

Transportation Environmental Study Report



Highway 416 at Barnsdale Road Interchange
Preliminary Design and Class Environmental
Assessment

GWP 4057-20-00

September 2023



MORRISON HERSHFIELD



TRANSPORTATION ENVIRONMENTAL STUDY REPORT

PRELIMINARY DESIGN AND CLASS ENVIRONMENTAL ASSESSMENT FOR AN INTERCHANGE FOR HIGHWAY 416 AND BARNSDALE ROAD

MINISTRY OF TRANSPORTATION
EASTERN REGION

GWP 4057-20-00
September 2023

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THE PUBLIC RECORD

A copy of this document has been sent to the following office of the Ministry of the Environment, Conservation and Parks for reference purposes:

Ministry of the Environment, Conservation and Parks

Ottawa District Office
103-2430 Don Reid Drive
Ottawa ON, K1H 1E1

A copy of the TESR is available for public review at:

www.highway416barnsdale.com

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Executive Summary

The Ontario Ministry of Transportation (MTO) has retained Morrison Hershfield Limited (MH) to complete a Preliminary Design and Environmental Assessment Study for an interchange at the intersection of Highway 416 and Barnsdale Road in the City of Ottawa.

This Transportation Environmental Study Report (TESR) has been prepared to document the existing environmental conditions in the vicinity of the interchange; the generation, evaluation and selection of preferred alternatives; the environmental and engineering mitigation/protection measures that were considered and developed to address the environmental impacts identified; and, the consultation process that was completed to engage members of the public, government agencies, and other interested parties.

The environmental assessment study was conducted in accordance with the requirements of a Group B project under the *Class Environmental Assessment for Provincial Transportation Facilities* (2000) and other relevant federal, provincial, and municipal legislation, policies, and guidelines. All process requirements related to a Group B project were implemented, including environmental inventory and screening of sensitivities, evaluation of alternatives, identification of mitigation measures, a public and agency consultation program, communication of concerns and commitments for further actions, as well as documentation of the environmental process that was followed.

The study included an inventory and analysis of significant environmental features that addressed the natural, socio-economic, and cultural environments. The results of studies and analysis determined which mitigation measures should be applied. Factor-specific technical reports are summarized in this TESR and available in the appendices of this report.

Commitments were made to protect environmental features with mitigation measures for terrestrial and aquatic ecosystems, species at risk, traffic, and construction staging, among other areas. **Section 7** summarizes each mitigation measure and their associated commitments to future work. The study also considered any legislative approvals and permit requirements for the project.

In summary, this TESR and its referenced documents are part of the final deliverables for this Preliminary Design and Class Environmental Assessment Study. By way of this study, MTO has demonstrated that they are in concurrence and conformity with the *Class Environmental Assessment for Provincial Transportation Facilities*. This Transportation Environmental Study Report is being made available for a **30-day public review that will start on September 28, 2023 and end on October 27, 2023**.

Interested persons are encouraged to review the TESR and provide comments by **October 27, 2023**. The Study Team will respond to all comments received during the 30-day public review.

To obtain additional information or to provide comments please contact the following individuals:

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Outstanding concerns are to be directed to the proponents listed above for a response, unless the outstanding concerns are regarding potential adverse impacts to constitutionally protected Aboriginal and treaty rights, in which case Part II Order requests on these matters should be addressed in writing to:

Minister of the Environment, Conservation and Parks

Ministry of Environment, Conservation and Parks
777 Bay Street, 5th Floor
Toronto, ON M7A 2J3
E-mail: minister.mecp@ontario.ca

and

Director, Environmental Assessment Branch

Ministry of Environment Conservation and Parks
135 St. Clair Avenue West, 1st Floor
Toronto, ON M4V 1P5
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If there are no outstanding concerns after completion of the 30-day review period, the project will be considered to have met the requirements of the Class EA and will proceed to the next steps, subject to funding and provincial priorities.

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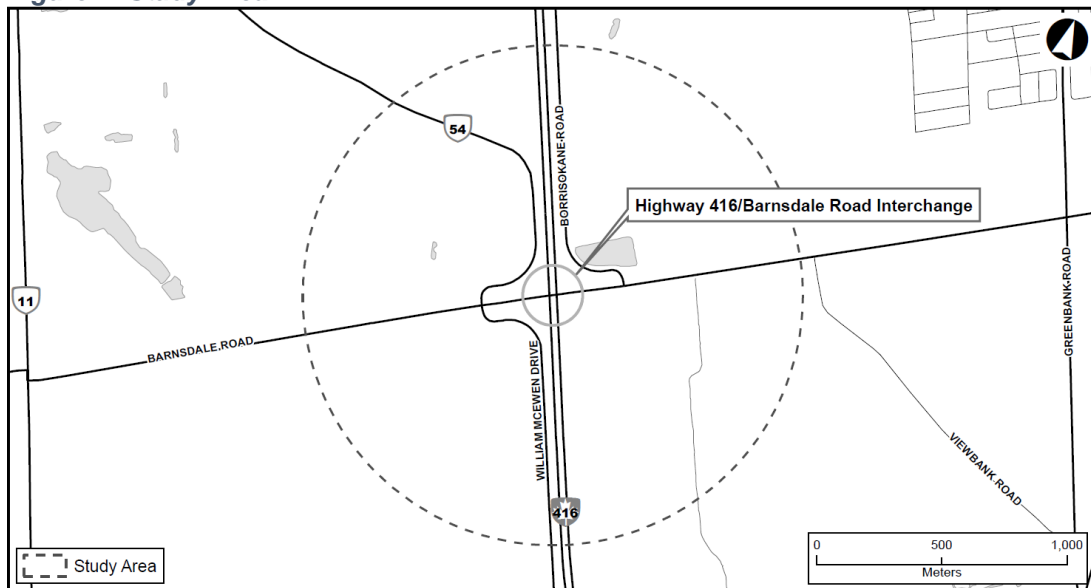
1 PROJECT OVERVIEW

1.1 SUMMARY OF THE UNDERTAKING

The Ministry of Transportation (MTO) retained Morrison Hershfield Limited (MH) to conduct a Preliminary Design and Class Environmental Assessment (EA) Study for an interchange around the intersection of Highway 416 and Barnsdale Road in the City of Ottawa (see Figure 1)

This Transportation Environmental Study Report (TESR) summarizes the proposed Highway 416/Barnsdale Interchange in accordance with the approved planning process for Group B projects under the Ministry of Transportation’s *Class Environmental Assessment (Class EA) for Provincial Transportation Facilities (2000)*.

Figure 1: Study Area



1.2 STUDY PURPOSE AND OBJECTIVES

The purpose of this study is to determine a preferred interchange design that would accommodate entry and exit to and from both the northbound and southbound lanes of Highway 416. This study evaluates alternatives in order to determine a Technically Preferred Design to allow for entry to, or exit from, Highway 416. The proposed interchange at Highway 416 and Barnsdale Road Interchange improves operations, safety, and addresses future transportation needs. The study recommends strategies to implement the new interchange, which will be carried forward to Detail Design.

1.3 PROJECT LOCATION AND SCOPE

The interchange is located near the community of Barrhaven, approximately 15.5 km south of the intersection between Highway 416 and Highway 417 and falls within the Geographic Township of Nepean. The project area is located within the Kemptville District of the Ministry of Natural Resources and Forestry (MNRF), as well as the jurisdiction of the Rideau Valley Conservation Authority (RVCA).

The project's study area includes a 1 km buffer from the existing Highway 416 and Barnsdale Road overpass, which includes Barnsdale Road from Moodie Drive to Greenbank Road, Trail Road from Moodie Drive to Barnsdale Road, segments of William McEwen Drive and Borrisokane Road, as well as Viewbank Road. The interchange is located directly west of the existing City of Ottawa Urban Boundary limits, with the eastern portion of the study area located within the Urban Boundary limits.

Currently, an overpass carries traffic east-west along Barnsdale Road, over Highway 416. The current configuration does not allow for any entry to, or exit from, Highway 416. The proposed interchange would accommodate traffic movements in all directions by providing entry and exit to and from the northbound and southbound lanes of Highway 416.

The proposed interchange improvements are to occur to an existing transportation facility (Highway 416), which are intended to accommodate movements in all directions, and to address increased traffic demands, and operational and safety concerns.

2 ENVIRONMENTAL ASSESSMENT PROCESS

2.1 IMPACT ASSESSMENT ACT

The Canadian *Impact Assessment Act (IAA)* applies to projects described in the Regulations Designating Physical Activities (available on the e-Laws website). Although any project may be designated under the *Impact Assessment Act* by the federal Minister of the Environment, if they are of the opinion that carrying out the project may cause adverse effects, or that public concerns related to those effects warrant designation, the federal environmental assessment process typically only designates projects that significantly impact one or more of the following:

- Fish and fish habitat;
- Migratory birds;
- Federal lands;
- Effects that cross provincial or international boundaries;
- Effects that impact Indigenous peoples, such as their lands and resources for traditional purposes; and,
- Changes to the environment that are directly linked to or necessarily incidental to any federal decisions about a project.

This project is not captured within the Regulations Designating Physical Activities, will not affect federal lands or the traditional use of resources by Indigenous communities, and will not cross a provincial or international boundary. The project will be screened under the established MTO/DFO/OMNR *Protocol for Protecting Fish and Fish Habitat on Provincial Transportation Undertakings (2009)* to satisfy the requirements of the Fisheries Act and ensure that the project is unlikely to cause a harmful alteration, disruption, or destruction of fish habitat (HADD). In addition, the project will conform to the requirements of the *Migratory Birds Convention Act (MBCA)* to ensure there are no lasting negative impacts to migratory birds. For these reasons, a screening under the IAA is not required.

2.2 ONTARIO ENVIRONMENTAL ASSESSMENT ACT

The *Class Environmental Assessment for Provincial Transportation Facilities* (the MTO Class EA) is an approved planning process that MTO must follow to satisfy the requirements of the *Ontario Environmental Assessment Act (EAA)*. This process ensures that the intent of the EAA is met by requiring that project alternatives be assessed, environmental concerns be identified, mitigation and protection measures be considered, and that the public, government agencies, Indigenous Communities, and interest groups be given an opportunity to comment throughout the project. Subject to the approved process being followed, no further approval is required under the EAA.

2.3 PROJECT SPECIFIC CLASS EA PROCESS

The MTO Class EA is an approved planning document that defines groups of studies and activities, and the EA process that the proponent commits to following for each of these

undertakings. Study groupings within the MTO Class EA were established for the purposes of consultation, documentation, and formal EA challenge (bump-up or Part II order request).

Under the MTO Class EA, this study followed the approved planning process for a Group B project. Group B projects are those which consist of major improvements to existing facilities, such as replacement of an existing bridge and interchange improvements.

The key steps in the Class EA process that have been completed include:

- Review of design alternatives;
- Development of a Technically Preferred Preliminary Design Alternative;
- Consultations with stakeholders regarding the proposed improvements;
- Consideration of environmental sensitivities and the selection of environmental protection measures; and,
- Documentation of the Class EA process in the Transportation Environmental Study Report (TESR).

2.4 PURPOSE OF A TRANSPORTATION ENVIRONMENTAL STUDY REPORT

This TESR documents the planning process followed, to fulfill the requirements of the MTO Class EA. It contains pertinent information regarding the following:

- Study objectives;
- Existing conditions of the study area;
- Generation and evaluation of alternatives;
- Consultation;
- Changes to design alternatives as a result of consultation;
- Potential impacts and mitigation measures; and,
- The Recommended Plan.

Technical documents prepared under this assignment which provide additional background information to support the project recommendations as outlined in this report, including an inventory and analysis of existing environmental conditions (physical, natural, socio-economic, and cultural environments), identification of potential impacts and determination of mitigation measures to be applied are contained in the supporting documents included in **Section 11**.

These specific technical reports, submitted under separate cover, are part of the project file. These reports are available in the appendices of this report.

The preparation of this TESR fulfills the requirements for Group B projects under the Class EA process.

As required under the Class EA, this TESR is being made available to the public, other interested parties, and external agencies for a 30-day review period.

3 CONSULTATION

One of the intentions of the EA is to ensure that, from the earliest stages of planning, decisions are made after careful consideration of environmental benefits and impacts, and that stakeholder input is considered in the decision-making process. Consultation with interested and/or affected parties is an essential part of this planning process and provides a mechanism for the proponent to identify and respond to issues before decisions are made and documentation is filed with the Minister of the Environment, Conservation and Parks (MECP).

The purpose of consultation activities conducted during this study is to present and address issues and concerns pertaining to the range and types of alternatives considered, obtain input to assist in the impact assessment and evaluation process, and to seek input in the development of mitigation measures and EA process commitments. Consultation activities include providing opportunities for interested parties to comment. Such parties include: the public, government agencies, municipal governments, and Indigenous Communities. The following sections outline the consultation undertaken to engage these parties.

A Consultation Plan was submitted to the Ministry of Transportation in November 2021, and outlined the consultation activities that would be carried out during the study. Proposed frequency and timing, methods of notification, and key stakeholders were identified in the plan. The contact list was updated as additional stakeholders were identified throughout the course of the study.

3.1 CONSULTATION FEATURES

Consultation is an integral component of the MTO Class EA process and is essential to the successful completion of the study. Consultation must be inclusive, timely and clear to be effective, and aims to achieve the following goals, as outlined in the MTO Class EA:

- Identify public concerns and values;
- Identify agency concerns;
- Collect information about the existing environment;
- Involve stakeholders, government and the public in the generation and evaluation of alternatives;
- Provide relevant information regarding decisions and potential effects; and,
- Provide regulatory compliance regarding the EA process.

The Consultation Plan developed for Highway 416 and Barnsdale Road Interchange used various tools and techniques to consult and engage with various interest groups (Government Agencies, Municipalities, Indigenous Communities, and the Public). The overall objectives were to both provide information about the study and obtain input at key stages to assist the Study Team in making recommendations.

As such the consultation program developed was based on the following principles:

- Allow for early and ongoing involvement in the study before key decisions are made;
- Consult with the most directly affected stakeholders;
- Constructively address the input received;
- Show how input received has informed the decision-making process;
- Use the appropriate tools and techniques for the various consultation groups;
- Make all reasonable efforts to proactively resolve concerns; and,
- Involve stakeholders, government, and the public in the development of solutions.

Our overall approach is intended to foster a two-way dialogue with interested stakeholders to provide a process that is transparent, open, traceable, timely, accountable, respectful, and defensible.

Members of the public and other interested stakeholders were notified of the project at Study Commencement and provided with the opportunity to identify concerns and comment on the proposed scope of work. Two Public Information Centres (PICs) were held to inform and receive feedback from stakeholders regarding the proposed alternatives. An opportunity to review the proposed design, potential environmental impacts and proposed mitigation is being provided as part of the 30-day TESR review period. The following sections outline the consultation process implemented for this undertaking. Copies of all relevant correspondence to and from stakeholders have been included in **Appendix B**.

In general, the consultation program for this study included the following:

- Preparation and maintenance of an external agency/stakeholder contact list;
- Preparation and publication of Ontario Government Notices (OGNs) including Notice of Study Commencement, Notice of PIC, and Notice of Study Completion, and TESR Filing, in English and French;
- Preparation and distribution of notification letters to external agency/stakeholder contacts;
- Communication, negotiation and consultation with municipalities, external agencies/stakeholders, property owners and local businesses, as required;
- Consultation with Indigenous Communities;
- Maintenance of a project website;
- Host two Public Information Sessions (PICs); and
- Summary of the consultation process and maintenance in the comment tracking matrix.

3.2 EXTERNAL AGENCIES/STAKEHOLDER CONTACT LIST

A Contact List of potentially affected stakeholder groups and individuals was created and maintained while being updated for completeness and accuracy as required. This list included government agencies and ministries, utility companies, municipal staff and elected officials, Indigenous communities, Members of Provincial Parliament (MPP), emergency services, public interest groups and property owners who may be directly or indirectly affected by the project. A full list of stakeholders can be found in **Appendix A**.

3.3 AGENCY & MUNICIPAL CONSULTATION

As part of the consultation program, the following external agencies were placed on the Stakeholder List and contacted during the project:

- Ontario Ministry of Indigenous Affairs;
- Ontario Ministry of Citizenship and Multiculturalism (MCM)
- Ontario Ministry of the Environment, Conservation and Parks (MECP);
- Ontario Ministry of Natural Resources and Forestry (MNRF);
- Ontario Ministry of Agriculture, Food and Rural Affairs;
- Lisa MacLeod, MPP Nepean;
- Rideau Valley Conservation Authority; and
- Ontario Progressive Conservative Party.

The following municipalities and agencies were also consulted during the project:

- City of Ottawa;
- Ontario Provincial Police (OPP);
- English and French Language Local School Boards;
- Ottawa Student Transportation Authority; and
- Consortium de transport scolaire d'Ottawa.

A full list of all stakeholders can be found in **Appendix A**.

Agencies and stakeholders on the Contact List were notified of the study by letter or email at each study milestone (Commencement, PICs, TESR/Completion). A copy of these letters can be found in **Appendix B**.

3.4 INDIGENOUS CONSULTATION

Consultation with Indigenous Communities was in accordance with the *Consultation with Aboriginal Peoples – Interim Directive (2007)*.

Study notification letters were sent directly to the following communities:

- Algonquins of Ontario Consultation Office;
- Algonquins of Pikwàkanagàn First Nation; and
- Métis Nation of Ontario Head Office

Copies of these letters can be found in **Appendix B**.

3.5 PUBLIC INVOLVEMENT

3.5.1 NOTICE OF STUDY COMMENCEMENT

At the start of the study, Notice of Study Commencement letters were sent to government agencies and ministries, utility companies, municipal staff and elected officials, Indigenous communities, MPP emergency services, public interest groups and property owners included on the project stakeholder contact list. This letter introduced the study and requested that stakeholders reply using a 'Contact Information Form'. Notice of Study Commencement letters were distributed the week of January 17th, 2021. A sample copy of this letter can be found in **Appendix B**.

An Ontario Government Notice (OGN) for Notice of Study Commencement was published in the Ottawa Citizen newspaper in English and Le Droit newspaper in French.

The Notice of Study Commencement outlined the purpose of the Notice, the study and study area, discussed the Class EA process, provided information on how the public may participate in the study, and included contact information. The Notice also included a Freedom of Information statement. A copy of the Notice of Study Commencement is provided in **Appendix B**.

3.6 STAKEHOLDER MEETINGS

Meetings were held with various stakeholders throughout the duration of the project to discuss specific issues. These included meetings with affected property owners, City of Ottawa staff, and local businesses.

3.7 PUBLIC INFORMATION CENTRES

The online PICs provided an opportunity for members of the public, agencies, and stakeholders to be informed and comment on the proposed Highway 416 and Barnsdale interchange. The purpose of the PICs was to present:

- Project Overview and Purpose;
- Study Area;
- Class EA Process;
- Study Background;
- Existing Roadway Configuration / Traffic Conditions;

- Existing Environmental Conditions;
- Generation and Evaluation of Design Alternatives;
- Next Steps; and
- Receive feedback on the above.

A complete copy of the PIC display materials from PIC #1 and #2 is provided in **Appendix B**. A summary of the PICs, the comments received, and how they were addressed are provided in the following sections.

3.7.1 PUBLIC INFORMATION CENTRE 1

Notices for the first online PIC were placed in English in the Ottawa Citizen newspaper on March 23rd, 2022, and in French in the Le Droit newspaper on March 26th, 2022. The first online PIC invitations were sent to the stakeholder list on March 21st, April 1st, and April 8th, 2022.

Responses (including Contact Information Forms and other requests to continue contact throughout the study) were received from several stakeholders, in addition to members of the public. As summary of the comments as well as how they were addressed, are highlighted in **Table 1** below.

Table 1: Addressing PIC #1 Comments

Concern	Comment Received	How the Comment was Addressed
Interchange Location	The midway between the Bankfield interchange and the Barnsdale interchange at Cambrian seems like a better place to put a new interchange. It is also closer to the future and existing growth area.	It was explained that the Barnsdale location has greater potential to accommodate future growth / needs as well as providing connections for all possible movements.

3.7.2 PUBLIC INFORMATION CENTRE 2

Notices for the second online PIC were placed in English in the Ottawa Citizen newspaper on November 23rd, 2022, and in French in the Le Droit newspaper on November 26th, 2022. Invitations to the second online PIC were sent to the stakeholder list on November 24th, 2022. **Table 2** highlights comments received and how they were addressed.

Table 2: Addressing PIC #2 Comments

Concern	Comment Received	How the Comment was Addressed
Borrisokane Alignment Option 1.	Raised concerns for safety due to the Borrisokane realignment, with potential conflicts between pedestrians and cyclists with the increased traffic volumes and travel speeds. Comments noted that Viewbank Road is somewhat serpentine and has a limited line of	It was explained that the final design for the realignment of Borrisokane Road will likely be determined by other municipal processes and several other viable options have been proposed and would be considered.

	sight with several “blind” driveways located along the road.	
Borrisokane Alignment Option 2	Raised safety concerns for the Borrisokane realignment and safety of future residents in the ongoing and future development in the northwest quadrant of the interchange.	It was explained that phased implementation is anticipated for the interchange and in the interim Borrisokane may potentially remain at its current location and that the final design for the realignment of Borrisokane Road will likely be determined by other municipal processes and several other viable options have been proposed and would be considered.
Project Support	Support of the interchange as it would avoid forcing drivers to access Highway 416 through Bankfield Road.	Comment noted.
Active Transportation	Concern regarding the Highway 416 crossings for Active Transportation (AT) facilities.	McEwen Drive will remain open for AT users. AT connections have been accounted for along with future AT facilities along Barnsdale Rd.
City of Ottawa Landfill & Composting Facility Access	Expressed concern regarding transportation between the Barnsdale Composting facility to the city pit property across the road.	A future meeting will be held with the city to address these concerns.
Hydro One Utilities Conflicts	Brought to the study team’s attention the overhead and underground road crossings within the interchange vicinity.	The study team has noted these crossings and will reach out to Hydro Ottawa should information be required.

Correspondence and comments received by the Study Team throughout the duration of the study is provided in **Appendix B**.

3.7.1 NOTICE OF STUDY COMPLETION AND FILING OF TESR

A Notice of Study Completion and Public Review Period was published in the Ottawa Citizen (English) newspaper on **MONTH XX, 2023** and Le Droit (French) newspaper on **MONTH XX, 2023**. The purpose of the notice was to outline the recommended design plan, notify the public of the start of the formal 30-day public review period of the TESR and review locations, and provide an additional opportunity to discuss the project with the Study Team.

Letters notifying government agencies and ministries, utility companies, municipal staff and elected officials, Indigenous communities, MPP emergency services, public interest groups and property owners of the TESR filing were prepared and distributed to all those originally contacted at project commencement as well as anyone (including residents) subsequently added to the project’s stakeholder mailing list throughout the duration of the study.

Recipients of the letter were invited to review the document and provide comments within the 30-day public review period on the project website:

<http://www.highway416barnsdale.com/>

Copies of the Notice of Study Completion are provided in **Appendix B**.

4 EXISTING CONDITIONS, PROBLEMS, AND OPPORTUNITIES

4.1 TERRESTRIAL ECOSYSTEMS

Determining the existing conditions of the study area is a prerequisite to assessing the potential environmental impacts associated with the project. Background research and field investigations were coupled with agency consultation to determine the habitat function and significance of wetlands, woodlands, and other wildlife habitats and movement corridors within the study area. The following sections are informed by the Natural Sciences Existing Conditions and Preliminary Impact Assessment Report, which is located in **Appendix C** of this report.

4.1.1 BEDROCK AND SOILS

The study area is located within the Lake Simcoe- Rideau Ecoregion (Ecoregion 6E), which extends from Lake Huron in the west, to the Ottawa River in the east, encompassing 6,311,957 ha (6.4%) of the province. The underlying bedrock is comprised of Paleozoic dolomite and limestone from the Ordovician and Silurian ages. The eastern portion of the ecoregion is underlain by glaciomarine deposits which are a result of brief post-glacial incursions of salt water from the Champlain Sea along the St. Lawrence valley. The ecoregion is comprised of Gray Brown Luvisols (43%), and Melanic Brunisols (27%), Gleysols (14%) and Humo-ferric Podzols (5%). Most of the substrates provide a high capacity to buffer acidic atmospheric deposits before they reach the surface water (Crins, et.al., 2009).

4.1.2 WETLANDS

The wetland habitats within the study area primarily consist of low-lying deciduous swamps.

4.1.3 VEGETATION COMMUNITIES

The vegetation communities within the study area were classified based on the Ecological Land Classification Ecosites of Ontario Operational Draft (Banton et al., 2009) for the Great Lakes St. Lawrence region. The study area, including the Highway 416 and Barnsdale Road Interchange and adjacent 120 m, consist of a mixture of natural, agricultural, and disturbed vegetation communities indicative of past disturbance due to previous construction, maintenance activities, nearby rural residential homes, and maintained lawns. **Table 3** provides a list and description of the eleven (11) Ecological Land Classification (ELC) communities identified within the study area, including dominant plant species occurring within each community.

Table 3: Ecological Land Classification Ecosites Present Within the Study Area

Ecosite Name	Description of Ecosite	Dominant Species within Ecosite
CVR Residential	These anthropomorphic areas consist of residential properties and the surrounding maintained landscapes.	Species observed include mowed grass and planted ornamental trees, shrubs, and herbaceous plants.
CVI Transportation and Utilities – Highway	These anthropomorphic areas consist of roads, highways, rights of way (ROW), towers, pipelines, airports, railways, marinas, etc.	Species observed within the highway ROW include Cow Vetch (<i>Vicia cracca</i>), Ox-eye Daisy (<i>Leucanthemum vulgare</i>), Field Hawkweed (<i>Hieracium caespitosum</i> ssp. <i>Caespitosum</i>), Bird’s-foot Trefoil (<i>Lotus corniculatus</i>), Perennial Sow-thistle (<i>Sonchus arvensis</i> ssp. <i>Uliginosus</i>), Canada Goldenrod (<i>Solidago canadensis</i>) and White-sweet Clover (<i>Melilotus alba</i>).
CVC Commercial and Institutional	Commercial and Institutional (CVC) areas consist of commercial and businesses and the surrounding maintained landscapes. CVC areas also consist of abandon commercial or business structures.	Manicured lawn, ornamental vegetation, and quarry pits.
OAG Open Agriculture	Primarily annual row crops such as corn fields present within the study area.	Annual row crops.
OA Open Aquatic	Open Aquatic (OA) areas contain water typically > 2 m in depth with primarily submerged vegetation and a lack of emergent and floating vegetation due to depth.	Unidentified submergent vegetation; pond was too deep to access.
G045N Dry to Fresh, Coarse Meadow	Herbaceous vegetation community consisting mostly of forb and graminoid species. Small open-grown trees or shrubs present, however, never exceed 10% absolute cover. Ecosites in the study area may originate from agriculture (i.e., crop or pasture) abandonment or removal of woody material for hydro or gas corridors.	Species observed include Common Yarrow (<i>Achillea millefolium</i> ssp. <i>Millefolium</i>), Cow Vetch, Ox-eye Daisy, Canada Thistle (<i>Cirsium arvense</i>), Viper’s Bugloss (<i>Echium vulgare</i>), goldenrods, Wild Carrot (<i>Daucus carota</i>), Orange Hawkweed, Field Hawkweed, and Willow species (<i>Salix</i> sp).
G059Tt/TI Dry to Fresh, Coarse: Mixedwood	Mixture of hardwood tree species dominate the canopy. Stand composition is highly variable. Shrub and herb ground cover is moderately rich. Ground cover is primarily broad leaf litter and substrate is sandy to coarse loamy.	Dominant species include Manitoba Maple (<i>Acer negundo</i>), Ash Species (<i>Fraxinus</i> sp), Elm Species (<i>Ulmus</i> sp), Red Maple (<i>Acer rubrum</i>), Silver Maple (<i>Acer saccharinum</i>), Trembling Aspen, White Birch, Sensitive Fern (<i>Onoclea sensibilis</i>), Woodland Strawberry (<i>Fragaria vesca</i> ssp. <i>Americana</i>), Marginal Woodfern (<i>Dryopteris marginalis</i>), Fly Honeysuckle (<i>Lonicera canadensis</i>), Virginia Creeper (<i>Parthenocissus quinquefolia</i>).

Ecosite Name	Description of Ecosite	Dominant Species within Ecosite
G054Tt/TI Dry to Fresh, Coarse: Red Pine- White Pine Mixedwood	<p>Hardwood canopy dominated by Red Pine and White Pine trees (20% or greater canopy cover). Hardwood canopy cover can vary from pure to mixed stands but usually compose of greater than 50% of cover. Shrub and herb understory is relatively poor. Ground cover composed primarily of conifer litter, with sandy to coarse loamy substrate.</p>	<p>Dominant species include Red Pine (<i>Pinus resinosa</i>), Eastern White Pine (<i>Pinus strobus</i>), Ash Species (<i>Fraxinus sp</i>), Scots Pine (<i>Pinus sylvestris</i>), Trembling Aspen, and understory species such as Sensitive Fern, Large-leaved Aster (<i>Eurybia macrophylla</i>), Woodland Strawberry, goldenrods, and Honeysuckle species.</p>
G053Tt/TI Dry to Fresh, Coarse: Conifer	<p>Ecosite is composed of a combination of conifer species which represent over 50% of the main canopy. Other deciduous tree species are also present but are not dominant. Substrates are usually low in nutrients and moisture holding capacity which causes a decrease in vegetation diversity. High coarse fragment concentrations are present due to the morainal deposits in this ecosite.</p>	<p>Dominant species include White Spruce (<i>Picea glauca</i>), Norway Spruce (<i>Picea abies</i>), Blue Spruce (<i>Picea pungens</i>), Trembling Aspen, and Gray Birch (<i>Betula populifolia</i>), goldenrods, Grass species, Tall Buttercup (<i>Ranunculus acris</i>), and Philadelphia Fleabane (<i>Erigeron philadelphicus ssp. Philadelphicus</i>).</p>
G064Tt/TI Moist, Coarse: Red Pine- White Pine Conifer	<p>Canopy comprised of over 50% conifer species and can be Red Pine and Eastern White Pine dominant to mixed conditions dominated by conifer species. Shrub and herb cover is moderately poor, and the understory usually has low diversity of vegetation. Due to the moisture availability of this ecosite, vegetation can reflect hydric conditions.</p>	<p>Dominant species include Red Pine, Eastern White Pine, Trembling Aspen, White Spruce, and White Birch (<i>Betula papyrifera</i>). Understory vegetation primarily included Fly Honeysuckle, mosses, goldenrods, and Woodland Strawberry.</p>
G070Tt/TI Moist, Coarse: Aspen-Birch Hardwood	<p>Hardwood canopy composed of primarily Aspen and Birch species. Shrub and herb understory are rich. Ground surface is primarily broadleaf litter and sandy to coarse loamy substrate. This community usually succeeds after disturbance occurs and in lack of disturbance would progress into mixed wood.</p>	<p>Dominant species include Trembling Aspen (<i>Populus tremuloides</i>), White Birch (<i>Betula papyrifera</i>), Balsam Poplar (<i>Populus balsamifera ssp. Balsamifera</i>), Goldenrods, Yellow Avens (<i>Geum aleppicum</i>), Rose Twisted stalk (<i>Streptopus roseus</i>) and Asters.</p>
G061N Moist, Coarse: Meadow	<p>Herbaceous vegetation community with trees and shrubs generally absent. Ground cover mostly herbaceous litter and mineral material with sandy to coarse loamy substrate. Depending on disturbance timing can be primarily native or a mix of native and introduced plant species (more recently disturbed). Herbaceous species may reflect hydric conditions and may include sedge species.</p>	<p>Dominant species observed include Spotted Joe Pye Weed (<i>Eupatorium maculatum ssp. Maculatum</i>), Devil's Beggar-ticks (<i>Bidens frondose</i>), Narrow-leaved Cattail (<i>Typha angustifolia</i>), Willow species (<i>Salix sp.</i>) and Purple Loosestrife (<i>Lythrum salicaria</i>).</p>

4.1.4 RARE VEGETATION

Results from background review and Natural Heritage Information Centre (NHIC) data identified the potential for Butternut (*Juglans cinerea*) to be present within the vicinity of the study area. Butternut is provincially Endangered and is considered rare in Ontario. To confirm the presence or absence of Butternut within the study area, visual surveys were completed during the 2022 field investigations. This is further described in **Appendix C**. Correspondence with the MNRF Kemptville District, MTO and RVCA did not return additional records of rare flora immediately within or adjacent to the study area.

A targeted survey for Butternut from the MTO right-of-way was completed within the study area on April 22nd, 2022. Butternut were not identified within the study area during the field investigations. It should be noted that observations were limited to the existing ROW, and that further field investigations for Butternut may be warranted during detail design within private properties where permission to enter was not available for the preliminary surveys.

4.1.5 WILDLIFE AND WILDLIFE HABITAT

4.1.5.1 Birds

To confirm the presence or absence of SAR birds within the study area, targeted breeding bird surveys were completed. A total of thirty (30) breeding bird stations were established for surveying (distanced 200 m apart) along Highway 416 and Barnsdale Road ROW. Refer to **Appendix C** for a full list of the breeding bird station observations. In accordance with the Ontario Breeding Bird Atlas (OBBA) Guide for Participants (2001), surveys were conducted twice during the breeding bird season. The surveys consisted of five-minute point counts where the weather, time, species, breeding evidence and individual bird movement within a 100 m radius were recorded. Species heard outside of the 100 m radius or observed outside of their breeding habitat within the 100 m radius (i.e., flyovers) were recorded separately.

According to the OBBA, fifty-four (54) records of breeding birds found have been recorded within the 10 km x 10 km atlas square surrounding the study area, including four (4) Species at Risk (SAR). According to the eBird Species Map, four (4) records of SAR bird species have been recorded within 1 km of the project limits. SAR species are further discussed in **Section 4.1.7**.

4.1.5.2 Herpetofauna

According to the Ontario Reptile and Amphibian Atlas (ORAA), sixteen (16) herpetofauna species have been recorded within the 10 km x 10 km atlas square encompassing the study area. The sixteen (16) records for herpetofauna include one (1) snake species, four (4) SAR turtle species and eleven (11) amphibians, which includes one (1) SAR amphibian. Refer to **Appendix C** for the complete list of herpetofauna recorded by the Ontario Reptile and Amphibian Atlas surrounding the study area. Responses from the MNRF and MTO did not provide additional records of herpetofauna species within the study area and its surroundings. During the field investigations on April 22nd, 2022, seven (7) Midland Painted Turtles (*Chrysemys picta marginata*) were observed basking within

the Open Aquatic (OA) community. During the field investigations on June 24th, 2022, thirteen (13) Midland Painted Turtles were observed basking and foraging within the OA community within the study area.

4.1.5.3 Mammals

According to species range maps and iNaturalist records, the study area is likely to support a variety of mammals that make use of forest and open habitats such as Raccoon (*Procyon lotor*), Eastern Gray Squirrel (*Sciurus carolinensis*), White-tailed Deer (*Odocoileus virginianus*), Eastern Cottontail (*Sylvilagus floridanus*), Coyote (*Canis latrans*), Marten (*Martes americana*) and Red Fox (*Vulpes vulpes*). During the 2022 field investigations, a Red Squirrel (*Sciurus vulgaris*), an Eastern Chipmunk (*Tamias striatus*), Groundhog (*Marmota monax*) burrows and White-tailed Deer scat were all observed within the study area. Responses from the MNRF did not provide additional records of mammal species within the surrounding project area. Four (4) provincially designated Endangered SAR bat species are also known to have ranges that extend into this region (Naughton, 2012).

To confirm the presence or absence of potential bat habitat, bat maternity roosting surveys were completed to identify bat cavity trees within the study area, as described in **Section 4.1.6.1.1**

4.1.5.4 Insects

According to the Ontario Butterfly Atlas (OBA), fifty (50) butterfly species, including one (1) SAR, have been recorded within the 10 km x 10 km atlas square which encompasses the study area. Refer to **Appendix C** for the complete list of invertebrates recorded by the OBA surrounding the study area. Responses from the MNRF and MTO did not provide additional records of invertebrate species within the surrounding study area. During the 2022 field investigations, one (1) invertebrate species, Monarch (*Danaus plexippus*), was observed foraging within the Dry to Fresh, Coarse Meadow (G045N) within the study area.

4.1.6 SIGNIFICANT WILDLIFE HABITAT

A SWH screening exercise was conducted using the *Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E* (MNRF, 2015) to determine the presence of Candidate SWH within the study area.

The four (4) categories of SWH within Ecoregion 6E include:

- Seasonal Concentration Areas;
- Rare Vegetation Communities or Specialized Habitat for Wildlife;
- Habitat for Species of Conservation Concern (Not including Endangered or Threatened Species); and
- Animal Movement Corridors.

4.1.6.1 Seasonal Concentration Areas of Animals

Some species of animals gather from geographically wide areas at certain times of the year, to hibernate, bask (e.g., some reptiles and bats), over-winter (e.g., deer yards), or to breed (e.g., bird breeding colonies). Maintenance of the habitat features that result in these concentrations can be critical in sustaining local or even regional populations of wildlife. Based on information collected during the 2022 field investigations, the following seasonal concentration area may be present:

Candidate Bat Maternity Colonies may be present in the forested communities (G053Tt/TI, G070Tt/TI, G054Tt/TI, G059Tt/TI, G064Tt/TI) within the study area, where large diameter deciduous trees (>25 cm DBH) are located.

4.1.6.1.1 Bat Maternity Roosting

Based on *Phase 1: Bat Habitat Suitability Assessment of the Species at Risk Bats within Treed Habitat: Little Brown Myotis, Northern Myotis & Tri-colored Bat* (MNRF, 2017) protocol, any coniferous, deciduous, or mixed wooded ecosite that includes trees at least 10 cm in diameter at breast height (DBH) has the potential to be suitable maternity roosting habitat. The study area contains deciduous and mixed wood forest communities that meet this criterion. As per *Phase II: Identification of Suitable Maternity Roost Trees* of the protocol, cavity tree surveys were completed in April 2022. All areas within the proposed alternative designs, as well as a buffer area extending 15 m from the alternative designs, were surveyed for maternity roost trees from the publicly accessible MTO ROW; private properties were not accessed for this survey. Trees measuring 25 cm DBH and larger were identified within the study area, to identify potential trees for Phase III of the protocol: acoustic monitoring.

A total of eleven (11) potential bat cavity trees were identified within the study area, including hardwood species with flaking bark. Refer to **Appendix C** for the locations of each bat cavity tree.

A preliminary assessment of the 11 potential bat cavity trees was completed to identify low, moderate, or high-quality cavity trees, based on Phase III of the protocol: acoustic monitoring:

- Trees measuring 25 cm DBH or greater;
- Cavities/crevices/cracks were present 10 m or higher; and
- Trees in early stages of decay (Decay classes 1-3).

4.1.6.2 Rare Vegetation Communities and Specialized Habitat for Wildlife

Rare Vegetation Communities often contain unique species, particularly plants, which depend on specialized habitats for survival and cannot readily move or find alternative habitats. According to the *Significant Wildlife Habitat Criteria Schedule for Ecoregion 6E*, there were no significant habitat areas found within the study area for rare vegetation communities.

Based on information collected during field investigations, the following specialized habitat for wildlife areas may be present within and/or adjacent to the study area:

Candidate Woodland Raptor Nesting Habitat may be present within the forested communities (G053Tt/TI, G070Tt/TI, G054Tt/TI, G059Tt/TI, G064Tt/TI), as stick nests may be constructed within the large trees dominating the forest canopies. No raptor nests were observed during the 2022 field investigations; however, a Red-tailed Hawk was observed soaring over the study area during the July 6th, 2022, breeding bird survey.

Candidate Amphibian Breeding Habitat (Woodland) may be found within the Moist, Coarse Aspen – Birch Hardwood (G070Tt/TI) and the Moist, Coarse Red Pine-White Pine Conifer (G064Tt/TI) forested communities where vernal pools may be present.

Candidate Amphibian Breeding Habitat (Wetlands) may be present in the Open Aquatic (OA) pond within the study area. The shoreline of the OA community contains emergent vegetation with logs along the perimeter that create beneficial calling and foraging structures and offer concealment from predators.

4.1.6.3 Habitat for Species of Conservation Concern

Species of Conservation Concern includes species that may be locally rare or in decline, but that have not yet reached the level of rarity that is normally associated with “Endangered” or “Threatened” designations under the *Endangered Species Act* (ESA) and/or the *Species at Risk Act* (SARA). Rare wildlife status is based on species listed as Special Concern under the ESA, Global Rank (G-rank) or Provincial Rank (S-rank) status, identified through the National Heritage Information Centre.

Wood Thrush, a provincially designated Special Concern species, was heard calling within the Moist, Coarse: Aspen-Birch Hardwood (G070Tt/TI) forest at BBS-27. This confirms the presence of preferred foraging and perching habitat. Nesting habitat for Wood Thrush is most commonly found in mature forests comprised of American beech (*Fagus grandifolia*), and Sugar Maple (*Acer saccharum*), where trees greater than 25 cm DBH are present.

4.1.6.4 Significant Animal Movement Corridors

According to the guidelines for Ecoregion 6E and to the Significant Wildlife Habitat Technical Guidelines for Ecoregion 6E (MNR, 2015), the following potential Animal Movement Corridors may be present:

Candidate Amphibian Movement Corridor may be present within Open Aquatic (OA) community and the surrounding forested communities (G053Tt/TI, G064Tt/TI), as this provides both breeding (aquatic) habitat and terrestrial habitat for movement.

Candidate Deer Movement Corridors may be present in the forested communities (G053Tt/TI, G054Tt/TI, G070Tt/TI, G059Tt/TI, G064Tt/TI) within the study area, as White-tailed Deer will use corridors found in all treed ecosites. White-tailed Deer scat was observed within the Moist, Coarse: Aspen, Birch Hardwood forest (G070Tt/TI) during the April 22, 2022, field investigations.

4.1.7 SPECIES AT RISK

Background data collected within the study area identified nineteen (19) SAR likely to occur within the general study area based on background review, existing conditions on site, and the known habitat preferences for these SAR.

Refer to **Table 4** for the list of SAR likely to occur within the study area.

Table 4: SAR likely to be present within the study area

Species Group	Common Name	Scientific Name	ESA Status	Source
Avifauna	Bank Swallow	<i>Riparia riparia</i>	Threatened	eBird
Avifauna	Barn Swallow	<i>Hirundo rustica</i>	Special Concern	NHIC, OBBA
Avifauna	Bobolink	<i>Dolichonyx oryzivorus</i>	Threatened	NHIC
Avifauna	Common Nighthawk	<i>Chordeiles minor</i>	Special Concern	eBird
Avifauna	Eastern Meadowlark	<i>Sturnella magna</i>	Threatened	OBBA, NHIC
Avifauna	Eastern Whip-poor-will	<i>Antrostomus vociferus</i>	Threatened	SAR Range Maps
Avifauna	Eastern Wood-pewee	<i>Contopus virens</i>	Special Concern	OBBA
Avifauna	Evening Grosbeak	<i>Coccothraustes vespertinus</i>	Special Concern	SAR Range Map
Avifauna	Grasshopper Sparrow	<i>Ammodramus savannarum</i>	Special Concern	SAR Range Map
Avifauna	Short-eared Owl	<i>Asio flammeus</i>	Special Concern	SAR Range Map
Avifauna	Wood Thrush	<i>Hylocichla mustelina</i>	Special Concern	NHIC, OBBA
Lepidoptera	Monarch	<i>Danaus plexippus</i>	Special Concern	OBA
Vegetation	Butternut	<i>Juglans cinerea</i>	Endangered	NHIC
Herpetofauna	Blanding's Turtle	<i>Emydoidea blandingii</i>	Threatened	ORAA
Herpetofauna	Eastern Musk Turtle	<i>Sternotherus odoratus</i>	Special Concern	ORAA
Herpetofauna	Midland Painted Turtle	<i>Chrysemys picta marginate</i>	Not at Risk	ORAA
Herpetofauna	Snapping Turtle	<i>Chelydra serpentina</i>	Special Concern	ORAA
Herpetofauna	Western Chorus Frog	<i>Pseudacris triseriata</i>	Not at Risk	ORAA
Mammalia	Bat species	<i>Myotis and Perimyotis sp.</i>	Endangered	Naughton, 2012

During the 2022 field investigations, four (4) designated Special Concern SAR were observed within the Highway 416 and Barnsdale Road study area, including Barn Swallow, Wood Thrush, Midland Painted Turtle, and Monarch. Additionally, potential habitat for bat maternity colonies may be present within the study area, as bat cavity trees were identified. It should be noted that Barn Swallow were downlisted to Special Concern in 2023, the Natural Sciences Existing Conditions and Preliminary Impact Assessment Report in **Appendix C** of this report does not reflect this downlisting.

Potential suitable habitat was identified through background data review for four (4) endangered and/or threatened SAR protected under the ESA within the general vicinity of the project which include: Bobolink, Eastern Meadowlark, Eastern Whip-poor-will, and bat species. While these species have the potential to occur within the general vicinity of the project area, none were confirmed as present during the 2022 field investigations.

4.1.8 DESIGNATED SIGNIFICANT NATURAL AREAS

Designated Significant Natural Areas are defined by resource agencies, municipalities, or the government as natural areas which have special or unique ecological, recreational, or aesthetic values and functions.

A review of the Natural Heritage map of the City of Ottawa indicated one area within the study area that is classified as an 'Identified Natural Heritage System Features Overlay,' which includes the wooded area to the southwest of the proposed interchange. To the northwest, the Trail Road Waste Facility is also identified as an Identified Natural Heritage System Features Overlay.

4.1.8.1 PROVINCIALY SIGNIFICANT WETLANDS

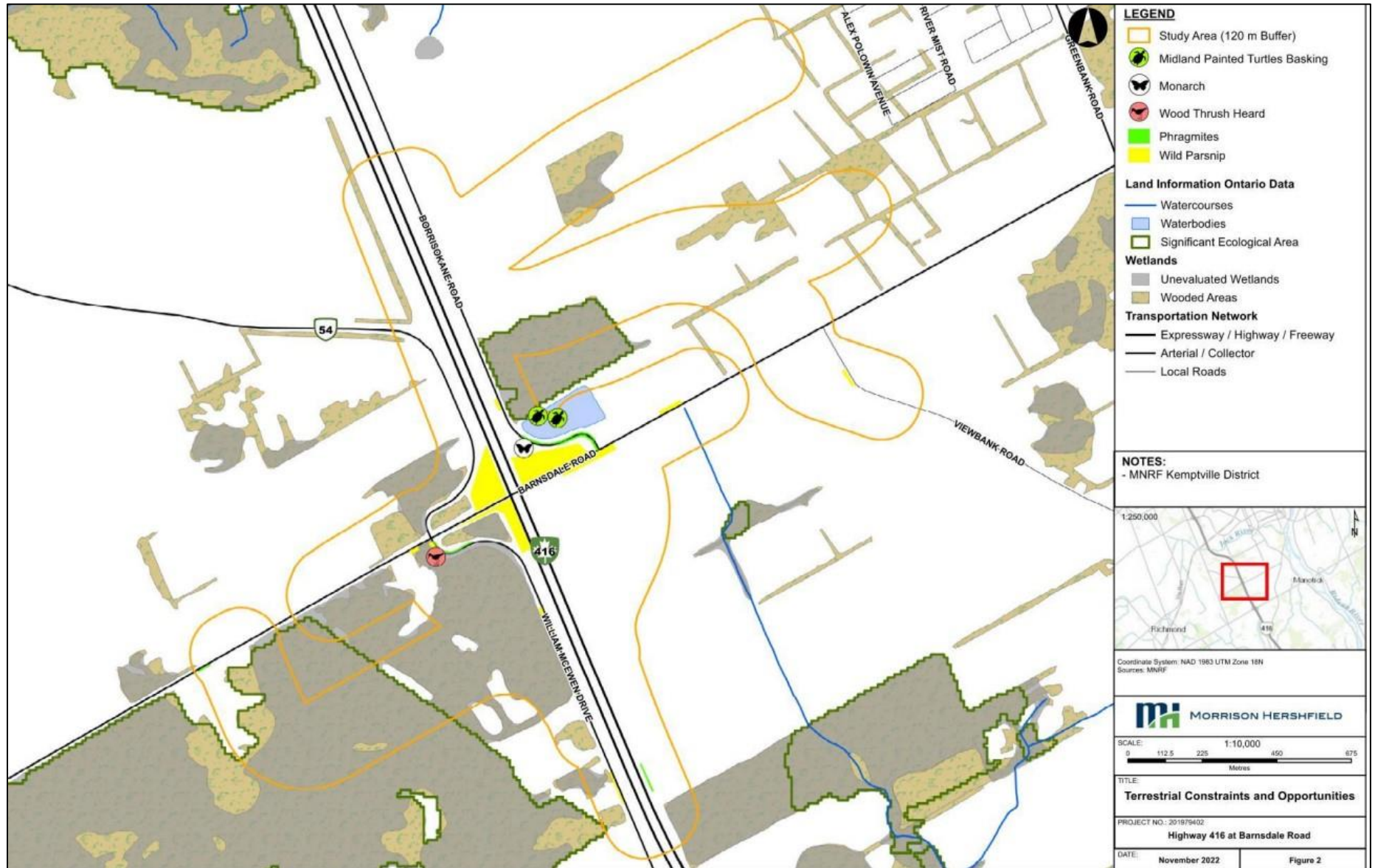
There are no Provincially Significant wetlands within the study area.

4.1.8.2 AREAS OF NATURAL AND SIGNIFICANT INTEREST

There are no Areas of Natural and Scientific Interest (ANSI) within the study area; however, the Barnsdale Woodland is a Natural Area located approximately 500 m southeast of the study area according to NHIC data. The Barnsdale Woodland is an upland deciduous forest that is fragmented and ecologically isolated by conifer plantations and surrounding agricultural activity. No rare vegetation communities have been observed within this Natural Area (MECP, 2017).

Constraints and opportunities associated with terrestrial ecosystems within the study area shown in **Figure 2**.

Figure 2: Terrestrial Constraints and Opportunities



4.2 AQUATIC ECOSYSTEMS

Background data specific to fish and fish habitat (i.e., thermal regime, fish community) was collected through a review of previous MTO reports, the MNR Fish ON-Line mapping tool, RVCA stream assessment reports, and the Aquatic Resource Area (ARA) mapping layer within the Land Information Ontario (LIO) database. The following sections are informed by the Fish and Fish Habitat Existing Conditions and Preliminary Impact Assessment Report, which is located in **Appendix D** of this report.

Following review of background data provided by MTO and publicly available resources, the information was compiled within an Information Request / Request to Confirm Letter that was submitted to the local MNR Kemptville District Office on December 16th, 2021. Based on feedback received from the MNR on June 2nd, 2022, all the watercourses within the study area are considered 'warmwater' with an in-water work timing window of July 1st to March 14th (works permitted).

Constraints and opportunities associated with aquatic ecosystems within the study area shown in **Figure 3**.

4.3 FISH AND FISH HABITAT

Thomas Baxter Municipal Drain (MD) likely conveys intermittent flows for a cool/warm water system, therefore potentially supporting seasonal fish habitat. The unnamed drainage feature on the east side of Highway 416 that connects to Thomas Baxter MD likely supports similar habitats, including intermittent flows and seasonal fish habitat. Based on the size and location of these two watercourses, it is likely that the fish community present would consist of common bait/forage fish. The location of these watercourses is shown in **Appendix D**. The pond located in the northeast is likely a permanent waterbody and therefore has the potential to support direct fish habitat year-round. However, online mapping does not identify any inflow or outflow channels, which may result in this pond being disconnected from any naturally occurring fish habitat and lowering the significance of any fish habitat present in the pond.

Mud Creek and its tributaries are classified as warmwater systems; however, no additional fish community information was provided beyond what was available from online sources. No Fisheries Management Objectives were identified for the project area. Due to the presence of warmwater fish species within Mud Creek, the appropriate in-water timing window for culverts which provide fish habitat within the study area includes (works permitted) from July 1st to March 14th of any given year.

Based on initial spring fisheries investigations completed on April 11th, 2022, some dead minnows were observed along the shoreline, likely from a winter kill event. As there is no connection of the pond to natural watercourses, it is considered a manmade feature that does not contribute to naturally occurring fish and fish habitat.

4.4 PROVINCIAL AQUATIC SPECIES AT RISK

There are no Aquatic Species at Risk in the Study Area.

4.5 FEDERAL AQUATIC SPECIES AT RISK

No federally listed aquatic SAR have been identified within the general project area.

Figure 3: Aquatic Constraints and Opportunities



Table 5: Summary of Existing Fish and Fish Habitat

Waterbody ID / Culvert Station	Date (DD/MM/YYYY)	Flow Regime	Thermal Regime	Fish Habitat*	Substrate Type	Channel Morphology	Vegetation	Constraints and Opportunity	Significant Fish Habitat
EC08 – Barnsdale Road – Thomas Baxter MD	Spring: April 12 th , 2022 Summer: June 30 th , 2022	Intermittent	Warmwater	Seasonal Indirect Fish Habitat	N/A	N/A	N/A	N/A	None identified
EC09 – Entrance from William McEwen Drive – Thomas Baxter MD	Spring: April 12 th , 2022 Summer: June 30 th , 2022	Intermittent	Warmwater	Seasonal Indirect Fish Habitat	N/A	N/A	N/A	N/A	None identified
EC11 & EC12 – Hwy 416 SB/NB Lanes – Drainage Feature of Thomas Baxter MD	Spring: April 12 th , 2022 Summer: June 30 th , 2022	Intermittent	Warmwater	Seasonal Direct Fish Habitat	Muck, silt, detritus	Flats	Cattails, grasses	None identified	None identified
EC13 & EC14 – Hwy 416 SB/NB Lanes – Drainage Feature of Thomas Baxter MD	Spring: April 12 th , 2022 Summer: June 30 th , 2022	Intermittent	Warmwater	Seasonal Direct Fish Habitat	Muck, silt, detritus	Flats	Cattails, grasses	None identified	None identified
EC15 & EC16 – Hwy 416 SB/NB Lanes – Drainage Feature of Thomas Baxter MD	Spring: April 12 th , 2022 Summer: June 30 th , 2022	Intermittent	Warmwater	Seasonal Direct Fish Habitat	Muck, silt, detritus	Flats	Cattails, grasses	None identified	None identified

* Fish habitat is defined in subsection 2(1) of the Fisheries Act as water frequented by fish and any other areas upon which fish depend directly or indirectly to carry out their life processes. The types of areas that can directly or indirectly support life processes spawning grounds and nursery, rearing, food supply and migration areas.

Table 6: Summary of Existing Fish Community

Waterbody ID / Culvert Station	Date (DD/MM/YYYY)	Fish Species Present	Year Class	Species at Risk Present	In-water Works Timing Window
EC11 & EC12 – Hwy 416 SB/NB Lanes – Drainage Feature of Thomas Baxter MD	Spring: April 12 th , 2022 Summer: June 30 th , 2022	MH Summer 2022: Brook Stickleback	Adult, juvenile	None	July 1 st to March 14 th
EC13 & EC14 – Hwy 416 SB/NB Lanes – Drainage Feature of Thomas Baxter MD	Spring: April 12 th , 2022 Summer: June 30 th , 2022	MH Summer 2022: Brook Stickleback	Adult, juvenile	None	July 1 st to March 14 th
EC15 & EC16 – Hwy 416 SB/NB Lanes – Drainage Feature of Thomas Baxter MD	Spring: April 12 th , 2022 Summer: June 30 th , 2022	MH Summer 2022: Brook Stickleback	Adult, juvenile	None	July 1 st to March 14 th

4.6 SOCIO-ECONOMIC AND CULTURAL ENVIRONMENT

4.6.1 LAND USE

4.6.1.1 GEOGRAPHICAL CONTEXT

The Study Area is situated within the Geographic Township of Nepean in the City of Ottawa. It is located approximately 15.5 km south of the intersection between Highway 416 and Highway 417 adjacent to the community of Barrhaven. Barrhaven is a rapidly growing suburban neighbourhood situated east of the existing Highway 416 / Barnsdale Road underpass. The community of Manotick is located approximately 5 km southeast and the community of Barrhaven is located northeast of the proposed interchange.

4.6.1.2 EXISTING USES

A high-level land use review was undertaken to document the existing land use conditions within the Study Area and to provide context from a land use perspective. This description is based primarily on a desktop review of online socio-economic information, and no ground-truthing and / or roadside reconnaissance activities were undertaken. Highway 416 / Barnsdale Road is located southwest of the Ottawa urban boundary.

Based on digital aerial imagery available online, the Study Area and its immediate surrounding environment can be characterized as primarily rural-agricultural, with active farmlands and woodlands as the predominant land uses, as shown in **Figure 4**. Due to the severe soil limitations within the Study Area, the active farming operations are used primarily for cash cropping and pasture.

To the east of Highway 416, the area south of Barnsdale Road is primarily agricultural while the former agricultural area to the north of the roadway is currently under development as part of the Barrhaven South Urban Expansion Area (BSUEA). Much of the lands within the southeast quadrant are actively used for cash cropping and pasture operations.

To the west of Highway 416, two existing sand and gravel pit operations - Lafarge Canada Inc. and R.W. Tomlinson Limited - are located north of Barnsdale Road, while Westboro Utilities and Just the Spot Secure Storage occupy lands on the south side. Hydro One's 115 kV electrical transmission line corridor crosses Barnsdale Road approximately 700 m west of Highway 416. Wooded areas are also prevalent on the south side of Barnsdale Road within the Study Area. William McEwen Drive is located to the south of Barnsdale Road, and this rural paved two-lane roadway includes extensive wooded areas and some rural properties along its western side.

Lafarge Canada's Johnson Pit has an Authorized Area of 45.7 ha and is licenced (Class A) to extract greater than 20,000 tonnes per year (MNRF, 2022). Tomlinson operate both the Howe-Ross Pit and Miller Berry Farm Pit. Tomlinson's Howe-Ross Pit has an Authorized Area of 113.1 ha and is licenced (Class A) to extract a maximum annual tonnage of 750,000 tonnes (MNRF, 2022). Its Miller Berry Farm Pit has an Authorized Area of 36.4 ha and is licenced (Class A) to extract greater than 20,000 tonnes per year (MNRF, 2022).

The City of Ottawa’s Trail Road Waste Facility is located approximately 1 km northwest of the proposed interchange. The northeast quadrant includes a large pond abutting Borrisokane Road, a rural paved two-lane roadway lined with rural properties. Some of these properties are part of the BSUEA and were under construction at the time of field review in early 2022. As the unnamed pond is not connected to any nearby watercourses or drainage features, it is assumed to be a former pit or quarry from around the time the existing four lane cross section of Highway 416 was constructed, that has subsequently filled with water.

Figure 4: Existing Land Uses Near the Proposed Interchange



4.6.1.3 OFFICIAL PLAN DESIGNATIONS

On November 4th, 2022, the Ministry of Municipal Affairs and Housing (MMAH) approved the new City of Ottawa Official Plan, which added 1,281 developable hectares of land to the urban boundary. The Barnsdale Rd Interchange is located directly south of the new urban boundary.

The City of Ottawa (2022) designates the lands along the east side of Highway 416 within the study area as Suburban/Rural, and a small patch of land further the northeast of the Barnsdale and Hwy 416 are designated as Natural Heritage, as well as to the southwest along William McEwan Drive. The west side of Hwy 416 is designated as Rural.

The Rural designation encompasses a variety of uses that protect and enhance rural character, strengthen the rural economy by permitting a diversity of uses that support the local rural community, limit the fragmentation of rural lands, and ensure the preservation of health. Uses permitted under this designation include:

- a) Forestry, conservation, and natural resource management activities;
- b) Agriculture, agriculture-related and on-farm diversified uses;
- c) Residential uses according to the policies of this plan;
- d) Animal services boarding, breeding, and training and equestrian establishments;
- e) Bed and breakfasts;
- f) Utility Installations;
- g) Cemeteries; and
- h) Sand and gravel pits.

The Greenspace designation delineates the “natural heritage system” within the City of Ottawa, and includes significant habitat areas, Areas of Natural and Scientific Interest (ANSIs), and public lands. In general, the only uses permitted within this designation are agricultural uses, forestry uses, and passive recreational uses.

4.6.2 ARCHAEOLOGY

Pursuant to the Class Environmental Assessment for Provincial Transportation Facilities (MTO, 2000) and the Ontario Heritage Act (1990), a Stage 1 Archaeological Assessment (AA) was completed in November 2021. In accordance with the Archaeological Assessment Technical Guidelines (1993), this study identified and assessed features throughout the study area. The full Stage 1 Archeological Assessment can be found in **Appendix E** of this report.

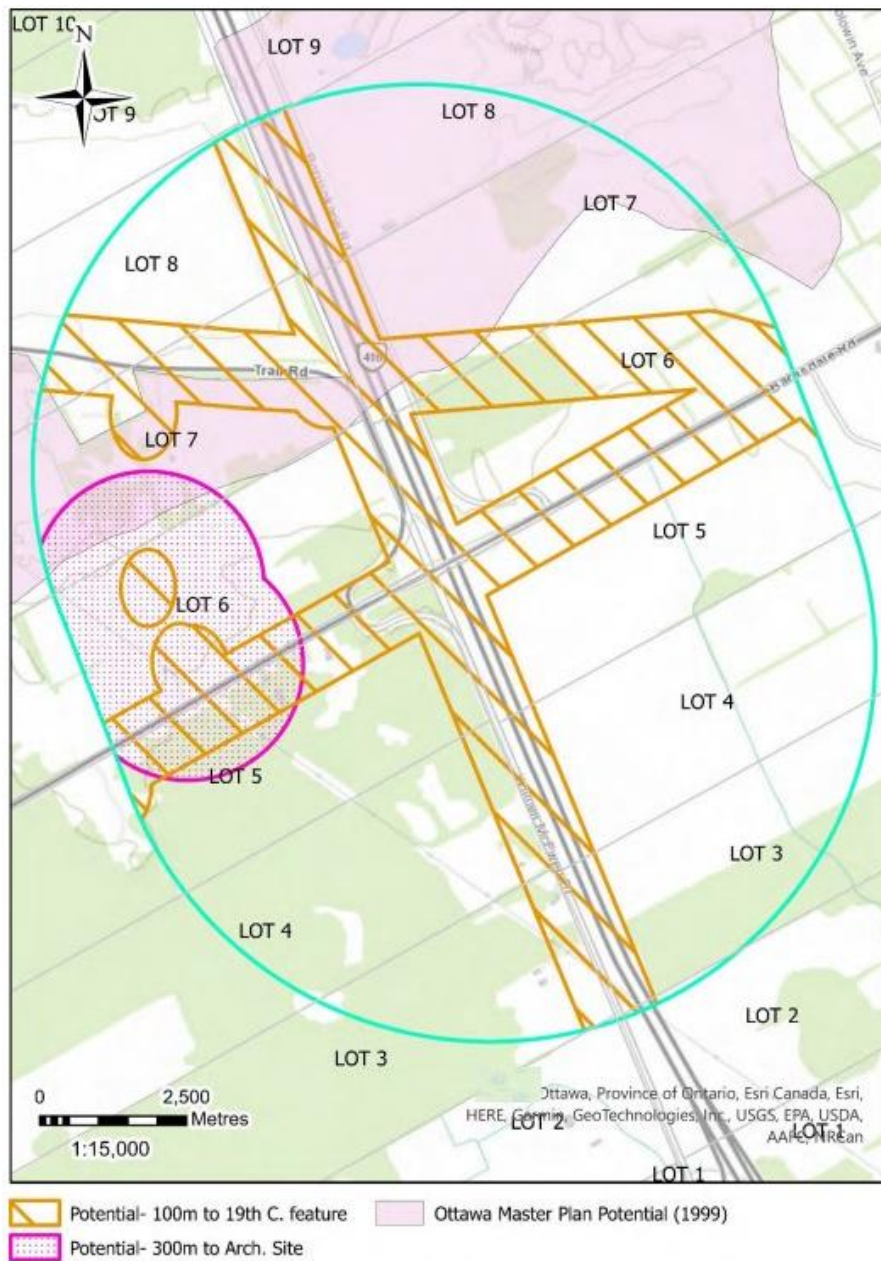
Two registered archaeological sites are located within the study area, including historic period sites, BhFw-10 and BhFw-11. These sites have been completely excavated as part of other projects. Most of the land north of Barnsdale Road has been extensively disturbed or subject to previous assessment. The features of archaeological potential include nineteenth-century roads including Barnsdale Road, William McEwen Drive and Trail Road.

The background review of nineteenth-century maps indicated there are no show early houses within the study area except for the two registered sites above. Based on the site inspection, the water sources appear to be artificial drains, and are not marked on any nineteenth-century maps or early twentieth-century topographic maps. Most of the land within the ROW has been disturbed by the construction of Highway 416. Refer to **Figure 5** for the features of archaeological potential.

A limited Stage 2 AA will be required within the ROW. Areas in the southeast and southwest quadrant will require further archaeological assessment. A small area in the

northwest quadrant between the Barnsdale Road overpass and Trail Road will require a Stage 2 AA.

Figure 5: Features or Archaeological Potential



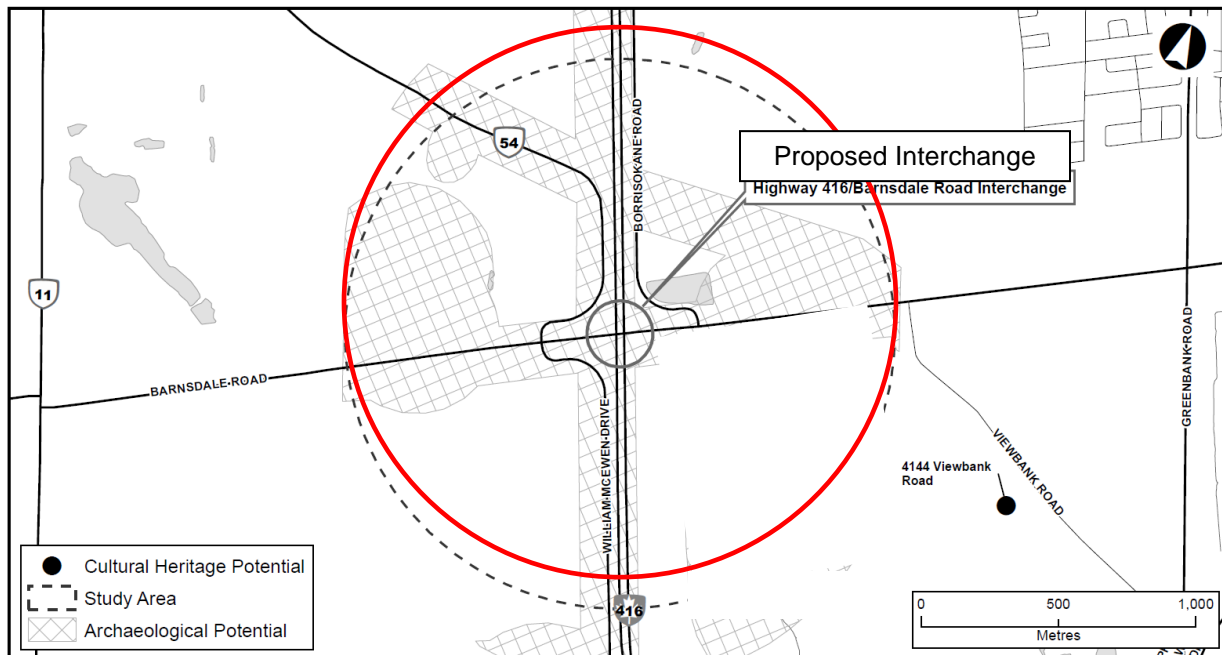
4.6.3 BUILT HERITAGE & CULTURAL HERITAGE LANDSCAPES

Background historical research and a review of secondary source material, including historical mapping, indicate that the Study Area has a rural land use history dating back to the late eighteenth century. A review of federal, provincial, and municipal registers, inventories, and databases revealed no previously identified features of cultural heritage value within the Highway 416 and Barnsdale Road Interchange Study Area. As the Bridge

that carries Barnsdale Road over Highway 416 was constructed in 1995, it is under 40 years old, and is not considered to have potential cultural heritage value or interest. One Cultural Heritage Landscape (CHL) was identified in the Cultural Heritage Assessment Report conducted by Archaeological Services Inc. (ASI).

A field review of the Study Area was undertaken by Archaeological Services Inc. (ASI) on February 15th, 2022, to document the existing conditions from existing ROWs. The full Cultural Heritage Report can be found in **Appendix F**. The limits of the field review included an approximate 1 km radius around the crossing of Barnsdale Road over Highway 416. Based on the results of background research and field review, one potential CHL was identified within the study area, and is shown on **Figure 6**. This potential cultural heritage landscape is historically, architecturally, and contextually associated with rural land use patterns in the former Township of Nepean, presently the City of Ottawa.

Figure 6: Archaeological and Cultural Heritage Potential



4.6.4 NOISE AND VIBRATION

The study area and its immediate surrounding environs can be characterized as primarily rural-agricultural. To the west of Highway 416 / Barnsdale Road overpass is a utility company and storage yard as well as three sand and gravel pits and the City of Ottawa’s Trail Road Waste Facility to the northwest. No residences are within a 1 km radius of the existing overpass.

The BSUEA, located 1.3 km northeast of the existing overpass, is anticipated to be developed in years to come as suburban housing. Also, rural residences are located along Viewbank Road and William McEwen Drive. Due to the November 2022 MMAH approval of the new City of Ottawa official plan, industrial and logistics uses are designated directly east of the interchange.

RWDI was retained to complete an environmental noise assessment for the interchange to predict operational sound levels as it relates to the project. Current and future road traffic data were analysed to identify future sound levels as a result of the undertaking, as compared with the no-built scenario. The full Environmental Noise Assessment can be found in **Appendix G**.

An analysis of potential worst-case construction sound levels was also conducted based on generic equipment types and activities. All construction activities for this project will be confined within the existing right of way. Construction activities are temporary in nature, and largely unavoidable, but with adequate controls impacts can be minimized.

4.6.5 AIR QUALITY

RWDI was retained by Morrison Hershfield to conduct an air quality assessment for the interchange. The assessment followed the methodology described in the Environmental Guide for Assessing and Mitigating the Air Quality Impacts and Greenhouse Gas Emissions of Provincial Transportation Projects (2020). The impact of the project on regional air quality and greenhouse gas emissions was assessed by calculating the total annual emissions associated with the section of the Highway 416 within the Study Area during no-build and future build scenarios. The project is not expected to have a significant impact on local air quality. The full assessment methodology and results can be found in the Air Quality Assessment Report in **Appendix H** of this report.

4.6.6 TRAFFIC

Highway 416 has an Average Annual Daily Traffic volume of 31,100 vehicles. Peak hourly volume is 1,950 vehicles in the northbound direction and 1,940 vehicles in the southbound direction during the morning peak hour (8 to 9 AM) and operates at free-flow speeds during peak periods. Barnsdale Road has peak hourly volume of 260 vehicles in the eastbound direction during the morning peak hour. Trail Road, William McEwen Drive and Borrisokane Road intersections all operate with good level-of-service with free flow movements. See **Figure 7** for existing Highway 416 and Barnsdale Road traffic volumes, including Trail Road and Borrisokane Road.

4.6.1 UTILITIES AND MUNICIPAL INFRASTRUCTURE

Specific utility companies that were contacted to confirm and ascertain the location of their respective plant within the Study Area included: Bell Canada, Cogeco, Enbridge, Hydro One, Hydro Ottawa, Rogers Communications, Telus Communications, Westboro Utilities and Zayo Group. In addition, the City of Ottawa was contacted to confirm the location of respective municipal infrastructure, including water drainage infrastructure and sewer networks.

Refer to **Table 7** for a summary of potential conflicts identified through correspondence received during the initial stages of the Class EA Study.

Figure 7: Existing Highway 416 and Barnsdale Road Traffic Volumes



Table 7: Summary of Existing Utility Infrastructure Near the Study Area

Utility	Relocation Details
Bell Canada	<ul style="list-style-type: none"> - Conflict with above ground infrastructure running along the west side Hwy. 416/William McEwen Dr. – utility pole relocation requirements to be confirmed during the future Detail Design phase. - No Conflict with above ground infrastructure running along the south side of Barnsdale west of Hwy. 416. - No Conflict with underground bell infrastructure running along the south side of Barnsdale west of Hwy. 416.
Hydro One	<ul style="list-style-type: none"> - No Conflict with above ground power lines south of the interchange limits.
Hydro Ottawa	<ul style="list-style-type: none"> - Conflict with above ground infrastructure running along the west side Hwy. 416/William McEwen Dr. – utility pole relocation requirements to be confirmed during the future Detail Design phase. - Conflict with planned future underground 12x680 Hydro Ottawa Ducts running along the east side of Borrisokane Rd., crossing Barnsdale Rd. – final location and impacts to be confirmed during the future Detail Design phase. - No Conflict with underground 8x680 duct crossing Hwy. 416 both north and south of Barnsdale Rd. - No Conflict with above ground infrastructure running along the south side of Barnsdale west of Hwy. 416.

5 GENERATION AND EVALUATION OF ALTERNATIVES

5.1 TRANSPORTATION NEEDS ASSESSMENT / GENERATION OF INTERCHANGE DESIGN ALTERNATIVES

To begin the preparation of design alternatives for evaluation, the Study Team reviewed the existing highway and Barnsdale Road. The team identified different design configurations for an interchange at Highway 416 and Barnsdale Road. The review also assessed on-ramps, and controlled intersections.

The different design configurations considered are described below:

- **Diamond Interchange:** A diamond interchange typically contains (4) ramps, meeting the arterial road at a regular intersection;
- **Parclo:** A Parclo (Partial Cloverleaf) interchange is a modification of the cloverleaf interchange, containing loops ramps in fewer than all four quadrants; and
- **Button Hook:** the ramps exit the highway onto a perpendicular arterial road.

Several high-level alternatives to meet the transportation objectives of this project were considered during Preliminary Design, which involved a two-step process. The first stage involved a long list of several alternatives developed to address the deficiencies at the interchange, which were subject to a high-level screening process to narrow the choices down to five alternatives. The ten long listed alternatives are described in **Table 8**.

Table 8: Long List Alternatives

Alternative	Alternative Description
Do nothing	Do Nothing – maintain existing conditions with no entry or exit to and from Highway 416 at Barnsdale Road.
1A	Single Diamond – Single diamond interchange with 4 ramps connected through 2 controlled intersections on Barnsdale Road
1B	Tight Single Diamond – Same arrangement as 1A with tighter connections closer to the existing structure
2	Parclo A - 4 free flow on-ramps and 2 off-ramps connected through 2 controlled intersections on Barnsdale Road
3	Parclo B - 4 free flow off-ramps and 2 on-ramps connected through 2 controlled intersections on Barnsdale Rd
4	Parclo AB North Side Loops – 4 free flow ramps servicing movements to and from the south and 2 connected through 2 controlled intersections on no Barnsdale Road servicing movements to and from the north
5	Parclo AB South Side of the Loops - 4 free flow ramps servicing movements to and from the north and 2 ramps connected through 2 controlled intersections on Barnsdale Rd. servicing movements to and from the south
6	Button Hook NE/NW – Button Hook interchange with 4 ramps in the NE/NW quadrants connected through 2 controlled intersections on Borrisokane Road and Trail Road
7	Button Hook SW/NE – Button Hook interchange with 4 ramps in the SW/NE quadrants connected through 2 controlled intersections on William McEwen Drive and Borrisokane Road

8	Button Hook SW Parclo A SE - Button Hook connection to southbound 416 includes two ramps in SW quadrant with a controlled intersection to northbound 416 includes two ramps in the SE quadrant with a controlled intersection on Barnsdale Rd. at Borrisokane Rd.
9	Button Hook SW – Button Hook connection to southbound 416 includes 2 ramps in SW quadrant with a controlled intersection on William McEwen Drive. Connections to northbound 416 includes a free flow S-E ramp, and a E/W-N ramp off a controlled intersection on Borrisokane Road.

After completing this coarse evaluation of the Long-List of Alternatives, the Study Team carried forward five Alternatives, including the Do Nothing alternative. From this stage a detailed evaluation of the five Short-List Alternatives were undertaken to recommend the Technically Preferred Alternative. The short-list represents the alternatives that have the greatest ability to address future capacity and operational issues, improve safety conditions, and minimize overall impacts to the natural, social, economic, and cultural environment.

The alternatives were evaluated based on the criteria detailed in **Table 9**.

Table 9: Evaluation Criteria of Alternatives

Evaluation Component	Evaluation Criteria
Transportation	<ul style="list-style-type: none"> ▪ Level of Service/Delays ▪ Impact to Municipal Roads ▪ Accommodation of Active Transportation (on Barnsdale Rd.) ▪ Ramp Geometry ▪ Conflicts due to turning and weaving ▪ Staging Opportunities
Social / Natural Environment	<ul style="list-style-type: none"> ▪ Watercourses / Fisheries ▪ Vegetation, Woodlots, and Wildlife Habitat ▪ Water Resources ▪ Property Impacts ▪ Agriculture Lands and Operations ▪ Archaeology
Cost / Staging	<ul style="list-style-type: none"> ▪ Construction Cost ▪ Utility Conflicts ▪ Construction Duration

A weighted-scoring method was used to select a technically preferred alternative. This approach had two inputs, scores (level of impact) and weights (the level of importance of each criteria). This weighted scoring method evaluated in more detail the best alternative selected as the Recommended Plan as outlined in **Section 6**.

The short-listed options are summarized in **Table 10** below.

Table 10: Preliminary Design Short-listed Options

Alternative	Alternative Description
1	Do Nothing – maintain existing conditions with no entry or exit to and from Highway 416 at Barnsdale Road.
2	Parclo A - 4 free flow on-ramps and 2 off-ramps connected through 2 controlled intersections on Barnsdale Road
3	Parclo B - 4 free flow off-ramps and 2 on-ramps connected through 2 controlled intersections on Barnsdale Rd
5	Parclo AB South Side of the Loops - 4 free flow ramps servicing movements to and from the north and 2 ramps connected through 2 controlled intersections on Barnsdale Rd. servicing movements to and from the south
8	Button Hook SW Parclo A SE - Button Hook connection to southbound 416 includes two ramps in SW quadrant with a controlled intersection to northbound 416 includes two ramps in the SE quadrant with a controlled intersection on Barnsdale Rd. at Borrisokane Rd.

5.1.1 DO NOTHING

The “Do Nothing” alternative represents a continuation of the current condition, with no significant infrastructure improvements. As stated in the table above, the “Do Nothing” alternative maintains the interchange’s existing conditions and does not provide an entry or exit from Highway 416 at Barnsdale Road. No new connections will be provided and short- and long-term traffic demands will not be met, however, there will be no negative impacts to the environment or increase in project costs.

Figure 8: Do Nothing Alternative

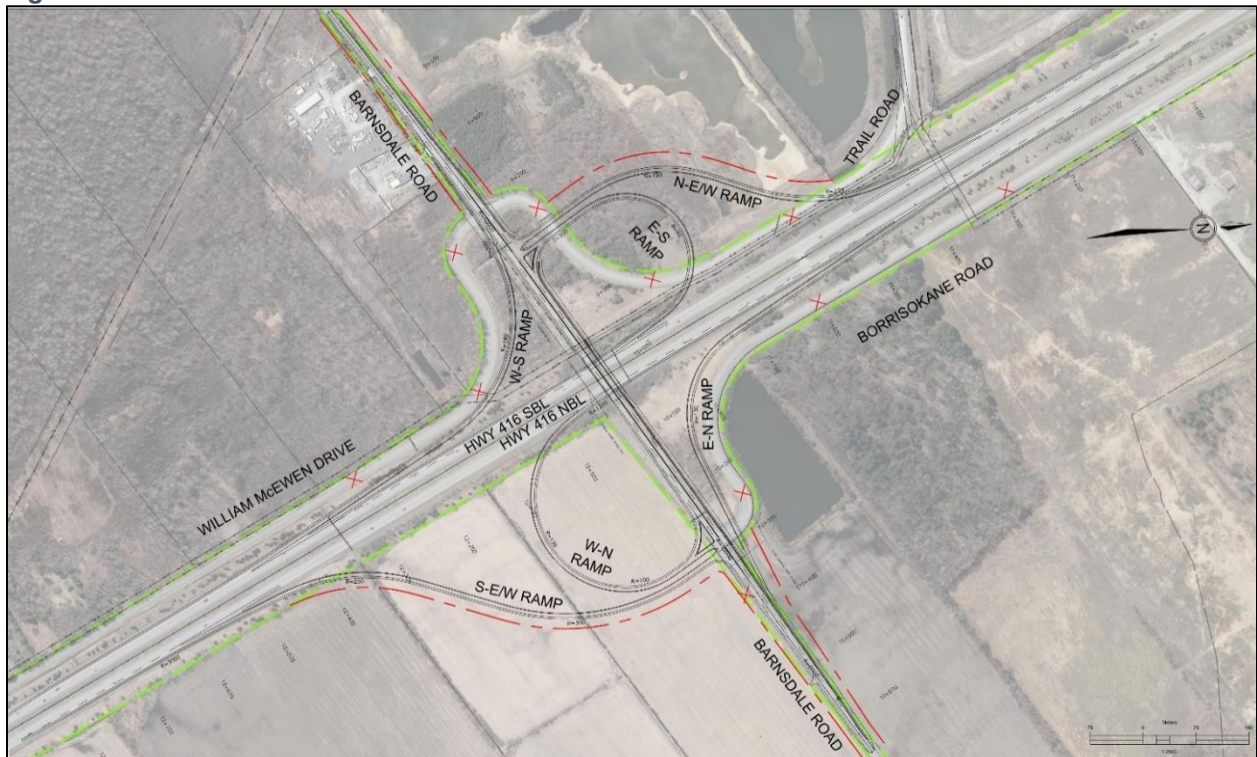


5.1.2 ALTERNATIVE 2: PARCLO A

Alternative 2 (**Figure 9**) implements a Parclo A interchange with four (4) free flow on-ramps and 2 off-ramps connected through 2 controlled intersections on Barnsdale Road. The design implements two (2) controlled intersections with a N-E, and S-W left turn movement and two (2) right turn movements, a S-E and a N-W. There are no weaving conflicts merging from off ramps, but two left turn movements conflict with oncoming Barnsdale Road traffic.

Improvements to Barnsdale Road involved widening the road from two lanes to four lanes, however the connections on Trail Road, Borrisokane Road, and William McEwen Drive will be closed. Active transportation facilities are accommodated on the north side of Barnsdale Road, however two high, and one moderate risk potential conflict areas.

Figure 9: Alternative 2: Parclo A



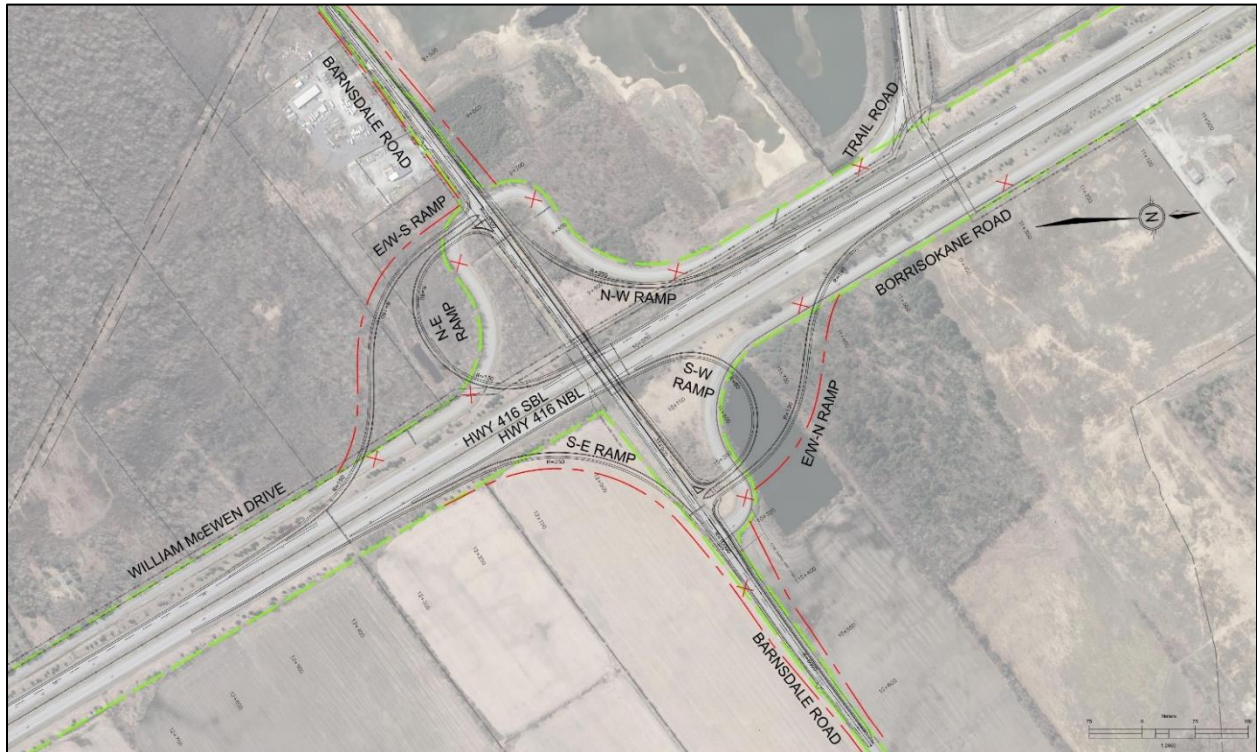
5.1.3 ALTERNATIVE 3: PARCLO B

Alternative 3 (**Figure 10**) implements a Parclo B interchange with four (4) free flow off-ramps and two (2) outer connection on-ramps. The design implements two (2) controlled intersections on Barnsdale Road with an N-E and S-W free flow ramps. Alternative 3 contains E-S and W-N left turn movements and E-N and W-S right turn movements. Two (2) of the left turn movements conflict with oncoming Barnsdale Road traffic and four (4) weaving conflicts occur while merging from off-ramps.

Improvements to Barnsdale Road involved widening the road from two lanes to four lanes, however the connections on Trail Road, Borrisokane Road, and William McEwen Drive

will be closed. Active transportation facilities are accommodated on the north side of Barnsdale Road, however two high and one moderate risk potential conflict areas.

Figure 10: Alternative 3 – Parclo B



5.1.4 ALTERNATIVE 5 PARCLO AB SOUTH SIDE LOOPS

Alternative 5 (**Figure 11**) implements a Parclo AB interchange with four (4) free flow ramps servicing movements to and from the north and two (2) inner loop ramps. The design implements two (2) controlled intersections on Barnsdale Road servicing movements to and from the south. Alternative 5 contains two (2) left turn movements travelling E-S and S-W and two (2) right turn movements travelling W-S and S-E. One left turn movement conflicts with oncoming Barnsdale traffic and two weaving conflicts are present while merging from the off-ramps.

Implementation of Alternative 5 will require the closure of the connections on Trail Road, Borrisokane Road, and William McEwen Drive will be closed. Active transportation facilities are accommodated on the north side of Barnsdale road, with two high risk potential conflict areas.

Figure 11: Alternative 5 – Parclo AB

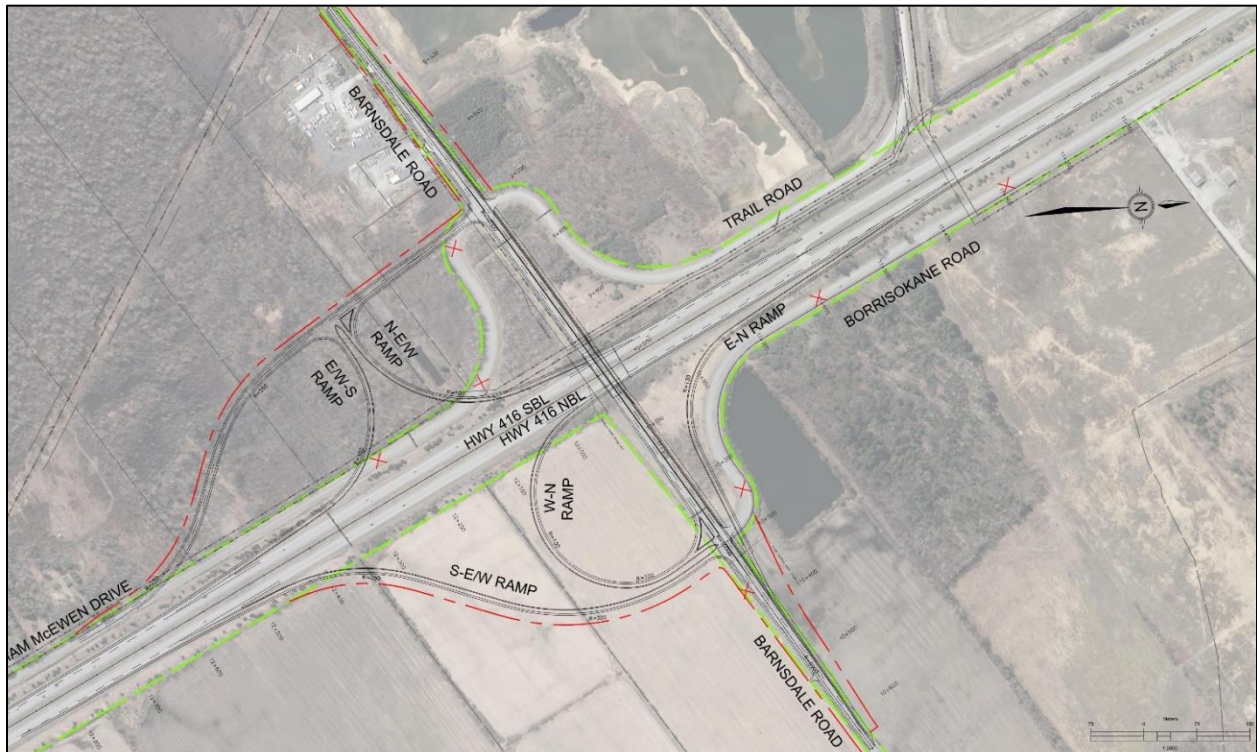


5.1.5 ALTERNATIVE 8 BUTTON HOOK SW PARCLO A SE

Alternative 8 (**Figure 12**) implements a button hook connection in the southwest quadrant of the intersection that services movements to/from the southbound 416 with a controlled intersection on William McEwen Drive. Alternative 5 has a Parclo A connection in the southeast quadrant that services movements to/from northbound 416 with a controlled intersection on Barnsdale Road at Borrissokane Road. This is an atypical interchange geometry and direct connections to Barnsdale Road are not provided for traffic travelling from north or to the south. This alternative provides three (3) controlled intersections, two (2) free flow ramps, five (5) left turn movements and three (3) right turn movements. There are a couple conflicts due to left turns with two left turn movements conflicting with oncoming Barnsdale Road traffic, and one left turn movement conflicting with oncoming William McEwen drive traffic. There is one weaving conflict while merging from the off-ramps.

Improvements to Barnsdale Road involved widening the road from two lanes to four lanes. The connection on Trail Road will remain open while the Borrissokane Road and William McEwen Drive will be closed. Active transportation facilities are accommodated on the north side of Barnsdale Road, with one high risk potential conflict areas.

Figure 12: Alternative 8 - Button Hook



5.2 EVALUATION AND SELECTION OF PREFERRED ALTERNATIVES

5.2.1 INTERCHANGE ALTERNATIVE

The shortlisted options were evaluated on six (6) separate criteria, as listed below.

- Interchange Operations: Modeling of traffic volumes and flows on both Barnsdale Road and Highway 416 was undertaken to determine how the options would impact Level-of-Service, delays, active transportation facilities, and municipal roadways;
- Interchange Geometry: Highway and Municipal Road Design: The designs were compared against the standards within the TAC Geometric Design Guide for Canadian Roads (June 2017) and the accompanying MTO Design Supplement (December 2017) to ensure that technical deficiencies were not present;
- Impact to Natural Environment: Designs were assessed to determine the extent to which they impact terrestrial and aquatic features;
- Impact to Social /Economic/ Cultural Environment: Designs were assessed to determine the extent to which archaeological and agricultural features are impacted, as well as the potential property acquisitions requirements;

- Preliminary Construction Cost: A rough estimate of the cost of each plan was developed for comparison purposes; and
- Constructability/Staging: Conceptual staging was considered to determine how traffic and existing utilities would be impacted during construction, and if detours would potentially be required.


































Each design option's performance on these criteria is outlined in the evaluation summary presented in **Table 11**. The evaluation of the most desirable options is presented in **Table 12** and recommends that Alternative 5 (Parclo AB /South Side Loop) be selected as the Technically Preferred Alternative for the interchange configuration because it provides the best balance between highway design standards & traffic operation, cost, constructability, and associated environmental/property impacts.





Table 11: Shortlisted Interchange Options - Evaluation Summary

Evaluation Criteria Summary	Do nothing	Alt 2	Alt 3	Alt 5	Alt 8
	No changes	Parclo A	Parclo B	Parclo AB	Button Hook
Interchange Operations (LOS, municipal road impacts, Active transportation)	Increased pressure on adjacent roadways, no AT provided	2 high risk potential AT conflict areas, Trail Rd, Borrisokane Rd, and William McEwen Dr existing connection closed	2 high risk potential AT conflict areas, Trail Rd, Borrisokane Rd, and William McEwen Dr existing connection closed	2 high risk potential AT conflict areas, Trail Rd, Borrisokane Rd, and William McEwen Dr existing connection closed	1 high risk potential AT conflict areas, Borrisokane Rd, and William McEwen Dr existing connection closed
Interchange Geometry (Ramp geometry, turning conflicts, staging opportunities)	No connection to Hwy 416	No left turn movements conflicting with oncoming Barnsdale traffic, no weaving conflicts merging from off-ramps	2 left turn movements conflicting with oncoming Barnsdale traffic, 4 weaving conflicts merging from off-ramps	1 left turn movements conflicting with oncoming Barnsdale traffic, 2 weaving conflicts merging from off-ramps	1 left turn movements conflicting with oncoming Barnsdale and William McEwan traffic, 1 weaving conflict merging from off-ramps
Natural Environment (Impact to fisheries, wildlife, wildlife habitat, drainage)	No potential impact	Two areas of direct interaction with fish habitat, no SAR habitat, less impact to wetlands than other options	Three areas of direct interaction with fish habitat, Wood Thrush, no municipal drain realignment	Four areas of direct interaction with fish habitat, Wood Thrush identified, no municipal drain realignment,	Four areas of direct interaction with fish habitat, Wood Thrush identified, no municipal drain realignment, small number of culverts impacted
Social /Economic / Cultural Environment (Impacts to property, agriculture, archaeology)	No potential impact	High impact to existing agricultural lands, Arch potential within all 4 quadrants require stage 2 AA	High impact to existing agricultural lands, Arch potential within all 4 quadrants require stage 2 AA	High impact to existing agricultural lands, Arch potential within all 4 quadrants require stage 2 AA	High impact to existing agricultural lands, Arch potential within 3 quadrants require stage 2 AA
Construction Cost	No associated cost	Barnsdale Rd widening, 6 ramps, 6 Hwy 416 speed change lanes, Borrisokane Rd Realignment, Trail Rd cul-de-sac, William McEwan cul-de-sac	Barnsdale Rd widening, 6 ramps, 6 Hwy 416 speed change lanes, Borrisokane Rd Realignment, Trail Rd cul-de-sac, William McEwan cul-de-sac	Barnsdale Rd widening, 6 ramps, 6 Hwy 416 speed change lanes, Borrisokane Rd Realignment, Trail Rd cul-de-sac, William McEwan cul-de-sac	Barnsdale Rd widening, 5 ramps, 5 Hwy 416 speed change lanes, Borrisokane Rd Realignment, William McEwan realignment
Constructability (utility conflicts, construction duration)	No potential conflict	<ul style="list-style-type: none"> Estimated to take 3 years Potential conflict with aboveground bell/hydro and future underground hydro 	<ul style="list-style-type: none"> Estimated to take 3 years Potential conflict with aboveground bell/hydro and future underground hydro 	<ul style="list-style-type: none"> Estimated to take 3 years Potential conflict with aboveground bell/hydro and future underground hydro 	<ul style="list-style-type: none"> Estimated to take 3 years, less construction impacts to Hwy 416 Potential conflict with aboveground bell/hydro
Overall Recommendation	3	2	4	1	5

Table 12: Most Desirable Interchange Options – Evaluation Summary

		Do Nothing	ALT. 2	ALT. 3	ALT. 5	ALT. 8
	Structure Type	Do Nothing	Parclo A	Parclo B	Parclo AB	Button Hook
Interchange Operations	Level of Service					
	Municipal Road Impacts					
	Active Transportation					
Interchange Geometry	Ramp Geometry					
	Traffic Conflicts / Weaving					
	Staging Opportunities					
Costs	Cost					
Constructability	Utility Conflicts					
	Construction Duration					

Natural Environment	Fisheries Impact					
	Wildlife/Habitat					
	Water Resources					
Social/ Economic/ Cultural Environment	Property					
	Agriculture					
	Archaeological					
Overall						

 the least desirable
  less desirable
  desirable
  the most desirable

6 MAJOR FEATURES OF THE RECOMMENDED PLAN

The study has examined alternatives for the interchange configuration at Highway 416 and Barnsdale Road to improve operations, safety and address future transportation needs. The features of the Preliminary Design are described in this section and depicted in **Figure 13**, **Figure 14**, **Figure 15**, and **Figure 16**.

6.1 INTERCHANGE

A Parclo AB Interchange means a Partial Cloverleaf, a grade separation having loop ramps in fewer than all four quadrants. A parclo AB has loop ramps in adjacent quadrants and has application where there are property and/or environmental restrictions in two adjacent quadrants on the same side of the crossing road.

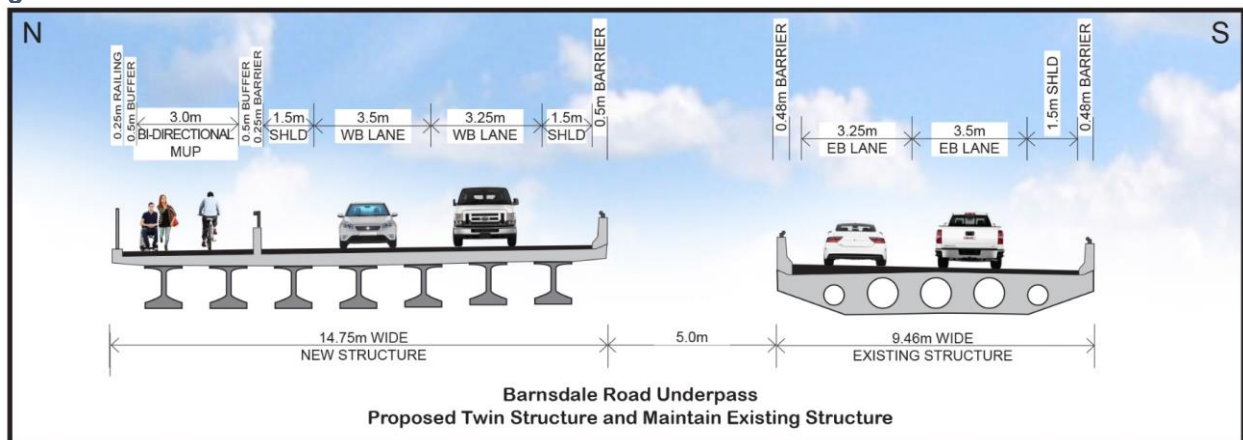
The proposed Parclo AB interchange at this site has the loop ramps on the south side of Barnsdale Road, to minimize environmental and property impacts to existing facilities and future development planned within the City of Ottawa. The interchange will facilitate movements in all directions and is designed to satisfy both the existing 2-lane configuration of Barnsdale Road and any future widening of the roadway to 4 lanes.

6.2 STRUCTURAL

The existing Barnsdale Road underpass (MTO site #03X/0552-B0) is a 64 m long two-span post-tensioned concrete voided slab bridge. The bridge was constructed in 1992. It is a 9.5 m wide structure that carries two (2) lanes of traffic with 1.0 m wide shoulders. There are no sidewalks. It is currently in very good condition.

At the time of implementation of the interchange, it is anticipated that Barnsdale Road will be widened to a 4-lane cross section. Based on the age and condition of the structure, it is recommended to construct a new bridge adjacent to the existing one, separate by approximately 5 m. This new structure would be 14.75 m wide and carry westbound traffic and a multi-use path, whereas the existing bridge would carry eastbound traffic. Minor modifications to the paved surface of the existing bridge would be required to facilitate this change. **Figure 13** below depicts the cross section on the proposed structure.

Figure 13: Structure Cross Sections



6.3 ACTIVE TRANSPORTATION

Barnsdale Road is part of the City of Ottawa’s Rural Active Transportation Network. Currently there are no active transportation facilities and pedestrians and cyclists utilize the road’s shoulder. As part of the Recommended Plan, a new 4.0m wide Multi-Use Path (MUP) will be incorporated into the north side of Barnsdale Road within the interchange. The MUP would ultimately connect to the future active transportation facilities planned and built by the City of Ottawa along Barnsdale Road. **Figure 14** depicts the anticipated future Barnsdale Road cross section.

Figure 14: Proposed Barnsdale Cross Section



6.4 DRAINAGE/STORMWATER MANAGEMENT

The majority of the project area is within the Mud Creek watershed. A small area at the north of the project along Highway 416 is located within the Jock River watershed. Runoff from the project area within the Mud Creek watershed is collected and conveyed by ditches and culverts to Thomas Baxter (Dynes Branch) Municipal Drain (TBMD), conveyed south along the Highway 416 approximately 2 km to the Bankfield Rd interchange, and subsequently east approximately 4 km to Mud Creek. Runoff within the Jock River watershed is conveyed by ditches along Highway 416 to an unnamed tributary of the Jock River. In total, there are 25 existing culverts within the limits of the project, of which, 13 are municipal assets and 12 are owned by MTO.

The new interchange will result in new roadways that impact the existing drainage network and increase impervious area, resulting in requirements for management of stormwater through provision of quantity and quality control. The recommended plan will result in a realignment of the existing Thomas Baxter Municipal Drain of approximately 500m, removal of eight (8) culverts that are no longer required, installation of six (6) new culverts, and replacement, relocation, or extension of fourteen (14) culverts to facilitate the Work. A total of 7,986 m³ of on-site detention volume will be required to attenuate post development flows to pre-development rates, including consideration of the effect of climate change on peak flows. The recommended plan includes design of enhanced grass swales and vegetated filter strips to provide enhanced 80% Total Suspended Solids Removal treatment of runoff and quantity control as well as detention of the required quantity control volume.

6.5 ELECTRICAL/ILLUMINATION

There is no existing illumination within the Study Limits. The interchange will be fully illuminated at the interchange terminals. All illumination will be designed to meet current design standards.

6.6 MUNICIPAL ROADS

There are three (3) existing sideroads in the vicinity of the highway, William McEwen Drive, Trail Road and Borrisokane Road. All of these sideroads are impacted by the new interchange as they are all within the footprint of the new interchange ramps.

The study team evaluated the impacts and modifications for each of these roads and the proposed work can be summarized as follows:

William McEwen Drive: William McEwen Drive will remain in service upon completion of the interchange, access to Barnsdale Road will be realigned to 400m from the W-S ramp terminal.

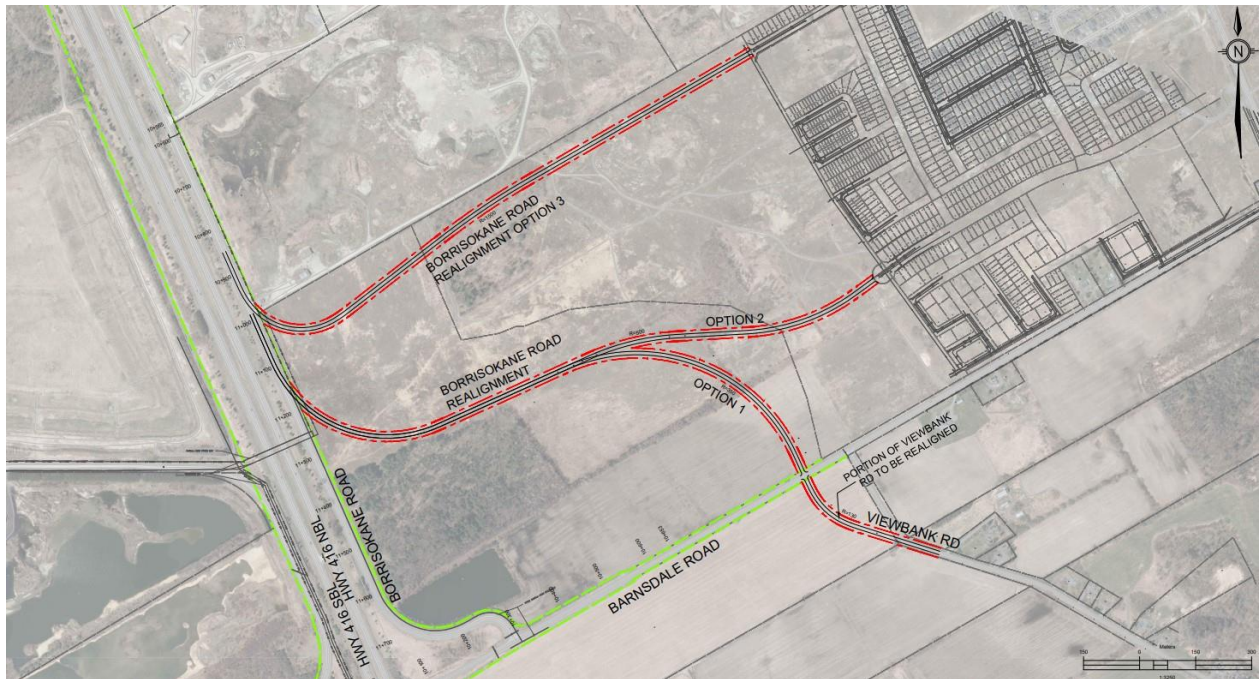
Trail Road: The connection to Trail Road will be closed in advance of Barnsdale Road, and a cul-de-sac will be constructed. Access from Trail Road will still be available at Moodie Drive and Cambrian Road West.

Borrisokane Road: The Borrisokane Road to Barnsdale Road connection will be removed and a cul-de-sac constructed. As a result of the removal of this connection, three (3) alternatives were reviewed to create a new route from Borrisokane Road to Barnsdale Road. The preferred option for this connection is anticipated to be Option 3 (as shown in **Figure 15**), an extension of Kilbirnie Drive to Borrisokane Road, however, the exact location, design, and implementation of this roadway will be undertaken as part of separate municipal development processes. As such, additional environmental studies may be required during those processes to recommend appropriate mitigation measures for the roadway.

6.7 PROPERTY

To facilitate the new interchange, additional property will be required from both private owners and the City of Ottawa for the road widening, ramp terminals and the realignment of William McEwen Drive. Property acquisition will be carried out at a later date to facilitate the work. Property impacts are further discussed in Section 7.4.7.

Figure 15: Borrisokane Road Realignment Options



6.8 IMPLEMENTATION OF THE RECOMMENDED PLAN

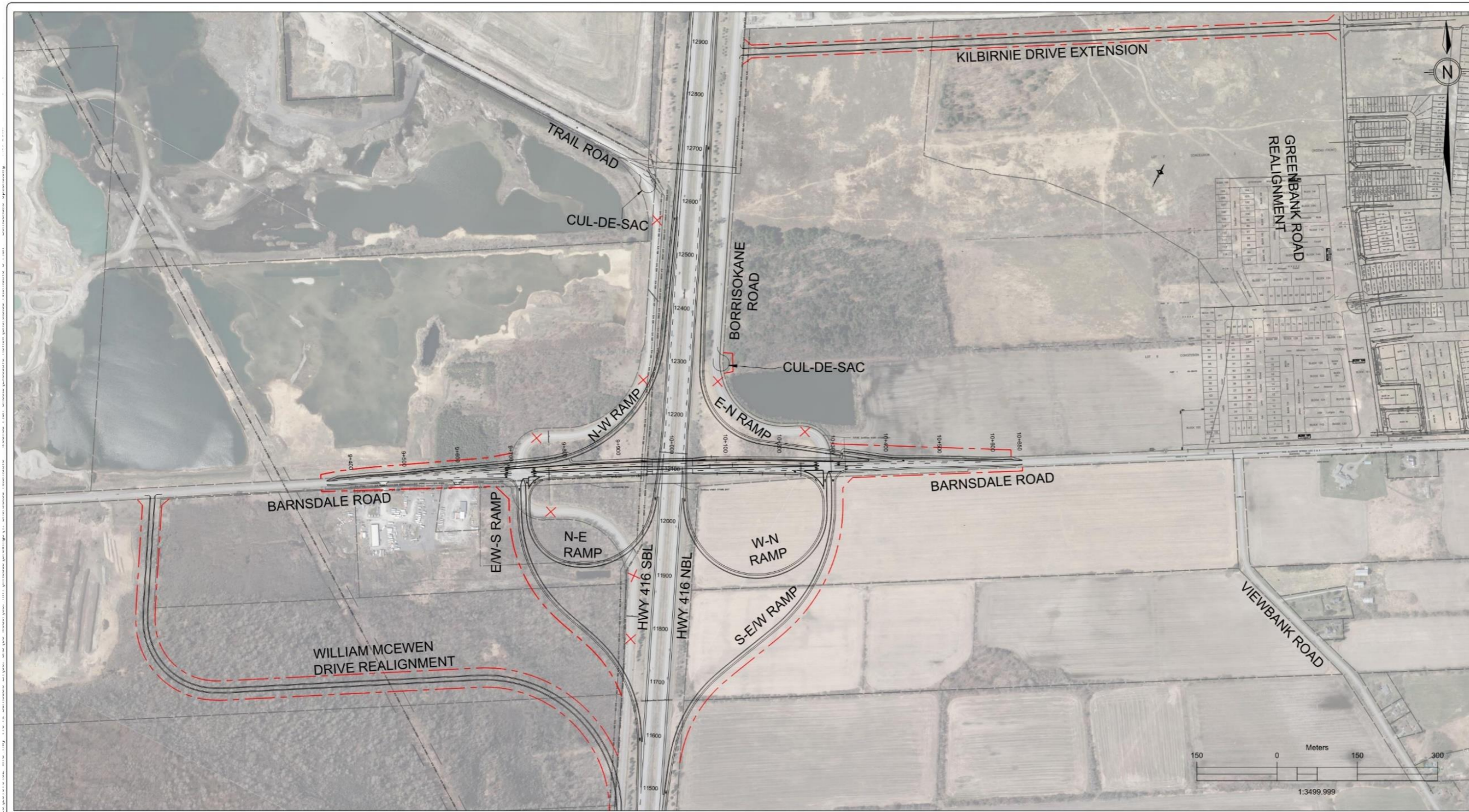
Based on funding, provincial priorities, and the current and future traffic levels anticipated for the Highway 416/Barnsdale interchange, the full interchange may not be built all at one time. It is anticipated that some form of phased approach may be taken to construct a partial interchange based on the traffic demands and development in the area.

In this scenario, an “interim” interchange could feasibly be designed and constructed such that all the entrance and exit ramps on the south side of Barnsdale Road are constructed. In this scenario, the existing intersections of Barnsdale Road with Borrisokane Road and Trail Road can remain in operation, as they are directly opposite the proposed ramp terminals. It is anticipated that the Kilbirnie Drive extension will be required in advance of the full intersection as driven by future development in the northeast quadrant of Barnsdale Road and Highway 416.

The ultimate configuration will only be warranted when increased traffic volumes from the City’s arterial road reach a critical threshold. Through consultation with the City it is not anticipated that traffic volumes will reach this threshold within the next 15 to 20 years. Interim traffic control measures at the ramp terminals, such as traffic lights, may be required as traffic volumes increase.

Both the interim and full interchange can be constructed to the existing 2-lane and future 4-lane cross sections of Barnsdale Road.

Figure 16: Preferred Design Alternative Plan for the Highway 416/ Barnsdale Road Interchange



7 POTENTIAL ENVIRONMENTAL EFFECTS, PROPOSED MITIGATION AND COMMITMENTS TO FUTURE WORK

7.1 TERRESTRIAL ECOSYSTEMS

Activities associated with the Highway 416 and Barnsdale Road interchange have the potential to impact existing terrestrial habitat and SAR within the study area if appropriate mitigation measures are not implemented. Activities undertaken in relation to the project will follow the *Endangered Species Act (ESA)*, *Fish and Wildlife Conservation Act (FWCA)*, *Migratory Birds Conservation Act (MBCA)*, the *Environmental Protection Requirements for Transportation Planning and Highway Design, Construction, Operation and Maintenance (MTO 2014)*, and the *MTO Best Management Practices for Species at Risk Protection During Maintenance Activities (MTO 2017)*.

It is anticipated that vegetation clearing, including trees and shrubs, will be required for road construction and realignment within the Highway 416 and Barnsdale Road interchange within and outside of the ROW, resulting in permanent impacts to the forested and meadow communities identified within the study area. The following mitigation measures are proposed to minimize impacts to the terrestrial ecosystems and general wildlife within the study area.

7.1.1 VEGETATION AND VEGETATION COMMUNITIES

Clearing of vegetation should be kept to a minimum whenever possible, and existing trails, roads or cut lines should be used to avoid disturbance to vegetation and prevent soil compaction. Additional measures to minimize impacts to terrestrial communities and vegetation on site, the following mitigations are recommended:

- All vegetation removals and tree clearing will be completed in accordance with **OPSS 201: Construction Specification for Clearing, Close Cut Clearing, Grubbing, and Removal of Surface and Piled Boulders;**
- Areas of non-woody vegetation removed or disturbed by construction shall be restored, where possible, using an appropriate native seed mix for this study area and site conditions as per **OPSS-803: Construction Specification for Vegetative Cover** and **OPSS-802: Construction Specifications for Topsoil;**
- Vegetation removal shall be minimized, where possible, and shall be limited within the construction footprint;
- Limits of construction shall be clearly delineated to avoid intrusion into adjacent areas;
- Exposed soils shall be restored immediately following the completion of the required work. All seeded areas shall be inspected at 30, 60 and 90 days after seeding to ensure success of the seed mix and cover application as per *Seeding and Cover Quality Assurance Visual Inspection Field Guide (MTO, 1990)*;
- To protect trees not recommended for removal, tree protection shall be installed along the limits of construction adjacent to treed areas as per **OPSS-801: Construction Specification for the Protection of Trees;**

- Trees and shrubs to be protected shall be replaced or repaired if damaged by construction activities; and
- Invasive species (i.e., Phragmites australis) identified within the project area should be managed using appropriate methods (i.e., chemical [spraying] or mechanical [mowing] controls) where feasible.

7.1.2 WILDLIFE AND WILDLIFE HABITAT

During the 2022 field investigations 39 species (33 birds, 4 mammals, 1 reptile and 1 insect) of wildlife, or evidence of these species, were recorded within the Highway 416 and Barnsdale Road study area. These observations include four (4) special concern SAR (Barn Swallow, Wood Thrush, Midland Painted Turtle, and Monarch). SAR are further discussed as part of **Section 7.2** below. Construction activities that have the potential to impact wildlife and wildlife habitat include:

- Noise during construction; and
- Loss of wildlife habitat due to vegetation removal.

Most wildlife species will move away from noise and disturbance during construction activities. However, some wildlife species may remain within the work limits. As per **NSSP No. 001A860: Prevention of Wildlife Harassment**, no wildlife encountered during construction may be harassed or killed. Therefore, if any wildlife are encountered within the work limits that do not, or cannot, move away safely on their own, they should be moved to a similar, safe location outside of the work area. It is noted that SAR species and migratory birds receive additional protection and mitigation measures as detailed in this report.

Nesting migratory birds are protected under the Migratory Bird Convention Act (MBCA). The following mitigation measures are recommended to avoid impacts to migratory birds protected under the MBCA:

- The Contractor is responsible for abiding by **NSSP No.001A870: Migratory Bird Protection** and will not destroy active nests or eggs of protected migratory birds. As such, all vegetation removals and clearing should be completed outside of the active breeding bird season, which begins April 15th and ends August 31st of any given year.

If nesting activity (nest building, carrying nesting material etc.) and/or nests or eggs/young are found, all activity in the area should temporarily cease, until the Contractor retains an Avian Biologist to determine whether the nests/eggs/young belong to a migratory bird species. Any nests found belonging to migratory birds must be protected while they are active with a species appropriate buffer (determined by the avian biologist), within which no work can occur until such a time that the nest is no longer active.

7.1.3 MIGRATORY BIRDS AND WILDLIFE

Several wildlife species, including birds and bird nests protected under the MBCA, were observed during the 2022 field investigations and have been recorded in the area as

confirmed through background data review. Changes to MBCA regulations were updated in July 2022, protecting Schedule 1 Species nests. Given the forested communities identified within the project area, the Schedule 1 Species that has the potential to use the project area during its life cycle for nesting, foraging, or breeding purposes include Pileated Woodpecker (PIWO). PIWO nests are protected at all times unless monitoring of the nesting cavity for 36 months indicates the nest is unoccupied. No PIWO were observed during the 2022 field investigations, it is noted that PIWO nesting cavities were not completed for this project at the time of investigation. During detail design, targeted surveys for PIWO nesting cavities will be conducted, based upon the presence or absence of nesting cavities, next steps can be determined.

Construction noise, dust, and vibration have the potential to indirectly impact a variety of wildlife occurring within the general study area, including migratory birds. Direct impacts associated with the preliminary design to general wildlife and migratory birds within the study area include vegetation removals required for road construction and realignment activities. Impacts resulting from construction may occur but can be sufficiently diminished through the implementation of standard mitigation measures as described within this report.

7.2 SPECIES AT RISK

It is anticipated that four (4) provincially endangered or threatened SAR (Bobolink, Eastern Meadowlark, Eastern Wood-pewee, and bat species), and their habitat have the potential to be impacted by the proposed work. While these species have the potential to occur within the general vicinity of the project area, none were confirmed as present during the 2022 field investigations. Additional surveys to confirm the presence of SWH or SAR bat species within the study area are required for detail design, the results of which may warrant the inclusion of **SSP ENV0007: Protection of Species at Risk** which will detail species specific mitigations that are required for species protection.

Vegetation removals within naturalized habitats of the study area have the potential to directly impact SAR; by adhering to wildlife timing windows and the appropriate mitigation measures discussed below, impacts to these species resulting from construction activities may be minimized.

Vegetation removal (including trees and shrubs) within the Highway 416 and Barnsdale Road study area shall be completed outside of both the active bat season (April 1st – September 30th) and the breeding bird window (April 15th – August 31st).

If the contractor encounters a SAR within the work limits at any time that is likely to be impacted by the operations:

- The Contractor shall immediately notify the Contract Administrator and suspend operations within the area identified by the Contract Administrator, as per **OPSS PROV 100: MTO General Conditions of Contract**; and
- Work shall remain suspended within that area until otherwise directed by the Contract Administrator in writing, as per **OPSS PROV 100**.

7.3 AQUATIC ECOSYSTEMS

7.3.1 FISH AND FISH HABITAT

As part of the proposed interchange within the study area, several proposed activities have the potential to impact fish and fish habitat, these activities include culvert removal, culvert replacement, new culvert installations, and channel realignments due to new on and off ramps, all of which may result in direct alteration or loss of habitat. In addition, general construction activities which have the potential to result in impacts to fish and fish habitat include (but are not limited to) construction staging/site access, debris removal, material stockpiles, and site isolation/de-watering. Impacts which could result from the project activities may include sedimentation within downstream areas of either watercourse which has the potential to result in respiratory distress and reduced feeding efficiency of fish. Additionally, staging/site access and site isolation has the potential to result in temporary footprint increases depending on whether machinery can work from the existing ROW. It is expected that impacts to fish and fish habitat throughout the study area will be assessed during Detail Design, and therefore, potential impacts to fish and fish habitat are high-level at this time. The preliminary assessment of potential impacts to each quadrant is provided in the sections below.

7.3.1.1 Northeast Quadrant

Given that there was no fish habitat identified within the northeast quadrant, as defined, and protected under the *Fisheries Act*, it is expected that the proposed culvert modifications and ditch realignment can proceed without further assessment.

7.3.1.2 Northwest Quadrant

The northwest quadrant was identified as supporting indirect fish habitat at EC08 and the channel segment between Barnsdale Road and Trail Road (EC07), which is the start of the Thomas Baxter MD. However, EC07 was identified as not fish habitat given that lack of channel definition upstream of Trail Road and unlikely contribution of flows or nutrient inputs. Due to the proposed realignment of Thomas Baxter MD, the channel segment between Barnsdale Road and Trail Road as well as EC08 would need to be relocated approximately 100 m west. Therefore, the existing channel segment would be decommissioned/infilled from construction of the southbound offramp, which would result in permanent loss of indirect fish habitat. The approximate footprint of permanent loss of indirect habitat between EC08 and EC07 is estimated at 100 m², which is considered a low spatial scale/extent in relation to habitat available within Thomas Baxter MD south of Barnsdale Road. Given that the habitat within the northwest quadrant was considered low quality and did not support significant habitat, the intensity of this residual effective will likely be low. The existing channel segment likely provides marginal contributions with respect to flow and nutrient inputs to downstream habitats, both of which can likely be maintained within the realigned channel segment. However, the residual effects within the northwest quadrant would need to be reviewed in conjunction with impacts to fish habitat in the other quadrants that support fish habitat to determine the cumulative effect of fish habitat alteration/loss for the entire project.

7.3.1.3 Southeast Quadrant

The southeast quadrant supports direct fish habitat at the three (3) culvert locations under the Highway 416 northbound lane including an EC15, EC13 and EC11. Based on the habitat characteristics observed, it is likely that the direct fish habitat present at these culvert locations is a result of backwatering from Thomas Baxter MD, west of Highway 416, as the drainage features upstream of the culverts were poorly defined and unlikely to support the same type of habitat (if any) as observed at the culverts. It is also likely that the direct fish habitat is seasonal and becomes dry during the summer months. Activities below the highwater mark are anticipated to include replacement of EC15 and EC13, and relocation of EC11 approximately 30 m north of its current location. The replacement of culvert EC15 and EC13 are anticipated to result in minimal, if any, residual effects to fish and fish habitat assuming standard mitigation measures to prevent erosion/sediment and fish passage impacts are implemented. The relocation of EC11 is expected to result in permanent loss of seasonal direct fish habitat at both the inlet and outlet. Based on the location of confirmed direct fish habitat, the approximate area of permanent loss would be 20 m² and would include general highway ditchline habitat with grasses and cattails that support common bait/ forage fish species that can adapt to changes in habitat (i.e., Brook Stickleback). No sensitive or significant fish habitat would be affected by the anticipated habitat loss and similar habitats would likely be maintained at the new culvert location.

7.3.1.4 Southwest Quadrant

Both indirect and direct fish habitat was identified within the southwest quadrant, both of which may be affected by the preferred interchange alternative and associated drainage modifications. Indirect habitat within Thomas Baxter MD is anticipated to be permanently lost due to the relocation of culvert EC08 (Barnsdale Road) and realignment of Thomas Baxter MD to the west side of the new southbound on-ramp. The approximate length of channel to be realigned between culvert EC08 and EC12 is 520 m and the habitat that would be lost includes intermittent, low quality indirect habitat due to the channelized morphometry along William MacEwen Drive and roadside ditch characteristics. The seasonal direct fish habitat present at culvert EC12 (Highway 416 southbound lane) is anticipated to be permanently lost due to the footprint of the new southbound on-ramp and relocation of EC12 approximately 30 m north. With respect to the footprints/impacts below the high-water mark from the culvert EC08 relocation, channel realignment and relocation of EC12, there is a potential for the area of loss/alteration to be approximately 1,040 m². The majority of this area would be within intermittent indirect fish habitat and a small portion (~20 m²) of seasonal direct fish habitat at the outlet of culvert EC12. As previously noted, the habitat that is expected to be lost includes low quality seasonal habitat, highly impacted from highway runoff and litter, consisting primarily of grasses and cattails. The habitat features present can be replicated and possibly improved within the new realigned channel segment of the Thomas Baxter MD along the west side of the southbound on-ramp. The proposed activities within the southwest quadrant are not expected to impact sensitive or significant fish habitat features as all fish habitat identified occurred within channelized roadside/highway ditchlines and intermittent drainage features.

Additional in-water activities within the southwest quadrant are anticipated to occur as a result of replacing culvert EC14 and EC16 near the southern extent of the Highway 416 project limits. Both culverts support seasonal direct fish habitat and replacing the culverts at the same location are not likely to result in significant residual effects to fish habitat such as habitat alteration/loss or impacts to fish passage.

7.3.2 EROSION AND SEDIMENT CONTROL

Disturbed soils will be properly contained to prevent migration of materials and sediments beyond the work limits and into adjacent communities using **OPSS-804: Construction Specification for Temporary Erosion Control** and **OPSS-805: Construction Specification for Temporary Sediment Control**.

7.3.3 CONTAINMENT AND EMERGENCY SPILL RESPONSE

For the proposed works within the Highway 416 and Barnsdale Road study area, the Contractor must develop a response plan that is to be implemented immediately in the event of a sediment release or spill of a deleterious substance as well as keep emergency spill kits on site (and in heavy machinery) in case of emergency.

All spills shall be reported to the Ministry of Environment, Conservation and Parks (MECP) Spills Action Centre (1-800-268-6060), the local municipality as well as the MNRF Kemptville District if there is potential for impacts to fisheries or wildlife resources.

7.3.4 MITIGATION MEASURES AND DESIGN CONSIDERATIONS

Given the low sensitivity of both the indirect and direct fish habitat identified within the study area, many of the potential impacts from construction activities are anticipated to be mitigated using standard provincial and MTO specifications.

The exception, however, is the proposed realignment of 520 m of Thomas Baxter MD within the southwest quadrant that would involve permanent loss of fish habitat through infilling the existing channel. The effects of this impact (i.e., habitat loss) are likely not mitigable and have the potential to result in harmful alteration, destruction, or disruption (HADD) of fish habitat. The specific intensity and spatial scale of this residual effect would need to be further reviewed during Detail Design to confirm the likelihood of the project resulting in HADD of fish habitat and given the spatial scale, it is anticipated that submission of Request for Review application form to DFO would likely be required during Detail Design.

For most of the in-water works, protection of fish and fish habitat is expected to be achieved through implementation of the prescribed in-water timing window (July 1st to March 14th) and the measures outlined within **OPSS.PROV 182**. Adhering to the MTO design standards as they relate to fish passage for culvert relocations and new culvert installations is expected to be sufficient for maintaining passage at culverts identified to support direct fish habitat. Mitigation of impacts to fish habitat from sources such as erosion and sedimentation that can occur during construction activities including, but not limited to, staging, vegetation clearing, dewatering, and stockpiling, are anticipated to be

achieved through implementation and adherence to standard measures outlined within **OPSS.PROV 180, OPSS.PROV 517, OPSS.PROV 804, and OPSS.PROV 805.**

7.4 SOCIO-ECONOMIC AND CULTURAL ENVIRONMENT

7.4.1 LAND USE

Impacts to adjacent land uses are anticipated due to the property requirements for the reconfigured interchange, as a permanent footprint impact will be required outside of the existing ROW. The preferred design alternative will require the acquisition of farmland and forest land in the south of the study area to construct the new N-E and W-N Ramps. These lands are designated as suburban/rural in the City of Ottawa Official Plan (2022). Discussions with the current property owners are ongoing, and the property will be acquired in advance of construction start.

As there will be no significant reduction in total suburban/rural land within the area as a result of the Preferred Design Alternative, land use impacts are anticipated to be minor. The selection of the Preferred Design Alternative considers the impact of the project on adjacent lands, and the remaining shortlisted options feature greater impacts to farms and residences in the area due to their respective property requirements. Discussions with adjacent property owners and businesses occur throughout the study, and their concerns are considered to ensure that impacts to operations are kept to a minimum both during and following construction.

Indirect impacts to adjacent properties included as part of cultural heritage investigations were also considered. Please see **Section 7.4.3** for further details on these impacts and proposed mitigation measures.

7.4.2 ARCHAEOLOGY

Prior to any construction, the study area around the future Highway 416 and Barnsdale Road interchange will require a Stage 2 assessment. A test pit assessment will be completed before any impacts to the 23 hectares. Nine of the hectares will require a Stage 2 assessment.

The remaining portions of the Highway 416 and Barnsdale Road interchange study area are either not close to a feature of archeological potential or is intensively and extensively disturbed or has already been subject to a Stage 2 assessment. These areas do not require a Stage 2 archeological assessment.

7.4.3 BUILT HERITAGE & CULTURAL HERITAGE LANDSCAPES

Indirect impacts from construction-related vibration have the potential to negatively affect built heritage resources and cultural heritage landscapes depending on the type of construction methods and machinery selected for the project and proximity, and composition of the identified resources.

Based on the preliminary designs of the proposed interchange improvements provided June 2023, the proposed right-of-way will result in direct impacts to CHL 1 (4144

Viewbank Road) through encroachment onto the northeast corner of the property. Given the proposed impacts of the proposed right-of-way, a Cultural Heritage Evaluation Report is required based on the current alignment.

Should the cultural heritage evaluation report determine that the property retains cultural heritage value or interest, a resource-specific heritage impact assessment should be conducted to assess potential impacts to the resource and recommend appropriate mitigation measures.

7.4.4 NOISE

7.4.4.1 OPERATIONAL NOISE

As no receptors will experience sound levels above 65.0 dBA based on the technically preferred alternative, noise mitigation was not considered.

7.4.4.2 CONSTRUCTION NOISE

To minimize the potential for construction noise impacts, it is recommended that provisions be written into the contract documentation during Detail Design for the contractor, as outlined below:

- All equipment should be properly maintained to limit noise emissions. As such, all construction equipment should be operated with effective muffling devices that are in good working order;
- Monitor and maintain haul routes to minimize movement over rough ground and potholes which in turn can generate noise;
- All equipment shall be kept in good working order as deterioration may increase equipment sound levels. A documented, regular inspection and maintenance program must be implemented;
- Vehicle on-site speed limits must be met and will be enforced;
- Idling vehicles will be kept to a minimum;
- In the presence of persistent noise complaints, all construction equipment should be verified to comply with MOE NPC-115 guidelines; and
- In the presence of persistent complaints and subject to the results of a field investigation, alternative noise control measures may be required where reasonably available. In selecting appropriate noise control and mitigation measures, consideration should be given to the technical, administrative, and economic feasibility of the various alternatives.

7.4.5 AIR QUALITY

The interchange is expected to have little to no impacts on air contaminant levels at the most-impacted receptors. The project is predicted to have similar air quality impacts to the do nothing alternative, and therefore, not expected to have a significant impact on

local air quality. No mitigation measures are recommended, beyond those already in place through phased-in federal regulations for on-road vehicle and engine emissions.

Construction phase impacts were addressed qualitatively. It is recommended that in order to minimize potential air quality impacts during construction, the construction tendering process should include requirements for implementation of an Air Quality Management Plan.

7.4.6 UTILITIES

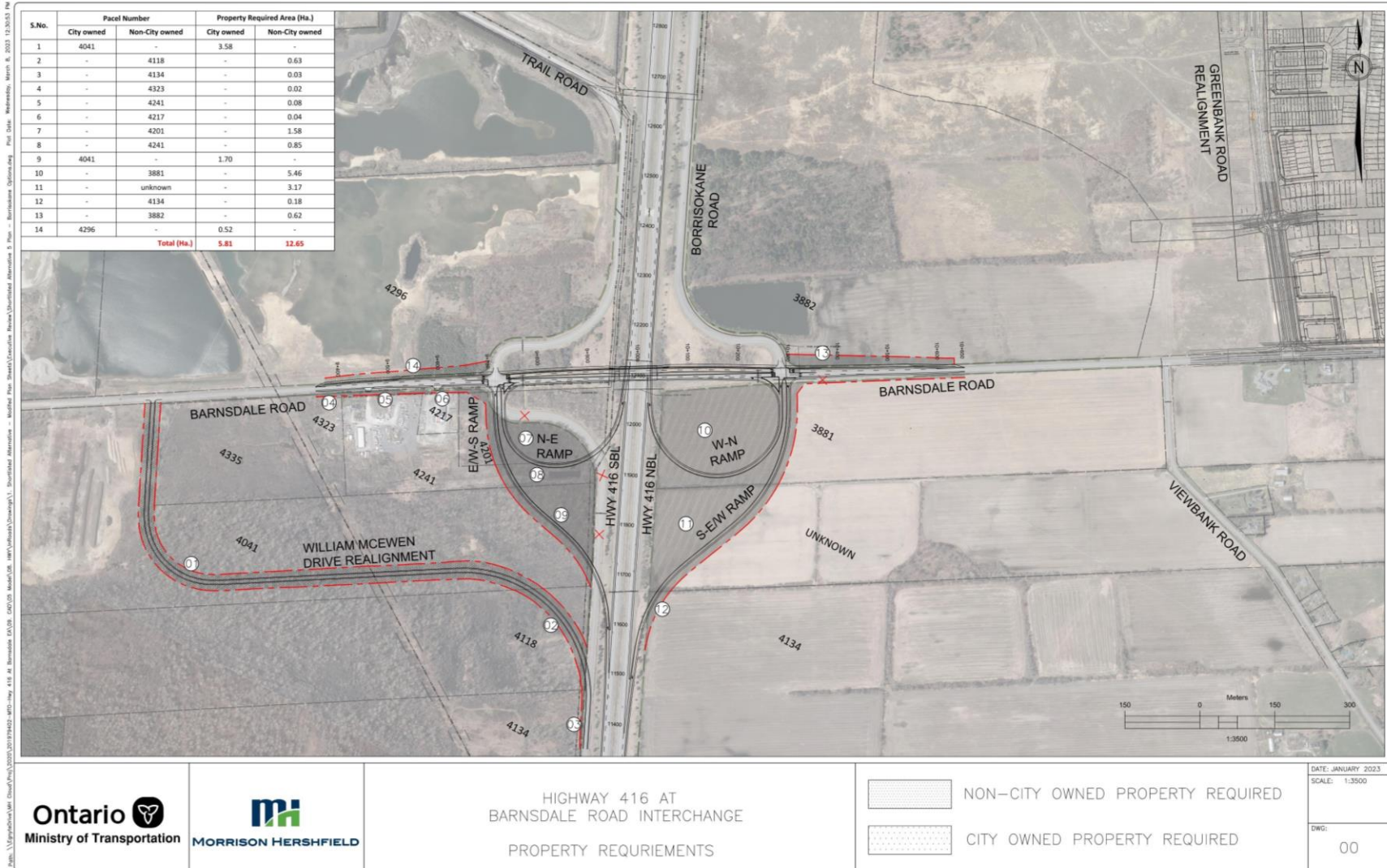
Correspondence occurred between the Study Team and affected utility companies to determine how to handle conflicts during Detail Design. There are potential conflicts with above ground infrastructure along the west side of Hwy 416/ William McEwen Drive from Bell Canada and Hydro Ottawa and potential conflict with future underground Hydro Ottawa Ducts running along the east side of Borrisokane Road, crossing Barnsdale Road. There is potential for conflict with the underground bell lines on the west of Barnsdale Road.

Utility pole relocation requirements for the above ground conflicts to be confirmed during the future Detail Design phase. Relocations of future underground Hydro Ottawa Ducts to be confirmed during the future detail design phase.

7.4.7 PROPERTY

The selection of the Technically Preferred Alternative included the consideration of property impacts and will require the acquisition of property from both private owners and the City of Ottawa. Property acquisition will be carried out at a later date to facilitate the work. The total amount of property required for the project is approximately 18.46 hectares (5.81ha of City owned property and 12.65 ha of private land). Anticipated new property limits and property takings for individual properties are shown in **Figure 17**.

Figure 17: Property Requirements



7.5 SUMMARY OF ENVIRONMENTAL CONCERNS, AND COMMITMENTS

Table 13: Summary of Environmental Effects, Mitigations, and Commitments to Future Work

ENVIRONMENTAL ISSUE/CONCERN	CONCERNED AGENCIES	PROPOSED MITIGATION/COMMITMENTS TO FUTURE WORK
NATURAL ENVIRONMENT		
Terrestrial Ecosystems and Species at Risk		
Terrestrial Habitat and Vegetation	<ul style="list-style-type: none"> • MTO • MNRF • RVCA • Indigenous communities 	<ul style="list-style-type: none"> • All vegetation removals and tree clearing will be completed in accordance with OPSS 201: Construction Specification for Clearing, Close Cut Clearing, Grubbing, and Removal of Surface and Piled Boulders. • Areas of non-woody vegetation removed or disturbed by construction shall be restored, where possible, using an appropriate native seed mix for this study area and site conditions as per OPSS-803: Construction Specification for Vegetative Cover and OPSS-802: Construction Specifications for Topsoil. • Vegetation removal shall be minimized, where possible, and shall be limited within the construction footprint. • Limits of construction shall be clearly delineated to avoid intrusion into adjacent areas. • Exposed soils shall be restored immediately following the completion of the required work. All seeded areas shall be inspected at 30, 60 and 90 days after seeding to ensure success of the seed mix and cover application as per Seeding and Cover Quality Assurance Visual Inspection Field Guide (MTO, 1990). • To protect trees not recommended for removal, tree protection shall be installed along the limits of construction adjacent to treed areas as per OPSS-801: Construction Specification for the Protection of Trees. • Trees and shrubs to be protected shall be replaced or repaired if damaged by construction activities. • Invasive species (i.e., Phragmites australis) identified within the project area should be managed using appropriate methods (i.e., chemical [spraying] or mechanical [mowing] controls) where feasible.
Migratory Birds	<ul style="list-style-type: none"> • MTO • MNRF • Indigenous communities • Environment and Climate Change Canada 	<ul style="list-style-type: none"> • As per NSSP No. 001A860: Prevention of Wildlife Harassment, no wildlife encountered during construction may be harassed or killed. Therefore, if any wildlife are encountered within the work limits that do not, or cannot, move away safely on their own, they should be moved to a similar, safe location outside of the work area. • The Contractor is responsible for abiding by NSSP No.001A870: Migratory Bird Protection and will not destroy active nests or eggs of protected migratory birds. As such, all vegetation removals and clearing should be completed outside of the active breeding bird season, which begins April 15 and ends August 31 of any given year. • If nesting activity (nest building, carrying nesting material etc.) and/or nests or eggs/young are found, all activity in the area should temporarily cease, until the Contractor retains an Avian Biologist to determine whether the nests/eggs/young belong to a migratory bird species. Any nests found belonging to migratory birds must be protected while they are active with a species appropriate buffer (determined by the avian biologist), within which no work can occur until such a time that the nest is no longer active. • During detail design, targeted surveys for PIWO nesting cavities will be conducted, upon the presence or absence of nesting cavities, next steps can be determined.
Species at Risk	<ul style="list-style-type: none"> • MTO • MNRF • Indigenous communities 	<ul style="list-style-type: none"> • It is anticipated that four (4) provincially endangered or threatened SAR (Bobolink, Eastern Meadowlark, Eastern Wood-pewee, and bat species), have the potential to be impacted by the proposed work. Additional surveys to confirm the presence of species within the study area are required for detail design, the results of which may warrant the inclusion of SSP ENV0007 Protection of Species at Risk which will detail species specific mitigations that are required for species protection. • Vegetation removal (including trees and shrubs) within the Highway 416 and Barnsdale Road study area shall be completed outside of both the active bat season (April 1 – September 30) and the breeding bird window (April 15 – August 31). • If the contractor encounters a SAR within the work limits at any time that is likely to be impacted by the operations: • The Contractor shall immediately notify the Contract Administrator and suspend operations within the area identified by the Contract Administrator, as per OPSS PROV 100: MTO General Conditions of Contract. • Work shall remain suspended within that area until otherwise directed by the Contract Administrator in writing, as per OPSS PROV 100.

ENVIRONMENTAL ISSUE/CONCERN	CONCERNED AGENCIES	PROPOSED MITIGATION/COMMITMENTS TO FUTURE WORK
Aquatic Ecosystems		
Fish and Fish Habitat	<ul style="list-style-type: none"> • MTO • MNRF • Indigenous communities • DFO 	<ul style="list-style-type: none"> • Ensure new culverts within direct fish habitat are installed in a manner to enhance fish passage to upstream areas including appropriate sizing and embedment with the elimination of any existing culvert perches. • Stabilize highway embankments to minimize future erosion and washout of granular material from entering fish habitat. • Where possible, consider the incorporation of riparian plantings using native species common to the area to increase vegetative cover and stabilize exposed soils within disturbed areas. This can be done using native seed mixtures and/or potted plants. Areas likely suitable for riparian plantings include segments of road removal adjacent to fish habitat (i.e., William McEwen Drive). • For most of the in-water works, protection of fish and fish habitat is expected to be achieved through implementation of the prescribed in-water timing window (July 1 to March 14) and the measures outlined within OPSS.PROV 182. • Mitigation of impacts to fish habitat are anticipated to be achieved through implementation and adherence to standard measures outlined within OPSS.PROV 182, OPSS.PROV 180, OPSS.PROV 517, OPSS.PROV 804, and OPSS.PROV 805. • The specific intensity and spatial scale of the Thomas Baxter MD would need to be further reviewed during Detail Design to confirm the likelihood of the project resulting in HADD of fish habitat and given the spatial scale, it is anticipated that submission of Request for Review application form to DFO would likely be required during Detail Design. <p>Submission and acceptance of the Municipal Drain Improvement Request form will be required to proceed with changes to the drain.</p>
Erosion and Sediment Control	<ul style="list-style-type: none"> • MTO • MNRF • Indigenous communities • RVCA 	<ul style="list-style-type: none"> • Disturbed soils will be properly contained to prevent migration of materials and sediments beyond the work limits and into adjacent communities using OPSS-804: Construction Specification for Temporary Erosion Control and OPSS-805: Construction Specification for Temporary Sediment Control.
Operation of Machinery	<ul style="list-style-type: none"> • MTO • Local Residents • Indigenous communities • City of Ottawa 	<ul style="list-style-type: none"> • Heavy machinery access will be limited to areas within the existing right-of-way (ROW) and along the banks above the normal high-water mark. The watercourse will not be crossed (i.e., forded) or treated as machinery staging areas at any time. • Whenever possible, operate machinery on land above the high-water mark in a manner that minimizes disturbance to the banks and bed of the waterbody. • Wash, refuel and service machinery and store fuel and other materials for the machinery a minimum of 30 m from any surface water features to prevent any deleterious substances from entering the water as per SP: Equipment Refueling, Maintenance and Washing. • Have spill kits onsite and drip pans under all non-mobile machinery.
Contaminant and Emergency Spill Response	<ul style="list-style-type: none"> • MTO • Local Residents • Indigenous communities • City of Ottawa 	<ul style="list-style-type: none"> • For the proposed works within the Highway 416 and Barnsdale Road study area, the Contractor must develop a response plan that is to be implemented immediately in the event of a sediment release or spill of a deleterious substance as well as keep emergency spill kits on site (and in heavy machinery) in case of emergency. • All spills shall be reported to the Ministry of Environment, Conservation and Parks (MECP) Spills Action Centre (1-800-268-6060), the local municipality as well as the MNRF Kemptville District if there is potential for impacts to fisheries or wildlife resources.
SOCIO-ECONOMIC & CULTURAL ENVIRONMENT		
Land Use		
Land Use	<ul style="list-style-type: none"> • MTO • Indigenous communities • City of Ottawa • Nearby Residents/Businesses 	<ul style="list-style-type: none"> • Discussions with adjacent landowners and businesses will continue throughout Detail Design to ensure that their comments and concerns are considered when finalizing the design. • Traffic staging plans should be developed that minimize disruptions to property access. • Discussions with current property owners will continue throughout Detail Design, and property will be acquired in advance of construction start.

ENVIRONMENTAL ISSUE/CONCERN	CONCERNED AGENCIES	PROPOSED MITIGATION/COMMITMENTS TO FUTURE WORK
Archaeology		
Archaeology	<ul style="list-style-type: none"> • MTO • Indigenous communities • MHSTCI 	<ul style="list-style-type: none"> • The background research identified that 125 hectares within the study area are within 100-metres of a feature indicating the potential for historic archaeological remains. The two registered archaeological sites have overlapping buffers of 300-metres, indicating the potential for archaeological remains across 39 hectares. However, there are extensive and intensive disturbances from highway and road construction, aggregate extraction, and other developments across 188 hectares (45 percent) of the overall study area. The combination of the disturbances and overlapping previously assessed lands indicates that 32 hectares (7.6 percent of the study area) around the archaeological potential features will require Stage 2 field assessment before any future impacts from the new highway interchange. Test pit assessment following Section 2.1.2 Test Pit Survey in the Standards and Guidelines for Consultant Archaeologists, 2011 will be required before any impacts on the 23 hectares. Nine hectares will require Stage 2 assessment following Section 2.1.1 Pedestrian Survey in the Standards and Guidelines for Consultant Archaeologists, 2011. • Part of the study area around the future Highway 416 and Barnsdale Road interchange will require Stage 2 assessment before any construction impacts. Test pit assessment following Section 2.1.2 Test Pit Survey will be required before any impacts to the 23 hectares (Map 16). Nine hectares will require Stage 2 assessment following Section 2.1.1 Pedestrian Survey in the Standards and Guidelines for Consultant Archaeologists, 2011 (MHSTCI 2011: 30-32).
Built Heritage & Cultural Heritage Landscapes		
Built Heritage Resources / Cultural Heritage Landscapes	<ul style="list-style-type: none"> • MTO • Nearby Residents/Businesses • City of Ottawa • MHSTCI • Local Heritage Groups 	<ul style="list-style-type: none"> • Based on the preliminary designs of the proposed interchange improvements provided June 2023, the proposed right-of-way will result in direct impacts to CHL 1 (4144 Viewbank Road) through encroachment onto the northeast corner of the property. Given the proposed impacts of the proposed right-of-way, a cultural heritage evaluation report is required based on the current alignment. • Should the cultural heritage evaluation report determine that the property retains cultural heritage value or interest, a resource-specific heritage impact assessment should be conducted to assess potential impacts to the resource and recommend appropriate mitigation measures. • Should future work require an expansion of the study area then a qualified heritage consultant should be contacted in order to confirm the impacts of the proposed work on potential built heritage resources and C.H.L.s.
NOISE		
Construction Noise and Vibration	<ul style="list-style-type: none"> • MTO • Nearby Residents/Businesses • City of Ottawa 	<ul style="list-style-type: none"> • It is expected that mitigation measures based on best practices be written into the contract documentation for the contractor as part of a Construction Noise Mitigation Plan. • All equipment should be properly maintained to limit noise emissions. As such, all construction equipment should be operated with effective muffling devices that are in good working order. • Monitor and maintain haul routes to minimize movement over rough ground and potholes which in turn can generate noise. • Idling vehicles will be kept to a minimum. • In the presence of persistent noise complaints, all construction equipment should be verified to comply with MOE NPC-115 guidelines. • In the presence of persistent complaints and subject to the results of a field investigation, alternative noise control measures may be required, where reasonably available. In selecting appropriate noise control and mitigation measures, consideration should be given to the technical, administrative, and economic feasibility of the various alternatives.
Air Quality	<ul style="list-style-type: none"> • MTO • Nearby Residents/Businesses • City of Ottawa 	<ul style="list-style-type: none"> • The project is predicted to have little to no impacts on air contaminant levels, no mitigation measures are recommended. • To minimize potential air quality impacts during construction, the construction tendering process should include requirements for implementation of an Air Quality Management Plan.
CONSTRUCTION IMPACTS		
Construction Impacts	<ul style="list-style-type: none"> • MTO • Nearby Residents/Businesses • City of Ottawa 	<ul style="list-style-type: none"> • The construction staging approach will continue to be reviewed and refined as part of Detail Design to minimize impacts to adjacent landowners/commercial operations and members of the travelling public.

ENVIRONMENTAL ISSUE/CONCERN	CONCERNED AGENCIES	PROPOSED MITIGATION/COMMITMENTS TO FUTURE WORK
UTILITIES		
Utilities	<ul style="list-style-type: none"> • MTO • Utility Companies 	<ul style="list-style-type: none"> • Utility pole relocation requirements for the above ground conflicts to be confirmed during the future Detail Design phase. Relocations of future underground Hydro Ottawa Ducts to be confirmed during the future detail design phase.
PROPERTY		
Property Acquisition	<ul style="list-style-type: none"> • MTO • Property Owners 	<ul style="list-style-type: none"> • The project will require the acquisition of property from both private owners and the City of Ottawa. Property acquisition will be carried out at a later date to facilitate the work

8 APPLICATION OF CLASS EA PRINCIPLES AND PROCESS

8.1 TRANSPORTATION ENGINEERING PRINCIPLES

The Preliminary Design for the Highway 416 and Barnsdale Road Interchange addresses the transportation engineering principles of the Class EA. The improvements will provide a constructible and cost-effective design that minimizes impact on the local community and natural environment.

8.2 ENVIRONMENTAL PROTECTION PRINCIPLES

The Preliminary Design study addressed the Class EA principles for environmental protection through the following steps undertaken during the study:

- Scientific and technical studies were undertaken to identify existing conditions for the natural environment (terrestrial, fisheries), cultural environment and socio-economic factors (land use, noise, transportation, local community services, etc.);
- The development of design alternatives gave due consideration to the environmental impacts of the alternatives during the evaluation process and through the assessment of construction feasibility;
- The development of design alternatives was carried out with the approach of avoiding or minimizing potential environmental impacts;
- Environmental studies were carried out in sufficient detail to identify requirements for legislative environmental approvals. Regulatory agencies were consulted and involved in the process to acquire input regarding proposed engineering designs and potential mitigation solutions; and
- The study team made a concerted effort to consult with all identified stakeholders.

8.3 EXTERNAL CONSULTATION PRINCIPLES

In carrying out the study, the consultation principles of the Class EA were given due regard by:

- Providing all stakeholders, including external agencies and the public, with notification of the Preliminary Design and Class EA study through Ontario Government Notices. Letters were directly mailed to known stakeholders at key project milestones, and additional consultative efforts were made to new stakeholders as they became known to the study team;
- Consultation with Indigenous communities; and
- Consultation with the public and external agencies was used to obtain information regarding the study area, potential effects on external agency mandates as it pertains to the project, and to identify issues and concerns.

8.4 DOCUMENTATION PRINCIPLES

The documentation principles set forth in the Class EA were addressed through the preparation of this TESR, which fulfills the content requirements outlined in the Class EA. This document provides a summary of the need and justification for the proposed undertaking, outlines existing environmental conditions, identifies significant features of the technically preferred alternative, identifies potential environmental impacts and appropriate mitigation measures, and summarizes the consultation process employed throughout this study, to-date.

8.5 CLEARANCE TO PROCEED TO DETAIL DESIGN

This project has followed the study principles and processes set forth in the Class Environmental Assessment for Provincial Transportation Facilities (2000). Following the publication of this TESR, the public and relevant government agencies will be given 30 days to comment on the document. Should concerns be raised, the Study Team will make every reasonable effort to accommodate these concerns. However, if after consultation with MTO, significant unresolved concerns remain, a request may be made to the Ministry of the Environment, Conservation and Parks for an order requiring a higher level of study (i.e. requiring an individual/comprehensive EA approval before being able to proceed), or that conditions be imposed (e.g. require further studies), only on the grounds that the requested order may prevent, mitigate or remedy adverse impacts on constitutionally protected Aboriginal and treaty rights. Requests on other grounds will not be considered. Once the TESR is submitted and the opportunity for a higher level of study is offered, there is no further opportunity to request a Part II Order and the project will proceed to Detail Design.

8.6 EA PROCESS NEXT STEPS

Following completion of the TESR review and the processes described above, changes to the Recommended Plan that are identified during Detail Design will be assessed for their significance. Should a change be deemed significant, a TESR Addendum would be required. The TESR Addendum would be made available for a 30-day public review period and would be eligible for Part II Orders requests for the changes identified.

The need for a TESR Addendum is determined by an assessment of significance by MTO and informed by the specifics of the project and the change being recommended. Non-significant changes would be documented in the Design and Construction Report (DCR) produced during the Detail Design phase. DCRs are published for a 30-day public review period.

The DCR prepared during Detail Design will provide further details regarding the project's design, address all outstanding commitments which were remaining at the end of Preliminary Design and/or any identified during Detail Design, and document final mitigation measures that will be implemented during construction.

9 APPROVALS AND PERMITS

In addition to the completion of the Class Environmental Assessment process there are a number of approvals and permits that could be required to implement the Preferred Design Alternative. Some of the below noted permits and approvals may or may not be required based on current information, and all permit and approval requirements will be confirmed during Detail Design.

9.1 MIGRATORY BIRDS CONVENTION ACT

The removal or destruction of any active nest of a migratory bird protected under the *Migratory Birds Convention Act, 1994* is prohibited. On July 30, 2022, Migratory Birds Regulations (MBR) under the MBCA was updated, establishing the minimum number of months for which Schedule 1 Species nests must be unoccupied before protection may be lifted. If targeted surveys completed during detail design identify presence of PIWO nests, they are protected at all times unless monitoring of the nesting cavity for 36 months indicates the nest is unoccupied.

As all vegetation removals shall be conducted outside of the breeding bird window from April 1 to August 30 of any given year, no permit will be required.

9.2 ENDANGERED SPECIES ACT & SPECIES AT RISK ACT

Species at Risk are protected and listed under the *Endangered Species Act (ESA)* or *Species at Risk Act (SARA)*. Endangered and Threatened Species are protected under the provincial *Endangered Species Act*, which specifically prohibits willful harm to endangered species that are listed in regulations under the Act and the willful destruction of, or interference with their habitats. Fragmentation of the vegetation communities within the study area may result in the permanent loss of potential SAR habitat for Bobolink, Eastern Meadowlark, and Eastern Wood-pewee. During Detail Design, targeted surveys for these species should be completed within all suitable habitat. If targeted surveys completed at Detail Design confirm presence of Bobolinks and/or Eastern Meadowlarks, discussions with MECP will be required to confirm requirements for the project under the ESA, including potential compensation requirements, such as registration of the project under a *Notice of Activity Form: Bobolink and Eastern Meadowlark – Activities impacting 30 hectares or less of habitat*.

9.3 FISHERIES ACT

It is anticipated that a submission of Request for Review application form to DFO would likely be required during Detail Design, as a result of the moderate scale of negative affects to fish and fish habitat from the Thomas Baxter MD realignment. Through the application form process, DFO will review the project impacts, confirm if the works are likely to cause HADD of fish habitat, and determine if a *Fisheries Act* Authorization/Offsetting Plan is required.

9.4 DRAINAGE ACT

Municipal Drains are regulated through the Drainage Act (1990). Modifications to municipal drains therefore require additional consideration of the various requirements imposed by the Drainage Act process, including sufficient outlet, concerns of affected landowners, assessments, changes to the Engineer's Report, access, maintenance, and other priorities. A Drainage Engineer will be required to complete detail design modifications to the Thomas Baxter MD, including an update to the Engineer's Report. Submission and acceptance of the Municipal Drain Improvement Request form will be required to proceed with changes to the drain.

10 CONCLUSIONS

The Ministry of Transportation and Morrison Hershfield Limited have conducted extensive environmental investigations, public and stakeholder consultation, and design exercises to ensure that the new interchange on Highway 416 at Barnsdale can proceed with minimal impacts to the surrounding environment. Those environmental impacts that are expected to result from the work, such as footprint impacts beyond the existing MTO ROW and acquisition of property have been minimized, where technically and economically feasible. Compliance with recommended mitigation measures will ensure that environmental protection requirements are met.

The proposed interchange design considers the environmental sensitivities present at the site in addressing the need for the project and the way it will be carried out. Consultation included publishing Ontario Government Notices and direct letter mailing to interested and affected stakeholders. The evaluation principles outlined in the Class EA were addressed through the analysis and evaluation of alternative designs and construction methodology, which also considered all factors relevant to the decision-making process, as prescribed by the Class EA process.

The documentation principles set forth in the Class EA were addressed through the preparation of this TESR, which fulfills the Preliminary Design content requirements outlined in the Class EA. This document provides a summary of the need and justification for the proposed undertaking, outlines existing environmental conditions, identifies the significant features of the design, identifies potential environmental impacts and appropriate mitigation measures, and summarizes the consultation process employed throughout the study. By following the processes set forth in the MTO Class Environmental Assessment for Provincial Transportation Facilities (2000), there are no outstanding issues related to the design of this project that make it ineligible to proceed to Detail Design.

A Design and Construction Report (DCR) will be prepared during Detail Design to provide further details regarding the project's design, addressing all outstanding commitments which were remaining at the end of Preliminary Design and/or any identified during Detail Design.

11 REFERENCES

- Air Quality Assessment Highway 416 and Barnsdale Road Interchange – Guelph, Ontario, RWDI #2003291 / MTO Assignment #4019-E-0023 (RWDI, 2023)
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- City of Ottawa Official Plan (2022) - [Volume 1 | City of Ottawa](#)
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- Cultural Heritage Report: Existing Conditions Highway 416 and Barnsdale Road Interchange Class Environmental Assessment - City of Ottawa, File: 21CH-047 (Ontario Archaeological Services Inc. 2022)
- Environmental Noise Assessment Highway 416 and Barnsdale Road Interchange – Ottawa, Ontario, RWDI #2003291 / MTO #4019-E-0023 (RWDI, 2023)
- Existing Conditions Report - Preliminary Design and Environmental Assessment, Highway 416 at Barnsdale Road Interchange, Ministry of Transportation, Eastern Region, Agreement No. 4019-E-0023, Assignment No. 2, G.W.P. 4057-20-00 (MH, 2022)
- Fish and Fish Habitat Existing Conditions and Preliminary Impact Assessment Report - Preliminary Design and Environmental Assessment Highway 416 at Barnsdale Road Interchange Ministry of Transportation, Eastern Region Agreement No. 4019-E-0023, Assignment No. 2 G.W.P. 4057-20-00 (MH, 2022)
- Landscape Composition and Existing Conditions Report - Preliminary Design and Environmental Assessment, Highway 416 at Barnsdale Road Interchange, Ministry of Transportation, Eastern Region, Agreement No. 4019-E-0023, Assignment No. 2, G.W.P. 4057-20-00 (MH, 2022)
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