00
(NIGHT): 66.06

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:35:50**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2041_4.te Time Period: Day/Night 16/8 hours**
**Description: 2041 Speedsville to Briardeen Day 65 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 25541/2838 veh/TimePeriod *
Medium truck volume : 272/30 veh/TimePeriod *
Heavy truck volume : 1359/151 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 30190
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 42.77 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 65.00 + 0.00) = 65.00 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.66 74.01 0.00 -7.55 -1.46 0.00 0.00 0.00 0.00 65.00
---
Segment Leq : 65.00 dBA

Total Leq All Segments: 65.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 66.18 + 0.00) = 66.18 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 67.48 0.00 0.00 -1.30 0.00 0.00 0.00 0.00 66.18
---
Segment Leq : 66.18 dBA

Total Leq All Segments: 66.18 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.00
(NIGHT): 66.18

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:36:23**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2041_4.te Time Period: Day/Night 16/8 hours**
**Description: 2041 Speedsville to Briardeen Day 60 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 25541/2838 veh/TimePeriod *
Medium truck volume : 272/30 veh/TimePeriod *
Heavy truck volume : 1359/151 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 30190
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 85.57 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.66 | 74.01 | 0.00 | -12.55 | -1.46 | 0.00 | 0.00 | 0.00 | 60.00 |

Segment Leq : 60.00 dBA

Total Leq All Segments: 60.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 66.18 + 0.00) = 66.18 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 67.48 | 0.00 | 0.00 | -1.30 | 0.00 | 0.00 | 0.00 | 66.18 |

Segment Leq : 66.18 dBA

Total Leq All Segments: 66.18 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.00
(NIGHT): 66.18

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:42:04**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2041_5.te Time Period: Day/Night 16/8 hours**
**Description: 2041 Briardeen to Compass Trail Day 65 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 25321/2813 veh/TimePeriod *
Medium truck volume : 269/30 veh/TimePeriod *
Heavy truck volume : 1347/150 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 29930
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 42.53 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 65.00 + 0.00) = 65.00 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.66 | 73.97 | 0.00 | -7.51 | -1.46 | 0.00 | 0.00 | 0.00 | 65.00 |

Segment Leq : 65.00 dBA

Total Leq All Segments: 65.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 66.15 + 0.00) = 66.15 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 67.45 | 0.00 | 0.00 | -1.30 | 0.00 | 0.00 | 0.00 | 66.15 |

Segment Leq : 66.15 dBA

Total Leq All Segments: 66.15 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.00
(NIGHT): 66.15

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:42:33**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2041_5.te Time Period: Day/Night 16/8 hours**
**Description: 2041 Briardeen to Compass Trail Day 60 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 25321/2813 veh/TimePeriod *
Medium truck volume : 269/30 veh/TimePeriod *
Heavy truck volume : 1347/150 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 29930
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 85.10 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.66 | 73.97 | 0.00 | -12.51 | -1.46 | 0.00 | 0.00 | 0.00 | 60.00 |

Segment Leq : 60.00 dBA

Total Leq All Segments: 60.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 66.15 + 0.00) = 66.15 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 67.45 | 0.00 | 0.00 | -1.30 | 0.00 | 0.00 | 0.00 | 66.15 |

Segment Leq : 66.15 dBA

Total Leq All Segments: 66.15 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.00
(NIGHT): 66.15

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:47:36**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2041_6.te Time Period: Day/Night 16/8 hours**
**Description: 2041 Compass Trail to Old Maple Grove Day 65 Free**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 25633/2848 veh/TimePeriod *
Medium truck volume : 270/30 veh/TimePeriod *
Heavy truck volume : 1079/120 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 29980
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 38.98 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 65.00 + 0.00) = 65.00 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.66 | 73.34 | 0.00 | -6.88 | -1.46 | 0.00 | 0.00 | 0.00 | 65.00 |

Segment Leq : 65.00 dBA

Total Leq All Segments: 65.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 65.50 + 0.00) = 65.50 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 66.81 | 0.00 | 0.00 | -1.31 | 0.00 | 0.00 | 0.00 | 65.50 |

Segment Leq : 65.50 dBA

Total Leq All Segments: 65.50 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.00
(NIGHT): 65.50

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:47:58**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2041_6.te Time Period: Day/Night 16/8 hours**
**Description: 2041 Compass Trail to Old Maple Grove Day 60 Free**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 25633/2848 veh/TimePeriod *
Medium truck volume : 270/30 veh/TimePeriod *
Heavy truck volume : 1079/120 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 29980
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 77.99 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.66 | 73.34 | 0.00 | -11.88 | -1.46 | 0.00 | 0.00 | 0.00 | 60.00 |

Segment Leq : 60.00 dBA

Total Leq All Segments: 60.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 65.50 + 0.00) = 65.50 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 66.81 | 0.00 | 0.00 | -1.31 | 0.00 | 0.00 | 0.00 | 65.50 |

Segment Leq : 65.50 dBA

Total Leq All Segments: 65.50 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.00
(NIGHT): 65.50

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:51:45**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2041_7.te Time Period: Day/Night 16/8 hours**
**Description: 2041 Old Maple Grove to Beaverdale Day 65 Free**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 23443/2605 veh/TimePeriod *
Medium truck volume : 249/28 veh/TimePeriod *
Heavy truck volume : 1247/139 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 27710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 40.64 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 65.00 + 0.00) = 65.00 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.66 73.64 0.00 -7.19 -1.46 0.00 0.00 0.00 65.00
---

Segment Leq : 65.00 dBA

Total Leq All Segments: 65.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 65.82 + 0.00) = 65.82 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 67.12 0.00 0.00 -1.30 0.00 0.00 0.00 65.82
---

Segment Leq : 65.82 dBA

Total Leq All Segments: 65.82 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.00
(NIGHT): 65.82

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:52:01**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2041_7.te Time Period: Day/Night 16/8 hours**
**Description: 2041 Old Maple Grove to Beaverdale Day 60 Free**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 23443/2605 veh/TimePeriod *
Medium truck volume : 249/28 veh/TimePeriod *
Heavy truck volume : 1247/139 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 27710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 40.64 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 65.00 + 0.00) = 65.00 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.66 73.64 0.00 -7.19 -1.46 0.00 0.00 0.00 65.00
---

Segment Leq : 65.00 dBA

Total Leq All Segments: 65.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 65.82 + 0.00) = 65.82 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 67.12 0.00 0.00 -1.30 0.00 0.00 0.00 65.82
---

Segment Leq : 65.82 dBA

Total Leq All Segments: 65.82 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.00
(NIGHT): 65.82

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:58:21**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2041_8.te Time Period: Day/Night 16/8 hours**
**Description: 2041 Beaverdale to Hespeler Day 65 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 24017/2669 veh/TimePeriod *
Medium truck volume : 253/28 veh/TimePeriod *
Heavy truck volume : 1011/112 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 28090
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 37.50 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 64.99 + 0.00) = 64.99 dBA

Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.66 73.06 0.00 -6.61 -1.46 0.00 0.00 0.00 64.99
---
Segment Leq : 64.99 dBA

Total Leq All Segments: 64.99 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 65.21 + 0.00) = 65.21 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 66.52 0.00 0.00 -1.31 0.00 0.00 0.00 65.21
---

Segment Leq : 65.21 dBA

Total Leq All Segments: 65.21 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 64.99
(NIGHT): 65.21

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 20:59:46**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2041_8.te Time Period: Day/Night 16/8 hours**
**Description: 2041 Beaverdale to Hespeler Day 60 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 24017/2669 veh/TimePeriod *
Medium truck volume : 253/28 veh/TimePeriod *
Heavy truck volume : 1011/112 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 28090
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 74.97 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.66 73.06 0.00 -11.60 -1.46 0.00 0.00 0.00 60.00
---

Segment Leq : 60.00 dBA

Total Leq All Segments: 60.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 65.21 + 0.00) = 65.21 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 66.52 0.00 0.00 -1.31 0.00 0.00 0.00 65.21
---

Segment Leq : 65.21 dBA

Total Leq All Segments: 65.21 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.00
(NIGHT): 65.21

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 21:06:11**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2041_1.te Time Period: Day/Night 16/8 hours**
**Description: 2041 Guelph to Maple Grove Day 65 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 30015/3335 veh/TimePeriod *
Medium truck volume : 326/36 veh/TimePeriod *
Heavy truck volume : 2284/254 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 36250
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 7.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 50.17 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.63 m

ROAD (0.00 + 65.00 + 0.00) = 65.00 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.66 | 75.13 | 0.00 | -8.68 | -1.45 | 0.00 | 0.00 | 0.00 | 65.00 |

Segment Leq : 65.00 dBA

Total Leq All Segments: 65.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.63 m

ROAD (0.00 + 67.31 + 0.00) = 67.31 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 68.60 | 0.00 | 0.00 | -1.30 | 0.00 | 0.00 | 0.00 | 67.31 |

Segment Leq : 67.31 dBA

Total Leq All Segments: 67.31 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.00
(NIGHT): 67.31

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 21:06:35**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2041_1.te Time Period: Day/Night 16/8 hours**
**Description: 2041 Guelph to Maple Grove Day 60 Free Field**

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 30015/3335 veh/TimePeriod *
Medium truck volume : 326/36 veh/TimePeriod *
Heavy truck volume : 2284/254 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 36250
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 7.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 100.49 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.63 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA

Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.66 75.13 0.00 -13.68 -1.45 0.00 0.00 0.00 60.00
---
Segment Leq : 60.00 dBA

Total Leq All Segments: 60.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.63 m

ROAD (0.00 + 67.31 + 0.00) = 67.31 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 68.60 0.00 0.00 -1.30 0.00 0.00 0.00 67.31
---
Segment Leq : 67.31 dBA

Total Leq All Segments: 67.31 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.00
(NIGHT): 67.31

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 21:12:43**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2041_10.te Time Period: Day/Night 16/8 hours**
**Description: 2041 Maple Grove to Queen Day 65 Free Field**

Road data, segment # 1: Hespeler (day/night)
---
Car traffic volume : 34278/3809 veh/TimePeriod *
Medium truck volume : 1209/134 veh/TimePeriod *
Heavy truck volume : 3510/390 veh/TimePeriod *
Posted speed limit : 80 km/h
Road gradient : 1 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 43330
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 3.10
Heavy Truck % of Total Volume : 9.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Hespeler (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 74.80 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Hespeler (day)
---

Source height = 1.73 m

ROAD (0.00 + 65.00 + 0.00) = 65.00 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 77.98 0.00 -11.54 -1.44 0.00 0.00 0.00 65.00
---

Segment Leq : 65.00 dBA

Total Leq All Segments: 65.00 dBA

Results segment # 1: Hespeler (night)
---

Source height = 1.73 m

ROAD (0.00 + 70.16 + 0.00) = 70.16 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 71.45 0.00 0.00 -1.29 0.00 0.00 0.00 70.16
---

Segment Leq : 70.16 dBA

Total Leq All Segments: 70.16 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.00
(NIGHT): 70.16

**STAMSON 5.0 NORMAL REPORT**
**Date: 27-07-2021 21:13:05**
**MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT**

**Filename: 2041_10.te Time Period: Day/Night 16/8 hours**
**Description: 2041 Maple Grove to Queen Day 60 Free Field**

Road data, segment # 1: Hespeler (day/night)
---
Car traffic volume : 34278/3809 veh/TimePeriod *
Medium truck volume : 1209/134 veh/TimePeriod *
Heavy truck volume : 3510/390 veh/TimePeriod *
Posted speed limit : 80 km/h
Road gradient : 1 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 43330
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 3.10
Heavy Truck % of Total Volume : 9.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Hespeler (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 149.99 / 15.00 m
Receiver height : 1.50 / 4.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Hespeler (day)
---

Source height = 1.73 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 77.98 0.00 -16.53 -1.44 0.00 0.00 0.00 60.00
---

Segment Leq : 60.00 dBA

Total Leq All Segments: 60.00 dBA

Results segment # 1: Hespeler (night)
---

Source height = 1.73 m

ROAD (0.00 + 70.16 + 0.00) = 70.16 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 71.45 0.00 0.00 -1.29 0.00 0.00 0.00 70.16
---

Segment Leq : 70.16 dBA

Total Leq All Segments: 70.16 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.00
(NIGHT): 70.16

# RECEIVER 1 – NOISE LEVELS

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:08:09
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 1_1B.te Time Period: Day/Night 16/8 hours
Description: Receiver 1 - Option 1 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 22317/2480 veh/TimePeriod *
Medium truck volume : 237/26 veh/TimePeriod *
Heavy truck volume : 1187/132 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 26380
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 38.50 / 38.50 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 0.24 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 65.21 + 0.00) = 65.21 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 73.42 0.00 -6.77 -1.44 0.00 0.00 0.00 65.21
---

Segment Leq : 65.21 dBA

Total Leq All Segments: 65.21 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 59.21 + 0.00) = 59.21 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 66.89 0.00 -6.40 -1.29 0.00 0.00 0.00 59.21
---

Segment Leq : 59.21 dBA

Total Leq All Segments: 59.21 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.21
(NIGHT): 59.21

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:08:17
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 2_1B.te Time Period: Day/Night 16/8 hours
Description: Receiver 2 - Option 1 (2036)

Road data, segment # 1: Maple Grove (day/night)
---

Car traffic volume : 20905/2323
veh/TimePeriod *
Medium truck volume : 222/25
veh/TimePeriod *
Heavy truck volume : 1112/124
veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 24710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 62.60 / 62.60 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 0.33 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 61.46 + 0.00) = 61.46 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 73.14 0.00 -10.24 -1.44 0.00 0.00 0.00 61.46
---

Segment Leq : 61.46 dBA

Total Leq All Segments: 61.46 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 55.66 + 0.00) = 55.66 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 66.62 0.00 -9.68 -1.28 0.00 0.00 0.00 55.66
---

Segment Leq : 55.66 dBA

Total Leq All Segments: 55.66 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.46
(NIGHT): 55.66

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:08:21
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 3_1B.te Time Period: Day/Night 16/8 hours
Description: Receiver 3 - Option 1 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 20905/2323
veh/TimePeriod *
Medium truck volume : 222/25
veh/TimePeriod *
Heavy truck volume : 1112/124
veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 24710

Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 91.60 / 91.60 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 0.30 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 58.72 + 0.00) = 58.72 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 73.14 0.00 -12.97 -1.44 0.00 0.00 0.00 58.72
---

Segment Leq : 58.72 dBA

Total Leq All Segments: 58.72 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 53.07 + 0.00) = 53.07 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 66.62 0.00 -12.27 -1.29 0.00 0.00 0.00 53.07
---

Segment Leq : 53.07 dBA

Total Leq All Segments: 53.07 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 58.72
(NIGHT): 53.07

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:08:25
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 4_1B.te Time Period: Day/Night 16/8 hours
Description: Receiver 4 - Option 1 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 20905/2323 veh/TimePeriod *
Medium truck volume : 222/25 veh/TimePeriod *
Heavy truck volume : 1112/124 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 24710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 92.40 / 92.40 m
Receiver height : 1.50 / 4.50 m

Topography : 3 (Elevated; no barrier)
Elevation : 0.81 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 58.81 + 0.00) = 58.81 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.64 73.14 0.00 -12.92 -1.42 0.00 0.00 0.00 58.81
---

Segment Leq : 58.81 dBA

Total Leq All Segments: 58.81 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 53.16 + 0.00) = 53.16 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.55 66.62 0.00 -12.21 -1.26 0.00 0.00 0.00 53.16
---

Segment Leq : 53.16 dBA

Total Leq All Segments: 53.16 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 58.81
(NIGHT): 53.16

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:08:52

MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 5_1B.te Time Period: Day/Night 16/8 hours
Description: Receiver 5 - Option 1 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 20905/2323 veh/TimePeriod *
Medium truck volume : 222/25 veh/TimePeriod *
Heavy truck volume : 1112/124 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 24710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 62.40 / 62.40 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 1.22 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 61.69 + 0.00) = 61.69 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

---
-90 90 0.62 73.14 0.00 -10.05 -1.40 0.00 0.00 0.00 61.69
---

Segment Leq : 61.69 dBA

Total Leq All Segments: 61.69 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 55.89 + 0.00) = 55.89 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.53 66.62 0.00 -9.49 -1.24 0.00 0.00 0.00 55.89
---

Segment Leq : 55.89 dBA

Total Leq All Segments: 55.89 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.69
(NIGHT): 55.89

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:08:58
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 6_1B.te Time Period: Day/Night 16/8 hours
Description: Receiver 6 - Option 1 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 20905/2323 veh/TimePeriod *
Medium truck volume : 222/25 veh/TimePeriod *
Heavy truck volume : 1112/124 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 24710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 32.90 / 32.90 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 0.29 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 66.07 + 0.00) = 66.07 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 73.14 0.00 -5.63 -1.44 0.00 0.00 0.00 66.07
---

Segment Leq : 66.07 dBA

Total Leq All Segments: 66.07 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 60.01 + 0.00) = 60.01 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 66.62 0.00 -5.33 -1.29 0.00 0.00 0.00 0.00 60.01
---

Segment Leq : 60.01 dBA

Total Leq All Segments: 60.01 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 66.07
(NIGHT): 60.01

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:09:26
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 7_1B.te Time Period: Day/Night 16/8 hours
Description: Receiver 7 - Option 1 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 21563/2396 veh/TimePeriod *
Medium truck volume : 227/25 veh/TimePeriod *
Heavy truck volume : 908/101 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 25220
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 25.00 / 25.00 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 1.02 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 67.56 + 0.00) = 67.56 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.63 72.59 0.00 -3.62 -1.41 0.00 0.00 0.00 0.00 67.56
---

Segment Leq : 67.56 dBA

Total Leq All Segments: 67.56 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 61.39 + 0.00) = 61.39 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.54 66.06 0.00 -3.42 -1.25 0.00 0.00 0.00 0.00 61.39
---

Segment Leq : 61.39 dBA

Total Leq All Segments: 61.39 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 67.56
(NIGHT): 61.39

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:09:41
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 8_1B.te Time Period: Day/Night 16/8 hours
Description: Receiver 8 - Option 1 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 21563/2396 veh/TimePeriod *
Medium truck volume : 227/25 veh/TimePeriod *
Heavy truck volume : 908/101 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 25220
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 90.20 / 90.20 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 2.32 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 58.84 + 0.00) = 58.84 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.59 72.59 0.00 -12.41 -1.34 0.00 0.00 0.00 58.84
---

Segment Leq : 58.84 dBA

Total Leq All Segments: 58.84 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 53.17 + 0.00) = 53.17 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.50 66.06 0.00 -11.71 -1.18 0.00 0.00 0.00 53.17
---

Segment Leq : 53.17 dBA

Total Leq All Segments: 53.17 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 58.84
(NIGHT): 53.17

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:09:43
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 9_1B.te Time Period: Day/Night 16/8 hours
Description: Receiver 9 - Option 1 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 21563/2396 veh/TimePeriod *
Medium truck volume : 227/25 veh/TimePeriod *
Heavy truck volume : 908/101 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 25220
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 53.20 / 53.20 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 2.66 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 62.56 + 0.00) = 62.56 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.58 72.59 0.00 -8.70 -1.32 0.00 0.00 0.00 62.56
---

Segment Leq : 62.56 dBA

Total Leq All Segments: 62.56 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 56.69 + 0.00) = 56.69 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.49 66.06 0.00 -8.21 -1.16 0.00 0.00 0.00 56.69
---

Segment Leq : 56.69 dBA

Total Leq All Segments: 56.69 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 62.56
(NIGHT): 56.69

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:09:45
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 10_1B.te Time Period: Day/Night 16/8 hours
Description: Receiver 10 - Option 1 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 21563/2396 veh/TimePeriod *
Medium truck volume : 227/25 veh/TimePeriod *

Heavy truck volume : 908/101
veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 25220
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 65.60 / 65.60 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 3.16 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 61.24 + 0.00) = 61.24 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 72.59 0.00 -10.05 -1.30 0.00 0.00 0.00 61.24
---

Segment Leq : 61.24 dBA

Total Leq All Segments: 61.24 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 55.46 + 0.00) = 55.46 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.48 66.06 0.00 -9.47 -1.13 0.00 0.00 0.00 55.46
---

Segment Leq : 55.46 dBA

Total Leq All Segments: 55.46 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.24
(NIGHT): 55.46

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:09:54
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 11_1b.te Time Period: Day/Night 16/8 hours
Description: Receiver 11 - Option 1 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 21563/2396
veh/TimePeriod *
Medium truck volume : 227/25
veh/TimePeriod *
Heavy truck volume : 908/101
veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 25220
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00

Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 48.50 / 48.50 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 3.05 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 63.28 + 0.00) = 63.28 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 72.59 0.00 -8.01 -1.30 0.00 0.00 0.00 63.28
---

Segment Leq : 63.28 dBA

Total Leq All Segments: 63.28 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 57.37 + 0.00) = 57.37 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.48 66.06 0.00 -7.55 -1.14 0.00 0.00 0.00 57.37
---

Segment Leq : 57.37 dBA

Total Leq All Segments: 57.37 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 63.28
(NIGHT): 57.37

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:09:51
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 12_1B.te Time Period: Day/Night 16/8 hours
Description: Receiver 12 - Option 1 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 21563/2396 veh/TimePeriod *
Medium truck volume : 227/25 veh/TimePeriod *
Heavy truck volume : 908/101 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 25220
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 44.20 / 44.20 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 4.36 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 64.17 + 0.00) = 64.17 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.53 | 72.59 | 0.00 | -7.19 | -1.23 | 0.00 | 0.00 | 0.00 | 64.17 |

Segment Leq : 64.17 dBA

Total Leq All Segments: 64.17 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 58.23 + 0.00) = 58.23 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.44 | 66.06 | 0.00 | -6.77 | -1.06 | 0.00 | 0.00 | 0.00 | 58.23 |

Segment Leq : 58.23 dBA

Total Leq All Segments: 58.23 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 64.17
(NIGHT): 58.23

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:08:09
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 1_1B.te Time Period: Day/Night 16/8 hours
Description: Receiver 1 - Option 1 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 22317/2480 veh/TimePeriod *
Medium truck volume : 237/26 veh/TimePeriod *
Heavy truck volume : 1187/132 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 26380
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 38.50 / 38.50 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 0.24 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 65.21 + 0.00) = 65.21 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.65 | 73.42 | 0.00 | -6.77 | -1.44 | 0.00 | 0.00 | 0.00 | 65.21 |

Segment Leq : 65.21 dBA

Total Leq All Segments: 65.21 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 59.21 + 0.00) = 59.21 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.56 | 66.89 | 0.00 | -6.40 | -1.29 | 0.00 | 0.00 | 0.00 | 59.21 |

Segment Leq : 59.21 dBA

Total Leq All Segments: 59.21 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.21
(NIGHT): 59.21

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:08:17
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 2_1B.te Time Period: Day/Night 16/8 hours
Description: Receiver 2 - Option 1 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 20905/2323 veh/TimePeriod *

Medium truck volume : 222/25
veh/TimePeriod *
Heavy truck volume : 1112/124
veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 24710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 62.60 / 62.60 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 0.33 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 61.46 + 0.00) = 61.46 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 73.14 0.00 -10.24 -1.44 0.00 0.00 0.00 61.46
---

Segment Leq : 61.46 dBA

Total Leq All Segments: 61.46 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 55.66 + 0.00) = 55.66 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 66.62 0.00 -9.68 -1.28 0.00 0.00 0.00 55.66
---

Segment Leq : 55.66 dBA

Total Leq All Segments: 55.66 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.46
(NIGHT): 55.66

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:08:21
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 3_1B.te Time Period: Day/Night 16/8 hours
Description: Receiver 3 - Option 1 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 20905/2323
veh/TimePeriod *
Medium truck volume : 222/25
veh/TimePeriod *
Heavy truck volume : 1112/124
veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 24710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00

Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 91.60 / 91.60 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 0.30 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 58.72 + 0.00) = 58.72 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 73.14 0.00 -12.97 -1.44 0.00 0.00 0.00 58.72
---

Segment Leq : 58.72 dBA

Total Leq All Segments: 58.72 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 53.07 + 0.00) = 53.07 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 66.62 0.00 -12.27 -1.29 0.00 0.00 0.00 53.07
---

Segment Leq : 53.07 dBA

Total Leq All Segments: 53.07 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 58.72
(NIGHT): 53.07

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:08:25
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 4_1B.te Time Period: Day/Night 16/8 hours
Description: Receiver 4 - Option 1 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 20905/2323 veh/TimePeriod *
Medium truck volume : 222/25 veh/TimePeriod *
Heavy truck volume : 1112/124 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 24710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 92.40 / 92.40 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)

Elevation : 0.81 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 58.81 + 0.00) = 58.81 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.64 73.14 0.00 -12.92 -1.42 0.00 0.00 0.00 58.81
---

Segment Leq : 58.81 dBA

Total Leq All Segments: 58.81 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 53.16 + 0.00) = 53.16 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.55 66.62 0.00 -12.21 -1.26 0.00 0.00 0.00 53.16
---

Segment Leq : 53.16 dBA

Total Leq All Segments: 53.16 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 58.81
(NIGHT): 53.16

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:08:52
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 5_1B.te Time Period: Day/Night 16/8 hours
Description: Receiver 5 - Option 1 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 20905/2323 veh/TimePeriod *
Medium truck volume : 222/25 veh/TimePeriod *
Heavy truck volume : 1112/124 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 24710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 62.40 / 62.40 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 1.22 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 61.69 + 0.00) = 61.69 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---

-90 90 0.62 73.14 0.00 -10.05 -1.40
0.00 0.00 0.00 61.69
---

Segment Leq : 61.69 dBA

Total Leq All Segments: 61.69 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 55.89 + 0.00) = 55.89 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj
F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.53 66.62 0.00 -9.49 -1.24
0.00 0.00 0.00 55.89
---

Segment Leq : 55.89 dBA

Total Leq All Segments: 55.89 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.69
(NIGHT): 55.89

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:08:58
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 6_1B.te Time Period: Day/Night 16/8 hours
Description: Receiver 6 - Option 1 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 20905/2323 veh/TimePeriod *
Medium truck volume : 222/25 veh/TimePeriod *
Heavy truck volume : 1112/124 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 24710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 32.90 / 32.90 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 0.29 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 66.07 + 0.00) = 66.07 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj
F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 73.14 0.00 -5.63 -1.44
0.00 0.00 0.00 66.07
---

Segment Leq : 66.07 dBA

Total Leq All Segments: 66.07 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 60.01 + 0.00) = 60.01 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 66.62 0.00 -5.33 -1.29 0.00 0.00 0.00 0.00 60.01
---

Segment Leq : 60.01 dBA

Total Leq All Segments: 60.01 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 66.07
(NIGHT): 60.01

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:09:26
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 7_1B.te Time Period: Day/Night 16/8 hours
Description: Receiver 7 - Option 1 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 21563/2396 veh/TimePeriod *
Medium truck volume : 227/25 veh/TimePeriod *
Heavy truck volume : 908/101 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 25220
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 25.00 / 25.00 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 1.02 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 67.56 + 0.00) = 67.56 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.63 72.59 0.00 -3.62 -1.41 0.00 0.00 0.00 0.00 67.56
---

Segment Leq : 67.56 dBA

Total Leq All Segments: 67.56 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 61.39 + 0.00) = 61.39 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.54 66.06 0.00 -3.42 -1.25 0.00 0.00 0.00 0.00 61.39
---

Segment Leq : 61.39 dBA

Total Leq All Segments: 61.39 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 67.56
(NIGHT): 61.39

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:09:41
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 8_1B.te Time Period: Day/Night 16/8 hours
Description: Receiver 8 - Option 1 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 21563/2396 veh/TimePeriod *
Medium truck volume : 227/25 veh/TimePeriod *
Heavy truck volume : 908/101 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 25220
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 90.20 / 90.20 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 2.32 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 58.84 + 0.00) = 58.84 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.59 | 72.59 | 0.00 | -12.41 | -1.34 | 0.00 | 0.00 | 0.00 | 58.84 |

Segment Leq : 58.84 dBA

Total Leq All Segments: 58.84 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 53.17 + 0.00) = 53.17 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.50 | 66.06 | 0.00 | -11.71 | -1.18 | 0.00 | 0.00 | 0.00 | 53.17 |

Segment Leq : 53.17 dBA

Total Leq All Segments: 53.17 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 58.84
(NIGHT): 53.17

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:09:43
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 9_1B.te Time Period: Day/Night 16/8 hours
Description: Receiver 9 - Option 1 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 21563/2396 veh/TimePeriod *
Medium truck volume : 227/25 veh/TimePeriod *
Heavy truck volume : 908/101 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 25220
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 53.20 / 53.20 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 2.66 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 62.56 + 0.00) = 62.56 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.58 72.59 0.00 -8.70 -1.32 0.00 0.00 0.00 62.56

---

Segment Leq : 62.56 dBA

Total Leq All Segments: 62.56 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 56.69 + 0.00) = 56.69 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.49 66.06 0.00 -8.21 -1.16 0.00 0.00 0.00 56.69

---

Segment Leq : 56.69 dBA

Total Leq All Segments: 56.69 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 62.56
(NIGHT): 56.69

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:09:45
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 10_1B.te Time Period: Day/Night 16/8 hours
Description: Receiver 10 - Option 1 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 21563/2396 veh/TimePeriod *
Medium truck volume : 227/25 veh/TimePeriod *
Heavy truck volume : 908/101 veh/TimePeriod *
Posted speed limit : 70 km/h

Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 25220
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 65.60 / 65.60 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 3.16 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 61.24 + 0.00) = 61.24 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 72.59 0.00 -10.05 -1.30 0.00 0.00 0.00 61.24
---

Segment Leq : 61.24 dBA

Total Leq All Segments: 61.24 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 55.46 + 0.00) = 55.46 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.48 66.06 0.00 -9.47 -1.13 0.00 0.00 0.00 55.46
---

Segment Leq : 55.46 dBA

Total Leq All Segments: 55.46 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.24
(NIGHT): 55.46

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:09:54
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 11_1b.te Time Period: Day/Night 16/8 hours
Description: Receiver 11 - Option 1 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 21563/2396 veh/TimePeriod *
Medium truck volume : 227/25 veh/TimePeriod *
Heavy truck volume : 908/101 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 25220
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 48.50 / 48.50 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 3.05 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 63.28 + 0.00) = 63.28 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 72.59 0.00 -8.01 -1.30 0.00 0.00 0.00 63.28
---

Segment Leq : 63.28 dBA

Total Leq All Segments: 63.28 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 57.37 + 0.00) = 57.37 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.48 66.06 0.00 -7.55 -1.14 0.00 0.00 0.00 57.37
---

Segment Leq : 57.37 dBA

Total Leq All Segments: 57.37 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 63.28
(NIGHT): 57.37

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:09:51
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 12_1B.te Time Period: Day/Night 16/8 hours
Description: Receiver 12 - Option 1 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 21563/2396 veh/TimePeriod *
Medium truck volume : 227/25 veh/TimePeriod *
Heavy truck volume : 908/101 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 25220
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 44.20 / 44.20 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 4.36 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 64.17 + 0.00) = 64.17 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj
F.Adj  W.Adj  H.Adj  B.Adj SubLeq
---
---
  -90     90   0.53  72.59   0.00  -7.19  -1.23
0.00   0.00   0.00  64.17
---
---

Segment Leq : 64.17 dBA

Total Leq All Segments: 64.17 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 58.23 + 0.00) = 58.23 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj
F.Adj  W.Adj  H.Adj  B.Adj SubLeq
---
---
  -90     90   0.44  66.06   0.00  -6.77  -1.06
0.00   0.00   0.00  58.23
---
---

Segment Leq : 58.23 dBA

Total Leq All Segments: 58.23 dBA

TOTAL Leq FROM ALL SOURCES (DAY):
64.17
(NIGHT): 58.23

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:10:02
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 1_1C.te Time Period: Day/Night 16/8 hours
Description: Receiver 1 - Option 1 (2041)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 25321/2813 veh/TimePeriod *
Medium truck volume : 269/30 veh/TimePeriod *
Heavy truck volume : 1347/150 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 29930
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 38.50 / 38.50 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 0.24 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 65.76 + 0.00) = 65.76 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.65 | 73.97 | 0.00 | -6.77 | -1.44 | 0.00 | 0.00 | 0.00 | 65.76 |

Segment Leq : 65.76 dBA

Total Leq All Segments: 65.76 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 59.76 + 0.00) = 59.76 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.56 | 67.45 | 0.00 | -6.40 | -1.29 | 0.00 | 0.00 | 0.00 | 59.76 |

Segment Leq : 59.76 dBA

Total Leq All Segments: 59.76 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.76
(NIGHT): 59.76

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:12:54
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 2_1C.te Time Period: Day/Night 16/8 hours
Description: Receiver 2 - Option 1 (2041)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 23443/2605 veh/TimePeriod *

Medium truck volume : 249/28
veh/TimePeriod *
Heavy truck volume : 1247/139
veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 27710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 62.60 / 62.60 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 0.33 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 61.96 + 0.00) = 61.96 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 73.64 0.00 -10.24 -1.44 0.00 0.00 0.00 61.96
---

Segment Leq : 61.96 dBA

Total Leq All Segments: 61.96 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 56.15 + 0.00) = 56.15 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 67.12 0.00 -9.68 -1.28 0.00 0.00 0.00 56.15
---

Segment Leq : 56.15 dBA

Total Leq All Segments: 56.15 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.96
(NIGHT): 56.15

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:13:09
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 3_1C.te Time Period: Day/Night 16/8 hours
Description: Receiver 3 - Option 1 (2041)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 23443/2605
veh/TimePeriod *
Medium truck volume : 249/28
veh/TimePeriod *
Heavy truck volume : 1247/139
veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 27710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00

Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 91.60 / 91.60 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 0.30 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 59.22 + 0.00) = 59.22 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 73.64 0.00 -12.97 -1.44 0.00 0.00 0.00 59.22
---

Segment Leq : 59.22 dBA

Total Leq All Segments: 59.22 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 53.56 + 0.00) = 53.56 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 67.12 0.00 -12.27 -1.29 0.00 0.00 0.00 53.56
---

Segment Leq : 53.56 dBA

Total Leq All Segments: 53.56 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.22
(NIGHT): 53.56

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:13:23
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 4_1C.te Time Period: Day/Night 16/8 hours
Description: Receiver 4 - Option 1 (2041)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 23443/2605 veh/TimePeriod *
Medium truck volume : 249/28 veh/TimePeriod *
Heavy truck volume : 1247/139 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 27710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 92.40 / 92.40 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)

Elevation : 0.81 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 59.31 + 0.00) = 59.31 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.64 73.64 0.00 -12.92 -1.42 0.00 0.00 0.00 59.31
---

Segment Leq : 59.31 dBA

Total Leq All Segments: 59.31 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 53.65 + 0.00) = 53.65 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.55 67.12 0.00 -12.21 -1.26 0.00 0.00 0.00 53.65
---

Segment Leq : 53.65 dBA

Total Leq All Segments: 53.65 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.31
(NIGHT): 53.65

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:13:28
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 5_1C.te Time Period: Day/Night 16/8 hours
Description: Receiver 5 - Option 1 (2041)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 23443/2605 veh/TimePeriod *
Medium truck volume : 249/28 veh/TimePeriod *
Heavy truck volume : 1247/139 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 27710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 62.40 / 62.40 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 1.22 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 62.19 + 0.00) = 62.19 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---

-90 90 0.62 73.64 0.00 -10.05 -1.40
0.00 0.00 0.00 62.19
---

Segment Leq : 62.19 dBA

Total Leq All Segments: 62.19 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 56.39 + 0.00) = 56.39 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj
F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.53 67.12 0.00 -9.49 -1.24
0.00 0.00 0.00 56.39
---

Segment Leq : 56.39 dBA

Total Leq All Segments: 56.39 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 62.19
(NIGHT): 56.39

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:13:32
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 6_1C.te Time Period: Day/Night 16/8 hours
Description: Receiver 6 - Option 1 (2041)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 23443/2605 veh/TimePeriod *
Medium truck volume : 249/28 veh/TimePeriod *
Heavy truck volume : 1247/139 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 27710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 32.90 / 32.90 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 0.29 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 66.56 + 0.00) = 66.56 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj
F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 73.64 0.00 -5.63 -1.44
0.00 0.00 0.00 66.56
---

Segment Leq : 66.56 dBA

Total Leq All Segments: 66.56 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 60.51 + 0.00) = 60.51 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 67.12 0.00 -5.33 -1.29 0.00 0.00 0.00 0.00 60.51
---

Segment Leq : 60.51 dBA

Total Leq All Segments: 60.51 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 66.56
(NIGHT): 60.51

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:13:42
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 7_1c.te Time Period: Day/Night 16/8 hours
Description: Receiver 7 - Option 1 (2041)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 24017/2669 veh/TimePeriod *
Medium truck volume : 253/28 veh/TimePeriod *
Heavy truck volume : 1011/112 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 28090
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 25.00 / 25.00 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 1.02 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 68.03 + 0.00) = 68.03 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.63 73.06 0.00 -3.62 -1.41 0.00 0.00 0.00 0.00 68.03
---

Segment Leq : 68.03 dBA

Total Leq All Segments: 68.03 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 61.84 + 0.00) = 61.84 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.54 66.52 0.00 -3.42 -1.25 0.00 0.00 0.00 0.00 61.84
---

Segment Leq : 61.84 dBA

Total Leq All Segments: 61.84 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 68.03
(NIGHT): 61.84

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:13:46
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 8_1c.te Time Period: Day/Night 16/8 hours
Description: Receiver 8 - Option 1 (2041)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 24017/2669 veh/TimePeriod *
Medium truck volume : 253/28 veh/TimePeriod *
Heavy truck volume : 1011/112 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 28090
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 90.20 / 90.20 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 2.32 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 59.30 + 0.00) = 59.30 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.59 73.06 0.00 -12.41 -1.34 0.00 0.00 0.00 59.30
---

Segment Leq : 59.30 dBA

Total Leq All Segments: 59.30 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 53.63 + 0.00) = 53.63 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.50 66.52 0.00 -11.71 -1.18 0.00 0.00 0.00 53.63
---

Segment Leq : 53.63 dBA

Total Leq All Segments: 53.63 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.30
(NIGHT): 53.63

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:15:39
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 9_1c.te Time Period: Day/Night 16/8 hours
Description: Receiver 9 - Option 1 (2041)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 24017/2669 veh/TimePeriod *
Medium truck volume : 253/28 veh/TimePeriod *
Heavy truck volume : 1011/112 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 28090
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 53.20 / 53.20 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 2.66 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 63.03 + 0.00) = 63.03 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.58 73.06 0.00 -8.70 -1.32 0.00 0.00 0.00 63.03
---

Segment Leq : 63.03 dBA

Total Leq All Segments: 63.03 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 57.15 + 0.00) = 57.15 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.49 66.52 0.00 -8.21 -1.16 0.00 0.00 0.00 57.15
---

Segment Leq : 57.15 dBA

Total Leq All Segments: 57.15 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 63.03
(NIGHT): 57.15

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:15:43
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 10_1c.te Time Period: Day/Night 16/8 hours
Description: Receiver 10 - Option 1 (2041)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 24017/2669 veh/TimePeriod *
Medium truck volume : 253/28 veh/TimePeriod *
Heavy truck volume : 1011/112 veh/TimePeriod *
Posted speed limit : 70 km/h

Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 28090
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 65.60 / 65.60 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 3.16 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 61.71 + 0.00) = 61.71 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 73.06 0.00 -10.05 -1.30 0.00 0.00 0.00 61.71
---

Segment Leq : 61.71 dBA

Total Leq All Segments: 61.71 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 55.91 + 0.00) = 55.91 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.48 66.52 0.00 -9.47 -1.13 0.00 0.00 0.00 55.91
---

Segment Leq : 55.91 dBA

Total Leq All Segments: 55.91 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.71
(NIGHT): 55.91

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:15:46
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 11_1c.te Time Period: Day/Night 16/8 hours
Description: Receiver 11 - Option 1 (2041)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 24017/2669 veh/TimePeriod *
Medium truck volume : 253/28 veh/TimePeriod *
Heavy truck volume : 1011/112 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 28090
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 48.50 / 48.50 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 3.05 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 63.75 + 0.00) = 63.75 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 73.06 0.00 -8.01 -1.30 0.00 0.00 0.00 63.75
---

Segment Leq : 63.75 dBA

Total Leq All Segments: 63.75 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 57.83 + 0.00) = 57.83 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.48 66.52 0.00 -7.55 -1.14 0.00 0.00 0.00 57.83
---

Segment Leq : 57.83 dBA

Total Leq All Segments: 57.83 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 63.75
(NIGHT): 57.83

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:15:50
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 12_1c.te Time Period: Day/Night 16/8 hours
Description: Receiver 12 - Option 1 (2041)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 24017/2669 veh/TimePeriod *
Medium truck volume : 253/28 veh/TimePeriod *
Heavy truck volume : 1011/112 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 28090
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 44.20 / 44.20 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 4.36 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 64.63 + 0.00) = 64.63 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj
F.Adj  W.Adj  H.Adj  B.Adj SubLeq
---
---
  -90     90   0.53  73.06   0.00  -7.19  -1.23
0.00   0.00   0.00  64.63
---
---

Segment Leq : 64.63 dBA

Total Leq All Segments: 64.63 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 58.69 + 0.00) = 58.69 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj
F.Adj  W.Adj  H.Adj  B.Adj SubLeq
---
---
  -90     90   0.44  66.52   0.00  -6.77  -1.06
0.00   0.00   0.00  58.69
---
---

Segment Leq : 58.69 dBA

Total Leq All Segments: 58.69 dBA

TOTAL Leq FROM ALL SOURCES (DAY):
64.63
(NIGHT): 58.69

# RECEIVER 2 – NOISE LEVELS

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:16:23
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 1_2a.te Time Period: Day/Night 16/8 hours
Description: Receiver 1 - Option 2 (2018)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 16751/1861 veh/TimePeriod *
Medium truck volume : 178/20 veh/TimePeriod *
Heavy truck volume : 891/99 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 19800
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 43.80 / 43.80 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 0.46 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---
Source height = 1.50 m

ROAD (0.00 + 63.08 + 0.00) = 63.08 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 72.18 0.00 -7.66 -1.43 0.00 0.00 0.00 63.08
---

Segment Leq : 63.08 dBA

Total Leq All Segments: 63.08 dBA

Results segment # 1: Maple Grove (night)
---
Source height = 1.50 m

ROAD (0.00 + 57.13 + 0.00) = 57.13 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 65.65 0.00 -7.24 -1.28 0.00 0.00 0.00 57.13
---

Segment Leq : 57.13 dBA

Total Leq All Segments: 57.13 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 63.08
(NIGHT): 57.13

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:16:45
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 2_2a.te Time Period: Day/Night 16/8 hours
Description: Receiver 2 - Option 2 (2018)

Road data, segment # 1: Maple Grove (day/night)

---
Car traffic volume : 15854/1762 veh/TimePeriod *
Medium truck volume : 169/19 veh/TimePeriod *
Heavy truck volume : 843/94 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 18740
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 67.10 / 67.10 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 0.18 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 59.73 + 0.00) = 59.73 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 71.94 0.00 -10.77 -1.45 0.00 0.00 0.00 59.73
---

Segment Leq : 59.73 dBA

Total Leq All Segments: 59.73 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 53.95 + 0.00) = 53.95 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 65.42 0.00 -10.18 -1.29 0.00 0.00 0.00 53.95
---

Segment Leq : 53.95 dBA

Total Leq All Segments: 53.95 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.73
(NIGHT): 53.95

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:16:50
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 3_2a.te Time Period: Day/Night 16/8 hours
Description: Receiver 3 - Option 2 (2018)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 15854/1762 veh/TimePeriod *
Medium truck volume : 169/19 veh/TimePeriod *
Heavy truck volume : 843/94 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 18740
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 96.10 / 96.10 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 0.43 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 57.22 + 0.00) = 57.22 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 71.94 0.00 -13.29 -1.44 0.00 0.00 0.00 57.22
---

Segment Leq : 57.22 dBA

Total Leq All Segments: 57.22 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 51.58 + 0.00) = 51.58 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 65.42 0.00 -12.56 -1.28 0.00 0.00 0.00 51.58
---

Segment Leq : 51.58 dBA

Total Leq All Segments: 51.58 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 57.22
(NIGHT): 51.58

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:16:55
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 4_2a.te Time Period: Day/Night 16/8 hours
Description: Receiver 4 - Option 2 (2018)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 15854/1762 veh/TimePeriod *
Medium truck volume : 169/19 veh/TimePeriod *
Heavy truck volume : 843/94 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 18740
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 96.50 / 96.50 m

Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 0.93 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 57.33 + 0.00) = 57.33 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.63 71.94 0.00 -13.20 -1.41 0.00 0.00 0.00 57.33
---

Segment Leq : 57.33 dBA

Total Leq All Segments: 57.33 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 51.70 + 0.00) = 51.70 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.54 65.42 0.00 -12.47 -1.25 0.00 0.00 0.00 51.70
---

Segment Leq : 51.70 dBA

Total Leq All Segments: 51.70 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 57.33
(NIGHT): 51.70

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:17:01
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 5_2a.te Time Period: Day/Night 16/8 hours
Description: Receiver 5 - Option 2 (2018)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 15854/1762 veh/TimePeriod *
Medium truck volume : 169/19 veh/TimePeriod *
Heavy truck volume : 843/94 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 18740
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 62.70 / 62.70 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 1.22 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 60.46 + 0.00) = 60.46 dBA

Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.62 71.94 0.00 -10.09 -1.40 0.00 0.00 0.00 60.46
---

Segment Leq : 60.46 dBA

Total Leq All Segments: 60.46 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 54.66 + 0.00) = 54.66 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.53 65.42 0.00 -9.53 -1.24 0.00 0.00 0.00 54.66
---

Segment Leq : 54.66 dBA

Total Leq All Segments: 54.66 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.46
(NIGHT): 54.66

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:17:04
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 6_2a.te Time Period: Day/Night 16/8 hours
Description: Receiver 6 - Option 2 (2018)

Road data, segment # 1: Maple Grove (day/night)
---

Car traffic volume : 15854/1762 veh/TimePeriod *
Medium truck volume : 169/19 veh/TimePeriod *
Heavy truck volume : 843/94 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 18740
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 32.90 / 32.90 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 0.29 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 64.86 + 0.00) = 64.86 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 71.94 0.00 -5.63 -1.44 0.00 0.00 0.00 64.86
---

Segment Leq : 64.86 dBA

Total Leq All Segments: 64.86 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 58.81 + 0.00) = 58.81 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj
F.Adj W.Adj H.Adj B.Adj SubLeq
---
---
-90 90 0.56 65.42 0.00 -5.33 -1.29
0.00 0.00 0.00 58.81
---
---

Segment Leq : 58.81 dBA

Total Leq All Segments: 58.81 dBA

TOTAL Leq FROM ALL SOURCES (DAY):
64.86
(NIGHT): 58.81

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:17:08
MINISTRY OF ENVIRONMENT AND ENERGY /
NOISE ASSESSMENT

Filename: 7_2a.te Time Period:
Day/Night 16/8 hours
Description: Receiver 7 - Option 2 (2018)

Road data, segment # 1: Maple Grove
(day/night)
---
Car traffic volume : 16844/1872
veh/TimePeriod *
Medium truck volume : 177/20
veh/TimePeriod *
Heavy truck volume : 709/79 veh/TimePeriod
*
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or
concrete)

* Refers to calculated road volumes based on
the following input:

24 hr Traffic Volume (AADT or SADT): 19700
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground
surface)
Receiver source distance : 25.00 / 25.00 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no
barrier)
Elevation : 1.02 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 66.49 + 0.00) = 66.49 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj
F.Adj W.Adj H.Adj B.Adj SubLeq
---
---
-90 90 0.63 71.52 0.00 -3.62 -1.41
0.00 0.00 0.00 66.49
---
---

Segment Leq : 66.49 dBA

Total Leq All Segments: 66.49 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 60.32 + 0.00) = 60.32 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj
F.Adj W.Adj H.Adj B.Adj SubLeq
---
---
-90 90 0.54 64.99 0.00 -3.42 -1.25
0.00 0.00 0.00 60.32
---
---

Segment Leq : 60.32 dBA

Total Leq All Segments: 60.32 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 66.49
(NIGHT): 60.32

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:18:10
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 8_2a.te Time Period: Day/Night 16/8 hours
Description: Receiver 8 - Option 2 (2018)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 16844/1872 veh/TimePeriod *
Medium truck volume : 177/20 veh/TimePeriod *
Heavy truck volume : 709/79 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 19700
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 90.20 / 90.20 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 2.32 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 57.76 + 0.00) = 57.76 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.59 | 71.52 | 0.00 | -12.41 | -1.34 | 0.00 | 0.00 | 0.00 | 57.76 |

Segment Leq : 57.76 dBA

Total Leq All Segments: 57.76 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 52.10 + 0.00) = 52.10 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.50 | 64.99 | 0.00 | -11.71 | -1.18 | 0.00 | 0.00 | 0.00 | 52.10 |

Segment Leq : 52.10 dBA

Total Leq All Segments: 52.10 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 57.76
(NIGHT): 52.10

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:18:16

MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 9_2a.te Time Period: Day/Night 16/8 hours
Description: Receiver 9 - Option 2 (2018)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 16844/1872 veh/TimePeriod *
Medium truck volume : 177/20 veh/TimePeriod *
Heavy truck volume : 709/79 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 19700
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 53.80 / 53.80 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 2.67 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 61.41 + 0.00) = 61.41 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.58 71.52 0.00 -8.78 -1.32 0.00 0.00 0.00 61.41
---

Segment Leq : 61.41 dBA

Total Leq All Segments: 61.41 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 55.56 + 0.00) = 55.56 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.49 64.99 0.00 -8.28 -1.16 0.00 0.00 0.00 55.56
---

Segment Leq : 55.56 dBA

Total Leq All Segments: 55.56 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.41
(NIGHT): 55.56

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:21:16
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 10_2a.te Time Period: Day/Night 16/8 hours
Description: Receiver 10 - Option 2 (2018)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 16844/1872 veh/TimePeriod *

Medium truck volume : 177/20 veh/TimePeriod *
Heavy truck volume : 709/79 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 19700
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 67.40 / 67.40 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 3.18 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 59.99 + 0.00) = 59.99 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 71.52 | 0.00 | -10.23 | -1.30 | 0.00 | 0.00 | 0.00 | 59.99 |

Segment Leq : 59.99 dBA

Total Leq All Segments: 59.99 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 54.22 + 0.00) = 54.22 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.48 | 64.99 | 0.00 | -9.64 | -1.13 | 0.00 | 0.00 | 0.00 | 54.22 |

Segment Leq : 54.22 dBA

Total Leq All Segments: 54.22 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.99
(NIGHT): 54.22

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:21:23
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 11_2a.te Time Period: Day/Night 16/8 hours
Description: Receiver 11 - Option 2 (2018)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 16844/1872 veh/TimePeriod *
Medium truck volume : 177/20 veh/TimePeriod *
Heavy truck volume : 709/79 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 19700
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00

Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 49.40 / 49.40 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 3.06 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 62.08 + 0.00) = 62.08 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 71.52 0.00 -8.13 -1.30 0.00 0.00 0.00 62.08
---

Segment Leq : 62.08 dBA

Total Leq All Segments: 62.08 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 56.19 + 0.00) = 56.19 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.48 64.99 0.00 -7.66 -1.14 0.00 0.00 0.00 56.19
---

Segment Leq : 56.19 dBA

Total Leq All Segments: 56.19 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 62.08
(NIGHT): 56.19

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:21:43
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 12_2a.te Time Period: Day/Night 16/8 hours
Description: Receiver 12 - Option 2 (2018)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 16844/1872 veh/TimePeriod *
Medium truck volume : 177/20 veh/TimePeriod *
Heavy truck volume : 709/79 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 19700
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 44.10 / 44.10 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)

Elevation : 4.37 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 63.11 + 0.00) = 63.11 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj
F.Adj W.Adj H.Adj B.Adj SubLeq
---
---
-90 90 0.53 71.52 0.00 -7.17 -1.23
0.00 0.00 0.00 63.11
---
---

Segment Leq : 63.11 dBA

Total Leq All Segments: 63.11 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 57.18 + 0.00) = 57.18 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj
F.Adj W.Adj H.Adj B.Adj SubLeq
---
---
-90 90 0.44 64.99 0.00 -6.75 -1.06
0.00 0.00 0.00 57.18
---
---

Segment Leq : 57.18 dBA

Total Leq All Segments: 57.18 dBA

TOTAL Leq FROM ALL SOURCES (DAY):
63.11
(NIGHT): 57.18

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:22:36
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 1_2b.te Time Period: Day/Night 16/8 hours
Description: Receiver 1 - Option 2 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 22317/2480 veh/TimePeriod *
Medium truck volume : 237/26 veh/TimePeriod *
Heavy truck volume : 1187/132 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 26380
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 43.80 / 43.80 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 0.46 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 64.33 + 0.00) = 64.33 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.65 | 73.42 | 0.00 | -7.66 | -1.43 | 0.00 | 0.00 | 0.00 | 64.33 |

Segment Leq : 64.33 dBA

Total Leq All Segments: 64.33 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 58.37 + 0.00) = 58.37 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.56 | 66.89 | 0.00 | -7.24 | -1.28 | 0.00 | 0.00 | 0.00 | 58.37 |

Segment Leq : 58.37 dBA

Total Leq All Segments: 58.37 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 64.33
(NIGHT): 58.37

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:22:44
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 2_2b.te Time Period: Day/Night 16/8 hours
Description: Receiver 2 - Option 2 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 20905/2323 veh/TimePeriod *

Medium truck volume : 222/25
veh/TimePeriod *
Heavy truck volume : 1112/124
veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 24710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 67.10 / 67.10 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 0.18 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 60.93 + 0.00) = 60.93 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 73.14 0.00 -10.77 -1.45 0.00 0.00 0.00 60.93
---

Segment Leq : 60.93 dBA

Total Leq All Segments: 60.93 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 55.15 + 0.00) = 55.15 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 66.62 0.00 -10.18 -1.29 0.00 0.00 0.00 55.15
---

Segment Leq : 55.15 dBA

Total Leq All Segments: 55.15 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.93
(NIGHT): 55.15

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:22:48
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 3_2b.te Time Period: Day/Night 16/8 hours
Description: Receiver 3 - Option 2 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 20905/2323
veh/TimePeriod *
Medium truck volume : 222/25
veh/TimePeriod *
Heavy truck volume : 1112/124
veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 24710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00

Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 96.10 / 96.10 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 0.43 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 58.42 + 0.00) = 58.42 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 73.14 0.00 -13.29 -1.44 0.00 0.00 0.00 58.42
---

Segment Leq : 58.42 dBA

Total Leq All Segments: 58.42 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 52.78 + 0.00) = 52.78 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 66.62 0.00 -12.56 -1.28 0.00 0.00 0.00 52.78
---

Segment Leq : 52.78 dBA

Total Leq All Segments: 52.78 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 58.42
(NIGHT): 52.78

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:22:51
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 4_2b.te Time Period: Day/Night 16/8 hours
Description: Receiver 4 - Option 2 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 20905/2323 veh/TimePeriod *
Medium truck volume : 222/25 veh/TimePeriod *
Heavy truck volume : 1112/124 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 24710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 96.50 / 96.50 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)

Elevation : 0.93 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 58.54 + 0.00) = 58.54 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.63 73.14 0.00 -13.20 -1.41 0.00 0.00 0.00 58.54
---

Segment Leq : 58.54 dBA

Total Leq All Segments: 58.54 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 52.90 + 0.00) = 52.90 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.54 66.62 0.00 -12.47 -1.25 0.00 0.00 0.00 52.90
---

Segment Leq : 52.90 dBA

Total Leq All Segments: 52.90 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 58.54
(NIGHT): 52.90

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:22:53
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 5_2b.te Time Period: Day/Night 16/8 hours
Description: Receiver 5 - Option 2 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 20905/2323 veh/TimePeriod *
Medium truck volume : 222/25 veh/TimePeriod *
Heavy truck volume : 1112/124 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 24710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 62.70 / 62.70 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 1.22 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 61.66 + 0.00) = 61.66 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---

-90 90 0.62 73.14 0.00 -10.09 -1.40
0.00 0.00 0.00 61.66
---

Segment Leq : 61.66 dBA

Total Leq All Segments: 61.66 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 55.86 + 0.00) = 55.86 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj
F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.53 66.62 0.00 -9.53 -1.24
0.00 0.00 0.00 55.86
---

Segment Leq : 55.86 dBA

Total Leq All Segments: 55.86 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.66
(NIGHT): 55.86

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:22:55
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 6_2b.te Time Period: Day/Night 16/8 hours
Description: Receiver 6 - Option 2 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 20905/2323 veh/TimePeriod *
Medium truck volume : 222/25 veh/TimePeriod *
Heavy truck volume : 1112/124 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 24710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 32.90 / 32.90 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 0.29 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 66.07 + 0.00) = 66.07 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj
F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 73.14 0.00 -5.63 -1.44
0.00 0.00 0.00 66.07
---

Segment Leq : 66.07 dBA

Total Leq All Segments: 66.07 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 60.01 + 0.00) = 60.01 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 66.62 0.00 -5.33 -1.29 0.00 0.00 0.00 0.00 60.01
---

Segment Leq : 60.01 dBA

Total Leq All Segments: 60.01 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 66.07
(NIGHT): 60.01

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:23:02
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 7_2b.te Time Period: Day/Night 16/8 hours
Description: Receiver 7 - Option 2 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 21563/2396 veh/TimePeriod *
Medium truck volume : 227/25 veh/TimePeriod *
Heavy truck volume : 908/101 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 25220
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 25.00 / 25.00 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 1.02 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 67.56 + 0.00) = 67.56 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.63 72.59 0.00 -3.62 -1.41 0.00 0.00 0.00 0.00 67.56
---

Segment Leq : 67.56 dBA

Total Leq All Segments: 67.56 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 61.39 + 0.00) = 61.39 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.54 66.06 0.00 -3.42 -1.25 0.00 0.00 0.00 0.00 61.39
---

Segment Leq : 61.39 dBA

Total Leq All Segments: 61.39 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 67.56
(NIGHT): 61.39

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:23:07
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 8_2b.te Time Period: Day/Night 16/8 hours
Description: Receiver 8 - Option 2 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 21563/2396 veh/TimePeriod *
Medium truck volume : 227/25 veh/TimePeriod *
Heavy truck volume : 908/101 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 25220
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 90.20 / 90.20 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 2.32 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 58.84 + 0.00) = 58.84 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.59 | 72.59 | 0.00 | -12.41 | -1.34 | 0.00 | 0.00 | 0.00 | 58.84 |

Segment Leq : 58.84 dBA

Total Leq All Segments: 58.84 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 53.17 + 0.00) = 53.17 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.50 | 66.06 | 0.00 | -11.71 | -1.18 | 0.00 | 0.00 | 0.00 | 53.17 |

Segment Leq : 53.17 dBA

Total Leq All Segments: 53.17 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 58.84
(NIGHT): 53.17

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:23:14
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 9_2b.te Time Period: Day/Night 16/8 hours
Description: Receiver 9 - Option 2 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 21563/2396 veh/TimePeriod *
Medium truck volume : 227/25 veh/TimePeriod *
Heavy truck volume : 908/101 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 25220
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 53.80 / 53.80 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 2.67 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 62.49 + 0.00) = 62.49 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.58 72.59 0.00 -8.78 -1.32 0.00 0.00 0.00 62.49
---

Segment Leq : 62.49 dBA

Total Leq All Segments: 62.49 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 56.62 + 0.00) = 56.62 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.49 66.06 0.00 -8.28 -1.16 0.00 0.00 0.00 56.62
---

Segment Leq : 56.62 dBA

Total Leq All Segments: 56.62 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 62.49
(NIGHT): 56.62

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:23:25
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 10_2b.te Time Period: Day/Night 16/8 hours
Description: Receiver 10 - Option 2 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 21563/2396 veh/TimePeriod *
Medium truck volume : 227/25 veh/TimePeriod *
Heavy truck volume : 908/101 veh/TimePeriod *
Posted speed limit : 70 km/h

Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 25220
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 67.40 / 67.40 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 3.18 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 61.07 + 0.00) = 61.07 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 72.59 0.00 -10.23 -1.30 0.00 0.00 0.00 61.07
---

Segment Leq : 61.07 dBA

Total Leq All Segments: 61.07 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 55.29 + 0.00) = 55.29 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.48 66.06 0.00 -9.64 -1.13 0.00 0.00 0.00 55.29
---

Segment Leq : 55.29 dBA

Total Leq All Segments: 55.29 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.07
(NIGHT): 55.29

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:23:34
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 11_2b.te Time Period: Day/Night 16/8 hours
Description: Receiver 11 - Option 2 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 21563/2396 veh/TimePeriod *
Medium truck volume : 227/25 veh/TimePeriod *
Heavy truck volume : 908/101 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 25220
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 49.40 / 49.40 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 3.06 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 63.16 + 0.00) = 63.16 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 72.59 0.00 -8.13 -1.30 0.00 0.00 0.00 63.16
---

Segment Leq : 63.16 dBA

Total Leq All Segments: 63.16 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 57.26 + 0.00) = 57.26 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.48 66.06 0.00 -7.66 -1.14 0.00 0.00 0.00 57.26
---

Segment Leq : 57.26 dBA

Total Leq All Segments: 57.26 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 63.16
(NIGHT): 57.26

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:23:50
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 12_2b.te Time Period: Day/Night 16/8 hours
Description: Receiver 12 - Option 2 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 21563/2396 veh/TimePeriod *
Medium truck volume : 227/25 veh/TimePeriod *
Heavy truck volume : 908/101 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 25220
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 44.10 / 44.10 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 4.37 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 64.18 + 0.00) = 64.18 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj
F.Adj  W.Adj  H.Adj  B.Adj SubLeq
---
---
  -90     90   0.53  72.59   0.00  -7.17  -1.23
0.00   0.00   0.00  64.18
---
---

Segment Leq : 64.18 dBA

Total Leq All Segments: 64.18 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 58.25 + 0.00) = 58.25 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj
F.Adj  W.Adj  H.Adj  B.Adj SubLeq
---
---
  -90     90   0.44  66.06   0.00  -6.75  -1.06
0.00   0.00   0.00  58.25
---
---

Segment Leq : 58.25 dBA

Total Leq All Segments: 58.25 dBA

TOTAL Leq FROM ALL SOURCES (DAY):
64.18
(NIGHT): 58.25

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:24:03
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 1_2c.te Time Period: Day/Night 16/8 hours
Description: Receiver 1 - Option 2 (2041)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 25321/2813 veh/TimePeriod *
Medium truck volume : 269/30 veh/TimePeriod *
Heavy truck volume : 1347/150 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 29930
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 43.80 / 43.80 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 0.46 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 64.88 + 0.00) = 64.88 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.65 | 73.97 | 0.00 | -7.66 | -1.43 | 0.00 | 0.00 | 0.00 | 64.88 |

Segment Leq : 64.88 dBA

Total Leq All Segments: 64.88 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 58.93 + 0.00) = 58.93 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.56 | 67.45 | 0.00 | -7.24 | -1.28 | 0.00 | 0.00 | 0.00 | 58.93 |

Segment Leq : 58.93 dBA

Total Leq All Segments: 58.93 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 64.88
(NIGHT): 58.93

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:24:30
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 2_2c.te Time Period: Day/Night 16/8 hours
Description: Receiver 2 - Option 2 (2041)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 23443/2605 veh/TimePeriod *

Medium truck volume : 249/28
veh/TimePeriod *
Heavy truck volume : 1247/139
veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 27710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 67.10 / 62.60 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 0.18 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 61.42 + 0.00) = 61.42 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 73.64 0.00 -10.77 -1.45 0.00 0.00 0.00 61.42
---

Segment Leq : 61.42 dBA

Total Leq All Segments: 61.42 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 56.12 + 0.00) = 56.12 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 67.12 0.00 -9.71 -1.29 0.00 0.00 0.00 56.12
---

Segment Leq : 56.12 dBA

Total Leq All Segments: 56.12 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.42
(NIGHT): 56.12

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:24:33
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 3_2c.te Time Period: Day/Night 16/8 hours
Description: Receiver 3 - Option 2 (2041)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 23443/2605
veh/TimePeriod *
Medium truck volume : 249/28
veh/TimePeriod *
Heavy truck volume : 1247/139
veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 27710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00

Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 96.10 / 96.10 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 0.43 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 58.92 + 0.00) = 58.92 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 73.64 0.00 -13.29 -1.44 0.00 0.00 0.00 58.92
---

Segment Leq : 58.92 dBA

Total Leq All Segments: 58.92 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 53.28 + 0.00) = 53.28 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 67.12 0.00 -12.56 -1.28 0.00 0.00 0.00 53.28
---

Segment Leq : 53.28 dBA

Total Leq All Segments: 53.28 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 58.92
(NIGHT): 53.28

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:24:38
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 4_2c.te Time Period: Day/Night 16/8 hours
Description: Receiver 4 - Option 2 (2041)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 23443/2605 veh/TimePeriod *
Medium truck volume : 249/28 veh/TimePeriod *
Heavy truck volume : 1247/139 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 27710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 96.50 / 96.50 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)

Elevation : 0.93 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 59.03 + 0.00) = 59.03 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.63 73.64 0.00 -13.20 -1.41 0.00 0.00 0.00 59.03
---

Segment Leq : 59.03 dBA

Total Leq All Segments: 59.03 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 53.40 + 0.00) = 53.40 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.54 67.12 0.00 -12.47 -1.25 0.00 0.00 0.00 53.40
---

Segment Leq : 53.40 dBA

Total Leq All Segments: 53.40 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.03
(NIGHT): 53.40

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:24:43
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 5_2c.te Time Period: Day/Night 16/8 hours
Description: Receiver 5 - Option 2 (2041)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 23443/2605 veh/TimePeriod *
Medium truck volume : 249/28 veh/TimePeriod *
Heavy truck volume : 1247/139 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 27710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 62.70 / 62.70 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 1.22 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 62.16 + 0.00) = 62.16 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---

-90 90 0.62 73.64 0.00 -10.09 -1.40
0.00 0.00 0.00 62.16
---

Segment Leq : 62.16 dBA

Total Leq All Segments: 62.16 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 56.36 + 0.00) = 56.36 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj
F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.53 67.12 0.00 -9.53 -1.24
0.00 0.00 0.00 56.36
---

Segment Leq : 56.36 dBA

Total Leq All Segments: 56.36 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 62.16
(NIGHT): 56.36

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:24:46
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 6_2c.te Time Period: Day/Night 16/8 hours
Description: Receiver 6 - Option 2 (2041)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 23443/2605 veh/TimePeriod *
Medium truck volume : 249/28 veh/TimePeriod *
Heavy truck volume : 1247/139 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 27710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 32.90 / 32.90 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 0.29 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 66.56 + 0.00) = 66.56 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj
F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 73.64 0.00 -5.63 -1.44
0.00 0.00 0.00 66.56
---

Segment Leq : 66.56 dBA

Total Leq All Segments: 66.56 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 60.51 + 0.00) = 60.51 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 67.12 0.00 -5.33 -1.29 0.00 0.00 0.00 0.00 60.51
---

Segment Leq : 60.51 dBA

Total Leq All Segments: 60.51 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 66.56
(NIGHT): 60.51

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:24:49
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 7_2c.te Time Period: Day/Night 16/8 hours
Description: Receiver 7 - Option 2 (2041)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 24017/2669 veh/TimePeriod *
Medium truck volume : 253/28 veh/TimePeriod *
Heavy truck volume : 1011/112 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 28090
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 25.00 / 25.00 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 1.02 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 68.03 + 0.00) = 68.03 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.63 73.06 0.00 -3.62 -1.41 0.00 0.00 0.00 0.00 68.03
---

Segment Leq : 68.03 dBA

Total Leq All Segments: 68.03 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 61.84 + 0.00) = 61.84 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.54 66.52 0.00 -3.42 -1.25 0.00 0.00 0.00 0.00 61.84
---

Segment Leq : 61.84 dBA

Total Leq All Segments: 61.84 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 68.03
(NIGHT): 61.84

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:24:59
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 8_1c.te Time Period: Day/Night 16/8 hours
Description: Receiver 8 - Option 2 (2041)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 24017/2669 veh/TimePeriod *
Medium truck volume : 253/28 veh/TimePeriod *
Heavy truck volume : 1011/112 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 28090
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 90.20 / 90.20 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 2.32 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 59.30 + 0.00) = 59.30 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.59 73.06 0.00 -12.41 -1.34 0.00 0.00 0.00 59.30
---

Segment Leq : 59.30 dBA

Total Leq All Segments: 59.30 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 53.63 + 0.00) = 53.63 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.50 66.52 0.00 -11.71 -1.18 0.00 0.00 0.00 53.63
---

Segment Leq : 53.63 dBA

Total Leq All Segments: 53.63 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.30
(NIGHT): 53.63

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:25:08
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 9_2c.te Time Period: Day/Night 16/8 hours
Description: Receiver 9 - Option 2 (2041)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 24017/2669 veh/TimePeriod *
Medium truck volume : 253/28 veh/TimePeriod *
Heavy truck volume : 1011/112 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 28090
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 53.80 / 53.80 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 2.67 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 62.95 + 0.00) = 62.95 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.58 73.06 0.00 -8.78 -1.32 0.00 0.00 0.00 62.95

---

Segment Leq : 62.95 dBA

Total Leq All Segments: 62.95 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 57.08 + 0.00) = 57.08 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.49 66.52 0.00 -8.28 -1.16 0.00 0.00 0.00 57.08

---

Segment Leq : 57.08 dBA

Total Leq All Segments: 57.08 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 62.95
(NIGHT): 57.08

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:25:11
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 10_2c.te Time Period: Day/Night 16/8 hours
Description: Receiver 10 - Option 2 (2041)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 24017/2669 veh/TimePeriod *
Medium truck volume : 253/28 veh/TimePeriod *
Heavy truck volume : 1011/112 veh/TimePeriod *
Posted speed limit : 70 km/h

Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 28090
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 67.40 / 67.40 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 3.18 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 61.53 + 0.00) = 61.53 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 73.06 0.00 -10.23 -1.30 0.00 0.00 0.00 61.53
---

Segment Leq : 61.53 dBA

Total Leq All Segments: 61.53 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 55.74 + 0.00) = 55.74 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.48 66.52 0.00 -9.64 -1.13 0.00 0.00 0.00 55.74
---

Segment Leq : 55.74 dBA

Total Leq All Segments: 55.74 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.53
(NIGHT): 55.74

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:25:13
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 11_2c.te Time Period: Day/Night 16/8 hours
Description: Receiver 11 - Option 2 (2041)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 24017/2669 veh/TimePeriod *
Medium truck volume : 253/28 veh/TimePeriod *
Heavy truck volume : 1011/112 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 28090
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 49.40 / 49.40 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 3.06 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 63.62 + 0.00) = 63.62 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 73.06 0.00 -8.13 -1.30 0.00 0.00 0.00 63.62
---

Segment Leq : 63.62 dBA

Total Leq All Segments: 63.62 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 57.71 + 0.00) = 57.71 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.48 66.52 0.00 -7.67 -1.14 0.00 0.00 0.00 57.71
---

Segment Leq : 57.71 dBA

Total Leq All Segments: 57.71 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 63.62
(NIGHT): 57.71

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:25:15
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 12_2c.te Time Period: Day/Night 16/8 hours
Description: Receiver 12 - Option 2 (2041)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 24017/2669 veh/TimePeriod *
Medium truck volume : 253/28 veh/TimePeriod *
Heavy truck volume : 1011/112 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 28090
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 44.10 / 44.10 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 4.37 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 64.65 + 0.00) = 64.65 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj
F.Adj  W.Adj  H.Adj  B.Adj SubLeq
---
---
  -90     90   0.53  73.06   0.00  -7.17  -1.23
0.00   0.00   0.00  64.65
---
---

Segment Leq : 64.65 dBA

Total Leq All Segments: 64.65 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 58.70 + 0.00) = 58.70 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj
F.Adj  W.Adj  H.Adj  B.Adj SubLeq
---
---
  -90     90   0.44  66.52   0.00  -6.75  -1.06
0.00   0.00   0.00  58.70
---
---

Segment Leq : 58.70 dBA

Total Leq All Segments: 58.70 dBA

TOTAL Leq FROM ALL SOURCES (DAY):
64.65
(NIGHT): 58.70

# RECEIVER 3 – NOISE LEVELS

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:25:23
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 1_3a.te Time Period: Day/Night 16/8 hours
Description: Receiver 1 - Option 3 (2018)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 16751/1861 veh/TimePeriod *
Medium truck volume : 178/20 veh/TimePeriod *
Heavy truck volume : 891/99 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 19800
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 35.80 / 35.80 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 0.23 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 64.49 + 0.00) = 64.49 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 72.18 0.00 -6.25 -1.45 0.00 0.00 0.00 64.49
---

Segment Leq : 64.49 dBA

Total Leq All Segments: 64.49 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 58.45 + 0.00) = 58.45 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 65.65 0.00 -5.91 -1.29 0.00 0.00 0.00 58.45
---

Segment Leq : 58.45 dBA

Total Leq All Segments: 58.45 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 64.49
(NIGHT): 58.45

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:25:30
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 2_3a.te Time Period: Day/Night 16/8 hours
Description: Receiver 2 - Option 3 (2018)

Road data, segment # 1: Maple Grove (day/night)
---

Car traffic volume : 15854/1762
veh/TimePeriod *
Medium truck volume : 169/19
veh/TimePeriod *
Heavy truck volume : 843/94 veh/TimePeriod
*
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or
concrete)

* Refers to calculated road volumes based on
the following input:

24 hr Traffic Volume (AADT or SADT): 18740
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground
surface)
Receiver source distance : 59.10 / 59.10 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no
barrier)
Elevation : 0.17 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 60.64 + 0.00) = 60.64 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj
F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.66 71.94 0.00 -9.86 -1.45
0.00 0.00 0.00 60.64
---

Segment Leq : 60.64 dBA

Total Leq All Segments: 60.64 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 54.81 + 0.00) = 54.81 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj
F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 65.42 0.00 -9.32 -1.29
0.00 0.00 0.00 54.81
---

Segment Leq : 54.81 dBA

Total Leq All Segments: 54.81 dBA

TOTAL Leq FROM ALL SOURCES (DAY):
60.64
(NIGHT): 54.81

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:25:28
MINISTRY OF ENVIRONMENT AND ENERGY /
NOISE ASSESSMENT

Filename: 3_3a.te Time Period:
Day/Night 16/8 hours
Description: Receiver 3 - Option 3 (2018)

Road data, segment # 1: Maple Grove
(day/night)
---
Car traffic volume : 15854/1762
veh/TimePeriod *
Medium truck volume : 169/19
veh/TimePeriod *
Heavy truck volume : 843/94 veh/TimePeriod
*
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or
concrete)

* Refers to calculated road volumes based on
the following input:

24 hr Traffic Volume (AADT or SADT): 18740

Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 88.10 / 88.10 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 0.46 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 57.85 + 0.00) = 57.85 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 71.94 0.00 -12.66 -1.43 0.00 0.00 0.00 57.85
---

Segment Leq : 57.85 dBA

Total Leq All Segments: 57.85 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 52.18 + 0.00) = 52.18 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 65.42 0.00 -11.97 -1.28 0.00 0.00 0.00 52.18
---

Segment Leq : 52.18 dBA

Total Leq All Segments: 52.18 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 57.85
(NIGHT): 52.18

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:25:32
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 4_3a.te Time Period: Day/Night 16/8 hours
Description: Receiver 4 - Option 3 (2018)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 15854/1762 veh/TimePeriod *
Medium truck volume : 169/19 veh/TimePeriod *
Heavy truck volume : 843/94 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 18740
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 89.60 / 89.60 m
Receiver height : 1.50 / 4.50 m

Topography : 3 (Elevated; no barrier)
Elevation : 0.95 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 57.87 + 0.00) = 57.87 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.63 71.94 0.00 -12.67 -1.41 0.00 0.00 0.00 57.87
---

Segment Leq : 57.87 dBA

Total Leq All Segments: 57.87 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 52.20 + 0.00) = 52.20 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.54 65.42 0.00 -11.97 -1.25 0.00 0.00 0.00 52.20
---

Segment Leq : 52.20 dBA

Total Leq All Segments: 52.20 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 57.87
(NIGHT): 52.20

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:25:37

MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 5_3a.te Time Period: Day/Night 16/8 hours
Description: Receiver 5 - Option 3 (2018)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 15854/1762 veh/TimePeriod *
Medium truck volume : 169/19 veh/TimePeriod *
Heavy truck volume : 843/94 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 18740
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 60.60 / 60.60 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 1.22 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 60.70 + 0.00) = 60.70 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq

---
-90 90 0.62 71.94 0.00 -9.84 -1.40 0.00 0.00 0.00 60.70
---

Segment Leq : 60.70 dBA

Total Leq All Segments: 60.70 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 54.88 + 0.00) = 54.88 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.53 65.42 0.00 -9.30 -1.24 0.00 0.00 0.00 54.88
---

Segment Leq : 54.88 dBA

Total Leq All Segments: 54.88 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.70
(NIGHT): 54.88

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:25:41
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 6_3a.te Time Period: Day/Night 16/8 hours
Description: Receiver 6 - Option 3 (2018)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 15854/1762 veh/TimePeriod *
Medium truck volume : 169/19 veh/TimePeriod *
Heavy truck volume : 843/94 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 18740
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 34.30 / 34.30 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 0.32 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 64.57 + 0.00) = 64.57 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 71.94 0.00 -5.93 -1.44 0.00 0.00 0.00 64.57
---

Segment Leq : 64.57 dBA

Total Leq All Segments: 64.57 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 58.53 + 0.00) = 58.53 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 65.42 0.00 -5.61 -1.29 0.00 0.00 0.00 58.53
---

Segment Leq : 58.53 dBA

Total Leq All Segments: 58.53 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 64.57
(NIGHT): 58.53

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:25:45
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 7_3a.te Time Period: Day/Night 16/8 hours
Description: Receiver 7 - Option 3 (2018)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 16844/1872 veh/TimePeriod *
Medium truck volume : 177/20 veh/TimePeriod *
Heavy truck volume : 709/79 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 19700
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 24.70 / 24.70 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 1.02 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 66.57 + 0.00) = 66.57 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.63 71.52 0.00 -3.53 -1.41 0.00 0.00 0.00 66.57
---

Segment Leq : 66.57 dBA

Total Leq All Segments: 66.57 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 60.40 + 0.00) = 60.40 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.54 64.99 0.00 -3.34 -1.25 0.00 0.00 0.00 60.40
---

Segment Leq : 60.40 dBA

Total Leq All Segments: 60.40 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 66.57
(NIGHT): 60.40

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:25:51
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 8_3a.te Time Period: Day/Night 16/8 hours
Description: Receiver 8 - Option 3 (2018)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 16844/1872 veh/TimePeriod *
Medium truck volume : 177/20 veh/TimePeriod *
Heavy truck volume : 709/79 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 19700
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 90.90 / 90.90 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 2.32 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 57.71 + 0.00) = 57.71 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.59 71.52 0.00 -12.46 -1.34 0.00 0.00 0.00 57.71
---

Segment Leq : 57.71 dBA

Total Leq All Segments: 57.71 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 52.05 + 0.00) = 52.05 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.50 64.99 0.00 -11.76 -1.18 0.00 0.00 0.00 52.05
---

Segment Leq : 52.05 dBA

Total Leq All Segments: 52.05 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 57.71
(NIGHT): 52.05

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:25:56
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 9_3a.te Time Period: Day/Night 16/8 hours
Description: Receiver 9 - Option 3 (2018)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 16844/1872 veh/TimePeriod *
Medium truck volume : 177/20 veh/TimePeriod *
Heavy truck volume : 709/79 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 19700
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 54.00 / 54.00 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 2.67 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 61.39 + 0.00) = 61.39 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.58 71.52 0.00 -8.80 -1.32 0.00 0.00 0.00 61.39
---

Segment Leq : 61.39 dBA

Total Leq All Segments: 61.39 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 55.53 + 0.00) = 55.53 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.49 64.99 0.00 -8.30 -1.16 0.00 0.00 0.00 55.53
---

Segment Leq : 55.53 dBA

Total Leq All Segments: 55.53 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.39
(NIGHT): 55.53

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:27:17
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 10_3a.te Time Period: Day/Night 16/8 hours
Description: Receiver 10 - Option 3 (2018)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 16844/1872 veh/TimePeriod *
Medium truck volume : 177/20 veh/TimePeriod *

Heavy truck volume : 709/79 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 19700
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 67.30 / 67.30 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 3.18 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 71.52 0.00 -10.22 -1.30 0.00 0.00 0.00 60.00
---

Segment Leq : 60.00 dBA

Total Leq All Segments: 60.00 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 54.23 + 0.00) = 54.23 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.48 64.99 0.00 -9.63 -1.13 0.00 0.00 0.00 54.23
---

Segment Leq : 54.23 dBA

Total Leq All Segments: 54.23 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.00
(NIGHT): 54.23

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:27:19
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 11_3a.te Time Period: Day/Night 16/8 hours
Description: Receiver 11 - Option 3 (2018)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 16844/1872 veh/TimePeriod *
Medium truck volume : 177/20 veh/TimePeriod *
Heavy truck volume : 709/79 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 19700
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00

Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 49.40 / 49.40 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 3.06 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 62.08 + 0.00) = 62.08 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 71.52 0.00 -8.13 -1.30 0.00 0.00 0.00 62.08
---

Segment Leq : 62.08 dBA

Total Leq All Segments: 62.08 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 56.19 + 0.00) = 56.19 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.48 64.99 0.00 -7.66 -1.14 0.00 0.00 0.00 56.19
---

Segment Leq : 56.19 dBA

Total Leq All Segments: 56.19 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 62.08
(NIGHT): 56.19

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:27:21
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 12_3a.te Time Period: Day/Night 16/8 hours
Description: Receiver 12 - Option 3 (2018)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 16844/1872 veh/TimePeriod *
Medium truck volume : 177/20 veh/TimePeriod *
Heavy truck volume : 709/79 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 19700
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 44.10 / 44.10 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 4.37 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 63.11 + 0.00) = 63.11 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj
F.Adj W.Adj H.Adj B.Adj SubLeq
---
---
-90 90 0.53 71.52 0.00 -7.17 -1.23
0.00 0.00 0.00 63.11
---
---

Segment Leq : 63.11 dBA

Total Leq All Segments: 63.11 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 57.18 + 0.00) = 57.18 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj
F.Adj W.Adj H.Adj B.Adj SubLeq
---
---
-90 90 0.44 64.99 0.00 -6.75 -1.06
0.00 0.00 0.00 57.18
---
---

Segment Leq : 57.18 dBA

Total Leq All Segments: 57.18 dBA

TOTAL Leq FROM ALL SOURCES (DAY):
63.11
(NIGHT): 57.18

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:27:25
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 1_3b.te Time Period: Day/Night 16/8 hours
Description: Receiver 1 - Option 3 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 22317/2480 veh/TimePeriod *
Medium truck volume : 237/26 veh/TimePeriod *
Heavy truck volume : 1187/132 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 26380
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 35.80 / 35.80 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 0.23 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 65.73 + 0.00) = 65.73 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.65 | 73.42 | 0.00 | -6.25 | -1.45 | 0.00 | 0.00 | 0.00 | 65.73 |

Segment Leq : 65.73 dBA

Total Leq All Segments: 65.73 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 59.70 + 0.00) = 59.70 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.56 | 66.89 | 0.00 | -5.91 | -1.29 | 0.00 | 0.00 | 0.00 | 59.70 |

Segment Leq : 59.70 dBA

Total Leq All Segments: 59.70 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.73
(NIGHT): 59.70

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:27:30
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 2_3b.te Time Period: Day/Night 16/8 hours
Description: Receiver 2 - Option 3 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 20905/2323 veh/TimePeriod *

Medium truck volume : 222/25
veh/TimePeriod *
Heavy truck volume : 1112/124
veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 24710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 59.10 / 59.10 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 0.17 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 61.84 + 0.00) = 61.84 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.66 73.14 0.00 -9.86 -1.45 0.00 0.00 0.00 61.84
---

Segment Leq : 61.84 dBA

Total Leq All Segments: 61.84 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 56.01 + 0.00) = 56.01 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 66.62 0.00 -9.32 -1.29 0.00 0.00 0.00 56.01
---

Segment Leq : 56.01 dBA

Total Leq All Segments: 56.01 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.84
(NIGHT): 56.01

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:27:58
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 3_3b.te Time Period: Day/Night 16/8 hours
Description: Receiver 3 - Option 3 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 20905/2323
veh/TimePeriod *
Medium truck volume : 222/25
veh/TimePeriod *
Heavy truck volume : 1112/124
veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 24710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00

Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 88.10 / 88.10 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 0.46 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 59.05 + 0.00) = 59.05 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 73.14 0.00 -12.66 -1.43 0.00 0.00 0.00 59.05
---

Segment Leq : 59.05 dBA

Total Leq All Segments: 59.05 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 53.38 + 0.00) = 53.38 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 66.62 0.00 -11.97 -1.28 0.00 0.00 0.00 53.38
---

Segment Leq : 53.38 dBA

Total Leq All Segments: 53.38 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.05
(NIGHT): 53.38

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:28:06
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 4_3b.te Time Period: Day/Night 16/8 hours
Description: Receiver 4 - Option 3 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 20905/2323 veh/TimePeriod *
Medium truck volume : 222/25 veh/TimePeriod *
Heavy truck volume : 1112/124 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 24710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 89.60 / 89.60 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)

Elevation : 0.95 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 59.07 + 0.00) = 59.07 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.63 73.14 0.00 -12.67 -1.41 0.00 0.00 0.00 59.07
---

Segment Leq : 59.07 dBA

Total Leq All Segments: 59.07 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 53.40 + 0.00) = 53.40 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.54 66.62 0.00 -11.97 -1.25 0.00 0.00 0.00 53.40
---

Segment Leq : 53.40 dBA

Total Leq All Segments: 53.40 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.07
(NIGHT): 53.40

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:28:08
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 5_3b.te Time Period: Day/Night 16/8 hours
Description: Receiver 5 - Option 3 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 20905/2323 veh/TimePeriod *
Medium truck volume : 222/25 veh/TimePeriod *
Heavy truck volume : 1112/124 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 24710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 60.60 / 60.60 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 1.22 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 61.90 + 0.00) = 61.90 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---

-90 90 0.62 73.14 0.00 -9.84 -1.40
0.00 0.00 0.00 61.90
---

Segment Leq : 61.90 dBA

Total Leq All Segments: 61.90 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 56.09 + 0.00) = 56.09 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj
F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.53 66.62 0.00 -9.30 -1.24
0.00 0.00 0.00 56.09
---

Segment Leq : 56.09 dBA

Total Leq All Segments: 56.09 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.90
(NIGHT): 56.09

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:28:12
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 6_3b.te Time Period: Day/Night 16/8 hours
Description: Receiver 6 - Option 3 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 20905/2323 veh/TimePeriod *
Medium truck volume : 222/25 veh/TimePeriod *
Heavy truck volume : 1112/124 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 24710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 34.30 / 34.30 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 0.32 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 65.77 + 0.00) = 65.77 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj
F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 73.14 0.00 -5.93 -1.44
0.00 0.00 0.00 65.77
---

Segment Leq : 65.77 dBA

Total Leq All Segments: 65.77 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 59.73 + 0.00) = 59.73 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 66.62 0.00 -5.61 -1.29 0.00 0.00 0.00 59.73
---

Segment Leq : 59.73 dBA

Total Leq All Segments: 59.73 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.77
(NIGHT): 59.73

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:28:16
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 7_3b.te Time Period: Day/Night 16/8 hours
Description: Receiver 7 - Option 3 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 21563/2396 veh/TimePeriod *
Medium truck volume : 227/25 veh/TimePeriod *
Heavy truck volume : 908/101 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 25220
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 24.70 / 24.70 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 1.02 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 67.65 + 0.00) = 67.65 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.63 72.59 0.00 -3.53 -1.41 0.00 0.00 0.00 67.65
---

Segment Leq : 67.65 dBA

Total Leq All Segments: 67.65 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 61.47 + 0.00) = 61.47 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.54 66.06 0.00 -3.34 -1.25 0.00 0.00 0.00 61.47
---

Segment Leq : 61.47 dBA

Total Leq All Segments: 61.47 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 67.65
(NIGHT): 61.47

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:28:21
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 8_3b.te Time Period: Day/Night 16/8 hours
Description: Receiver 8 - Option 3 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 21563/2396 veh/TimePeriod *
Medium truck volume : 227/25 veh/TimePeriod *
Heavy truck volume : 908/101 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 25220
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 90.90 / 90.90 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 2.32 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 58.78 + 0.00) = 58.78 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.59 72.59 0.00 -12.46 -1.34 0.00 0.00 0.00 58.78
---

Segment Leq : 58.78 dBA

Total Leq All Segments: 58.78 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 53.12 + 0.00) = 53.12 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.50 66.06 0.00 -11.76 -1.18 0.00 0.00 0.00 53.12
---

Segment Leq : 53.12 dBA

Total Leq All Segments: 53.12 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 58.78
(NIGHT): 53.12

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:28:25
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 9_3b.te Time Period: Day/Night 16/8 hours
Description: Receiver 9 - Option 3 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 21563/2396 veh/TimePeriod *
Medium truck volume : 227/25 veh/TimePeriod *
Heavy truck volume : 908/101 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 25220
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 54.00 / 54.00 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 2.67 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 62.46 + 0.00) = 62.46 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.58 72.59 0.00 -8.80 -1.32 0.00 0.00 0.00 62.46
---

Segment Leq : 62.46 dBA

Total Leq All Segments: 62.46 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 56.60 + 0.00) = 56.60 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.49 66.06 0.00 -8.30 -1.16 0.00 0.00 0.00 56.60
---

Segment Leq : 56.60 dBA

Total Leq All Segments: 56.60 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 62.46
(NIGHT): 56.60

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:28:32
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 10_3b.te Time Period: Day/Night 16/8 hours
Description: Receiver 10 - Option 3 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 21563/2396 veh/TimePeriod *
Medium truck volume : 227/25 veh/TimePeriod *
Heavy truck volume : 908/101 veh/TimePeriod *
Posted speed limit : 70 km/h

Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 25220
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 67.30 / 67.30 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 3.18 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 61.08 + 0.00) = 61.08 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 72.59 0.00 -10.22 -1.30 0.00 0.00 0.00 61.08
---

Segment Leq : 61.08 dBA

Total Leq All Segments: 61.08 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 55.30 + 0.00) = 55.30 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.48 66.06 0.00 -9.63 -1.13 0.00 0.00 0.00 55.30
---

Segment Leq : 55.30 dBA

Total Leq All Segments: 55.30 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.08
(NIGHT): 55.30

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:28:36
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 11_3b.te Time Period: Day/Night 16/8 hours
Description: Receiver 11 - Option 3 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 21563/2396 veh/TimePeriod *
Medium truck volume : 227/25 veh/TimePeriod *
Heavy truck volume : 908/101 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 25220
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 49.40 / 49.40 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 3.06 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 63.16 + 0.00) = 63.16 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 72.59 0.00 -8.13 -1.30 0.00 0.00 0.00 63.16
---

Segment Leq : 63.16 dBA

Total Leq All Segments: 63.16 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 57.26 + 0.00) = 57.26 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.48 66.06 0.00 -7.66 -1.14 0.00 0.00 0.00 57.26
---

Segment Leq : 57.26 dBA

Total Leq All Segments: 57.26 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 63.16
(NIGHT): 57.26

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:28:40
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 12_3b.te Time Period: Day/Night 16/8 hours
Description: Receiver 12 - Option 3 (2036)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 21563/2396 veh/TimePeriod *
Medium truck volume : 227/25 veh/TimePeriod *
Heavy truck volume : 908/101 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 25220
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 44.10 / 44.10 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 4.37 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 64.18 + 0.00) = 64.18 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj
F.Adj  W.Adj  H.Adj  B.Adj SubLeq
---
---
  -90     90   0.53  72.59   0.00  -7.17  -1.23
0.00   0.00   0.00  64.18
---
---

Segment Leq : 64.18 dBA

Total Leq All Segments: 64.18 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 58.25 + 0.00) = 58.25 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj
F.Adj  W.Adj  H.Adj  B.Adj SubLeq
---
---
  -90     90   0.44  66.06   0.00  -6.75  -1.06
0.00   0.00   0.00  58.25
---
---

Segment Leq : 58.25 dBA

Total Leq All Segments: 58.25 dBA

TOTAL Leq FROM ALL SOURCES (DAY):
64.18
(NIGHT): 58.25

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:28:43
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 1_3c.te Time Period: Day/Night 16/8 hours
Description: Receiver 1 - Option 3 (2041)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 25321/2813 veh/TimePeriod *
Medium truck volume : 269/30 veh/TimePeriod *
Heavy truck volume : 1347/150 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 29930
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 35.80 / 35.80 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 0.23 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 66.28 + 0.00) = 66.28 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.65 | 73.97 | 0.00 | -6.25 | -1.45 | 0.00 | 0.00 | 0.00 | 66.28 |

Segment Leq : 66.28 dBA

Total Leq All Segments: 66.28 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 60.25 + 0.00) = 60.25 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.56 | 67.45 | 0.00 | -5.91 | -1.29 | 0.00 | 0.00 | 0.00 | 60.25 |

Segment Leq : 60.25 dBA

Total Leq All Segments: 60.25 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 66.28
(NIGHT): 60.25

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:28:46
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 2_3c.te Time Period: Day/Night 16/8 hours
Description: Receiver 2 - Option 3 (2041)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 23443/2605 veh/TimePeriod *

Medium truck volume : 249/28
veh/TimePeriod *
Heavy truck volume : 1247/139
veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 27710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 59.10 / 59.10 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 0.17 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 62.33 + 0.00) = 62.33 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.66 73.64 0.00 -9.86 -1.45 0.00 0.00 0.00 62.33
---

Segment Leq : 62.33 dBA

Total Leq All Segments: 62.33 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 56.51 + 0.00) = 56.51 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 67.12 0.00 -9.32 -1.29 0.00 0.00 0.00 56.51
---

Segment Leq : 56.51 dBA

Total Leq All Segments: 56.51 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 62.33
(NIGHT): 56.51

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:28:48
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 3_3c.te Time Period: Day/Night 16/8 hours
Description: Receiver 3 - Option 3 (2041)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 23443/2605
veh/TimePeriod *
Medium truck volume : 249/28
veh/TimePeriod *
Heavy truck volume : 1247/139
veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 27710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00

Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 88.10 / 88.10 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 0.46 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 59.55 + 0.00) = 59.55 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 73.64 0.00 -12.66 -1.43 0.00 0.00 0.00 59.55
---

Segment Leq : 59.55 dBA

Total Leq All Segments: 59.55 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 53.87 + 0.00) = 53.87 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 67.12 0.00 -11.97 -1.28 0.00 0.00 0.00 53.87
---

Segment Leq : 53.87 dBA

Total Leq All Segments: 53.87 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.55
(NIGHT): 53.87

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:28:51
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 4_3c.te Time Period: Day/Night 16/8 hours
Description: Receiver 4 - Option 3 (2041)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 23443/2605 veh/TimePeriod *
Medium truck volume : 249/28 veh/TimePeriod *
Heavy truck volume : 1247/139 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 27710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 89.60 / 89.60 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)

Elevation : 0.95 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 59.56 + 0.00) = 59.56 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.63 73.64 0.00 -12.67 -1.41 0.00 0.00 0.00 59.56
---

Segment Leq : 59.56 dBA

Total Leq All Segments: 59.56 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 53.90 + 0.00) = 53.90 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.54 67.12 0.00 -11.97 -1.25 0.00 0.00 0.00 53.90
---

Segment Leq : 53.90 dBA

Total Leq All Segments: 53.90 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.56
(NIGHT): 53.90

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:28:53
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 5_3c.te Time Period: Day/Night 16/8 hours
Description: Receiver 5 - Option 3 (2041)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 23443/2605 veh/TimePeriod *
Medium truck volume : 249/28 veh/TimePeriod *
Heavy truck volume : 1247/139 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 27710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 60.60 / 60.60 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 1.22 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 62.40 + 0.00) = 62.40 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---

-90 90 0.62 73.64 0.00 -9.84 -1.40
0.00 0.00 0.00 62.40
---

Segment Leq : 62.40 dBA

Total Leq All Segments: 62.40 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 56.58 + 0.00) = 56.58 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj
F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.53 67.12 0.00 -9.30 -1.24
0.00 0.00 0.00 56.58
---

Segment Leq : 56.58 dBA

Total Leq All Segments: 56.58 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 62.40
(NIGHT): 56.58

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:28:56
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 6_3c.te Time Period: Day/Night 16/8 hours
Description: Receiver 6 - Option 3 (2041)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 23443/2605 veh/TimePeriod *
Medium truck volume : 249/28 veh/TimePeriod *
Heavy truck volume : 1247/139 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 27710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 34.30 / 34.30 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 0.32 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

ROAD (0.00 + 66.27 + 0.00) = 66.27 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj
F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.65 73.64 0.00 -5.93 -1.44
0.00 0.00 0.00 66.27
---

Segment Leq : 66.27 dBA

Total Leq All Segments: 66.27 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

ROAD (0.00 + 60.23 + 0.00) = 60.23 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.56 67.12 0.00 -5.61 -1.29 0.00 0.00 0.00 0.00 60.23
---

Segment Leq : 60.23 dBA

Total Leq All Segments: 60.23 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 66.27
(NIGHT): 60.23

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:28:58
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 7_3c.te Time Period: Day/Night 16/8 hours
Description: Receiver 7 - Option 3 (2041)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 24017/2669 veh/TimePeriod *
Medium truck volume : 253/28 veh/TimePeriod *
Heavy truck volume : 1011/112 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 28090
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 24.70 / 24.70 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 1.02 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 68.11 + 0.00) = 68.11 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.63 73.06 0.00 -3.53 -1.41 0.00 0.00 0.00 0.00 68.11
---

Segment Leq : 68.11 dBA

Total Leq All Segments: 68.11 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 61.92 + 0.00) = 61.92 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.54 66.52 0.00 -3.34 -1.25 0.00 0.00 0.00 0.00 61.92
---

Segment Leq : 61.92 dBA

Total Leq All Segments: 61.92 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 68.11
(NIGHT): 61.92

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:29:13
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 8_3c.te Time Period: Day/Night 16/8 hours
Description: Receiver 8 - Option 3 (2041)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 24017/2669 veh/TimePeriod *
Medium truck volume : 253/28 veh/TimePeriod *
Heavy truck volume : 1011/112 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 28090
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 90.90 / 90.90 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 2.32 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 59.25 + 0.00) = 59.25 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.59 73.06 0.00 -12.46 -1.34 0.00 0.00 0.00 59.25
---

Segment Leq : 59.25 dBA

Total Leq All Segments: 59.25 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 53.57 + 0.00) = 53.57 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.50 66.52 0.00 -11.76 -1.18 0.00 0.00 0.00 53.57
---

Segment Leq : 53.57 dBA

Total Leq All Segments: 53.57 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.25
(NIGHT): 53.57

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:29:37
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 9_3c.te Time Period: Day/Night 16/8 hours
Description: Receiver 9 - Option 3 (2041)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 24017/2669 veh/TimePeriod *
Medium truck volume : 253/28 veh/TimePeriod *
Heavy truck volume : 1011/112 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 28090
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 54.00 / 54.00 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 2.67 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 62.93 + 0.00) = 62.93 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.58 73.06 0.00 -8.80 -1.32 0.00 0.00 0.00 62.93

---

Segment Leq : 62.93 dBA

Total Leq All Segments: 62.93 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 57.05 + 0.00) = 57.05 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.49 66.52 0.00 -8.30 -1.16 0.00 0.00 0.00 57.05

---

Segment Leq : 57.05 dBA

Total Leq All Segments: 57.05 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 62.93
(NIGHT): 57.05

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:29:42
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 10_3c.te Time Period: Day/Night 16/8 hours
Description: Receiver 10 - Option 3 (2041)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 24017/2669 veh/TimePeriod *
Medium truck volume : 253/28 veh/TimePeriod *
Heavy truck volume : 1011/112 veh/TimePeriod *
Posted speed limit : 70 km/h

Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 28090
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 67.30 / 67.30 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 3.18 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 61.54 + 0.00) = 61.54 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 73.06 0.00 -10.22 -1.30 0.00 0.00 0.00 61.54
---

Segment Leq : 61.54 dBA

Total Leq All Segments: 61.54 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 55.75 + 0.00) = 55.75 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.48 66.52 0.00 -9.63 -1.13 0.00 0.00 0.00 55.75
---

Segment Leq : 55.75 dBA

Total Leq All Segments: 55.75 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.54
(NIGHT): 55.75

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:29:47
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 11_3c.te Time Period: Day/Night 16/8 hours
Description: Receiver 11 - Option 3 (2041)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 24017/2669 veh/TimePeriod *
Medium truck volume : 253/28 veh/TimePeriod *
Heavy truck volume : 1011/112 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 28090
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 49.40 / 49.40 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 3.06 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 63.62 + 0.00) = 63.62 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.57 73.06 0.00 -8.13 -1.30 0.00 0.00 0.00 63.62
---

Segment Leq : 63.62 dBA

Total Leq All Segments: 63.62 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 57.71 + 0.00) = 57.71 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.48 66.52 0.00 -7.67 -1.14 0.00 0.00 0.00 57.71
---

Segment Leq : 57.71 dBA

Total Leq All Segments: 57.71 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 63.62
(NIGHT): 57.71

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:29:51
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 12_3c.te Time Period: Day/Night 16/8 hours
Description: Receiver 12 - Option 3 (2041)

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 24017/2669 veh/TimePeriod *
Medium truck volume : 253/28 veh/TimePeriod *
Heavy truck volume : 1011/112 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 28090
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 44.10 / 44.10 m
Receiver height : 1.50 / 4.50 m
Topography : 3 (Elevated; no barrier)
Elevation : 4.37 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

ROAD (0.00 + 64.65 + 0.00) = 64.65 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj
F.Adj  W.Adj  H.Adj  B.Adj SubLeq
---
---
  -90     90   0.53  73.06   0.00  -7.17  -1.23
0.00   0.00   0.00  64.65
---
---

Segment Leq : 64.65 dBA

Total Leq All Segments: 64.65 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

ROAD (0.00 + 58.70 + 0.00) = 58.70 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj
F.Adj  W.Adj  H.Adj  B.Adj SubLeq
---
---
  -90     90   0.44  66.52   0.00  -6.75  -1.06
0.00   0.00   0.00  58.70
---
---

Segment Leq : 58.70 dBA

Total Leq All Segments: 58.70 dBA

TOTAL Leq FROM ALL SOURCES (DAY):
64.65
(NIGHT): 58.70

# RECEIVER 1 – MITIGATED NOISE LEVELS

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:51:31
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 1_1cf.te Time Period: Day/Night 16/8 hours
Description: Receiver 1 - Option 1 (2041) - 2.4m Barrier

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 25321/2813 veh/TimePeriod *
Medium truck volume : 269/30 veh/TimePeriod *
Heavy truck volume : 1347/150 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 29930
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 38.50 / 38.50 m
Receiver height : 1.50 / 4.50 m
Topography : 4 (Elevated; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 2.40 m
Elevation : 0.00 m
Barrier receiver distance : 19.90 / 10.00 m
Source elevation : 311.72 m
Receiver elevation : 311.96 m
Barrier elevation : 311.59 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

Barrier height for grazing incidence
---

| Source Height (m) | Receiver Height (m) | Barrier Height (m) | Elevation of Barrier Top (m) |
|---|---|---|---|
| 1.50 | 1.50 | 1.74 | 313.33 |

ROAD (0.00 + 60.87 + 0.00) = 60.87 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.52 | 73.97 | 0.00 | -6.21 | -1.20 | 0.00 | 0.00 | -5.69 | 60.87 |

Segment Leq : 60.87 dBA

Total Leq All Segments: 60.87 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

Barrier height for grazing incidence
---

| Source Height (m) | Receiver Height (m) | Barrier Height (m) | Elevation of Barrier Top (m) |
|---|---|---|---|
| 1.50 | 4.50 | 4.03 | 315.62 |

ROAD (0.00 + 59.72 + 0.00) = 59.72 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.43 | 67.45 | 0.00 | -5.84 | -1.03 | 0.00 | 0.00 | -0.50 | 60.08* |
| -90 | 90 | 0.57 | 67.45 | 0.00 | -6.43 | -1.30 | 0.00 | 0.00 | 0.00 | 59.72 |

---
---

* Bright Zone !

Segment Leq : 59.72 dBA

Total Leq All Segments: 59.72 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.87
(NIGHT): 59.72

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:51:38
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 6_1cf.te Time Period: Day/Night 16/8 hours
Description: Receiver 6 - Option 1 (2041) - 2.1m Barrier

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 23443/2605 veh/TimePeriod *
Medium truck volume : 249/28 veh/TimePeriod *
Heavy truck volume : 1247/139 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 27710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 32.90 / 32.90 m
Receiver height : 1.50 / 4.50 m
Topography : 4 (Elevated; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 2.10 m
Elevation : 0.00 m
Barrier receiver distance : 4.40 / 10.00 m
Source elevation : 309.23 m
Receiver elevation : 308.94 m
Barrier elevation : 308.73 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

Barrier height for grazing incidence
---
Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---+---+---+---
1.50 ! 1.50 ! 1.75 ! 310.48

ROAD (0.00 + 61.66 + 0.00) = 61.66 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.53 73.64 0.00 -5.23 -1.24 0.00 0.00 -5.51 61.66
---

Segment Leq : 61.66 dBA

Total Leq All Segments: 61.66 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

Barrier height for grazing incidence
---
Source ! Receiver ! Barrier ! Elevation of

Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---
1.50 ! 4.50 ! 3.89 ! 312.62

ROAD (0.00 + 60.46 + 0.00) = 60.46 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.44 67.12 0.00 -4.93 -1.07 0.00 0.00 -0.38 60.74*
-90 90 0.57 67.12 0.00 -5.36 -1.30 0.00 0.00 0.00 60.46
---

* Bright Zone !

Segment Leq : 60.46 dBA

Total Leq All Segments: 60.46 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.66
(NIGHT): 60.46

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:51:42
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 7_1cf.te Time Period: Day/Night 16/8 hours
Description: Receiver 7 - Option 1 (2041) - 1.8m Barrier

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 24017/2669 veh/TimePeriod *
Medium truck volume : 253/28 veh/TimePeriod *
Heavy truck volume : 1011/112 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 28090
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 25.00 / 25.00 m
Receiver height : 1.50 / 4.50 m
Topography : 4 (Elevated; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 1.80 m
Elevation : 0.00 m
Barrier receiver distance : 4.90 / 10.00 m
Source elevation : 307.12 m
Receiver elevation : 306.10 m
Barrier elevation : 306.22 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

Barrier height for grazing incidence
---
Source ! Receiver ! Barrier ! Elevation of Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---
1.41 ! 1.50 ! 1.56 ! 307.78

ROAD (0.00 + 63.10 + 0.00) = 63.10 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.55 73.06 0.00 -3.45 -1.27 0.00 0.00 -5.23 63.10
---

Segment Leq : 63.10 dBA

Total Leq All Segments: 63.10 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

Barrier height for grazing incidence
---
Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier
Top (m)
---+---+---+---
1.41 ! 4.50 ! 3.55 ! 309.77

ROAD (0.00 + 61.72 + 0.00) = 61.72 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj
F.Adj W.Adj H.Adj B.Adj SubLeq
---
---
-90 90 0.46 66.52 0.00 -3.25 -1.11
0.00 0.00 -0.34 61.82*
-90 90 0.57 66.52 0.00 -3.49 -1.31
0.00 0.00 0.00 61.72
---
---

* Bright Zone !

Segment Leq : 61.72 dBA

Total Leq All Segments: 61.72 dBA

TOTAL Leq FROM ALL SOURCES (DAY):
63.10
(NIGHT): 61.72

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:51:49
MINISTRY OF ENVIRONMENT AND ENERGY /
NOISE ASSESSMENT

Filename: 12_1cf.te Time Period:
Day/Night 16/8 hours
Description: Receiver 12 - Option 1 (2041) -
1.8m Barrier

Road data, segment # 1: Maple Grove
(day/night)
---
Car traffic volume : 24017/2669
veh/TimePeriod *
Medium truck volume : 253/28
veh/TimePeriod *
Heavy truck volume : 1011/112
veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or
concrete)

* Refers to calculated road volumes based on
the following input:

24 hr Traffic Volume (AADT or SADT): 28090
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground
surface)
Receiver source distance : 44.20 / 44.20 m
Receiver height : 1.50 / 4.50 m
Topography : 4 (Elevated; with
barrier)
Barrier angle1 : -90.00 deg Angle2 :
90.00 deg
Barrier height : 1.80 m
Elevation : 0.00 m
Barrier receiver distance : 19.40 / 10.00 m
Source elevation : 302.58 m
Receiver elevation : 298.22 m
Barrier elevation : 300.70 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

Barrier height for grazing incidence
---
Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier
Top (m)

```
------------+-------------+-------------+--------------
       1.41 !        1.50 !        0.90 !       301.60

ROAD (0.00 + 58.40 + 0.00) = 58.40 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj
F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
-----------
   -90     90   0.55  73.06   0.00  -7.30  -1.27
0.00   0.00  -6.08  58.40
-------------------------------------------------------------------
-----------

Segment Leq : 58.40 dBA

Total Leq All Segments: 58.40 dBA


Results segment # 1: Maple Grove (night)
----------------------------------------

Source height = 1.41 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier
Top  (m)
------------+-------------+-------------+--------------
       1.41 !        4.50 !        2.31 !       303.01

ROAD (0.00 + 57.83 + 0.00) = 57.83 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj
F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
-----------
   -90     90   0.46  66.52   0.00  -6.87  -1.11
0.00   0.00  -4.39  54.14*
   -90     90   0.57  66.52   0.00  -7.38  -1.31
0.00   0.00   0.00  57.83
-------------------------------------------------------------------
-----------

 * Bright Zone !

Segment Leq : 57.83 dBA

Total Leq All Segments: 57.83 dBA




TOTAL Leq FROM ALL SOURCES (DAY):
58.40
                    (NIGHT): 57.83
```

# RECEIVER 2 – MITIGATED NOISE LEVELS

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:52:47
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 1_2cf.te Time Period: Day/Night 16/8 hours
Description: Receiver 1 - Option 2 (2041) - 2.4m Barrier

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 25321/2813 veh/TimePeriod *
Medium truck volume : 269/30 veh/TimePeriod *
Heavy truck volume : 1347/150 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 29930
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 43.80 / 43.80 m
Receiver height : 1.50 / 4.50 m
Topography : 4 (Elevated; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 2.40 m
Elevation : 0.00 m
Barrier receiver distance : 20.10 / 10.00 m
Source elevation : 311.50 m
Receiver elevation : 311.96 m
Barrier elevation : 311.59 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

Barrier height for grazing incidence
---

| Source Height (m) | Receiver Height (m) | Barrier Height (m) | Elevation of Barrier Top (m) |
|---|---|---|---|
| 1.50 | 1.50 | 1.66 | 313.25 |

ROAD (0.00 + 59.94 + 0.00) = 59.94 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.52 | 73.97 | 0.00 | -7.06 | -1.20 | 0.00 | 0.00 | -5.78 | 59.94 |

Segment Leq : 59.94 dBA

Total Leq All Segments: 59.94 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

Barrier height for grazing incidence
---

| Source Height (m) | Receiver Height (m) | Barrier Height (m) | Elevation of Barrier Top (m) |
|---|---|---|---|
| 1.50 | 4.50 | 4.08 | 315.67 |

ROAD (0.00 + 58.84 + 0.00) = 58.84 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.43 | 67.45 | 0.00 | -6.64 | -1.03 | 0.00 | 0.00 | -0.49 | 59.29* |
| -90 | 90 | 0.57 | 67.45 | 0.00 | -7.31 | -1.30 | 0.00 | 0.00 | 0.00 | 58.84 |

---
---

* Bright Zone !

Segment Leq : 58.84 dBA

Total Leq All Segments: 58.84 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.94
(NIGHT): 58.84

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:50:46
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 6_2cf.te Time Period: Day/Night 16/8 hours
Description: Receiver 6 - Option 2 (2041) - 2.1m Barrier

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 23443/2605 veh/TimePeriod *
Medium truck volume : 249/28 veh/TimePeriod *
Heavy truck volume : 1247/139 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 27710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 32.90 / 32.90 m
Receiver height : 1.50 / 4.50 m
Topography : 4 (Elevated; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 2.10 m
Elevation : 0.00 m
Barrier receiver distance : 2.40 / 10.00 m
Source elevation : 309.23 m
Receiver elevation : 308.94 m
Barrier elevation : 308.73 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

Barrier height for grazing incidence
---
Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---
1.50 ! 1.50 ! 1.73 ! 310.46

ROAD (0.00 + 61.26 + 0.00) = 61.26 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.53 73.64 0.00 -5.23 -1.24 0.00 0.00 -5.91 61.26
---

Segment Leq : 61.26 dBA

Total Leq All Segments: 61.26 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

Barrier height for grazing incidence
---
Source ! Receiver ! Barrier ! Elevation of

Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---
1.50 ! 4.50 ! 3.89 ! 312.62

ROAD (0.00 + 60.46 + 0.00) = 60.46 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.44 67.12 0.00 -4.93 -1.07 0.00 0.00 -0.38 60.74*
-90 90 0.57 67.12 0.00 -5.36 -1.30 0.00 0.00 0.00 60.46
---

* Bright Zone !

Segment Leq : 60.46 dBA

Total Leq All Segments: 60.46 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.26
(NIGHT): 60.46

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:51:13
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 7_2cf.te Time Period: Day/Night 16/8 hours
Description: Receiver 7 - Option 2 (2041) - 1.8m Barrier

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 24017/2669 veh/TimePeriod *
Medium truck volume : 253/28 veh/TimePeriod *
Heavy truck volume : 1011/112 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 28090
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 25.00 / 25.00 m
Receiver height : 1.50 / 4.50 m
Topography : 4 (Elevated; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 1.80 m
Elevation : 0.00 m
Barrier receiver distance : 4.50 / 10.00 m
Source elevation : 307.12 m
Receiver elevation : 306.10 m
Barrier elevation : 306.22 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

Barrier height for grazing incidence
---
Source ! Receiver ! Barrier ! Elevation of Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---
1.41 ! 1.50 ! 1.55 ! 307.77

ROAD (0.00 + 63.05 + 0.00) = 63.05 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.55 73.06 0.00 -3.45 -1.27 0.00 0.00 -5.28 63.05
---

Segment Leq : 63.05 dBA

Total Leq All Segments: 63.05 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

Barrier height for grazing incidence
---
Source ! Receiver ! Barrier ! Elevation of Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---
1.41 ! 4.50 ! 3.55 ! 309.77

ROAD (0.00 + 61.72 + 0.00) = 61.72 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.46 66.52 0.00 -3.25 -1.11 0.00 0.00 -0.34 61.82*
-90 90 0.57 66.52 0.00 -3.49 -1.31 0.00 0.00 0.00 61.72
---

* Bright Zone !

Segment Leq : 61.72 dBA

Total Leq All Segments: 61.72 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 63.05
(NIGHT): 61.72

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:51:20
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 12_2cf.te Time Period: Day/Night 16/8 hours
Description: Receiver 12 - Option 2 (2041) - 1.8m Barrier

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 24017/2669 veh/TimePeriod *
Medium truck volume : 253/28 veh/TimePeriod *
Heavy truck volume : 1011/112 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 28090
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 44.10 / 44.10 m
Receiver height : 1.50 / 4.50 m
Topography : 4 (Elevated; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 1.80 m
Elevation : 0.00 m
Barrier receiver distance : 19.10 / 10.00 m
Source elevation : 302.59 m
Receiver elevation : 298.22 m
Barrier elevation : 300.70 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

Barrier height for grazing incidence
---
Source ! Receiver ! Barrier ! Elevation of Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)

```
------------+-------------+-------------+--------------
       1.41 !        1.50 !        0.88 !       301.58

ROAD (0.00 + 58.37 + 0.00) = 58.37 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj
F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
-----------
   -90     90   0.55  73.06   0.00  -7.28  -1.27
0.00   0.00  -6.13  58.37
-------------------------------------------------------------------
-----------

Segment Leq : 58.37 dBA

Total Leq All Segments: 58.37 dBA


Results segment # 1: Maple Grove (night)
----------------------------------------

Source height = 1.41 m

Barrier height for grazing incidence
------------------------------------
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier
Top  (m)
------------+-------------+-------------+--------------
       1.41 !        4.50 !        2.31 !       303.01

ROAD (0.00 + 57.84 + 0.00) = 57.84 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj
F.Adj  W.Adj  H.Adj  B.Adj SubLeq
-------------------------------------------------------------------
-----------
   -90     90   0.46  66.52   0.00  -6.86  -1.11
0.00   0.00  -4.39  54.16*
   -90     90   0.57  66.52   0.00  -7.37  -1.31
0.00   0.00   0.00  57.84
-------------------------------------------------------------------
-----------

 * Bright Zone !

Segment Leq : 57.84 dBA

Total Leq All Segments: 57.84 dBA




TOTAL Leq FROM ALL SOURCES (DAY):
58.37
                    (NIGHT): 57.84
```

# RECEIVER 3 – MITIGATED NOISE LEVELS

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:34:31
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 1_3cf.te Time Period: Day/Night 16/8 hours
Description: Receiver 1 - Option 3 (2041) - 2.4m Barrier

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 25321/2813 veh/TimePeriod *
Medium truck volume : 269/30 veh/TimePeriod *
Heavy truck volume : 1347/150 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 29930
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 35.80 / 35.80 m
Receiver height : 1.50 / 4.50 m
Topography : 4 (Elevated; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 2.40 m
Elevation : 0.00 m
Barrier receiver distance : 20.10 / 10.00 m
Source elevation : 311.73 m
Receiver elevation : 311.96 m
Barrier elevation : 311.59 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

Barrier height for grazing incidence
---

| Source Height (m) | Receiver Height (m) | Barrier Height (m) | Elevation of Barrier Top (m) |
|---|---|---|---|
| 1.50 | 1.50 | 1.74 | 313.33 |

ROAD (0.00 + 61.28 + 0.00) = 61.28 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.52 | 73.97 | 0.00 | -5.73 | -1.20 | 0.00 | 0.00 | -5.76 | 61.28 |

Segment Leq : 61.28 dBA

Total Leq All Segments: 61.28 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

Barrier height for grazing incidence
---

| Source Height (m) | Receiver Height (m) | Barrier Height (m) | Elevation of Barrier Top (m) |
|---|---|---|---|
| 1.50 | 4.50 | 3.97 | 315.56 |

ROAD (0.00 + 60.21 + 0.00) = 60.21 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.43 | 67.45 | 0.00 | -5.39 | -1.03 | 0.00 | 0.00 | -0.53 | 60.50* |
| -90 | 90 | 0.57 | 67.45 | 0.00 | -5.93 | -1.30 | 0.00 | 0.00 | 0.00 | 60.21 |

---
---

* Bright Zone !

Segment Leq : 60.21 dBA

Total Leq All Segments: 60.21 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 61.28
(NIGHT): 60.21

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:50:12
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 6_3cf.te Time Period: Day/Night 16/8 hours
Description: Receiver 6 - Option 3 (2041) - 2.1m Barrier

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 23443/2605 veh/TimePeriod *
Medium truck volume : 249/28 veh/TimePeriod *
Heavy truck volume : 1247/139 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 2 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 27710
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 5.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 34.30 / 34.30 m
Receiver height : 1.50 / 4.50 m
Topography : 4 (Elevated; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 2.10 m
Elevation : 0.00 m
Barrier receiver distance : 2.80 / 10.00 m
Source elevation : 309.26 m
Receiver elevation : 308.94 m
Barrier elevation : 308.73 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.50 m

Barrier height for grazing incidence
---
Source ! Receiver ! Barrier ! Elevation of
Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---
1.50 ! 1.50 ! 1.74 ! 310.47

ROAD (0.00 + 61.11 + 0.00) = 61.11 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.53 73.64 0.00 -5.51 -1.24 0.00 0.00 -5.78 61.11
---

Segment Leq : 61.11 dBA

Total Leq All Segments: 61.11 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.50 m

Barrier height for grazing incidence
---
Source ! Receiver ! Barrier ! Elevation of

Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---
1.50 ! 4.50 ! 3.93 ! 312.66

ROAD (0.00 + 60.18 + 0.00) = 60.18 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.44 67.12 0.00 -5.19 -1.07 0.00 0.00 -0.37 60.49*
-90 90 0.57 67.12 0.00 -5.64 -1.30 0.00 0.00 0.00 60.18
---

* Bright Zone !

Segment Leq : 60.18 dBA

Total Leq All Segments: 60.18 dBA

STAMSON 5.0 NORMAL REPORT
Date: 24-06-2023 14:17:25
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 7_3cf.te Time Period: Day/Night 16/8 hours
Description: Receiver 7 - Option 3 (2041) - 1.8m Barrier

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 24017/2669 veh/TimePeriod *
Medium truck volume : 253/28 veh/TimePeriod *
Heavy truck volume : 1011/112 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 28090
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 24.70 / 24.70 m
Receiver height : 1.50 / 4.50 m
Topography : 4 (Elevated; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 1.80 m
Elevation : 0.00 m
Barrier receiver distance : 4.00 / 10.00 m
Source elevation : 307.12 m
Receiver elevation : 306.10 m
Barrier elevation : 306.22 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

Barrier height for grazing incidence
---
Source ! Receiver ! Barrier ! Elevation of Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---
1.41 ! 1.50 ! 1.53 ! 307.75

ROAD (0.00 + 63.07 + 0.00) = 63.07 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.55 73.06 0.00 -3.37 -1.27 0.00 0.00 -5.35 63.07
---

Segment Leq : 63.07 dBA

Total Leq All Segments: 63.07 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

Barrier height for grazing incidence
---
Source ! Receiver ! Barrier ! Elevation of Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---
1.41 ! 4.50 ! 3.54 ! 309.76

ROAD (0.00 + 61.80 + 0.00) = 61.80 dBA
Angle1 Angle2 Alpha RefLeq P.Adj D.Adj F.Adj W.Adj H.Adj B.Adj SubLeq
---
-90 90 0.46 66.52 0.00 -3.17 -1.11 0.00 0.00 -0.34 61.90*
-90 90 0.57 66.52 0.00 -3.41 -1.31 0.00 0.00 0.00 61.80
---

* Bright Zone !

Segment Leq : 61.80 dBA

Total Leq All Segments: 61.80 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 63.07
(NIGHT): 61.80

STAMSON 5.0 NORMAL REPORT
Date: 20-06-2023 11:34:06
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: 12_3fc.te Time Period: Day/Night 16/8 hours
Description: Receiver 12 - Option 3 (2041) - 1.8m Barrier

Road data, segment # 1: Maple Grove (day/night)
---
Car traffic volume : 24017/2669 veh/TimePeriod *
Medium truck volume : 253/28 veh/TimePeriod *
Heavy truck volume : 1011/112 veh/TimePeriod *
Posted speed limit : 70 km/h
Road gradient : 3 %
Road pavement : 1 (Typical asphalt or concrete)

* Refers to calculated road volumes based on the following input:

24 hr Traffic Volume (AADT or SADT): 28090
Percentage of Annual Growth : 0.00
Number of Years of Growth : 0.00
Medium Truck % of Total Volume : 1.00
Heavy Truck % of Total Volume : 4.00
Day (16 hrs) % of Total Volume : 90.00

Data for Segment # 1: Maple Grove (day/night)
---
Angle1 Angle2 : -90.00 deg 90.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0 / 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 44.10 / 44.10 m
Receiver height : 1.50 / 4.50 m
Topography : 4 (Elevated; with barrier)
Barrier angle1 : -90.00 deg Angle2 : 90.00 deg
Barrier height : 1.80 m
Elevation : 0.00 m
Barrier receiver distance : 19.10 / 10.00 m
Source elevation : 302.59 m
Receiver elevation : 298.22 m
Barrier elevation : 300.70 m
Reference angle : 0.00

Results segment # 1: Maple Grove (day)
---

Source height = 1.41 m

Barrier height for grazing incidence
---
Source ! Receiver ! Barrier ! Elevation of Height (m) ! Height (m) ! Height (m) ! Barrier Top (m)
---
1.41 ! 1.50 ! 0.88 ! 301.58

ROAD (0.00 + 58.37 + 0.00) = 58.37 dBA

Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj
F.Adj  W.Adj  H.Adj  B.Adj SubLeq
---
---
  -90     90   0.55  73.06   0.00  -7.28  -1.27
0.00   0.00  -6.13  58.37
---
---

Segment Leq : 58.37 dBA

Total Leq All Segments: 58.37 dBA

Results segment # 1: Maple Grove (night)
---

Source height = 1.41 m

Barrier height for grazing incidence
---
Source      ! Receiver    ! Barrier     ! Elevation of
Height  (m) ! Height  (m) ! Height  (m) ! Barrier
Top  (m)
---+---+---+---
       1.41 !        4.50 !        2.31 !       303.01

ROAD (0.00 + 57.84 + 0.00) = 57.84 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj
F.Adj  W.Adj  H.Adj  B.Adj SubLeq
---
---
  -90     90   0.46  66.52   0.00  -6.86  -1.11
0.00   0.00  -4.39  54.16*
  -90     90   0.57  66.52   0.00  -7.37  -1.31
0.00   0.00   0.00  57.84
---
---

 * Bright Zone !

Segment Leq : 57.84 dBA

Total Leq All Segments: 57.84 dBA

TOTAL Leq FROM ALL SOURCES (DAY):
58.37
                    (NIGHT): 57.84