



Highway 138 Improvements from Highway 401 to Highway 417

GWP 4015-08-00

June 2017

**Eastern Region
Planning & Design Section
Ministry of Transportation Ontario**

Transportation Environmental Study Report

TRANSPORTATION ENVIRONMENTAL STUDY REPORT

Highway 138 Improvements from Highway 401 to Highway 417

June 2017



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**THE PUBLIC RECORD
ONTARIO MINISTRY OF TRANSPORTATION
HIGHWAY 138 IMPROVEMENTS FROM HIGHWAY 401 TO HIGHWAY 417 (GWP 4015-08-00)
TRANSPORTATION ENVIRONMENTAL STUDY REPORT**

This Transportation Environmental Study Report (TESR) is available for review from June 29, 2017 to July 28, 2017 during regular business hours at the following locations:

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Clerk's Department
Cornwall ON

Monday to Friday: 8:30 AM to
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Executive Summary

GENERAL DESCRIPTION OF PROJECT

Highway 138 is a provincial highway connecting Highway 417 in the north with Highway 401 and the City of Cornwall in the south. Highway 138 also functions as a link to the City of Ottawa and the Province of Quebec. Locally, Highway 138 provides access to adjacent agricultural lands and for local communities including St. Andrews West, Strathmore, Martintown, Moose Creek, Warina and Monkland.

Stantec Consulting Ltd. (Stantec) was retained by the Ontario Ministry of Transportation (MTO) to complete the Preliminary Design and Class Environmental Assessment (Class EA) Study for operational and safety improvements to approximately 35 km of Highway 138 between Highway 401 and Highway 417 in the City of Cornwall, and the Townships of North Stormont and South Stormont. The purpose of the study was to identify a 'Recommended Plan' for improvements as part of the Ministry's ongoing review of safety and operational needs for the provincial highway network. These include intersection improvements, turning lanes, passing lanes, drainage improvements, carpool parking, corridor access and entrance improvements, and snowdrift mitigation.

This *Transportation Environmental Study Report* (TESR) documents the environmentally significant aspects of the study. The TESR includes a description of the project and its purpose; the existing natural, social, economic, and cultural environmental factors; analysis and evaluation of alternatives that were considered; consultation processes; documentation of the Recommended Plan; anticipated environmental effects and proposed mitigation measures; and commitments to future work and monitoring.

ENVIRONMENTAL ASSESSMENT PROCESS

This Preliminary Design and Environmental Assessment Study is being carried out under the requirements of the MTO Class EA. The project is being carried out following the requirements of the MTO Class EA as a Group 'B' project. Group 'B' projects include major improvements to existing transportation facilities, including highway improvements over land or water that provide a significant increase in traffic capacity or cause a significant widening of the "footprint" beyond the roadbed of an existing highway.

PUBLIC CONSULTATION

The consultation process provided an opportunity for the Project Team to discuss the study process with the public, property owners, external agencies, and stakeholders.

The process aims to notify all interested parties of the project and to provide an opportunity for input to the study and decision-making processes. This was accomplished by presenting the findings of each stage of work to the public, and through ongoing discussions with various government agencies and ministries, non-government interest groups and property owners.

Stakeholders and the public were formally contacted four times throughout the study process. To make sure that all interested members of the public and stakeholders were contacted, a Consultation Plan was developed at the start of the project and included the following consultation components:

- Notice of Study Commencement – January 2016
- Communication with external agencies in order to obtain pertinent technical information and identify the requirement for legislative or regulatory approvals related to the undertaking
- Meetings with municipal staff and Council (City of Cornwall, Township of North Stormont, Township of South Stormont)
- Communication with adjacent property owners where work proposed is likely to have an impact on their property
- Communication with affected property owners where temporary or permanent interest in property is required
- Two Public Information Centres (June 15, 2016 and December 14, 2016)
- Notice of Study Completion/*Transportation Environmental Study Report* Review Period – June 2017

In addition, a project website (highway138study.ca) was developed and has been maintained for this project. The website functions as an interactive tool to provide study updates, and an opportunity for stakeholders to submit comments at any time during the study.

Public input was received at two Public Information Centres (PICs) and continuously during the study through correspondence and emails from the project website.

EVALUATION OF ALTERNATIVES

The purpose of this project was to identify safety and operational deficiencies on Highway 138 and develop alternatives to address each deficiency. Section 5.0 of the report describes the alternatives considered and the process used to identify a Recommended Plan.

The preliminary stage of the operational and safety review was to identify areas of operational and safety concern within the study area. These preliminary areas of concern were identified as a result of geometric deficiencies, collision history, and operational deficiencies. Each location was then reviewed to develop alternative improvements.

The development of alternatives began with identifying and evaluating a range of potential interchange, passing lane, and carpool lot alternatives to meet the goal of improving the safety and operation of Highway 138, while minimizing impacts to the natural environment, local community, and cultural environment within the study limits.

Separate improvement alternatives were developed for each deficient intersection that were evaluated alongside a "Do Nothing" alternative for each intersection. Following a complete evaluation of alternatives, a recommended plan was selected.

RECOMMENDED PLAN

The Recommended Plan evolved through a process that included the development and evaluation of alternatives, with additional details being developed as the study progressed, as documented in this report. The Recommended Plan is shown in Appendix A.

The improvements in the Recommended Plan include: intersection improvements, left-turn slip around lanes, passing lanes, entrance modifications, carpool parking lots, and drainage improvements. Details of the Recommended Plan intersections improvements include:

- A northbound right-turn channelization will be provided on Brookdale Avenue at the intersection with Cornwall Centre Road.
- The southbound corner radius on St. Andrews Road (Highway 138) at Cornwall Centre Road will be increased
- A roundabout is recommended at the intersection of Headline Road and Highway 138.
- Minor improvements to the Dundas Street intersection are recommended. The minor improvements include:
 - New sidewalk with pedestrian ramps on the northwest and northeast corners
 - New barrier curb adjacent to the cemetery stone wall on the northwest corner
 - New curb on the east side adjacent to the convenience store
 - Minor centreline shift to the east and minor crosswalk shift to the north on the north leg
 - Minor crosswalk shift to the south on the south leg
 - Minor centreline shift to the south and minor crosswalk shift to the west on the west leg
 - Shift to the east and minor crosswalk shift to the north on the north leg
- Opposing northbound and southbound left-turn lanes constructed at the intersection of Highway 138 and Valade Road/Island Road.
- A northbound left-turn lane constructed on the east side of the centreline of Highway 138 at the intersection of Wheeler Road.
- Opposing northbound and southbound left-turn lanes constructed about the centreline of Highway 138 at the intersection of Myers/McPhail Road.
- The closure of the south intersection at Guindon Road.
- A southbound left-turn lane constructed on the west side of the centerline of Highway 138 and McDonald Road.
- A left-turn sliparound lane is recommended on Highway 138 at the following eight T-intersections:
 - Archambault Road
 - Cameron Road
 - Willy Allan Road

- Amell & Ranald Road
- Campbell Road
- Rombough Road
- Warina Road
- Norman Road

The Recommended Plan also includes the provision of passing lanes. The northbound passing lane is in Cornwall Township and is 2.0 km in length, which includes the 80 m entrance taper and the 180 m exit taper. The northbound passing lane starts at a point that is approximately 500 m north of Myers Road/McPhail Road and terminates at a point that is approximately 220 m north of Cameron Road.

The southbound passing lane is in Roxborough Township and is 1.7 km in length, which includes the 80 m long entrance taper and the 180 m long exit taper. The southbound passing lane starts approximately 200 m south of County Road 43 (Monkland) and terminates at a point that is approximately 200 m south of McDonald Road.

The Recommended Plan includes two potential carpool lot sites within the project limits. One carpool lot will be located on the north side of Cornwall Centre Road, just east of Brookdale Avenue. The property at this location has an area of approximately 1.10 ha and is currently owned by MTO. The second carpool lot will be located approximately 1.0 km north of Dundas Street (St. Andrews), on the east side of Highway 138. The property at this location has an area of approximately 1.83 ha and is also currently owned by MTO.

PROPERTY

The Recommended Plan will result in the partial acquisition (generally highway frontage) of 22 private properties (16 residential/farm, 4 commercial, and 1 vacant property and 1 recreational/club-owned property). Four additional properties (farm land) will require partial property acquisitions and/or easements for permanent snow fencing installations.

Generally, MTO will not initiate the property acquisition process until the project is approved for construction. However, MTO may consider acquiring land under its Advance Purchase Policy in hardship situations, based on a willing-seller, willing-buyer situation and subject to regional priorities and funding.

1.0 Overview of the Undertaking

1.1 INTRODUCTION

Highway 138 is a provincial highway connecting Highway 417 in the north with Highway 401 and the City of Cornwall in the south. Highway 138 also functions as a northerly link to the City of Ottawa and the Province of Quebec. Locally, Highway 138 provides access to adjacent agricultural lands and for local communities including St. Andrews West, Strathmore, Martintown, Moose Creek, Warina, and Monkland.

Stantec Consulting Ltd. (Stantec) was retained by the Ontario Ministry of Transportation (MTO) to complete the Preliminary Design and Class Environmental Assessment (Class EA) Study for operational and safety improvements to approximately 35 km of Highway 138 between Highway 401 and Highway 417 in the City of Cornwall and the Townships of North Stormont and South Stormont. A map of the study area is provided in Figure 1. MTO initiated this Preliminary Design and Environmental Assessment Study in the fall of 2015.

1.2 GENERAL DESCRIPTION OF PROJECT

The purpose of the study was to identify a Recommended Plan for improvements as part of the Ministry’s ongoing review of safety and operational needs for the provincial highway network. The improvements include intersection improvements, turning lanes, passing lanes, drainage improvements, carpool parking facilities, corridor access and entrance improvements, and snowdrift mitigation.

This study was carried out as a ‘Group B’ project under the MTO *Class Environmental Assessment (EA) for Provincial Transportation Facilities (2000)*. The study included undertaking environmental and engineering field investigations and seeking input from the public, local municipalities, external ministries/agencies, and businesses. The study included reviewing existing conditions and the development and evaluation of a range of reasonable alternatives to determine the most appropriate improvement plan. A Recommended Plan was selected and will be designated (protected) at the completion of the study.

The study and the development and selection of the Recommended Plan has been separated into in three timeline improvement plans to address safety and operational concerns on the highway. The three timelines are broken down as follows:

- Short-term: 1-10 years
- Medium-term: 10-20 years
- Long-term: greater than 20 years

The Ministry of Transportation will continue to monitor the facility and may implement certain components of the plan when needed to meet provincial transportation needs.

1.2.1 Study Area

The study limits include Highway 138 from 0.3 km north of Highway 417 southerly for approximately 35 km to Highway 401 in the Townships of North and South Stormont in the United Counties of Stormont, Dundas and

Glengarry, and the City of Cornwall. North of Highway 417, Highway 138 is located within the Nation Municipality in the United Counties of Prescott and Russell. The study area is shown in Figure 1.

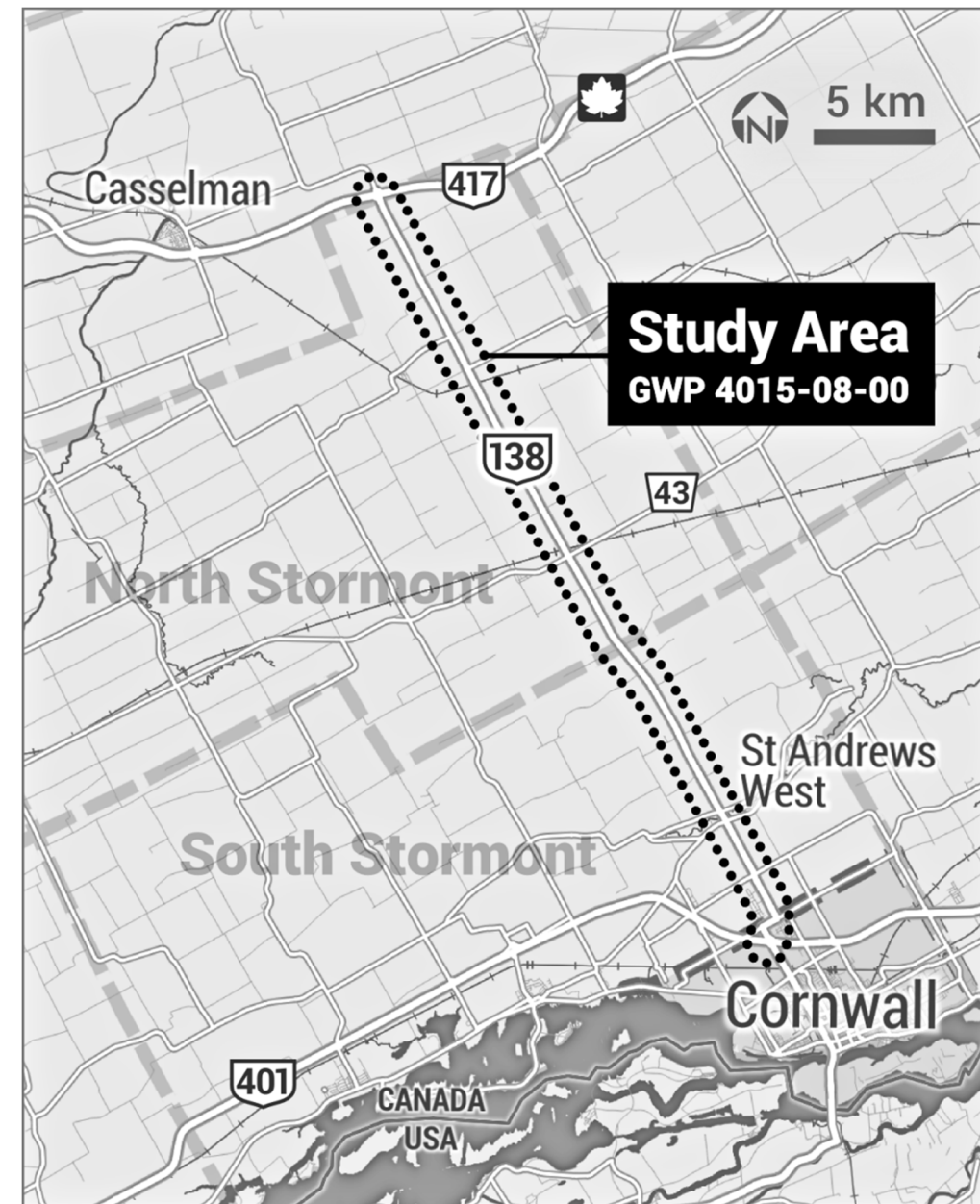


Figure 1: Study Area

1.3 PROJECT BACKGROUND

1.3.1 Project History

Highway 138 is located between two large, regional centres of population and commerce: Ottawa and Cornwall. As a result, the highway is divided between its historical function, serving local businesses and agriculture, and its more recent role as a major commercial and commuter link. These two are not always compatible, and when they conflict they can result in issues like speeding and aggressive driving.

The Town of St. Andrews West has significant historical value. The cemetery stone wall at the intersection of Highway 138 and County Road 18 has been struck several times by vehicles. A long-term by-pass of the town has been designated (but is not entirely owned) by the MTO, but the by-pass is considered a long-term improvement plan and is not within the scope of this study.

The MTO has noted many complaints from the public about operations of intersections in the study area. Likewise, it has been identified that there is a lack of passing opportunities along the corridor.

These identified deficiencies have resulted in the need to conduct the Preliminary Design and Class EA Study that is documented in this report.

1.3.2 Previous and Adjacent Studies

A previous *Traffic Operations and Safety Review* report prepared by IBI Group identified several possible improvement options from a technical nature, but did not consider the Environmental Assessment process, including public, municipal, and agency consultation. The previous IBI report did however, investigate the feasibility of passing lane alternatives at a preliminary level based on a previous MTO internal report. The recommendations from that study, including installation of left-turn lanes at select intersections, installation of passing lanes, and reconfiguration of intersections, were carried forward into the Preliminary Design and Class EA Study that is documented in this report.

MTO initiated a Preliminary Design and Environmental Assessment Study to review the operational improvements of Highway 138 between Highway 417 and Cornwall Centre Road in 2010. Genivar Inc. was retained to complete the factor-specific environmental reports, including an existing conditions report, noise report, archaeology report, and drainage and hydrology report.

Additionally, MTO is currently conducting a pilot snow fencing program along the northern section of the study area. The winter 2015 results of the pilot program were positive; however, the amount of snow was less than normal, which may have contributed to the favourable results.

There was one recent adjacent concurrent MTO study, Contract 2015-4008, on Highway 138 between Highway 417 and 0.3 km south of County Road 43, which involved resurfacing, culvert improvements, and structural improvements. This work was completed in 2015.

1.4 PURPOSE OF THE TRANSPORTATION ENVIRONMENTAL STUDY REPORT

This *Transportation Environmental Study Report* (TESR) documents the environmentally significant aspects of the study. The TESR includes a description of the project and its purpose; the existing natural, social, economic, and cultural environmental factors; analysis and evaluation of alternatives that were considered; consultation process; documentation of the Recommended Plan; anticipated environmental effects and proposed mitigation measures; and commitments to future work and monitoring.

The TESR fulfills the documentation requirements of the Class EA process for a Group 'B' project. The TESR has been filed for a 30-day period of public and external agency review.

You are encouraged to contact Stantec or MTO if you have questions or concerns about this study.

The following individuals are available to discuss the TESR and may be contacted as follows:

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Fax: (613) 540-5106
Email: peter.freure@ontario.ca

Interested persons are encouraged to review the TESR and provide comments by **July 28, 2017**. If you feel, after consultation with Stantec or MTO staff, that serious environmental concerns remain unresolved, and that the study did not follow the MTO Class EA process, it is your right to request a Part II Order ('bump-up') by writing to the Minister of the Environment and Climate Change (77 Wellesley Street West, 11th Floor, Ferguson Block, Toronto ON M7A 2T5) to 'bump-up' (i.e., issue a Part II Order) this project. A 'bump-up' may lead to preparation of an Individual Environmental Assessment.

If no concerns or issues are outstanding by the end of the 30-day review period, the project is considered to have met the requirements of the Class EA, and MTO may proceed to Detail Design, subject to the commitments documented in the TESR, and obtain any outstanding environmental approvals.

The potential exists for final design plans completed during the Detail Design stage to identify design modifications or refinements that may result in environmental benefits or impacts that were not anticipated or identified in this TESR. Any changes that result in design modifications will be discussed with affected external agencies, interested stakeholders and property owners during the next study phase and documented in a *Design and Construction Report* (DCR) that will be made available for public review. If significant changes are made to the project following the completion of the TESR and eligibility for Environmental Clearance, a TESR Addendum may be required to document the project changes.

1.4.1 Environmental Clearance

If there are no significant concerns following the Public Review Period, or once the Minister of the Environment and Climate Change has reviewed any submitted Part II Order Requests and provided permission to move forward, the project will be eligible for Environmental Clearance. This will permit The MTO to:

- Negotiate temporary and permanent property acquisition, consistent with the project needs (including ROW designation)
- Relocate utilities
- Initiate subsequent study stages (i.e., Detail Design and contract preparation) for the Recommended Plan

Although the timeline for implementing the results of this study are not confirmed, this planning will assist the Ministry, municipalities, business owners, and private land owners with future planning and development within the study area. The implementation of the identified improvements is dependent on regional and provincial priorities and available funding.

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2.0 The Environmental Assessment Process

2.1 PROJECT-SPECIFIC STUDY PROCESS

The Class EA planning document defines groups of projects and activities, and the environmental assessment processes that the MTO has committed to follow for these projects. Provided that this process is followed and its requirements are met for a project, the requirements of the Ontario *Environmental Assessment Act* are considered to be met.

This Preliminary Design and Environmental Assessment Study is being carried out under the requirements of the MTO Class EA. The project is being carried out following the requirements of the Class EA as a Group ‘B’ project. Group ‘B’ projects include major improvements to existing transportation facilities including highway improvements over land or water that provide a significant increase in traffic capacity or cause a significant widening of the “footprint” beyond the roadbed of an existing highway.

For additional information on the MTO EA process, the public may contact the MTO (contact information provided in Section 1.4). In addition, the following documents are available to assist with understanding the process:

- *Class Environmental Assessment for Provincial Transportation Facilities*, MTO, July 2000
- *Environmental Reference for Highway Design*, MTO, 2006, updated in June 2013
- *Code of Practice for Preparing, Reviewing, and using Class Environmental Assessments in Ontario*, MOE, January 2014

These publications are available from the MTO Research Library Online Catalogue (library.mto.gov.on.ca) and from Publications Ontario (publications.serviceontario.ca).

The study process is illustrated in Figure 2.

2.2 ENVIRONMENTAL ASSESSMENT APPROVAL REGULATIONS

A Preliminary Design and Environmental Assessment Study of this type must be carried out in accordance with applicable environmental legislation and the current government policies and procedures. The policies and legislation that apply to this study are described below.

2.2.1 Ontario Environmental Assessment Act

The Ontario *Environmental Assessment Act* (EAA) governs the conduct of planning studies in the province of Ontario. The purpose of the EAA is to make sure that:

- A reasonable and traceable planning process is followed
- The need for the project is demonstrated
- The public has input into the process and investigations

- The study includes a review of a full range of alternatives
- The selected alternative minimizes any environmental impacts or provides mitigation strategies to minimize impacts resulting from the improvements

2.2.2 Canadian Environmental Assessment Act

The *Canadian Environmental Assessment Act, 2012* (CEAA 2012) and its regulations establish the legislative basis for the federal environmental assessment process. Under CEAA 2012, an environmental assessment is only required for projects included in the list of “designated projects”. These types of projects are likely to have significant adverse environmental effects and therefore may be subject to a federal EA.

A proponent is not required to complete the federal EA process if a project is not on this list. This project does not fall under the list of designated projects.

2.2.3 Permits and Approvals Required

Undertaking an Environmental Assessment also requires consideration of other approvals and review agencies, as outlined below.

Federal Review Agencies

- Department of Fisheries and Oceans (DFO) – *MTO/DFO/OMNRF Fisheries Protocol, Fisheries Act* (FAA)
- Environment and Climate Change Canada (ECCC) – *Species at Risk Act* (SARA), *Migratory Birds Convention Act* (MBCA)

Provincial Review/Policy Requirements

- Provincial Policy Statement (2014)
- Ministry of the Environment and Climate Change – *Environmental Assessment Act, Environmental Protection Act, Ontario Water Resources Act, Permits to Take Water, and Ontario Noise Protocol*
- Ontario Access and Privacy Office – *Freedom of Information and Protection of Privacy Act and Accessibility for Ontarians with Disabilities Act*
- Ministry of Natural Resources and Forestry – *MTO/DFO/OMNRF Fisheries Protocol, Ontario Wetlands Policy, Endangered Species Act (ESA)*
- Ministry of Tourism, Culture, and Sport – *Ontario Archaeological Protocol, Ontario Heritage Act*

Municipal Policy

- Development control, Official Plans
- Zoning bylaws
- Noise bylaws
- Transportation Planning Policy

The MTO is not required to obtain approvals or exemptions for municipal Official Plans, bylaw exemptions, or policies. However, municipal policies and plans are considered during the study, including during the development and evaluation of alternatives. Permits and approvals will be reviewed and obtained, as required, during Detail Design.

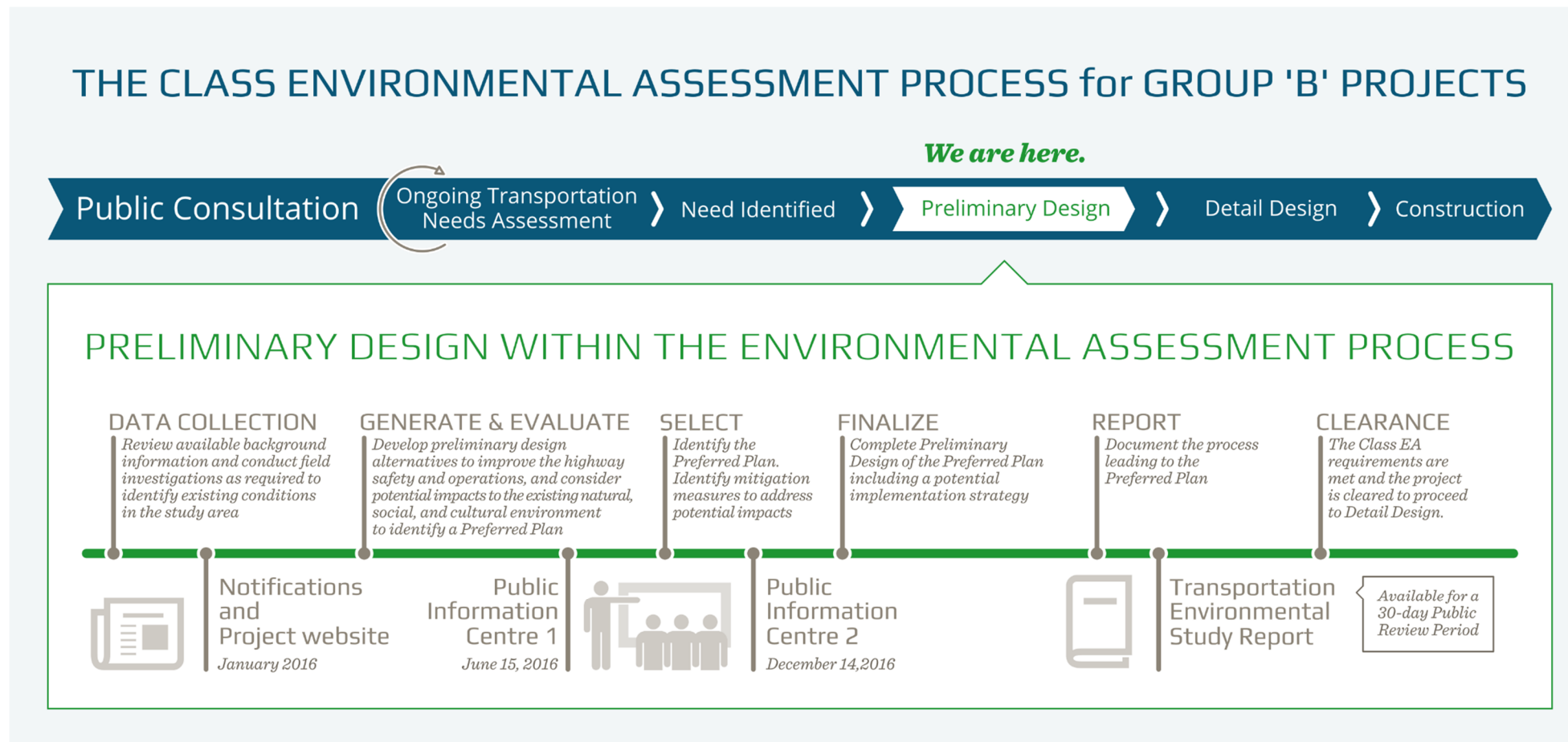


Figure 2: Project-Specific Study Process

3.0 Transportation Needs Assessment

The Transportation Needs Assessment process is part of the ongoing management and administration of the transportation systems by the Province. Assessment of needs can result in a number of recommendations, including initiating a study, initiating major or minor improvements, initiating routine maintenance, monitoring a situation, or doing nothing. Because of the range of potential outcomes, the transportation needs assessment process includes the following:

- Identifying transportation problems and opportunities
- Evaluating and selecting reasonable alternatives, including ‘do nothing’
- Developing potential transportation study objectives
- Initiating the study process

This section of the report provides an overview of the transportation *problem* and *opportunity* and assessment of Alternatives to the Undertaking that led to the initiation of this study.

3.1 EXISTING HIGHWAY

Highway 138 within the project limits is classified as a north-south, two-lane, undivided provincial facility that connects to Highway 401 in the south and to Highway 417 in the north. Highway 138 is located between Cornwall and Ottawa, two large regional centres of population and commerce. The highway has a historical function of serving local businesses and agriculture, as well as a more recent role as a commercial and commuter link.

3.2 PROVINCIAL RESPONSIBILITIES

The Ontario Ministry of Transportation (MTO) has a mandate to provide transportation services for the people of Ontario. This mandate is to:

- Preserve the safety and efficiency of Ontario’s provincial highway network and the Ontario government’s investment in highway infrastructure
- Provide a safe and efficient transportation system that is critical to Ontario’s quality of life, a strong economy, and a clean and healthy environment

The Ministry’s actions are guided by the transportation policies found under both the Transportation Systems and Transportation and Infrastructure Corridors sections of the Ontario *Provincial Policy Statement, 2014* (PPS). These policies include, but are not limited to:

- Providing transportation systems that are safe, energy efficient, facilitate the movement of people and goods, and are appropriate to address projected needs
- Making efficient use of existing and planned infrastructure
- Integrating transportation and land use considerations

- Planning for and protecting corridors and rights-of-way for transportation, transit, and infrastructure facilities to meet current and projected needs

The Transportation Needs Assessment for this study was carried out within the context of the MTO responsibilities and requirements of the PPS, and to meet the requirements of the Class EA process.

3.3 TRANSPORTATION PROBLEM AND OPPORTUNITY

The identified *problem* is a need for safety and operational improvements to Highway 138 in a way that acknowledges the local sensitivities – users of the existing highway (residents, long-distance travellers, the agricultural industry) – while meeting MTO highway safety and operations requirements. The *Highway 138 Corridor Traffic Operations and Safety Review* was carried out in 2013-2014 to identify any operational and safety issues on in the Highway 138 corridor.

The recommendations of this previous report included:

- Installation of centreline and shoulder rumble strips
- Installation of northbound left-turn lane at Valade Road/Island Road and Myers Road/McPhail Road
- Install passing lanes between Country Road 18 and Country Road 43 with further investigation of passing lanes between Country Road 43 and Highway 417
- Investigate the benefits of snow fence for 1.6 km southward from McNeil Road/Dyer Road and Sandringham Road to Lafleche Road/Allaire Road
- Convert Headline Road intersection to a roundabout

3.3.1 Traffic Safety and Operations

Increasing truck and passenger vehicle volumes on the existing highway contributes to a reduction in safety. The high percentage of commercial traffic combined with numerous at-grade intersections in the study area results in a reduction of the level of service and has the potential to increase the number of collisions due to the mixing of slower moving vehicles with higher speed highway traffic.

Improvements to the transportation system have the potential to improve safety and operations so that the movement of people and goods in the corridor meets public expectations.

The identified *opportunity* is to consider alternatives for intersection improvements, construction of passing lanes, and carpool parking lots, such that it would improve the safety and operation of Highway 138, while minimizing impacts to the natural environment, local community, and cultural environment during construction.

The planning opportunities and study objectives of this Preliminary Design, and Environmental Assessment study are to:

- Improve movement and safety of provincial and local traffic
- Facilitate the movement of natural resources and encourage economic development
- Plan for capacity improvements to accommodate future traffic volumes
- Maintain a safe highway facility

3.4 ALTERNATIVES TO THE UNDERTAKING

The Ontario *Environmental Assessment Act* requires that ‘reasonable alternatives’ be considered in addressing the identified deficiencies. This involves two levels of analysis. The Alternatives to the Undertaking considers a broad range of alternatives that could address the project needs. Once the best alternative is selected, the Alternative Methods of Carrying out the Undertaking is studied. For this project, two alternatives to the undertaking were identified: do nothing and rehabilitation/improvements (i.e. intersection improvements, turning lanes, passing lanes, and carpool lots).

3.4.1 Preliminary Screening of Alternatives to the Undertaking

A screening process has been developed to evaluate these options and select only the most reasonable alternatives for more detailed study. This process allows unreasonable alternatives or alternatives that do not meet provincial policy requirements to be eliminated from consideration in advance of the detailed development and evaluation stage.

The screening of the conceptual alternatives uses two screening criteria. They are:

- Does the alternative realistically address all of the problem/opportunity statements?
- Does the alternative, when used in combination with other alternatives, make a significant contribution towards realistically addressing all of the problem/opportunity statements?

Only those alternatives that satisfy at least one of the above criteria are carried forward. Generally, the preliminary screening of the Alternatives to the Undertaking indicates that most of the options should be eliminated from further consideration.

The ‘do nothing’ alternative involves making no improvements (or minor improvements such as sidewalk and curb improvements) to the operational and safety concern areas identified along Highway 138 in the study area.

Considering the varying degrees of operational and safety issues identified, the ‘do nothing’ alternative is considered a reasonable option and was carried forward for further analysis for each identified operational and safety concern and improvement area on Highway 138. A ‘do nothing’ alternative was included for each intersection and portion of the study area identified for operational and safety improvements and was evaluated alongside the other proposed alternative improvements. Section 5.0 provides information on the evaluation of alternatives.

Rehabilitation or various types of improvements to the identified areas with operational and safety concerns on Highway 138 is considered to be a reasonable solution and was carried forward for further analysis. Rehabilitation alternatives considered are discussed in Section 5.0.

Extensive highway expansion, such as four-laning or a by-pass of St. Andrews West was screened out early on and was not consistent with the planning horizon for this study. This study included reviewing existing traffic and highway conditions and a range of reasonable alternatives to determine the most appropriate short, medium, and long term improvement plans. Based on a preliminary traffic analysis, the existing corridor can operate to meet current and projected traffic projections and highway safety and traffic operations issues can be adequately addressed by implementing intersection and passing lane improvements (Recommended Plan presented at second Public Information Centre) within the existing Highway 138 corridor. The Ministry would only consider a major expansion, such as four-laning or a by-pass, when the existing and projected traffic volumes indicate that the existing corridor will no longer meet the provincial transportation needs. A Highway 138 by-pass of St. Andrews is a long-term plan that is not required within the planning horizon (2032) of this Preliminary Design Study.

4.0 Existing Conditions

This section of the report provides an overview of the existing natural, social, and cultural environmental conditions in the study area.

Background studies and site-specific field investigations were carried out for archaeology, noise, fisheries and aquatic resources, terrestrial resources, hydraulics/drainage, and land use. All work was carried out in accordance with the requirements of the *Environmental Reference for Highway Design (2006)*, which provides standards for scope of work, evaluation of potential impacts and proposed mitigation measures for MTO undertakings.

The background reviews to identify existing conditions were initiated in the spring of 2016 and continued throughout the study. Significant environmental features identified as a result of the background studies were documented as constraints that were considered during the development and evaluation of alternatives.

Existing conditions in the study area are described in the following sections and are depicted in Figure 3, which is provided at the end of section 4.1.

4.1 NATURAL ENVIRONMENT

The natural environment along the Highway 138 corridor from Cornwall to Highway 417 was originally studied as part of the *Highway 138 from Cornwall to Highway 17 Preliminary Design Study* in 2011. The study produced an inventory of the natural environment from a review of previous studies, field investigations and information provided from external agencies and the public. Detailed terrestrial and aquatic studies have been conducted as part of this project, since the study area and conditions may have changed since the previous report, and to confirm information gathered from secondary sources.

The main ecological characteristics of the region are:

- Main habitat types include upland deciduous forest, upland mixed forest, upland cultural meadow and scrub, deciduous swamp, mineral marsh, and thicket swamp
- Champlain sea sediments and glacial tills cover much of the region
- Three physiographic regions - Winchester Clay Plain, Glengarry Till Plain, Lancaster Flats
- Characteristic forest species include sugar maple, red maple, American beech, white ash, green ash, black ash, yellow birch, eastern hemlock, eastern white cedar, and balsam fir
- Six Species at Risk (SAR) have confirmed records in the area including: butternut, snapping turtle, Blanding's turtle, bobolink, barn swallow, and eastern meadowlark. Two barn swallow nests were found at one culvert structure and a nest scar was found on a bridge structure. Four barn swallow adults were observed near the culvert
- Fish communities are comprised primarily of baitfish species, although sport fish and one SAR, the Cutlip Minnow, has been recorded in the Raisin River and McIntosh Creek
- Two significant natural areas, Moose Creek Bog Provincially Significant Wetland (PSW) (candidate Life Area of Natural and Scientific Interest (ANSI)), and the West Monkland Newington Bog PSW (candidate Life ANSI)

- Land use around the study area varies and includes active row crop agriculture, forested wetlands, urban areas, and low-density residential areas

4.1.1 Physiography, Geology, and Soils

The study area is situated within the Kemptville physiographic region; specifically, Ecodistrict 6E-12, a limestone and sandstone bedrock plain with shallow to moderate soil coverage. Champlain sea sediments and glacial tills cover much of the region. There are three physiographic regions that traverse the study area. These are:

- Winchester Clay Plain, located in the northern portion of the study area, is characterized by glaciolacustrine sediments of generally low topographic silt and clay deposits with occasional wetlands
- Glengarry Till Plain, which covers a significant portion of the study area, is characterized by undulating to rolling topography with few moraines and drumlins, and clay flats and swamps
- Lancaster Flats, in the southern limits of the study area, including the area of Highway 138 from Cornwall Centre Road to Highway 401, is characterized by generally flat glaciolacustrine sediments of clay to very fine sand underlain by glacial till

The Raisin Region Source Protection Committee indicates that this general region is characterized by relatively flat topography with ground surface elevations generally less than 90 m above mean sea level (AMSL), and rising to elevations of about 130 m AMSL through the mid-section of the Highway 138 study area near Warina Road.

Surficial geology along the entire section of Highway 138 varies and is comprised predominantly of basin water clay and silt, transitioning to mainly nearshore deposits of fine to medium sand and some areas of sand and gravel near Warina. The southern section of the study area near the City of Cornwall includes differentiated till with a sandy silt to silt matrix containing occasional organic deposits.

The study area transitions from shallow bedrock formations including the Lindsay Formation in the north section to the Verulam Formation from Bonville to Headline Road and the Bobcaygeon Formation in the southern section through to Highway 401. The depth to top of bedrock ranges from less than 2 m to more than 25 m, depending on the location, but on average is from 5 m to 15 m below ground surface.

4.1.2 Soil Capabilities for Agriculture

The majority of the agricultural land in the study area has an agricultural soil capability of Class 3 (moderately severe limitations). The soil types found throughout the study area include organic (muck), sandy loam, well-drained medium-textured till loam, and muck deposits. South of Cornwall Centre Road, soil is classified as Class 2 (moderate limitations that restrict the range of crops or require moderate conservation practices) and Class 3 (moderately severe limitations). It should be noted that south of Cornwall Centre Road, the study area is mainly comprised of commercial and residential land use.

4.1.3 Drainage, Surface Water, Groundwater, and Sourcewater

The main surface water features in the study area are the North Raisin River, which crosses Highway 138 twice north of McMillan's Corners, and the Raisin River, which crosses Highway 138 in the vicinity of St. Andrews West. The North Raisin River flows easterly within the study area and drains towards the St. Lawrence River. The Raisin River Watershed is located in the southern portion of the study area. Watercourse crossings in this watershed include the Raisin River and McIntosh Creek.

In accordance with the *Clean Water Act* (2006), the Raisin South Nation Source Protection Region completed a source water protection assessment for the Raisin Region Source Protection Area. As part of the assessment process, vulnerable areas within the source water area were defined. The assessment is documented in the *Source Protection Plan – Raisin – South Nation Source Protection Plan (RSNPP)*. The following is a summary of features identified within the study area:

- Wellhead Protection Area (WHPA)–D for the Village of Moose Creek, where the municipal water supply crosses a 500 m section of Highway 138 near McLean Road. The section of WHPA-D was mapped with a vulnerability score of 2 and 4. Within the WHPA-D, the *Clean Water Act* does not define any significant chemical or pathogen threats related to highway design or construction.
- The City of Cornwall obtains its water supply through surface water intake from the St. Lawrence River, with the associated surface water protection area located about 3.5 km from Highway 138 at Highway 401. The study area does not cross the Intake Protection Zone (IPZ) for the Cornwall water supply system.
- The Township of North Stormont obtains water from a groundwater source in the communities of Finch, Crysler, and Moose Creek.
- The Township of South Stormont obtains water from both groundwater (community of Newington) and surface water (community of Long Sault).
- The majority of the study area is located within areas mapped as high and medium intrinsic aquifer vulnerability based on the relatively thin overburden and shallow groundwater. The RSNPP did not indicate any policies for Highly Vulnerable Aquifers (HVAs) related to highway improvements.

No other municipal water supply systems were located in the immediate vicinity of the study area.

Based on updated Ministry of the Environment and Climate Change Water Well Records, 180 water wells are located within 250 m of the study area, with the majority of the water wells completed in bedrock and ranging in depth from approximately 5 m to 130 m. The identified wells generally have static levels between 0.5 m and 10 m below ground surface (BGS). It is expected that these wells provide water supply to private residences along the highway.

Areas designated within Regulatory Floodlines are located along the Raisin River in St. Andrews West, along the Eastman Drain near Cheryl Street, and along the North Raisin River between Campbell Road and McMillan's Corners Road. No further floodplain areas are within the study area south of Cornwall Centre Road.

There are 16 municipal drains that cross Highway 138 within the study area.

4.1.4 Potential Contaminated Property

A *Contamination Overview Study* (COS) was completed by Genivar in 2011 with study area limits on Highway 138 from north of Highway 417 to Cornwall Centre Road. The COS identified several potential sources of contamination including historical spills, farming operations, pesticide distribution, industrial operations, and businesses associated with repair and fuel provisions for motor vehicles. Approximately ten properties were identified as sites with potential sources of contamination within the study area.

The following areas were identified in the previous report as sites of potential environmental concern:

- Farming facility, near Highway 138 and Sandringham Road (pesticides)
- Vehicle repair facility, 2116 Highway 138 (hydrocarbons, solvents, paints)
- Gas station, near Highway 138 and County Road 43 (hydrocarbons)
- Vehicle repair facility, near Highway 138 and Gravel Hill Road (hydrocarbons, solvents, paints, leached metals)
- Metal processing facility, near Highway 138 and Archambault Road (lubricants, solvents, fuel)
- Vehicle sales and repair facility, near Highway 138 and Cornwall Centre Road (hydrocarbons)

Stantec has completed a preliminary review of the study area from Cornwall Centre Road to Highway 401 and has identified the following potentially contaminated properties:

- Vehicle sales and repair facility, near Cornwall Centre Road and Brookdale Avenue (petroleum hydrocarbons and solvents)
- Gas station, near Cornwall Centre Road and Brookdale Avenue (petroleum hydrocarbons)
- Vehicle repair facility, near Cornwall Centre Road and Brookdale Avenue (petroleum hydrocarbons and solvents)
- Vehicle repair facility, near Cornwall Centre Road and Brookdale Avenue (petroleum hydrocarbons and solvents)

4.1.5 Designated Areas

Designated Areas are defined by resource agencies, municipalities, the government and/or the public, and through legislation, policies, or approved management plans, to have special or unique value. These areas may have a variety of ecological, recreational, or aesthetic features and functions that are highly valued. Designated Areas include, but are not limited to: Provincially Significant Areas of Natural and Scientific Interest (ANSI), Provincially Significant Wetlands (PSW), heritage rivers and national and provincial parks. There are no existing provincial or national parks or designated conservation areas located within the study area.

There are two Designated Areas located within 1 km of Highway 138 in the study area: the Moose Creek Bog and West Monkland Newington Bog PSW, and the Newington Bog Candidate Regional Life Science ANSI. The Newington Bog ANSI is a Class 1 wetland and has been designated in part due to the presence of rare features and a deer yard within its boundaries. Deciduous and mixed forests are common throughout the site and there is an extensive open bog heath, which supports low shrub bog vegetation. The West Monkland Newington Bog PSW crosses Highway 138 near McDonald Road. The MNR confirmed the presence of the above-mentioned designated areas in their April 2016

correspondence (documented in the *Terrestrial Ecosystems Existing Conditions Report* - October 2016), on file with the MTO.

4.1.6 Natural Sciences

A Fish and Fish Habitat Study and Terrestrial Ecosystems Study were carried out as part of this study. Terrestrial and aquatic ecosystems field investigations were conducted in May and June of 2016 (terrestrial investigations) and May and July of 2016 (aquatic investigations). The studies are documented in a *Terrestrial Ecosystems Existing Conditions Report* (October 2016), and *Fish and Fish Habitat Existing Conditions Report* (November 2016) that are on file with MTO. All field investigations were conducted according to the MTO *Environmental Reference for Highway Design* (2013) and the MTO *Environmental Guide for Fish and Fish Habitat* (2009).

Secondary source and background information was obtained from the MNRF and published resources.

Within the study area, the following areas were targeted for the collection of aquatic and terrestrial field data:

- Areas potentially affected by intersection improvement alternatives, passing lane alternatives, and carpool lot alternatives
- Aquatic areas potentially affected by intersection improvement alternatives, passing lane alternatives, and carpool lot alternatives (i.e., wetlands impacted, and number and location of new culverts)
- Areas where significant data gaps were identified

4.1.6.1 Fisheries and Aquatic Resources

Lakes, rivers, streams, ponds and many wetlands provide fish habitat. Intermittent and seasonally flooded areas can also provide important habitat for some fish species at certain times of the year. In-water structures such as logs, stumps and other woody debris, pools and riffle areas, riparian and aquatic vegetation, and groundwater recharge/discharge areas also provide fish habitat. Fish habitat includes watercourses that act as corridors that allow fish to move from one area to another.

The Highway 138 study area includes portions of the South Nation River watershed, North Raisin River watershed, and Raisin River watershed. The two primary natural watercourses in the study area are the North Raisin and Raisin Rivers, and there are numerous additional watercourses and municipal drains with evidence of recent or historical dredging. North of Cornwall Centre Road within the study area, fish habitats range from good quality warm and cool water feeding to spawning habitats, and marginally sensitive cattail marsh.

The field investigations completed as part of the 2011 existing conditions study identified twenty-two watercourses that provide fish habitat and also identified the following fish species: creek chub, brook stickleback, common shiner, brassy minnow, bluntnose minnow, fathead minnow, johnny darter, finescale dace, golden shiner, blacknose dace, cutlip minnow, northern redbelly dace, blacknose shiner, brown bullhead, central mudminnow, common white sucker, longear sunfish, smallmouth bass, and rock bass.

Thirty-nine culverts and bridges were investigated. Twenty-two of the crossings were identified as watercourses that provide fish habitat for warmwater fish species, including sportfish and a Species at Risk (SAR). In addition, Stantec

contacted the MNRF Kemptville District office for available fish and fish habitat for the study area and the MNRF provided this information in April 2016.

Additional water crossings were identified through background data review, totalling 44 water crossings with the potential to provide fish habitat. Twenty-seven of the forty-four water crossings are municipal drains with an assigned DFO drain class. There are DFO Type C, E, and F Drains within the study area. The MNRF confirmed the thermal regime for the 22 crossings summarized by Genivar (2010) and did not have additional information for the remaining 22 sites. Through a combination of data sources, drain class or thermal regime information was available for 28 of the 44 crossing locations in the study area.

Field investigations were conducted by Stantec in 2016 to document aquatic conditions in the study area. Among the 44 potential watercourses and water bodies investigated within the study area, fish habitat was documented at 36 sites.

Existing fish and fish habitat information is summarized below, by watershed, and is shown in Appendix B on Exhibit 5. Additional details including photographic records of the surveys, field data sheets, and tabular summaries of existing conditions for fish and fish habitat are provided in the *Fish and Fish Habitat Existing Conditions Report*, on file with the MTO.

South Nation River Watershed – Crossings 01A to 07A

The South Nation River watershed is located at the north end of the study area. Watercourse crossings in the watershed include ten municipal drains, eight of which have an assigned DFO Drain Class. Several of the drains have been recently dredged and others have started to naturalize within the historically dredged channel. Based on the results of Stantec's spring and summer field investigations, it was concluded that the culverts at Crossings 01B and 02A do not convey watercourses that provide fish habitat.

Sixteen common fish species were captured in this watershed during the 2016 surveys, including Creek Chub (*Semotilus atromaculatus*), Banded Killifish (*Fundulus diaphanus*) and Blacknose Dace (*Rhinichthys obtusus*). No sportfish were captured during the 2016 field investigations.

At most locations, water quality parameters were within ranges expected for eastern Ontario; however, conductivity readings were high at some sites, which was likely a result of agricultural inputs. During the summer survey, dissolved oxygen was recorded below the water quality guidelines for the protection of freshwater aquatic life (i.e., < 5.5 mg/L) at some locations, which was likely a result of the standing or stagnant water conditions at the culvert.

North Raisin River Watershed – Crossings 08 to 16B

The North Raisin River watershed is situated in the middle portion of the study area. During the spring 2016 survey, the northern crossing of the North Raisin River (Crossing 14) consisted of shallow flow through a flat, riffle, run, pool, run sequence. The southern crossing of the North Raisin River (Crossing 15) consisted primarily of a shallow flat which transitioned into a large riffle under the Highway 138 bridge and then transitioned back into a flat farther downstream. During the summer survey, water levels were lower and the riffles under the bridges were characterized by shallow slow-moving water with areas of exposed coarse substrate. Floating vegetation was present within the upstream and downstream flats. Riparian cover was sparse within the surveyed reach, with the occasional shrub and

tree along the banks. Twelve common fish species were captured in this watershed during the 2016 surveys, including Creek Chub, Brook Stickleback (*Culaea inconstans*) and Northern Redbelly Dace (*Chrosomus eos*). No sportfish were captured during the 2016 field investigations.

At most locations, water quality parameters were within ranges expected for eastern Ontario. However, conductivity readings were high at some sites, which was likely a result of agricultural inputs. During the summer survey, dissolved oxygen was recorded below the water quality guidelines for the protection of freshwater aquatic life (i.e., < 5.5 mg/L) at some locations, which was likely a result of the standing or stagnant water conditions at the culvert.

Raisin River Watershed – Crossings 16C to 25

The Raisin River Watershed is located in the southern portion of the study area. Watercourse crossings in this watershed include the Raisin River and McIntosh Creek, four municipal drains with an assigned DFO drain class, one unnamed drain that did not have an assigned DFO drain class (Crossing 20A), and six reaches of roadside drainage that provide seasonal fish habitat. Eight common fish species were captured in this watershed during the 2016 surveys, including Creek Chub, Brook Stickleback and Central Mudminnow (*Umbra limi*). Based on the results of Stantec’s spring and summer field investigations, it was concluded that the culverts at survey locations 20B, 22A and 23 do not provide fish habitat. No sportfish were captured during the 2016 field investigations.

At most locations, water quality parameters were within ranges expected for eastern Ontario. However, conductivity readings were high at some sites, which was likely a result of agricultural inputs. During the summer survey, dissolved oxygen was recorded below the water quality guidelines for the protection of freshwater aquatic life (i.e., < 5.5 mg/L) at some locations, which was likely a result of the standing or stagnant water conditions at the culvert.

Raisin River – Crossing 20

The Raisin River is a wide, shallow river. During the spring survey, wetted width and depth averaged 8m to 10m and 0.3m, respectively. Riparian vegetation consisted of large trees and shrubs that provide shade and cover along the stream margins. During the summer survey, water levels were lower and stream morphology consisted of a slow flat throughout the surveyed reach, except for a small riffle approximately 12 m downstream from the bridge.

McIntosh Creek – Crossing 20C/21

McIntosh Creek flows east toward Highway 138, and then turns to the south. The creek crosses Highway 138 through a new culvert, located immediately south of an abandoned concrete box culvert. During the spring survey, upstream habitat consisted of a run, riffle sequence with a wetted width and depth of 1 m and 0.2 m, respectively. A large pool at the culvert inlet was approximately 3 m wide and 0.5 m deep. During the summer survey, the upstream reach was dry. The upstream end of the culvert is perched; therefore, water cannot enter the culvert during low flow conditions. During the summer survey, a pool at the downstream end of the culvert was approximately 4 m wide, 1.5 m long and 20 cm deep and provided refuge for fish during low flow conditions. Farther downstream, isolated pools of standing water were observed within the forest.

Aquatic Species at Risk

One aquatic Species at Risk, the Cutlip Minnow (*Ecoglossum maxillingua*), has been recorded in the study area. The records for this species are from the Raisin River (Crossing 20; Genivar 2010) and McIntosh Creek (Crossing 20C/21 MNR 2016a). The Cutlip Minnow is a threatened species, protected by Ontario’s *Endangered Species Act, 2007*. Therefore, the Cutlip Minnow and its habitat will need to be considered during culvert design and construction.

Habitat in the Raisin River is suitable for the Cutlip Minnow; however, the presence of aquatic vegetation, slow flows/low summer water level, and presence of silt substrates are not ideal conditions for this species. Once information is available regarding the nature and extent of work required at the two locations where the Cutlip Minnow have been documented, the MNR should be consulted with respect to the potential need for a permit under the ESA, 2007.

4.1.6.2 Terrestrial Ecosystems

The terrestrial ecosystem is defined as the interaction of land, air, water, and biotic components functioning as an ecological unit over space and time, and includes vegetation, wetlands, wildlife, and wildlife habitat. Primary terrestrial concerns related to transportation projects include loss of habitat or habitat function, and habitat fragmentation.

Within the study area, existing land use is primarily rural agricultural land. The study area has been heavily influenced by human activity including agricultural activities, residential and commercial land use. The Highway 138 right-of-way is primarily a maintained grass feature that travels through a variety of land uses including active row crop agricultural, forested wetlands and urban areas.

The Terrestrial Ecosystem Study that was carried out for this study included:

- Documenting existing vegetation communities and wildlife habitat
- Describing the sensitivities of vegetation communities and wildlife habitats, including an assessment of habitat suitability for potential Species at Risk and provincially rare species

The Terrestrial Ecosystem Study included identifying vegetation units and wildlife habitat, based on available background data and field investigations carried out for the study. For this report, the study area includes the area within 1 km of Highway 138 from Highway 401 to Highway 417. The terrestrial features are depicted in Appendix B on Exhibit 6 and are based on the features and rationale provided in Table 1.

Vegetation and Wetlands

The three physiographic regions within the study area (Winchester Clay Plain, Glengarry Till Plain, and Lancaster Flats) provide conditions resulting in a variety of vegetation communities (Chapman and Putnam 1984). Historical plant life in this region consisted of swamp-forest and bog, although a high percentage has since been cleared for agriculture.

Natural vegetation cover within Ecodistrict 6E-12 is primarily forest and swamp, with other wetland types and alvar also present. Characteristic forest species include sugar maple (*Acer Saccharum*), red maple (*Acer rubrum*),

American beech (*Fagus grandifolia*), white ash (*Fraxinus Americana*), green ash (*Fraxinus pennsylvanica*), black ash (*Fraxinus nigra*), yellow birch (*Betula alleghaniensis*), eastern hemlock (*Tsuga canadensis*), eastern white cedar (*Thuja occidentalis*), and balsam fir (*Abies balsamea*). Alvars are relatively uncommon in the area, but high quality occurrences are significant where present.

Genivar (2011) documented the following main habitat types: upland deciduous forest, upland mixed forest, upland cultural meadow and scrub, deciduous swamp, mineral marsh, and thicket swamp.

Twenty-eight vegetation communities were observed within the Highway 138 study area, in addition to agricultural lands, and residential and commercial areas. The 28 vegetation communities observed are discussed below in Table 1.

Table 1: Ecological Land Classification (ELC) Vegetation Types

ELC Type	Community Description
Terrestrial System	
Meadow Communities (ME)	
ME – Meadow	ME communities occupied much of the Highway 138 ROW as well as the Highway 401/417 interchanges.
MEG – Graminoid Meadow	This community was located at Highway 138 and Cornwall Centre Road. This monoculture graminoid meadow had a small walking path through it.
MEF – Forb Meadow	One forb dominant old field was present north of Sand Road.
Thicket Communities (TH)	
THDM4 – Dry-Fresh Deciduous Regeneration Thicket	Deciduous tree thicket dominated by regenerating immature white elm (<i>Ulmus laevis</i>). The shrub layer was occupied by occasional gray dogwood (<i>Cornus racemose</i>), prickly-ash (<i>Zanthoxylum americanum</i>) and hawthorn sp. (<i>Crataegus sp.</i>). The ground layer is dominated by goldenrods (<i>Solidago sp.</i>) and asters (<i>Asteridae sp.</i>).
THDM5 – Fresh-Moist Deciduous Thicket	Open thicket community dominated by patches of prickly ash and widespread gray dogwood. Sensitive fern (<i>Onoclea sensibilis</i>) can be a dominant herb throughout these communities.
THDM5-1 – Fresh-Moist Gray Dogwood Deciduous Thicket	Open thicket community dominated by patches of willow sp. (<i>Salix sp.</i>) and widespread gray dogwood. Usually associated with a watercourse or aquatic feature.
Woodland Communities (WO)	
WOD – Deciduous Woodland	Typical community adjacent to Highway 138. Usually dominated with green ash, white elm or trembling aspen (<i>Populus tremuloides</i>), and evidence of previous disturbances.
WOCM1-2 – Dry-Fresh White Cedar Coniferous Woodland	A woodlot with extensive, on-going disturbances. White cedar was dominant, with goldenrods dominant in the herbaceous layer.
WODM5 – Fresh-Moist Deciduous Woodland	Semi-open canopy dominated by trembling aspen. Gray dogwood was abundant in understory shrub layer.
WODM5-1 – Fresh-Moist Poplar Deciduous Woodland	Semi-open canopy dominated by large trembling aspen with green ash associates. Gray dogwood was abundant in understory shrub layer with sensitive fern in the herbaceous layer.

ELC Type	Community Description
Forest Communities (FO)	
FOMM2-2 – Dry-Fresh White Pine – Sugar Maple Mixed Type	This community had super-canopy white pines (<i>Pinus strobus</i>) throughout with occasional associates of basswood (<i>Tilia americana</i>) and sugar maple in the canopy. Sugar maple was the dominant understorey species with associates of white spruce (<i>Picea glauca</i>), green ash and eastern white cedar. White trillium (<i>Trillium grandiflorum</i>) and trout-lily (<i>Erythronium americanum</i>) were present in the herbaceous layer.
FOMM7-2 – Fresh-moist White Cedar – Hardwood Mixed Type	This mixed-wood community was found in several areas throughout the study area. Red maple was found to be dominant with trembling aspen, white birch, white cedar associates with smaller numbers of tamarack (<i>Larix laricina</i>) and balsam fir.
FODM6-1 – Fresh-Moist Sugar Maple – Lowland Ash Deciduous Type	Sugar maple was the dominant species in the canopy layer with red maple, green ash and bur oak (<i>Quercus macrocarpa</i>) associates. Sugar maple and green ash were observed in all layers of the canopy and understorey with white trillium and trout-lily in the herbaceous layer.
FODM6-5 – Fresh-Moist Sugar Maple – Hardwood Deciduous Type	This hardwood dominated feature had an abundance of bitternut hickory (<i>Carya cordiformis</i>), and sugar maples in the canopy. Sub-canopy species included bur oak and green ash with sugar maple being dominant in all layers. White trillium and trout-lily were observed in the herbaceous layer.
FODM7 – Fresh-Moist Lowland Deciduous Ecosite	Typical community adjacent to the highway. Usually dominated by green ash, white elm or trembling aspen, with evidence of previous disturbance. Reed-canary grass (<i>Phalaris arundinacea</i>), dandelion (<i>Taraxacum sp.</i>) and queen-anne’s lace (<i>Daucus carota</i>) was noted in the herbaceous layer.
FODM7-2 – Fresh-Moist Green Ash – Hardwood Lowland Deciduous Type	This feature was completely dominated by green ash in the canopy and understorey layers. Trembling aspen and white elm were uncommon throughout the community. Ferns were the dominant species observed in the herbaceous layer.
FODM9 – Fresh-Moist Oak – Maple – Hickory Deciduous Ecosite	This red maple dominated community was found adjacent to Highway 138. Green ash was abundant and bur oak was rare within the understorey layers. Gooseberry (<i>Ribes sp.</i>) and ferns were found to be abundant in the understorey and herbaceous layers, respectfully.
Open Agriculture (OAG)	
OAGM1 – Annual Row Crops	Annual row crops such as corn and soy beans. Very common throughout assessment area.
OAGM2 – Perennial Cover Crops	This feature was mainly observed as a hayfield or sometimes as winter wheat cover field.
OAGM4 – Open Pasture	When these communities were observed, they were found to have active livestock within them.
Treed Agriculture (TAG)	
TAGM1 – Coniferous Plantation	White pine plantation.
TAGM5 – Fencerow	Deciduous fencerow between OAG fields.
Mixed Swamp (SWM)	
SWM – Mixed Swamp	This feature was associated with the Newington Bog.
SWMM4 – Ash Mineral Mixed Swamp Ecosite	This feature had a variety of coniferous species (white cedar, balsam fir) with green ash noted as dominant throughout. Ferns were dominant in the herbaceous layer.

ELC Type	Community Description
SWMM5-2 – Conifer-Hardwood Mineral Mixed Swamp Type	Small feature associated with the Newington Bog complex north of Highway 43.
Deciduous Swamp (SWC)	
SWDM2-2 – Green Ash Mineral Deciduous Swamp Type	This green ash dominated swamp type is common in the southern portion of the study area. There were characteristic hummocks with vernal pools throughout each feature. Ferns, horsetails (<i>Equisetum sp.</i>) and grasses were dominant in the herbaceous layer of this community with marsh marigold (<i>Caltha palustris</i>) noted as an associate.
Thicket Swamp (SWT)	
SWTM3 – Willow Mineral Deciduous Thicket Swamp Ecosite	This feature was associated with the watercourse south of Myers/McPhail Road. It is an extensive feature on either side of the wetland. Many standing dead trees (e.g. tamarack, green ash) remain with an extensive shrub layer of willow species and speckled alder (<i>Alnus incana</i>). Grasses were dominant throughout the feature in the herbaceous layer.

No communities or species observed are considered provincially at risk or of conservation concern. A dead butternut (provincially Endangered), was observed within the highway right-of-way (ROW); however, no live Butternut was observed within the Highway 138 ROW or within adjacent vegetation communities.

Wetlands

Wetlands are an important natural resource since they maintain and improve water quality, help control flooding, provide habitat for fish and wildlife, provide conditions for a wide variety of vegetation, and contribute to the substantial social and economic benefits of hunting, fishing, wildlife viewing, and appreciation of nature in general. Wetlands are sensitive to drainage alterations that can be caused by highway development.

The West Monkland Newington Bog Provincially Significant Wetland (PSW) is located in the study area. The Newington Bog PSW is approximately 1,800 ha of wetland and includes bog and swamp habitat.

Rare Vegetation

A review of the Natural Heritage Information Centre (NHIC) database identified records of Atlantic Sedge (*Carex atlantica*) and Butternut (*Juglans cinerea*) within one km of the study area in the last 35 years. The MNR confirmed records of Butternut in the area, and Genivar (2011) also reported one dead Butternut occurring within the study area.

Genivar (2011) also made field observations of the following regionally significant plant species: Goldie’s fern (*Dryopteris goldiana*), Clustered Sedge (*Carex cumulate*), Climbing Poison-ivy (*Toxicodendron radicans*), Downy Arrowwood (*Viburnum dentatum*), and Hairy Aster (*Symphotrichum pilosum*).

Significant Wildlife Habitat

Significant Wildlife Habitat (SWH) is defined as habitat that is ecologically important in terms of features, functions, representation or amount of contribution to the quality and diversity of an identifiable geographic area or Natural Heritage System, and is protected under the *Provincial Policy Statement, 2014*.

Significant Wildlife Habitat includes habitats that fall within any of the following four categories:

- Seasonal concentration areas: such as moose aquatic feeding and wintering areas, deer winter yards, colonial bird nesting sites, reptile hibernacula, and heronries;
- Rare vegetation communities and specialized habitats for wildlife: such as old-growth forest, areas known to support an unusually high diversity of species or vegetation communities, raptor nesting habitat, areas with concentrations of cavity trees, and moose or bear foraging areas;
- Habitats for species of conservation concern, such as special concern species or species ranked provincially S1-S3, excluding the habitats of endangered and threatened species; and
- Animal movement corridors.

The following candidate SWH features were documented in the study area:

- Seasonal Concentration Areas – Turtle wintering areas, deer yard, and waterfowl stopover and staging areas;
- Rare or Specialized Habitat – Amphibian breeding habitat, and turtle nesting habitat;
- Habitat for Species of Conservation Concern – Habitat with provincially rare species (Atlantic Sedge, Snapping Turtle, Yellow Rail), and marsh bird breeding habitat; and
- Animal Movement Corridors – Amphibian movement corridors.

The potential for specialized wildlife habitat for additional species, such as bat maternity colonies, deer wintering areas and moose late winter cover areas, and specialized wildlife habitat for birds, such as raptor wintering areas, may occur in the study area. However, no records pertaining to these habitats were provided by the MNR and the habitats were not encountered during field work.

Seasonal Concentration Areas

Seasonal concentration areas are those sites where large numbers of a species gather together at one time of the year, or where several species congregate. Such areas include, but are not limited to: deer yards, snake and bat hibernacula, waterfowl staging and moulting areas, raptor roosts, bird nesting colonies, shorebird staging areas, and passerine migration concentrations. Only the best examples of these concentration areas are usually designated as SWH. Areas that support a Species at Risk, or areas where a large proportion of the population may be lost if the habitat is destroyed, are examples of seasonal concentration areas which should be designated as significant.

The following candidate habitat for seasonal concentration areas was identified within the study area during field investigations:

- **Turtle Wintering Areas:** Although no turtles were observed basking during field observations, it is assumed that open aquatic features with permanent water could provide habitat for wintering individuals. Turtle wintering habitat does not extend into the ROW of Highway 138.
- **Deer Yard:** The Newington Bog candidate ANSI includes a deer yard within its boundaries near the Highway 138 corridor. A Wildlife Detection System is in place between Station 11+500 and 13+700 to monitor wildlife movement within the area due to a high percentage of wildlife/vehicle collisions. The MTO is still collecting data with the

detection system. Earlier collision analysis confirmed a high proportion of wildlife/vehicle collisions near McDonald Road, Seguin Road, and between Amell Road and Myers Road.

- **Waterfowl Stopover and Staging:** Field investigations documented a high number of “Greater” Snow Geese (*Chen caerulescens*) in the fields surrounding the Lafleche Landfill (n: ~10,000) in the northern part of the study area. The habitat does not extend into the ROW of Highway 138.

Rare or Specialized Habitat

Rare or Specialized habitats are two separate components. Rare habitats are those with vegetation communities that are considered rare in the province. Specialized habitats are microhabitats that are critical to some wildlife species. The SWH Criteria Schedules for Ecoregion 6E identifies a number of habitats that could be considered specialized habitats, such as habitat for area-sensitive species, forests providing a high diversity of habitats, amphibian woodland breeding ponds, turtle nesting habitat, highly diverse sites, seeps and springs. The following candidate habitats for rare or specialized habitat were identified within the study area:

- **Amphibian Breeding Habitat:** Ponds, wetlands, and other temporary pools throughout the study area provide suitable habitat for amphibian breeding. Targeted breeding surveys were not conducted. The highest quality candidate breeding features are located outside the ROW
- **Turtle Nesting Habitat:** Suitable turtle nesting areas were present in the form of road shoulders throughout the length of the study area when within range of aquatic features. Such areas contained loose gravel and exposed sand. Although gravel roadsides are generally suitable for turtles nesting, they are not considered candidate SWH. No other nesting areas were visible from the highway ROW and no nests were observed

Animal Movement Corridors

Migration corridors are areas that are traditionally used by wildlife to move from one habitat to another, often in response to different seasonal habitat requirements. The SWH Criteria Schedule for Ecoregion 6E speaks specifically to amphibian movement corridors. These corridors are only considered when wetland breeding amphibian habitat is identified for: Eastern Newt (*Notophthalmus viridescens*), American Toad (*Anaxyrus americanus*), Spotted Salamander (*Ambystoma maculatum*), Four-toed Salamander (*Hemidactylium scutatum*), Blue-spotted Salamander (*Ambystoma laterale*), Gray Treefrog (*Hyla versicolor*), Western Chorus Frog (*Pseudacris triseriata*), Northern Leopard Frog (*Lithobates pipiens*), Pickerel Frog (*Lithobates palustris*), Green Frog (*Rana clamitans*), Mink Frog (*Lithobates septentrionalis*), or American Bullfrog (*Lithobates catesbeianus*). Documentation of amphibian movement corridors is beyond the scope of this study; however, given the proximity of suitable breeding wetlands to the road, and random dispersal patterns of amphibians, regular road mortality is expected.

Avian Species and Migratory Birds

Three rounds of breeding bird surveys were conducted at four locations where works are proposed outside of the highway ROW. The surveys were conducted by traversing the subject lands on foot (where access was permitted) recording all species of birds that were heard or seen. A conservative approach to determining breeding status was taken; all birds seen or heard in appropriate habitat during the breeding season were assumed to be breeding. Three rounds of surveys were conducted on June 3, 15, and 24, 2016, during suitable mornings with light winds and little or

no precipitation. Culverts located in the study area were also searched for nests of migratory birds, as defined by the *Migratory Bird Convention Act, 1994*.

Species encountered during the surveys were a mixture of common species according to their respective habitat types, and no avian SAR showed evidence of breeding at any of the four locations. Two active Barn Swallow nests were identified at one culvert (Beaver Creek Drain Culvert) within the study area. An additional inactive nest scar was recorded below a bridge (North Raisin River Bridge).

Species of Conservation Concern

Significant species are considered at a number of levels, including globally, nationally and provincially. In Ontario, significant species include species that are provincially rare (with a Provincial S-rank of S1 to S3) or listed as Endangered, Threatened, or Special Concern on the Species at Risk in Ontario list (SARO) and/or Schedule 1 of the federal *Species at Risk Act* (SARA).

The Ontario *Endangered Species Act, 2007* prohibits harm or harassment to Threatened or Endangered species, and damage or disturbance to their habitat. The ESA applies on all private and Crown owned lands in Ontario. Habitat protection under the ESA typically includes all habitats that directly or indirectly support SAR.

Federally protected Endangered, Threatened and Special Concern species are listed in Schedule 1 of the *Species at Risk Act, 2002* and apply only to federally owned lands. Fish species are protected under the *Fisheries Act* and migratory bird species are protected under the *Migratory Bird Convention Act*, both of which are afforded protection on all lands.

Provincial ranks (S-ranks) are used by the NHIC to set protection priorities for rare species and vegetation communities. They are based on the number of occurrences in Ontario and are not legal designations. By comparing the global and provincial ranks, the status, rarity and the urgency of conservation needs can be determined. Species with provincial ranks of S1 to S3, and those tracked by the MNRF, are considered species of conservation concern. Provincial S-ranks are defined as follows:

S1: Critically imperiled-usually fewer than 5 occurrences

S2: Imperiled- usually fewer than 20 occurrences

S3: Vulnerable- usually fewer than 100 occurrences

S4: Apparently secure- uncommon but not rare, usually more than 100 occurrences

S5: Secure- common, widespread, and abundant

S-rank followed by a “?” indicates that the rank is uncertain

The probability that a Significant Species occurred near the subject location was assessed by comparing preferred habitat types to existing conditions as documented in the background review and field investigations. Significant Species with preferred habitat in the study area were considered likely to be present. Significant Species with no preferred habitat in the study area were assumed to be absent.

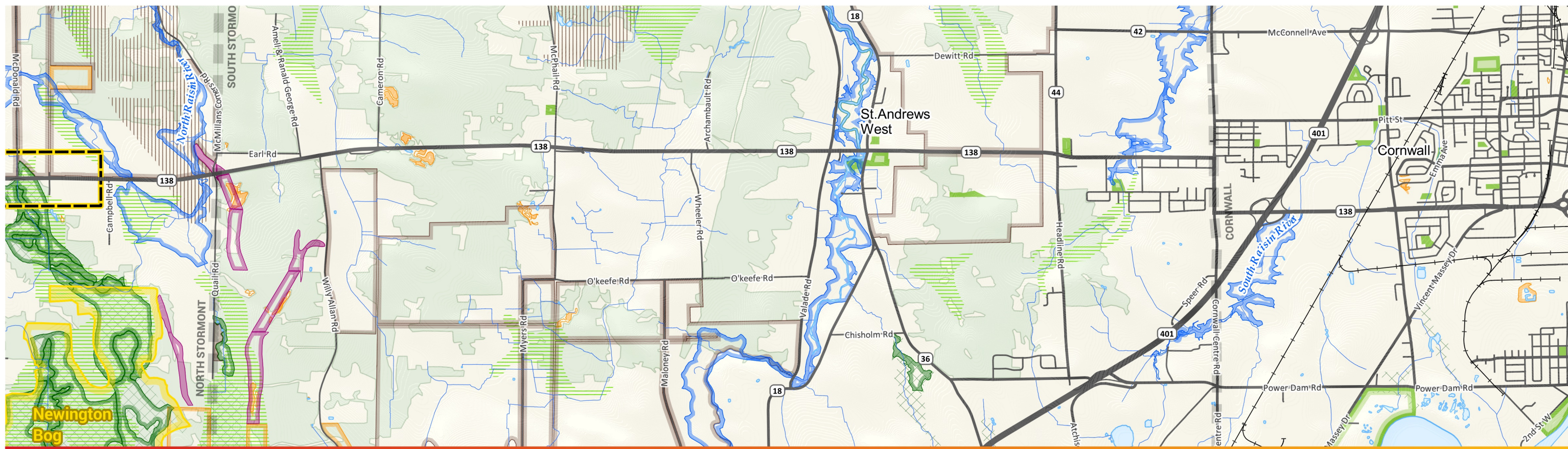
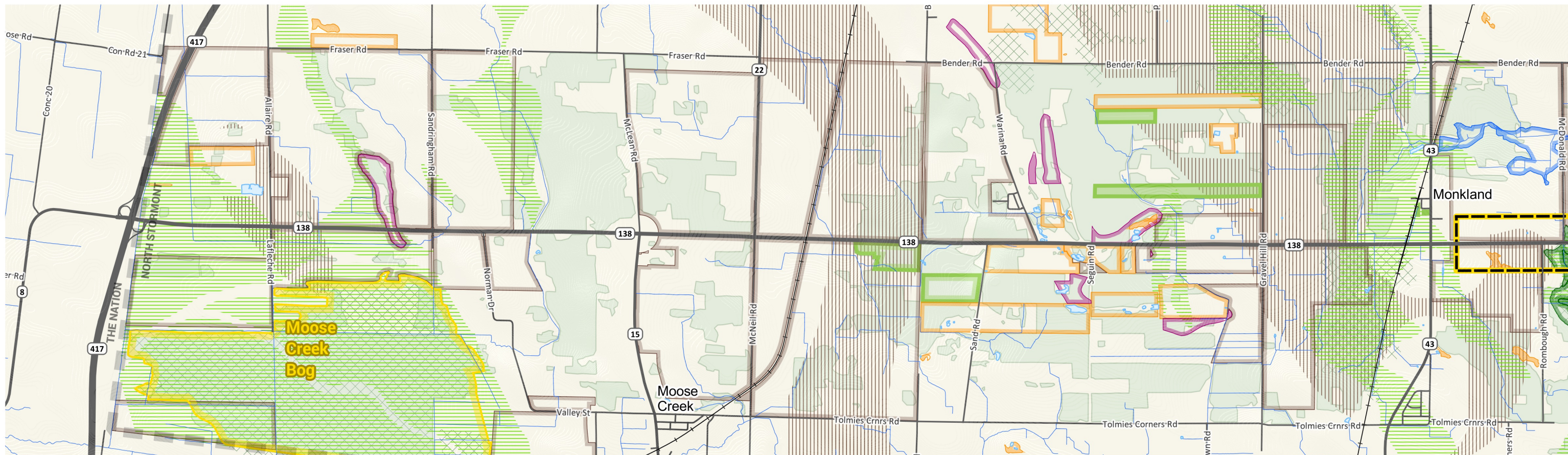
Identification of potentially sensitive plant species was based on the coefficient of conservatism value (CC) assigned to each native species in southern Ontario. The value of CC, ranging from 0 (low) to 10 (high), is based on a species' tolerance of disturbance and fidelity to natural habitats. Species with a CC value of 9 or 10 generally exhibit a high degree of fidelity to a narrow range of habitat parameters and undisturbed environments.

A review of the atlas records indicated that four reptile, 14 breeding bird, and four mammal SAR and provincially rare (S1-S3) species have ranges that overlap with the study area. Eighteen of these species are designated in Ontario and/or Canada as Endangered (four species), Threatened (eight species), and Special Concern (six species), and four additional species are provincially rare (S1-S3). All species identified during the atlas review are documented in the *Terrestrial Ecosystems Existing Conditions Report* (October 2016), on file with the MTO.

The bird, mammal, reptile, and amphibian range maps are relatively coarse in nature and do not offer precise locations or information on concentrations/densities of records. For example, the Ontario Breeding Bird Atlas records are provided in 10 km by 10 km square grids. The NHIC database provides more precise mapping than the atlases (1 km by 1 km squares) and is a better indicator of occurrence of significant species, particularly when used in combination with MNRFC correspondence.

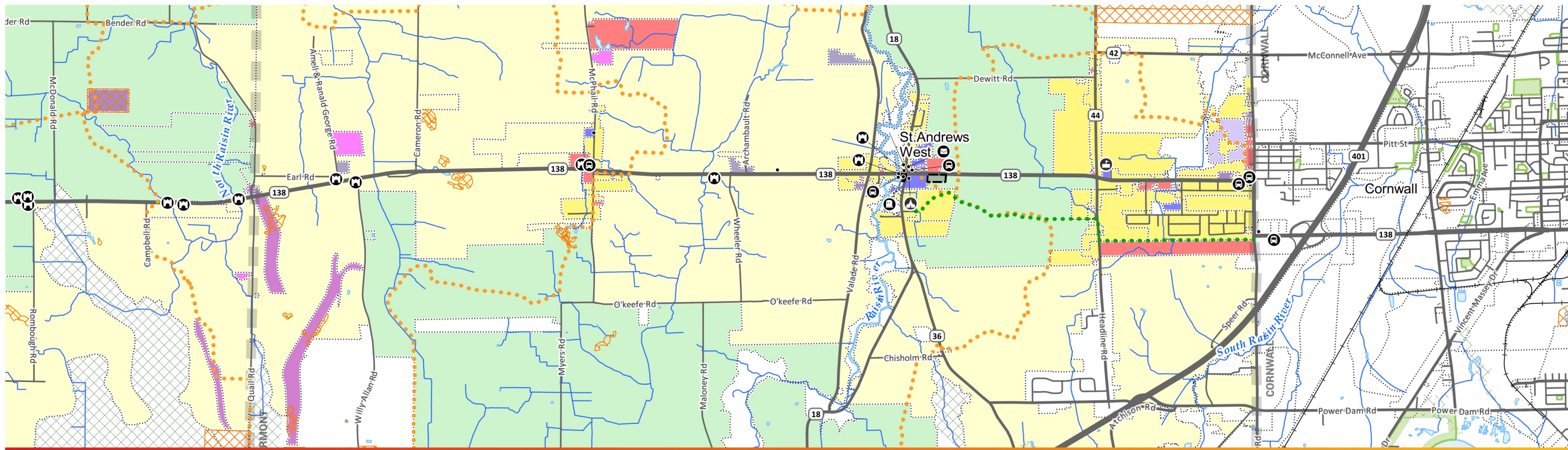
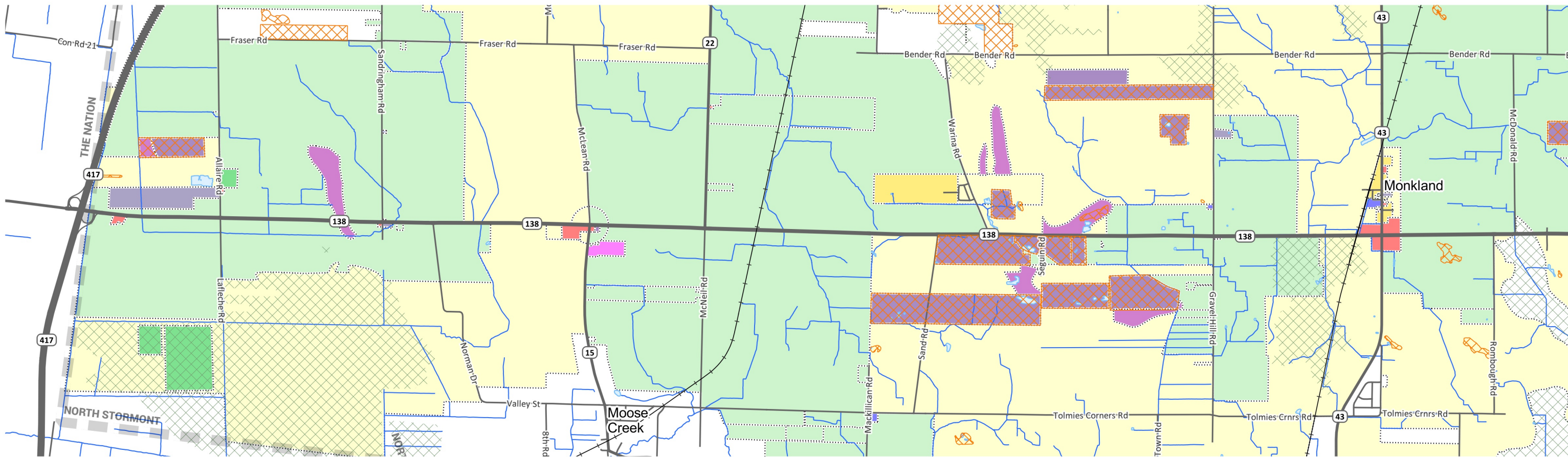
A review of the NHIC database identified records of the following SAR and provincially rare (S1-S3) species records within 1 km of the study area in the last 35 years: Atlantic Sedge, Butternut, Snapping Turtle, Yellow Rail, Bobolink, and Eastern Meadowlark. The MNRFC confirmed records of six SAR to be present within the study area including: Butternut, Snapping Turtle, Blanding's Turtle, Bobolink, Barn Swallow, and Eastern Meadowlark. Genivar (2011) also reported a Butternut in the study area. An aquatic SAR, Cutlip Minnow, was also identified in the study area and is discussed on page 14.

Little Brown Myotis (S5), Small-footed Myotis (S3?), Northern Myotis (S3?), and Tri-coloured Bat (S3?) are also SAR that are protected by the ESA. Although there were no records in the NHIC database for these species, they have not been historically tracked by MNRFC and may occur in the area. Surveys were conducted by Stantec (2016) at the four locations where breeding bird surveys occurred. Proposed works are anticipated to occur outside of the highway ROW at these four locations and habitat was assessed to determine the potential presence of bat maternity colonies. Forest or Swamp ELC communities with trees 25 cm in diameter at breast height are considered suitable, but did not occur at any of the four surveyed locations.



Legend

- Municipal Boundary
- Railroads
- Roads
- Wildlife Detection System
- Watercourse
- Waterbody
- Floodplain
- Woodlands
- Wetlands
- Prov. Sig. Wetland
- ANSI
- Aggregate Reserve
- Pit or Quarry
- Parks & Recreation
- Organic Soils
- Bedrock



Ontario
Highway 138 Improvements
 from Highway 401 to Highway 417
 GWP 4015-08-00



Legend

- Municipal Boundary
- Railroads
- Roads
- Watercourse
- Trail
- Snowmobile trail
- Parks
- Cemetery
- Pit or quarry
- Waterbody
- Wetland

Zoning

- Commercial
- Institutional
- Agricultural
- Rural
- Residential
- Woodlot
- Scrap/Waste

Points of Interest

- cemetery
- church
- post office
- school
- heritage site
- bus stop

Sheet
Figure 3-2
 Title
Land Use

4.2 SOCIO/ECONOMIC ENVIRONMENT

This section of the report provides an overview of the existing socio-economic conditions in the study area.

The socio-economic background review to identify existing conditions was initiated in the winter of 2015 and included a detailed review of the 2011 Existing Conditions Report, an initial site visit (October 2015), a review of data provided from the United Counties of Stormont, Dundas and Glengarry, the Townships of North and South Stormont and the City of Cornwall, and other background / secondary sources.

4.2.1 Land Use

The study area is located within the Townships of North and South Stormont and the City of Cornwall, in the United Counties of Stormont, Dundas and Glengarry. There is a small northerly portion of the study area (the westbound ramp of the Highway 138 and Highway 417 interchange) that is located within The Nation Municipality in the United Counties of Prescott and Russell.

Existing land use within the study area is primarily rural agricultural land, rural residential and commercial land use. The study area has been heavily influenced by human activities, including agricultural activities, residential and commercial land use and aggregate extraction activities.

Existing land use and zoning is shown in Figure 3 (following section 4.1).

4.2.1.1 Official Plan

The *Official Plan* (2006) for the United Counties of Stormont, Dundas, and Glengarry describes existing and future land use designations in the Township of North Stormont and the Township of South Stormont. The City of Cornwall *Official Plan* (2004) documents existing and future land use within the City's municipal boundaries.

The following is a brief description of the land use designations found along and adjacent to the Highway 138 corridor:

Commercial Land/Employment Land

Within the study area there is a designated Employment District at the southwest corner of the Highway 138 and Highway 417 interchange. No other commercial or employment land designations are identified in the Townships of North and South Stormont. In the City of Cornwall *Official Plan* (2004) the northwest portion of the Highway 138 and Highway 401 interchange is designated General Commercial.

Residential/Rural Residential Land

The following areas have been designated as residential and urban settlement land use areas:

- Township of North Stormont – Residential District for the Town of Monkland
- Town of Moose Creek – Urban Settlement Area
- Township of South Stormont – St. Andrews West and Rosedale Terrace – Urban Settlement Areas
- Township of South Stormont – McPhail Road and Highway 138

- Township of South Stormont – St. Andrews West and Rosedale Terrace – Rural Settlement Area
- City of Cornwall – The northeast portion of the Highway 138 and Highway 401 interchange is Urban Residential

Agricultural Land/Extractive Resource Land

The majority of the study area adjacent to Highway 138 through the Townships of North and South Stormont is designated Agricultural Resource Lands and Rural.

In the City of Cornwall *Official Plan* (2004) the northwest portion of the Highway 138 and Highway 401 interchange is designated as Prime Agricultural land. There are also Extractive Resource land designations (i.e., active pits or quarries) adjacent to Highway 138 near Seguin Road.

Communities

The northern section of the study area is located within the Township of North Stormont. The Township of North Stormont is part of the United Counties of Stormont, Dundas and Glengarry. The Township of North Stormont has a population of approximately 6,700 residents (Statistics Canada 2012). The Township includes the communities of Moose Creek, Warina, and Strathmore, which are within or adjacent to the study area. North Stormont borders the Township of South Stormont.

The middle and southern portion of the study area is located within the Township of South Stormont. The Township of South Stormont is part of the United Counties of Stormont, Dundas, and Glengarry, and has a population of approximately 12,000 residents. The Township includes the communities of Bonville, Long Sault, Northfield, and St. Andrews West, and borders the City of Cornwall.

The community of St. Andrews West is the largest settlement in the study area. The community's most prominent landmark, St. Andrews West Church, is located at the intersection of Highway 138 and County Road 18/Dundas Street. The historic St. Andrews/Pioneer Cemetery is located at the northwest corner of the Highway 138/County Road 18/Dundas Street intersection.

The City of Cornwall northern boundary is located at Cornwall Centre Road and is located in the southern-most portion of the study area. The City has a population of approximately 46,000 residents and the economy is based on the automotive industry, manufacturing, high tech, distribution centres, and call centres.

Future Development

The *Official Plan* for the United Counties of Stormont, Dundas, and Glengarry and the *Official Plan* for the City of Cornwall do not have any areas designated for Future Development within the study area.

4.2.1.2 Commercial

Highway 138 functions as a major commercial and commuter link between Cornwall and Ottawa, two large regional centres of population and commerce. Additionally, it serves local businesses situated along the highway.

Within the study area on Highway 138, highway-oriented businesses include, but are not limited to: Cornwall Mazda, Stephen Fitzgerald Motors, St. Andrews West Post Office, Crossroads Convenience, Quinn's Inn, Mo's Diner, Esso, Ryder Truck Maintenance Shop, Crawford Mobile Truck Repair, and MacEwen Gas Bar.

4.2.2 Student Transportation

The study area is located within two school boards: The Student Transportation of Eastern Ontario provides student transportation services for the Catholic District School Board of Eastern Ontario and the Upper Canada District School Board, and all schools in and surrounding the study area (i.e., in the City of Cornwall).

4.2.3 Emergency Services

Emergency Services are comprised of police, fire, and medical response providers. The following is the summary of emergency services within the study area:

- Police service in the study area is provided by the Ontario Provincial Police (OPP) – Stormont-Dundas-Glengarry detachment, and the Cornwall Community Police Service. The OPP Detachment office is located in Long Sault, with satellite offices in Alexandria, Lancaster, Winchester, and Morrisburg
- Fire services are provided by the South Stormont Fire and Rescue, North Stormont Fire Department, and the Cornwall Fire Department
- Cornwall Stormont Dundas & Glengarry Emergency Medical Services provides ambulance service to Cornwall, Alexandria, Avonmore, Morrisburg, Winchester, Lancaster, South Stormont and North Stormont. The EMS headquarters are located in Cornwall. The nearest hospital, Cornwall Community Hospital, is located in the City of Cornwall outside of the direct study area

The South Stormont Fire and Rescue fire hall in St. Andrews West has a direct entrance to Highway 138 south of Dundas Street.

4.2.4 Agriculture

A significant portion of the study area has active agricultural operations and facilities located directly adjacent to Highway 138. Most of the agricultural operations in the study area are large-scale cereal crop operations (i.e., corn). However, there are smaller operations, including a mushroom production facility at Highway 138 and Lafleche Road. As per the Canada Land Inventory (CLI) and the Genivar (2011) Existing Conditions Report, the study area contains primarily Class 3 soils. Class 3 soils have moderately severe limitations that restrict the range of crops.

4.2.5 Aggregates

Existing, potential, developed and undeveloped aggregate sources exist within the study area. There are nine existing aggregate operations located in the northern half of the study area.

4.2.6 Parks and Trails

There are no provincial parks located within the study area.

There is one existing trail located in the study area, the St. Andrews / Rosedale Trail, identified in the Township of South Stormont *Recreational Master Plan (2007)*. The trail runs from Cornwall Centre Road, near the intersection of Brookdale Avenue in South Stormont, to Headline Road, South Stormont, and then to County Road 18 in St. Andrews West. The Township of South Stormont maintains and operates this trail (shown in Figure 3). There are no plans for trail development in the study area. The proposed Project will not impact the existing trail system.

4.2.6.1 Snowmobile Trails

The study area is located within District 1 of the Ontario Federation of Snowmobile Clubs (OFSC). Trans Ontario Provincial (TOP) Trails, and the Seaway Valley Snowmobile Association maintains the snowmobile trails located in the study area (OFSC 2016). GIS mapping of the current trail network was provided in January 2016 and existing OFSC trails that cross the study area are shown in Figure 3.

The following OFSC snowmobile trails cross Highway 138:

- Valleys Corners Club Trail – SV 7
- A213 Feeder Trail
- A104 Feeder Trail
- SV10 Club Trail
- SV17 Club Trail

4.2.7 Transit and Commuter Parking Facilities

Within the study area Greyhound and Delaney Bus Lines provide daily bus service from the study area to the City of Ottawa. The Greyhound bus stop is located at 5757 St. Andrews Road in the town of St. Andrews West. Delaney Bus Lines Ltd. has bus stops located in Cornwall, St. Andrews West, Monkland, and Moose Creek. There are no designated carpool or commuter parking lots in the study area. There are anecdotal reports that parking lots at St. Andrews Church and the Tim Hortons in Monkland are used for commuter parking.

4.2.8 Noise

An *Existing Noise Conditions Report* was completed as part of the previous *Existing Conditions Report* in 2011 (Genivar) and the report identified that due to a high percentage of trucks, the sound levels on Highway 138 are higher than a typical 2-lane rural highway. The previously completed noise report utilized an equivalent sound level (level of a continuous sound having the same energy as a fluctuating sound in a given time period) modelled over a 24-hour average. Generally, residents adjacent to Highway 138 experience existing sound levels of 60 dBA. An *Environmental Noise Assessment* was completed as part of this Preliminary Design Study and can be found in Appendix G. The environmental noise assessment identified sound levels ranging between 43 dBA to 67 dBA at the most exposed sides (MES) of the identified noise sensitive receptors along Highway 138.

4.3 CULTURAL ENVIRONMENT

4.3.1 Archaeology

A Stage 1 Archaeological Assessment was carried out as part of the previous *Existing Conditions Report* (2011) in accordance with the provisions of the *Ontario Heritage Act* (1990) and the *Standards and Guidelines for Archaeological Assessments* (2006) provided by the Ministry of Tourism, Culture and Sport (MTCS). The Stage 1 Assessment was carried out for the Highway 138 corridor and extends from Cornwall Centre Road to Highway 417. The previously completed Stage 1 Assessment indicated that no archaeological sites have been registered within a one km radius of the study area. The MTO ROW has limited archaeological potential due to previous ground disturbances and therefore no further archaeological assessments are required for parts of the study area that fall within the ROW. Stage 2 Archaeological Assessments were recommended for any areas that have been identified as part of the potential improvements that extend beyond the ROW.

As part of this Preliminary Design Study, a Stage 1 Archaeological Assessment was completed for the area that was not previously assessed (Highway 138 from Cornwall Centre Road to Highway 401) (see Appendix G).

Archaeological potential is established by determining the likelihood that archaeological resources may be present on a subject property. Archaeological potential criteria includes proximity to previously identified archaeological sites, distance to various types of water sources, soil type, and topography.

The study area lies within the Upper St Lawrence – Raisin River watershed. The closest potable water source is the southern branch of the Raisin River, which crosses the southern portion of the study area. A number of unnamed tertiary waters sources, e.g. small tributaries of primary and secondary sources, seasonal streams, and marshes and swamps, have also been identified within the study area.

For historic Euro-Canadian sites, archaeological potential can be extended to areas of early Euro-Canadian settlement, including places of military or pioneer settlements, early transportation routes, and properties listed on the municipal register or designated under the Ontario Heritage Act or property that local histories or informants have identified with possible historical events. Background and secondary source research as part of the Stage 1 Assessment demonstrate that the study area and its environs were occupied by Euro-Canadian farmers by the mid-late 19th century. Much of the established road and rail networks and agricultural settlement from that time is still visible today. Considering the above, the historic Euro-Canadian archaeological potential of the study areas is judged to be moderate to high.

When the above listed criteria are applied to the study area, the archaeological potential for pre-contact Aboriginal and post-contact Aboriginal sites is considered to be high. Archaeological potential for historic Euro-Canadian homestead sites is considered to be high.

The property inspection revealed that the archaeological potential in portions of the study area had been removed due to extensive and deep modern disturbances, including the existing Highway 138 and Highway 401 ROWs, other infrastructure, existing commercial and residential buildings, and associated ground disturbance such as berms, paved and gravel yards and laneways. These construction activities have subjected the relevant portions of the study area to extensive and deep land alterations which would have severely damaged the integrity of any archaeological resources, thus removing archaeological potential as per the *Standards and Guidelines for Consultant Archaeologists*.

The Stage 1 Archaeological Assessment identified portions of the study area that exhibit moderate to high potential for the identification and recovery of archaeological resources. As a result of the Stage 1 Assessment, a Stage 2 Archaeological Assessment was conducted for all areas where potential improvements have been identified outside of the MTO ROW.

The Stage 2 Assessment is discussed in Section 8.0.

A *Cultural Heritage Evaluation Report* (CHER) was completed by Archaeological Services Inc. on behalf of Genivar as part of the 2011 *Existing Conditions Report*. Twenty-two built heritage resources and 18 cultural heritage complexes were identified within or adjacent to the study corridor. These identified resources include historic settlements and commercial structures (i.e., St. Andrews Church and St. Andrews Cemetery). St. Andrews Church is an identified cultural heritage resource and was built in 1860. Additionally, the St. Andrews / Pioneer Cemetery, another identified cultural heritage resource, is located at the northwest corner of the Highway 138 and Dundas Street. The cemetery is one of the oldest cemeteries in Ontario and houses the grave of John Sandfield MacDonald, the first Premier of Ontario, and the explorer Simon Fraser. Each of the identified built heritage resources and cultural heritage complexes are listed in Table 2 and documented in the CHER.

No additional designated heritage properties have been identified in the expanded study area not covered in the 2011 study, south of Cornwall Centre Road.

The CHER recommended that cultural heritage resources should be avoided, if possible, and mitigation measures for cultural heritage resources should be developed.

Table 2: Identified Built Heritage Resources and Cultural Landscapes in the Study Corridor

Feature Number and Feature Type	Location	Recognition/Designation
BHR 1- Residence	1719 Highway 138	Identified during previous field review
BHR 2 - Residence	Northwest corner of Sandringham Road and Highway 138	Identified during previous field review
BHR 3 - Residence/Commercial	Southwest corner of Sandringham Road and Highway 138	Identified during previous field review
BHR 4 - Residence	2806 Highway 138	Identified during previous field review
BHR 5 - Residence	2812 Highway 138	Identified during previous field review
BHR 6 - Residence	Northeast corner of Gravel Hill Road and Highway 138	Identified during previous field review
BHR 7- Residence	3192 Highway 138	Identified during previous field review
BHR 8 - Residence	3522 Highway 138	Identified during previous field review
BHR 9 - Residence	3635 Highway 138	Identified during previous field review
BHR 10 - Bridge	Station 11+100, northern branch of North Raisin River	Identified during previous field review
BHR 11- Residence	Station 10+900, south of north branch of North Raisin River	Identified during previous field review

Feature Number and Feature Type	Location	Recognition/Designation
BHR 12 - Bridge	Station 10+200, southern branch of the North Raisin River	Identified during previous field review
BHR 13 - Historic Plaque	Northeast corner of Amell and Randal George Road and Highway 138	Identified during previous field review
BHR 14 - Outbuilding	Northwest corner of Willy Allan Road and Highway 138	Identified during previous field review
BHR 15 - Residence/Hotel	Northeast corner of Myers Road and Highway 138	Identified by the United Counties of Stormont, Dundas and Glengarry
BHR 16 - Barn	Northeast corner of Myers Road and Highway 138	Identified during previous field review
BHR 17 - Residence	Northeast corner of Myers Road and Highway 138	Identified during previous field review
BHR 18 - Residence	4850 Highway 138	Identified during previous field review
BHR 19 - Bridge	Highway 138 over Raisin River in St. Andrews West	Identified during previous field review
BHR 20- Residence/Restaurant/Hotel	Northeast corner of Highway 138 and Dundas Street	Designated under Part IV of the <i>Ontario Heritage Act</i>
BHR 21- Residence	Station 12+900, east side of Highway 138	Identified during previous field review
BHR 22 - Residence	Station 12+900, east side of Highway 138	Identified during previous field review
CHL 1- Farm Complex	1781 Highway 138	Identified during previous field review
CHL 2 - Farm Complex	1782 Highway 138	Identified during previous field review
CHL 3 - Farm Complex	Northeast corner of McLean Drive and Highway 138	Identified during previous field review
CHL 4 - Remnant Farm Complex	2415 Highway 138	Identified during previous field review
CHL 5- Farm Complex	Lot 12, Concession 4, Township of North Stormont	Identified during previous field review
CHL 6 - Farm Complex	Lot 13 Concession 4, Township of North Stormont	Identified during previous field review
CHL 7 - Farm Complex	3195 Highway 138	Identified during previous field review
CHL 8 - Farm Complex	3198 Highway 138	Identified during previous field review
CHL 9 - Remnant Farm Complex	3512 Highway 138	Identified during previous field review
CHL 10 - Remnant Farm Complex	3603 Highway 138	Identified during previous field review
CHL 11- Remnant Farm Complex	3835 Highway 138	Identified during previous field review
CHL 12 - Historic Road; private driveway	Amell and Randal George Road	Identified during previous field review
CHL 13 - Farm Complex	Approximately 200 m south of Cameron Road, east side of Highway 138	Identified during previous field review

Feature Number and Feature Type	Location	Recognition/Designation
CHL 14 - Farm Complex	4560 Highway 138	Identified during previous field review
CHL 15 - Farm Complex	Southeast corner of Myers Road and Highway 138	Identified during previous field review
CHL 16 - Evolving Historic Settlement	Highway 138 from Valade Road south to station 15+200 and west side and north of Station 15+700 on east side	Identified during previous field review and containing properties designated under Part IV of the <i>Ontario Heritage Act</i>
CHL 17 - Cemetery	Northwest corner of Highway 138 and Dundas Street	Designated under Part IV of the <i>Ontario Heritage Act</i>
CHL 18 - Church and Parish Hall	Southwest corner of Highway 138 and Dundas Street	Designated under Part IV of the <i>Ontario Heritage Act</i>

4.3.2 Summary of Sensitive Features

The following key environmental features were identified in the study area:

- **Land Use:** Existing land use within the study area is primarily rural agricultural land and rural residential and commercial land use. The Highway 138 corridor is mainly rural with some wooded areas and wetlands. There are also several utility corridors (hydro, pipeline, and rail) that cross or run adjacent to Highway 138 within the study area.
- **Designated Areas:** The Moose Creek Bog and West Monkland Newington Bog Provincially Significant Wetland (PSW) and the Newington Bog Candidate Regional Life Science ANSI are located in and in close proximity to the study area.
- **Fish and Fish Habitat:** The study area includes the North Raisin River, and multiple tributaries of that river fish habitat ranged from good quality warm and cool water feeding and spawning habitats and marginally sensitive cattail marsh habitat. Additional water crossings were identified through background data review, totalling 44 water crossings with the potential to provide fish habitat.
- **Species of Conservation Concern:** Species at Risk and provincially rare (S1-S3) species that are potentially within the study area, include fourteen bird species, four reptile species, four mammal species, and one plant species. One aquatic Species at Risk, the Cutlip Minnow (*Ecoglossum maxillingua*), has been recorded in the study area. The records for this species are from the Raisin River (Crossing 20; Genivar 2010) and McIntosh Creek (Crossing 20C/21 MNRF 2016a). The Cutlip Minnow is a threatened species, protected by Ontario's Endangered Species Act, 2007.
- **Archaeology:** The Stage 1 report identified that no archaeological sites have been registered within a 1 km radius of the study area. The MTO ROW has limited archaeological potential due to previous ground disturbances and therefore no further archaeological assessments are required for parts of the study area that fall within the ROW. Stage 2 Archaeological Assessments are recommended for any areas that have been identified as part of the potential improvements that extend beyond the ROW.

- **Cultural and Built Heritage:** 22 built heritage resources and 18 cultural heritage complexes within or adjacent to the study corridor. These identified resources include historic settlements and commercial structures (i.e., St. Andrews West Church and St. Andrews West/Pioneer Cemetery).

4.4 TRANSPORTATION CONDITIONS

4.4.1 Provincial

Highway 138 is located between Ottawa and Cornwall, two large regional centres of population and commerce. Highway 138 is also the primary connection linking the communities of Cornwall, St. Andrews West, Bonville, and Monkland, and forms a north-south link between Highway 417 and Highway 401. The highway has a historical function of serving local businesses and agriculture, as well as a more recent role of a commercial and commuter link.

The posted speed limit on Highway 138 ranges from 50 km/h in the southerly section to 80 km/h in the northerly section.

4.4.2 Railways

A Canadian Pacific Railway (CP Rail) crossing is located north of County Road 43 at Highway 138 in the Township of North Stormont. No rail traffic information was available for the CP Rail crossing.

A Canadian National Railway (CN Rail) crossing is located south of McNeil Road in the Township of North Stormont. Existing daytime train traffic is approximately 13 freight trains, 2 way-freight and 13 passenger trains on the CN rail. Evening train traffic is approximately 8 freight and zero way-freight or passenger trains on the CN rail line (provided by CN Rail). On average these trains travel at speed of 105-153 km.

4.4.3 Utilities

The following utility companies have existing infrastructure within the study area:

- Hydro One (Distribution), overhead on poles
- Hydro One (Transmission), overhead on steel towers
- Bell Canada, overhead on poles and underground
- Cornwall Electric, overhead on poles
- Union Gas, underground
- TransCanada Pipeline, underground
- Enbridge Pipelines, underground
- Eastlink Communications, underground

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5.0 Generation and Evaluation of Alternatives

The purpose of this project was to identify safety and operational deficiencies on Highway 138 and develop alternatives to address each deficiency. Section 5.0 describes the alternatives considered and the process used to identify a Recommended Plan.

The preliminary stage of the operational and safety review was to identify areas of operational and safety concern within the study area. These preliminary areas of concern were identified as a result of geometric deficiencies, collision history, and operational deficiencies. Each location was then reviewed to develop alternative improvements.

5.1 DEVELOPMENT OF ALTERNATIVES

The development of alternatives began with identifying and evaluating a range of potential interchange, passing lane, and carpool lot alternatives to meet the goal of improving the safety and operation of Highway 138, while minimizing impacts to the natural environment, local community, and cultural environment within the study limits. The development of alternatives was a systematic process that included consideration of input from the public, agencies, and stakeholder groups to help identify project specific issues and impacts. The alternatives are presented in Appendix C. Preliminary alternatives were generated based on the Principles for Generating Alternatives in the *Class EA for Provincial Transportation Facilities (2000)*.

The *Highway 138 Corridor Traffic Operations and Safety Review* was carried out in 2013-2014 to identify any operational and safety issues on in the Highway 138 corridor.

The recommendations of this previous report included:

- Install centreline and shoulder rumble strips
- Install northbound left-turn lane at Valade Road/Island Road and Myers Road/McPhail Road
- Install passing lanes between Country Road 18 and Country Road 43 with further investigation of passing lanes between Country Road 43 and Highway 417
- Investigate the benefits of snow fence for 1.6 km southward from McNeil Road/Dyer Road and Sandringham Road to Lafleche Road/Allaire Road
- Convert Headline Road intersection to a roundabout

The proposed alternatives for this current study are summarized in the subsections below and illustrated in Appendix C.

5.1.1 Passing Lane Alternatives

Four passing lane alternatives were developed and evaluated as part of this project. Two northbound and two southbound alternatives were developed. Alternative NB-1 is approximately 2 km long and is located between Myers Road and Guindon Road. Alternative SB-1 is approximately 1.7 km and is located between Red Schoolhouse Road and County Road 43. Alternative NB-2 is approximately 2 km long and is located between Gravel

Hill Road and Warina Road. Alternative SB-2 is approximately 2 km long and is located between County Road 15 and Sandringham Road.

5.1.2 Carpool Lot Alternatives

Four carpool lot alternatives were initially developed as part of this project. The first carpool lot alternative is located on the north side of Cornwall Centre Road at the Brookdale intersection. The second carpool lot alternative is located on the east side of Highway 138 approximately 1 km north of Dundas Street. The third carpool lot alternative is located on the east side of Highway 138 north of County Road 43. Carpool lot alternative 4 is located at the interchange of Highway 138 and Highway 417. Carpool Lot Alternative 4 was screened out following the preliminary screening of carpool alternatives due to a lack of adjacent communities directly nearby and existing carpool parking facilities nearby along Highway 417. Carpool parking lot alternatives 1, 2 and 3 were carried forward for evaluation.

5.1.3 Intersection Alternatives

The development of intersection alternatives began with a preliminary review of existing safety and operations throughout the study area, and documentation of existing issues. Following this review, a series of preliminary intersection alternatives was developed. Separate improvement alternatives were developed for each deficient intersection, that were evaluated alongside a “Do Nothing” alternative for each intersection.

5.1.3.1 Brookdale Avenue Intersection

The existing Brookdale Avenue intersection is a T-intersection with Cornwall Centre Road. The traffic movements between Brookdale Avenue and the east leg of Cornwall Centre Road form part of the connection between Highway 401 and Highway 138. The northbound right-turning movement includes 170 vehicles per hour in the morning (AM) peak hour, and 335 vehicles per hour in the afternoon (PM) peak hour, based on August 2016 counts. Typically, a channelized right-turn lane is provided when the peak hour volume exceeds 60 vehicles per hour.

Two alternatives were developed to accommodate the predominant traffic movements between Brookdale Avenue and Cornwall Centre Road.

Alternative A1: Northbound Right-Turn Channelization

- Channelized right-turn lane
- Provision for future stop controlled or signal controlled intersection

Alternative A2: Realign Intersection

- Continuous traffic flow from Cornwall Centre Road to Brookdale Avenue
- Cornwall Centre Road (west leg) intersects as a T-intersection with stop control

5.1.3.2 Cornwall Centre Road Intersection

The existing Cornwall Centre Road intersection is a T-intersection with Brookdale Avenue. The traffic movements between Cornwall Centre Road and the west leg of Brookdale Avenue form part of the connection between Highway 401 and Highway 138. The southbound right-turning movement includes 180 vehicles per hour in the morning (AM) peak hour, and 175 vehicles per hour in the afternoon (PM) peak hour, based on 2012 counts. Typically, a channelized right-turn lane is provided when the peak hour volume exceeds 60 vehicles per hour. It is also noted that large trucks currently have difficulty making this turn, which is causing operational issues at this intersection.

Two alternatives were developed to accommodate the predominant southbound-to-westbound traffic movement between Cornwall Centre Road and Brookdale Avenue, and to accommodate large trucks.

Alternative B1: Improved Corner Radius

- Larger turning radius for right turning vehicles
- Pedestrian sidewalk

Alternative B2: Channelized Right-Turn Lane

- Channelized right-turn lane for uninterrupted flow
- Pedestrian sidewalks

5.1.3.3 Headline Road Intersection

Intersection traffic control is warranted at Headline Road. Two alternatives were developed to provide intersection traffic control at Headline Road.

Alternative C1: Signalized Intersection with Left-Turn Lanes

- Left-turn lanes provided on all legs of the intersection
- Full signalized intersection

Alternative C2: Roundabout

- Single-lane roundabout design

5.1.3.4 Dundas Street/County Road 18 Intersection

The Dundas Street/County Road 18 intersection is a confined intersection that is constrained by heritage features in three quadrants. It has been observed that southbound to westbound trucks have difficulty navigating the corner, and the historic stone wall in the northwest quadrant of the intersection has been damaged by large trucks several times. Three alternative have been developed to improve the intersection geometrics and to minimize potential future damage to the historic stone wall.

Alternative D1: Major Realignment of Dundas Street

- Major realignment of Dundas Street to align east and west legs
- Single lane at each leg
- Removal of channelized right-turn lane on west leg

Alternative D2: Minor Realignment of Dundas Street and Minor Shift of Highway 138 to the East

- Minor realignment of Dundas Street
- Single lane at each leg
- Maintain channelized right-turn lane on west leg
- Minor realignment of Highway 138

Alternative D3: Major Realignment of Dundas Street and Minor Shift of Highway 138 to the East

- Major realignment of Dundas Street to align east and west legs
- Single lane at each leg
- Maintain channelized turn lane on west leg
- Minor realignment of Highway 138 to the east

5.1.3.5 Valade Road/Island Road Intersection

A northbound left turn lane is warranted at this location. Three alternatives were developed for this intersection.

Alternative E1: Northbound Left-Turn Lane on Highway 138 with Widening East of the Centreline

- Northbound left-turn lane on right side of centreline
- Widening to east side of Highway 138

Alternative E2: Northbound Left-Turn Lane on Highway 138 with Widening on Both Sides of the Centreline

- Northbound left-turn lane on centre of centreline
- Widening to east and west sides of Highway 138

Alternative E3: Northbound and Southbound Left-Turn Lanes on Highway 138 with Widening on Both Sides of the Centreline

- Northbound and southbound left-turn lane on centre of centreline
- Widening to east and west sides of Highway 138

5.1.3.6 Wheeler Road Intersection

A northbound left turn lane is warranted at this location. Two alternatives were developed for this intersection.

Alternative F1: Northbound Left-Turn Lane on Highway 138 with Widening East of the Centreline

- Northbound left turn lane on right of centreline
- Widening to east side of Highway 138

Alternative F2: Northbound Left-Turn Lane on Highway 138 with Widening on Both Sides of the Centreline

- Northbound left turn lane on right of centreline
- Widening to east and west sides of Highway 138

5.1.3.7 Myers Road/McPhail Road Intersection

A northbound left turn lane is warranted at this location. Three alternatives were developed for this intersection.

Alternative G1: Northbound Left-Turn Lane on Highway 138 with Widening East of the Centreline

- Northbound left turn lane on right of centreline
- Widening to east side of Highway 138

Alternative G2: Northbound Left-Turn Lane on Highway 138 with Widening on Both Sides of the Centreline

- Northbound left turn lane on centre of centreline
- Widening to east and west sides of Highway 138

Alternative G3: Northbound and Southbound Left-Turn Lanes on Highway 138 with Widening on Both Sides of the Centreline

- Northbound and southbound left turn lane on centre of centreline
- Widening to east and west sides of Highway 138

5.2 EVALUATION OF ALTERNATIVES

The evaluation process identifies an improvement plan that is cost-effective, provides safe operations, and is compatible with local planning and transportation objectives, while minimizing impacts to the environment. This is completed by identifying evaluation criteria, and evaluating each alternative based on the relative importance of the criteria. The process generally follows four steps, which are outlined below:

- Identify and confirm evaluation criteria
- Screening evaluation of Passing Lane and Carpool Lot alternatives
- Evaluate alternatives
- Confirm Recommended Plan

An evaluation process was developed to provide an objective approach to the analysis and evaluation of the alternatives that would form a justifiable tool for the selection of a Recommended Plan. The goal of the evaluation process was to select a cost-effective improvement plan that provides safe operation and accommodates local access to adjacent properties, while minimizing impacts to the natural, social, and cultural environments.

In accordance with the *Class EA for Provincial Transportation Facilities (2000)*, Ministry of Transportation projects are required to consider a wide range of potential impacts to the natural, social, and cultural environments in the study area in addition to meeting highway engineering requirements.

The development of evaluation criteria and the evaluation of alignment alternatives are discussed below.

5.2.1 Evaluation Criteria

In accordance with the *Class EA for Provincial Transportation Facilities (2000)*, MTO projects are required to consider a wide range of potential impacts to the natural, social, cultural and applied environments in the study area. Evaluation criteria were identified in advance of Public Information Centre (PIC) 1 and were established based on existing conditions and background data, provincial guidelines, project experience, and public and agency input. Following PIC 1, both the criteria, and factors considered within each criterion were reviewed and updated to reflect comments received and updated study area conditions.

The evaluation criteria are independent variables, each of which may contribute a positive or negative influence on the overall suitability of an alternative. Although it is important to explicitly consider the suitability of an alternative in terms of each criterion, it is also useful to establish an overall composite score by determining appropriate weighting (relative importance) among the criteria. Each evaluation criterion is assigned a weight that represents its relative importance to the other criteria.

Table 3 to Table 5 identify the evaluation criteria for this study, including the factors considered for each criterion, and the methodology and measurement for each of the factors. Since this study includes several different components (i.e., intersections, passing lanes, and carpool parking lots), some factors were identified that did not apply to all of the components. Generally, the factors for each criterion have been developed for each study component.

The judgements on the relative importance of the evaluation criteria were based on a pairwise comparison of each criterion to each other criterion to assess which criterion is more important and by how much. Determining the

importance of each criterion was based on engineering judgement, environmental significance, input received from external agencies, and input received from the public. The results of this process are depicted in Figure 4.

Figure 4: Evaluation Criteria Weight

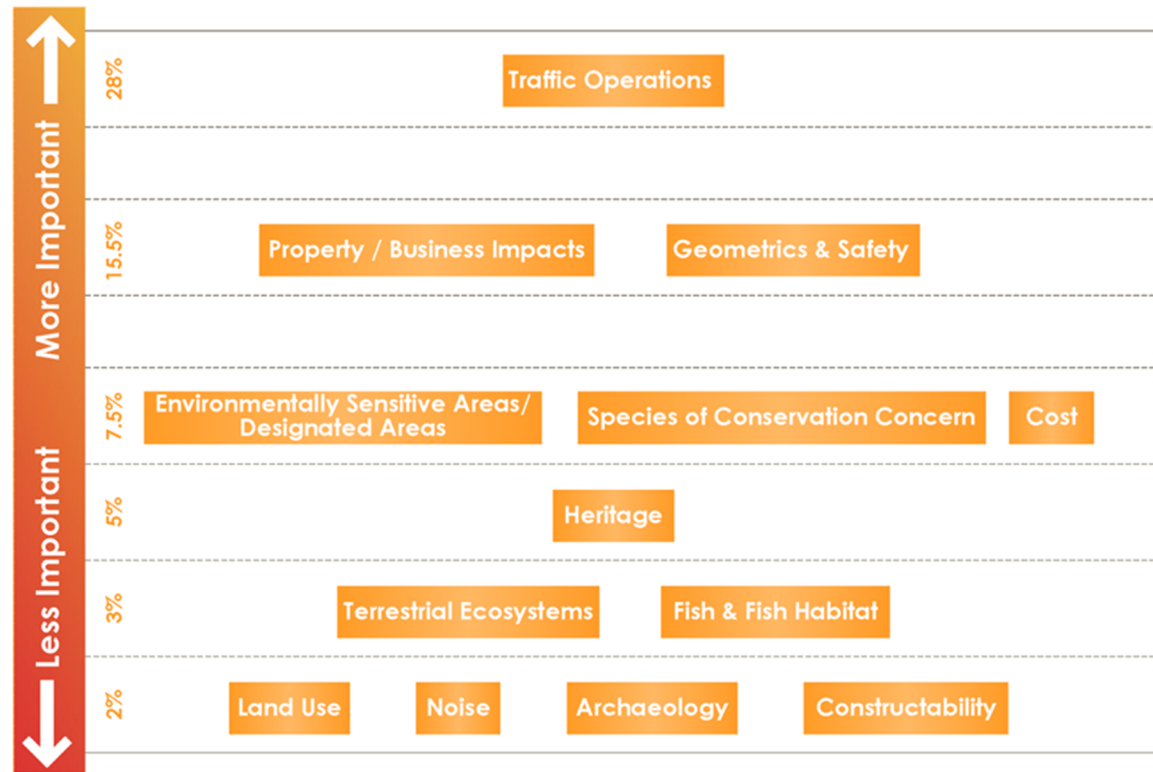


Table 3: Highway Engineering Evaluation Criteria

Highway Engineering

Criteria	The Best Improvement Plan...	Factors Considered:	Applies to:	Methodology/Measure
Traffic Operations	... provides acceptable Level of Service (LOS) on Highway 138 and at intersections	Traffic delay	Intersections	Delay values have been calculated based on alternative design using future projected (2039) volumes. For signalized intersections, the overall intersection traffic delay (seconds/vehicle) is calculated by taking a volume weighted average of all the total delays. The average intersection delay for non-signalized intersections is based on an average of each movement's delays.
		Traffic queue length	Intersections	The average queue lengths were calculated for each alternative design using future projected (2039) volumes.
		Assured Passing Opportunity (APO)	Passing Lanes	Is the Required Assumed Passing Opportunity greater than the Available Assumed Passing Opportunity?
		Level of Service	Passing Lanes	A measure of the level of service improvement with the passing lane. Source: <i>Highway 138 Corridor Traffic Operations and Safety Review, IBI Group, January 2014</i>
		Total Travel Time Savings	Passing Lanes	A measure of the total travel time (vehicle hours) in percentage with the passing lane. Source: <i>Highway 138 Corridor Traffic Operations and Safety Review, IBI Group, January 2014</i>
		Percent Time Spent Following	Passing Lanes	A measure of the time spent following another vehicle in percent with a passing lane. Source: <i>Highway 138 Corridor Traffic Operations and Safety Review, IBI Group, January 2014</i>
		Proximity to Existing Parking	Carpool Lots	Is the location near to existing known parking areas?
		Access to an Interchange	Carpool Lots	Is the location near to an interchange?
Geometrics & Safety	...meets the design standards for provincial highways and intersections ...minimizes potential for collisions on Highway 138 and at intersections	Geometrics and Safety	All components	Do horizontal and vertical alignments meet standards? Are warrants satisfied? Has pedestrian safety been considered? Source: <i>Geometric Design Standards for Ontario Highways</i>
		Impacts to driveways	Intersections	A measure of the number of driveways requiring reconstruction.
		Safety Benefit	Passing Lanes	A measure of the expected collision reduction in absolute collision savings. Source: <i>Highway 138 Corridor Traffic Operations and Safety Review, IBI Group, January 2014</i>
		Site Topography	Carpool Lots	Suitability of site to construct a carpool lot; flat preferred.
		Site Access	Carpool Lots	Does site provide good opportunity for access considering: adjacent intersections, turning lanes & railway.
		Proximity to Utility Services	Carpool Lots	Are existing utility services readily available?
Constructability	...can be constructed using conventional construction techniques ...can be constructed with minimal impacts to traffic	Construction feasibility	All components	Construction techniques (conventional or non-conventional), and constraints.
		Traffic impacts during construction	All components	Number of lane shifts, number of traffic detours, number of closures.
Total Cost	...has the lowest total cost including utility relocations and property acquisition	Construction costs	All components	Cost estimate based on material quantities (2016 unit prices).
		Utility relocations costs	All components	Cost estimate based on a measure of utility impacts.
		Property acquisition costs	All components	Cost estimate based on area of property impacted.

Table 4: Social and Cultural Environment Evaluation Criteria

Social & Cultural Environment

Criteria	The Best Improvement Plan...	Factors Considered:	Applies to:	Methodology/Measure
Property & Business	...has the least impact to private property	Number and area of private property impacts	All components	Count of the number and area of private property impacted. Source: <i>Ontario Parcel Data as provided by MTO</i>
		Impact to area identified for future development	All components	Identify property required in hectares based on lands identified for future development. Source: <i>City of Cornwall and SDG Official Plans; and submitted applications to MTO Corridor Control</i>
		Access to businesses	All components	Number of entrance and access modifications to existing businesses.
		Business acquisitions	All components	Number of business acquisitions.
Noise	...minimizes noise impacts at Noise Sensitive Receivers (NSR's)	Potential for noise increase at Noise Sensitive Receivers (NSRs)	All components	Number of NSRs (residential properties) within 600 metres that have the potential to experience an increase in noise.
Land Use	...minimizes impacts to sensitive land uses ... is compatible with existing and future development plans	Accommodates existing snowmobile crossings	All components	Identify requirement to realign or relocate existing Trans Ontario Provincial Snowmobile Trail crossing. Source: <i>OFSC Trail Maps</i>
		Impact to active farmland	All components	Identify area of agricultural land required in hectares. Source: <i>Site conditions and the SDG Agricultural Land Layer (SDG)</i>
		Impact to aggregate and mineral reserves	All components	Identify impact to current or identified quarries/pits in hectares, including modifications to access and direct property requirements based on site conditions, SDG Mineral and Aggregate Reserve lands and MNR Pits and Quarries maps.
		Impact to potentially contaminated property	All components	Identify property required from potentially contaminated properties in hectares. Source: <i>COS (Genivar, 2011), Stantec limited COS review (2016)</i>
Built & Cultural Heritage	...does not impact existing cultural and built heritage features along the Highway 138 corridor	Impact to registered built heritage / cultural feature	All components	Number and scale of impact to designated built and cultural heritage features. Source: <i>Built Heritage Resources and Cultural Heritage Landscapes (Genivar, 2010)</i>
		Impact to stone wall at Pioneer Cemetery (Dundas Street only)	Dundas Street / CR 18 Alternatives	Identify impact to the stone wall at Pioneer Cemetery.
Archaeology	...has the least impact on archaeological resources	Impact to registered archaeological sites	All components	Identify area of impact to registered archaeological sites in hectares. Source: <i>Stage 1 Archaeological Assessment (Genivar, 2010)</i>

Table 5: Natural Environment Evaluation Criteria

Natural Environment

Criteria	The Best Improvement Plan...	Factors Considered:	Applies to:	Methodology/Measure
Terrestrial Ecosystem	...has the least impact on wildlife habitat (i.e. deer yards) ...has the least impact on significant trees or vegetation	Unevaluated wetlands	All components	Identify area of unevaluated wetland impacted (m ²). Source: <i>Terrestrial Existing Conditions Report (Stantec, 2016) and SDG and Cornwall Official Plans</i>
		Impact to significant trees	All components	Number of large or significant trees impacted. Source: <i>Site review, Terrestrial Existing Conditions Report (Stantec, 2016), Existing Conditions Report (Genivar, 2011)</i>
		Area of vegetation removal	All components	Identify area of natural vegetation that will be removed in m ² . Source: <i>Terrestrial Existing Conditions Report (Stantec, 2016), Existing Conditions Report (Genivar, 2011)</i>
Fish & Fish Habitat	...minimizes impacts to creeks and water bodies ...minimizes impacts to fish and fish habitat	Number of new culverts or culvert extensions over fish bearing watercourses	All components	Number of new culverts or culvert extensions required at fish bearing watercourses and length of realignments in metres. Source <i>Fish and Fish Habitat Existing Conditions Report (Stantec, 2016)</i>
		Area of impact to fish habitat	All components	Identify area of impact to identified fish habitat in m ² . Source: <i>Fish and Fish Habitat Existing Conditions Report (Stantec, 2016)</i>
Species of Conservation Concern	...does not impact Species at Risk or habitat associated with Species at Risk	Impact to rare species	All components	Identify impact to identified rare species and Species-at-Risk. Source: <i>Terrestrial Existing Conditions Report (Stantec, 2016), Existing Conditions Report (Genivar, 2011)</i>
		Impact to potential rare species habitat	All components	Identify area of impact to potential rare or Species-at-Risk habitat in m ² . Source: <i>Terrestrial Existing Conditions Report (Stantec, 2016), Existing Conditions Report (Genivar, 2011)</i>
Environmentally Sensitive Areas, Designated Areas	...does not impact the Newington Bog Provincially Significant Wetland (PSW) / Area of Natural and Scientific Interest (ANSI) ...does not impact Sourcewater Protection Areas	Impact to Newington Bog (Passing Lanes only)	Passing Lanes	Identify area of the Newington Bog Provincially Significant Wetland in m ² . Source: <i>Provincially Significant Wetland Layer (SDG) and MNRF Natural Heritage Mapping</i>
		Impact to Sourcewater Protection Areas	All components	Identify area of impact to designated Sourcewater Protection Areas in m ² . Source: <i>Raisin Region Conservation Authority Sourcewater Protection Maps (2016)</i>

5.2.2 Passing Lane Alternatives

For the passing lane alternatives, a screening process was developed to confirm technically feasible alternatives, or combinations of alternatives, to carry forward to a detailed evaluation.

The screening of the conceptual alternatives uses two screening criteria:

1. Does the alternative realistically address the existing problem and opportunity?
2. Does the alternative, when used in combination with other alternatives, make a significant contribution towards realistically addressing the problem and opportunity?

Only those passing lane alternatives or combinations of alternatives that satisfy at least one of the above criteria were carried forward to the detailed evaluation. Table 6 provides a summary of the screening evaluation of passing lane alternatives. Generally, the need for passing lanes is identified based on a combination of traffic volumes, highway operations, and driving conditions (e.g. aggressive driving, frequent overtaking).

Table 6: Screening Evaluation of Passing Lanes

Conceptual Alternative	Addresses Problem / Opportunity?	Carry Forward to Evaluation?
Do Nothing	<ul style="list-style-type: none"> Does not address the lack of passing opportunities in the study area 	No
One set of Passing Lanes (one northbound and one southbound)	<ul style="list-style-type: none"> Previous traffic studies have identified a need for future passing lanes between Headline Road and Highway 417 Has the potential to improve safety by providing passing opportunities that reduce the risk of conflicts with opposing or turning traffic Has the potential to improve highway capacity 	Yes
Two sets of passing lanes (two northbound and two southbound)	<ul style="list-style-type: none"> Previous traffic studies have identified a need for future passing lanes between Headline Road and Highway 417 Has the potential to improve safety by providing passing opportunities that reduce the risk of conflicts with opposing or turning traffic Has the potential to improve highway capacity Current traffic volume projections do not warrant two set of passing lanes 	No

A Corridor Traffic Operations and Safety Review (2014) identified preliminary locations for northbound and southbound passing lane alternatives based on travel time savings and reduction in time spent following a slower vehicle. These locations were reviewed, based on the results of the screening evaluation and study area conditions.

A second set of passing lanes could be viable in the future if there are changes to traffic volumes or operations in the study area. Based on current traffic volumes, the need for a second set of passing lanes is outside of this current planning horizon. A separate environmental assessment study would be required to identify the need for a second set of passing lanes and complete environmental requirements at that time.

The following four passing lane alternatives were carried forward based on an ideal length (1.5 – 2 km), avoiding municipal road intersections, minimizing impacts to entrances and private property, and minimizing impacts to natural, social and cultural features:

- NB-1 Headline Road to County Road 43 – between Myers Road and Guindon Road (2 km long)
- SB-1 Headline Road to County Road 43 – between Red Schoolhouse Road and County Road 43 (1.7 km long)
- NB-2 County Road 43 to Highway 417 – between Gravel Hill Road and Warina Road (2 km long)
- SB-2 County Road 43 to Highway 417 – between County Road 15 and Sandringham Road (2 km long)

Based on the screening evaluation, one preferred northbound and one preferred southbound passing lane will be carried forward following the detailed evaluation.

5.2.3 Carpool Lot Alternatives

For the carpool lot alternatives, a screening process was developed to confirm technically feasible alternatives, or combinations of alternatives, to carry forward to a detailed evaluation.

The screening of the conceptual alternatives uses two criteria:

- Does the alternative realistically address the existing problem and opportunity?
- Does the alternative, when used in combination with other alternatives, make a significant contribution towards realistically addressing the problem and opportunity?

Only those carpool lot alternatives, or combinations of alternatives that satisfy at least one of the above criteria were carried forward to the detailed evaluation.

Table 7 provides a summary of the screening evaluation of carpool lot alternatives. Generally, the need for a carpool lot has been identified based on existing conditions and comments received from the public and local businesses.

Table 7: Screening Evaluation of Carpool Lot Alternatives

Conceptual Alternative	Addresses Problem / Opportunity?	Carry Forward to Evaluation?
Do Nothing	<ul style="list-style-type: none"> Does not address concerns identified by the public and businesses regarding carpool and commuter parking on private property 	No
Carpool parking in the vicinity of Highway 401	<ul style="list-style-type: none"> The public has identified a need for carpool parking in the vicinity of Highway 401 through comments submitted to MTO and a petition There is a commuter bus stop in this location 	Yes
Carpool parking mid-block between Highway 401 and Highway 417	<ul style="list-style-type: none"> The public has identified a need for carpool parking along Highway 138 through comments submitted to MTO Local businesses have identified concerns with commuter parking in commercial parking lots There are four private commuter bus stops located between Highway 401 and Highway 417 (St. Andrews West, Bonville, Monkland, and Moose Creek with daily ridership of approximately 20) 	Yes
Carpool parking in the vicinity of Highway 417	<ul style="list-style-type: none"> Based on public feedback, the carpool survey, and site observations, there does not appear to be a need for carpool parking in the vicinity of Highway 417 There are no adjacent communities that would benefit directly from a carpool parking lot at this location There are additional carpool parking lots at nearby interchanges along Highway 417 that are currently being considered for expansion The need for a carpool parking lot in this location could be reconsidered in the future 	Not within the current planning horizon

Two carpool lots are recommended: one in the vicinity of Highway 401 and one mid-block between Highway 401 and Highway 417. The mid-block location is recommended based on observations, the carpool lot survey, and public and agency comments. A mid-block location will satisfy the identified parking need in the northern part of the study area.

The results of the screening evaluation indicate that carpool lots should be considered in the vicinity of Highway 401 and mid-block between Highway 401 and Highway 417. The following alternatives were considered for the carpool lots:

1. North side of Cornwall Centre Road just east of Brookdale Avenue
2. East side of Highway 138, approximately 1.0 km north of Dundas Street (St. Andrews West)
3. East side of Highway 138, approximately 200 m north of County Road 43 (Monkland)

Two carpool lots were developed for consideration in the vicinity of Highway 417 to confirm if there are any current significant impacts with the locations. Since these locations did not meet the screening requirements, they will not be carried forward as part of this study. An environmental assessment study would be required to move forward with the Highway 417 carpool lot alternatives.

5.2.4 Detailed Evaluation of Alternatives

Qualitative Assessment

A qualitative assessment of the alternatives was completed by tabulating the advantages and disadvantages of each alternative based upon the evaluation criteria developed and the scale of potential impacts for each criterion. Advantages and disadvantages are identified by plus sign (+) and minus sign (-), respectively. Otherwise, a bullet sign (•) identifies a neutral comment where there is no clear advantage or disadvantage.

Quantitative Assessment

A quantitative assessment that provides a score based on the weights of each evaluation criterion and number of advantages and disadvantages for each alternative was completed. A total score has been established for each

intersection study area, passing lane, and carpool lot by adding the score for each factor together to determine a total weighted score for each alternative.

Once the number of positive, negative, and neutral counts is tabulated, each alternative was scored based on the sum of positive, neutral and negative counts multiplied by the criteria weights to determine a weighted score for each alternative.

The formula to determine the weighted score for each evaluation criteria is:

$$\left[\frac{Positive\ Count + \frac{1}{2} Neutral\ Count}{Positive\ Count + Neutral\ Count + Negative\ Count} \right] \times Criteria\ Weight$$

The access alternatives were evaluated using a comparative analysis based on the evaluation criteria and using the advantages and disadvantages identified in the previous subsection. The alternatives were given a score based on how well each alternative was judged to satisfy the evaluation criteria. The individual scores were multiplied by the criterion weight factor (relative importance) to produce a weighted score for each evaluation criterion and each alternative. The sum of the weighted scores provided a total score for each alternative. The results of the evaluation process were used to rank the alternatives with the highest weighted score representing the highest ranked alternative. This process resulted in identifying the “best” improvement plan. It also identified the advantages (high scores) and disadvantages (low scores) of each alternative.

The following sections provide the results of the qualitative and quantitative assessment of the alternatives, including a summary of the advantages and disadvantages of each alternative. The advantages and disadvantages were identified following a detailed assessment of the evaluation criteria and factors for each alternative. Data sheets and the scoring worksheets for each alternative are provided in Appendix C. The score for each alternative is provided at the end of the advantages and disadvantages table. Plans showing the alternatives are provided in Appendix C.

5.2.4.1 Brookdale Avenue

A summary of the advantages and disadvantages of the Brookdale Avenue alternatives is provided in Table 8.

Table 8: Brookdale Avenue Advantages and Disadvantages

Category	Criteria	Alternative		
		Do Nothing	A1	A2
Highway Engineering	Traffic Operations	<ul style="list-style-type: none"> - Has the longest overall average intersection delay - Has the longest vehicle queue lengths 	+ Improves the northbound traffic operations compared to Do Nothing	<ul style="list-style-type: none"> + Improves the northbound traffic operations compared to Do Nothing + Has the shortest overall average intersection delay + Has the shortest vehicle queue lengths
	Geometrics & Safety	<ul style="list-style-type: none"> + Horizontal alignment meets design standard + Accommodates future Highway 138 By-Pass - Required northbound right-turn channelization is not provided • No operational or safety issues identified • No measurable pedestrian safety differences between alternatives • No impacts to driveways 	<ul style="list-style-type: none"> + Horizontal alignment meets design standard + Required northbound right-turn channelization is provided + Accommodates future Highway 138 By-Pass • No measurable pedestrian safety differences between alternatives • No impacts to driveways 	<ul style="list-style-type: none"> + Vertical alignment meets design standard - Horizontal alignment does not satisfy minimum design standard - T-intersection on horizontal curve is not desirable - Does not accommodate future by-pass • No measurable pedestrian safety differences between alternatives • No impacts to driveways
	Constructability	+ No construction required	<ul style="list-style-type: none"> • Minimal impact to traffic during construction 	- Significant impact to traffic during construction
	Total Cost	+ No cost	<ul style="list-style-type: none"> • Approximate total cost of \$150,000 	- Approximate total cost of \$340,000
Social & Cultural Environment	Business & Property	<ul style="list-style-type: none"> + No impacts to properties • No impact on future development lands 	<ul style="list-style-type: none"> - Minor impacts to business property • No impact on future development lands 	<ul style="list-style-type: none"> - Minor impacts to business property • Has the potential to improve access to future development in the southwest quadrant
Natural Environment	Terrestrial Ecosystem	+ No impacts to vegetation	<ul style="list-style-type: none"> • Approximately 100 m² of vegetation impacted 	<ul style="list-style-type: none"> • Approximately 200 m² of vegetation impacted
	Fish & Fish Habitat	<ul style="list-style-type: none"> + There are no new culverts or culvert extensions required + There are no fish-bearing watercourses impacted 	<ul style="list-style-type: none"> - 2 new crossings of a watercourse that provides seasonal fish habitat - Impacts approximately 230 m² of an Unnamed Tributary 	<ul style="list-style-type: none"> - 2 new crossings of a watercourse that provides seasonal fish habitat - Impacts approximately 305 m² of an Unnamed Tributary
Overall Score		49	63	49

* The following factors that are relevant to this study were not present in this study area or had minor impacts in the same degree or in the same way for all of the alternatives: Noise, Land Use, Built and Cultural Heritage, Archaeology, Species of Conservation Concern, and Environmentally Sensitive / Designated Areas

5.2.4.2 Cornwall Centre Road

A summary of the advantages and disadvantages for the Cornwall Centre Road alternatives is provided in Table 9.

Table 9: Cornwall Centre Road Advantages and Disadvantages

Category	Criteria	Alternative		
		Do Nothing	B1	B2
Highway Engineering	Traffic Operations	<ul style="list-style-type: none"> No measurable difference between alternatives Potential traffic delays if southbound trucks cannot make right-turn 	<ul style="list-style-type: none"> No measurable difference between alternatives Accommodates southbound right-turning trucks, which minimizes potential for traffic delays 	<ul style="list-style-type: none"> No measurable difference between alternatives Accommodates southbound right-turning trucks, which minimizes potential for traffic delays
	Geometrics & Safety	<ul style="list-style-type: none"> Large trucks have difficulty with southbound right-turn No impact to driveways 	<ul style="list-style-type: none"> Improves southbound right-turn radius Improves eastbound left-turn lane storage May provide a more desirable route for trucks Longer walk distance for pedestrians crossing north leg Minor impact to 1 driveway approach 	<ul style="list-style-type: none"> Improves southbound right-turn radius Improves eastbound left-turn lane storage May provide a more desirable route for trucks Channelized island provides refuge for pedestrians crossing on north leg Pedestrians must cross channelized right-turn without traffic control Minor impact to 1 driveway approach
	Constructability	<ul style="list-style-type: none"> No construction required 	<ul style="list-style-type: none"> Moderate impact to traffic during construction 	<ul style="list-style-type: none"> Moderate impact to traffic during construction
	Total Cost	<ul style="list-style-type: none"> No cost 	<ul style="list-style-type: none"> Approximate total cost of \$86,000 	<ul style="list-style-type: none"> Approximate total cost of \$117,000
Social & Cultural Environment	Business & Property	<ul style="list-style-type: none"> No impacts to properties 	<ul style="list-style-type: none"> Minor impacts to business property 	<ul style="list-style-type: none"> Minor impacts to business property
Overall Score		43	50	46

* The following factors that are relevant to this study were not present in this study area or had minor impacts in the same degree or in the same way for all of the alternatives: Noise, Land Use, Built and Cultural Heritage, Archaeology, Terrestrial Ecosystems, Fish and Fish Habitat, Species of Conservation Concern, and Environmentally Sensitive / Designated Areas

5.2.4.3 Headline Road

A summary of the advantages and disadvantages for the Headline Road alternatives is provided in Table 10.

Table 10: Headline Road Advantages and Disadvantages

Category	Criteria	Alternative		
		Do Nothing	C1	C2
Highway Engineering	Traffic Operations	<ul style="list-style-type: none"> - Has the longest overall average intersection delay - Has the longest vehicle queue lengths on the side road approaches 	<ul style="list-style-type: none"> • Improves the overall average intersection delay compared to “Do Nothing” • Vehicle queue lengths will be shorter on the side road approaches than “Do Nothing” 	<ul style="list-style-type: none"> + Has the shortest overall average intersection delay + Approach delays will be shortest + Vehicle queue lengths will be shortest
	Geometrics & Safety	<ul style="list-style-type: none"> - Does not satisfy MTO commitment to provide signals or a roundabout - Required northbound & southbound left-turn lanes are not provided - Does not adequately accommodate pedestrians & cyclists - Highest expected collision frequency - Potential for severity of collisions remains unchanged + No impact to driveways 	<ul style="list-style-type: none"> + Satisfies MTO commitment to provide signals or a roundabout + Required northbound & southbound left-turn lanes are provided + Improves safety for pedestrians & cyclists crossing Highway 138 - Does not reduce sight line requirements due to higher operating speeds • Lower expected collision frequency compared to “Do Nothing” • Potential to decrease the severity of collisions • Minor impact to 1 driveway approach 	<ul style="list-style-type: none"> + Satisfies MTO commitment to provide signals or a roundabout + Does not require northbound & southbound left-turn lanes, while still accommodating these movements + Improves safety for pedestrians & cyclists crossing Highway 138 + Lowest expected collision frequency + Greatest potential to decrease the severity of collisions + Serves as a “Gateway” in a key transition area + Provides traffic calming with reduced speeds + Reduced sight line requirements due to lower operating speeds - Minor impacts to 3 driveway approaches • Perceived to be difficult for large trucks to negotiate
	Constructability	<ul style="list-style-type: none"> + No construction required 	<ul style="list-style-type: none"> • Moderate impacts to traffic during construction 	<ul style="list-style-type: none"> - Significant impacts to traffic during construction
	Total Cost	<ul style="list-style-type: none"> + No cost 	<ul style="list-style-type: none"> • Approximate total cost of \$1.15 M 	<ul style="list-style-type: none"> - Approximate total cost of \$1.85 M
Social & Cultural Environment	Business & Property	<ul style="list-style-type: none"> + No impacts to properties 	<ul style="list-style-type: none"> • Minimal impacts to 1 residential property 	<ul style="list-style-type: none"> - Minimal impacts to 3 residential properties
Natural Environment	Terrestrial Ecosystem	<ul style="list-style-type: none"> • No impacts to unevaluated wetlands • No impacts to vegetation 	<ul style="list-style-type: none"> • No impacts to unevaluated wetlands - Approximately 320 m² of vegetation impacted 	<ul style="list-style-type: none"> - Approximately 100 m² of unevaluated wetland impacted - Approximately 820 m² of vegetation impacted
Overall Score		43	51	55

* The following factors that are relevant to this study were not present in this study area or had minor impacts in the same degree or in the same way for all of the alternatives: Noise, Land Use, Built and Cultural Heritage, Archaeology, Fish and Fish Habitat, Species of Conservation Concern, and Environmentally Sensitive / Designated Areas

5.2.4.4 Dundas Street/County Road 18

A summary of the advantages and disadvantages for the Dundas Street/County Road 18 alternatives is provided in Table 11.

Table 11: Dundas Street/County Road 18 –Advantages and Disadvantages

Category	Criteria	Alternative			
		Do Nothing	D1	D2	D3
Highway Engineering	Traffic Operations	<ul style="list-style-type: none"> • Acceptable intersection operations + Has a shorter average intersection delay when compared to D1 and D3 	<ul style="list-style-type: none"> • Acceptable intersection operations - Has a longer average intersection delay with the removal of eastbound right-turn channelization when compared to the Do Nothing and D2 alternatives 	<ul style="list-style-type: none"> • Acceptable intersection operations + Has the shortest average intersection delay with the removal of eastbound right-turn channelization 	<ul style="list-style-type: none"> • Acceptable intersection operations - Has a longer average intersection delay with the removal of eastbound right-turn channelization when compared to the Do Nothing and D2 alternatives
	Geometrics & Safety	<ul style="list-style-type: none"> - Southbound right-turning large trucks impact the Cemetery stone wall - Slightly offset cross street intersection alignment • No measurable pedestrian safety differences between alternatives 	<ul style="list-style-type: none"> + Significantly improves cross street intersection alignment - Unconventional stop bar setback on west leg - Eliminates the eastbound channelized right-turn lane - Eliminates on-street parking in front of church - Minor impacts to 6 driveway approaches • No significant improvement for southbound right-turn truck movement • No measurable pedestrian safety differences between alternatives 	<ul style="list-style-type: none"> + Slightly improves cross street intersection alignment - Horizontal alignment deflection on Highway 138 - Unconventional stop bar setback on west leg - Minor impacts to 4 driveway approaches • No significant improvement for southbound right-turn truck movement • No measurable pedestrian safety differences between alternatives 	<ul style="list-style-type: none"> + Significantly improves cross street intersection alignment - Horizontal alignment deflection on Highway 138 - Eliminates the eastbound channelized right-turn lane - Eliminates on-street parking in front of church - Minor impacts to 7 driveway approaches • No significant improvement for southbound right-turn truck movement • No measurable pedestrian safety differences between alternatives
	Constructability	+ No construction required	- Significant impacts to traffic during construction	- Significant impacts to traffic during construction	- Significant impacts to traffic during construction
	Total Cost	+ No cost	- Approximate total cost of \$2.60M	• Approximate total cost of \$1.85M	- Approximate total cost of \$2.74M
Social & Cultural Environment	Business & Property	+ No impacts to properties	<ul style="list-style-type: none"> - One business property buyout - One residential property buyout • Minor property acquisition from 3 properties 	<ul style="list-style-type: none"> - One business property buyout - Minor property acquisition from 8 properties 	<ul style="list-style-type: none"> - One business property buyout - One residential property buyout - Minor property acquisition from 8 properties
	Built & Cultural Heritage	<ul style="list-style-type: none"> • No impacts to built or cultural heritage features in the study area 	<ul style="list-style-type: none"> • There are minor impacts to the St. Andrews Church parking area but no direct impacts to heritage features • Impacts Evolving Historic Settlement cultural heritage feature (not designated under Part IV of the <i>Ontario Heritage Act</i>) and minor impacts to the St. Andrews Church + Potential to minimize future impacts to the stone wall at Pioneer Cemetery 	<ul style="list-style-type: none"> • Minor impacts to the historically significant Quinn’s Inn property but no direct impacts to the building • Impacts Evolving Historic Settlement cultural heritage feature (not designated under Part IV of the <i>Ontario Heritage Act</i>) and minor impacts to the St. Andrews Church + Potential to minimize future impacts to the stone wall at Pioneer Cemetery 	<ul style="list-style-type: none"> • Minor impacts to the St. Andrews Church parking area but no direct impacts to heritage features • Minor impacts to the historically significant Quinn’s Inn property but no direct impacts to the building • Impacts Evolving Historic Settlement cultural heritage feature (not designated under Part IV of the <i>Ontario Heritage Act</i>) and minor impacts to the St. Andrews Church + Potential to minimize future impacts to the stone wall at Pioneer Cemetery
	Archaeology	+ No impact	<ul style="list-style-type: none"> • Potential to impact unmarked graves outside of the cemetery boundary 	<ul style="list-style-type: none"> • Potential to impact unmarked graves outside of the cemetery boundary 	<ul style="list-style-type: none"> • Potential to impact unmarked graves outside of the cemetery boundary
Natural Environment	Terrestrial Ecosystem	<ul style="list-style-type: none"> • No impacts to vegetation 	<ul style="list-style-type: none"> • Approximately 150 m² of vegetation impacted 	<ul style="list-style-type: none"> • No impacts to vegetation 	<ul style="list-style-type: none"> • Approximately 140 m² of vegetation impacted
Overall Score		65	31	46	28

* The following factors that are relevant to this study were not present in this study area or had minor impacts in the same degree or in the same way for all of the alternatives: Noise, Land Use, Fish and Fish Habitat, Species of Conservation Concern, and Environmentally Sensitive / Designated Areas

5.2.4.5 Valade Road / Island Road

A summary of the advantages and disadvantages for the Valade Road/Island Road alternatives is provided in Table 12.

Table 12: Valade Road / Island Road Advantages and Disadvantages

Category	Criteria	Alternative			
		Do Nothing	E1	E2	E3
Highway Engineering	Traffic Operations	<ul style="list-style-type: none"> • Acceptable traffic operations • Negligible difference in overall intersection delay between alternatives – No operational benefit without northbound left-turn lane 	<ul style="list-style-type: none"> + Northbound left-turn lane provides operational benefit • Negligible difference in overall intersection delay between alternatives 	<ul style="list-style-type: none"> + Northbound left-turn lane provides operational benefit • Negligible difference in overall intersection delay between alternatives 	<ul style="list-style-type: none"> + Northbound left-turn lane provides operational benefit + Southbound left-turn lane provides additional operational benefit • Negligible difference in overall intersection delay between alternatives
	Geometrics & Safety	<ul style="list-style-type: none"> – Required northbound left-turn lane is not provided • No impact to driveways • No measurable pedestrian safety differences between alternatives 	<ul style="list-style-type: none"> + Required northbound left-turn lane is provided + Left-turn lane constructed on right of centreline is preferred (with no opposing left-turn lane) – Minor impacts to 6 driveway approaches • No measurable pedestrian safety differences between alternatives 	<ul style="list-style-type: none"> + Required northbound left-turn lane is provided • Left-turn lane constructed on centreline reduces horizontal alignment deflection – Minor impacts to 12 driveway approaches • No measurable pedestrian safety differences between alternatives 	<ul style="list-style-type: none"> + Required northbound left-turn lane is provided • Left-turn lane constructed on centreline reduces horizontal alignment deflection + Centreline widening lends itself to an opposing southbound left-turn lane – Minor impacts to 12 driveway approaches • No measurable pedestrian safety differences between alternatives
	Constructability	+ No construction required	• Moderate impacts to traffic during construction	– More significant impacts to traffic during construction	– More significant impacts to traffic during construction
	Total Cost	+ No cost	• Approximate total cost of \$480,000	– Approximate total cost of \$630,000	– Approximate total cost of \$658,000
Social & Cultural Environment	Business & Property	+ No impacts to properties	– Minor impacts to 5 properties	• Minor impacts to 3 properties	• Minor impacts to 3 properties
Natural Environment	Terrestrial Ecosystem	• No impacts to vegetation	• Approximately 110 m ² of roadside vegetation impacted	• Approximately 100 m ² of roadside vegetation impacted	• Approximately 100 m ² of roadside vegetation impacted
Overall Score		55	51	52	56

* The following factors that are relevant to this study were not present in this study area or had minor impacts in the same degree or in the same way for all of the alternatives: Noise, Land Use, Built and Cultural Heritage, Archaeology, Fish and Fish Habitat, Species of Conservation Concern, and Environmentally Sensitive / Designated Areas

5.2.4.6 Wheeler Road

A summary of the advantages and disadvantages for the Wheeler Road alternatives is provided in Table 13.

Table 13: Wheeler Road Advantages and Disadvantages

Category	Criteria	Alternative		
		Do Nothing	F1	F2
Highway Engineering	Traffic Operations	<ul style="list-style-type: none"> • Acceptable traffic operations • Negligible difference in overall intersection delay between alternatives – No operational benefit without northbound left-turn lane 	<ul style="list-style-type: none"> + Northbound left-turn lane provides operational benefit • Negligible difference in overall intersection delay between alternatives 	<ul style="list-style-type: none"> + Northbound left-turn lane provides operational benefit • Negligible difference in overall intersection delay between alternatives
	Geometrics & Safety	<ul style="list-style-type: none"> – Required northbound left-turn lane is not provided • No impact to driveways • No measurable pedestrian safety differences between alternatives 	<ul style="list-style-type: none"> + Required northbound left-turn lane is provided + Left-turn lane constructed on right of centreline is preferred at a T-intersection – Minor impacts to 3 driveway approaches • No measurable pedestrian safety differences between alternatives 	<ul style="list-style-type: none"> + Required northbound left-turn lane is provided • Left-turn lane constructed on centreline reduces horizontal alignment deflection – Minor impacts to 3 driveway approaches • No measurable pedestrian safety differences between alternatives
	Constructability	+ No construction required	– Moderate impacts to traffic during construction	– Moderate impacts to traffic during construction
	Total Cost	+ No cost	• Approximate total cost of \$211,000	– Approximate total cost of \$314,000
Overall Score		47	62	52

* The following factors that are relevant to this study were not present in this study area or had minor impacts in the same degree or in the same way for all of the alternatives: Business and Property, Noise, Land Use, Built and Cultural Heritage, Archaeology, Terrestrial Ecosystem, Fish and Fish Habitat, Species of Conservation Concern, and Environmentally Sensitive / Designated Areas

5.2.4.7 Myers Road / McPhail Road

A summary of the advantages and disadvantages for the Myers Road/McPhail Road alternatives is provided in Table 14.

Table 14: Myers Road / McPhail Road Advantages and Disadvantages

Category	Criteria	Alternative			
		Do Nothing	G1	G2	G3
Highway Engineering	Traffic Operations	<ul style="list-style-type: none"> • Acceptable traffic operations • Negligible difference in overall intersection delay between alternatives – No operational benefit without northbound left-turn lane 	<ul style="list-style-type: none"> + Northbound left-turn lane provides operational benefit • Negligible difference in overall intersection delay between alternatives 	<ul style="list-style-type: none"> + Northbound left-turn lane provides operational benefit • Negligible difference in overall intersection delay between alternatives 	<ul style="list-style-type: none"> + Northbound left-turn lane provides operational benefit + Southbound left-turn lane provides operational benefit • Negligible difference in overall intersection delay between alternatives
	Geometrics & Safety	<ul style="list-style-type: none"> – Required northbound left-turn lane is provided • No impact to driveways • No measurable pedestrian safety differences between alternatives 	<ul style="list-style-type: none"> + Required northbound left-turn lane is provided + Left-turn lane constructed on right of centreline is preferred (with no opposing left-turn lane) – Minor impacts to 3 driveway approaches • No measurable pedestrian safety differences between alternatives 	<ul style="list-style-type: none"> + Required northbound left-turn lane is provided • Left-turn lane constructed on centreline reduces horizontal alignment deflection – Minor impacts to 3 driveway approaches • No measurable pedestrian safety differences between alternatives 	<ul style="list-style-type: none"> + Required northbound left-turn lane is provided • Left-turn lane constructed on centreline reduces horizontal alignment deflection + Centreline widening lends itself to an opposing southbound left-turn lane – Minor impacts to 3 driveway approaches • No measurable pedestrian safety differences between alternatives
	Constructability	<ul style="list-style-type: none"> • No construction required 	<ul style="list-style-type: none"> – Moderate impacts to traffic during construction 	<ul style="list-style-type: none"> – More significant impacts to traffic during construction 	<ul style="list-style-type: none"> – More significant impacts to traffic during construction
	Total Cost	<ul style="list-style-type: none"> • No cost 	<ul style="list-style-type: none"> – Approximate total cost of \$303,000 	<ul style="list-style-type: none"> – Approximate total cost of \$428,000 	<ul style="list-style-type: none"> – Approximate total cost of \$469,000
Social & Cultural Environment	Business & Property	<ul style="list-style-type: none"> • No impacts to properties 	<ul style="list-style-type: none"> – Minor impacts to one residential property 	<ul style="list-style-type: none"> – Minor impacts to one residential property 	<ul style="list-style-type: none"> – Minor impacts to one residential property
Natural Environment	Terrestrial Ecosystem	<ul style="list-style-type: none"> • No impacts to vegetation 	<ul style="list-style-type: none"> • Approximately 10 m² of vegetation impacted 	<ul style="list-style-type: none"> • Approximately 20 m² of vegetation impacted 	<ul style="list-style-type: none"> • Approximately 20 m² of vegetation impacted
	Fish & Fish Habitat	<ul style="list-style-type: none"> + There are no new culverts or culvert extensions required + There are no fish-bearing watercourses impacted 	<ul style="list-style-type: none"> – 1 crossing extension of a watercourse that provides fish habitat – Impacts approximately 25 m² of the Beaver Creek Tributary / Glenco Branch and Spur to the Benneville Drain 	<ul style="list-style-type: none"> – 1 crossing extension of a watercourse that provides fish habitat – Impacts approximately 25 m² of the Beaver Creek Tributary / Glenco Branch and Spur to the Benneville Drain 	<ul style="list-style-type: none"> – 1 crossing extension of a watercourse that provides fish habitat – Impacts approximately 25 m² of the Beaver Creek Tributary / Glenco Branch and Spur to the Benneville Drain
Overall Score		44	45	43	47

* The following factors that are relevant to this study were not present in this study area or had minor impacts in the same degree or in the same way for all of the alternatives: Noise, Land Use, Built and Cultural Heritage, Archaeology, Species of Conservation Concern, and Environmentally Sensitive / Designated Areas

5.2.4.8 Passing Lane Alternatives Evaluation

A summary of the advantages and disadvantages of the passing lane alternatives is provided in Table 15.

Table 15: Passing Lane Advantages and Disadvantages

Category	Criteria	Alternative			
		NB-1	SB-1	NB-2	SB-2
Highway Engineering	Traffic Operations	<ul style="list-style-type: none"> • Minor Level of Service improvement compared to existing + Reduces the % Time Spent Following + Reduces Total Travel Time + Required Assured Passing Opportunity > Available Assured Passing Opportunity 	<ul style="list-style-type: none"> • Minor Level of Service improvement compared to existing + Reduces the % Time Spent Following + Reduces Total Travel Time + Required Assured Passing Opportunity > Available Assured Passing Opportunity 	<ul style="list-style-type: none"> • Minor Level of Service improvement compared to existing • Reduces the % Time Spent Following less than NB-1 • Reduces Total Travel Time less than NB-1 - Required Assured Passing Opportunity < Available Assured Passing Opportunity 	<ul style="list-style-type: none"> • Minor Level of Service improvement compared to existing • Reduces the % Time Spent Following less than SB-1 • Reduces Total Travel Time less than SB-1 - Required Assured Passing Opportunity < Available Assured Passing Opportunity
	Geometrics & Safety	<ul style="list-style-type: none"> + Required northbound passing lane is provided + Provides greatest safety benefit + Located in a desirable area with a long vertical crest curve • Difference in the number and location of existing intersections and entrances is negligible between alternatives 	<ul style="list-style-type: none"> + Required southbound passing lane is provided + Provides greatest safety benefit + Located in a desirable area with a long vertical crest curve + Location will assist with potentially slower truck traffic stopped at signalized intersection • Difference in the number and location of existing intersections and entrances is negligible between alternatives 	<ul style="list-style-type: none"> • A northbound passing lane is not warranted in the north section • Does not provide the greatest safety benefit + Located in a desirable area with a long vertical crest curve • Difference in the number and location of existing intersections and entrances is negligible between alternatives 	<ul style="list-style-type: none"> • A southbound passing lane is not warranted in the north section • Does not provide the greatest safety benefit + Located in a desirable area with an upgrade for the entire length and a long vertical crest curve • Difference in the number and location of existing intersections and entrances is negligible between alternatives
	Total Cost	<ul style="list-style-type: none"> • Approximate total cost of \$1.82M 	<ul style="list-style-type: none"> • Approximate total cost of \$1.72M 	<ul style="list-style-type: none"> • Approximate total cost of \$1.53M 	<ul style="list-style-type: none"> • Approximate total cost of \$1.42M
Social & Cultural Environment	Business & Property	<ul style="list-style-type: none"> - Impacts to 3 properties 	<ul style="list-style-type: none"> - Impacts to 5 properties 	<ul style="list-style-type: none"> - Impacts to 5 properties 	<ul style="list-style-type: none"> - Impacts to 4 properties
	Land Use	<ul style="list-style-type: none"> • No impacts to snowmobile crossings • No impacts to active farmland • No impact to aggregate and mineral reserves 	<ul style="list-style-type: none"> • No impacts to snowmobile crossings - Impacts approximately 2150 m² of active farmland • No impact to aggregate and mineral reserves 	<ul style="list-style-type: none"> - Passing lane is located at an existing Ontario Federation of Snowmobile Clubs trail crossing - Impacts approximately 3875 m² of active farmland - Minor property required from 3 licensed aggregate extraction areas 	<ul style="list-style-type: none"> - Passing lane is located at an existing Ontario Federation of Snowmobile Clubs trail crossing - Impacts approximately 1945 m² of active farmland. • No impact to aggregate and mineral reserves
	Built & Cultural Heritage	<ul style="list-style-type: none"> • Minor property required from a potential Cultural Heritage Landscape (CHL 10) 	<ul style="list-style-type: none"> • Minor property required from a potential Cultural Heritage Landscape (CHL 10) 	<ul style="list-style-type: none"> • There are no built/cultural heritage features in the study area 	<ul style="list-style-type: none"> • There are no built/cultural heritage features in the study area

Category	Criteria	Alternative			
		NB-1	SB-1	NB-2	SB-2
Natural Environment	Terrestrial Ecosystem	<ul style="list-style-type: none"> + No impacts to unevaluated wetlands • Approximately 65 m² of vegetation impacted - All alternatives impact potential Species-at-Risk habitat 	<ul style="list-style-type: none"> + No impacts to unevaluated wetlands - Approximately 1390 m² of vegetation impacted - All alternatives impact potential Species-at-Risk habitat 	<ul style="list-style-type: none"> - Approximately 1020 m² of unevaluated wetland impacted - Approximately 1540 m² of vegetation impacted - All alternatives impact potential Species-at-Risk habitat 	<ul style="list-style-type: none"> - Approximately 200 m² of unevaluated wetland impacted - Approximately 1770 m² of vegetation impacted - All alternatives impact potential Species-at-Risk habitat
	Fish & Fish Habitat	<ul style="list-style-type: none"> - Requires 3 culvert extensions at watercourses that provide fish habitat - Requires the potential realignment of an intermittent tributary - Impacts approximately 70 m² of fish-bearing watercourses 	<ul style="list-style-type: none"> - Requires 1 culvert extension of a watercourse that provides fish habitat - Impacts approximately 15 m² of a fish-bearing watercourse 	<ul style="list-style-type: none"> - Requires 1 culvert extension of a watercourse that provides fish habitat - Impacts approximately 20 m² of a fish-bearing watercourse 	<ul style="list-style-type: none"> - Requires 1 culvert extension of a watercourse that provides fish habitat - Requires realignment of approximately 100 metres of a watercourse that provides fish habitat - Impacts approximately 15 m² of a fish-bearing watercourse
	Environmentally Sensitive Areas, Designated Areas	<ul style="list-style-type: none"> • No Sourcewater Protection Areas in the study area • Does not impact the Newington Provincially Significant Wetland 	<ul style="list-style-type: none"> • No Sourcewater Protection Areas in the study area - Impacts approximately 1770 m² of the Newington Provincially Significant Wetland 	<ul style="list-style-type: none"> • Does not impact the Newington Provincially Significant Wetland • Requires construction within approximately 6975 m² of wellhead protection area 	<ul style="list-style-type: none"> • No Sourcewater Protection Areas in the study area • Does not impact the Newington Provincially Significant Wetland
Overall Score		57	55	37	37

* The following factors that are relevant to this study were not present in this study area or had minor impacts in the same degree or in the same way for all of the alternatives: Constructability, Noise, Archaeology, and Species of Conservation Concern

5.2.4.9 Carpool Lot Alternatives Evaluation

A summary of the advantages and disadvantages for the carpool lot alternatives is provided in Table 16.

Table 16: Carpool Lots – Alternative Advantages and Disadvantages

Category	Criteria	Alternative		
		1	2	3
Highway Engineering	Site Location	+ Near Highway 401 interchange	+ Approximately 1.0 km north of St. Andrews (existing parking) – Approximately 17.0 km south of Highway 417	+ Near existing parking at Monkland – Approximately 17.0 km south of Highway 417
	Geometrics & Safety	+ Located on a tangent section of the highway alignment + Located on very flat section of the highway	+ Located on a tangent section of the highway alignment • Located on flat section of the highway, near the bottom of a 2% grade	+ Located on a tangent section of the highway alignment + Located on very flat section of the highway
	Site Characteristics	+ Site very flat, can be constructed using conventional construction techniques + Good access opportunity + Convenient utility services	+ Site very flat, can be constructed using conventional construction techniques + Good access opportunity + Convenient utility services	+ Site very flat, can be constructed using conventional construction techniques – Access may conflict with County Road 43 turning lanes – Access close to CP Railway (100 m south) + Convenient utility services
	Total Cost	• Cost similar to locations C2 & C3	• Cost similar to locations C1 & C3	• Cost similar to locations C1 & C2
Natural Environment	Terrestrial Ecosystem	– Approximately 4600 m ² of vegetation impacted	– Approximately 5750 m ² of vegetation impacted	– Approximately 4650 m ² of vegetation impacted
	Fish & Fish Habitat	+ There are no new culverts or culvert extensions required + There are no fish-bearing watercourses impacted	+ There are no new culverts or culvert extensions required + There are no fish-bearing watercourses impacted	– One new crossing of a watercourse that provides fish habitat – Impacts approximately 20 m ² of the Monkland Drain / McDonald – Kennedy Branch
	Species of Conservation Concern	• No impact to rare species • No impact to potential rare species habitat	• No impact to rare species • No impact to potential rare species habitat	– Potential to impact rare species – Potential to impact rare species habitat
Overall Score		74	56	52

* The following factors that are relevant to this study were not present in this study area or had minor impacts in the same degree or in the same way for all of the alternatives: Business & Property, Land Use, Noise, Built and Cultural Heritage, Archaeology, Species of Conservation Concern

5.3 CONFIRMATION OF THE RECOMMENDED PLAN

It is important to note that the Recommended Plan was not identified solely on the merits of mathematical calculations. The matrices and application of weightings to data or numeric values were used as a tool to identify the alternative with the greatest advantages and least disadvantages. When the matrices were completed, it was confirmed that the Recommended Plan that was identified through the data gathering, analysis and evaluation process was the “best” plan, with the largest number of advantages and that the decision-making process that led to its selection was rational and took into consideration information received, including public and agency input.

Brookdale Avenue – Alternative A1

A right-turn channelization is warranted based on the current traffic volumes at Brookdale Avenue. The addition of a right-turn channelization will improve traffic flow on Highway 138 with minimal impacts to the natural, social, and cultural environment.

The recommended alternative for Brookdale Avenue is Alternative A1: Northbound right-turn channelization. Alternative A1 was selected as the recommended alternative at Brookdale Avenue because it:

- Improves traffic flow by providing northbound right-turn channelization;
- Provides the required northbound right-turn channelization; and
- Accommodates a possible future Highway 138 By-Pass.

Cornwall Centre Road – Alternative B1

The operation of the southbound right-turn has been identified as a local concern at the Highway 138 / Cornwall Centre Road intersection. This movement is challenging for trucks and vehicles with a wide turning radius, can slow following vehicles, and can create operational issues for eastbound left-turning vehicles if a truck must enter into their lane to make its turn. There is also a perception that improvements to this turn could support making this section of Highway 138 a more desirable route for trucks.

The recommended alternative for Cornwall Centre Road is Alternative B1: improved corner radius. Alternative B1 was selected as the recommended alternative at Cornwall Centre Road because it:

- Accommodates southbound right-turning trucks, which minimizes potential for traffic delays;
- Requires less property than Alternative B2; and
- May provide a more desirable route for trucks, which has the potential to reduce the number of southbound right-turns at Dundas Street / CR 18.

Headline Road – Alternative C2

Traffic control (i.e., traffic signals or a roundabout) is warranted at the Highway 138 / Headline Road intersection, based on current traffic volumes and the existing operations of the intersection. Traffic control at this location will improve traffic operations and has the potential to minimize collisions.

The recommended alternative for Headline Road is Alternative C2: Roundabout. Alternative C2 was selected as the recommended alternative at Headline Road because it:

- Provides improved traffic operations, including shorter delay in travel time and vehicle queue lengths for the overall intersection
- Has the potential to decrease the number and severity of collisions
- Provides traffic calming with reduced speeds
- Has the potential to act as a gateway feature in a key transition area

Although there is a perception that roundabouts can be difficult for trucks to navigate, the roundabout will be designed to accommodate all vehicles. Roundabouts are becoming a more common traffic control measure on provincial highways.

Dundas Street/County Road 18 – Do Nothing

The overall traffic operations at the Highway 138 / Dundas Street / CR 18 intersection are acceptable. However, the intersection geometrics, including the southbound right-turn radius, are not desirable, and have resulted in impacts to the historically designated Pioneer Cemetery stone wall. Although a range of intersection improvement alternatives were developed and evaluated, the property adjacent to the intersection is significantly constrained by designated heritage properties, which limit the scope of intersection improvements that can be considered. None of the alternatives that were developed and evaluated provide an overall improvement to the operation of the intersection.

The recommended alternative for Dundas Street / CR 18 is Do Nothing. This plan was selected as the recommended alternative at Dundas Street because it:

- Maintains acceptable overall traffic operations
- Avoids impacts to private property
- Does not impact built and cultural heritage features
- Avoids impacts to potential unmarked graves outside of the cemetery boundary

Minor improvements that are being provided as part of the recommended plan to provide additional delineation between vehicles and pedestrians include:

- New sidewalk with pedestrian ramps on north-west and north-east corners
- New barrier curb adjacent to the stone wall on the north-west corner
- New curb on east side adjacent to convenience store
- Minor centreline shift to the east and minor crosswalk shift to the north on the north leg
- Minor crosswalk shift to the south on the south leg
- Minor centreline shift to the south and minor crosswalk shift to the west on the west leg

It is recommended that additional minor improvements be considered to minimize impacts to the stone wall at the Pioneer Cemetery. Further discussions with St. Andrews Church, the Cornwall Township Historical Society, and Ministry of Tourism, Culture, and Sport, will be required to confirm the range of minor improvements that can be considered.

Valade Road / Island Road – Alternative E3

A northbound left-turn lane is warranted at the Highway 138 Valade Road / Island Road intersection, based on traffic volumes and turning movements. A left-turn lane at this location will improve traffic operations.

The recommended alternative for Valade Road / Island Road is Alternative E3: Northbound and southbound left-turn lanes on Highway 138 with widening on both sides of the centreline. Alternative E3 was selected as the recommended alternative at Valade Road/Island Road because it:

- Provides the required northbound left-turn lane
- Accommodates a southbound left-turn lane
- Includes left-turn lanes which provide a safer place for turning drivers to wait for a gap in the opposing traffic
- Improves the overall intersection operation
- Has minimal property impacts

Wheeler Road – Alternative F1

A northbound left-turn lane is warranted at the Highway 138 / Wheeler Road intersection based on traffic volumes and turning movements. A left-turn lane at this location will improve traffic operations.

The recommended alternative for Wheeler Road is Alternative F1: Northbound left-turn lane on Highway 138 with widening east of the centreline. Alternative F1 was selected as the recommended alternative at Wheeler Road because it:

- Provides the required northbound left-turn lane
- Includes a left-turn lane which provides a safer place for turning drivers to wait for a gap in the opposing traffic
- Improves the overall intersection operation
- Has a left-turn lane constructed on the right of centerline, which is preferred at a T-intersection
- Has a lower cost when compared to Alternative F2
- Avoids impacts to the natural, social, and cultural environments

Myers Road / McPhail Road – Alternative G3

A northbound left-turn lane is warranted at the Highway 138 / Myers Road / McPhail Road intersection, based on traffic volumes and turning movements. A left-turn lane at this location will improve traffic operations.

The recommended alternative for Myers Road / McPhail Road is Alternative G3: Northbound and southbound left-turn lanes on Highway 138 with widening on both sides of the centreline. Alternative G3 was selected as the recommended alternative at Myers Road/McPhail Road because it:

- Provides the required northbound left-turn lane
- Provides a southbound left-turn lane
- Includes left-turn lanes which provide a safer place for turning drivers to wait for a gap in the opposing traffic
- Improves the overall intersection operation
- Has minimal property impacts

Passing Lanes – Alternative NB1 and SB1

Further to the Screening Evaluation, one northbound and one southbound passing lane are required to improve traffic operations along the highway corridor. Two northbound and two southbound alternatives were developed and evaluated based on preliminary locations for northbound and southbound passing lane alternatives identified in the *Traffic Operations and Safety Review* (2014).

The recommended passing lane alternatives are Alternative NB1: Headline Road to County Road 43 – between Myers Road and Guindon Road, and Alternative SB1: Headline Road to County Road 43 – between Red Schoolhouse Road and County Road 43. Alternatives NB-1 and SB-1 were selected as the recommended passing lane alternatives because they:

- Provide the required passing opportunities
- Provide the greatest safety improvement since they are located in areas with higher traffic volumes and a lack of passing opportunities
- Provide a significant improvement to both total travel time and percent time spent following other vehicles

No significant operational or natural, social, or cultural impacts were identified with the remaining alternatives. Alternatives NB 2 and SB 2 are viable passing lane locations if a need is identified in the future based on changes to traffic volumes or operations in the study area. The need for a second set of additional passing lanes is outside of the planning horizon of the current study. A separate environmental assessment study would be required to identify the need for additional passing lanes, and complete environmental requirements at that time.

Carpool Lots – Alternatives 1 and 2

The screening evaluation discussed in Section 5.2.3 determined that two locations for Carpool Lots should be selected at the following locations:

- Carpool parking near Highway 401
- Carpool parking mid-block between Highway 401 and Highway 417 (one location)

The two carpool lots that were developed for consideration near Highway 417 did not meet the screening requirements and were not carried forward to the detailed evaluation. An environmental assessment study would be required to move forward with either site.

The recommended alternative for the Highway 401 area is Alternative 1, a carpool lot on the north side of Cornwall Centre Road, east of Brookdale Avenue. Alternative 1 was selected as the recommended alternative because:

- It is located in an area where there is demand for carpool / commuter parking
- It is located near a Highway 401 interchange to attract a broad cross-section of users
- There is good access and minimal impacts to the natural, social, and cultural environments

The recommended alternative for the mid-block site is Alternative 2, a carpool lot in St. Andrews West, on the east side of Highway 138, approximately 1.0 km north of Dundas Street. Alternative 2 was selected as the recommended alternative because:

- It is located in an area where there is demand for carpool / commuter parking
- There is good access and minimal impacts to the natural, social, and cultural environments

5.3.1 Additional Refinements to Recommended Plan

Following the first and second Public Information Centres for the project, additional refinements were made to the Recommended Plan based upon updated existing condition information (e.g. drainage information) and through additional consultation and concerns raised by property owners. The following refinements were made to the Recommended Plan:

5.3.1.1 Brookdale Avenue

The Recommended Plan that was presented at PIC 2 included a channelized right-turn lane with a radius of 45 m to accommodate the predominant traffic northbound to eastbound traffic movement. However, the adjacent property/business owner identified the following concerns:

- Private property impacts, including the relocation of an internal drainage swale
- Relocation of the existing roadside ditch and potential impacts to the highway drainage system

Following PIC 2 the need for the channelized right-turn lane was reviewed to minimize private property and drainage impacts. It was confirmed that the channelized right-turn lane is justified based on the relatively high volume of northbound to eastbound traffic at this location. However, the radius of the channelized right-turn lane was reduced from 45 m to 25 m to minimize private property and drainage impacts.

5.3.1.2 Guindon Road

The north intersection of Guindon Road and Highway 138 was initially identified for closure. However, the property owner on Guindon Road identified the following issues and concerns:

- Preference to maintain both north and south intersections

- The north intersection has better sight lines based on the property owner's observations and preference
- The south intersection includes an adjacent tight-radius curve on Guindon Road, which is difficult to navigate when entering Guindon Road from the north (i.e. a hair-pin curve)

Following PIC 2 it was confirmed that Guindon Road does not require two intersections at Highway 138 based on the relatively low traffic volumes; and that the closure of one intersection will improve safety and operations on Highway 138. However, the Recommended Plan was revised to include the closure of the south intersection to provide better sight lines and access to Guindon Road.

5.3.1.3 Northbound Passing Lane

In conjunction with the modifications at Guindon Road, the north limit of the northbound passing lane was shifted approximately 150 m to the south to minimize interactions with the north intersection of Guindon Road. The south limit of the northbound passing lane was also shifted to the south to maintain the desirable passing lane length of 2 km.

5.3.1.4 Carpool Lots

Additional details of the carpool lots were further developed following PIC 2. The property limits were subsequently adjusted to accommodate the carpool lot layouts. Both carpool lots are located on lands owned by the Ministry of Transportation.

6.0 Consultation Process

The consultation process provided an opportunity for the Project Team to discuss the study process with the public, property owners, external agencies, and stakeholders.

The process aims to notify all interested parties of the project and to provide an opportunity for input to the study and decision-making processes. This was accomplished by presenting the findings of each stage of work to the public, and through ongoing discussions with various government agencies and ministries, non-government interest groups and property owners.

Stakeholders and the public were formally contacted several times throughout the study process. To make sure that all interested members of the public and stakeholders were contacted, a Consultation Plan was developed at the start of the project and included the following consultation components:

- Notice of Study Commencement – January 2016
- Communication with external agencies to obtain pertinent technical information and identify the requirement for legislative or regulatory approvals related to the undertaking
- Meetings with municipal staff and Council (City of Cornwall, Township of North Stormont, Township of South Stormont)
- Communication with adjacent property owners where work proposed is likely to have an impact on the property
- Communication with affected property owners where temporary or permanent interest in property is required
- Two Public Information Centres (June 15, 2016 and December 14, 2016)
- Notice of Study Completion/*Transportation Environmental Study Report* Review Period – June 2017

In addition, a project website (highway138study.ca) was developed and has been maintained for this project. The website functions as an interactive tool to provide study updates, and an opportunity for stakeholders to submit comments at any time during the study.

A copy of all notification materials is provided in Appendix D.

Stakeholder input was incorporated into the project findings and recommendations, as appropriate, and responses were provided to all input received.

All project correspondence to/from the public was collected in accordance with the *Freedom of Information and Protection of Privacy Act*. Accordingly, with the exception of personal information, all public comments form part of the public record.

6.1 PROJECT WEBSITE

A project website (highway138study.ca) was developed to provide the public with easy access to project information, including background information, an opportunity to submit comments, an opportunity to take the Carpool and Commuter Survey, and the ability to transfer information easily throughout the course of the study. The website was

updated frequently as the study progressed, and included links to project-specific documentation (i.e., study notifications, EA process, and Public Meeting displays). and supplementary information (i.e., Class EA document).

6.2 NOTICE OF STUDY COMMENCEMENT

The purpose of the Notice of Study Commencement was to inform the public and external agencies about the study and to seek input from agencies, property owners, and users of the highway.

The Notice of Study Commencement was carried out through newspaper advertisements in the *Cornwall Standard Freeholder*, *Cornwall Seaway News* (both in English), and the *Cornwall Express* (in French) on Thursday, January 14, 2016. The notice described the study including the Class EA process, and provided a map and contact information for project team representatives. It was also posted on the project website.

The notice described the purpose of the study and the Class EA process. The notice also provided contact information for additional information on the study and requested public involvement.

Individual notification letters were sent to federal, provincial, and municipal agencies, property owners and stakeholder groups expected to have an interest in the study on January 11, 2016. Letters to agencies requested information on the environmental (i.e., natural, social, or cultural) features of the study area and to seek their input on the project. The correspondence included a flyer with additional information and a map of the study area. The following external agencies and stakeholders also received an agency comment sheet, requesting input by Friday, January 29, 2016:

Provincial Agencies

- Ministry of Natural Resources and Forestry
- Ministry of the Environment and Climate Change
- Infrastructure Ontario
- Ministry of Agriculture, Food and Rural Affairs
- Ministry of Municipal Affairs and Housing, Eastern Municipal Services Office
- Ministry of Tourism, Culture and Sport, Heritage Program Unit
- MPP Glengarry-Prescott-Russell
- MPP Stormont-Dundas-South Glengarry
- Ontario Provincial Police - Stormont Dundas and Glengarry Detachment

Municipalities

- City of Cornwall
- Cornwall Community Police Service
- Township of South Stormont
- Township of North Stormont
- United Counties of Stormont, Dundas and Glengarry
- The Nation Municipality

Stakeholders and Utilities

- Seaway Valley Snowmobile Association
- Delaney Bus Lines Ltd.
- Canadian National Railway
- Cornwall Township Historical Society
- Cornwall and Area Chamber of Commerce
- Upper Canada District School Board
- Ontario Federation of Snowmobile Clubs
- Raisin Region Conservation Authority
- St. Andrews Catholic Church
- Greyhound Canada Transportation Corp.
- Canadian Pacific Railway
- Student Transportation of Eastern Ontario
- South Stormont Chamber of Commerce
- Catholic District School Board of Eastern Ontario
- South Nation Conservation Authority

Notification materials, including the newspaper notices are provided in Appendix D.

6.2.1 Comments Received from Notice of Study Commencement

A total of 34 comment sheets, letters, emails, and phone calls were received following the Notice of Study Commencement up to, and beyond the submission date of Friday, January 29, 2016. General comments included requests to be added to the project mailing list, safety concerns, speeding and enforcement, preference for a by-pass of St. Andrews, and improvement requests for specific intersections along the Highway 138 corridor. Comments received and responses are summarized in Table 1 and Table 2 in Appendix E.

6.3 PUBLIC INFORMATION CENTRE 1

A Public Information Centre (PIC) was held to display and seek input on the preliminary improvement alternatives and existing conditions in the study area. It was held on Wednesday, June 15, 2016, at the Cornwall Township Lions Club, in St. Andrews West. External agencies were invited to attend the PIC from 3:00 PM to 4:00 PM in advance of the public session from 4:00 PM to 8:00 PM. External agencies and stakeholders that were represented at the PIC included the Township of North Stormont, Township of South Stormont, City of Cornwall, United Counties of Dundas, Stormont and Glengarry, Ontario Federation of Snowmobile Clubs, St. Andrews Parish, Cornwall Township Historical Society, and Raisin River Conservation Authority.

The PIC was a ‘drop-in’ style session where representatives from MTO and Stantec were available to discuss the study, answer questions, and receive input on the existing conditions in the study area.

The PIC was advertised in the *Cornwall Standard Freeholder*, the *Cornwall Seaway News* (both in English), and the *Cornwall Express* (in French) on Thursday, June 2, 2016. The Notice was also posted on the project website in advance of the meeting.

In addition, notification letters were mailed to Indigenous groups, external agencies, stakeholders, property owners and the general public on Wednesday, June 1, 2016. A copy of the PIC notice is included in Appendix D.

Potentially impacted property owners were sent a separate letter on Thursday, June 2 and June 3, 2016, noting that one or more of the Preliminary Improvement Alternatives may directly affect their property, along with the PIC Notice. Impacted property owners were encouraged to attend the PIC to review the alternatives and potential impacts to their properties, as well as pose any questions or concerns to the project team.

The following information was displayed at the PIC:

English

- Welcome
- Objectives
- About the Study
- About the Project
- The Evaluation Process
- Project Overview
- Intersection Improvements (Brookdale Avenue, Cornwall Centre Road, Headline Road Dundas Street/CR 18, Valade Road/Island Road, Wheeler Road, Myers Road/McPhail Road)
- Passing Lane Alternatives
- Possible Carpool Lot Locations
- Thank You

French

- Bienvenue
- Objectifs
- À propos de l'étude
- À propos du projet
- Le processus d'évaluation
- Survol du projet
- Stationnements pour covoiturage
- Merci

A copy of the PIC displays is included in Appendix F.

6.3.1 Attendance

The PIC was well attended, with representatives from 17 external agencies, as noted above, and 125 members of the public.

6.3.2 Comments Received from Public Information Centre 1

A total of 105 comment sheets, letters, emails and phone calls were received following the PIC up to, and beyond the submission date of Wednesday, July 15, 2016. General comments included safety and speeding concerns on Highway 138, support for passing and turning lanes, preference for a by-pass of St. Andrews, property impact concerns, and comments on community character and heritage preservation. Comments received at the PIC and responses are summarized in Table 1 and Table 2 in Appendix E.

6.4 COMMUTER PARKING SURVEY

A commuter parking survey was included in the project to gain an understanding of existing carpool/commuter parking use along Highway 138 between Highway 401 and Highway 417. The results assisted with confirming the need for carpool facilities, the size and location of possible carpool parking lots, and the evaluation of the carpool lot alternatives.

The questionnaire was delivered electronically via a survey provider (Survey Monkey) and in hard copy at the first Public Information Centre (PIC). A direct link to the survey was provided on the project website for simplified access.

The following distribution methods were employed:

- Information about the survey was included in the PIC Ontario Government Notice
- A link to the survey was provided on the project website
- Signs were posted at local congregation areas (e.g. St. Andrews Church, community centres) in the study area
- Flyers were distributed on vehicles in the parking areas where there are known bus stops
- The City of Cornwall and the Townships of North and South Stormont hosted a link to the survey on their respective websites

A total of 72 surveys were completed and general results of the survey included:

- 80% of respondents utilize Highway 138 for commuting/carpooling
- Average daily commute distance between 81-120 km, and average daily commute time is between 36-65 minutes
- Approximately 14% of respondents carpool to get to their destination and 88.5% utilize cars to commute to their destination
- Respondents identified that the nearest intersections to their departure point for daily commute along Highway 138 were Cornwall Centre Road, County Road 43 and County Road 44/Headline Road
- People that carpool utilize the St. Andrews Church parking lot or the Tim Hortons parking lot at County Road 43
- 82% of respondents think there is a need for a new carpool parking facility along Highway 138

Overall, the survey results indicated a need for carpool parking facilities in the southern half of the study area.

6.5 PUBLIC INFORMATION CENTRE 2

The second Public Information Centre (PIC) was held to display and seek input on the evaluation of alternatives and the Recommended Plan. It was held on Wednesday, December 14, 2016, at the Cornwall Township Lions Club, in St. Andrews West. External agencies were invited to attend the PIC from 3:00 PM to 4:00 PM in advance of the public session from 4:00 PM to 8:00 PM. External agencies and stakeholders that were represented at the PIC included the Township of North Stormont, Township of South Stormont, United Counties of Dundas, Stormont and Glengarry, Ontario Federation of Snowmobile Clubs, St. Andrews Parish, Cornwall Township Historical Society, and the South Nation Conservation Authority.

The PIC was a ‘drop-in’ style session where representatives from MTO and Stantec were available to discuss the study, answer questions, and receive input on the existing conditions in the study area.

The PIC was advertised in the *Cornwall Standard Freeholder* on Tuesday, November 29, 2016, and the *Cornwall Seaway News* (both in English) and the *Cornwall Express* (in French) on Thursday, December 1, 2016. The Notice was also posted on the project website in advance of the meeting.

In addition, notification letters were mailed to Indigenous groups, external agencies, stakeholders, property owners and the general public on Friday, November 25, 2016. A copy of the PIC notice is provided in Appendix D.

Potentially impacted property owners were sent a separate letter on Friday, November 25, 2016, noting that the Recommended Plan impacts their property, along with the PIC Notice. Impacted property owners were encouraged to attend the PIC to review the Recommended Plan and potential impacts to their properties, as well as pose any questions or concerns to the project team.

The following information was displayed at the PIC:

English

- Welcome
- Objectives
- About the Study
- About the Project
- The Evaluation Process
- Existing Conditions
- Project Overview
- Recommended Intersection Improvements (Brookdale Avenue, Cornwall Centre Road, Headline Road Dundas Street/CR 18, Valade Road/Island Road, Wheeler Road, Myers Road/McPhail Road)
- Recommended Passing Lanes
- Recommended Carpool Lot Locations
- Environmental Mitigation Measures and Commitments
- Thank You

French

- Bienvenue
- Objectifs
- À propos de l'étude
- À propos du projet
- Le processus d'évaluation
- Survol du projet
- Stationnements pour covoiturage
- Engagements et atténuation
- Merci

A copy of the PIC displays is included in Appendix F.

6.5.1 Attendance

The PIC was well attended, with representatives from 17 external agencies, as noted above, and 63 members of the public.

6.5.2 Comments Received from Public Information Centre 2

A total of 27 comment sheets, letters, emails and phone calls were received following the PIC up to, and beyond the submission date of Friday, January 13, 2017. General comments included support for carpool lot locations, support for a roundabout at Headline Road, safety and speeding concerns on Highway 138, support for passing and turning lanes, concern for increased traffic and noise, preference for a by-pass of St. Andrews, property impact concerns, and requests for additional improvements at Dundas Street/County Road 18. Comments received at the PIC and responses are summarized in Table 1 and Table 2 in Appendix E.

6.6 INDIGENOUS AND MÉTIS CONSULTATION AND ENGAGEMENT

The consultation program included written communications with the Mohawks of Akwesasne, Mohawk Council of Akwesasne, Mohawks of the Bay of Quinte, Algonquins of Pikwakanagan First Nation, Algonquins of Ontario Consultation Office, Curve Lake First Nation, and the Métis Nation of Ontario.

During the study, the Mohawk Council of Akwesasne provided correspondence that indicated that the study and improvements are supported. In addition, the Mohawk Council of Akwesasne requested a meeting with the MTO to discuss the project. On Monday, November 28, 2016 a delegation from the Ministry of Transportation Ontario gathered with representatives for the Environment Program within the Department of Tehotiennawakon of the Mohawk Council of Akwesasne to review on-going developments with Highway 138 Preliminary Design Study. At this meeting the technically preferred alternatives to be presented at PIC 2 were discussed to gather feedback.

Representatives of the Environment Program requested they be provided with a digital copy of the TESR and that they be kept updated throughout the project up to and including construction. Specifically, they requested that:

- Any culverts replaced maintain an open-air space to ensure turtles will use them;
- A temporary pathway between proposed carpool parking lot and Trans-Canada Trail at Cornwall Centre Road;
- They be provided an opportunity to pre-screen any areas to be cleared for plants of medicinal value and those areas of impacted sweet grass be replanted; and
- Supportive of roundabout at Headline Road and installation of living snow fence.

The Ministry agreed to re-visit requests during Detail Design and to continue to keep them updated on progress.

Copies of correspondence to Indigenous groups are included in Appendix E.

6.7 MUNICIPAL CONSULTATION

As part of the study consultation with the City of Cornwall, the Township of North Stormont, the Township of South Stormont, and the United Counties of Stormont, Dundas and Glengarry staff members were invited to a series of Municipal Advisory Committee (MAC) meetings to provide input on the existing study area, road users, municipal

projects, preliminary alternatives, and selection of a Recommended Plan. Three MAC meetings were planned as part of this project. The first MAC meeting was held on February 18, 2016 and the purpose of the meeting was to provide a study overview, opportunity for discussion / municipal input, review of planned consultation, and next steps in the project. During the first MAC meeting, there were discussions regarding the previous by-pass of St. Andrews West, the need for a speed limit review along Highway 138, a review of signage along the corridor, drainage issues, future consultation with the municipalities, intersection improvements and constrained areas at County Road 18 and Highway 138, need for carpool facilities, and traffic and safety concerns in the study area.

The second MAC meeting was held on August 17, 2016 and the purpose of the second MAC meeting was to provide a project update, present the improvement alternatives and answer questions. The following items were discussed during the second MAC meeting:

- Construction timing and funding
- Carpool lot alternatives
- Support for roundabout alternative at Headline Road
- Farm entrance closures for passing lane alternatives
- Future development proposals at Myers Road
- Speed limit reviews
- Snow drifting issues
- Future development and plans for Cornwall Centre Road

The meeting notes from the MAC meetings are included in Appendix E.

In addition to the MAC meetings, separate council presentations were scheduled at key consultation events (PIC 1 and PIC 2) to provide project information and updates and to seek input on the project from council members. Council presentations were provided prior to Public Information Centre 1 for the City of Cornwall, Township of North Stormont and the Township of South Stormont on June 13, June 7, and June 14, 2016, respectively. The purpose of the Council presentations was to provide an overview of the study and the preliminary alternatives being presented at the first PIC.

The third MAC meeting was held on January 10, 2017 and the purpose of the third MAC meeting was to provide a project update, present the evaluation of alternatives and Recommended Plan, and answer questions and obtain input/concurrence on the Recommended Plan. The following items were discussed during the third MAC meeting:

- Construction timing and funding
- Carpool lot facility priorities
- Support for roundabout alternative at Headline Road
- Road closure at Guindon Road
- Council Resolutions for the Recommended Plan

- Future development and plans at Brookdale Avenue and Cornwall Centre Road

The meeting notes from the MAC meetings are included in Appendix E.

In addition to the MAC meetings, separate council presentations were scheduled at key consultation events (PIC 1 and PIC 2) to provide project information and updates and to seek input on the project from council members. Council presentations were provided prior to Public Information Centre 1 for the City of Cornwall, Township of North Stormont and the Township of South Stormont on June 13, June 7, and June 14, 2016, respectively. The purpose of the Council presentations was to provide an overview of the study and the preliminary alternatives being presented at the first PIC. Council presentations were also provided prior to Public Information Centre 2 for the City of Cornwall on December 12, 2016, and the Township of North Stormont and the Township of South Stormont on December 13, 2016. Council resolutions in support of the Recommended Plan were obtained from the City of Cornwall, the Township of North Stormont and the Township of South Stormont and the resolutions are on file with the municipalities.

6.8 NOTICE OF STUDY COMPLETION

The Notice of Study Completion was placed in local newspapers (*Cornwall Standard Freeholder*, *Cornwall Seaway News*, *Cornwall Express*) when the *Transportation Environmental Study Report (TESR)* was made available for public review. The Notice was also made available on the project website and distributed to agencies, key stakeholders, Indigenous communities, and the public on the project mailing list.

6.9 FUTURE CONSULTATION

During the subsequent Detail Design stage of this undertaking, the external agencies, First Nations and Métis communities, and property owners will continue to be contacted and consulted regarding design/construction details and commitments to future work as outlined in this document, where appropriate and/or necessary.

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7.0 Recommended Plan

This section of the report provides a description of the Recommended Plan for improvements to Highway 138 from Highway 401 to Highway 417, within the City of Cornwall, and the Townships of North Stormont and South Stormont.

The Recommended Plan evolved through a process that included the development and evaluation of alternatives, with additional details being developed as the study progressed, as documented in this report.

The Recommended Plan includes: intersection improvements, left-turn slip around lanes, passing lanes, entrance modifications, carpool parking lots, and drainage improvements. Details of the plan are provided in the following sections.

Plans that illustrate details of the Recommended Plan are provided in Appendix A.

7.1 DESIGN CRITERIA

Highway 138 within the project limits is classified as a two-lane Rural Arterial Undivided (RAU) highway. The posted speed limit on this section of the highway is predominantly 80 km/h and the design speed is 100 km/h. There are sections of the highway where the posted speed limits are reduced due to higher density residential areas/community development. Improvements in these areas have been designed with a reduced design speed and are identified in the description of the improvement section.

7.2 HIGHWAY 138 ALIGNMENT

7.2.1 Horizontal Alignment

The existing horizontal alignment for Highway 138 will be maintained. There are some minor deficiencies with the existing horizontal alignment; however, since there is no evidence to indicate that these deficiencies are contributing to collisions and no operational problems were identified, the existing horizontal alignment will be retained.

7.2.2 Vertical Alignment

The existing vertical alignment for Highway 138 will be maintained. There are some minor deficiencies with the existing vertical alignment; however, since there is no evidence to indicate that these deficiencies are contributing to collisions and no operational problems were identified, the existing vertical alignment will be retained.

7.3 INTERSECTION IMPROVEMENTS

This section of the report provides a description of improvements to intersections to address operational deficiencies, warrant compliance, and improved traffic flow. The following intersections have improvements that are part of the Highway 138 Recommended Plan.

7.3.1 Brookdale Avenue

A northbound right-turn channelization will be provided on Brookdale Avenue at the intersection with Cornwall Centre Road. The new lane will provide a more direct connection between Brookdale Avenue and Cornwall Centre Road, which is the predominant traffic movement. The new lane will have a 5.75 m wide paved surface with a 2.5 m gravel shoulder on the right side and a 0.5 m paved shoulder adjacent to the curbed divisional island on the left side. The horizontal alignment of the new lane will have a radius of $R=25$ m, with a 55 m exit taper and a 40 m entrance taper. These design parameters satisfy the requirements for a ramp design speed of 30 km/h. Partial property acquisition is required from one property on the south-east corner of this intersection. One hydro pole will require relocation to accommodate the new turning lane. Sheet 1 in Appendix A shows a plan of the recommended improvement.

7.3.2 Cornwall Centre Road

The southbound corner radius on St. Andrews Road (Highway 138) at Cornwall Centre Road will be increased with a compound radius $R=18$ m and $R=110$ m. These design parameters satisfy the requirements for a two-centred compound curve to accommodate large transport trucks at a 90-degree intersection. The larger corner radius will allow large trucks to turn right from the southbound approach without conflicting with eastbound vehicles queued at the intersection. The traffic signals at Cornwall Centre Road will require minor modifications. The combination light standard/traffic signal pole in the northwest corner will require relocation. Partial property acquisition is required from one property in the northwest corner of this intersection. Sheet 2 in Appendix A shows a plan of the recommended improvement.

7.3.3 Headline Road

A roundabout is recommended at the intersection of Headline Road and Highway 138. The intersection setting affects much of the design strategy: its location in a speed transition zone, in a residential area, and near an elementary school suggests that the speed regime—thus safety performance—should not be excessively compromised for truck accommodation.

The speed regime is the primary design criteria and has been selected to be reflective of the intersection setting, traffic volumes, and approach speeds. The southbound approach has the highest fastest-path entry speed (FPES) at 41 km/h, followed by the northbound entry at 38 km/h, then the eastbound and westbound entries at 34 and 32 km/h, respectively.

Splitter island lengths are roughly proportional to approach speeds. Splitter island lengths are as follows: southbound approach 85 m, eastbound approach 70 m, northbound approach 50 m, and westbound approach 65 m. The high-speed southbound splitter island also has curb flares on both sides to further reduce speed.

Given the acute intersection angle of Headline Road approaching Highway 138, outer truck aprons have been included in the design to achieve a balance between truck accommodation and speed control: by adding outer truck aprons that

allow trucks to track onto them, entry lane widths can remain narrower in order to avoid excessively high entry speeds. The roundabout has been designed such that all large-sized truck movements have a clearance of 0.5 m to any barrier curb (which excludes truck apron curbs that are intended to be tracked over). Partial property acquisition is required from three properties in the southeast corner, and one property in the northwest corner of this intersection. Utility impacts for this improvement include: 2 hydro poles, one light standard, 4 catch basins, one fire hydrant and underground bell plant. Sheet 4 in Appendix A shows a plan of the recommended improvement.

7.3.4 Dundas Street (County Road 18)

Minor improvements to this intersection are recommended and can be accommodated without significant property and cost implications. The minor improvements include:

- New sidewalk with pedestrian ramps on the northwest and northeast corners
- New barrier curb adjacent to the cemetery stone wall on the northwest corner
- New curb on the east side adjacent to the convenience store
- Minor centreline shift to the east and minor crosswalk shift to the north on the north leg
- Minor crosswalk shift to the south on the south leg
- Minor centreline shift to the south and minor crosswalk shift to the west on the west leg

The traffic signals at this intersection will require minor modifications. Some pedestrian signal heads will require relocation, due to crosswalk modifications. No other traffic signal modifications are required. There are no property impacts associated with these improvements. Sheet 5 in Appendix A shows a plan of the recommended improvements.

7.3.5 Valade Road/Island Road

Opposing northbound and southbound left-turn lanes constructed about the centreline of Highway 138 are recommended at this intersection. The left-turn lanes will be 3.5 m wide and designed with 15 m storage, 40 m parallel lane and 115 m taper length. These design parameters satisfy the requirements for a design speed of 70 km/h, as this intersection is in a reduced speed zone (posted speed 50 km/h). The intersection improvements include reinstating the existing 60 m southbound right-turn taper and a new sidewalk on the west side between Valade Road and Carleton Street. In addition, the Highway 138 west side ditch between Valade Road and Carleton Street is eliminated, and road drainage in this area will be accommodated by a new 375 mm storm sewer from Valade Road southerly to the Raisin River (280 m). Utility impacts for this improvement include: 5 hydro poles, underground gas plant, and underground Bell plant. Partial property acquisition is required from one property in the northwest corner of Carleton Street and Highway 138, and three properties on the east side of Highway 138. Sheets 6 & 7 in Appendix A shows a plan of the recommended improvements.

7.3.6 Wheeler Road

A northbound left-turn lane constructed on the east side of the centreline of Highway 138 is recommended at this intersection. The left-turn lane will be 3.5 m wide and designed with 15 m storage, 70 m parallel lane and 160 m taper length. These design parameters satisfy the requirements for a design speed of 100 km/h. Relocation of one hydro

pole outside of the clear zone is required. There are no property impacts associated with this improvement. Sheet 9 in Appendix A shows a plan of the recommended improvement.

7.3.7 Myers Road/McPhail Road

Opposing northbound and southbound left-turn lanes constructed about the centreline of Highway 138 is recommended at this intersection. The left-turn lanes will be 3.5 m wide and designed with 15 m storage, 70 m parallel lane and 160 m taper length. These design parameters satisfy the requirements for a design speed of 100 km/h. The intersection improvements include reinstating the existing 60 m northbound right-turn taper and the existing 110 m southbound right-turn taper. In addition, partial removal of the existing embankment within the MTO right-of-way in the southwest corner, is required to improve intersection sight distance. Partial property acquisition is required from one property in the southeast corner of Highway 138 and McPhail Road. Impacts to existing utilities include underground Bell plant. Sheet 10 in Appendix A shows a plan of the recommended improvement.

7.3.8 Guindon Road

Guindon Road currently intersects with Highway 138 at two locations. The Recommended Plan includes the closure of the south intersection (Station 22+177 Cornwall Township). The north intersection (Station 22+603 Cornwall Township) will remain open. Sheets 15 & 16 in Appendix A shows a plan of the recommended improvements.

7.3.9 McDonald Road

A southbound left-turn lane constructed on the west side of the centreline of Highway 138 is recommended at this intersection. The left-turn lane will be 3.5 m wide and designed with 15 m storage, 70 m parallel lane and 160 m taper length. These design parameters satisfy the requirements for a design speed of 100 km/h. The intersection improvements keep the existing 60 m northbound right-turn taper. There are no property impacts associated with this intersection improvement. Impacts to existing utilities include underground Bell plant at this intersection. Sheet 22 in Appendix A shows a plan of the recommended improvement.

7.3.10 Left-Turn Slip Around Lanes

A left-turn slip around lane is recommended on Highway 138 at the following eight T-intersections:

- Archambault Road
- Cameron Road
- Willy Allan Road
- Amell & Ranald Road
- Campbell Road
- Rombough Road
- Warina Road
- Norman Road

The slip around design is comprised of a 45 m parallel lane and 50 m tapers at each end. Partial property acquisition is required from one property on the west side of Highway 138 for the left-turn slip around at Warina Road. Utility impacts are not anticipated at any of the left-turn slip around locations.

7.4 PASSING LANES

One northbound passing lane and one southbound passing lane are recommended within the project limits.

The northbound passing lane is in Cornwall Township and is 2.0 km in length, which includes the 80 m entrance taper and the 180 m exit taper. The northbound passing lane starts at a point that is approximately 500 m north of Myers Road/ McPhail Road and terminates at a point that is approximately 220 m north of Cameron Road. Partial property acquisition is required from three properties on the east side of Highway 138 to accommodate the road platform widening. Three hydro poles (Station 20+915 to 22+015) and underground Bell plant (Station 20+800 to 21+600) are impacted by the northbound passing lane. Sheets 11 to 16 in Appendix A shows a plan of the recommended improvement.

The southbound passing lane is in Roxborough Township and is 1.7 km in length, which includes the 80 m long entrance taper and the 180 m long exit taper. The southbound passing lane starts approximately 200 m south of County Road 43 (Monkland) and terminates at a point that is approximately 200 m south of McDonald Road. Partial property acquisition is required from five properties on the west side of Highway 138 to accommodate the road platform widening. Impacts to existing utilities include underground Bell plant at McDonald Road. Sheets 22 to 26 in Appendix A shows a plan of the recommended improvement.

The station limits for each passing lane are provided in Table 17.

Table 17: Recommended Passing Lane Locations

Passing Lane	Township	From Station	To Station	Length (m)
Northbound	Cornwall	20+450	22+450	2,000
Southbound	Roxborough	14+100	12+400	1,700

A typical cross-section of Highway 138 with a new passing lane is shown in Figure 5.

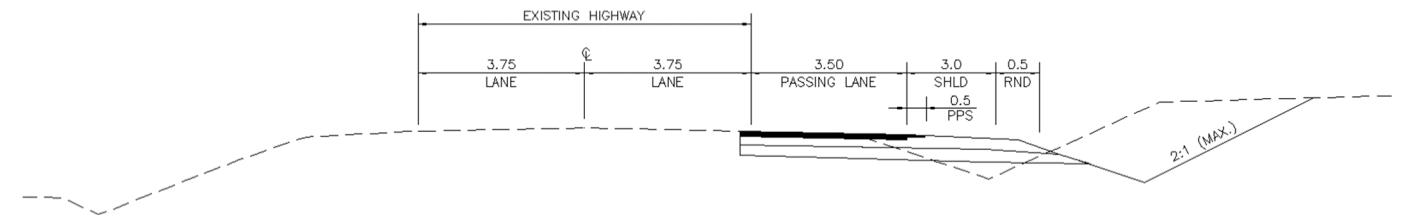


Figure 5: Typical Cross-Section

7.5 CARPOOL LOTS

Two carpool lots are recommended within the project limits.

One carpool lot will be located on the north side of Cornwall Centre Road, just east of Brookdale Avenue. The property at this location is generally square, has an area of approximately 1.1 ha and is currently owned by MTO.

The second carpool lot will be located approximately 1.0 km north of Dundas Street (St. Andrews), on the east side of Highway 138. The property at this location is generally rectangular, has an area of approximately 0.8 ha and is also currently owned by MTO.

A preliminary layout of the two carpool lots is shown in Sheets 1 & 8 in Appendix A. The design of the carpool lots will be further developed and confirmed during Detail Design. The design of each carpool lot will follow the guidelines as stated in Ministry Directive PLNG-B-008, "Carpool Parking Facilities Policy, Procedures, and Responsibilities".

7.6 ENTRANCES

Existing entrances that are located within improvement areas were reviewed to determine necessity and possible operational issues. Four commercial entrances have been identified for closure as part of the Recommended Plan, and are noted in Table 18.

Table 18: Entrance Closures

Station-Side	Township	Entrance Type	Reason for Closure
11+430-Left	Cornwall	Commercial	Entrance is currently not used and property has use of a second entrance further from the intersection
13+500-Right	Cornwall	Commercial	An entrance to this property is available from Headline Road
13+350-Right (on Headline Road)	Cornwall	Commercial	This entrance is too close to the new roundabout and a second entrance further from the roundabout will remain open for use
19+975-Left	Cornwall	Commercial	Abandoned commercial property, entrance no longer required

Fifty-three additional entrances to be closed and/or modified have been identified by MTO Corridor Management, including commercial, residential and farm entrances.

7.7 DRAINAGE AND HYDROLOGY

As part of this study, a *Preliminary Drainage and Hydrology Report* has been prepared.

7.7.1 Existing Centreline Culverts

The Recommended Plan includes improvements to 17 centreline culverts.

7.7.2 Additional Drainage Recommendations

7.7.2.1 Carleton Street Area

Flooding has been experienced at the end of Carleton Street (Station 16+250, Cornwall Township), due to insufficient drainage capacity to collect and convey the drainage from the west ditch along Highway 138 during large rainfall events. A 375 mm diameter storm sewer is recommended from approximately Station 16+360 (Cornwall Township), southerly to outlet at the Raisin River, Station 16+000 (Cornwall Township), to improve drainage on the west side of Highway 138 in this area. This storm sewer is also required for the intersection improvements at Valade Road/Island Road. Sheets 5 to 7 in Appendix A shows a plan of the recommended improvements.

7.7.2.2 McDonald Construction Area

Currently, the property located on the east side of Highway 138 at Station 11+730 (Cornwall Township) has a drain (culvert) that crosses directly under the property from the east side highway ditch to the east limit of the property (approximately 100 m in length). The Recommended Plan includes regrading of the east side highway ditch, to have drainage be directed to the north and around the edge of the property through the municipal right-of-way, connecting with the drain on the eastern side. This will eliminate the need for the drain/culvert under the private property. Partial property acquisition is required from this property to realign the east side highway ditch. Sheet 3 in Appendix A shows a plan of the recommended improvement.

7.7.2.3 Campbell Road Area

Clean out of the existing west ditch along Highway 138 is required from approximately Station 12+170 (Roxborough Township), southerly to the North Raisin River (Station 11+100 Roxborough Township), to eliminate standing water. Sheets 19 to 21 in Appendix A shows a plan of the recommended improvement.

7.8 MINOR IMPROVEMENTS

7.8.1 Improved Sight Lines at Intersections

Clearing and grading is required to improve sight lines within the Ministry right-of-way at several intersections. Table 19 provides a summary of these improvements.

Table 19: Summary of Intersection Sight Line Improvements

Location	Improvement Required to Improve Sight Lines
Valade Road/ Island Road intersection Station 16+376 Cornwall Township	Clear existing vegetation in northwest, northeast, and south-east quadrants
Myers Road/ McPhail Road intersection Station 19+940 Cornwall Township	Partial embankment removal in southwest quadrant
Cameron Road intersection Station 22+234 Cornwall Township	Clear existing vegetation in northeast and southeast quadrants
Willy Allan Road intersection Station 22+988 Cornwall Township	Clear existing vegetation in northwest and southwest quadrants
Amell & Ranald Road intersection Station 23+241 Cornwall Township	Clear vegetation in the northeast and southeast quadrants
Warina Road intersection Station 19+384 Roxborough Township	Clear existing vegetation in southeast quadrant

7.8.2 Snow Fencing

Previous feasibility and studies identified a need for snow fencing and mitigation measures in specific areas of the study area. Based on these findings, the Recommended Plan is carrying forward these recommendations and includes permanent snow fencing for the west side of Highway 138 in the Township of Roxborough at the following locations:

- Station 21+800 to Station 23+050
- Station 27+300 to Station 29+300

Property acquisitions and/or easements may be required for permanent snow fencing installations. Additional permanent snow fence details will be confirmed during Detail Design.

7.9 ILLUMINATION

Existing illumination along Highway 138 will be retained, except at Headline Road.

Full illumination will be installed at the new roundabout at Headline Road, as per the MTO Policy for Roundabout Lighting. Lighting requirements and design will be confirmed during Detail Design.

7.10 SIGNAGE

Traffic signs will be relocated as required to accommodate intersection improvements and the two new passing lanes. Additional signage will be installed at the roundabout and on the approaches, as well as approaching the two new passing lanes. New signage requirements will be confirmed during Detail Design.

7.11 UTILITIES

Utility relocations will be required to accommodate the Recommended Plan. Utility conflicts are summarized in Table 20. Final utility relocations will be determined during Detail Design.

Table 20: Utility Conflicts

Location	Utility Impacted
Cornwall Township	
Brookdale Avenue (Station 10+700)	1 hydro pole
Cornwall Centre Road (Station 11+400)	1 combination light standard/traffic signal pole 2 catch basins
Headline Road (Station 13+430)	2 hydro poles 1 light standard 4 catch basins 1 fire hydrant Underground Bell
Valade Road/ Island Road (Station 16+380)	5 hydro poles Underground Gas Underground Bell
Wheeler Road (Station 18+180)	1 hydro pole
Myers Road/ McPhail Road (Station 19+940)	Underground Bell
Northbound Passing Lane (Station 20+915 to 22+015) (Station 20+800 to 21+600)	3 hydro poles Underground Bell
Roxborough Township	
McDonald Road (Station 12+580)	Underground Bell
Southbound Passing Lane (Station 12+850)	Underground Bell

7.12 PROPERTY

The Recommended Plan will result in the partial acquisition (generally highway frontage) of 22 private properties (16 residential/farm, 4 commercial, 1 vacant property owned by the Roman Catholic Episcopal Corp., and 1 property owned by Cornwall Handgun Club). Four additional properties (farm land) will require partial property acquisitions and/or easements for permanent snow fencing installations.

Potentially impacted property owners will be notified at the start of Detail Design to confirm potential impacts and discuss next steps once construction staging and laydown areas are confirmed. Potentially impacted property owners will be invited to provide input and participate during all consultation opportunities during Detail Design, including a Public Information Centre.

Generally, MTO will not initiate the property acquisition process until the project is approved for construction. However, MTO may consider acquiring land under its Advance Purchase Policy in hardship situations, based on a willing-seller, willing-buyer situation and subject to regional priorities and funding. The implementation of the recommended improvements including property acquisitions are dependent on regional and provincial priorities and available funding.

The preliminary property requirements are illustrated on the preliminary design plans, which are included in Appendix A.

7.13 CONSTRUCTION STAGING AND TRAFFIC MANAGEMENT PLAN

Construction staging will be required for the construction of the Recommended Plan. Final construction staging and traffic management details will be determined during Detail Design.

7.14 IMPLEMENTATION PLAN

Construction of the Recommended Plan has been separated into two timeline improvement plans to address safety and operational concerns on the highway. The two timelines are broken down as follows:

- Short-term: 1-10 years
- Medium-term: 10-20 years

The Ministry of Transportation will continue to monitor the facility and may implement certain components of the plan when needed to meet provincial transportation needs. The implementation of the recommended improvements is dependent on regional and provincial priorities and available funding. The implementation of the recommended improvements is dependent on regional and provincial priorities and available funding.

The following timeline for implementing the recommended improvements will assist the Ministry, municipalities, businesses, and private land owners with future planning and development within the study area:

7.14.1 Short-term Improvement Plans

- Brookdale Avenue intersection improvements
- Cornwall Centre Road intersection improvements

- Headline Road intersection improvements
- Dundas Street (County Road 18) intersection improvements
- Valade Road/ Island Road intersection improvements
- Wheeler Road intersection improvements
- Myers Road/ McPhail Road intersection improvements
- Carpool lot located at Brookdale Avenue
- Carpool lot located north of St. Andrews West
- Left-turn slip around lanes at all identified locations

7.14.2 Medium-term Improvement Plans

- Northbound passing lane located approximately 500 m north of Myers Road/ McPhail Road to approximately 220 m north of Cameron Road.
- Southbound passing lane located approximately 200 m south of County Road 43 (Monkland) to approximately 200 m south of McDonald Road

7.14.3 Long-term Improvement Plans

This Preliminary Design and Environmental Assessment Study does not include improvement plans and recommendations for the long-term (i.e., greater than 20 years) planning horizon.

8.0 Environmental Impacts and Mitigation

Section 8.0 of the report describes the expected environmental impacts associated with the Recommended Plan, and appropriate mitigation at a Preliminary Design level of detail, in accordance with the *Class EA for Provincial Transportation Facilities (2000)* and the *Environmental Reference for Highway Design (2006)*.

During the study, the Project Team followed the principles of the Class EA document, including but not limited to:

- *Transportation engineering principles*— providing for the efficient movement of people and goods; addressing the identified transportation problems and opportunities, and maximizing the opportunity to satisfy existing and future provincial travel demand; reflecting sound engineering judgement and ensuring consistency with other transportation facilities in the vicinity;
 - The Recommended Plan addresses the transportation problems identified in Section 3.0 by providing intersection improvements and passing lanes that will improve safety and operations. For example, a Corridor Traffic Operations and Safety Review (2014) identified preliminary locations for northbound and southbound passing lane alternatives based on travel time savings and reduction in time spent following a slower vehicle. These locations were reviewed, based on the results of the screening evaluation and study area conditions and recommendations were made for the inclusion of passing lanes in the Recommended Plan.
- *Environmental protection principles*—avoiding or minimizing environmental impacts through consideration of alternatives, balancing environmental protection considerations with transportation considerations, and providing mitigation efforts in proportion to environmental significance and ability to reasonably mitigate;
 - The Recommended Plan minimizes impacts to terrestrial ecosystems because the proposed improvements are located on the existing highway and ROW and minimal impacts to terrestrial habitats outside of the ROW.
- *Evaluation principles*—providing an evaluation process that is traceable, replicable, and understandable, providing both subjective and objective processes, and refining factors from one stage to the next;
 - The evaluation process was presented to the public at each stage in the study. Evaluation criteria were modified or added to reflect comments received during the study (e.g., as the study progressed, the measurement of each evaluation criteria increased in detail).
- *Consultation principles*—placing an emphasis on consulting with stakeholders most directly affected, using the consultation process to assist in the identification of data requirements, showing how consultation received in earlier stages of a study affected a project, and making reasonable efforts to resolve concerns.
 - As discussed in Section 6.0, the study process evolved to meet the needs of all stakeholders and to reflect information received from specialist investigations, agencies, and changing priorities.
 - Following the notice of study commencement, several comments were received and information was provided regarding an existing petition for carpool parking facilities along Highway 138. As a result of this information, the project team initiated a carpool/commuter survey which was made available online. The results of the survey assisted the Project Team in identifying areas along the Highway 138 corridor where carpool/commuter

parking facilities are needed and developed a set of carpool location alternatives. The carpool lot alternatives were presented at the first PIC, evaluated and incorporated into the Recommended Plan.

8.1 NATURAL ENVIRONMENT

The development of improvement alternatives was a systematic process that included consideration of input from the public, agencies, and stakeholder groups to help identify project issues and impacts. Alignment alternatives were generated based on the Principles for Generating Alternatives in the *Class EA for Provincial Transportation Facilities (2000)*.

Impacts to the natural environment have been minimized in part, by minimizing footprint impacts to undisturbed natural environments. Impacts and mitigation to major components of the ecological system and the study area are described in the following sections.

A variety of environmental protection and mitigation measures will be adopted to guide the planning, design, construction, operation, and decommissioning of the Project. These include:

- Avoiding sensitive areas such as wetlands, sensitive fish habitat where possible, and where unavoidable, minimize the size and number of natural features that may be affected;
- Regulated standards for air and water emissions, for storage and disposal of solid wastes, and for handling and disposal of hazardous materials;
- Implement Best Management Practices for erosion and sediment control including:
 - Minimize the duration of soil exposure;
 - Retain existing vegetation, where feasible;
 - Encourage re-vegetation;
 - Divert runoff away from exposed soils;
 - Keep runoff velocities low; and
 - Trap sediment as close to the source as possible,
- Minimizing the “footprint” of Project facilities and activities to consequently minimize the amount of disturbed land, wetlands, fish habitat and water resources;
- Implement in-water construction timing restrictions (i.e., in-water work allowed from July 1 – March 14); and
- Implement a well-developed consultation program with key agencies during all phases of the Project.

The details of the Recommended Plan will be refined and finalized during Detail Design. To the extent possible, project facilities and components will be sited to avoid and minimize interactions with wetlands, high sensitivity

habitats, and areas of high archaeological, built and cultural heritage potential; where avoidance is not possible, mitigation or compensation measures will be developed in consultation with the applicable regulatory authorities.

Although the Recommended Plan will have direct impacts to wildlife habitat and vegetation, impacts at the larger watershed and ecosystem scale are not expected to be significant.

8.1.1 Physiography, Geology, and Soils

8.1.1.1 Erosion and Sediment Control and Protection Measures

This study included a review of potential erosion and sediment control requirements for the Recommended Plan, based on the results of the geotechnical assessment and available background information, including soils and geological mapping.

Various mitigation techniques will be employed during construction to reduce the risk of impacts to natural environment features. Mitigation measures for sedimentation, erosion, and dust control should be implemented to prevent sediment and dust from entering sensitive natural features. An Erosion and Sediment Control Plan is recommended to be developed during Detail Design to confirm appropriate erosion and sediment protection measures when construction staging plans are developed.

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. To address these principles, the following mitigation measures are proposed:

- The limits of construction (site boundaries) adjacent to all natural areas should be flagged and fenced prior to construction, and monitored during construction (along with sediment and erosion control measures)
- No equipment should be permitted to enter any natural areas beyond the sediment fencing (site boundaries) during construction
- All materials requiring stockpiling (fill, topsoil, etc.) should be stabilized and kept a safe distance from any sensitive natural features
- All exposed soil areas should be stabilized and re-vegetated. Seed and mulching, or seed and an erosion control blanket should be applied to disturbed sites promptly upon completion of construction activities
- Refuelling of equipment should be carried out away from any sensitive natural features to avoid potential impacts, in the event that an accidental spill occurs
- In addition to any specified requirements, additional sediment fence should be available on site, prior to grading operations, to provide a contingency supply in the event of an emergency
- All sediment and erosion controls should be monitored regularly and properly maintained, as required. Controls should be removed only after the soils of the construction area have been stabilized and vegetation cover is re-established

- Any natural areas that are temporarily disturbed for access or construction should be restored to natural self-sustaining conditions
- Environmental controls should be monitored by an environmental inspector

8.1.2 Drainage, Surface Water, Groundwater, and Sourcewater

There is potential for impacts to surface water and groundwater as a result of construction activities and disturbance of contaminated soils, leaks and accidental spills during construction. Preliminary proposed protection and mitigation measures include:

- Complete drainage design to provide appropriate drainage capacity
- Direct runoff and overland flow away from working areas and areas of exposed soils
- Store all oils, lubricants and other chemicals in suitable containers and handle them in accordance with applicable regulations
- Do not permit refuelling within 30 m of a watercourse
- During construction, identify best management practices for fuel management including secondary containment of temporary fuel storage
- Identify spill response plan for construction and clean up all spills immediately and dispose of contaminated materials in an approved manner. The Ministry of the Environment and Climate Change will be informed of reportable spills.
- Obtain draft Permit to Take Water (PTTW), if required

Protection and mitigation measures for surface water and groundwater impacts will be confirmed during Detail Design once construction methods and activities are identified.

8.1.3 Potential Contaminated Property

A *Contamination Overview Study* (COS) was completed by Genivar in 2011 with study area limits on Highway 138 from north of Highway 417 to Cornwall Centre Road. The COS identified several potential sources of contamination including historical spills, farming operations, pesticide distribution, industrial operations, and businesses associated with repair and fuel provisions for motor vehicles. Approximately ten properties were identified as sites with potential sources of contamination within the study area. Potential impacts to contaminated soils will be confirmed during Detail Design and if required, specific protection measures will be developed. General protection measures to prevent accidental spills, leaks and disturbance of contaminated soils are discussed in Section 8.1.2 and Section 9.0. The management of excess materials will be in accordance with OPSS 180 and standard MTO specifications.

8.1.4 Designated Areas

For MTO Class EA projects, the study process for Designated Areas includes identifying boundaries, understanding the feature and potential impacts of the project on the feature, attempting to avoid impacts, and mitigating any potential residual impacts. Where Designated Areas cannot be avoided as demonstrated by the Environmental

Assessment approval process, transportation and highway design will be done in a manner that minimizes the extent of intrusion, minimizes visual impacts, maintains access to Designated Areas, and buffers adjacent to Designated Areas (*MTO Environmental Standards and Practices for Designated Areas*).

The Recommended Plan does not impact any known Designated Areas.

8.1.5 Natural Sciences

This preliminary impact assessment identifies potential impacts (direct and indirect) to natural environment features and ecosystems functions that may arise from the implementation of the Recommended Plan. The assessment of impacts and mitigation recommendations will be refined further during Detail Design.

8.1.5.1 Fisheries and Aquatic Resources

Fisheries impacts and potential mitigation are described below. All fisheries impacts will be mitigated in accordance with the *MTO/DFO/MNRF Fisheries Protocol (2013)* or current MTO / DFO / MNRF fisheries regulations.

Thirty-six water crossings were identified as watercourses and water bodies that provide fish habitat for warmwater fish species. Species lists from background data sources and Stantec's field surveys indicate that the fish communities are comprised primarily of baitfish species. In addition to a diverse baitfish community, the Raisin River also supports Smallmouth Bass. Among the 36 sites that provide fish habitat, 19 have a permanent flow regime and 17 have an intermittent flow regime.

At many of the locations surveyed, riparian vegetation (i.e., trees or shrubs) was sparse or non-existent; therefore, where possible, existing riparian trees and shrubs within the Highway 138 right-of-way should be maintained to provide shade and cover to adjacent watercourses. Opportunities for habitat enhancement in the Study Area include stabilizing eroding banks and removing man-made barriers (e.g., dredged pools, sand berms and a perched culvert).

One aquatic species at risk, Cutlip Minnow, has been recorded in the Raisin River and in McIntosh Creek. Cutlip Minnow is Threatened and protected by the ESA, 2007.

If work is required at the Raisin River or McIntosh Creek, design and construction is required to consider Cutlip Minnow and their habitat. Cutlip Minnow generally prefer clear, warm to cool watercourses, with moderate to swift current and minimal to no rooted vegetation. Cutlip Minnow spawn in clear, silt-free water with substrates consisting of small cobble and gravel. Threats to this species' survival and recovery include siltation, turbidity, dredging and channel/shoreline alterations.

Habitat in the Raisin River is suitable for Cutlip Minnow; however, the presence of aquatic vegetation, slow flows/low summer water level, and presence of silt substrates are not ideal conditions for the species. At the two locations where Cutlip Minnow have been documented, the MNRF should be consulted early during the Detail Design phase of the project with respect to the potential need for a permit under the ESA, 2007.

Culvert replacements are proposed at the following watercourse crossings where fish habitat was identified (Appendix B – Exhibit 5). With the exception of the concrete box culvert at Crossing 18, the following existing culverts are corrugated steel pipes (CSP):

- South Nation River watershed – Crossings 02, 02B, 04, 04B and 05

- North Raisin River watershed – Crossing 15B
- Raisin River watershed – Crossings 16C, 18, 20A and 24

Culvert replacements are also proposed at the following locations that do not provide fish habitat (Appendix B – Exhibit 5):

- South Nation River watershed – Crossing 01B
- North Raisin River watershed – Crossings 12A
- Raisin River watershed – Crossings 20B and 22A

Culvert Extensions

Due to the addition of passing lanes, culvert extensions are proposed at the following locations where fish habitat was identified (Appendix B – Exhibit 5):

North Raisin River Watershed

- A new southbound passing lane begins south of County Road 43 and continues to just south of McDonald Road; a culvert extension 5.8 m west is proposed at Crossing 13 (McIntosh Branch Drain).
- A new northbound passing lane begins north of Myers Road and continues to just north of Cameron Road; a culvert extension of 6.4 m east is proposed at Crossing 16A (Unnamed Tributary to McDonald Creek Drain).

Raisin River Watershed

- New northbound and southbound left-turn lanes at the intersection of Myers Road/McPhail Road will require a culvert extension of 1.5 m at Crossing 17.

A culvert extension of 4.4 m west is also required at Crossing 12B (North Raisin River subwatershed); however, this crossing location does not provide fish habitat. The extension is needed due to construction of the southbound passing lane between County Road 43 and McDonald Road.

Potential Watercourse Realignments

Some channel realignments may be necessary, due to interchange improvements and the addition of passing lanes, although the extent of channel realignments or relocations is not known at this time. The following is a summary of proposed work within each watershed that may require channel realignments. During Detail Design, the size and extent of potential watercourse realignments associated with the proposed passing lanes and interchange improvements will be confirmed.

North Raisin River Watershed

- A new northbound passing lane begins north of Myers Road and continues to just north of Cameron Road; a watercourse realignment may be required north and south of the culvert extension at Crossing 16A and in the vicinity of Crossing 16B. The need for channel realignments will be determined during Detail Design.

Raisin River Watershed

- New northbound and southbound left-turn lanes at the intersection of Myers Road/McPhail Road may require a realignment of the watercourses on the east and west side of the highway, north of Myers Road at Watercourse Crossings 16D and 16E.
- A northbound channelized right-turn lane at Highway 138 and Brookdale Avenue will require the realignment of the watercourse associated with Crossing 24. The watercourse at this location provides fish habitat.

Installation of Storm Sewer Outlet at Raisin River

A new 375 mm storm sewer is proposed on the west side of Highway 138, from south of Valade Road south to the Raisin River (Crossing 20). The storm sewer would convey stormwater runoff from Highway 138 and discharge water to the Raisin River. Construction of the proposed outlet may trigger DFO review and an ESA permit for Cutlip Minnow, as Preliminary Design plans indicated the outfall is located within the high-water mark of the Raisin River. Cutlip Minnow was recorded in the Raisin River (Crossing 20) during a previous MTO study.

Applicability of Best Management Practices and Self-Assessment

In consultation with DFO, MTO has developed the Best Management Practices Manual for Fisheries (MTO 2016b). The Best Management Practices (BMPs) were developed for routine activities in or near water with minimal to no impacts to fish and fish habitat (MTO 2016b). The BMPs streamline the regulatory review process for routine highway activities and provide mitigation measures to avoid serious harm to fish. A project can proceed without DFO review if the conditions and mitigation measures outlined in a BMP can be met. For these projects or sites, an MTO Project Notification Form must be completed and submitted to MTO and DFO.

If a project cannot meet the conditions of a BMP at Step 3 of the Protocol (MTO 2016a), the Watercourse Crossing Self-Assessment Tool is used (DFO 2016). The purpose of the tool is to identify low risk watercourse crossing projects for which the scope of the impacts and the sensitivity of the fish and fish habitat are unlikely to result in serious harm to fish. The DFO Project Notification Form must be submitted to DFO when the tool is used, regardless of the outcome of the Self-Assessment.

The Watercourse Crossing Self-Assessment Tool consists of cumulative true or false statements. If the answer to all of the statements is 'true', the project is not likely to result in serious harm to fish or impacts to species at risk. DFO review is not necessary and an MTO Project Notification Form must be completed and submitted to MTO and DFO as per Step 5 of the Protocol. If the answer to any of the statements is 'false', the likelihood of causing serious harm to fish is determined using the Pathways of Effects (i.e. negative residual effects are determined as per Step 4 of the Protocol). If required, an MTO Request for Review Application Form is submitted to DFO for review under the Fisheries Act.

Culvert Replacements

The Culvert Replacement/Extension BMP (MTO 2016b) may be applicable for ten proposed Highway 138 culvert replacements where fish habitat was identified (Step 3 of the Protocol). Final details of the proposed culverts must

meet the BMP criteria, (e.g., in-water work will affect an area no greater than 250 m² below the high water mark and will not occur in important/exceptional fish habitat) and implement the necessary mitigation measures.

Culvert Extensions

Based on the proposed culvert extensions and the estimated bankfull widths identified during field investigations, the increase in the area of the culvert footprints at the three crossings that provide fish habitat will likely be less than 250 m². During Detail Design, details of the culvert extensions will be confirmed and the Culvert Replacement/Extension BMP (MTO 2016b) may be applicable, provided the work meets the criteria of the BMP (e.g., in-water work will affect an area no greater than 250 m² below the high water mark and will not occur in important/exceptional fish habitat).

Potential Watercourse Realignment Associated with Interchange Improvements or Passing Lanes

During Detail Design, the size and extent of potential watercourse realignments associated with the proposed passing lanes and interchange improvements will be confirmed. If a potential watercourse realignment requires less than 250 m² of alterations below the high water mark and will not take place within important/exceptional habitat, the project can likely be self-assessed using the Watercourse Crossing Self-Assessment Tool or using the Pathways of Effects (Step 4 of the Protocol). If the project can be self-assessed, then a Project Notification Form should be submitted to MTO as per Step 5 of the Protocol. If the project cannot be self-assessed in Step 4, it will need to be submitted to DFO for review (Step 6 of the Protocol).

Installation of Storm Sewer Outlet at Raisin River

Due to the presence of Cutlip Minnow in the Raisin River, the proposed storm sewer outlet to the river on the west side of Highway 138 will likely require DFO review and may require a permit under the ESA, 2007 if the proposed activities cannot be registered under Ontario Regulation 242/08. Project details necessary to determine steps required with respect to the DFO and ESA review processes will be confirmed during Detail Design.

Mitigation Measures

The following mitigation measures are applicable to protect fish and fish habitat in the study area and are consistent with DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat (<http://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures/measures-mesures-eng.html>).

Design

Culvert

The following elements should be considered during culvert design:

- Sufficient depth of flow and appropriate water velocities should be provided for fish passage
- Culvert size should be based on the capacity to handle peak flows
- To the extent possible, natural stream conditions (i.e. widths, habitat, etc.) should be maintained

- Natural bottom substrate and hydraulic capacity of watercourses are best maintained using open bottom/bottomless arch culverts. Footings for open bottom culverts should be installed outside the normal wetted perimeter of the watercourse and tied into the bedrock or sufficiently stabilized to prevent erosion or undermining around the footing
- Where used, cylindrical culverts should be installed to simulate open bottom or pipe arch culverts. Setting the culvert bottom at least 15 cm (or 10 to 20% of culvert diameter, whichever is greater) below the streambed elevation will allow for good fish passage and reduce the risk of the culvert being undermined
- Where possible, culverts should be aligned parallel to the existing natural channel and located on a straight stream section of uniform gradient
- Culverts should be sufficiently sized and installed such that scouring of the outlet streambed does not occur as a result of increased water velocities in the culvert. Elevated culvert entrances can cause scouring which may create an obstruction for migrating fish
- A minimum water depth of 200 mm should be provided throughout the culvert length. To maintain this water depth at low flow periods an entrance/downstream pool can be constructed. In some cases, an upstream pool may also be necessary
- The invert of the pool outlet should be at an elevation that maintains a minimum of 200 mm of water depth up to the inlet or upstream end of the culvert
- The culvert slope should follow the existing streambed slope where possible. Excessive culvert slope, reduced culvert capacity due to countersinking and maintenance of the 200 mm minimum depth of flow, and back watering due to the creation of an outlet pool should be considered when selecting the required culvert diameter to allow fish passage and pass peak flows
- Depending on site-specific conditions (e.g. steep slopes, long crossings, constricted streams resulting in high water velocities, etc.), installation of baffles/weirs may be necessary in culverts to facilitate fish passage. Baffles/weirs can provide an adequate depth of flow and reduce the water velocity in the culvert in order to facilitate fish passage

Rock Protection

The following mitigation measures for rock protection are included in the BMP:

- Use appropriately-sized clean rocks
- Do not obtain rocks from below the high water level of any waterbody
- Avoid the use of rock that is acid-generating and rock that fractures and breaks down quickly when exposed to the elements
- Install rock at a similar slope (to existing conditions) to maintain a uniform watercourse bank and natural watercourse alignment
- Place rock such that it does not interfere with fish passage or constrict the watercourse width.

Watercourse Realignment

Any proposed realignments to existing watercourses will follow natural channel design principles.

Construction

Timing Windows

Works adjacent to aquatic resources that provide fish habitat, or have the potential to support fish habitat, are often restricted to certain periods of time to avoid construction-related impacts to fish species during their most sensitive / vulnerable life cycles (i.e., during reproduction and early development stages of off-spring). Therefore, construction activities are often not permitted close to or within fish habitat during these periods.

For all watercourses in the Study Area, the MNRF recommended an in-water construction timing window of July 1 to March 14 (MNRF 2016a).

Best Management Practices

Where possible, activities associated with culvert replacements and culvert extensions will follow the MTO BMPs for Fisheries (MTO 2016b).

Ontario Provincial Standard Specifications

The following Ontario Provincial Standard Specifications (OPSSs) are applicable to the project:

- OPSS 180 - General Specification for the Management of Excess Materials
- OPSS 182 - General Specification for Environmental Protection for Construction in Waterbodies and on Waterbody Banks
- OPSS 185 - General Specification for Temporary Flow Control for Construction in Waterbodies
- OPSS 518 - Construction Specification for Control of Water from Dewatering Operations
- OPSS 804 - Construction Specification for Seed and Cover
- OPSS 805 - Construction Specification for Temporary Erosion and Sediment Control Measures

The OPSSs are applicable to the following general activities:

Equipment Use

Use of equipment shall be in accordance with OPSS 182.

Fish Salvage

Fish salvage operations shall be conducted in accordance with OPSS 182.

Flow Diversion

Isolation of the stream channel from in-water construction activities shall be conducted in accordance with OPSS 185.

Dewatering and the Use of Pumps

Dewatering activities and the use of pumps shall be conducted in accordance with OPSS 518.

Preservation of Riparian Vegetation

Removal of riparian vegetation shall be in accordance with OPSS 182 and OPSS 804.

Erosion and Sediment Control

The installation, monitoring, maintenance, and removal of temporary erosion and sediment control measures shall be according to OPSS 182 and OPSS 805.

Restoration of Disturbed Areas

Vegetation protection and rehabilitation shall be in accordance with OPSS 182 and OPSS 804.

Management of Excess Materials

All excess material shall be managed in accordance with OPSS 180.

Based on preliminary design plans, the *Culvert Replacement/Extension BMP* may be applicable for proposed culvert replacements and culvert extensions at ten watercourses that provide fish habitat, provided the work can meet the BMP criteria. Impact assessments may be required for watercourse realignments and the utility of the Watercourse Crossing Self-Assessment Tool should be determined during Detail Design once the extent of channel realignments are determined. Standard mitigation measures described in Section 6 are recommended to protect fish habitat during construction. The extent of effects on fish habitat will be quantified and confirmed during the Detail Design phase of the project, once grading, highway profile, and culvert details are confirmed. The Detail Design phase should include site-specific mitigation measures for the protection of fish and fish habitat.

8.1.5.2 Terrestrial Ecosystems

The Recommended Plan improvements will occur primarily within the existing ROW and minimal disturbance to vegetation cover and terrestrial habitat is anticipated, including temporary loss of areas disturbed during construction. Permanent loss will occur where the four new carpool lots are proposed. The carpool lots will result in localized loss of MEG, THDM5-1, MAMM1-2 and SWTM3 natural vegetation communities (as shown in Appendix B on Exhibit 6).

Potential indirect impacts associated with the proposed pavement and culvert rehabilitation/replacement works are minimal but could include soil compaction, siltation of on-site natural communities and watercourses, and spills of deleterious substances into natural communities, and noise impacts during construction. These impacts are considered to be short-term, localized to the construction area during construction activities, and/or avoidable through the application of appropriate construction techniques and mitigation measures. Greater discussion of potential impacts is provided under separate headers below.

Loss of Terrestrial Habitat

Planned improvements occur along the existing highway with the ROW and will displace areas of roadside adapted vegetation. Negligible effects to terrestrial habitat are anticipated as a result of the proposed work. The two carpool lots would result in a permanent loss of approximately 1.83 ha of THDM5-1, 1.10 ha of MEG, 0.3 ha of SWTM3 and 0.1

ha of MAMM1-2. All loss would occur adjacent to the existing Highway and new fragment effects are considered minimal. The proposed works will also require minimal temporary and short-term disturbance to vegetation cover and terrestrial habitat to accommodate construction within the ROW. Standard mitigation is available to address construction disturbance and degradation of terrestrial habitat is not anticipated as a result of the proposed work.

Potential Disturbance to Sensitive Species

The background review identified a number of significant species that may occur within close proximity to the Study Area. Correspondence with the Kemptville District MNR refined background data to species with potential occurrence within the Highway 138 study area. Based on a review of the preferred habitat of these species and field investigations there is potential for Snapping Turtle, Blanding's Turtle, Barn Swallow, Bobolink, Eastern Meadowlark, Little Brown Myotis, Small-footed Myotis and Northern Myotis to be present in the Study Area.

Of these species, suitable habitat is present in the ROW for:

- Barn Swallow
- Bobolink
- Eastern Meadowlark
- Snapping Turtle
- Blanding's Turtle
- Butternut

No SAR or habitat suitable for SAR were documented within the proposed carpool lot locations.

Potential project interactions with the above species are limited to construction phases of the project and are considered temporary. Similar habitat features will be available for all species after the project is complete. Project interaction with all other species is limited to indirect impacts during construction, such as noise disturbance and is considered negligible.

Special consideration is required for Barn Swallow because they are nesting on highway culverts, and the nests are protected by the ESA (2007).

Potential Interference with Migratory Birds

Field investigations identified nests of the Barn Swallow within structures at 11+125 (Roxborough) and 18+528 (Cornwall). Construction operations will be undertaken in the vicinity of these locations but not within the structures themselves. Therefore, exclusion measures are not required. New nests may also appear in any given year at any of the culvert sites. Any work near active migratory bird nests may disturb nesting behavior or destroy the nests.

In accordance with the Environmental Protection Requirements for Transportation Planning and Highway Design, Construction, Operation and Maintenance all activities shall be carried out to prevent the destruction of migratory birds or their nests and minimize the release of oil, oil wastes or any other substance harmful to migratory birds to any

waters or any area frequented by migratory birds (Migratory Birds Convention Act s.5, Migratory Bird Regulations s.6 and s.35).

Vegetation clearing during nesting periods in migratory bird breeding habitat can destroy active nests and violate the act. Culvert removal/rehabilitation operations can also lead to destruction and/or disturbance to migratory birds and their nests within and surrounding the structure. Measures put forward to avoid contravention of the MBCA are discussed below.

Potential Disturbance to Environmentally Sensitive Areas

The background review identified the following significant natural areas in the Study Area:

- Moose Creek Bog PSW and Candidate Life ANSI, and;
- Newington Bog PSW and Candidate Life ANSI.

Field investigations noted the following candidate SWH in the Study Area; candidate SWH features were primarily associated with existing natural areas:

- Turtle Wintering Areas;
- Amphibian Breeding Habitat/Amphibian Movement Corridors;
- Waterfowl Stopover and Staging Habitat, and;
- Deer Yard.

The majority of proposed work is planned to occur within the ROW, where no direct impacts to environmentally sensitive areas are anticipated. The carpool lots do not overlap with any environmentally sensitive areas and no direct impacts will occur. Protection from indirect impacts such as sedimentation and erosion will be addressed through standard environmental protection measures.

Erosion and Sediment Control

Mitigation will be employed during construction to reduce the risk of impacts to the natural environment. Mitigation measures for sedimentation, erosion, and dust control will be implemented to prevent sediment and dust from entering sensitive natural features.

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 to (6) trap sediment as close to the source as possible. To address these principles, the following mitigation measures are recommended:

- Sediment fencing and/or barriers will be used along construction areas that are adjacent to sensitive natural features (e.g. wetlands and watercourses). No equipment will be permitted to enter natural areas beyond the barrier fencing during construction.
- All materials requiring stockpiling (fill, topsoil, etc.) will be stabilized and kept a safe distance (>15 m) from natural areas.

- All exposed soil areas within 120 m of sensitive natural features (e.g. wetlands and watercourses) will be stabilized (seed mixes; sourced locally if possible) and re-vegetated, through the placement of seed and mulching or seed and an erosion control blanket within 15 days of soil exposure (45 days in all other areas) but no later than October 30.
- Equipment will be refueled a minimum of 30 m away from sensitive natural features (e.g. wetlands and watercourses) to avoid potential impacts, in the event that an accidental spill occurs.
- In addition to any specified requirements, additional sediment fence will be available on site, prior to grading operations, to provide a contingency supply in the event of an emergency.
- All erosion and sediment controls should be monitored regularly and properly maintained, as required. Controls are to be removed only after the soils of the construction area have been stabilized and adequately protected until cover is re-established.
- The limits of construction adjacent to sensitive natural features (e.g. wetlands and watercourses) to be retained will be fenced prior to construction, and monitored during construction (along with erosion and sediment control measures) to make sure that the limits are maintained with respect to vehicular traffic and soil or equipment stockpiling.
- The Contractor is required to restore any disturbed natural areas to pre-construction conditions.
- Banks of watercourses disturbed during site access or ditch construction will be re-stabilized to pre-construction configuration and condition (or better) using species native and naturally occurring to the site, where possible.
- Any ditch maintenance activities occurring within 30 m of a watercourse will follow MTO's Best Management Practices (BMP) for ditch maintenance.

Vegetation Protection

Proposed work will primarily occur within the existing ROW and activities will displace common roadside species. The removal of common species is not expected to require mitigation. A small amount of additional land is required to accommodate the carpool lots; in this case, the limits of vegetation removal should be limited to the extent possible. Sediment fencing should be used to separate work areas from sensitive natural features (e.g. wetlands and watercourses). Sediment fencing will minimize the release of sediments and other deleterious substances into adjacent areas of natural vegetation.

Topsoil, seed banks and organic matter should also be salvaged and reintroduced to any areas disturbed during construction, as appropriate. New seed should be introduced to disturbed substrates as soon as feasible following construction (within 15 days for areas less than 120 m from a watercourse, and 45 days for other areas), and sediment fencing should remain in place until vegetation cover is re-established.

Protection of Migratory Birds

The Primary Nesting Period (PNP; the period when the percent of total nesting species is greater than 10%) for migratory bird species in the study area is April 10 to August 9 (Environment Canada 2014), although nesting may occur outside of this period, particularly for birds that nest multiple times within the breeding season. Activity must avoid active nests at any time. If work is scheduled to occur outside of the PNP, no mitigation will be required. In the

event that construction is required during that time, an avian biologist must be retained to conduct nest sweeps of the area prior to works. The biologist will search for nests (or signs of nesting) of migratory birds to make sure there will be no destruction of active nests protected by the Migratory Birds Convention Act. Nest searches must be completed within seven days (168 hours) of the proposed works. If work is not completed within seven days following the nest search, the search must be repeated to make sure no new nests have been established during that period.

If no nests or signs of nesting are found, clearing or other activities may proceed in the area searched. If a nest is located a designated buffer will be delineated, within which no activity will be allowed while the nest is active. The radius of the buffer ranges from 5 – 60 m depending on the species. Activity restrictions would also depend on the proposed work in relation to the nest location. For example, crack sealing would likely have a very minimal impact to nesting; whereas, the vibration from jack hammering anywhere on the structure would likely crack and destroy the nests and would be restricted while the nest is active. The nest will be checked every few days to determine its status. Once the nest is determined to be inactive (i.e. the nest no longer has young), clearing and other activities in the area may proceed.

Barn Swallow

Barn Swallow and its habitat (i.e. nesting structures) are protected from harm or harassment by the ESA (2007), including the nests on structures 11+125 (Roxborough) and 18+528 (Cornwall). Under the streamlined approvals process for repair, maintenance, or demolition of a Barn Swallow nesting structure (i.e. ESA O.Reg 242/08) the following requirements must be followed if damage to nests is anticipated:

- If construction activities are timed to take place outside of the Barn Swallow nesting period (May 1 to August 31), inactive nests that have the potential to be damaged or destroyed in the culverts must be removed prior to commencement of construction. Artificial nest cups must be erected after construction and replace any removed nests at a ratio of 1:1.
- If activity that might disturb a nest (including excessive noise and vibration) is required to take place within the Barn Swallow nesting period, pre-netting of the culvert before May 1 will be required to dissuade Barn Swallow from nesting within it. If no suitable pre-existing nesting structures can be found within one kilometre of the culvert, the alternative nest structures (e.g., kiosks) should be installed with a nest replacement ratio of 1:1. The structure must be placed within 1 km of the removed habitat and within 500 m of suitable foraging habitat. Nest replacement must occur prior to May 1 of the year construction starts at each location. Experts should be consulted on appropriate design and siting of structures and/or nest cups.

Prior to activity that might disturb a nest, the project must register with MNRF and prepare a mitigation and 3-year monitoring plan that are in line with O.Reg 242/08 section 23.5 (Barn Swallow).

Protection of Wildlife

Standard environmental protection measures for erosion and sediment control will also serve as a wildlife barrier where construction encroaches into areas of natural vegetation, to avoid interaction with potential turtles, including Species at Risk (Blanding's Turtle and Snapping Turtle). If possible, installation of sediment fencing will occur before June 1 or after September 1 (i.e., outside of turtle nesting season) to define Work Zones and restrict the movement of

nesting turtles into the working area. A thorough visual search of the work area should be conducted by construction contractors before work commences each day to locate any turtles or other wildlife in the work area. If turtles or other wildlife are encountered during construction, work at that location will stop, and wildlife will be permitted reasonable time to flee the area on their own. If necessary, a qualified professional can move wildlife to a location that is both safe and suitable. Factsheets should be provided to assist contractors in the identification of potential Species at Risk (Blanding's Turtle and Snapping Turtle). Any observations of Species at Risk will be reported to the MNRF within 48 hours.

8.2 SOCIO/ECONOMIC ENVIRONMENT

This section of the report describes impacts and potential mitigation measures for the social and economic environments.

8.2.1 Land Use

Land use designations in the study area are not expected to change as a result of the Recommended Plan.

The Recommended Plan supports Regional and Provincial Growth Planning policies by providing the transportation infrastructure required to maintain a high level of service on the provincial highway system for the movement of people and goods.

Residents in the study area may experience minor temporary delay during construction, however potential impacts are expected to be very minor and not result in significant impacts. Therefore, no mitigation measures are proposed at this time. Construction staging plans will be confirmed during Detail Design and access to private entrances and sideroads will be maintained, wherever possible in the construction staging plans. Stakeholders (including EMS and school boards) and the public will have an opportunity to provide input on construction staging plans during Detail Design. Emergency service providers will be notified of the start of Detail Design and once construction staging plans are developed in order to minimize delays in emergency response times during and after construction.

8.2.1.1 Property

Potential impacts to private properties and appropriate protection and mitigation measures are discussed in Section 7.12.

8.2.1.2 Communities

There are no impacts to the community facilities identified in Section 4.2.

8.2.1.3 Student Transportation

There will be no long-term or significant impacts to student bus routes as construction of the Recommended Plan will not include off-site detours. There may be potential minor delays during construction of the Recommended Plan but they will not likely interfere with student transportation activities. Construction staging plans will be developed and confirmed during Detail Design and opportunities for public and stakeholder comments on construction staging will be provided during Detail Design.

8.2.1.4 Commercial

The Recommended Plan is not anticipated to have any negative impacts to local businesses in or surrounding the study areas access across throughout the study area and the communities will be maintained during construction of the Recommended Plan. There may be potential minor delays during construction of the Recommended plan but construction staging plans will be developed and confirmed during Detail Design.

8.2.1.5 Emergency Services

There will be no long-term or significant impacts to emergency service providers as construction of the Recommended Plan will not include off-site detours. Delays are expected to be minor during construction of the Recommended plan but construction staging plans will be confirmed during Detail Design and consultation with emergency service providers will occur during Detail Design.

8.2.1.6 Municipal Services

There are no direct impacts to municipal services as a result of the Recommended Plan.

8.2.2 Agriculture

The Recommended Plan will result in minor impacts to active agricultural land. The Recommended Plan impacts approximately 2150 m² of active agricultural land but impacts to agricultural land are located directly adjacent to Highway 138 and the existing ROW and will likely not result in significant impacts to farming activities and associated operations on the existing farm land and properties. Therefore, no mitigation measures are proposed at this time. Potential impacts to agricultural land will be confirmed during Detail Design.

8.2.3 Aggregates

The Recommended Plan does not directly impact any aggregate extraction facilities.

8.2.4 Mining

The Recommended Plan does not impact any mining operations or facilities.

8.2.5 Recreation and Tourism

The Recommended Plan supports regional tourism and recreational growth by replacing aging infrastructure, and improved safety and traffic operations within the study area; and by avoiding impacts to crown land, impacts to businesses and recreational facilities.

8.2.5.1 Trails and Active Transportation

The MTO is committed to sustainable transportation and active transportation as outlined in the MTO *Statement of Environmental Values* (2008). The Recommended Plan does not affect any identified trails in the study area.

8.2.5.2 Snowmobile Trails

The Ministry's practice is to accommodate existing Trans Ontario Provincial Snowmobile (TOPS) and Regionally Significant Trails in the final design of highway improvement projects in the vicinity of existing crossings. Snowmobiles are not permitted to operate within the right-of-way of a Controlled Access Highway or within interchange areas. There will be no direct impacts to any TOPS snowmobile trails as a result of the Recommended Plan and therefore no mitigation measures are required or proposed.

8.2.5.3 Other Recreational Features

The Recommended Plan does not directly impact any known recreational features in close proximity to the study area.

8.2.6 Utilities

Potential impacts to utilities are discussed in Section 7.11.

8.2.7 Noise

An *Environmental Noise Assessment* was carried out for the Recommended Plan in accordance with the MOE/MTO Noise Protocol and the MTO Noise Guide. A copy of the *Environmental Noise Assessment* is on file with the MTO and is available in Appendix G.

The study analysed existing noise conditions and compared them to future noise levels expected from the proposed improvements under a future 'do-nothing' and the future 'Recommended Plan' scenarios. In accordance with the MTO *Environmental Guide for Noise* (2006), residences that are exposed to sound level increases of 5 dBA or higher in the future, or to future sound levels of 65 dBA or higher warrant investigation to establish their eligibility for noise controls at their Outdoor Living Areas (OLA's). Mitigation measures are considered if they can reduce noise levels by at least 5 dBA over the first row of receptors or in areas of residential clusters / subdivisions within the transportation corridor right-of-way.

A total of 104 points of reception (POR) representing the Noise Sensitive Areas (NSAs) were selected within the Study Area. These receptors represent the most exposed sides of existing residential dwellings. Other residences with similar setback distances to the noise source will receive similar exposure and noise impacts. Therefore, the selected locations were considered representative of all receptors within the Study Area.

The future sound levels with and without the proposed Highway 138 improvements were predicted at these PORs. Consistent with MTO requirements, the selected POR locations were assessed at 1.2 m above grade, 3 m from the building façade with the most exposed side and aligned with the midpoint of the applicable façade.

There were no projected sound level increases at the PORs (with or without improvements); however, the sound levels are predicted to be at or above 65 dBA at 56 PORs. Therefore, as per MTO's guidelines, investigation of noise control measures at the OLAs of the associated NSA is required.

Among the 56 PORs predicted to exceed 65 dBA at the most exposed side of the dwelling, 24 PORs are fronting onto Highway 138 and their OLAs are shielded by the receptor building itself. For these receptors, the OLA sound levels are predicted to be below 65 dBA and thus, have not been considered further in the assessment.

The remaining 32 PORs have OLAs siding onto Highway 138 and were investigated further to determine if noise mitigation measures are warranted.

These OLAs were assessed at 1.2 m above grade, 3 m from the building façade and aligned with the midpoint of the applicable façade.

Table 21 summarizes the projected sound levels (with and without improvements) at the identified OLAs of the receptors. As shown in Table 21, the highest projected sound level at these OLAs is 64 dBA and the average projected sound level is 60 dBA. In addition, the change in sound level at all identified OLAs is less than 5 dB. Therefore, noise mitigation measures are not warranted at these locations.

Table 21: Sound Level Predictions (OLAs)

Receptors (Most Exposed Side)	Sound Level Leq 16-Hr (dBA)		Change in Sound Levels (dB) (B-A)	Projected Sound Level is 65 dBA or Greater? (Yes or No)	Change in Sound Level is 5 dB or Greater? (Yes or No)
	Future Ambient – No Improvement (Column A)	Projected with Improvements (Column B)			
OLA_001	62	62	0	No	No
OLA_003	59	59	0	No	No
OLA_005	61	61	0	No	No
OLA_006	63	63	0	No	No
OLA_007	64	64	0	No	No
OLA_009	64	64	0	No	No
OLA_025	59	59	0	No	No
OLA_026	62	62	0	No	No
OLA_038	62	62	0	No	No
OLA_041	60	60	0	No	No
OLA_043	60	60	0	No	No
OLA_044	60	60	0	No	No
OLA_048	64	64	0	No	No
OLA_053	57	57	0	No	No
OLA_055	61	61	0	No	No
OLA_057	58	58	0	No	No
OLA_061	56	56	0	No	No
OLA_062	63	63	0	No	No
OLA_070	56	56	0	No	No
OLA_071	62	62	0	No	No
OLA_072	60	60	0	No	No
OLA_073	54	54	0	No	No
OLA_081	60	60	0	No	No

Receptors (Most Exposed Side)	Sound Level Leq 16-Hr (dBA)		Change in Sound Levels (dB) (B-A)	Projected Sound Level is 65 dBA or Greater? (Yes or No)	Change in Sound Level is 5 dB or Greater? (Yes or No)
	Future Ambient – No Improvement (Column A)	Projected with Improvements (Column B)			
OLA_082	61	61	0	No	No
OLA_088	64	64	0	No	No
OLA_091	64	64	0	No	No
OLA_092	59	59	0	No	No
OLA_094	47	47	0	No	No
OLA_096	56	56	0	No	No
OLA_101	61	61	0	No	No
OLA_102	64	64	0	No	No
OLA_103	58	58	0	No	No

8.2.7.1 Construction Noise

In addition to the detailed construction noise evaluation, the contractor will be required to adhere to standard noise restrictions (i.e., proper maintenance of equipment, no unnecessary idling). MOECC Publication NPC-115 provides sound emission standards for various types of construction equipment. Due to the temporary and unavoidable nature of construction, these MOECC guidelines stipulate limits on individual pieces of equipment instead of a site limit. Table 22 illustrates maximum noise emission levels which should be adhered to for typical construction equipment per NPC-115.

Table 22: NPC-115 Noise Emission Limits for Construction Equipment

Type of Equipment	Maximum Sound Level (dBA)*
Excavation equipment, bulldozers, loaders, backhoes or other equipment	83 (for Power Rating less than 75 kW) 85 (for Power Rating 75 kW and greater)
Pneumatic Pavement Breakers	85
Portable Air Compressors	70

* Maximum Sound Level (dBA) as determined using Publication NPC-103 – Procedures, Section 6

Standard measures for mitigating noise emissions shall be implemented for construction. These measures will include, but will not be limited to:

- Where possible, major construction activities to be scheduled to take place during daytime hours (i.e., 07:00 to 19:00) to avoid sensitive nighttime periods
- Noise mitigation measures (e.g., muffler systems) to be installed on construction equipment and equipment will be properly maintained

- Construction equipment to be turned off when not in use (i.e., a no idling policy)

The need for night-time construction will be confirmed during Detail Design and if required, appropriate protection and mitigation measures will be developed and documented during Detail Design.

8.3 CULTURAL ENVIRONMENT

Should human remains be identified during operations, all work in the vicinity of the discovery will be suspended immediately. Notification will be made to the Ontario Provincial Police, or local police, who will conduct a site investigation and contact the district coroner. Notification should also be made to the Registrar of Cemeteries, Ministry of Government Services. Other government staff may be contacted as appropriate. Media contact should not be made in regard to the discovery.

Should other cultural heritage values (archaeological or historical materials or features) be identified during operations, all activity in the vicinity of the recovery will be suspended and the Ministry of Tourism, Culture, and Sport archaeologist will be contacted (807-475-1551).

8.3.1 Archaeology

The Recommended Plan does not directly impact any registered archaeological sites. The Stage 1 background research resulted in the determination of high archaeological potential and that a Stage 2 Archaeological Assessment would be required. A Stage 2 Archaeological Assessment was initiated in the fall of 2016 for the Recommended Plan and partial fieldwork was completed for potentially impacted properties where permission to enter was provided. Additional fieldwork will be required for properties where permission to enter is still pending and will be completed in the spring and summer of 2017 and the results of the assessment will be documented in a Stage 2 report. If required, mitigation measures will be documented in the Stage 2 Archaeological Assessment Report.

The Stage 1 Archaeological Assessment Report was filed with the MTCS for concurrence and endorsement through a Letter of Review and entry into the *Ontario Public Register of Archaeological Reports*. Once the Stage 2 Archaeological Assessment report is completed it will be filed with the MTCS for concurrence and endorsement.

8.3.2 Built Heritage and Cultural Landscape

The Recommended passing lanes (Northbound Passing Lane 1 and Southbound Passing Lane 1) may potentially result in minor impacts to a potential Cultural Heritage Landscape (CHL 10), a remnant farm complex located in the Township of South Stormont. Potential impacts to this identified Cultural Heritage Landscape and protection and mitigation measures will be determined during Detail Design. The Recommended Plan will not impact any other built heritage resources and cultural heritage complexes identified as part of the previously completed CHER (2011) or within the expanded study area south of Cornwall Centre Road. The Recommended Plan avoids impacts to identified resources including St. Andrews Church and the Pioneer Cemetery.

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9.0 Future Consultation and Summary of Identified Concerns, Mitigating Measures and Future Commitments

9.1 FUTURE COMMITMENTS

Future consultation will be required during Detail Design to deal with all outstanding issues, including permits and approvals from external agencies (international, federal, provincial), detailed environmental investigations regarding impacts and mitigation, and engineering investigations to confirm the final design.

Future consultation is expected to include notification of the start of Detail Design to the public and external agencies, and a Public Information Centre near the completion of Detail Design stage to display plans, and to answer questions about the final design and proposed mitigation measures. The coordination of provincial, federal, and international permits and approvals is a key component of this project and for future project phases, including Detail Design. A summary of proposed future consultation is in Table 23.

Table 23: Future Consultation with External Agencies

External Agency	Subject of Consultation
Fisheries and Oceans Canada	<ul style="list-style-type: none"> Requirements of current MTO/DFO/MNRF Fisheries Protocol Confirm fisheries impacts, and final culvert and bridge recommendations Timing restrictions and other fisheries mitigation in contract package Fisheries Act Authorization, if required
Ministry of Natural Resources and Forestry	<ul style="list-style-type: none"> Confirm that habitat for Species-at-Risk are not negatively impacted by the Recommended Plan Confirm potential mitigation measures for minor impacts to Newington Bog Provincially Significant Wetland (PSW) and Candidate Life ANSI Confirm fisheries and terrestrial impacts and mitigation Confirm fisheries impacts, and final bridge recommendations Endangered Species Act authorization/permit, if required Timing restrictions and other fisheries mitigation in contract package
Ministry of Tourism, Culture, and Sport	<ul style="list-style-type: none"> Concurrence with results of Stage 2 Archaeological Assessment If required, identify and develop mitigation measures for potential impacts to identified cultural heritage landscape and areas of archaeological significance, if applicable
Ministry of the Environment and Climate Change	<ul style="list-style-type: none"> Prepare a <i>Design and Construction Report</i> for each Detail Design contract to be placed on the public record
South Nation Conservation Authority, Raisin Region Conservation Authority	<ul style="list-style-type: none"> Ongoing consultation during Detail Design Confirm potential impacts and mitigation measures for minor impacts to Newington Bog Provincially Significant Wetland (PSW) and Candidate Life ANSI
City of Cornwall, Township of North Stormont, Township of South Stormont, United Counties of Stormont, Dundas and Glengarry	<ul style="list-style-type: none"> Confirm design details during Detail Design Ongoing consultation during Detail Design Obtain noise by-law exemptions for construction, if required

External Agency	Subject of Consultation
Railways	<ul style="list-style-type: none"> Notify of start of Detail Design and construction phases
Snowmobile Clubs	<ul style="list-style-type: none"> Notify of start of Detail Design and construction phases
Emergency service agencies (i.e., OPP, Fire, ambulance, etc.)	<ul style="list-style-type: none"> Notify of start of Detail Design (i.e., staging etc.) and construction phases to minimize impacts to emergency response times during and after construction
All other agencies/groups involved in planning and preliminary design study	<ul style="list-style-type: none"> Notify of start of Detail Design and construction phases
Utility companies	<ul style="list-style-type: none"> Notify of start of Detail Design to confirm that potential conflict areas are properly identified and resolved

Other issues to be dealt with during Detail Design include:

- Property concerns and entrance closures through negotiations with individual property owners
- Proposed permanent snow fencing property requirements through negotiations with individual property owners
- Additional details of the Recommended Plan such as tree clearing requirements will be confirmed during Detail Design
- Document results of additional Stage 2 Archaeological Assessment
- Confirm potential impacts to identified aquatic Species-at-Risk Cutlip Minnow, consult with the MNRF regarding the potential need for an ESA permit
- Special consideration is required for Barn Swallow because they are nesting on highway culverts, and the nests are protected by the ESA (2007). Any activities that will disturb the nests on structures at 11+125 (Roxborough) and 18+528 (Cornwall), including excessive noise and vibration, may require authorization under the ESA.
- Investigations during Detail Design should confirm precise tree clearing requirements. Forest (FO) or swamp (SW) communities may be suitable for the four endangered bat species with potential to occur in the Study Area (see Section 3.2.2.4). If tree clearing is required from within these communities, consultation with MNRF is required to confirm ESA authorization requirements.
- Confirm noise protection and mitigation measures for construction during Detail Design

9.2 SUMMARY OF ENVIRONMENTAL EFFECTS, PROPOSED MITIGATION AND COMMITMENTS TO FUTURE WORK

A summary of environmental effects, proposed mitigation, and commitments to future work, as identified at the end of this study, is provided in Section 9.2 Table 24 forms a comprehensive ‘checklist’ of outstanding issues identified at the end of preliminary design and will serve as a starting point for Detail Design.

Table 24: Outstanding Environmental Issues

ID #	Issue/Concerns and Potential Effects	Source	ID #	Mitigation or Commitment to Future Work
Natural Environment				
1	Surface Water <ul style="list-style-type: none"> Potential impacts to surface water and groundwater from disturbance of contaminated soils, leaks and accidental spills 	MTO	1.1	Complete drainage design to provide appropriate drainage capacity
		Municipalities	1.2	Direct runoff and overland flow away from working areas and areas of exposed soils
		Raisin Region	1.3	Store all oils, lubricants and other chemicals in suitable containers and handle them in accordance with applicable regulations
		Conservation Authority	1.4	Do not permit refuelling within 30 m of a watercourse
		South Nation	1.5	During construction, identify best management practices for fuel management including secondary containment of temporary fuel storage
		Conservation Authority	1.6	Identify spill response plan for construction and clean up all spills immediately and dispose of contaminated materials in an approved manner. The Ministry of the Environment and Climate Change will be informed of reportable spills.
		MOECC Public	1.7	Obtain draft Permit to Take Water (PTTW), if required
2	Fisheries and Aquatic <ul style="list-style-type: none"> Potential for impacts to fisheries habitat (direct habitat loss and indirect impact to habitat) 	MTO	2.1	Obtain fisheries approvals in accordance with the <i>Fisheries Act</i> , if required
		MNRF	2.2	Consult with MNRF in future study phases to confirm/update the environmental protection/mitigation proposed for sensitive fish habitat
		DFO	2.3	Obtain <i>Endangered Species Act</i> permit, if required
		Public	2.4	Include Special Provisions in Contract for work near watercourses
			2.5	Prepare erosion and sediment control plan to avoid or mitigate impacts to fish and fish habitat
			2.6	Confirm appropriate in-water work timing restrictions (in-water construction timing window of July 1 to March 14 for all watercourses in study area)
			2.7	Where de-watering is required and fish habitat is present, apply DFO's Freshwater Intake End-of-Pipe Fish Screen Guideline
			2.8	Any displaced fish will be captured and released outside of the work area prior to the start of construction
			2.9	Refuelling of equipment will be carried out away from any sensitive natural features to avoid potential impacts, in the event that an accidental spill occurs
			2.10	Materials and equipment used for site preparation and project completion shall be operated and stored in a manner that prevents any deleterious substance from entering the water
			2.11	In-water work areas will be isolated so that clean flow is maintained downstream/around the work area
			2.12	Apply appropriate culvert design measures to protect fish and fish habitat
			2.13	Apply appropriate rock protection, watercourse realignment mitigation and protection measures (i.e., natural channel design principles), if required
		2.14	OPSS 180, 182, 185, 518, 804, 805 are applicable to the project and will be adhered to	
3	Vegetation and Wetlands <ul style="list-style-type: none"> Potential for vegetation loss Potential impact to species at risk Potential impact to and loss of wetland habitat Potential for wetland communities to be impacted by degradation of water quality due to erosion or surface water run-off during construction, or from contaminants from road run-off Potential for heavy construction equipment to damage peripheral vegetation from contact, excavation or soil compaction 	MTO	3.1	Areas to be cleared of existing vegetation should be clearly marked to prevent any unnecessary clearing
		MNRF	3.2	Identify wetlands that provide sensitive species habitat and are not impacted by construction as an Environmentally Sensitive Area on construction drawings and the contractor will not be permitted to enter or store materials in these areas
		Public	3.3	Fill placement into wetlands and vegetated areas should be avoided where possible, and edge plantings that are tolerant of edge effects should be implemented, where possible, along the newly created edges of woodlands/wetlands
			3.4	Topsoil, seed banks and organic matter should also be salvaged and reintroduced to any disturbed areas, as appropriate
		South Nation	3.5	New seed should be introduced to disturbed substrates as soon as feasible following construction (within 15 days for areas less than 120 m from a watercourse, and 45 days for other areas), and sediment fencing should remain in place until vegetation cover is re-established
		Conservation Authority	3.6	Sediment fencing should be used to separate work areas from sensitive natural features
			3.7	The contractor is required to restore any disturbed natural areas to pre-construction conditions
			3.8	All materials requiring stockpiling will be stabilized and kept at a safe distance (> 15 m) from natural areas

ID #	Issue/Concerns and Potential Effects	Source	ID #	Mitigation or Commitment to Future Work
			3.9	Develop grading and stormwater management plans to attempt to make sure that existing wetlands are not adversely affected by highway runoff and sedimentation
4	Wildlife and SAR <ul style="list-style-type: none"> Potential for loss of wildlife habitat Potential for impacts to Species-at-Risk or species of Provincial concern 	MTO MNRF	4.1	Proposed mitigation measures for reducing impacts to SAR could include: <ul style="list-style-type: none"> Qualified biologist to survey potential habitat in construction limits for species, in advance of construction Maintain stream flows and velocity to protect potential habitat from indirect impacts Install silt fencing to protect identified nesting areas, hibernacula, basking areas Fencing to exclude SAR from construction areas and avoid species habitat (if possible, sediment fencing to occur before June 1 or after September 1 outside of turtle nesting seasons) Provide species recognition training and / or materials for construction crews Establish protocol for dealing with sightings and encounters with SAR with MNRF SAR Biologists Any observations of SAR will be reported to the MNRF within 48 hours Identification of a no-touch setback zone if reptile nests are encountered during construction Facilitating safe movement of Species-at-Risk through the construction zone, if required (if necessary, a qualified professional can move wildlife to a safe location)
			4.2	Include timing restrictions for tree clearing activities to minimize impacts to breeding birds (primary nesting period is April 10 to August 9 for migratory birds) and bats <ul style="list-style-type: none"> If work is scheduled during the primary nesting period, nest searches should be conducted within seven days of the proposed works by an avian biologist and if work is not completed within seven days of the nest search, the search must be repeated If proposed works are located near an identified nest, a designated buffer (ranging from 5-60 m depending on the species) should be established where work will not be allowed
			4.3	Adhere to the requirements under the Migratory Birds Convention Act and the Endangered Species Act (including ESA O. Reg 242/08 for Barn Swallow, streamlined approvals process for repair, maintenance, or demolition of a Barn Swallow nesting structure including mitigation and 3-year monitoring plan, if required)
5	Erosion and Sedimentation <ul style="list-style-type: none"> Potential for sediment laden runoff to impact downstream resources during construction Erosion of steep banks prior to stabilization Potential fisheries impacts at fisheries habitat Potential wildlife impacts at wetland 	MTO MNRF DFO Public	5.1	Prepare an Erosion and Sediment Control Plan in advance of construction
			5.2	Comply with Best Management Practices (BMPs) in the Environmental Guide for Erosion and Sediment Control During Construction of Highway Projects
			5.3	Minimize impacts at approaches to watercourses, including installation of sediment control fencing, slope restoration and stabilization during construction.
			5.4	Temporary erosion control measures will be maintained until vegetation is re-established to a sufficient degree to provide adequate protection to disturbed work areas
			5.5	Inspect slope areas regularly during construction to identify erosion problems and seepage areas and plan for appropriate temporary stabilization and drainage measures
			5.6	Depending on the proposed grading determined during Detail Design, rip rap may be required to protect the embankments
			5.7	The limits of construction (site boundaries) adjacent to all natural areas should be flagged and fenced prior to construction, and monitored during construction (along with sediment and erosion control measures)
			5.8	No equipment should be permitted to enter any natural areas beyond the sediment fencing (site boundaries) during construction
			5.9	All materials requiring stockpiling (fill, topsoil, etc.) should be stabilized and kept a safe distance from any sensitive natural features
			5.10	All exposed soil areas should be stabilized and re-vegetated. Seed and mulching, or seed and an erosion control blanket should be applied to disturbed sites promptly upon completion of construction activities
			5.11	Refuelling of equipment should be carried out away from any sensitive natural features to avoid potential impacts, in the event that an accidental spill occurs
			5.12	In addition to any specified requirements, additional sediment fence should be available on site, prior to grading operations, to provide a contingency supply in the event of an emergency

ID #	Issue/Concerns and Potential Effects	Source	ID #	Mitigation or Commitment to Future Work
			5.13	All sediment and erosion controls should be monitored regularly and properly maintained, as required. Controls should be removed only after the soils of the construction area have been stabilized and vegetation cover is re-established
			5.14	Any natural areas that are temporarily disturbed for access or construction should be restored to natural self-sustaining conditions
			5.15	Environmental controls should be monitored by an environmental inspector
6	Management of Excess Material <ul style="list-style-type: none"> Potential impacts to soil or surface water from the use of de-icing activities along provincial highways 	MTO	6.1	Manage excess materials in accordance with OPSS 180 and standard MTO specifications
Social and Economic Environment				
7	Land Use <ul style="list-style-type: none"> Temporary delay or disruption to residents during construction Temporary delay or disruption to EMS providers during construction 	MTO EMS Providers City of Cornwall Township of South Stormont Township of North Stormont OPP Public	7.1 7.2 7.3	Maintain access to private entrances and sideroads during construction Notify OPP, Fire department and ambulance of start of Detail Design, construction staging, start of construction, etc. to minimize delay in emergency response times during and after construction Maintain liaison/coordinate construction with responding agencies (including school boards)
8	Property <ul style="list-style-type: none"> Impacts 	MTO Property Owners	8.1 8.2 8.3 8.4	Contact impacted property owners to notify them at the start of Detail Design and to confirm impacts to property Contact general public through newspaper notices and directly affected property owners through correspondence at start of Detail Design Hold Public Information Centre during Detail Design to display and seek input on detailed plan and construction staging Confirm construction staging and laydown areas
9	Construction Noise <ul style="list-style-type: none"> Potential noise increase during construction 	MTO City of Cornwall Township of South Stormont Township of North Stormont Public	9.1 9.2 9.3 9.4	Confirm noise mitigation requirements and complete Construction Noise Evaluation during Detail Design Include standard construction noise mitigation measures in contract package The contractor will be required to adhere to standard noise restrictions (i.e., proper maintenance of equipment, no unnecessary idling). Obtain noise bylaw exemptions from municipalities, if required
10	Archaeology and Built and Cultural Heritage	MTCS	10.1	Confirm potential impacts and mitigation/protection measures to identified cultural heritage landscape feature in study area
11	Utilities <ul style="list-style-type: none"> Potential impacts to existing utilities 	MTO Utility Companies	11.1	Contact affected utilities at start of future study phases to confirm details of relocations required

10.0 Monitoring

The planning and preliminary design phase of the project is now complete. Specific mitigation measures identified in this report will require confirmation during Detail Design and monitoring during construction.

Monitoring will be conducted by on-site construction supervisory staff to make sure that environmental protection measures, as outlined in this report and confirmed during Detail Design, and included in the contract package, are implemented. This includes making sure that the implementation of mitigating measures and key design features is consistent with commitments made to external agencies prior to construction.

For certain activities, monitoring by a Qualified Environmental Specialist will be required.

In the event that protective measures do not address concerns identified or if major problems develop, the appropriate agency will be contacted to provide additional input.

In the event that the impacts of construction are different than anticipated, or that the method of construction is such that there are greater than anticipated impacts, the Contractor's method of operation will be modified to reduce those impacts.

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Appendix A: Recommended Plan

Appendix B: Natural Environment Exhibits

Appendix C: Evaluation of Alternatives

Appendix D: Newspaper Notices and Notification Materials

Appendix E: Correspondence

Appendix F: Public Information Centre Materials

Appendix G: Specialist Reports

- G1: Existing Conditions Report**
 - G2: Terrestrial Existing Conditions Report**
 - G3: Terrestrial Impact Assessment Report**
 - G4: Fish and Fish Habitat Existing Conditions Report**
 - G5: Fish and Fish Habitat Impact Assessment Report**
 - G6: Noise Assessment Report**
 - G7: Stage 1 Archaeological Assessment**
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