Ontario

MMM Group Limited

Highway 401 / Highway 15 Interchange Operational Improvements

G.W.P. 4059-11-00

Preliminary Design and Class Environmental Assessment Study

Transportation Environmental Study Report

COMMUNITIES

TRANSPORTATION

BUILDINGS

INFRASTRUCTURE

MMM GROUP

January 2016

Ontario

HIGHWAY 401 / HIGHWAY 15 INTERCHANGE OPERATIONAL IMPROVEMENTS

PRELIMINARY DESIGN AND ENVIRONMENTAL ASSESSMENT STUDY

G.W.P. 4059-11-00

City of Kingston

CLASS ENVIRONMENTAL ASSESSMENT FOR
PROVINCIAL TRANSPORTATION FACILITIES
GROUP 'B' PROJECT

MINISTRY OF TRANSPORTATION
EASTERN REGION

TRANSPORTATION ENVIRONMENTAL STUDY REPORT

January 2016

Highway 401 / Highway 15 Interchange Operational Improvements

PRELIMINARY DESIGN AND ENVIRONMENTAL ASSESSMENT STUDY

City of Kingston

CLASS ENVIRONMENTAL ASSESSMENT FOR
PROVINCIAL TRANSPORTATION FACILITIES (2000)
GROUP 'B' PROJECT

Ministry of Transportation
Eastern Region

G.W.P. 4059-11-00

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MMM GROUP

THE PUBLIC RECORD

A copy of this Transportation Environmental Study Report (TESR) is available for review at the following locations:

Kingston City Hall
216 Ontario Street
Kingston, Ontario K7L 2Z3

Monday to Friday: 8:30 am to 4:30 pm

Kingston Public Library – Pittsburgh Branch
80 Gore Road
Kingston, Ontario K7K 6X6

Monday: closed
Tuesday to Thursday: 10:00 am to 8:00 pm
Friday: closed
Saturday: 9:00 am to 5:00 pm
Sunday: closed

Ministry of Transportation – Eastern Region
1355 John Counter Boulevard
Kingston, Ontario K7L 5A3

Monday to Friday: 8:30 am to 5:00 pm

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EXECUTIVE SUMMARY

The Ontario Ministry of Transportation (MTO) retained MMM Group Limited to complete a Preliminary Design and Environmental Assessment (EA) Study for geometric and operational improvements to the Highway 401 interchange at Highway 15, in the City of Kingston (G.W.P. 4059-11-00).

The existing interchange was originally constructed in the 1950s, with minor modifications completed to the structure and eastbound off-ramp in the mid-90s. The Highway 15 interchange is in an off-set diamond configuration, with the eastbound off-ramp intersecting Highway 15 at the Middle Road intersection.

Geometric and operational issues associated with the existing interchange include:

- High traffic volumes on Highway 15, leading to delays and queuing during peak periods. Northbound and southbound left-turn queues overlap in the afternoon peak periods;
- A lack of dedicated left-turn lanes from Highway 15 to Highway 401 on-ramps;
- Increasing volumes of traffic using the interchange;
- Short 'slip ramps' provide little storage and no parallel merging areas for vehicles turning left onto the Highway 401 on-ramps ; and
- The stop-controlled north ramp terminal provides short gap times for traffic entering Highway 15 from the westbound off-ramp, increasing queuing and delay.

The objectives of the study included the review of the existing geometric and operational issues at the interchange, the identification of the potential improvement alternatives and the identification of the preferred improvement alternative, taking into account the natural environmental, social / economic, and cultural environmental impacts due to the improvements. Planning and design solutions considered include: relocation and / or realignment of interchange ramps; widening / replacement / rehabilitation of the existing Highway 15 underpass; and additional lanes and / or turning lanes. For the purposes of the study, alternatives were designed to address traffic conditions until the project horizon year of 2033.

Environmental Assessment Process

The study is being carried out in accordance with the approved planning process for Group 'B' projects under the Ministry of Transportation *Class Environmental Assessment for Provincial Transportation Facilities* (1999, amended in 2000). This Transportation Environmental Study Report (TESR) has been prepared in accordance with the requirements of the MTO Class EA process and documents the following:

- The generation, assessment, evaluation, selection and development of the design alternatives;
- The transportation engineering and environmental issues and how they were incorporated into the environmental assessment program;
- The identified potential environmental condition changes, effects and commitments to mitigation measures;
- Commitments to further work, including any environmental effects monitoring that is required;
- The consultation program followed throughout the study; and
- The identification of all project approvals, licenses and permits which have been or must be obtained prior to construction.

The TESR will be filed for a 30-day public review period. If, after consulting with the Ministry of Transportation, a person (or persons) has unresolved concerns with the recommended plan as documented in the TESR, they may request that the Minister of the Environment order MTO to comply with Part II of the *Ontario Environmental Assessment Act* and complete an individual environmental assessment.

The next steps in the engineering design and Environmental Assessment process involve the completion of Detail Design, followed by construction.

Consultation

Consultation with external agencies (including the City of Kingston), First Nations and Métis communities, local elected representatives, interest groups and members of the public was conducted over the course of the study through letter and brochure mail-outs, newspaper notices, two Public Information Centres (PICs) and individual stakeholder meetings.

Comments provided throughout the study were taken into consideration during the development and evaluation of design alternatives. Correspondence from external agencies pertained primarily to expressing interest in being kept informed of project proceedings; the proposed scope of work at the interchange; planned archaeological and cultural heritage investigations; the accommodation of long combination vehicles (LCVs) at the interchanges; and impacts to adjacent wetland habitat and woodlands. Other comments received included expressions of concern related to potential impacts to private properties, impacts to the natural environment and traffic safety.

Evaluation of Alternatives

A multi-phased evaluation process was used to identify a Technically Preferred Alternative for interchange improvements:

- Based on the identified interchange deficiencies, a long list of possible interchange improvements was developed. A high level screening of alternatives was carried out by qualitatively assessing technical criteria, environmental considerations and cost to develop a short list.
- A short list of 12 alternatives was evaluated quantitatively and qualitatively against 17 different key measures reflecting technical, environmental, cost and constructability considerations.
- The alternative with the best overall score emerged as the Technically Preferred Alternative for long-term interchange improvements.
- With the Technically Preferred Alternative selected, interim improvements that can be made in the short term (within 5-10 years) were identified.

Technically Preferred Alternative

The Technically Preferred Alternative for long-term improvements at the interchange includes:

- A new interchange configuration. The interchange will be reconfigured into a Parclo A / Diamond hybrid configuration, from its current off-set Diamond configuration. The reconfiguration requires a new westbound off-ramp and westbound inner-loop on-ramp in the northeast quadrant, a new westbound on-ramp in the northwest quadrant, and the removal of the existing westbound off-ramp. The existing eastbound off-ramp will also be widened and slightly realigned on approach to the Middle Road intersection;
- Widening of Highway 15 to accommodate left turn lanes at the south ramp terminal and the Middle Road intersection;
- Replacement of the Highway 15 underpass on a new alignment. As the existing bridge cannot accommodate five lanes (four general purpose lanes and a left-turn lane), a structural assessment concluded that replacing the underpass to the west of the existing bridge was preferred over bridge widening. To accommodate a new structure, Highway 15 is realigned to the west of the existing alignment;
- Relocation of the existing carpool lot to the southeast, to accommodate sight lines of the realigned eastbound off-ramp. A carpool lot demand assessment was not included as part of this

study and no capacity expansion is proposed as part of this study. If an expansion is required in the future, it is feasible to expand the carpool lot to the northeast and remain within MTO property; and

- Improvements to stormwater management infrastructure. A new stormwater management pond will be located in the northeast quadrant of the interchange, within the westbound inner-loop on-ramp.

Proposed Interim Improvements

Certain elements of the Technically Preferred Alternative can be implemented in the short-term (within 5-10 years) to provide geometric and operational benefits. The Proposed Interim Improvements include:

- Reconfiguring the north ramp terminal into a signalized intersection. The westbound off-ramp will be realigned on approach to the ramp terminal and traffic signals installed. The westbound on-ramp will also be widened to accommodate a parallel merging area;
- Minor rehabilitation on the existing Highway 15 underpass. The rehabilitation will include patching of the soffit and substructure; and
- Widening Highway 15 at the south ramp terminal to accommodate a left-turn lane. An additional left-turn lane for traffic entering Middle Road from Highway 15 results in widening Highway 15 from immediately south of the existing underpass, through the south ramp terminal. All widening is proposed to the west to minimise property impacts and throw-away costs.

Implementation / Construction Staging

Proposed Interim Improvements

- The widening of the Highway 15 south ramp terminal and the signalisation of the north ramp terminal are expected to have minimal impacts to operations at the interchange. No road or lane closures are required. Lane-width reduction is anticipated during construction.

Technically Preferred Alternative

- The majority of realigned Highway 15 and the new westbound off- and on-ramps can be constructed with minimal impact to traffic. Highway 401 will be subjected to a construction staging cross-section during the construction of the new underpass.
- The TPA requires a lowering of the vertical profile of Highway 15, north of Highway 401, and during this construction, traffic is shifted to the east of Highway 15 on a temporary alignment.
- The bridge-type and age of the existing bridge results in conventional demolition methodologies being non-viable. It is recommended that rapid demolition be used and Highway 15 closed for 14hrs. Highway 401 will be temporarily realigned through the interchange ramps during this time.

Environmental Issues and Commitments

An assessment of the environmental impacts associated with the Technically Preferred Alternative was completed and is outlined in this report. Key environmental impacts include:

- Natural environment: removal of contributory and significant woodlands; blasting and grading in forested areas that may result in hydrologic changes and disturbances to wildlife; temporary disturbances to turtle nesting on the embankment of the Highway 401 eastbound off-ramp during construction; and impacts to a potentially contaminated property northeast of the interchange.
- Social / cultural environment: acquisition of an estimated 4.8 ha of private property; and permanent closure of Station Road access to Highway 15, which is anticipated to affect the movement of farm equipment and cyclists.

Mitigation measures to address these and other environmental impacts, as well as commitments to further work in Detail Design are outlined in Sections 7.3, 7.4 and 7.5.

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1 OVERVIEW OF THE UNDERTAKING

1.1 PROJECT SUMMARY

1.1.1 INTRODUCTION

The Ministry of Transportation (MTO) has retained MMM Group to complete a Preliminary Design and Environmental Assessment Study (EA Study) for operational improvements to the Highway 401 interchange at Highway 15, in the City of Kingston (G.W.P. 4059-11-00). The location of the interchange is illustrated in **Figure 1-1** and **Figure 1-2**.

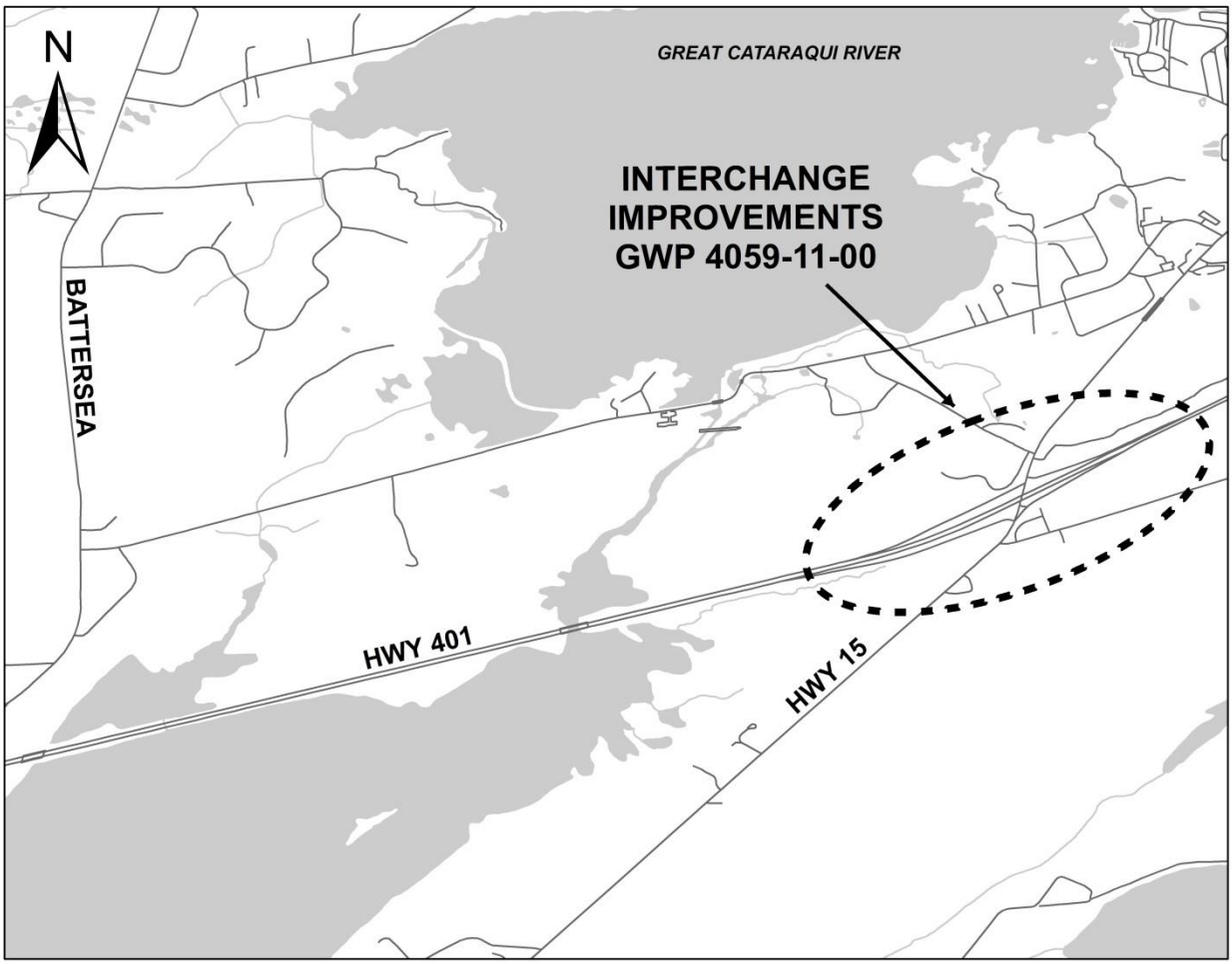

Figure 1-1: Study Area

This Transportation Environmental Study Report (TESR) presents the findings of this transportation engineering and Environmental Assessment Study, as per the approved planning process for Group 'B' undertakings outlined in the *Class Environmental Assessment* (Class EA) *for Provincial Transportation Facilities* (2000).

1.1.2 STUDY PURPOSE

The Highway 401 interchange at Highway 15 is located in Kingston, Ontario, in the former Township of Pittsburgh. The interchange is located immediately east of the Cataraqui River, and is one of six interchanges along the Highway 401 corridor that provide access to the City of Kingston. It provides a

vital connection between Kingston East and the provincial highway network, and to Kingston Road 2, which connects to the western part of the city.

The overall objectives of this study are to identify existing and future operational issues at the interchange, and determine the most appropriate solution to these issues while taking into account natural environmental, social / economic, and cultural environmental impacts. In general, the following planning and design options were considered: relocation of ramps; relocation of the carpool lot; bridge widening, replacement, or rehabilitation; the addition of new lanes; and the addition of turning lanes. For the purposes of the study, alternatives were designed to address traffic conditions until the project horizon year of 2033.

Figure 1-2: Highway 401 / Highway 15 Interchange - Aerial View

The existing interchange was originally constructed in 1953 and has been subject to a steadily increasing volume of traffic. The Highway 15 overpass bridge was last rehabilitated in 1995.

Operational issues associated with the existing interchange design include:

- Significant queuing and delays during peak periods for northbound Highway 15 traffic entering westbound Highway 401. During peak periods, queues extend to the south ramp terminal;
- Delays at the Highway 15 / Middle Road / eastbound off-ramp intersection due to queues from the north ramp terminal extending to the south ramp terminal during peak periods;
- Queuing at the eastbound Highway 401 off-ramp due to the high volume of traffic;
- Concerns associated with the short 'slip ramps' used by traffic turning left onto the Highway 401 on-ramps. The 'slip ramps' provide little storage and no parallel merging area with the higher-speed right-turning traffic.

1.1.3 CONSULTATION

Throughout the study, the City of Kingston, regulatory agencies, First Nations and Métis communities, local elected representatives, interest groups, and members of the public were encouraged to participate through a proactive consultation plan that included contact letters, newspaper notices, two Public Information Centres and individual stakeholder meetings.

Stakeholder comments provided throughout the study were taken into consideration during the development and evaluation of design alternatives and refinement of the Technically Preferred

Alternative. Correspondence from external agencies pertained primarily to the proposed scope of work at the interchange; planned archaeological and cultural heritage investigations; the use of the interchange by Long Combination Vehicles (LCVs); impacts to adjacent wetland habitat and woodlands; impacts to private properties; impacts to the natural environment; and traffic safety.

A comprehensive discussion of comments received, and how they have been addressed, is included in **Appendix C** of this report.

1.1.4 EVALUATION OF ALTERNATIVES

During preliminary design, a longlist of alternative interchange configurations were developed and screened based on technical and environmental considerations. Alternatives that did not meet minimum operational requirements were removed from consideration and not evaluated further.

The resulting short list of alternatives was evaluated in detail against criteria in three factor areas, including: transportation; environment (natural, social/economic, and cultural); and cost. The evaluation of short listed interchange alternatives led to the identification of a preferred long-term alternative for interchange improvements that best meets future transportation needs, while minimizing negative environmental impacts and costs to the extent possible. The detailed methodology and results of the evaluation process are documented in **Section 5** of this report.

1.1.5 GENERAL DESCRIPTION OF THE TECHNICALLY PREFERRED ALTERNATIVE

The Technically Preferred Alternative is described in detail in **Section 6** of this report, and detailed in **Figure 1-3**. In general, the recommended long term interchange improvements include:

- Reconfiguring the interchange into a Parclo A / Diamond Hybrid, including a new loop ramp for traffic accessing westbound Highway 401 from northbound Highway 15;
- Realigning Highway 15 to the west and constructing a new underpass;
- Widening the Highway 401 eastbound off-ramp;
- Shifting the carpool lot southeast to accommodate the Highway 401 eastbound off-ramp and providing it with full illumination; and,
- Closing the Station Road / Highway 15 intersection.

Prior to the full implementation of the recommended long term interchange improvements, interim interchange improvements have been identified to address operational issues in the short term (detailed in **Figure 1-4**). The Proposed Interim Improvements are expected to occur within 5-10 years, with the Technically Preferred Alternative being realized between 10-20 years. Both improvement stages will be subject to provincial funding and priorities.

In general, the recommended short term interchange improvements include:

- Realigning the westbound off-ramp with the westbound on-ramp to form a single signalized intersection;
- Providing a southbound left-turn lane for traffic to access Middle Road; and
- Re-marking lane and road markings to designate through and through/right turn lanes for northbound Highway 15 traffic at the south ramp terminal.

Environmental impacts resulting from the Technically Preferred Alternative were assessed and mitigation measures developed. Mitigation includes planning decisions, design features, detail design and construction requirements and construction constraints.

1.2 PURPOSE OF THE TRANSPORTATION ENVIRONMENTAL STUDY REPORT

This Transportation Environmental Study Report (TESR) documents the Environmental Assessment process carried out to identify the recommended plan for improvements to the interchange at Highway 401 and Highway 15. It includes a description of existing conditions in the study area, the consultation process undertaken and a summary of feedback received from stakeholders, the evaluation of alternatives (including alternatives to the undertaking and design alternatives), and the recommended plan, including mitigation measures developed to address environmental impacts.

This TESR has been prepared in accordance with the requirements of the approved environmental planning process for Group 'B' projects under the Ministry of Transportation's *Class Environmental Assessment* (Class EA) *for Provincial Transportation Facilities* (2000). The TESR will be filed for a 30-day public review period.

Interested persons are encouraged to review the TESR and provide comments by February 8, 2016. If after consulting with the Ministry of Transportation, you have serious unresolved concerns, you have the right to request the Minister of the Environment and Climate Change (11th Floor, Ferguson Block, 77 Wellesley Street West, Toronto, Ontario, M7A 2T5) issue a Part II Order ("bump-up") for this study. A Part II Order may lead to the preparation of an individual environmental assessment. A copy of the bump-up request should be forwarded to the addresses below.

If there are no outstanding concerns after February 8, 2016, the study will be considered to have met the requirements of the Class EA.

The Project Team is available to discuss information provided within this report or any other project-related inquiries. Members of the team can be contacted as follows:

Michael Chiu, P.Eng.
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MMM Group Limited
2655 Sheridan Way, Suite 300
Mississauga, Ontario L5K 2P8

Tel: 1-877-562-7947
Fax: (905) 823-8503
E-mail: chium@mmm.ca

Tina White
MTO Senior Project Manager
Ministry of Transportation –Eastern Region
1355 John Counter Blvd., Postal Bag 4000
Kingston, Ontario K7L 5A3

Tel: 1-800-267-0295
Fax: (613) 540-5106
E-mail: tina.white@ontario.ca

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Tel: 1-877-998-9912
Fax: (613) 736-8710
E-mail: dickinsont@mmm.ca

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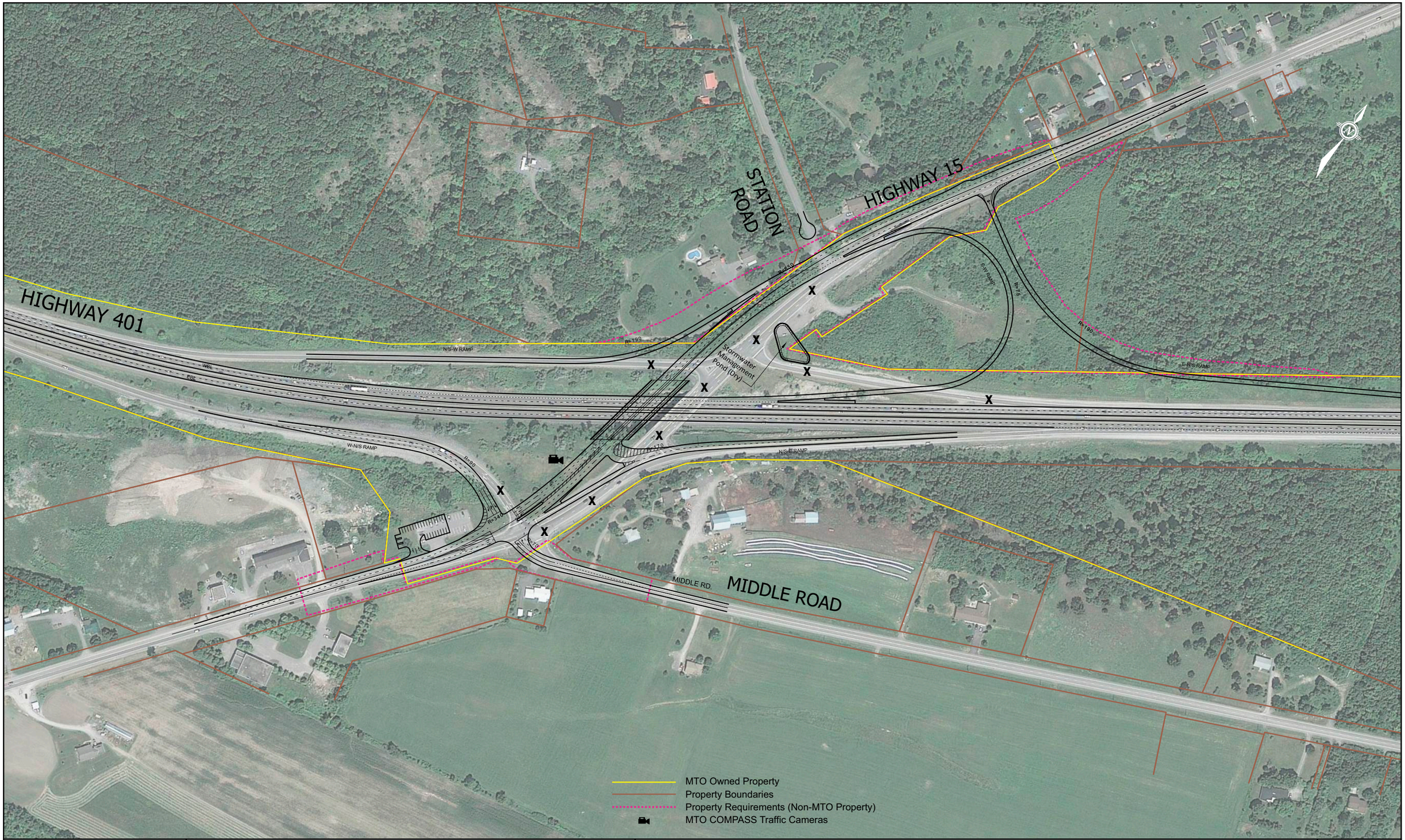
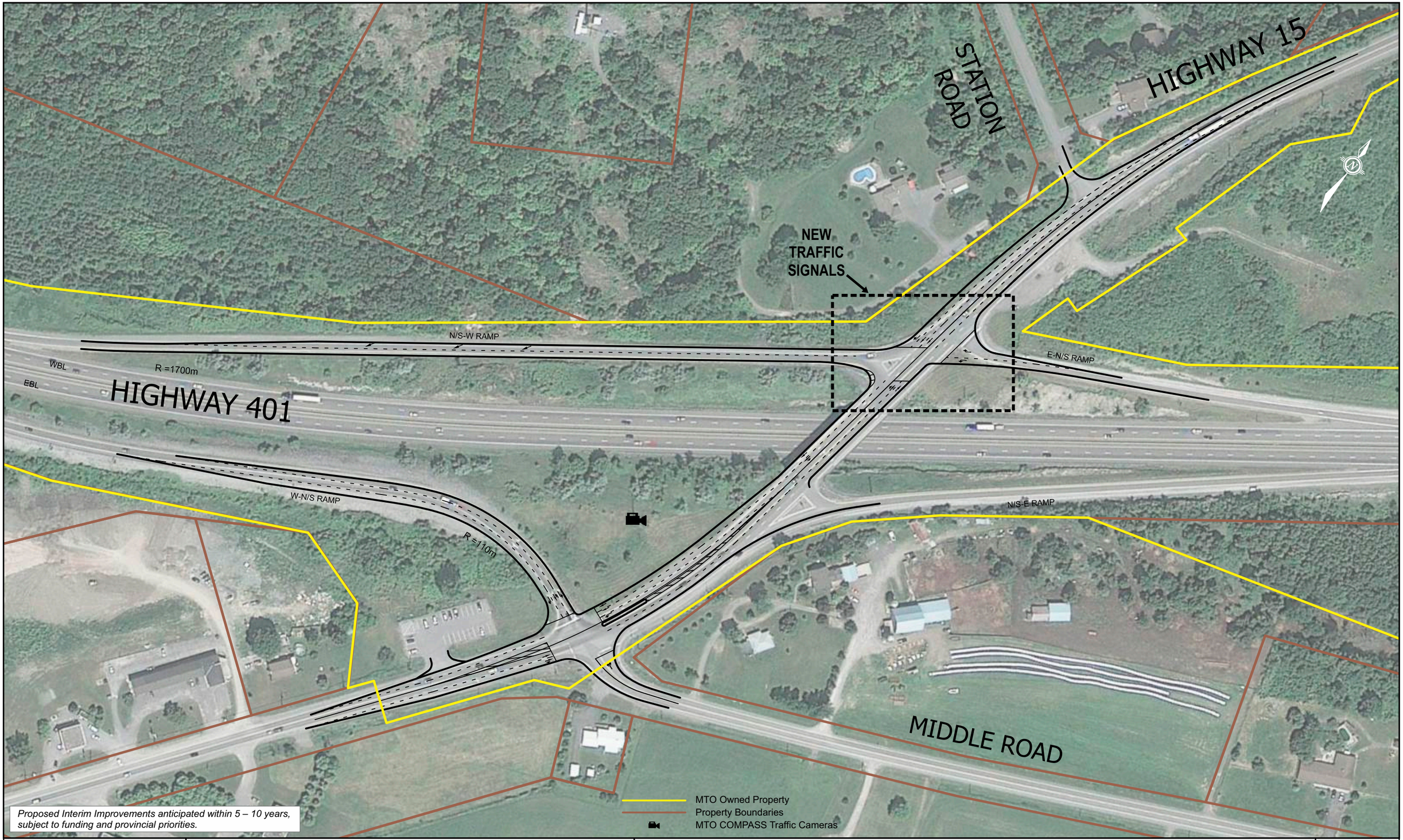
Ministry of Transportation – Eastern Region
1355 John Counter Blvd., Postal Bag 4000
Kingston, Ontario K7L 5A3

Tel: 1-800-267-0295
Fax: (613) 540-5106
E-mail: kevin.ogilvie@ontario.ca



MMM GROUP Ontario	G.W.P. 4059-11-00 Highway 401 Interchange Improvements Highway 15	**HIGHWAY 15 TECHNICALLY PREFERRED ALTERNATIVE (LONG TERM PLAN)**	Figure **1-3**



MMM GROUP Ontario	G.W.P. 4059-11-00 Highway 401 Interchange Improvements Highway 15	**HIGHWAY 15 PROPOSED INTERIM IMPROVEMENTS**	Figure **1-4**

2 ENVIRONMENTAL ASSESSMENT PROCESS

2.1 THE ONTARIO ENVIRONMENTAL ASSESSMENT ACT (OEAA) AND MTO CLASS ENVIRONMENTAL ASSESSMENT PROCESS

The Ministry of Transportation *Class Environmental Assessment for Provincial Transportation Facilities* (MTO Class EA) was approved under the *Ontario Environmental Assessment Act* (OEAA) in the fall of 1999 and amended in 2000. This planning document outlines the EA process that MTO has committed to follow for certain defined groups of projects and activities. Provided that this process is followed, projects and activities included under the MTO Class EA do not require formal review and approval under the OEAA.

The following principles underlie the MTO Class EA process:

- *Transportation engineering principles*

  The transportation engineering principles ensure that the project provides an *effective and safe transportation system*.

- *Environmental protection principles*

  The environmental protection principles ensure that the project provides *effective environmental protection*. Existing environmental conditions, sensitivities and environmental protection requirements were assessed and are documented in this TESR. Mitigation measures have been developed to avoid, prevent, and/or reduce any residual adverse effects.

- *External consultation principles*

  The consultation principles ensure that there is *effective consultation* with stakeholders early and throughout the study process. Throughout this study, local elected representatives, Aboriginal communities, provincial and federal agencies, local municipalities, interest groups, and members of the general public were encouraged to participate through a proactive consultation plan that included letters, newspaper notices, brochures and a Public Information Centre.

- *Evaluation principles*

  The evaluation principles ensure that an *effective evaluation* process is in place to provide a balance between transportation engineering and environmental protection principles and to fulfill the project goals. The evaluation process used to assess planning and design alternatives was traceable, replicable and understandable by those who may be affected by the decisions.

- *Documentation principles*

  The documentation principles ensure that there is *effective environmental documentation* and that the *opportunity to challenge the project* is provided. The environmental documentation required for this project is this Transportation Environmental Study Report, which will be filed for a 30-day public review period.

- *Bump-up principles*

  The bump-up process (i.e. a Part II order) for Group 'B' projects provides an appeal process to address unresolved concerns. Interested persons are encouraged to review this TESR and any individuals with serious concerns have the right to request that the Minister of the Environment "bump-up" this project. A Part II Order may lead to the preparation of an individual environmental assessment.

- *Environmental clearance principles* to proceed.

This study is being carried out in accordance with the approved planning process for Group 'B' projects. An overview of the Class EA process for Group 'B' projects is provided in **Figure 2-1**. As illustrated in **Figure 2-1**, this TESR is being submitted at the completion of the Preliminary Design phase. The next steps in the engineering design and Environmental Assessment process involve the completion of Detail Design, followed by construction subject to provincial funding and priorities. At the conclusion of Detail Design, a Design and Construction report will be prepared for public and stakeholder review to document how commitments to future work have been addressed and how recommended environmental mitigation measures will be implemented in Detail Design and construction.

As per the requirements of the MTO Class EA process, this TESR documents the following:

- The generation, assessment, evaluation, selection and development of the design alternatives;
- The transportation engineering and environmental issues and how they were incorporated into the environmental assessment program;
- The identified potential environmental condition changes, effects and commitments to mitigation measures;
- Commitments to further work, including any environmental effects monitoring that is required;
- The consultation program followed throughout the study; and
- The identification of all project approvals, licenses and permits which have been or must be obtained prior to construction.

The TESR will be filed for a 30-day public review period. If, after consulting with the Ministry, a person (or persons) have unresolved concerns with the recommended plan as documented in the TESR, they may request that the Minister of the Environment order MTO to comply with Part II of the OEAA and complete an individual environmental assessment.

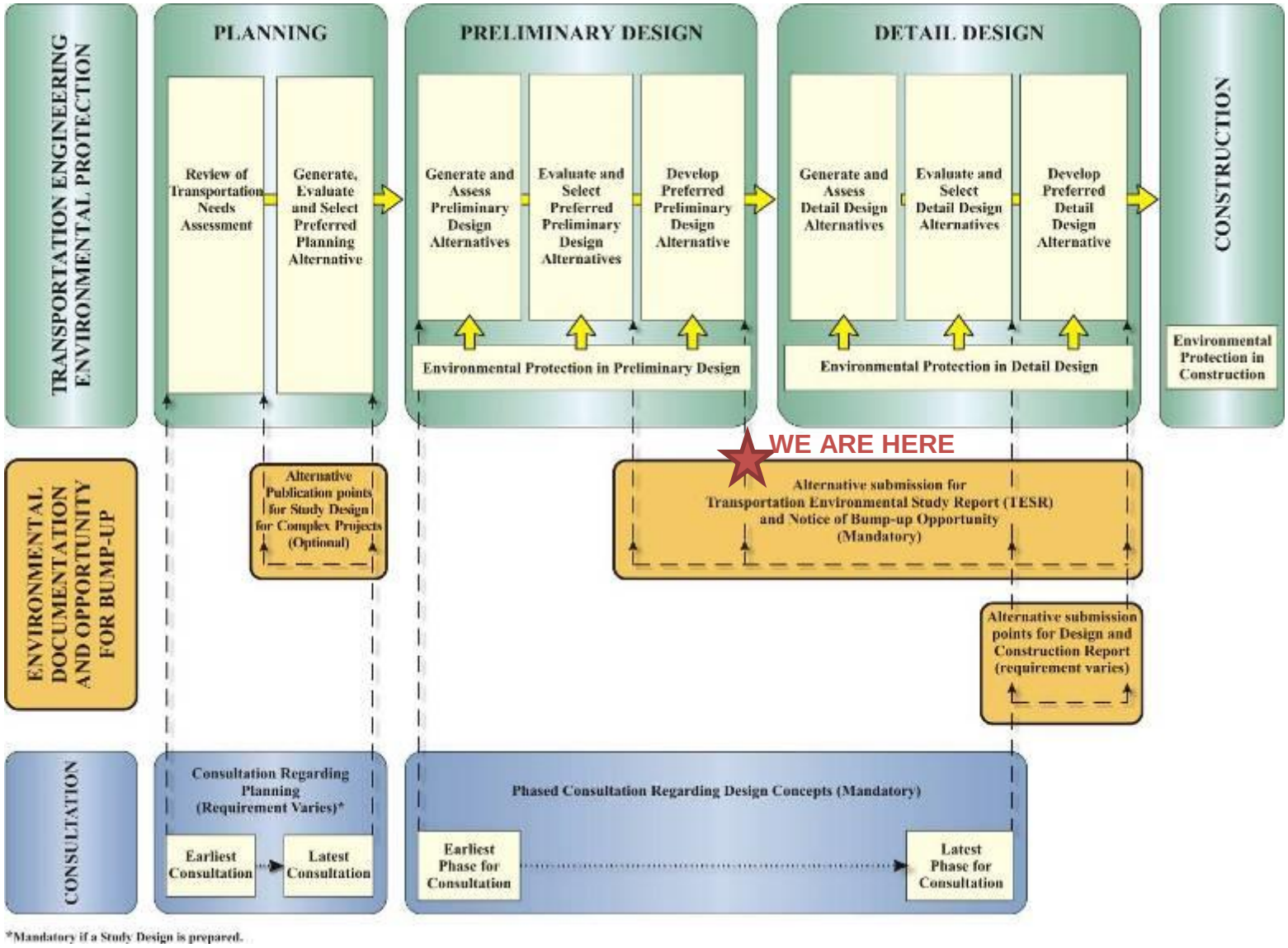


Figure 2-1: Overview of Class EA Process for Group 'B' Projects (MTO Class Environmental Assessment for Provincial Transportation Facilities, 2000)

2.2 CONSULTATION PROCESS

Consistent with the requirements for Group 'B' projects under the MTO Class EA, consultation with federal, provincial and municipal agencies, First Nations and Métis communities, local elected representatives, interest groups, and members of the public was on-going over the course of the study.

A comprehensive Consultation Plan was prepared to address the requirements of the MTO Class EA and placed emphasis on consultation with stakeholders and members of the public that have the potential to be most directly affected by the project. The Consultation Plan was designed to involve stakeholders and the public early and throughout the study, to identify public concerns and assist in the selection of a recommended plan.

Stakeholders and the public were kept informed of the study and were asked for input through the use of conventional, effective consultation methods including:

- Ontario Government Notices published in two local newspapers;
- Direct letter mailings and brochures mailed to nearby residents;
- Correspondence with external agencies and members of the public;
- Two Public Information Centres (PICs); and
- Filing of this Transportation Environmental Study Report (TESR) for public review.

2.2.1 EXTERNAL AGENCY CONSULTATION

2.2.1.1 *Study Contact List*

A contact list of local elected officials, First Nations and Métis communities, provincial and federal agencies, local municipal government, emergency services, utilities, school boards and interest groups was developed at the beginning of the study. Over the course of the study, any individuals or organizations expressing interest in the project were added to the contact list. The contact list includes the following individuals and organizations:

Local Elected Officials	MPP – Kingston and the Islands Mayor – City of Kingston Councillor – District 1 (Countryside) Councillor – District 2 (Loyalist-Cataraqui) Councillor – District 3 (Collins-Bayridge)
First Nations and Métis Communities and Organizations	Alderville First Nation Algonquins of Ontario Consultation Office Algonquins of Pikwakanagan First Nation Beausoleil First Nation (Christian Island) Chippewas of Georgina Island Chippewas of Rama First Nation (Mnjikaning) Curve Lake First Nation Hiawatha First Nation Métis Nation of Ontario Mississaugas of the Credit First Nation Mississaugas of Scugog Island First Nation Mohawks of the Bay of Quinte Mohawk Council of Akwesasne Moose Deer Point First Nation Northumberland Métis Council Shabot Obaadijwan First Nation Wahta Mohawks (Mohawks of Gibson)

	Coordinator, Williams Treaty First Nations
Provincial and Federal Government Agencies	Aboriginal Affairs and Northern Development Canada Ministry of the Environment Ministry of Tourism, Culture and Sport Ministry of Natural Resources and Forestry – Peterborough District Ontario Ministry of Aboriginal Affairs Canadian Forces Base Kingston Cataraqui Region Conservation Authority Ministry of Transportation – Goods Movement Office
Municipalities	Clerk – City of Kingston Manager, Traffic Division – City of Kingston Director, Transportation Services – City of Kingston Director, Public Works – City of Kingston Director, Planning and Development – City of Kingston Director, Engineering – City of Kingston Senior Planner, Heritage – City of Kingston Committee Clerk – Municipal Heritage Committee, Heritage & Urban Design Division Transit Service Project Manager – Kingston Transit Community Planner – County of Frontenac
Emergency Services	Ontario Provincial Police, Frontenac Detachment Kingston Police Kingston Fire & Rescue Frontenac Paramedic Services
Utilities	Allstream Bell Canada Cogeco Inc. Enbridge Gas Distribution Hydro One Rogers Communications Union Gas Utilities Kingston
School Boards	Algonquin and Lakeshore Catholic District School Board Conseil des écoles catholiques du Centre-Est Conseil des écoles publiques de l'Est de l'Ontario Limestone District School Board Tri-Board Student Transportation Services
Other Agencies / Interest Groups	Kingston Chamber of Commerce Frontenac Heritage Foundation Rideau Canal National Historic Site Ontario Trucking Association

2.2.1.2 ***Study Notification to External Agencies***

Study Commencement

Notification letters dated August 30, 2013 were sent to local elected officials, First Nations and Métis communities, provincial and federal agencies, local municipal government, emergency services, utilities, school boards and interest groups to announce the commencement of the preliminary design study.

These letters included an overview of the study process and contact information. The notices also noted the similar preliminary design and environmental assessment study being carried out concurrently for operational improvements to the Highway 401 / Kingston Road 38 interchange in the City of Kingston, which is documented in a separate TESR. A copy of the Study Commencement letter is provided in **Appendix A**.

Public Information Centre #1

Notification letters dated February 7, 2014 were sent to local elected officials, First Nations and Métis communities, provincial and federal agencies, local municipal government, emergency services, utilities, school boards and interest groups inviting them to attend the first Public Information Centre (PIC) held on Tuesday, February 25, 2014 (see **Section 2.2.2.2** for more information on the PIC). Local elected officials, First Nations and Métis communities, and external agency representatives were also invited to attend a one-hour session in advance of the PIC from 3:00 pm to 4:00 pm. This advance session was intended to provide agencies with the opportunity to discuss the project with Project Team representatives during regular business hours. The letters also included information regarding the first PIC for the concurrent Highway 401 / Highway 15 study, which was held on Wednesday, February 26, 2014. A copy of the PIC invitation letter is provided in **Appendix B**.

Public Information Centre #2

Notification letters dated January 23, 2015 were sent to local elected officials, First Nations and Métis communities, and on January 26, 2015, letters were sent to provincial and federal agencies, local municipal government, emergency services, utilities, school boards and interest groups inviting them to attend the second PIC held on Tuesday, February 10, 2015 (see **Section 2.2.2.2** for more information on the PIC). Local elected officials, First Nations and Métis communities, and external agency representatives were also invited to attend a one-hour session in advance of the PIC from 3:00 pm to 4:00 pm. This advance session was intended to provide agencies with the opportunity to discuss the project with the Project Team representatives during regular business hours. The letters also included information regarding the second PIC for the concurrent Highway 401 / Kingston Road 38 study, which was held on Wednesday, February 11, 2015. A copy of the PIC invitation letter is provided in **Appendix B**.

TESR Submission

Notification letters dated January 4 2016 were sent to local elected officials, First Nations and Métis communities, provincial and federal agencies, local municipal government, emergency services, utilities, school boards and interest groups announcing the submission of this TESR for a 30-day public review period. The letters identified the start and end dates for the TESR review period and the addresses and hours of operations for the review locations. A copy of the Notice of Submission letter is provided in **Appendix A**.

2.2.1.3 ***Comments Received from External Agencies***

A total of 20 comments were received from local elected officials, First Nations and Métis communities, provincial and federal agencies, local municipal government, emergency services, utilities, school boards and interest groups over the course of the study. A summary of all the comments received from external agencies and how they were addressed is provided in **Table 2-1**. Copies of all external agency correspondence received are included in **Appendix C**. Personal information has been redacted in accordance with the *Freedom of Information and Protection of Privacy Act*.

Table 2-1: Summary of External Agency Comments Received and How They Were Addressed

DATE / FORM OF CONTACT	AGENCY	COMMENTS RECEIVED	HOW IT WAS ADDRESSED / RESPONSE SENT
STUDY COMMENCEMENT			
Sept. 19, 2013 / Email	Alderville First Nation	• Advised that the project is located in Alderville First Nation traditional and treaty territory. • Interested in any archaeological findings, burial sites or any environmental impacts.	• Advised that we are undertaking ecological and archaeological investigations in the vicinity the interchange. Once completed, specialty reports will be available upon request.
Sept. 3, 2013 / Fax	City of Kingston, Engineering	• Advised that the City of Kingston is currently updating its Transportation Master Plan.	• No response required.
Sept. 6, 2013 / Email	Utilities Kingston	• Provided drawings indicating various City of Kingston / Utilities Kingston infrastructure in the vicinity of the interchange, on both sides of Highway 401 (street lights and associated wiring). • Identified that these utilities may be impacted depending on the extent of the work proposed and will require concurrence from Utilities Kingston prior to any relocation.	• Information regarding impacts to utilities was noted and considered in the evaluation of interchange improvement alternatives.
Sept. 9, 2013 / Fax	Conseil des écoles publiques de l'Est de l'Ontario	• Confirmed that the agency does not wish to participate in the study.	• No response required. • The agency was removed from the study contact list.
Sept. 12 & 16, 2013 / Email	Union Gas	• Confirmed that Union Gas has a 4" plastic gas main on Highway 15 approximately 80 m southwest of the Highway 401 interchange. • Subsequent correspondence provided	• The location of the main was noted.

DATE / FORM OF CONTACT	AGENCY	COMMENTS RECEIVED	HOW IT WAS ADDRESSED / RESPONSE SENT
		mapping and clarified that the main ends before the carpool parking lot. Union Gas has no facilities north of the 401 within the study area.	
Sept. 13, 2013 / Email	MNRF Peterborough District	• Provided background information related to fish and fish habitat data for Collins Creek and the Cataraqui River as well as Cataraqui Marsh wetland information. Also provided timing windows for in-water work and to protect hibernating turtles. • Requested that the information be considered during the preparation of TESR, and that the TESR be circulated to MNRF for further comment, as there are several provincially significant features in the vicinity of the interchange.	• No response required. • The background information and timing windows were incorporated into fish and fish habitat and terrestrial ecology reports, as well as the TESR. • MNRF will be notified of the 30-day TESR review period.
Sept. 24, 2013 / Email	Ministry of Culture, Tourism & Sport	• Inquired as to whether an archaeological assessment is planned. • Inquired as to the age of the interchange and whether a Cultural Heritage Evaluation Report would be prepared. • Inquired as to whether a separate study/report will examine built heritage resources and cultural heritage landscapes.	• Advised that Stage 1-2 Archaeological Assessments will be carried out in the interchange study area. The Stage 2 assessment will focus on areas of impact once a Technically Preferred Alternative has been identified. • The Highway 15 underpass was constructed in the mid-1950s and last rehabilitated in 1996. • A Cultural Heritage Evaluation Report (CHER) will be prepared as part of the EA study. • The archaeological assessment reports will be submitted to MTCS for their review upon completion.
Sept. 24, 2013 / Email	Councillor, Collins-Bayridge District	• Trees in the vicinity of the interchange should not be removed. • The interchange works well the way it is.	• Provided a summary of operational issues that have been noted, including significant queuing on Highway 15 and on the eastbound Highway 401 off-ramp.

DATE / FORM OF CONTACT	AGENCY	COMMENTS RECEIVED	HOW IT WAS ADDRESSED / RESPONSE SENT
			• In the evaluation of interchange improvement alternatives, consideration will be given to minimizing natural environmental impacts, including unnecessary clearing of vegetation.
Sept. 27, 2013 / Email	Distribution Manager, Tim Hortons Inc.	• Would like to be kept informed of any public information sessions on this project.	• Contact was added to the study contact list.
Oct. 1, 2013 / Email	Transportation Services / City of Kingston	• The City of Kingston may have an interest in a municipal park and ride at the Highway 15 interchange. If the city has an interest in a new park and ride, we will advise the study team.	• The information was noted. No further correspondence was issued.
Oct. 15, 2013 / Email	Goods Movement Office / Ministry of Transportation	• Would like to be kept informed as the study progresses.	• Contacts were added to the study contact list.
February 3rd 2014 / Email	Union Gas	• Provided new contact information.	• Study contact list was updated.
PUBLIC INFORMATION CENTRE #1			
Feb. 14, 2014 / Email	Vehicle Weights and Dimensions / Ministry of Transportation	• Referred all correspondence to MTO Goods Movement Office.	• Study contact list was updated.
Feb. 27, 2014 / Email	County of Frontenac	• Requested a copy of PIC display materials.	• A copy of PIC display materials was provided.
Feb. 25, 2014 / PIC Comment Sheet	SLH Transport	• Recommended that the maximum improvements possible should be completed on both the north and south sides to address immediate transportation	• Advised that MTO is aware that Long Combination Vehicles (LCVs) use the interchange, and LCV operations and geometric design requirements will be considered in the development and evaluation of all alternatives.

DATE / FORM OF CONTACT	AGENCY	COMMENTS RECEIVED	HOW IT WAS ADDRESSED / RESPONSE SENT
		concerns and to address future traffic volume requirements. • Requested that the analysis of alternatives consider the engineering prerequisites for Long Combination Vehicles used today for egress, exit ramps and turning radius for both Hwy 401 and Hwy 15.	• Explained that the recommended alternative would be the one that achieves the best balance between transportation performance, the ability to address long-term transportation needs, and cost, while minimizing impacts to residents / businesses and the environment.
Apr. 14, 2014 / Email	Ministry of Aboriginal Affairs	• Advised that the project is located in an area where the following First Nations and Métis communities may have existing or asserted rights or claims: • Algonquins of Ontario Consultation Office • Ottawa Region Métis Council • Métis Nation of Ontario	• Aboriginal community contacts provided were already included on the study contact list.
PUBLIC INFORMATION CENTRE #2			
Jan. 29, 2015 / Email	Aboriginal Affairs and Northern Development Canada	• Requested to be removed from the study contact list as AANDC official do not participate in environmental assessments that pertain to projects outside of reserve lands.	• The agency was removed from the study contact list.
Feb. 12, 2015 / Email	Ontario Trucking Association	• Kingston is a strategic location for both domestic and international trucking activity and is a key switch point for truck traffic operating in the Toronto-Montreal corridor. • OTA asks that proper consideration is given to the magnitude of trucking activity in the area, with an understanding of the industry's around the clock operating schedule.	• The proposed long-term improvements for each interchange will accommodate LCVs for all ramp movements (i.e., to/from all ramps to/from the north and south). The proposed interim improvements will maintain the currently approved LCV movements. • Commitments for mitigation measures to be implemented in Detail Design and during construction will include minimizing disruption to Highway 401 traffic and ramps, as well as impacts on the movement of LCVs through the work zone. Prior to construction and any road or ramp closures,

DATE / FORM OF CONTACT	AGENCY	COMMENTS RECEIVED	HOW IT WAS ADDRESSED / RESPONSE SENT
		• OTA respectfully requests the project team give consideration to the following: • That open lines of communication be maintained at all times between the construction contractor and the trucking industry, the MTO, the City of Kingston and the OPP; • That warning devices and sufficient signage be considered well in advance of construction zones along Hwy 401 alerting traffic to the ongoing work; • That sufficient lane widths be maintained in construction zones to safely facilitate all traffic, including over-size loads; • OTA also ask that consideration be given to transportation companies and their suppliers located in the area (fuel, restaurants, truck service facilities). to ensure access to Highway 401 is maintained .	the contractor will be required to notify stakeholders and members of the general public in advance.
Feb. 11, 2015 / Email	Cataraqui Region Conservation Authority	• The area south of the eastbound off ramp contains a tributary to the Cataraqui River, and is adjacent to the Cataraqui River Marsh ANSI.	• Efforts to minimize impacts to significant woodlands and natural features were made during the evaluation of alternatives and the refinement of the recommended plan. The Technically Preferred Alternative will have impacts on the significant woodland in the northeast quadrant; however, impacts are anticipated to be restricted to the edge of the woodland. • Watercourses were assessed and potential impacts to fish and fish habitat were considered in the evaluation of interchange improvement alternatives. • Standard mitigation measures, including adherence to

DATE / FORM OF CONTACT	AGENCY	COMMENTS RECEIVED	HOW IT WAS ADDRESSED / RESPONSE SENT
			timing windows for in water work and the implementation of erosion and sedimentation control measures during construction are anticipated to minimize the risk of causing serious harm to fish.
Mar. 2, 2015 / Email	Mohawks of the Bay of Quinte	• Mohawks of the Bay of Quinte has an interest in all projects occurring in our traditional territory. We are also interested if the preliminary archaeological investigations identified the potential for artifacts or burial remains. There is a traditional process that must be followed for the repatriation or re-internment of remains. • To determine our level of interest in your proposed project, please provide the following documentation: o Environmental reports and assessments; o Archaeological reports and assessments; and o Any comments provided by involved government parties (i.e. the Ministry of Natural Resources and Forestry; Ministry of the Environment; Department of Fisheries and Oceans; Environment Canada; Indian and Northern Affairs; etc.).	• Specialty reports were provided to Mohawks of the Bay of Quinte once finalized.
Mar. 4, 2015 / Email	Ministry of Tourism, Culture and Sport	• Would like an update on the status of the Stage 1-2 Archaeological Assessment and the Cultural Heritage Evaluation	• The Stage 1 Archaeological Assessment was completed for both interchanges in 2014. The Stage 1 assessment found that areas outside of the existing highway and road rights-

DATE / FORM OF CONTACT	AGENCY	COMMENTS RECEIVED	HOW IT WAS ADDRESSED / RESPONSE SENT
		Report.	of-way have archaeological potential, and that any areas to undergo subsurface disturbances require a Stage 2 assessment. • The Stage 2 Archaeological Assessment will be completed in summer 2015. Upon being finalized, reports will be submitted to MTCS. • A Cultural Heritage Evaluation Report was completed for the Highway 15 underpass, and concluded that the structure does not have cultural heritage value or interest.

2.2.2 PUBLIC CONSULTATION

2.2.2.1 *Notice of Study Commencement*

A Notice of Study Commencement was published in the following local newspapers to inform the general public of study commencement and to solicit questions, concerns, and pertinent information:

- Kingston Whig Standard (English and French) – Thursday, September 5, 2013
- Kingston EMC (English and French) – Thursday, September 5, 2013

At the same time, a study commencement brochure providing details about the study and the Class EA process was distributed via Canada Post Unaddressed Admail to potentially affected residents and businesses in a catchment area within 2.5 kilometres of the interchange.

Potentially impacted property owners in the immediate vicinity of the interchange received letter notifications by direct mail to inform them of study commencement and advise that members of the Project Team would be conducting an inventory of existing conditions in the study area.

Fifteen (15) comments were received from the public in response to the Study Commencement notification. In general, these comments provided observations, considerations and suggestions regarding interchange operations and area traffic volumes.

Copies of the newspaper notices, brochures, and direct letter mailings to potentially impacted property owners are included in **Appendix A**. All comments received from the general public in response to the study commencement notification are summarized in **Table 2-2**.

2.2.2.2 *Public Information Centres*

Public Information Centre #1

The first of two Public Information Centres (PICs) for this project was held on Tuesday, February 25, 2014 at the Rideau Acres Campground banquet hall (1014 Cunningham Road, Kingston, Ontario) from 4:00 pm to 8:00 pm to provide an opportunity for stakeholders and members of the general public to review and comment on the project, the study area existing conditions, the long list of interchange improvement alternatives, and the short list of interchange improvement alternatives. In order to ensure general public awareness and invite anyone with an interest in the project to attend the PIC, a notice was published in the following local newspapers:

- Kingston Whig Standard (English and French) – Tuesday, February 11, 2014
- Kingston EMC (English and French) – Thursday, February 13, 2014

In addition to the newspaper notices, targeted letter and brochure notifications were sent to property owners, businesses and the general public in the vicinity of the interchange to notify them of the PIC.

PIC notification letters were distributed to local elected officials, First Nations and Métis communities on Friday, February 7, 2014.

Potentially impacted property owners received a PIC notification letter dated February 7, 2014 which also included drawings of the short-listed interchange improvement alternatives and an invitation to meet with the Project Team prior to the PIC to discuss potential impacts to their property. One property owner responded to the invitation for an advance meeting, which was held on Monday, February 24, 2014.

Project Team members in attendance included the MTO Project Manager, Environmental Planner, and Property representative, and the Consultant Assistant Project Manager. Approximately 8 other potentially impacted property owners attended the meeting.

A PIC notification brochure was sent to approximately 3,700 nearby residential and business and addresses via Canada Post Unaddressed Admail on February 10, 2014.

Members of the Project Team, including bilingual team members, were available at the PIC to discuss the project and answer any questions.

Thirty-one (31) individuals signed the register at the PIC and were encouraged to complete comment sheets. No comment sheets were submitted at the PIC; however, two (2) comments were provided in response to the PIC notification, and an additional eleven (11) comments were submitted following the PIC. The majority of comments identified issues with traffic operations in the area or expressed concern regarding potential impacts of the interchange modifications to private properties.

A copy of the first PIC Summary Report, including copies of notification letters to potentially impacted property owners and members of the public, the brochure, PIC display materials, and comments received, is provided in **Appendix B**.

Public Information Centre #2

The second of two PICs for this project was held on Tuesday, February 10, 2015 at the Rideau Acres Campground banquet hall (1014 Cunningham Road, Kingston, Ontario) from 4:00 pm to 8:00 pm to provide an opportunity for stakeholders and members of the general public with an opportunity to review and comment on the recommended interchange improvement. A notice was published in the following local newspapers:

- Kingston Whig Standard (English and French) – Tuesday, January 27, 2015
- Kingston EMC (English and French) – Thursday, January 29, 2015

In addition to the newspaper notices, targeted letter and brochure notifications were sent to property owners, businesses and the general public in the vicinity of the interchange to notify them of the PIC.

PIC notification letters were sent to local elected official, First Nations and Métis communities on Friday, January 23, 2015.

Letters were sent on January 26, 2015 to directly impacted property owners and the general public.

A PIC notification brochure was sent to approximately 3,700 nearby residential and business addresses via Canada Post Unaddressed Admail on January 30, 2015.

Twenty-nine (29) individuals signed the register at the PIC and were encouraged to complete comment sheets. Six (6) comment sheets were received. An additional three (3) comments were submitted in advance of the PIC and four (4) comments following the PIC. Comments received were regarding traffic operations and cycling facilities in the area and wildlife mitigation measures for the recommended intersection modifications.

A copy of the second PIC Summary Report, including copies of notification letters to property owners, the brochure, PIC display materials, and comments received, is provided in **Appendix B**.

2.2.2.3 ***Impacted Property Owner Consultation***

Notification letters dated December 11, 2014 were sent to property owners to advise them of the Technically Preferred Alternative and to identify property requirements. The letters indicated that a portion

of the recipient's property would be required for the implementation of the Technically Preferred Alternative. The letter included a drawing of the Technically Preferred Alternative, including property requirements and an invitation to meet with the Project Team in advance of the February 2015 to discuss the property impacts in greater detail.

2.2.2.4 *City of Kingston Consultation*

The Project Team consulted with representatives of the City of Kingston throughout the study to provide study status updates and coordinate the proposed preliminary design plans with approved, ongoing and/or proposed municipal infrastructure and development plans within the study area.

Several meetings occurred during the study:

- Meetings were held (February 4, 2014 / December 17, 2014) between the project team and City of Kingston transportation representatives. The purpose of these meetings was to provide study status updates and discuss the project prior to both Public Information Centres (PICs).
- City of Kingston representatives attended both PICs, detailed in **Section 2.2.2.1 and Section 2.2.2.2.**
- MMM Group attended a council meeting (May 19, 2015) to provide a study overview, update on status and present the Technically Preferred Alternative.

2.2.2.5 *TESR Submission*

Notification letters dated January 4 were sent to the study mailing list announcing the submission of the TESR for a 30-day public review period. The letters identified the start and end dates for the TESR review period and the addresses and hours of operations for the review locations. Copies of the notification letters are provided in **Appendix A**.

2.2.2.6 *Comments Received from Members of the Public*

Table 2-2 provides a summary of all comments received from members of the public and how they were addressed. A total of thirty-four (34) comments were received from members of the public over the course of the study. Copies of these comments are included in **Appendix C**. Personal information has been redacted in accordance with the *Freedom of Information and Protection of Privacy Act*.

Table 2-2: Summary of Public Comments Received and How They Were Addressed

Date	Comments Received	How it was addressed
STUDY COMMENCEMENT		
Sept. 13, 2013 / Phone	• Expressed issues with speeding and U-turns.	• Concerns were noted and considered during the traffic analysis.
Sept. 13, 2013 / Phone	• Does not consider the current intersection dangerous, but understands we need to look to the future.	• MTO responded to the comment by phone.
Sept. 15, 2013 / Email	• Noted that the heaviest flow of traffic is heading north on Hwy 15 to access the west-bound Highway 401 ramp. This traffic is greater than the traffic continuing north of Highway 15 or accessing Highway 401 eastbound. • The greatest point of congestion, especially morning rush hour, is traffic turning left from northbound Hwy 15 to the west-bound Hwy 401 on-ramp. A second point of congestion is the traffic light at the Hwy 15, Middle Rd. intersection. • The east-bound off-ramp from Hwy 401 is a point of congestion, particularly in evening rush hour, where occasionally it backs up onto Highway 401. • Having north-bound Highway 15 traffic access west-bound Hwy 401 with a right turn would alleviate congestion, instead of the present left-turn. • A traffic circle to replace the traffic light and intersection at the Highway 15, Middle Rd. intersection would allow a more continuous flow.	• Observations were noted and considered during the traffic analysis and development / evaluation of alternatives.
Sept. 17, 2013 / Phone	• Noted an issue with vehicles not stopping on a red light when turning right at the Highway 401 eastbound off ramp terminal at Highway 15. • Traffic also turns down Middle Road thinking it is the on-ramp for Highway 401.	• Noted these observations during the traffic analysis and development / evaluation of alternatives.

Date	Comments Received	How it was addressed
Sept. 21, 2013 / Email	• Noted that since the repaving last year the traffic light timing seems different.	• Comments were noted and passed along to MTO traffic section.
Sept. 23, 2013 / Phone	• Expressed concerns about the operation of the W-N/S ramp; a dedicated right-turn lane should be added, as the existing through/right lane is congested and it takes multiple signal cycles to go through to Middle Rd. • Currently, people are using the shoulder to pass stopped traffic on the ramp to turn right at the ramp terminal (to go southbound on Hwy 15). • Queues back up along the ramp onto Hwy 401 and affect Hwy 401 live lanes.	• Observations were noted and considered during the traffic analysis and development / evaluation of alternatives.
Sept. 24, 2013 / Email	• Noted that there is a bottleneck at the intersection of the Highway 401 eastbound off-ramp and Highway 15. This causes traffic to be backed up all the way down the exit ramp and sometimes onto the 401. • This situation could be improved if there were three turn lanes at the intersection. One to turn left or northbound, one to go right or south and the third to go straight through onto Middle Road.	• Observations were noted and considered during the traffic analysis and development / evaluation of alternatives.
Sept. 26, 2013 / Email	• Noted that in the current configuration there is a lack of a clear "right of way" for northbound traffic of Highway 15 making a left turn onto the Highway 401 ramp versus southbound traffic on Highway 15 also entering the ramp. • This results in some very close calls and I assume at times collisions, which may be easily avoided if a simple "yield" sign was put in place. • A lack of clarity at this interchange and the dangers posed may be further enhanced by the volume of commercial traffic, an increased tourist presence in this particular area of the city	• Observations were noted and considered during the traffic analysis and development / evaluation of alternatives.

Date	Comments Received	How it was addressed
	and the fact that a great number of military personnel reside between this interchange and the local CFB less than 3 km to the south.	
Oct. 8, 2013 / Email	• Noted that this area is a very active farming area with farm equipment moving through this intersection. • It seems this is a very popular location for cyclists as well. • The interchange benefit from signage indicating the presence of both groups. • This intersection will only get busier with Base Kingston and the new Subdivisions being planned. Planning for the future expansion hopefully is in the works as well with turning lanes.	• Observations were noted and considered during the development / evaluation of alternatives.
PUBLIC INFORMATION CENTRE #1		
Feb. 25, 2014 / PIC Comment Sheet	• Expressed that the alternatives were very vague, with no clear answers as to the amount of land required. • Expressed that alternatives on the north side have fewer impacts to residents, and that the farm on the south side has been adversely affected for over 60 years. • Inquired if there have been any discussions with the City of Kingston regarding the widening of Highway 15. • Expressed that Alternatives SBH1 & 2 have a significant impact on 5 homes, including the elimination of a family farm. Suggested that having the intersection to the west keeps traffic away from existing homes. • Expressed concerns regarding roundabouts due to transport trucks, snowploughs, frequent emergency vehicles and noise.	• A response was not provided as the comment was received without contact information.
Feb. 18, 2014 / Email	• Expressed a safety concern that occurs where southbound vehicles on Highway 15 turn right (to head westbound on	• Observations were noted and considered during the development / evaluation of alternatives.

Date	Comments Received	How it was addressed
	Highway 401) have the right of way, while northbound vehicles also turn onto the same westbound ramp. • There is confusion over who has the right of way and as a result, vehicles make quick stops and abrupt manoeuvres. • Suggested that an unobstructed entrance onto the 401 westbound on-ramp is needed. • Suggested that traffic northbound on Highway 15 traffic could benefit from a dedicated left turn lane to access the 401 westbound on-ramp. • Expressed that there are no problems exiting 401 eastbound and heading north or south on Highway 15. • Expressed that the interchange at Highway 15 and John F. Scott / Kingston Mills Road is more problematic.	• Comments regarding John F. Scott Road / Kingston Mills Road were forwarded to the City of Kingston for their consideration.
Feb. 27, 2014 / Mail	• Expressed a safety concern for visibility of the highway travel lanes from the westbound onramp, and for the length of the westbound onramp merge lane. Visibility is compromised due to the angle of entry and obstructed by the rock cut and vegetation between the on-ramp and travel lanes. Visibility for drivers is obstructed until the end of the ramp where it meets the highway travel lanes. • Recounted a serious collision at the end of the merge lane that occurred because the driver's visibility was compromised and merging was blocked by two transport trucks travelling side by side. • Suggested extending the merge lane and removing or lowering the rock cut and vegetation alongside the on-ramp.	• Observations were noted and considered during the development / evaluation of alternatives.
Feb. 28 2014 / Mail	• Provided details regarding property impacts resulting from the previous relocation of the Highway 401 eastbound off-ramp to a controlled intersection with Middle Road.	• The issues are associated with previous works at the Highway 15 interchange and were referred to the MTO Contract Management Office.

Date	Comments Received	How it was addressed
Mar. 10 2014 / Email	• Expressed concern regarding property and farm impacts. • Expressed concerns about property values, well and water supply and wildlife.	• Impacts to private homes and businesses are an important consideration in the planning process and are given significant weighting in the evaluation of alternatives. • Upon selection of a Technically Preferred Alternative, a mitigation plan was prepared which will address impacts to private property, built heritage resources, businesses, terrestrial and aquatic wildlife and habitat, noise and private wells in the area.
Mar. 10, 2014 / Email	• Expressed concern regarding property and farm impacts.	• Impacts to private homes and businesses are an important consideration in the planning process and are given significant weighting in the evaluation of alternatives.
Mar. 10, 2014 / Fax	• Expressed concern regarding property and farm impacts. • Expressed concerns regarding increased traffic, noise, and light pollution. • Concerns regarding the potential use of blasting and impacts to well and septic systems.	• Impacts to private homes and businesses are an important consideration in the planning process and are given significant weighting in the evaluation of alternatives. • Upon selection of a Technically Preferred Alternative, a mitigation plan was prepared which will address impacts to private property, built heritage resources, businesses, noise, and private wells in the area.
Mar. 11, 2014 / Fax	• Expressed concern regarding property and farm impacts. • Expressed that the timeline provided to review the proposed alternatives and make comments was not sufficient. • Noted that they are unaware of any notable accidents due to operational issues. Requested a copy of the study conducted which supports the need for improvements at this location in order to understand why these improvements are needed.	• Impacts to private homes and businesses are an important consideration in the planning process and are given significant weighting in the evaluation of alternatives. • Noted that copies of the Existing Conditions and Deficiencies Report and an Existing Traffic Operations Report are available upon request. • Provided an explanation of future consultation and / or

Date	Comments Received	How it was addressed
	• Provided detailed comments regarding property impacts and other concerns related to alternatives SW1, SBH1 & SBH2, SD2, SD3, S-PA1.	meeting opportunities over the course of the study.
Mar. 12, 2014 / Email	• Expressed concern regarding property and farm impacts. • Noted that there are fewer alternatives impacting the vacant land in the northeast quadrant. • Requested further information about the research done to better understand the necessity for this project.	• Impacts to private homes and businesses are an important consideration in the planning process and are given significant weighting in the evaluation of alternatives. • Noted that copies of the Existing Conditions and Deficiencies Report and an Existing Traffic Operations Report are available upon request.
PUBLIC INFORMATION CENTRE #2		
Feb. 3, 2015 / Email	• Noted that they frequently use the interchange and have not observed any of the problems addressed through this study. • Concerned about the expense of addressing what is a non-existent problem.	• Noted that operational deficiencies associated with the existing interchange include queuing along Highway 15 and the Highway 401 eastbound off-ramp, and the need for geometric improvements for the Highway 401 on-ramps. • Noted that the Technically Preferred Alternative represents a long-term plan for improvements and that anticipated growth in traffic volumes using this interchange has been considered to ensure that the recommended plan can address future needs.
Feb. 4, 2015 / Email	• The left hand turn lane onto the Highway 401 westbound on-ramp is very dangerous for vehicles travelling northbound on Highway 15, especially during morning commutes. • Signals at this location should be expedited.	• Noted that the interim improvements recommend the installation of traffic signals at the north ramp terminal, as well as reconfiguration of the on- and off-ramps to form a single intersection. • In the long term, a new loop ramp is recommended in the northeast quadrant to allow northbound traffic on Highway 15 to access westbound Highway 401. This new loop ramp will eliminate the need for the current left-turn

Date	Comments Received	How it was addressed
		movement from Highway 15 and in turn, the traffic signals installed in the interim north of Highway 401. • Traffic signals will be retained at the eastbound Highway 401 off-ramp/Middle Road intersection in both the interim and long term.
February 4, 2015 / Email	• Purpose of this email is to advise that the westbound left hand turn onto 401 ramp by vehicles northbound on Hwy 15 is a very deadly affair, especially during morning commute • Signals at this location should be expedited.	• Noted that the interim improvements recommend the installation of traffic signals at the north ramp terminal, as well as reconfiguration of the on- and off-ramps to form a single intersection. • In the long term, a new loop ramp is recommended in the northeast quadrant to allow northbound traffic on Highway 15 to access westbound Highway 401. This new loop ramp will eliminate the need for the current left-turn movement from Highway 15 and in turn, the traffic signals installed in the interim north of Highway 401.
Feb. 10, 2015 / PIC Comment Sheet	• Underground wildlife crossing tunnels would help to decrease frequency of road kill.	• Noted that an assessment of impacts to the natural environment associated with recommended interchange improvements has been conducted. It is recommended that exclusionary fencing be installed to prevent turtles and other small animals from nesting on the ramp or crossing the roadway. • The fencing will be designed to redirect wildlife to existing drainage culverts under Highway 401.
Feb. 10, 2015 / PIC Comment Sheet	• Expressed concerns regarding the closure of Station Road at Highway 15. • Station Road is used by local residents and non-residents proceeding to Kingston Mills Road and points beyond as well as emergency service vehicles.	• Due to the location of the recommended on-ramp in the northwest quadrant, it is not possible to maintain access following the implementation of the improvements to the interchange. • Realignment of Station Road and the on-ramp were both examined, but were found to not be feasible due to significant private property impacts.

Date	Comments Received	How it was addressed
Feb. 10, 2015 / PIC Comment Sheet	• Put in stop lights at the off-ramp of Hwy 401 eastbound.	• As part of the recommended long-term and interim plans for improvements to the interchange, traffic signals will be retained at the terminal of the Highway 401 eastbound off-ramp. As part of the interim improvements, we have recommended the installation of traffic signals at the north ramp terminal, as well as reconfiguration of the on- and off-ramps to form a single intersection. • In the long term, a new loop ramp is recommended in the northeast quadrant to allow northbound traffic on Highway 15 to access westbound Highway 401. This new loop ramp will eliminate the need for the current left-turn movement from Highway 15 and in turn, the traffic signals installed in the interim north of Highway 401.
Feb. 10, 2015 / PIC Comment Sheet	• Requested fencing to prevent turtles from getting onto the highway and ramps. • Asked whether there been sufficient consideration of cyclist needs. Many cyclists use Middle Road and may wish to continue north. The bridge must safely accommodate them. Consider a raised cycling path. • Requested a 3m path for cyclists on Station Road.	• Due to its proximity to the Cataraqui River marsh, we have recommended that exclusionary fencing be installed to prevent turtles and other small animals from nesting on the ramp or crossing the roadway. The fencing will be designed to redirect wildlife to existing drainage culverts under Highway 401. • The Preliminary Design for the replacement of the Highway 15 Bridge includes a 2 metre paved shoulder in each direction over the new structure. This is consistent with the paved shoulder width typically provided to accommodate cyclists in rural areas. • Due to the location of the recommended on-ramp in the northwest quadrant, it is not possible to maintain access to Station Road following the implementation of the improvements to the interchange.
February 10, 2015 / Comment Sheet	• Thank you for all the work invested in preparing alternative proposals, and keeping the community stakeholders fully	• No response required.

Date	Comments Received	How it was addressed
	informed and consulted	
February 10, 2015 / Comment Sheet	• Expressed concerns regarding closure of Station Road as it is used for movement of farm equipment.	• Due to the location of the recommended on-ramp in the northwest quadrant, it is not possible to maintain access to Station Road following the implementation of the improvements to the interchange.

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3 EXISTING ENVIRONMENTAL CONDITIONS

3.1 TERRESTRIAL ENVIRONMENT

3.1.1 METHODOLOGY

Background information regarding the natural environment in the study corridor was drawn from:

- Aerial mapping of the study area;
- The Land Information Ontario (LIO) database;
- Wetland Summary Report, Peterborough District MNRF (2013);
- City of Kingston Official Plan (OP) (2013);
- Query of MNRF's Natural Heritage Information Centre (NHIC) database; and
- Consultation with the MNRF Peterborough District to gather existing terrestrial and aquatic information in the vicinity of the study area, and to determine the potential for Species at Risk (SAR).

Significant natural environmental work has been completed previously in the study area. A review of the following previously completed reports was conducted:

- Terrestrial Ecosystems Impact Assessment Report (IAR), Detail Design, Highway 401 Expansion from 600 m West of Montreal Street to Cataraqui River (2012);
- Preliminary Design Report, Highway 401 Widening from West of County Road 38 to Highway 15 (PDR) (2001); and
- Wildlife Mortality Study on Highway 401 from Sydenham Road to Highway 15, LGL Associates (2007).

Site investigations were conducted on September 12 and 13, 2013 to assess existing terrestrial ecosystems and wildlife. Weather conditions were rainy and overcast.

The terrestrial field investigation focused on assessing vegetation and wildlife habitat characteristics within the study area. For the purposes of field investigations, the study area was defined as the area extending approximately 50m from the edges of the preliminary interchange improvement alternatives with the largest footprint impacts. Vegetation communities were classified and mapped according to the Ecological Land Classification (ELC) system for Southern Ontario.

The full Terrestrial Ecosystem Existing Conditions and Impact Assessment Report is available in **Appendix D.**

3.1.2 VEGETATION

The lands within the study area are primarily a mix of forest, open cultural communities, and built areas, with smaller amounts of wetland and active agricultural land uses. The majority of the existing ROW lands are occupied by open, maintained old-field meadow (or cultural meadow) (CUM) communities, residential lawns, urban uses, or agricultural fields. Old-field meadow communities occur both on shallow (CUM2) and deeper soils (CUM1-1), but generally contain a similar species composition consisting of a mix of common grasses and other herbaceous plants.

There are a number of designated natural areas within the vicinity of the study area and these are discussed in detail below.

One Provincially Significant Wetland (PSW), the Greater Cataraqui Marsh, is found near the study area. This PSW is a coastal wetland comprised of marsh habitat. It occurs outside the study area, approximately 350 m from the western edge. Habitat values include nesting areas for colonial waterbirds, winter cover for aquatic furbearers, waterfowl staging and production, migratory passerine and shorebird

stopover areas, and significance for fish spawning and rearing. Eight provincially significant species also contributed to the designation of this wetland as a PSW.

Two Areas of Natural and Scientific Interest (ANSIs) are located within the study area: the Cataraqui River Marsh Provincially Significant Life Science ANSI and the Kingston Site No. 1 Regionally Significant Earth Science ANSI. The Cataraqui River Marsh ANSI is part of the Provincially Significant Wetland. The Kingston Site No. 1 Regionally Significant Earth Science ANSI is a rock outcrop located north of Highway 401 between the westbound on-ramp and the highway.

Significant Woodlands identified through the Central Cataraqui Region Natural Heritage Study (2006) were adopted by the City of Kingston and are mapped in the 2013 Official Plan. Significant woodlands have been identified within all 4 quadrants of the interchange. No Significant Wildlife Habitat has been identified in the study area.

Seventeen (17) natural and cultural vegetation units were delineated within the study area, consisting of a total of sixteen (16) different ELC vegetation types (i.e. some delineated units have the same ELC vegetation type). All of these community types are considered common in the province.

The most commonly encountered species in the study area include Awnless Brome (*Bromus inermis ssp. inermis*), Tall Goldenrod (*Solidago altissima*), knapweed (*Centaurea spp*.), Chicory (*Cichorium intybus*), Common Milkweed (*Asclepias syriaca*), Wild Carrot (*Daucus carota*), Bird's-foot Trefoil (*Lotus corniculatus*), and Poverty Oat-grass (*Danthonia spicata*). Common Juniper (*Juniperus communis*) and Staghorn Sumac (*Rhus typhina*) along with other deciduous trees and shrubs are occasionally scattered throughout these open areas. The vegetation communities found within the site are indicated on the map in **Figure 3-1** and described in detail in **Table 3-1**.

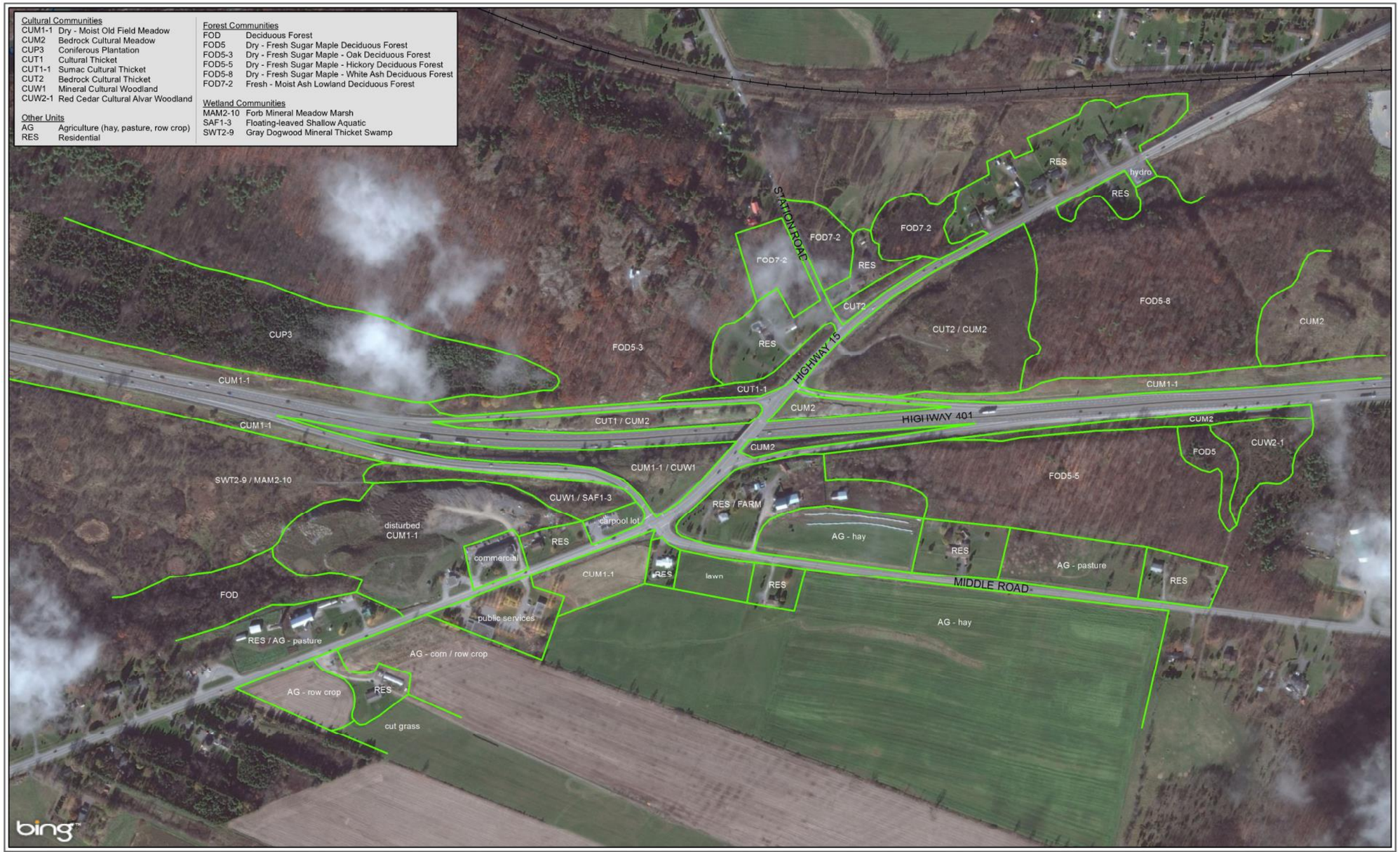


Figure 3-1: Existing Vegetation Communities in the Study Area

Table 3-1: Description of Existing Vegetation Communities in the Study Area

Vegetation Community	Description
CUM1-1/CUW: Dry – Moist Old Field Meadow with a Cultural Woodland inclusion	This unit consists of a dense ground layer of common cultural meadow species, as identified above, with a woodland inclusion confined primarily to the northern slope. Trees consisted mainly of young Olive (*Elaeagnus spp*) and American Elm (*Ulmus americana*) with a patchy understory of Amur maple (*Acer ginnala*), Staghorn Sumac, and Gray Dogwood.
CUP3: Coniferous Plantation	This unit is a mid-age mixed coniferous plantation with no ground vegetation or understory. The most abundant species is Black Spruce, with White Pine, Balsam Fir, Scotch Pine and American Elm associates.
CUT1-1: Staghorn Sumac Mineral Cultural Thicket	The dominant vegetation layer in this unit is the dense shrub layer, which consists mainly of Staghorn Sumac with some scattered overtopping mid-age to young deciduous trees such as American Elm, ash (*Fraxinus sp.),* and Norway Spruce (*Picea abies*). Ground vegetation is made up of old-field meadow species.
CUT2: Mineral Cultural Thicket Ecosite	This unit, located south of a residence just northeast of the interchange, is a narrow band made up of scattered deciduous trees overtopping a dense shrub layer of Staghorn Sumac and Common Lilac (*Syringa vulgaris*). Grass species and Field Goldenrod (*Solidago nemoralis ssp. nemoralis*) are the most abundant species in the ground layer. Patches of exposed bedrock were observed.
CUT1/CUM2: Mineral Cultural Thicket Ecosite and Bedrock Cultural Meadow Ecosite complex	This unit is a small Staghorn Sumac thicket with ground vegetation consisting of species typical of cultural meadows, as described above.
CUT2/CUM2: Bedrock Cultural Thicket Ecosite with a Bedrock Cultural Meadow inclusion	This community consists mainly of a very dense layer of Common Lilac with a small Bedrock Cultural Meadow inclusion in its interior. Staghorn Sumac and other deciduous trees occur at the edges. Soil depth as observed from the roadside is 20cm or less.
CUW1/SAF1-3: Mineral Cultural Woodland Ecosite with a Floating-leaved Shallow Aquatic (SAF1-3) inclusion	This unit is made up of patches of open CUM1-1 habitat and denser tree/shrub cover, giving an overall woodland cover of approximately 50%. Common tree species include Siberian Crabapple (*Malus baccata*), Balsam Poplar (*Populus balsamifera*), Staghorn Sumac and Manitoba Maple (*Acer negundo*). The community is located on a slope with a seepage area near its base where herbaceous species such as Orange Jewelweed (*Impatiens capensis*) and Climbing Nightshade (*Solanum dulcamara*) abound. The seep waters collect and flow to a small pond (SAF1-3) inclusion dominated by Lesser Duckweed (*Lemna minor*).

Vegetation Community	Description
CUW2-1: Red Cedar Cultural Alvar Woodland Type	This unit is a small relatively open community with Red Cedar (*Juniperus virginiana*) as the most abundant tree species followed by Sugar Maple (*Acer saccharum ssp. saccharum*) and ash. Common Juniper (*Juniperus communis*) and Gray Dogwood (*Cornus racemosa*) are the most abundant shrub species, while the ground layer contains Knapweed (*Centaurea* sp), Virginia Strawberry (*Fragaria virginiana ssp. virginiana*), Arrow-leaved Aster (*Symphyotrichum urophyllum*), and Field Goldenrod.
FOD: Deciduous Forest	This unit was assessed from the roadside and structure/composition could not be determined beyond the presence of a canopy consisting of an ash species and Sugar Maple. No species list was tallied.
FOD5: Dry – Fresh Sugar Maple Deciduous Forest Ecosite	This mid-age forest unit consists of a canopy dominated by Sugar Maple with rare occurrences of Hemlock (*Tsuga canadensis*), as well as Shagbark and Bitternut Hickory (*Carya ovata* and *C. cordiformis*, respectively), while the sub-canopy contains patches of Hemlock and Eastern Hop-hornbeam (*Ostrya virginiana*). Green Ash (*Fraxinus pennsylvanica*) and Common Juniper make up a sparse understory, while Chokecherry (*Prunus virginiana ssp. virginiana*) forms a sparse ground layer.
FOD5-3: Dry – Fresh Sugar maple – Oak Deciduous Forest	This mid-age to mature forest on rolling topography consists mainly of Sugar Maple with occasional occurrences of White Oak (*Quercus alba*), as well as scattered Red Oak (*Quercus rubra*) and Bitternut Hickory associates. The understory is not dense and is made up mainly of tree regeneration (Sugar Maple and ash) with Chokecherry. Grass, Herb-robert (*Geranium robertianum*), and Poison Ivy (*Toxicodendron rydbergi*) make up the moderately dense ground layer.
FOD5-5: Dry – Fresh Sugar Maple – Hickory Deciduous Forest Type	This mid-aged forest consists of a somewhat open canopy (65-70% cover) of Shagbark Hickory with Sugar Maple as an associate. The subcanopy is moderately dense and consists of Eastern Hop-hornbeam with Sugar Maple and scattered occurrences of ash. Chokecherry dominates the understory, along with an abundance of ash saplings and occasional Common Buckthorn (*Rhamnus cathartica*). The relatively sparse ground layer is composed mainly of Garlic Mustard (*Alliaria petiolata*), an unknown sedge species (*Carex sp*.), and Sugar Maple saplings.
FOD5-8: Dry – Fresh Sugar Maple – White Ash Deciduous Forest Type	This large mid-age to mature forest unit, located on a gently rolling plateau, consists of Sugar Maple as the most abundant canopy species, followed by White Ash (*Fraxinus americana*) and equal amounts of Black Cherry (*Prunus serotina*), Bitternut Hickory, and Shagbark Hickory. The understory is patchy, with Sugar Maple the most abundant species, followed by equal amounts of ash and Chokecherry. An unknown sedge species, Zig-Zag Goldenrod (*Solidago flexicaulis*), Bluestem Goldenrod (*Solidago caesia*), and Poison Ivy are the most abundant ground layer species, all occurring relatively sparsely. At its northern edge the community slopes steeply down to the roadside residential area.

Vegetation Community	Description
FOD7-2: Fresh – Moist Ash Lowland Deciduous Forest Type	There are three occurrences of this community type in the study area. Two occur to the north alongside Station Road, while the third occurs east along Highway 15. The two units along Station Road were assessed only from the property edge. Their canopies contain a variety of species including Green Ash, American Elm and Sugar Maple, as well as rare occurrences of White Spruce (*Picea glauca*) and Norway Spruce. Green Ash occurs occasionally in the sub-canopy with American Elm and Black Cherry, as well as in the understorey with American Elm, Black Cherry, Common Lilac, Common Buckthorn, and honeysuckle (*Lonicera* sp.). Ground cover species reflect the frequent openings in the forest canopy and includes Reed-canary Grass (*Phalaris arundinacea*), Panicled Aster (*Symphyotrichum lanceolatum ssp. lanceolatum*), Riverbank Grape (*Vitis riparia*), Canada Goldenrod (*Solidago canadensis*) and Elecampane (*Inula helenium*). The unit of this type located along Highway 15 is more homogenous than the other two units, with Green Ash dominating the canopy and rare occurrences of Sugar Maple, Black Cherry, and Bur Oak occurring primarily along the southern slope portion of the unit. Common Buckthorn is abundant in the understory with occasional to rare occurrences of Wild Red Raspberry, Chokecherry, and other woody shrub species. Ground vegetation is mainly made up of avens (*Geum* sp), Poison Ivy, Tall Hairy Agrimony (*Agrimonia gryposepala*), Thicket Creeper (*Parthenocissus vitacea*), Enchanter's Nightshade (*Circaea lutetiana ssp. canadensis*) and an unknown sedge species. A small vernal pool occurs at the bottom of the slope, extending approximately 10m by 10m, with no associated wetland vegetation or woody debris at the edges. No surface water was present at the time of the survey.
SWT2-9/MAM2-10: Gray Dogwood Thicket Swamp complexed with Forb Mineral Meadow Marsh	This unit is situated on complex rolling topography consisting of rocky high spots and wet depressions (often associated with small stream channels). Siberian Crabapple and other trees occur on high spots, with Gray Dogwood thicket and meadow marsh grading into the riparian vegetation of the low-lying stream channels. Commonly encountered herbs in the MAM portions of the unit include Elecampane, Creeping Bentgrass (*Agrostis stolonifera*), Tussock Sedge (*Carex stricta*), Woodland Strawberry, Aster species (*Symphyotrichum spp*), and Field Sow Thistle (*Sonchus arvensis ssp. arvensis*).

3.1.3 WILDLIFE

The forests, marshes and cultural communities in the study area support the variety of wildlife species described below.

3.1.3.1 *Birds*

Amid the thicket swamp in the Cataraqui River Marsh in the southwest quadrant were American Goldfinch (*Carduelis tristis*), Blue jay (*Cyanocitta cristata*), Cedar Waxwing (*Bombycilla cedrorum*), Gray Catbird (*Dumetella carolinensis*), Northern Flicker (*Colaptes auratus*) and Red-winged Blackbird (*Agelaius phoeniceus*). A Turkey Vulture (*Cathartes aura*) was seen flying over the Cataraqui River Marsh. In the disturbed cultural meadow close to Highway 15 was a species of Sparrow (*Spizella* sp.). American crows (*Corvus brachyrhynchos*) flew between forests on either side of Highway 15, north of Highway 401. No bird nests were seen under the Highway 15 underpass or elsewhere in the study area.

3.1.3.2 *Herpetofauna*

Anurans (frog and toad species) may occur in the thicket swamp and meadow marsh in the Cataraqui River Marsh in the southwest quadrant, but none were seen or heard during the survey.

A turtle nest was found on the south side of the embankment of the Highway 401 eastbound off-ramp, suggesting that the thicket swamp and meadow marsh in the Cataraqui River Marsh support turtles and that individuals may travel from the wetland to potential nesting sites in the study area. No herpetofauna were seen, but their activity would have been suppressed by the cold, overcast weather.

3.1.3.3 *Mammals*

An Eastern Gray Squirrel (*Sciurus carolinensis*) was seen in the forest in the southeast quadrant. Signs of mammal use observed during the survey include White-tailed Deer (*Odocoileus virginianus*) tracks in the Cataraqui River Marsh, Coyote (*Canis latrans*) scat in the northeast quadrant and old Beaver (*Castor canadensis*) gnawings in the southwest quadrant close to the Highway 15 underpass.

3.1.3.4 *Insects*

A Clouded Sulphur (*Colias philodice*) butterfly was seen along Highway 15 south of Highway 401. The Cataraqui River Marsh in the southwest quadrant contained two butterflies, Monarch (*Danaus plexippus*) and Cabbage White (*Pieris rapae*). There was also a dragonfly, White-Faced Meadowhawk (*Sympetrum obtrusum*); and a spider, Banded Garden Spider (*Argiope trifasciata*). Near the Highway 15 underpass was a Milkweed Tussock Moth caterpillar (*Euchaetes egle*) by the southwest culvert and another Cabbage White.

3.1.4 SPECIES OF CONSERVATION CONCERN

MNRF Peterborough District reported that the following seven Species at Risk (SAR) may occur within 1 km of the study area: Chimney Swift (*Chaetura pelagica*), Least Bittern (*Ixobrychus exilis*), Bobolink (*Dolichonyx oryzivorus*), Eastern Meadowlark (*Sturnella magna*), Barn Swallow (*Hirundo rustica*), Blanding's Turtle (*Emydoidea blandingii*) and Snapping Turtle (*Chelydra serpentina*). Two additional SAR, Black Tern (*Chlidonias niger*) and Northern Map Turtle (*Graptemys geographica*), may occur within 5 km of the study area.

The NHIC database indicated that the SAR Least Bittern, King Rail (*Rallus elegans*), Northern Bobwhite (*Colinus virginianus*), Henslow's Sparrow (*Ammodramus henslowii*) and Blanding's Turtle have been recorded within about 1 km of the study area (NHIC 2013). Henslow's Sparrow and Northern Bobwhite are historical records from 1951 and 1856, respectively (NHIC 2013), and these species are assumed not to be present.

The SAR reported by MNRF and the NHIC database are similar to those listed in the study completed for the Detail Design for the Highway 401 Expansion from 600 m West of Montreal Street to the Cataraqui

River, which report sightings of Barn Swallow nests in a culvert west of the Cataraqui River and a Snapping Turtle in the Cataraqui River Marsh wetland, also west of the Cataraqui River. The Snapping Turtle was observed in early spring and likely indicates that hibernation habitat is present in the marsh. Based on MNRF consultation and survey observations, Least Bittern, Black Tern, King Rail and Blanding's Turtle were also indicated to be potentially present.

The Wildlife Mortality Study completed by LGL (2007) reported potential for six SAR along the 401 including Least Bittern, Black Tern, Blanding's Turtle, Gray Ratsnake (*Pantherophis spiloides*), Eastern Ribbonsnake (*Thamnophis sauritus*) and Milksnake (*Lampropeltis triangulum*). Milksnake, Blanding's Turtle, Snapping Turtle and potentially Gray Ratsnake were observed during the wildlife mortality survey. A roadkilled Milksnake was observed southeast of the Montreal Street interchange on the highway shoulder. Blanding's Turtle were observed within the Greater Cataraqui Marsh and nesting females were observed along the highway shoulder. An unconfirmed Gray Ratsnake basking on the south highway shoulder adjacent to the Greater Cataraqui Marsh was also reported.

There is potential for six plant species of conservation concern to occur within the study area: Brainerd's Hawthorn (*Crataegus brainerdii*), Carolina Whitlow-grass (*Draba reptans*), Stiff Gentian (*Gentianella quinquefolia*), Bowman's-root (*Porteranthus trifoliatus*), Smith's Bulrush (*Schoenoplectus smithii*), and Branching Burreed (*Sparganium androcladum*). All of these species are considered provincially rare (i.e. provincial S-Ranks between S1-S3). None of these species were observed during field studies, though potentially suitable habitat exists. No other vascular plant species of conservation concern were observed during field surveys.

A summary of the species of conservation concern and study area observations is provided in **Table 3-2**.

Table 3-2: Species of Conservation Concern and Study Area Observations

Species	General Habitat Description and Study Area Observations
Barn Swallow *(Hirundo rustica)* MNRF Status: Threatened SARA Status: N/A	Breeding habitat usually contains open areas (fields, meadows) for foraging, nest site that includes a vertical or horizontal substrate (often enclosed) underneath some type of roof or ceiling, and a body of water that provides mud for nest-building. The study area contains open areas for foraging, ponds for obtaining mud, some farm buildings as well as residential buildings that could be used for nesting, sufficient habitat to support the species. It is unlikely that the Hwy 15 underpass would be a potential nest site as it does not provide ledges or angles to attach a nest and is a highly disturbed environment. None were observed during field investigations.
Black Tern *(Chlidonias niger)* MNRF Status: Special Concern SARA Status: N/A	Preferred habitat includes wetlands; coastal or inland marshes; large cattail marshes; marshy edges of rivers; lakes or ponds; wet open fens; and wet meadows. Returns to same area to nest each year in loose colonies on floating nests. Must have shallow (0.5 to 1 m deep) water and areas of open water near nests. Requires marshes >20 ha in size. Feeds over adjacent grasslands for insects, as well as on fish, crayfish and frogs. There is no suitable habitat within the study area. None were observed during field investigations.
Bobolink *(Dolichonyx oryzivorus)* MNRF Status: Threatened SARA Status: N/A	Preferred habitat includes grassland, hayfields, and lightly grazed pasture, and has adapted to nesting in winter wheat fields. Favours fields with high percentage of grass cover and moderate percent of forb cover and is not attracted to fields with woody vegetation. This species does not nest in woodland or shrubby thicket. Ideal habitat size varies widely

	and is likely affected by available habitat in a region. Individual territory size can range from 0.45-2.0 ha and may vary widely in different regions. Populations may require approximately 10-30 ha. Breeds in open grasslands, old fields, lightly-moderately grazed pastures, no-till cropland, hayfields, small grain fields, wet meadows and planted cover. In migration and in winter uses freshwater marshes, grasslands, rice and sorghum fields. Nests are built on the ground in dense grasses. There are hayfields and pasture south of Middle Road in the southeast quadrant that may support this species. None were observed during field investigations.
Chimney Swift *(Chaetura pelagica)* MNRF Status: Threatened SARA Status: Threatened	Appears more concentrated in urban areas where there are large concentrations of chimneys for nest sites and communal roosts. Most sightings occur in cities, towns, or small villages or open habitats near human settlement. However, in some relatively unpopulated areas, this species may still nest in hollow trees, tree cavities, or caves. Forages in a variety of habitats, even over forests, but most common over open country; above ponds and lakes, where insects concentrate; and residential areas. The study area has open areas to support foraging and may have suitable nesting sites in the form of residential building chimneys. None were observed during field investigations.
Eastern Meadowlark *(Sturnella magna)* MNRF Status: Threatened SARA Status: N/A	Preferred habitat includes grassland, including native prairies and savannahs, as well as non-native pastures, hayfields, weedy meadows, herbaceous fencerows, young orchards, golf courses, grassy roadside verges, young oak plantations, grain fields and grassy airfields with elevated singing perches. The minimum area required is estimated at 5 ha. There are hayfields and pasture south of Middle Road in the southeast quadrant that may support this species. None were observed during field investigations.
Henslow's Sparrow *(Ammodramus henslowii)* MNRF Status: Endangered SARA Status: Endangered	Preferred habitat includes open fields with tall grasses that are interspersed with tall herbaceous flowering plants, or shrubby species, but not those that are grazed or burned. It prefers undisturbed areas with dense living grasses and a dense thatch of dead grasses. The species may occupy hayfields, but if the hay is cut early, the nests are destroyed and the resulting losses are severe. Only areas that remain undisturbed for several years appear to be more successfully colonized. Henslow's sparrow is an area-sensitive species that requires more than 30 ha of grassland and preferably more than 100 ha. Larger meadows in the study area are too disturbed. Suitable habitat is not present in the study area. None were observed during field investigations.
Least Bittern *(Ixobrychus exilis)* MNRF Status: Threatened SARA Status: Threatened	Preferred habitat includes a variety of wetland habitats but the species strongly prefers cattail marshes with a mix of open pools and channels. Nests are built above the marsh water on strands of dense vegetation. No suitable habitat is present within the study area. None were observed during field investigations.
King Rail *(Rallus elegans)*	Preferred habitat includes a variety of freshwater marshes and marsh-shrub swamp habitats. The species occurs in areas where wild rice grows

MNRF Status: Endangered SARA Status: Endangered	but also in sedge and cattail marshes. Most importantly, the species requires large marshes with open shallow water that merges with shrubby areas. In fact, birds only return in successive years to large marshes that are not overgrown with cattails. Originally, the best habitat for King Rails was in southwestern Ontario, but most of these wetlands have since been eliminated. No suitable habitat is present within the study area. None were observed during field investigations.
Northern Bobwhite *(Colinus virginianus)* MNRF Status: Endangered SARA Status: Endangered	Northern Bobwhite requires early successional habitat consisting of grassland interspersed with cropland and brushy cover. The brush must be dense and in close proximity to the grassland and cropland to provide this species with effective escape from predators. Cropland is the Northern Bobwhite's main food source. Grassland is used primarily for nesting. Nests are shallow depressions lined with plant material and concealed with arching grasses or vines. This combination of habitat features does not occur in the study area. None were observed during field investigations.
Gray Ratsnake *(Pantherophis spiloides pop. 1)* (Frontenac Axis population) MNRF Status: Threatened SARA Status: Threatened	The Frontenac Axis gray ratsnake population prefers edge habitats, particularly old fields next to deciduous forest, and can often be found in hollow logs or rock crevices, or basking on bedrock outcrops. This type of habitat is present in all study area quadrants. None were observed during field investigations.
Eastern Ribbonsnake *(Thamnophis sauritus septentrionalis)* MNRF Status: Special Concern SARA Status: Special Concern	Preferred habitat includes sunny grassy areas with low dense vegetation near bodies of shallow permanent quiet water; wet meadows, grassy marshes or sphagnum bogs; and borders of ponds, lakes or streams. The Northern Ribbonsnake is semi-aquatic and most frequently found along wetland edges. Quiet, shallow water with low surrounding cover is preferred, although areas with good exposure to sunlight are also required. Gravid females may move away from water before nesting, as females and juveniles are occasionally found in upland areas. Eastern Ribbonsnake prefers meadows or forest edges, and they are often found near the edges of permanent bodies of water such as marshes, ponds, lakes, and rivers. They often bask on offshore rocks or logs, and feed in water, capturing frogs, fish and invertebrates. The species may travel from the Greater Cataraqui Marsh PSW and enter the study area at the western edge. None were observed during field investigations.
Milksnake *(Lampropeltis triangulum triangulum)* MNRF Status: Special Concern SARA Status: Special Concern	Preferred habitat includes farmlands, meadows, hardwood or aspen stands; pine forest with brushy or woody cover; and river bottoms or bog woods. Hides under logs, stones, or boards or in outbuildings. It is most frequently reported in and around buildings, especially old structures; however, it is found in a wide variety of habitats, from prairies, pastures, and hayfields, to rocky hillsides and a wide variety of forest types. Two other important features of good Milksnake habitat are proximity to water, and suitable locations for basking and egg-laying. Milksnake prefers open forest, forest edges, meadows, and cultivated areas. It's often found in barns and buildings, and overwinters underground in rocks. This habitat occurs throughout the study area. None were observed

	during field investigations.
Blanding's Turtle *(Emydoidea blandingii)* MNRF Status: Threatened SARA Status: Threatened	Blanding's Turtle is a primarily aquatic species. In the summer, preferred habitat includes lakes, permanent or temporary pools, slow-flowing streams, marshes, and swamps. In general, the species prefers shallow water that is rich in nutrients, organic soil and dense vegetation. Adults are generally found in open or partially vegetated sites, whereas juveniles prefer areas that contain thick aquatic vegetation including sphagnum, water lilies and algae. It also needs terrestrial environments; it can travel over long distances, between different aquatic environments, in order to find suitable sites for basking in the sun and nesting. The species usually nests in dry conifer or mixed hardwood forests, up to 410 m from any body of water. Females also like partially vegetated sites such as fields or roadways and dig nests in a variety of loose substrates, including sand, organic soil, gravel and cobblestone. Overwintering occurs in permanent pools that average about one metre in depth, or in slow-flowing streams. The species may travel from the Cataraqui marsh wetland overland to nest in suitable habitat in the study area. Potential habitat is limited to the south embankment of the 401 E to N/S. None were observed during field investigations.
Northern Map Turtle *(Graptemys geographica)* MNRF Status: Special Concern SARA Status: Special Concern	Preferred habitat includes large bodies of water with soft bottoms, and aquatic vegetation. Basks on logs or rocks or on beaches and grassy edges and will bask in groups. Uses soft soil or clean dry sand for nest sites and may nest at some distance from water. Home range size is larger for females (about 70 ha) than for males (about 30 ha) and includes hibernation, basking, nesting and feeding areas. Aquatic corridors (e.g. streams) are required for movement. The study area is too far from suitable aquatic habitat to provide habitat for this species. None were observed during field investigations.
Snapping Turtle *(Chelydra serpentina)* MNRF Status: Special Concern SARA Status: Special Concern	Preferred habitat includes permanent and semi-permanent fresh water; marshes, swamps or bogs; and rivers and streams with soft muddy banks or bottoms. Often uses soft soil or clean dry sand on south-facing slopes for nest sites. May nest at some distance from water. Often hibernate together in groups in mud under water. Home range is ~28 ha in area. Species is usually found in large bodies of water, and sometimes in small ponds as well. The species may travel from the Cataraqui marsh wetland overland to nest in suitable habitat in the study area. Potential habitat is limited to the south embankment of the 401 E to N/S. None were observed during field investigations.
White Wood Aster *(Eurybia divaricata)* MNRF Status: Threatened SARA Status: Threatened	Found in open, dry deciduous forests dominated by Sugar Maple and American Beech. Often found mixed with other asters. Does best in well-drained soils and may prefer a low level of disturbance, as it has been found to grow along trails. Potentially suitable habitat exists within the Sugar Maple dominated forests (FOD5, FOD5-3, FOD5-5, FOD5-8) within the study area. None were observed during field investigations.
White-tinged Sedge *(Carex albicans var. albicans)* MNRF Status: N/A	Found in dry, open sandy or rocky woods. Potentially suitable habitat exists within the FOD5, FOD5-3, FOD5-5, FOD5-8 communities, where rocky conditions were observed. None were

SARA Status: N/A	observed during field investigations.
Brainerd's Hawthorn *(Crataegus brainerdii)* MNRF Status: N/A SARA Status: N/A	Hawthorn species occur in disturbed sites and seral communities such as pastures, forest edges, open second growth forests, and thickets along streams. Suitable habitat exists throughout the study area. None were observed during field investigations.
Stiff Gentian *(Gentianella quinquefolia)* MNRF Status: N/A SARA Status: N/A	Found in woods and moist or wet open places. Suitable habitat exists throughout the study area. None were observed during field investigations.
One-sided Rush *(Juncus secundus)* MNRF Status: N/A SARA Status: N/A	Found in alvar pavement and granitic rock barrens. Potentially suitable habitat was noted at the eastern edge of the FOD5-3 and small bedrock-controlled areas contained entirely within the ROW.
Vasey's Rush *(Juncus vaseyi)* MNRF Status: N/A SARA Status: N/A	Widespread but typically found in open sandy ground. Limited potential to occur within sandy open areas of the SWT2-9/MAM2-10 unit (generally coincident with the Cataraqui River Marsh ANSI). None were observed during field investigations.
Southern Naiad *(Najas guadalupensis)* MNRF Status: N/A SARA Status: N/A	Found in lakes, rivers, and canals. No suitable habitat present. None were observed during field investigations.
Bowman's-root *(Porteranthus trifoliatus)* MNRF Status: N/A SARA Status: N/A	Found in open sandy woods and edges. Sandy woods are generally not present in the study area; woodland edge areas within the ROW have shallow soils that may have a sand component and suitable habitat would be limited to these areas. None were observed during field investigations.
Smith's Bulrush *(Schoenoplectus smithii)* MNRF Status: N/A SARA Status: N/A	Found in moist sandy or muddy shorelines. Suitable habitat exists within the SWT2-9/MAM2-10 unit (generally coincident with the Cataraqui River Marsh ANSI). None were observed during field investigations.
Monarch (Danaus plexippus) MNRF Status: Special Concern SARA Status: Special Concern	Monarchs in Canada exist primarily wherever milkweed (Asclepius) and wildflowers (such as Goldenrod, asters, and Purple Loosestrife) exist. This includes abandoned farmland, along roadsides, and other open spaces where these plants grow. Only the caterpillars feed on milkweed plants and are confined to meadows and open areas where milkweed grows. Adult butterflies can be found in more diverse habitats where they feed on nectar from a variety of wildflowers. Cultural meadow habitat within the ROW and in other areas provides suitable habitat. None were observed during field investigations.

3.2 AQUATIC ENVIRONMENT

3.2.1 METHODOLOGY

MNRF Peterborough District was contacted to request existing fish and fish habitat information and to identify the potential presence of Species at Risk (SAR) within the study area. The MNRF provided background information that indicated the following:

- Records of the SAR Lake Sturgeon (*Acipenser fulvescens*) (threatened) within 5 km of the study area;
- Watercourses within the study area are considered to provide warmwater habitat;
- Watercourses within the study area are subject to a July 1 to March 31 permissible timing window for in-water works; and,
- The fish and fish habitat sensitivity for watercourses within the study area has been identified by the MNRF as low.

The *Highway 401 West of County Road 38 to Highway 15 (W.P. 28-97-00) Preliminary Design Report* (PDR) (MTO, 2001) was also reviewed for background fisheries information in the study area.

Site investigations were conducted in the study area on September 13, 2013. Weather conditions were rainy and overcast. The fisheries investigation was carried out in accordance with the MTO/DFO/MNRF *Protocol for Protecting Fish and Fish Habitat on Provincial Transportation Undertakings – Version 2* (The Protocol). Investigations consisted of a field reconnaissance in the vicinity of the highway ROW, and the conditions were documented with photographs.

The full Fish and Fish Habitat Impact Assessment Report is available in **Appendix E.**

3.2.2 FISH AND FISH HABITAT

Within the study area, one un-named tributary of the Cataraqui River (WC-1) was identified. The watercourse is shown in **Figure 3-2**. The watercourse is considered to provide warmwater habitat by MNRF, however no fish community records for the tributary were provided. The tributary originates immediately south of Highway 401, approximately 500 m west of Highway 15. Flow was observed in this branch during the field investigations, suggesting a permanent flow regime. The tributary ultimately discharges to Cataraqui River approximately 1.0 km downstream of its origin.

Due to limited habitat diversity and shallow water depth, fish community sampling was undertaken using a dip net within a small pool located at the origin of the tributary; however, no fish were captured or observed. Based on the limited habitat diversity and shallow water depth, it is anticipated that the un-named tributary of Cataraqui River functions as indirect fish habitat in the assessed reach.

Drainage upstream of Highway 401 within the study area consists entirely of ditch flow and surface runoff from adjacent lands, and does not constitute fish habitat. Drainage downstream of Highway 401 is conveyed through a 1.2 m x 1.4 m concrete box culvert (perched approximately 0.75 m above the substrate) to a small outlet pool (1.5 m wide and 0.15 m deep) at the origin of the tributary. The watercourse is bounded by a combination of thicket and meadow riparian vegetation, and consists of a poorly defined channel (mean width = 0.90 m and mean depth = 0.05 m) with muck substrate. In-water cover is abundant and consists mainly of in stream and over hanging bank vegetation.

A summary of key features of the watercourse is provided in **Table 3-3**.

Table 3-3: Fish Habitat Summary

Waterbody	Flow	Thermal Regime	Substrate Type	Vegetation	Supports a Fishery
Un-named Tributary of Cataraqui River (WC-1)	Permanent	Warmwater	Muck	*Riparian:* Grass, cattail, sedges, goldenrod, willow herb, dogwood *In-stream:* Grass, cattail, willow herb	Indirect

Figure 3-2: Watercourses within the Study Area

3.3 LAND USE EXISTING CONDITIONS

The existing land uses within the study area are primarily open space, agriculture, rural residential and highway. The full Land Use Factors report is provided in **Appendix F**.

The study area is located outside of the urban boundary, within lands that have been designated Rural Industrial and Hamlet (Kingston Mills) to the north, and Rural Area and a Secondary Plan Area to the south. Schedules 3-A and 3-B of the Official Plan indicate Land Use designations.

Rural Area designations are intended to protect the rural community by balancing the environmental, resource protection, community and economic objectives of rural land use, and to protect land suitable for agricultural production from scattered development and land uses which are unrelated to agriculture. Limited non-farm growth is permitted in the Rural Area if it does not limit or interfere with agricultural use, agriculture-related uses or a broader range of rural uses.

The purpose of the Rural Industrial designation is to support the rural agricultural communities by allowing limited small- or large-scale industrial development, which may have impacts on adjacent land uses (through noise, vibration, reduction of privacy, increase in traffic) in appropriate locations that do not require municipal water or sewer services, or that may be incompatible with other uses in the urban area. Uses may include warehousing, processing, manufacturing, assembling, and outdoor storage. Retail and office uses that are clearly an accessory use to the primary Rural Industrial uses are also permitted.

Hamlets are small, compact, rural communities with a mix of uses, and have traditionally been small service centres and focal points for the surrounding rural community. They are recognized as historic settlement areas outside of the Urban Boundary. Limited growth of residential homes, community facilities, and businesses is permitted within Hamlets.

The Secondary Plan Area in the vicinity of the interchange provides more detailed land use designations for the area, which are provided in Schedule RC-1 (Rideau Community) of the Official Plan. Land uses within the interchange study area are Rural, Environmental Protection Area, and Highway Commercial. The goal of the Rideau Community Secondary Plan is to encourage the development of a mixed-use village centre and residential neighbourhood that retains the heritage characteristics of the area with a neighbourhood centre at its focal point.

Within the Secondary Plan Area, the main permitted use in the Rural area is agricultural. Secondary permitted uses include forestry, recreation, conservation, accessory residential uses and limited non-farm residential development.

Environmental Protection Areas are recognized for their inherent environmental sensitivity and must be maintained in their natural, undisturbed state to preserve their ecosystem role. Generally, permitted uses are limited to those related to open space, conservation or flood protection. Development is prohibited in the Environmental Protection Area associated with the Cataraqui River Marsh.

The Secondary Plan notes that designation of additional lands as Highway Commercial beyond what is presently shown on Schedule RC-1 is not permitted.

3.3.1 ZONING

Within the study area the following zoning currently exists:

Northeast Quadrant
- A1-Restricted Agricultural Zone
- M1-Restricted Industrial Zone
- OS-1-Private Open Space Zone
- C-General Commercial Zone

Northwest Quadrant
- A1-Restricted Agricultural Zone
- R1-Residential Type 1 Zone

Southeast Quadrant
- A1-Restricted Agricultural Zone
- M2-General Industrial Zone

Southwest Quadrant
- A1-Restricted Agricultural Zone
- CH-Highway Commercial Zone

The Restricted Agricultural zone generally permits farms (excluding specialized farms), forestry uses, single-family/converted/accessory dwellings, cemeteries, churches, conservation uses, home occupations, livestock sales, public uses, riding stables, and produce sales. The General Industrial zone permits accessory dwelling units, body shops, building supply yards, commercial garages, factory outlets, mills, fuel storage, warehouses, storage yards, public uses, and municipal service garages. The Restricted Industrial zone permits accessory dwelling units, assembly plants, factory outlets, manufacturing plants, merchandise service shops, parking lots, public uses, transformer stations, and warehouses.

The General Commercial zone prohibits residential uses, and permits the following non-residential uses: an auditorium; a beverage room; a business office; a commercial club; a day nursery; a dry cleaning/laundry outlet; a gasoline retail facility; a laundromat; a merchandise service shop; a private club; a professional office; a public use; a recreational establishment; a restaurant; and a retail store.

The Highway Commercial zone generally permits automobile service stations, day nurseries, drive-ins, home occupations, motels, garden centres, public uses, retail outlets, rental cabins, restaurants, vehicle sales centres and accessory dwellings. Within this zone, the CH-1 subzone limits uses permitted in the CH zone to restaurants and accessory dwellings, while the CH-7 subzone permits all CH uses as well as convenience stores and drive-through establishments, but prohibits dwelling units.

R1-Residential Type 1 Zoning generally permits only single-family dwellings, home occupations, and some public uses. The Private Open Space zone may only be used as a private park.

3.4 ARCHAEOLOGY

3.4.1 METHODOLOGY

Stage 1-2 Archaeological Assessments of the areas to be impacted by the Technically Preferred Alternative were conducted with the purpose of:

- Providing information about the study area geography, history, previous archaeological fieldwork and current land condition;
- Evaluating in detail the study area's archaeological potential;
- Documenting archaeological resources in the study area; and
- Determining whether the study area contains archaeological resources requiring further assessment.

The Stage 1 visual assessment was conducted on August 13, 2013 under warm and mostly sunny conditions. The entire area was visually assessed on foot and photo documented.

The Stage 2 investigations were conducted the week of August 13 – 18, 2015. The area assessed consisted of approximately 9.9 hectares.

3.4.2 ARCHAEOLOGICAL EXISTING CONDITIONS

The Stage 1 archaeological assessment found that the study corridor is located in close proximity to historic roadways, waterways, and an historic town. Given this proximity, there is a high possibility of locating some historic material in undisturbed areas. The Highway 401 and Highway 15 rights-of-way, however, have been disturbed by previous construction activities. They are therefore considered to be free of archaeological concern and require no further archaeological assessment.

Stage 2 archaeological investigations were undertaken in undisturbed areas of archaeological potential that are anticipated to be impacted during construction. Testing consisted of the excavation of test pits on a 5 m grid, with each test pit measuring approximately 30 cm by 30 cm. All soils were screened through millimeter hardware cloth. Areas that are steeply sloping, rocky or contain exposed limestone bedrock which are unsuitable for past human settlement were omitted from the assessment (approximately 5% of the area assessed).

No artefacts were recovered from the study area during the Stage 2 assessment.

3.5 CULTURAL HERITAGE

3.5.1 METHODOLOGY

A Heritage Impact Statement (HIS) was completed for a property located in the vicinity of the Highway 401 / Highway 15 interchange to assess its cultural heritage value and to identify potential impacts and mitigation measures. Archival materials, census data, historic maps, other reference documents, and property owners were consulted to research the history of the property and surrounding area. A site visit was conducted in May 2014 to examine the property.

A Cultural Heritage Evaluation Report (CHER) was undertaken for the Highway 15 Bridge over Highway 401. It consists of a historical summary of the bridge, a description of the bridge and its setting, an evaluation of the cultural heritage value of the bridge, a summary of cultural heritage value, and mitigation recommendations. The CHER employed the scoring system set out in the *Ontario Heritage Bridge Guidelines* adopted by MTO in 2008, which considers design / physical value, contextual value, and associative value in the evaluation of potential heritage structures. The CHER is included in **Appendix G**.

3.5.2 CULTURAL HERITAGE EXISTING CONDITIONS

The Highway 15 underpass is one of the original underpasses along the Highway 401 corridor in Eastern Ontario. The setting of the bridge, enclosed by rock outcrops as Highway 401 rises from the Cataraqui River valley, establishes the structure as a focal point. The arch-shaped bridge frames views along the highway corridor. The underpass is also one of the oldest concrete rigid frame rectangular voided slab bridges in the region.

The Highway 15 underpass bridge scored 50 out of 100 points under the Ontario Heritage Bridge Guidelines scoring system. Although it displays a high degree of technical merit and has visual appeal due to its setting and design, the bridge does not meet the threshold of 60 points to be considered provincially important and worthy of inclusion on the Ontario Heritage Bridge List.

3.7 TRANSPORTATION NETWORK

The Highway 401 / Highway 15 Interchange provides a vital connection between the east part of the City of Kingston and the surrounding provincial highway network. The interchange is located in the northeast of Kingston, and provides an integral connection across the Cataraqui River to the eastern portion of the City of Kingston. Currently, there are three connections across the Cataraqui River within the City of Kingston: the La Salle Causeway, Kingston Mills Road and Highway 401. The City of Kingston has completed an Environmental Assessment for a third crossing of the Cataraqui River at John Counter Boulevard and Gore Road; however, no timeframe for construction has yet been determined.

Highway 15 connects with Kingston Road 2 in the south, providing connections to the west of the City of Kingston and Gananoque to the east. As a key connection between the city and the highway network, the interchange is subjected to high volumes of traffic. The interchange was designed in the 1950s and it is known to experience delays and queuing.

3.7.1 EXISTING INTERCHANGE GEOMETRY

The Highway 15 Interchange has a 'Diamond' configuration with offset ramp terminals (i.e. the east- and westbound off-ramps do not align). The eastbound on- and off-ramps are offset by approximately 100 m, with the eastbound off-ramp joining the Middle Road / Highway 15 intersection. Highway 15 accommodates four lanes across the interchange, with one through and one through-left lane in each direction. The existing Highway 15 interchange has less-than desirable geometry. In particular, north- and southbound traffic on Highway 15 turning left onto the Highway 401 on-ramps do so on short 'slip ramps', which merge with higher-speed traffic entering the ramps from the other direction. The short slip ramps provide very little storage and no parallel merging area.

The Highway 401 speed-change lane lengths all conform to the design standards stipulated by the Geometric Design Standards for Ontario Highways (GDSOH). The Highway 401 westbound on-ramp and eastbound off-ramp both have less than desirable radii of 85 m and 120 m respectively, while the recommended radius for a design speed of 60 km/h is 130 m. Highway 15 is a classified as a rural highway, with two 3.65 m lanes in each direction and 2.5 m shoulders. Highway 401 through the study area is a four lane (3.65 m width) freeway with 2 m and 3 m inside and outside paved shoulders, respectively.

Figure 3-8 details the geometric problems and opportunities of the interchange, and the subsequent impacts on traffic operations.

3.7.2 PREVIOUS INTERCHANGE IMPROVEMENTS

Since its construction, there have been no significant improvements at the Highway 15 interchange. In 1995, the westbound off-ramp was realigned to intersect with the Middle Road / Highway 15 intersection to improve traffic operations south of Highway 401. Also in 1995, the bridge underwent minor rehabilitation to accommodate wider lanes across the structure.

3.7.3 LOCAL ROADS

Two municipal roads are located within close proximity to the interchange: Middle Road (south of Highway 401) and Station Road (north of Highway 401). The intersection of Middle Road and Highway 15 is also part of the south ramp terminal of the interchange. Station Road is located approximately 100 m north of the north ramp terminal. While the design standards state that the recommended distance between the interchange and service roads depends on the traffic characteristics and design of the crossing road, both intersections are located closer than the desirable spacing of 365 m (GDSOH).

Middle Road has a posted speed of 60 km/h and, as there is no existing speed signage, Station Road has a defacto maximum speed of 50 km/h (Guidelines for Establishing Posted Speed Limits, City of Kingston).

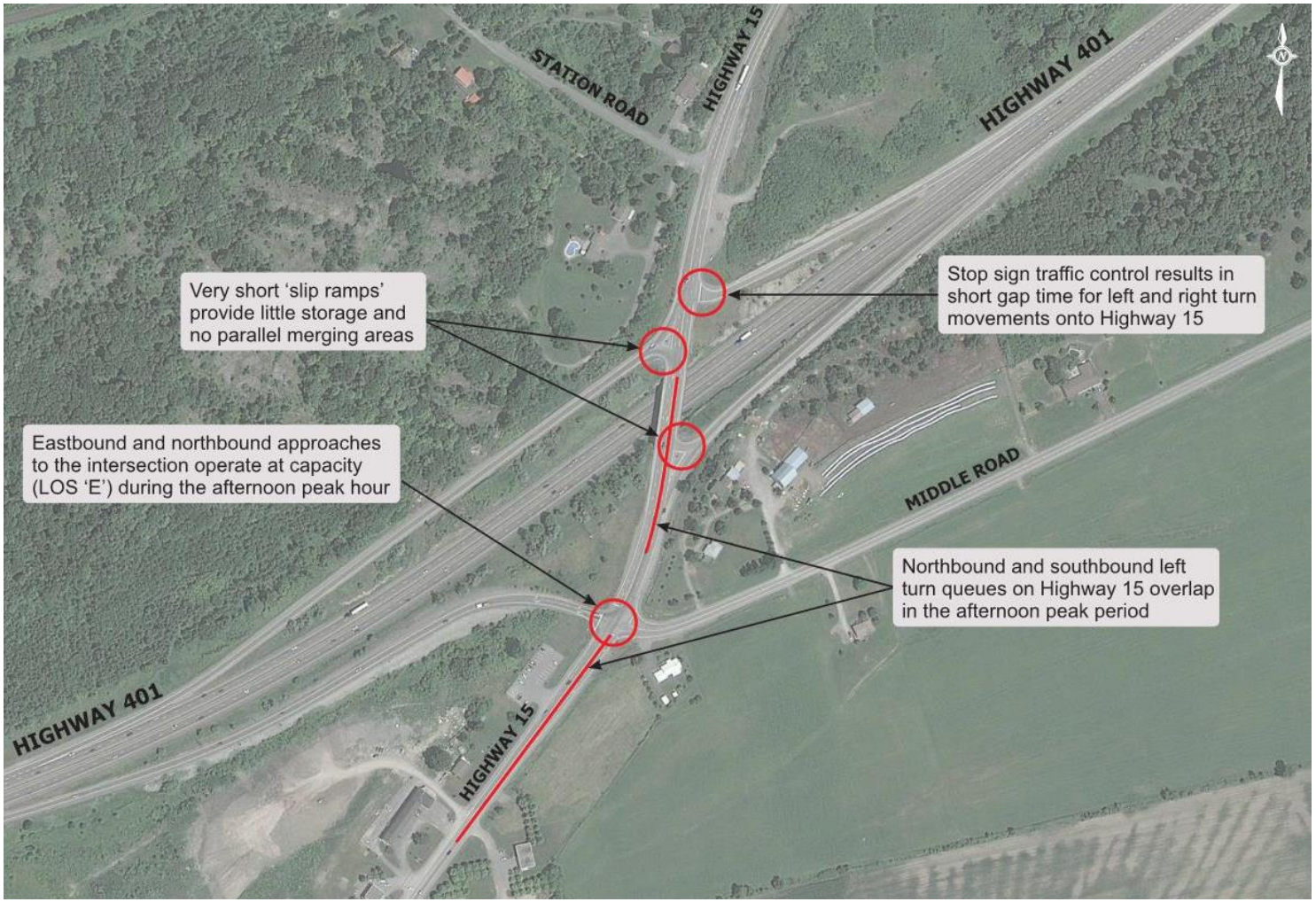


Figure 3-3 Highway 15 Interchange Problems and Opportunities

3.7.4 HIGHWAY 15 UNDERPASS

The Highway 15 underpass is a concrete rigid-frame structure with a span of 36.2 m, constructed in 1953. The bridge was last rehabilitated in 1995 when it was patched, received new sidewalks and barriers, and widened lanes.

The bridge carries four lanes of traffic along Highway 15 over Highway 401. On the structure, Highway 15 has a pavement width of 14.3 m, providing for four lanes of 3.58 m width. There are 1.58 m wide sidewalks on each side of the bridge and no shoulders. Highway 401 underneath the underpass has a pavement width of 25.4 m, providing for four lanes of 3.65 m, with 2 m and 3 m inside and outside paved shoulders, respectively.

3.7.5 EXISTING TRAFFIC OPERATIONS

A traffic analysis was undertaken for the interchange and the results are detailed in the Traffic Operations Report, included as **Appendix H**. Existing year (2013) traffic volumes were used for the intersection capacity and micro-simulation analysis. The analysis undertaken utilized Synchro 8 and VISSIM software. The operational analysis was conducted considering existing intersection lane configurations and traffic signal control timing plans for morning and afternoon peak periods. The Synchro software was used to estimate the volume to capacity (v/c) ratio for individual intersection movements at the signalized Highway 401 off-ramp / Highway 15 / Middle Road intersection. VISSIM (micro-simulation) was used to analyze existing vehicle delay, queue length (95th percentile) and resulting Level of Service (LOS) for the intersections. The LOS is used as a measurement of overall performance at an intersection / interchange:

- LOS A = Light Traffic / Free Flow Speeds
- LOS B = Slightly Increased traffic levels / Still free flow speeds
- LOS C = Approaching moderate congestion levels / Speeds near free flow
- LOS D = Speeds Reduced / Lane changes restricted due to traffic
- LOS E = Congestion / Irregular traffic flow
- LOS F = Road at capacity / Gridlock with frequent stops

3.7.5.1 *Highway 401 Traffic Operations Analysis*

A Highway 401 LOS analysis was undertaken using the methodology outlined in the Geometric Design Standards for Ontario Highways (GDSOH). It was concluded that:

- The Annual Average Daily Traffic (AADT) on Highway 401 within the study area has been growing at approximately 2% per annum.
- Highway 401 between Montreal Street and Highway 15 is currently operating at LOS ‘D’ or better during peak periods.
- Highway 401 between Highway 15 and Joyceville Road is currently operating at LOS ‘B / C’ and LOS ‘C’ during the morning peak hour and afternoon peak hour respectively.
- There are significant drops in speed due to the interchange, in each of the morning and afternoon peak periods.

3.7.5.2 *Highway 15 at Station Road Intersection*

The Highway 15 and Station Road intersection is a three-leg stop-controlled intersection that operates with an overall LOS ‘A’ during both peak hours, with side street queues of a maximum 10 m (approximately one or two vehicles).

3.7.5.3 *Highway 15, North Ramp Terminal*

The Highway 15 and Highway 401 north ramp terminal intersection includes the westbound on- and off-ramps. The westbound off-ramp is stop-controlled and the westbound on-ramp is free-flowing. This intersection operates with an overall LOS 'C' or better during both peak periods.

Operational disruptions can at the westbound on-ramp. The northbound left-turning and southbound right-turning traffic from Highway 15 to westbound Highway 401 competes for priority at the merge point, as there is confusion over which movement holds priority. Due to the absence of a yield sign for the southbound right turn, the northbound left-turn movements have to yield.

Furthermore, due to the high northbound left-turn demand of approximately 400 and 700 vehicles during morning and afternoon peak hours, respectively, queues periodically extend beyond the south ramp terminal and occasionally to the Middle Road / Highway 15 / eastbound off-ramp intersection. The close proximity of the north and south ramp terminal intersections, coupled with the absence of signalization and dedicated left-turn lanes on Highway 15, contribute to significant queuing.

A warrant analysis for a signalized intersection was completed following the Ontario Traffic Manual (OTM) Book 12 guidelines. The analysis suggested that traffic signals may be required in the near future as a result of the "delays caused to cross traffic." "Delays caused to cross traffic" occur when the traffic volume on a main road is so heavy that traffic on the minor road suffers excessive delay or hazard in entering or crossing the main road. The results of the signal warrant analysis are presented in the Traffic Operations Report, included in **Appendix H**.

3.7.5.4 *Highway 15, South Ramp Terminal*

Highway 401 eastbound on-ramp terminal

The south ramp terminal intersection is off-set, with the eastbound on-ramp terminal situated approximately 100 m north of the eastbound off-ramp terminal: the eastbound off-ramp / Middle Road / Highway 15 intersection.

The eastbound on-ramp terminal operates with an overall LOS 'A' during both morning and afternoon peak hours. Northbound traffic on Highway 15 wishing to turn left onto Highway 401 eastbound creates queues that extend from the north ramp terminal to beyond the south ramp terminal. Traffic travelling southbound on Highway 15 wishing to turn left onto eastbound Highway 401 has to rely on courtesy gaps as a result. Traffic volumes making this turning movement are relatively low and, for that reason, signals are not warranted.

Highway 401 eastbound off-ramp terminal

This signalized intersection operates with an overall LOS 'B' and 'D' during morning and afternoon peak hours, respectively. The eastbound and northbound approaches to the intersection operate at capacity (LOS 'E') during the afternoon peak hour. The 95th percentile queue length is over 300 m (approximately 43 vehicles) on both approaches due to capacity constraints. The poor LOS on northbound and eastbound approaches indicates that modifying the signal timing (i.e., allocating more green light time to these approaches) would not improve the capacity at this intersection and that additional lanes are required.

3.7.5.5 *Collision Analysis*

The five-year average motor vehicle collision rate (collisions per million vehicle km travelled) for Highway 401 in the study area is 0.42 (based on 2006-2010 data), which is lower than the average provincial collision rate for those years. During the same time period, 44% of the total collisions on Highway 401 occurred on dry pavement and the remaining 56% of the collisions occurred due to other (ice, snow, slush, wet) pavement conditions.

Collision analysis conducted on the interchange ramps identified three collisions that occurred during a turning movement at westbound on-ramp terminal. At the westbound off-ramp terminal, there have been two 'Angle' type and two 'Turning' type collisions during the last five years. Provision of traffic signals may reduce these types of collision at this ramp terminal. There have been a total of three collisions (two 'Side-sweep' and one 'Turning') at the eastbound on-ramp terminal during same time period. The collision analysis undertaken for this study is detailed in the Traffic Operations Report, included in **Appendix H**.

3.7.6 CARPOOL LOT

A carpool lot is located southwest of the Middle Road / eastbound off-ramp / Highway 15 intersection. The carpool lot has 30 spaces and is accessed directly from Highway 15. The carpool lot is partially illuminated and utilizes two poles with High Pressure Sodium (HPS) Luminaires.

3.7.7 ILLUMINATION

Currently, there is no full, continuous illumination on Highway 401 within the limits of the interchange. There is, however, partial lighting for the exit and entrance ramps of the interchange and full continuous lighting on Highway 15. All existing lighting is on conventional poles with High Pressure Sodium (HPS) Luminaires.

3.8 EXISTING UTILITIES

Figure 3-4 details the existing utility infrastructure within the area of the Highway 15 interchange. The utilities include plant belonging to Hydro One, Union Gas and Bell. The Hydro One plant includes Hydro poles and lines of various voltages, traversing the study area in a north / south direction adjacent and parallel to Highway 15. The hydro lines traverse Highway 15 at two locations: opposite the carpool lot and at the Station Road intersection. Bell plant within the study area includes Fibre optic cabling for properties both north and south of Highway 401, with cabling running through the sidewalk of the existing Highway 15 Underpass. Union Gas plant includes a 4" plastic gas main running adjacent Highway 15, south of Highway 401, with its northern limit near the entrance of the existing carpool lot.

3.9 EXISTING STORMWATER MANAGEMENT

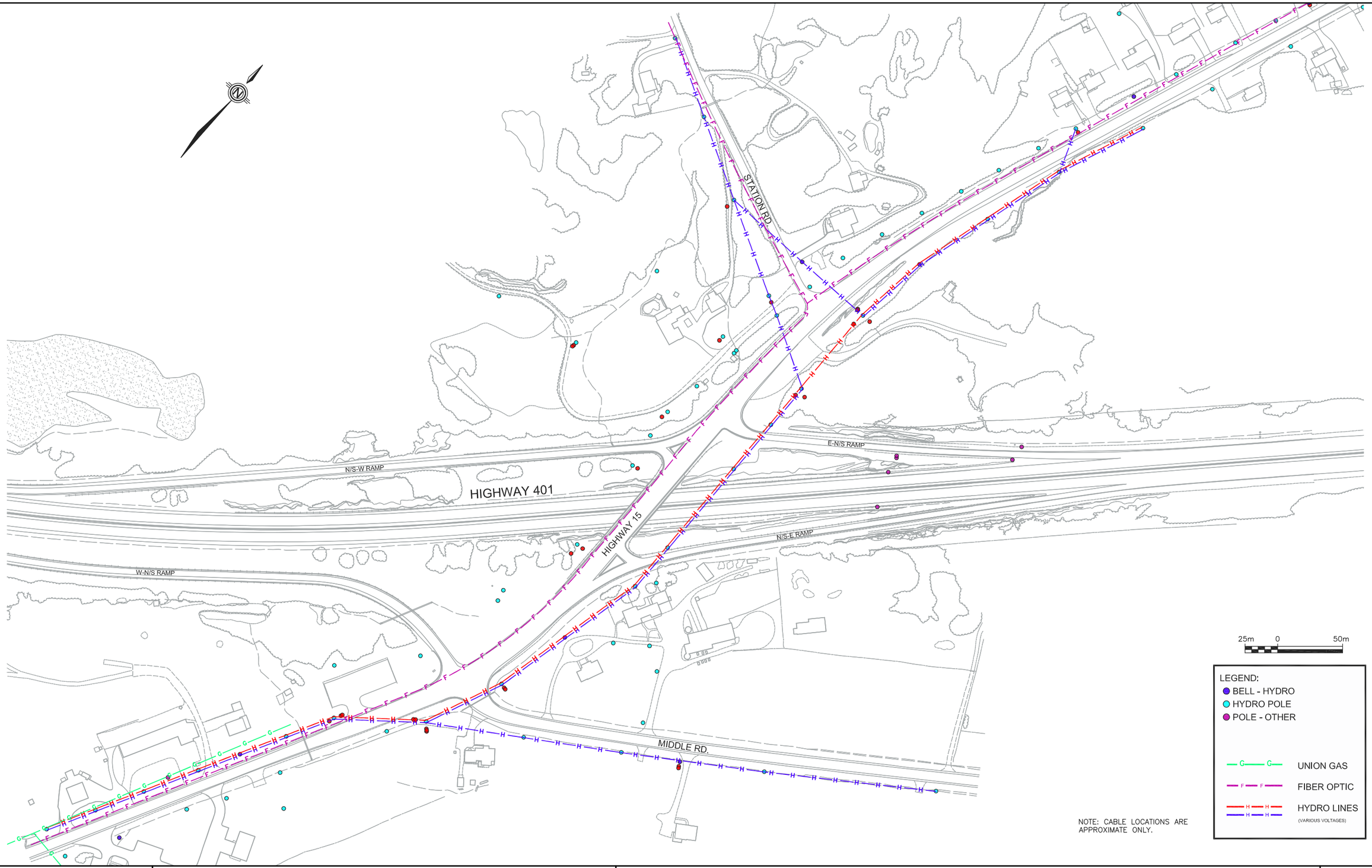
The overall area is within the Napanee Limestone Plain and slopes southward toward Lake Ontario. The Napanee Limestone Plain is characterized by undulating plains of limestone bedrock, tills, and fine-grained silty and clayey soil. The area upstream of Highway 401 is drained by three (3) major water courses including: Collins Creek, Little Cataraqui Creek, and Cataraqui River. Highway 401 also crosses three (3) Provincially Significant Wetlands (PSW) including: Lower Collins Creek Wetlands, Little Cataraqui Creek Wetlands, and the Cataraqui River Marsh.

According to Ontario Soil Mapping, the predominant soil types in the study area are Farmington Loam, Lansdowne Clay and Napanee Clay. Rock outcrop was also observed in some areas. The predominant land use is a combination of woodland and meadows with some impervious areas. **Figure 3-5(a-b)** details the existing drainage mosaic within the study area of the Highway 15 Interchange. The existing drainage systems consist primarily of open ditches, swales, culverts, storm sewers, and ditch inlets.

Catchments 100 and 105 both drain in a northeast direction to the south ditch of Highway 15. Catchment 110, which includes the existing westbound off-ramp, drains westerly and is conveyed to Catchment 120 through Culvert C1. Both catchments ultimately drain to a watercourse northwest of the interchange. This watercourse drains to Colonel By Lake, which ultimately discharges to the St. Lawrence River. The minor system runoff from Catchments 130, 135, 140, 150, 160, 170 and 180 are conveyed via storm sewers and discharges to Culvert C3. The major system-flows drain overland as well as via the north and south highway ditches. An existing Culvert C2 facilitates the drainage of the north ditch and discharges to the

upstream side of Culvert C3. Catchment 200 also drains to the upstream side of Culvert C3. Culvert C3 eventually drains to the St. Lawrence River.

Flows from Catchments 210 and 220 are conveyed by Culvert C4, combine with the flows from Catchment 230 and are conveyed through Culvert C5. Flows from Catchment 240 drain via Culvert C6. The combined flows from Culvert C5, Culvert C6 and Catchment 250 discharge to the creek downstream of Culvert C3. Runoff from Highway 401 is conveyed by storm sewers which run along the median of Highway 401. The storm sewer drains to Culvert C3. **Table 4-1** provides a summary of the characteristics of the existing six (6) culverts in the study area



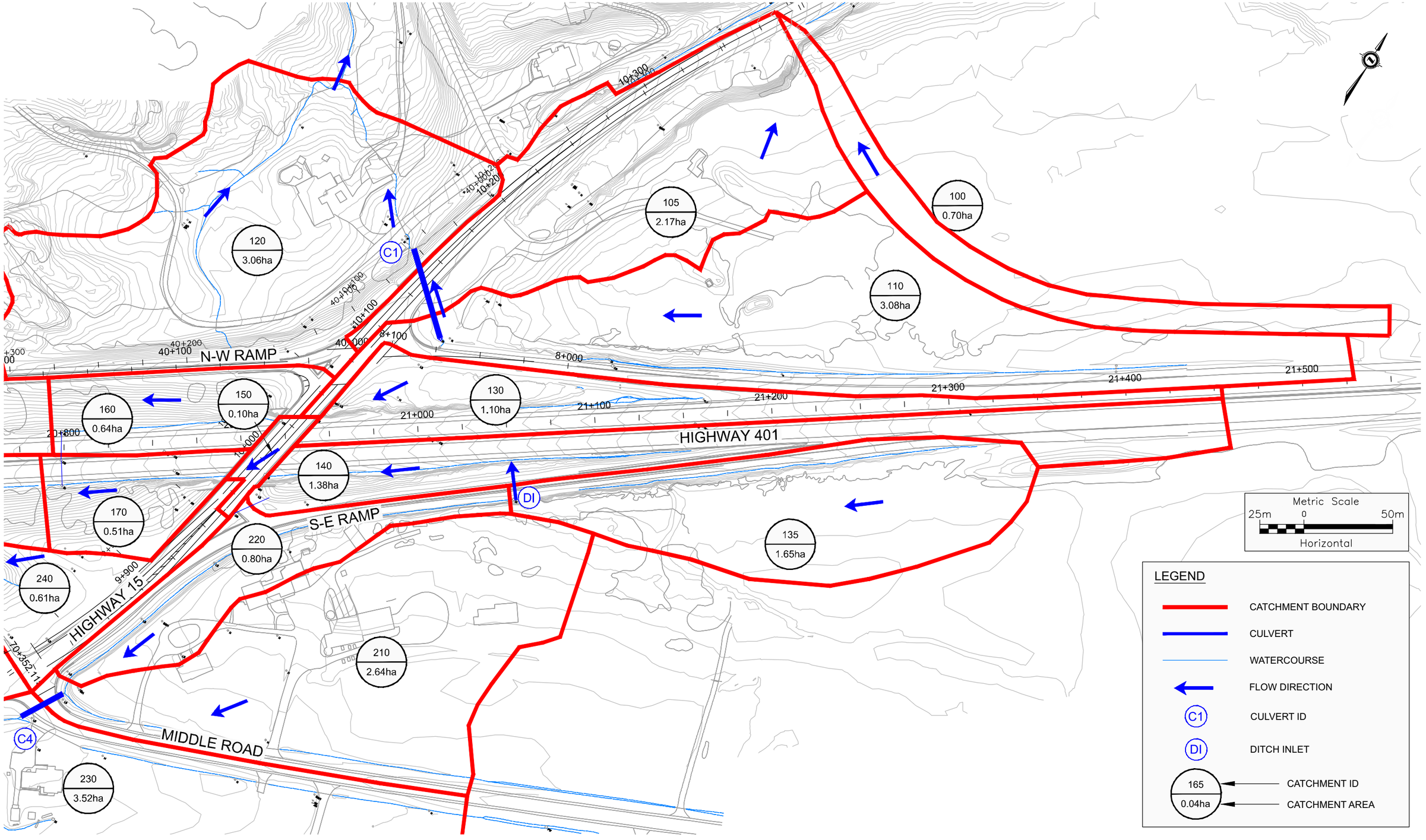
MMM GROUP

Ontario

G.W.P. 4059-11-00
Highway 401 Interchange Improvements
Highway 15

HIGHWAY 15
EXISTING UTILITIES

Figure
3-4



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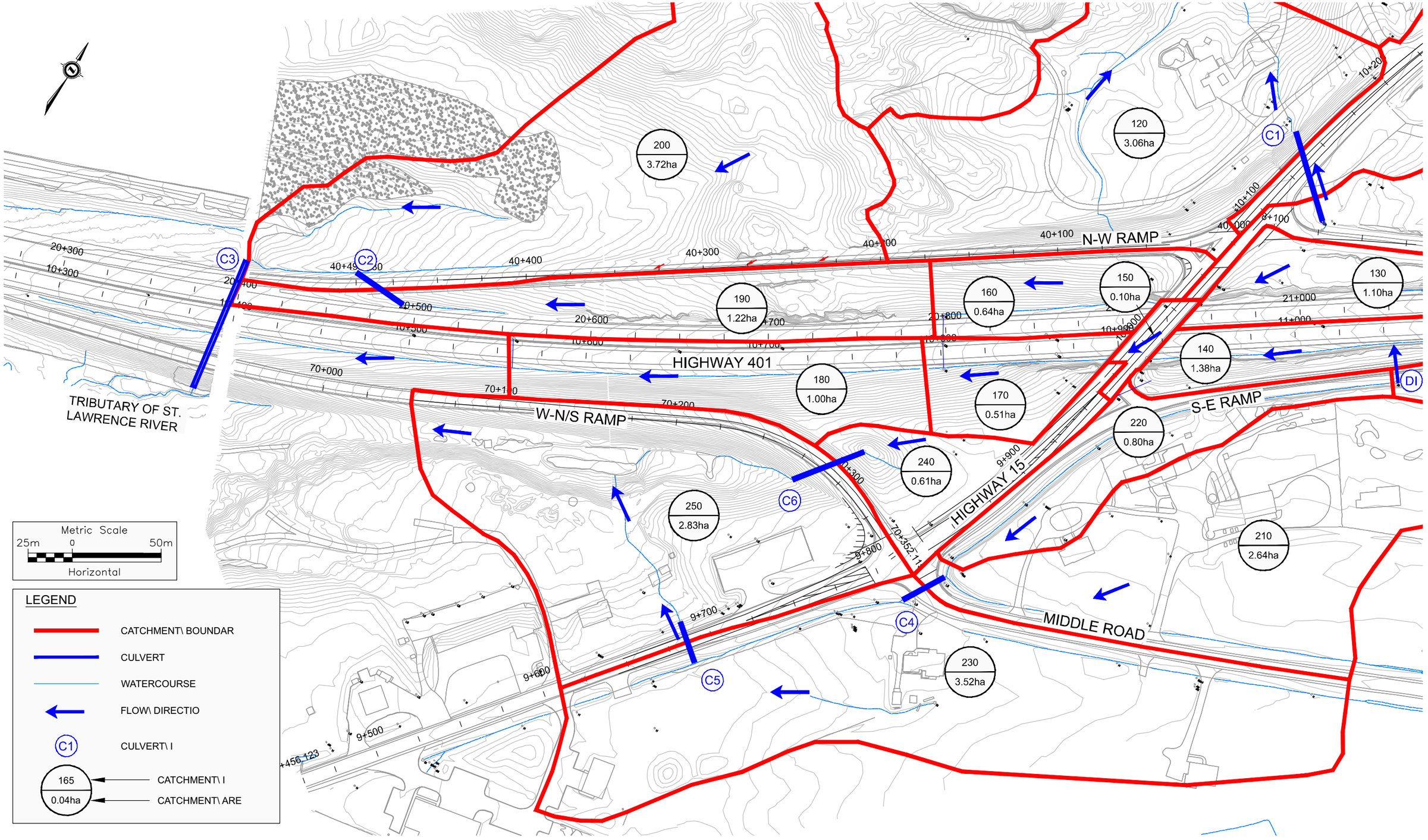
G.W.P. 4059-11-00
Highway 401 Interchange Improvements
Highway 15

EXISTING CONDITIONS DRAINAGE MOSAIC

Figure
3-5a



MMM GROUP Ontario	G.W.P. 4059-11-00 Highway 401 Interchange Improvements Highway 15	**EXISTING CONDITIONS DRAINAGE MOSAIC**	Figure **3-5b**

Table 4-1: Summary of Existing Culvert Characteristics

Culvert ID	Location	Station	Culvert Dimensions			Type	Material	Upstream Invert (m)	Downstream Invert (m)	Flow Direction
			Width (mm)	(Height (mm)	Length (m)					
C1	North of interchange, under Highway 15	10+150	910	610	54.0	Box	Concrete	111.03	108.0	SE → NW
C2	West of Highway 15, under N/S-W Ramp	20+500	600 mm diameter		36.3	CSP	Corrugated Steel	91.69	91.50	E → W
C3	West of interchange, under Highway 401	20+400	1220	1220	77.7	Box	Concrete	86.44	86.30	N → S
C4	East of Highway 15 and Middle Road Intersection, under Middle Road	80+030	450 mm diameter		27.0	CSP	Corrugated Steel	112.65	112.50	N → S
C5	South of interchange, under Highway 15	9+680	700 mm diameter		24.5	CSP	Corrugated Steel	109.20	109.00	E → W
C6	West of Highway 15, under W-N/S Ramp	7+280	700 mm diameter		43.0	CSP	Corrugated Steel	107.00	106.00	NE → SW

Note: CSP = Corrugated steel pipe
Culvert Inverts are estimated based on available information such as existing contract drawings, contour plans and survey information.

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4 PROJECT NEEDS ASSESSMENT & JUSTIFICATION

4.1 PROBLEM / OPPORTUNITY STATEMENTS

The Highway 401 interchange at Highway 15 is one of six interchanges along the Highway 401 corridor that provide access to the City of Kingston. The interchange was originally constructed in the 1950s and consists of a "tight diamond" configuration with offset ramp terminals. It is currently experiencing operational issues that include:

- Significant queuing and delays during peak periods for northbound Highway 15 traffic entering westbound Highway 401 due to: the absence of signalization the left-turn movement, the close proximity of the ramp terminals and no dedicated left-turn lanes on Highway 15;
- Delays at the Highway 15 / Middle Road / eastbound off-ramp intersection due to queues from the north ramp terminal extending to the south ramp terminal during peak periods;
- Queuing at the eastbound off-ramp due to a large proportion of right-turn movements and no designated right-turn lane;
- Concerns associated with the short 'slip ramps' used by traffic turning left onto the Highway 401 on-ramps, which provide little storage and no parallel merging area with higher-speed right-turning traffic; and
- The Highway 15 underpass was originally constructed in 1955 and was last rehabilitated in 1996. It is approaching the end of its service life.

4.2 ALTERNATIVES TO THE UNDERTAKING

The MTO Class EA process requires the consideration and evaluation of alternatives to the undertaking. Alternatives to the undertaking can be defined as all reasonable and feasible means of solving a stated problem or addressing a stated opportunity.

The following alternatives to the undertaking were considered:

- Do nothing
- Transportation demand management (TDM)
- New or improved provincial transportation facilities
- New or improved municipal / private roads

The "Do nothing" alternative was considered in order to provide a baseline against which the effects of other alternatives could be compared. The do nothing alternative does not address any of the problem / opportunity statements in **Section 4.1** and was therefore not considered a feasible solution. The Do Nothing alternative was carried forward throughout the process for comparison purposes.

Transportation demand management (TDM) includes the implementation of measures to sufficiently reduce, shift, or eliminate transportation demand, such that improved transportation infrastructure / operations within the study area are not required. TDM does not improve the safety or the operational issues of the existing interchange and is therefore not considered a feasible alternative.

New or improved provincial transportation facilities and new or improved municipal / private roads, individually, do not fully address the problem / opportunity statements, as issues have been identified in both areas. However, improvements to the Highway 401 and Highway 15 interchange, combined with modifications to the Highway 15 intersections with Middle and Station roads, can fully address the identified problems and opportunities.

Therefore, the preferred planning solution is to implement a combination of improvements to provincial transportation facilities and local roads in the study area.

5 GENERATION AND ASSESSMENT OF DESIGN ALTERNATIVES

5.1 EVALUATION OF DESIGN ALTERNATIVES

This section provides an overview of design alternatives developed to address operational issues at the Highway 401 / Highway 15 interchange, as well as the evaluation process used to identify a Technically Preferred Alternative.

5.1.1 OVERVIEW OF EVALUATION PROCESS

A multi-phased evaluation process was used to identify a Technically Preferred Alternative. **Figure 5-1** provides an overview of the evaluation process. Numbering corresponds to the steps described below.

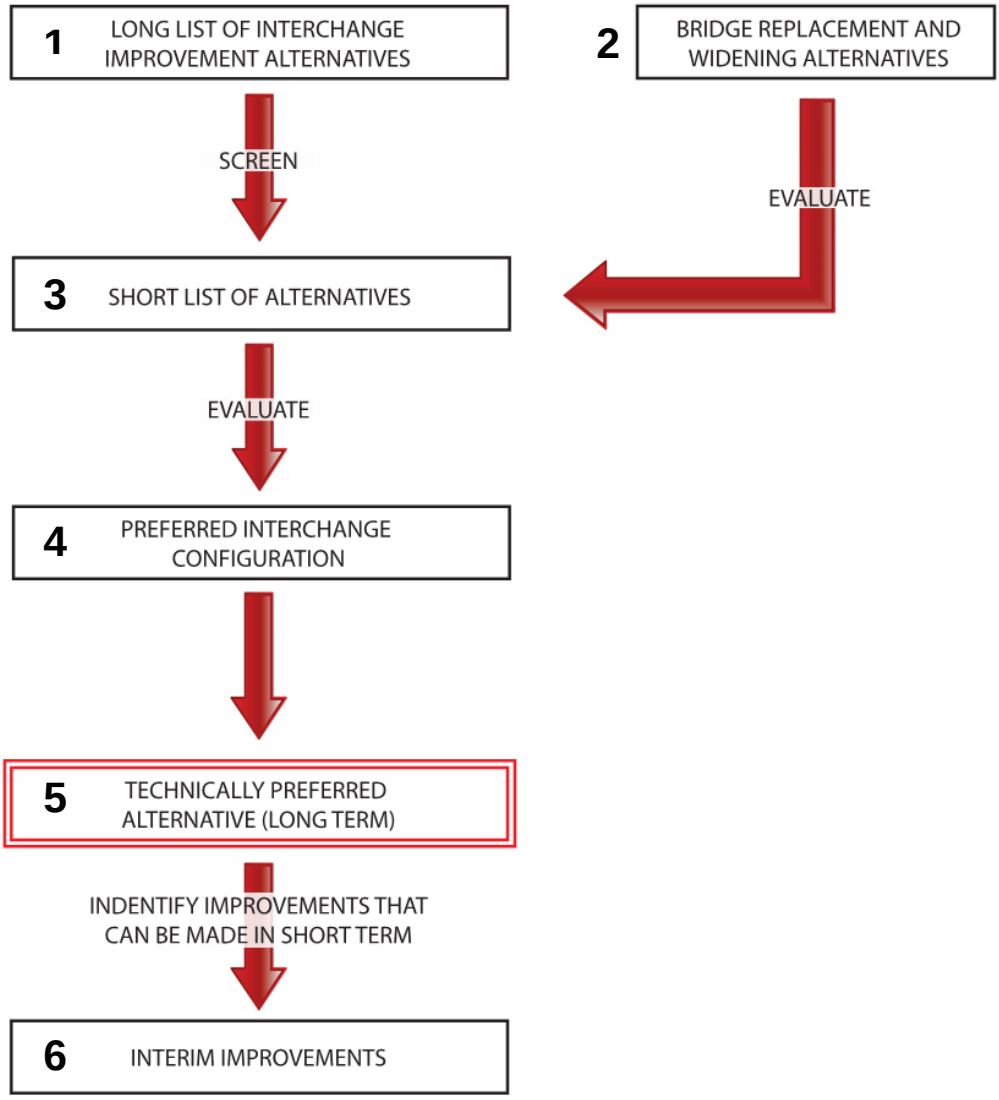


Figure 5-1: Overview of Evaluation Process

The evaluation process consisted of the following phases, described in more detail in the sections that follow:

1. Based on the identified interchange deficiencies, a long list of possible interchange improvements was developed. A screening of these alternatives was carried out by qualitatively assessing technical criteria, environmental considerations and cost. Alternatives that met minimum criteria for technical feasibility were carried forward for more detailed evaluation ('the short list').
2. Concurrently, a variety of alternatives were developed to accommodate possible widening and / or replacement of the Highway 15 underpass. Alternatives included replacement of the bridge on a new alignment (i.e., to the east or to the west of the exiting bridge).
3. The short list of alternatives included 12 interchange and alignment configurations. Each alternative was evaluated quantitatively and qualitatively against 17 different key measures reflecting technical, environmental, cost and constructability considerations. For each interchange alternative, each key measure was assigned a score of one to five. Key measures were also assigned a weighting to reflect their relative importance. An overall score was calculated for each alternative based on the weighted sum of key measures.
4. The alternative with the best overall score emerged as the preferred interchange configuration. Refinements to the preferred interchange configuration were then carried out, resulting in the Technically Preferred Alternative.
5. With the Technically Preferred Alternative selected, possible improvements that can be made in the short term (5-10 years) were identified. These are referred to in this report as the Proposed Interim Improvements.

5.1.2 PHASE 1 – SCREENING OF LONG LIST OF INTERCHANGE ALTERNATIVES

A total of 20 alternative interchange configurations were developed for preliminary screening: 10 for the north side of Highway 401, and 10 for the south side. Each is described in detail below. The alternatives are generally based on the standard intersection configurations illustrated in **Figure 5-2**.

The alternatives were screened based on a list of criteria, including natural environment impacts, cultural heritage impacts, social and economic impacts, constructability, traffic impacts, long-term suitability, and cost. The results of the screening are summarized below and detailed in **Appendix I.**

5.1.2.1 *Improvements North of Highway 401*

Do Nothing: This alternative involves no modifications to the existing. This alternative results in no construction costs or impacts, and does not address short- or long-term traffic needs. It was ***carried forward*** for comparison purposes only.

Alternative N-W1: This alternative involves the following elements:

- Realigning the westbound off-ramp so that it aligns with the westbound on-ramp;
- Widening the westbound on-ramp to two lanes and providing increased separation between traffic entering the ramp from southbound and northbound directions;
- Signalizing the north ramp terminal;
- Potential maintenance of the existing bridge;
- Potential closure or modification of Station Road at Highway 15.

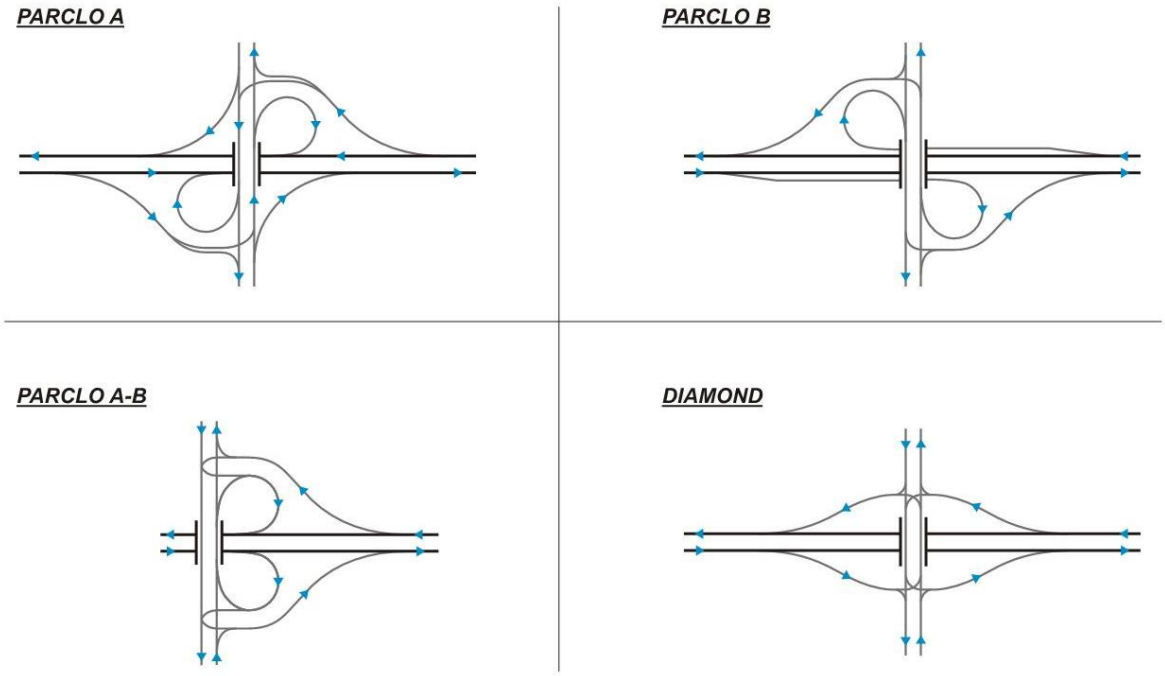


Figure 5-2 Standard Interchange Configurations

Alternative N-W1 is detailed in **Figure 5-3.** This alternative has a relatively low cost and minimal property impacts. It addresses short-term and possibly long-term traffic needs and does not require the short-term replacement of the Highway 15 underpass. However, the ramp terminal will be located in close proximity to the Station Road intersection, which is not optimal. This alternative was ***carried forward*** for further evaluation.

Alternative N-BH1: This alternative involves the following elements:

- Replacing the existing ramps with 'buttonhook' ramps and relocating the ramp terminal;
- Widening Highway 15 at the new ramp terminal to provide a southbound left turn lane and a northbound right-turn lane;
- Removing the existing ramps; and
- Potential maintenance of the existing bridge.

Alternative N-BH1 is detailed in **Figure 5-4.** This alternative addresses short-term and possibly long-term traffic needs and does not require the short-term replacement of the Highway 15 underpass. However, it would involve residential property impacts in the northeast quadrant of the intersection due to the relocation of the ramp terminal. It was ***not carried forward***.

Alternative N-D1: This alternative involves the following elements:

- Reconfiguring the existing ramp terminal to incorporate a roundabout;
- Constructing a new bridge to the west of the existing bridge; and
- Potential closure or modification of Station Road at Highway 15.

Alternative N-D1 is detailed in **Figure 5-5**. This alternative has relatively few property impacts. However it does not address long-term traffic needs, and a roundabout is less compatible with long-combination vehicles (LCVs) compared to a traditional intersection. This alternative was ***not carried forward***.

Alternative N-D2: This alternative involves the following elements:

- Reconfiguring the existing ramp terminal to incorporate a roundabout;
- Constructing a new bridge to the east of the existing bridge; and
- Potential closure or modification of Station Road at Highway 15.

Alternative N-D2 is detailed in **Figure 5-6.** This alternative provides a relatively short bridge over Highway 401. However, it does not address long-term traffic needs, and a roundabout is less compatible with long-combination vehicles compared to a traditional intersection. This alternative was ***not carried forward***.

Alternative N-D3: This alternative involves the following elements:

- Reconfiguring the existing ramp terminal to incorporate a roundabout;
- Potential maintenance or replacement of existing bridge;
- Potential closure or modification of Station road at Highway 15.

Alternative N-D3 is detailed in **Figure 5-7**. This alternative has minimal property impacts. However, it does not address long-term traffic needs, and a roundabout is less compatible with long-combination vehicles compared to a traditional intersection. This alternative was ***not carried forward***.

Alternative N-D4: This alternative involves the following elements:

- Realigning the westbound off-ramp to align with Station Road, and providing a roundabout intersection;
- Requiring northbound Highway 15 traffic accessing the westbound Highway 401 on-ramp to make a U-turn at the roundabout; and
- Potential maintenance or replacement of the existing bridge.

Alternative N-D4 is detailed in **Figure 5-8.** This alternative has minimal property impacts. However, it does not address long-term traffic needs, and a roundabout is less compatible with long-combination vehicles compared to a traditional intersection. In addition, the required U-turn for northbound Highway 15 vehicles accessing westbound Highway 401 may be unfamiliar to drivers. This alternative was ***not carried forward***.

Alternative N-PA1: This alternative includes the following elements:

- Replacing the existing ramps with ramps in a ‘Parclo A’ configuration;
- Configuring the ramp terminal as a roundabout aligned with Station Road (a signalized intersection will also be considered);
- Removing the existing ramps; and
- Constructing a new bridge to the west of the existing bridge.

Alternative N-PA1 is detailed in **Figure 5-9.** This alternative addresses short- and long-term traffic needs and has relatively few property impacts. However, a roundabout is less compatible with long-combination vehicles as compared with a traditional intersection. This alternative was ***carried forward*** for further evaluation.

Alternative N-PA2: This alternative involves reconfiguring the north ramps into a ‘Parclo A’ configuration. It includes the following elements:

- Realigning Station Road to tie into the new ramp terminal (closing Station Road at Highway 15 will also be considered); and
- Constructing a new bridge to the east of the existing bridge.

Alternative N-PA2 is detailed in **Figure 5-10**. This alternative provides improved ramp geometry and a high-capacity interchange configuration that addresses short- and long-term traffic needs. However it has relatively high cost and property impacts in the northeast quadrant of the interchange, and requires realignment of Station Road. This alternative was ***carried forward*** for further evaluation.

Alternative N-DD1: This alternative involves reconfiguring the north ramps into a 'diverging diamond' configuration. It includes the following elements:

- Replacing the existing bridge; and
- Closing or modifying the Station Road / Highway 15 interchange.
- Requires the south half of the interchange to be similarly configured.

Alternative N-DD1 is detailed in **Figure 5-11**. This alternative removes left turns, so that turning vehicles do not have to cross opposing traffic, and provides improved traffic capacity. However, it requires a wide bridge structure at increased cost, and the close proximity of the south ramp terminal to Middle Road is not desirable. This alternative was ***not carried forward***.

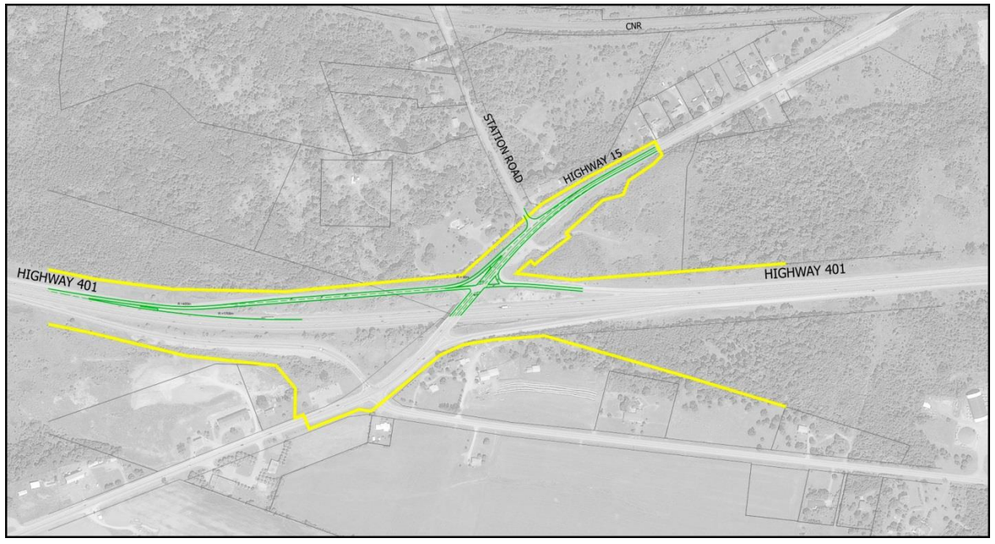


Figure 5-3: Alternative N-W1 (carried forward)

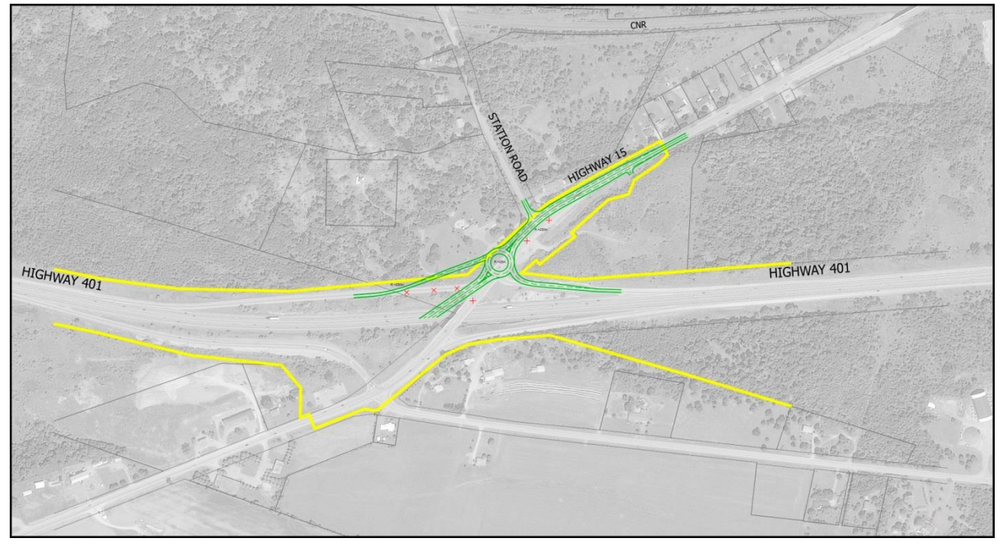


Figure 5-4: Alternative N-D1 (not carried forward)

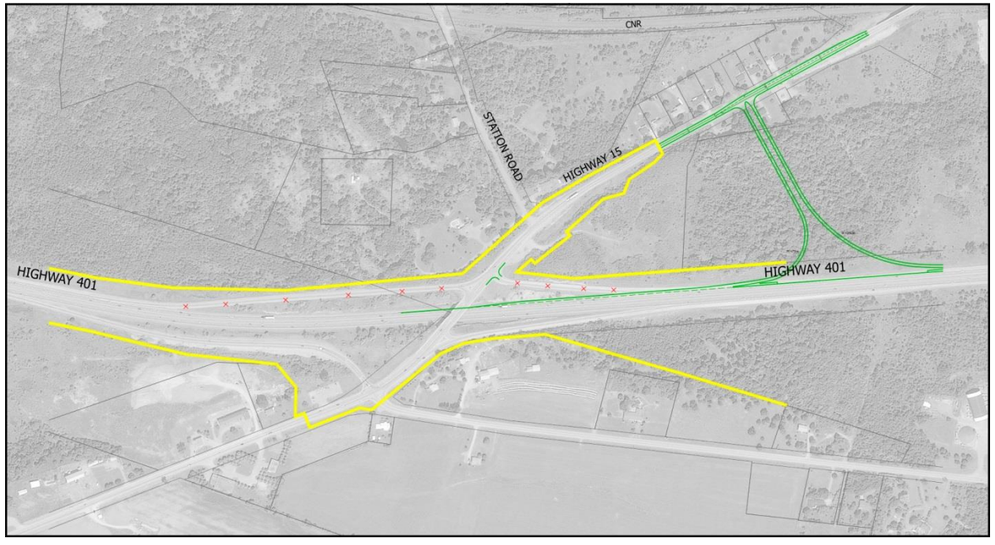


Figure 5-5: Alternative N-BH1 (not carried forward)

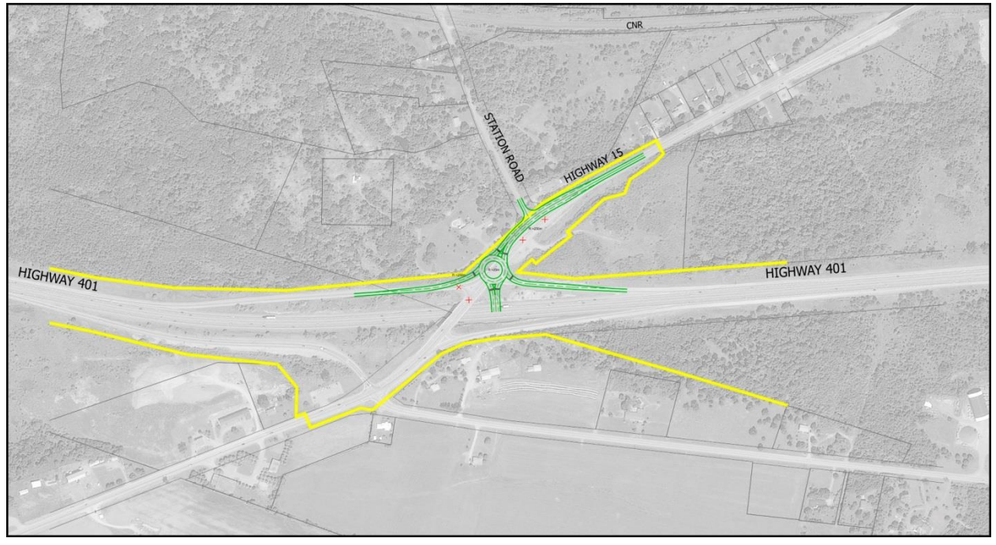


Figure 5-6 Alternative N-D2 (not carried forward)

Figure 5-7: Alternative N-D3 (not carried forward)

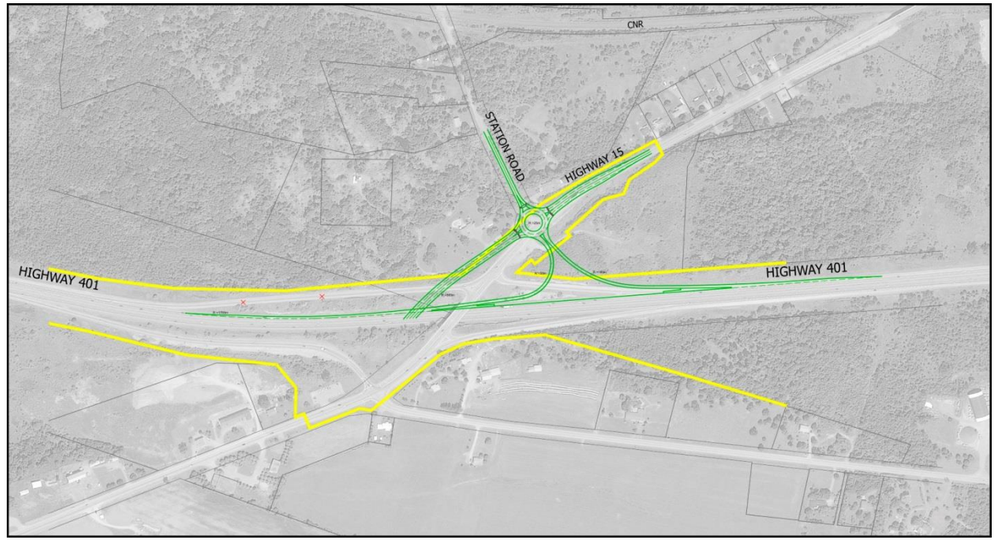


Figure 5-8: Alternative N-PA1 (carried forward)

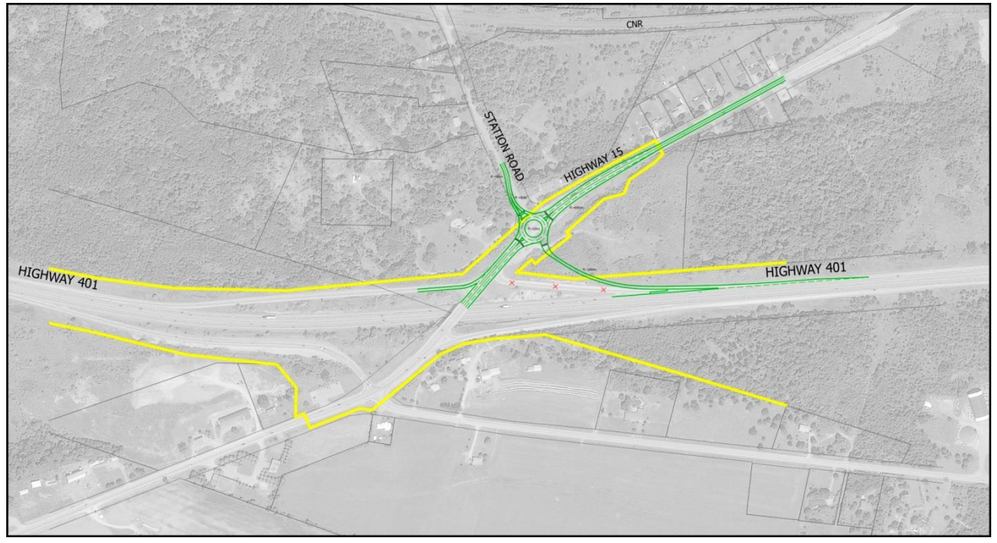


Figure 5-9: Alternative N-D4 (not carried forward)

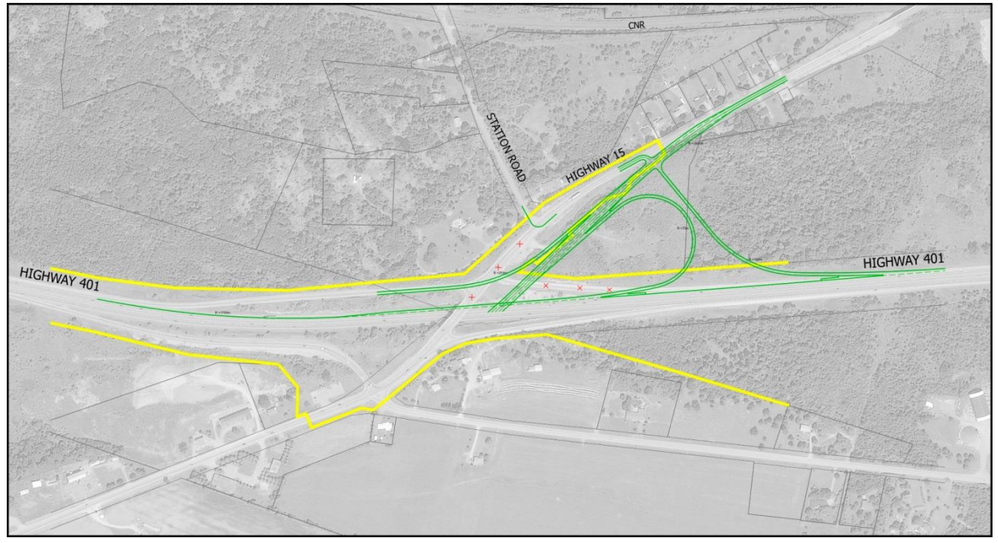


Figure 5-10: Alternative N-PA2 (carried forward)

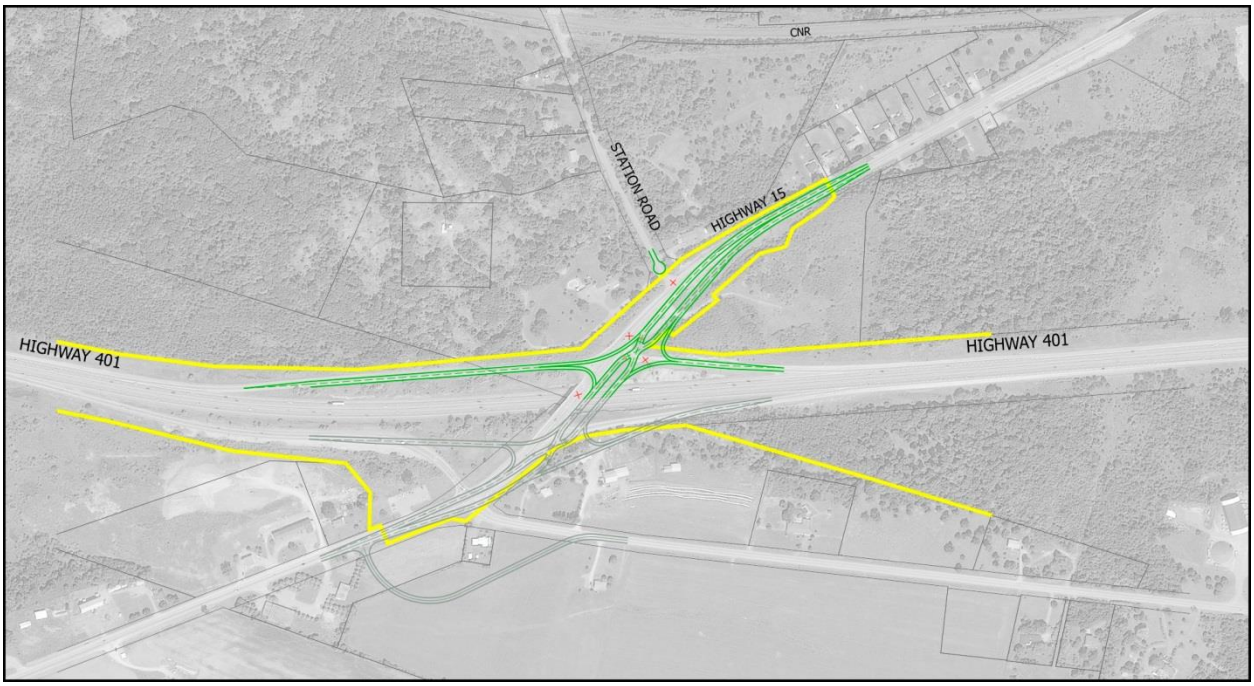


Figure 5-11: Alternative N-DD1 (not carried forward)

A summary of the alternatives carried forward for further evaluation is provided below.

Alternative	Recommendation	Rationale
Do Nothing	Carried forward	Carried forward for comparison purposes.
N-W1	Carried forward	Addresses short-term and possibly long-term traffic needs.
N-BH1	Not carried forward	Would involve significant residential property impacts.
N-D1	Not carried forward	Does not address long-term traffic needs, and a roundabout is less compatible with LCVs compared to a traditional intersection.
N-D2	Not carried forward	Does not address long-term traffic needs, and a roundabout is less compatible with LCVs compared to a traditional intersection.
N-D3	Not carried forward	Does not address long-term traffic needs, and a roundabout is less compatible with LCVs compared to a traditional intersection.
N-D4	Not carried forward	Does not address long-term traffic needs, and a roundabout is less compatible with LCVs compared to a traditional intersection.
N-PA1	Carried forward	Addresses short- and long-term traffic needs but a roundabout is less compatible with LCVs
N-PA2	Carried forward	Provides improved ramp geometry and a high-capacity interchange
N-DD1	Not carried forward	Requires wide bridge structure at significant increased cost.

5.1.2.2 *Improvements South of Highway 401*

Do Nothing: This alternative involves no modifications to the existing configuration and is included for comparison purposes. The Do Nothing alternative results in no construction costs or impacts, but does not address short- or long-term traffic needs. It was ***carried forward*** for comparison purposes only.

Alternative S-W1: This alternative involves the following elements:

- Widening the eastbound off-ramp to provide left-turn, through, and right-turn lanes;
- Reconfiguring the northbound Highway 15 right-turn lane at the eastbound off-ramp / Middle Road intersection to a through / right lane; and
- Potential maintenance of the existing bridge.

Alternative S-W1 is detailed in **Figure 5-12.** This alternative has a low cost and minimal impact, and addresses short-term and possibly long-term traffic needs. It also does not require short-term replacement of the Highway 15 underpass. However, it maintains the existing left-turn configuration from southbound Highway 15 to eastbound Highway 401. It was ***carried forward*** for further evaluation.

Alternative S-BH1: This alternative, detailed in **Figure 5-13,** involves the following elements:

- Widening the eastbound off-ramp to provide left-turn, through, and right-turn lanes;
- Reconfiguring the northbound Highway 15 right-turn lane at the eastbound off-ramp / Middle Road intersection to a through / right lane;
- Replacing the eastbound on-ramp with a 'buttonhook' ramp from Middle Road, with Middle Road improvements as required); and
- Potential maintenance of the existing bridge.

This alternative addresses short- and possibly long-term traffic needs and does not require short-term replacement of the Highway 15 underpass. However, it has property impacts in the southeast quadrant. It was ***carried forward*** for further evaluation.

Alternative S-BH2: This alternative, detailed in **Figure 5-14,** involves the following elements:

- Widening the eastbound off-ramp to provide left-turn, through, and right-turn lanes;
- Reconfiguring the northbound Highway 15 right-turn lane at the eastbound off-ramp / Middle Road intersection to a through / right lane;
- Replacing the eastbound on-ramp with a 'buttonhook' ramp from Middle Road, with Middle Road improvements as required); and
- Constructing a new bridge to the west of the existing bridge.

This alternative addresses short- and possibly long-term traffic needs. However, it has property impacts in the southeast and southwest quadrants. This option was ***carried forward*** for further evaluation.

Alternative S-D1: This alternative, detailed in **Figure 5-15,** involves the following elements:

- Reconfiguring the eastbound off-ramp / Middle Road intersection as a roundabout;
- Providing bypass channels for traffic exiting eastbound Highway 401 turning onto southbound Highway 15, and for traffic exiting northbound Highway 15 turning onto eastbound Middle Road;
- Requiring southbound Highway 15 traffic accessing the eastbound Highway 401 on-ramp to make a U-turn at the roundabout; and
- Constructing a new bridge to the west of the existing bridge.

This alternative has relatively few property impacts and addresses short- and long-term traffic needs. However, a roundabout is less compatible with long-combination vehicles compared to a traditional intersection, and the required U-turn for southbound Highway 15 vehicles accessing eastbound Highway 401 may be unfamiliar to drivers. This alternative was ***not carried forward***.

Alternative S-D2: This alternative, detailed in **Figure 5-16,** involves the following elements:

- Reconfiguring the ramp terminal / Middle Road intersection as a five-leg roundabout;

- Providing bypass channels for traffic exiting eastbound Highway 401 turning onto southbound Highway 15, and for traffic exiting northbound Highway 15 turning onto eastbound Middle Road; and
- Constructing a new bridge to the west of the existing bridge.

The roundabout included in this alternative would not provide an adequate level of service in the long-term (based on predicted 2033 traffic levels). This alternative has relatively few property impacts; however, a roundabout is less compatible with long-combination vehicles compared to a traditional intersection. This alternative was ***not carried forward*** for further evaluation.

Alternative S-D3: This alternative, detailed in **Figure 5-17**, involves the following elements:

- Reconfiguring the ramp terminal / Middle Road intersection as a five-leg roundabout;
- Providing bypass channels for traffic exiting eastbound Highway 401 turning onto southbound Highway 15, and for traffic exiting northbound Highway 15 turning onto eastbound Middle Road; and
- Constructing a new bridge to the east of the existing bridge.

The roundabout included in this alternative would not provide an adequate level of service in the long-term (based on predicted 2033 traffic levels). A roundabout is less compatible with long-combination vehicles compared to a traditional intersection. This alternative also has property impacts in the southeast quadrant. It was ***not carried forward*** for further evaluation.

Alternative S-D4: This alternative, detailed in **Figure 5-18,** involves the following elements:

- Reconfiguring the eastbound off-ramp / Middle Road intersection as a roundabout;
- Providing bypass channels for traffic exiting eastbound Highway 401 turning onto southbound Highway 15, and for traffic exiting northbound Highway 15 turning onto eastbound Middle Road;
- Requiring southbound Highway 15 traffic accessing the eastbound Highway 401 on-ramp to make a U-turn at the roundabout; and
- Potential maintenance or replacement of the existing bridge.

This alternative has relatively few property impacts and addresses short- and long-term traffic needs. However, a roundabout is less compatible with long-combination vehicles compared to a traditional intersection, and the required U-turn for southbound Highway 15 vehicles accessing eastbound Highway 401 may be unfamiliar to drivers. This alternative was ***not carried forward***.

Alternative S-PA1: This alternative, detailed in **Figure 5-19,** involves reconfiguring the south ramps into a 'Parclo A' configuration. It includes the following elements:

- Widening the eastbound Highway 401 off-ramp to provide left-turn, through, and right-turn lanes;
- Realigning Middle Road to the ramp terminal; and
- Constructing a new Highway 15 bridge to the east of the existing bridge.

This alternative provides a high-capacity interchange configuration that addresses short- and long-term traffic needs. However, it has a relatively high cost and property impacts. This alternative was ***carried forward*** for further evaluation.

Alternative S-DD1: This alternative, detailed in **Figure 5-20**, involves reconfiguring the south ramps into a 'diverging diamond' interchange. It includes the following elements:

- Realigning Middle Road to the south; and
- Replacing the existing bridge.

This alternative requires the north half of the interchange to be similarly configured.

This alternative removes left turns, so that turning vehicles do not have to cross opposing traffic, and provides improved traffic capacity. However, it requires a wide bridge structure at increased cost, and the close proximity of the south ramp terminal to Middle Road is not desirable. This alternative was ***not carried forward***.

A summary of the alternatives carried forward for further evaluation is provided below.

Alternative	Recommendation	Rationale
Do Nothing	Carried forward	Does not address short- or long-term traffic needs.
S-W1	Carried forward	Has low cost and minimal impact, and addresses short-term traffic needs
S-BH1	Carried forward	Addresses short- and possibly long-term traffic needs.
S-BH2	Carried forward	Addresses short- and possibly long-term traffic needs.
S-D1	Not carried forward	Roundabout is less compatible with LCVs.
S-D2	Not carried forward	Roundabout would not provide adequate level of service in long-term.
S-D3	Not carried forward	Roundabout would not provide adequate level of service in long-term.
S-D4	Not carried forward	Roundabout is less compatible with LCVs.
S-PA1	Carried forward	Provides a high-capacity interchange configuration that addresses short- and long-term traffic needs.
S-DD1	Not carried forward	Requires a wide bridge structure at a significantly increased cost.

Figure 5-12: Alternative S-W1 (carried forward)

Figure 5-13: Alternative S-BH2 (carried forward)

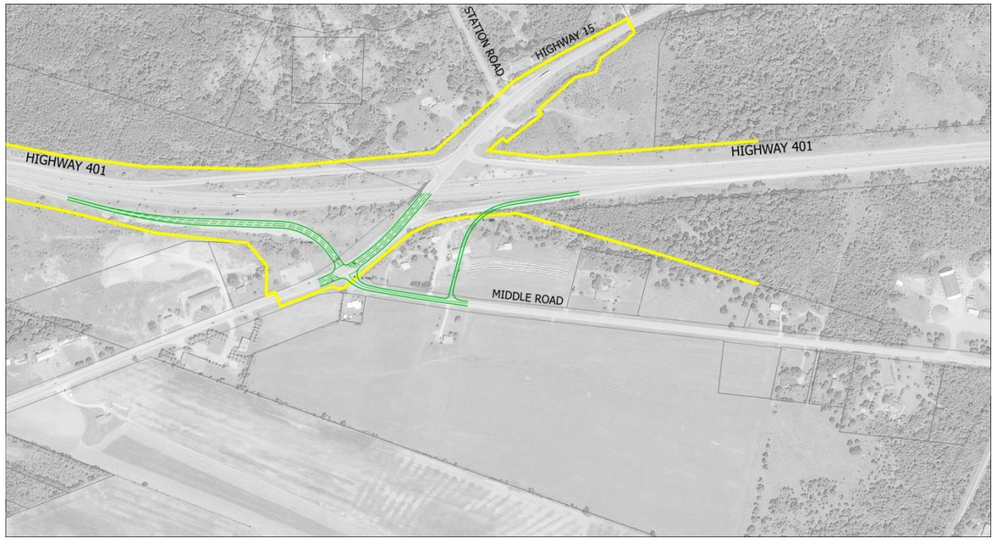


Figure 5-14: Alternative S-BH1 (carried forward)

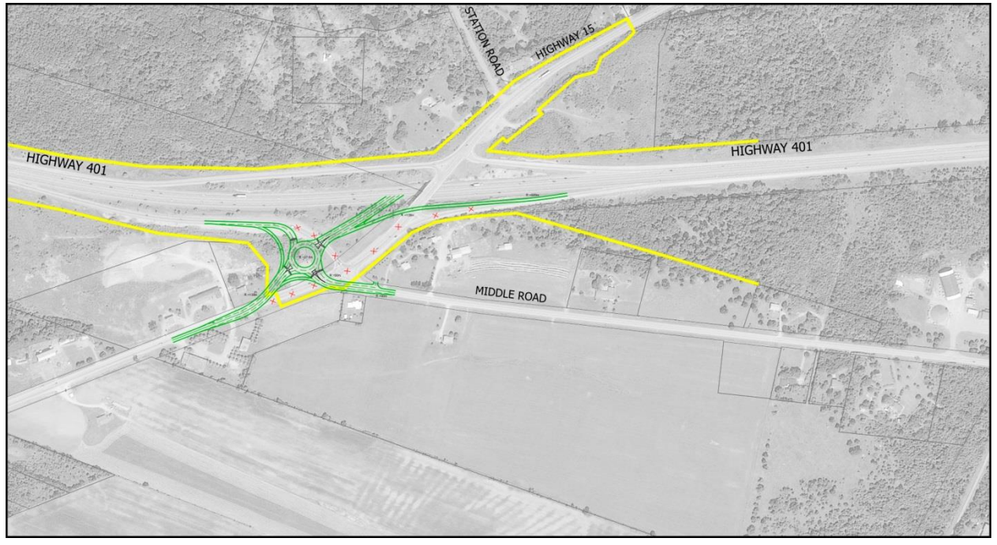


Figure 5-15: Alternative S-D1 (not carried forward)

Figure 5-16: Alternative S-D2 (not carried forward)

Figure 5-17: Alternative S-D4 (not carried forward)

Figure 5-18: Alternative S-D3 (not carried forward)

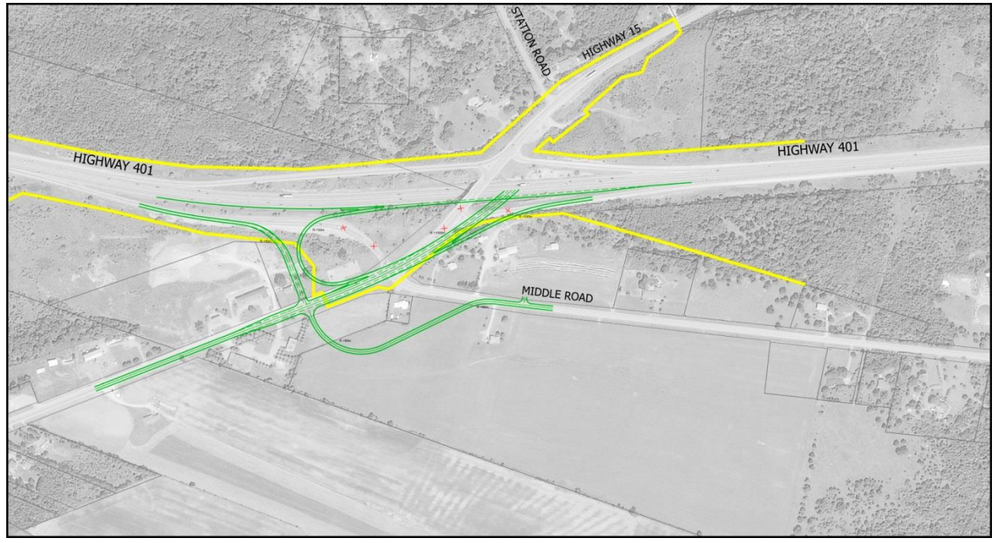


Figure 5-19 Alternative S-PA1 (carried forward)

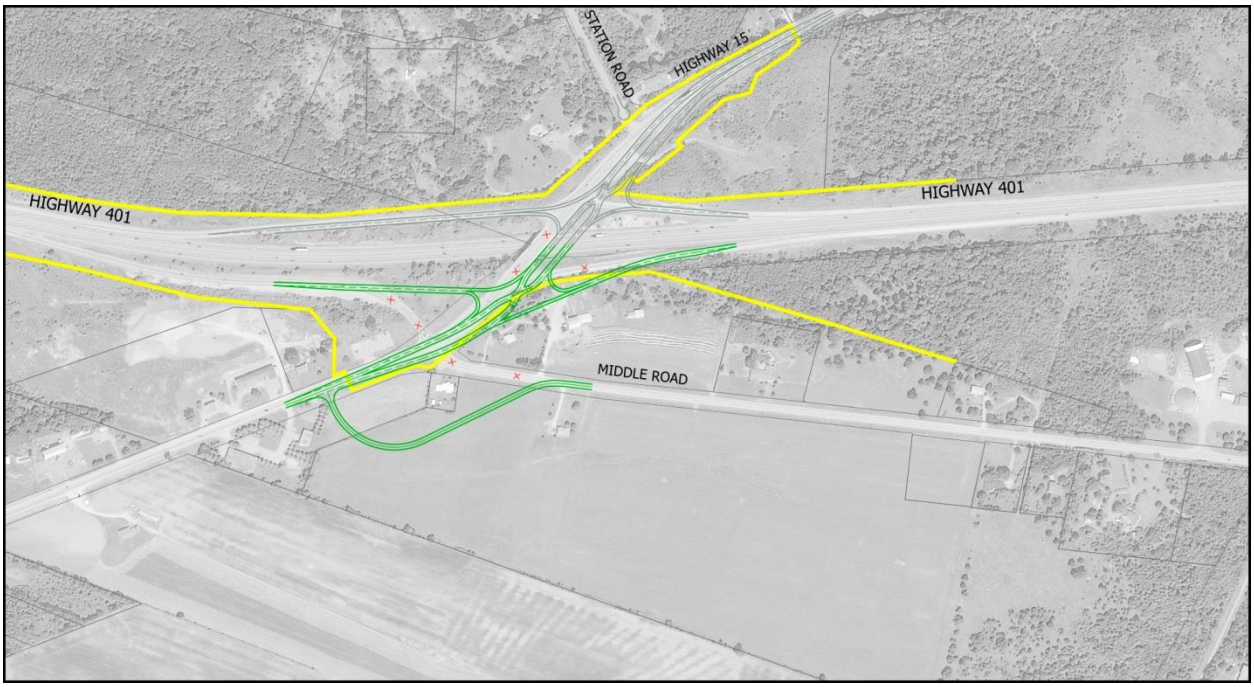


Figure 5-20: Alternative S-DD1 (not carried forward)

5.1.3 HIGHWAY 15 STRUCTURAL ALTERNATIVES

The existing Highway 15 underpass was originally built in 1953 and was most recently rehabilitated in 1995, wherein the sidewalks were removed to accommodate four lanes of traffic with a 3.58 m lane width.

A structural assessment was completed and concluded that the bridge would need to be replaced for the following reasons:

- The condition and age of the bridge is such that it will require a major rehabilitation in the near future and likely regular maintenance at short intervals thereafter.
- The existing bridge span would not accommodate any expansion of Highway 401 lanes, should it be required in the future.
- The existing bridge cannot accommodate a Highway 401 speed-change lane passing underneath the structure.

Due to the bridge type, staged construction is not feasible and due to the lack of staging area and bridge type, rapid-bridge replacement is also not feasible. Therefore, the bridge must be replaced on a new alignment within the project horizon: either shifted to the east or to the west of the existing bridge.

5.1.4 PHASE 2 – EVALUATION OF SHORT LIST OF INTERCHANGE ALTERNATIVES

The following seven interchange improvement alternatives were carried forward for further analysis and evaluation and comparison to the do nothing alternative:

North Side:

- N-W1 (Diamond configuration; widen and extend merge length of Highway 401 EB on-ramp; signalize intersection);

- N-PA1 (Parclo A configuration; construct roundabout at Station Road / Highway 15 intersection)
- N-PA2 (Parclo A configuration; realign Station Road to intersect Highway 15 at the Highway 401 WB off-ramp intersection)

South Side:

- S-W1 (Diamond configuration; widen EB off-ramp);
- S-BH1 (Buttonhook configuration; widen EB off-ramp and realign Highway 401 EB on-ramp);
- S-BH2 (Buttonhook configuration; widen EB off-ramp; realign Middle Road / Highway 15 and Highway 401 EB off-ramp intersection);
- S-PA1 (Parclo A configuration; realign Middle Road to intersect Highway 15 at the Highway 401 EB off-ramp intersection).

Various combinations of the north and south side improvements listed above are possible. Realignment of Highway 15 to the east or to the west is also compatible with various interchange improvement options.

A total of twelve viable combinations of interchange improvement alternatives and highway realignment alternatives were developed, as shown in **Figure 5-21** and listed below.

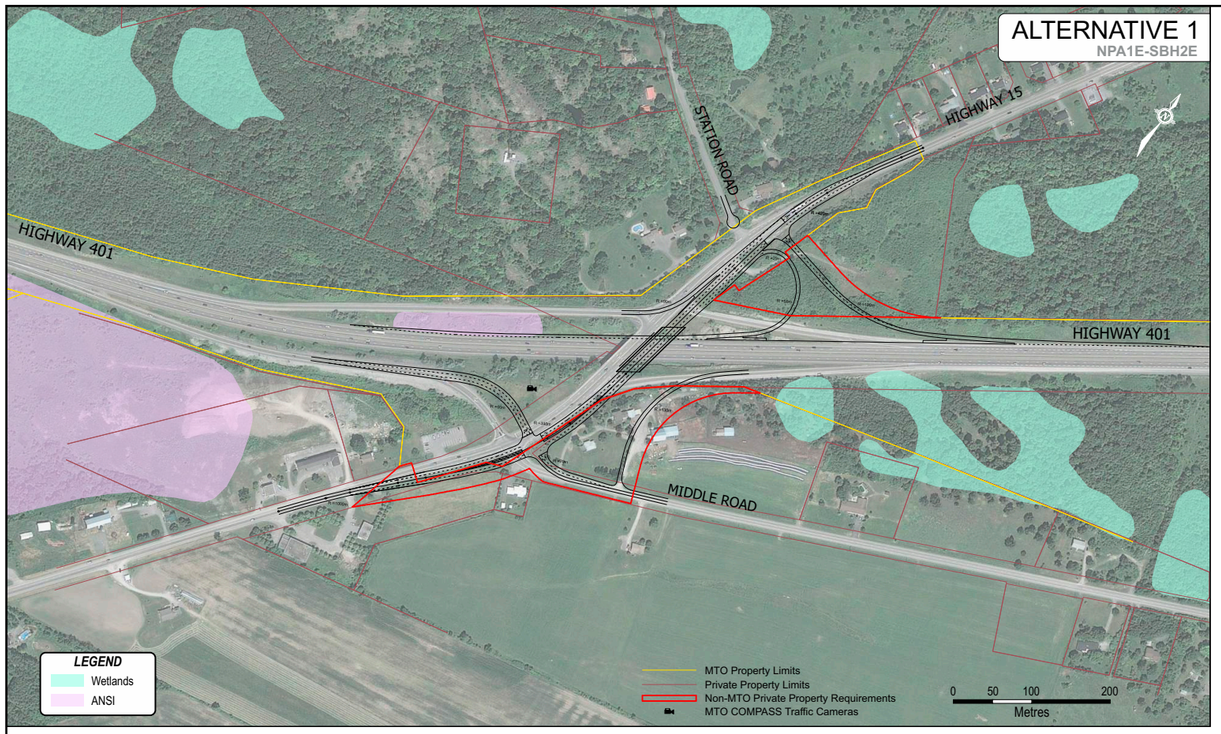
Alternative Number	Description
1	NPA1E-SBH2E: Parclo A1 / Buttonhook Interchange with Highway 15 Realignment to the East
2	NPA1W-SBH2W: Parclo A1 / Buttonhook Interchange with Highway 15 Realignment to the West
3	NPA1E-SW1E: Parclo A1 / Diamond Interchange with Highway 15 Realignment to the East
4	NPA1W-SW1W: Parclo A1 / Diamond Interchange with Highway 15 Realignment to the West
5	NPA1E-SPA1E: Parclo A1 Interchange with Highway 15 Realignment to the East
6	NPA1W-SPA1W: Parclo A1 Interchange with Highway 15 Realignment to the East
7	NPA2E-SBH2E: Parclo A2 / Buttonhook Interchange with Highway 15 Realignment to the East
8	NPA2W-SBH2W: Parclo A2 / Buttonhook Interchange with Highway 15 Realignment to the West
9	NPA2E-SPA1E: Parclo A2 / Parclo A1 Interchange with Highway 15 Realignment to the East
10	NPA2W-SPA1W: Parclo A2 / Parclo A1 Interchange with Highway 15 Realignment to the West
11	NPA2E-SW1E: Parclo A2 / Diamond Interchange with Highway 15 Realignment to the East
12	NPA2W-SW1W: Parclo A2 / Diamond Interchange with Highway 15 Realignment to the West
13	Do nothing (for comparison purposes)

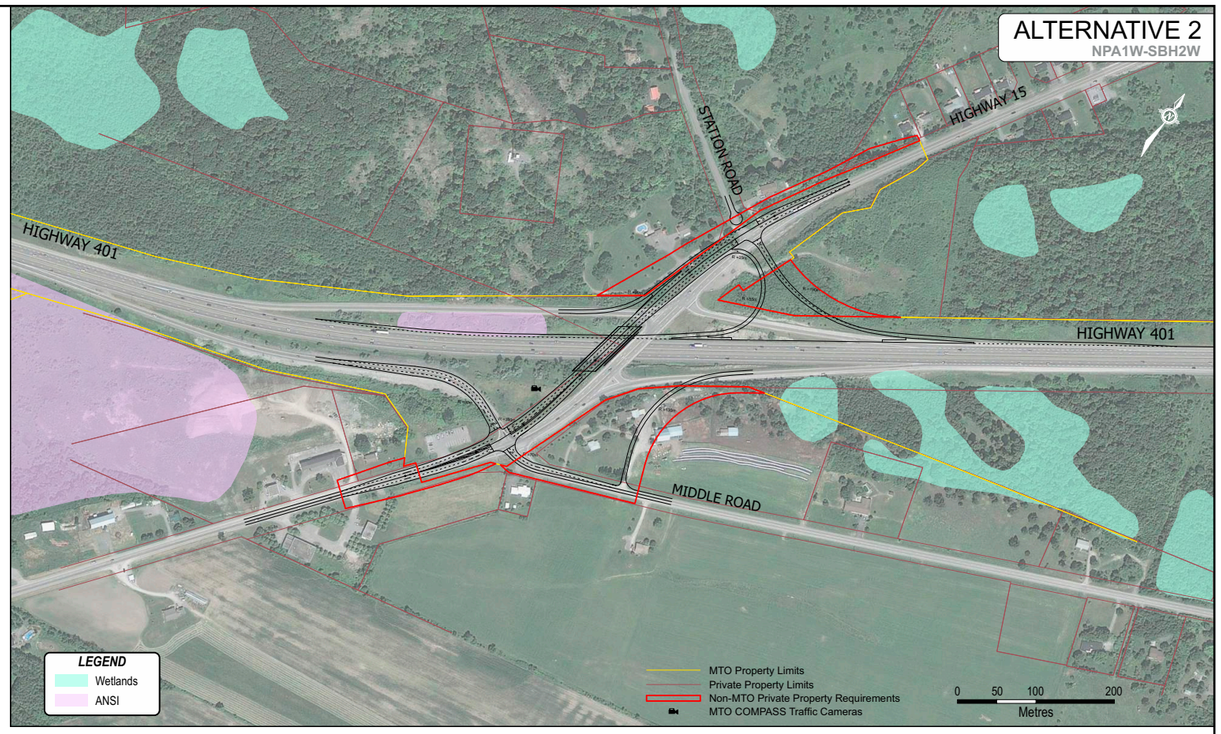
The short list was evaluated to identify a Technically Preferred Alternative. Each alternative was evaluated considering natural environmental factors, transportation considerations, and cost and constructability. Each factor area consists of a number of key measures, as outlined below. Factor areas were assigned a relative weighting, shown in parentheses. Key measures were also assigned relative weightings, outlined further in **Table 5-1**, **Table 5-2**, and **Table 5-3**.

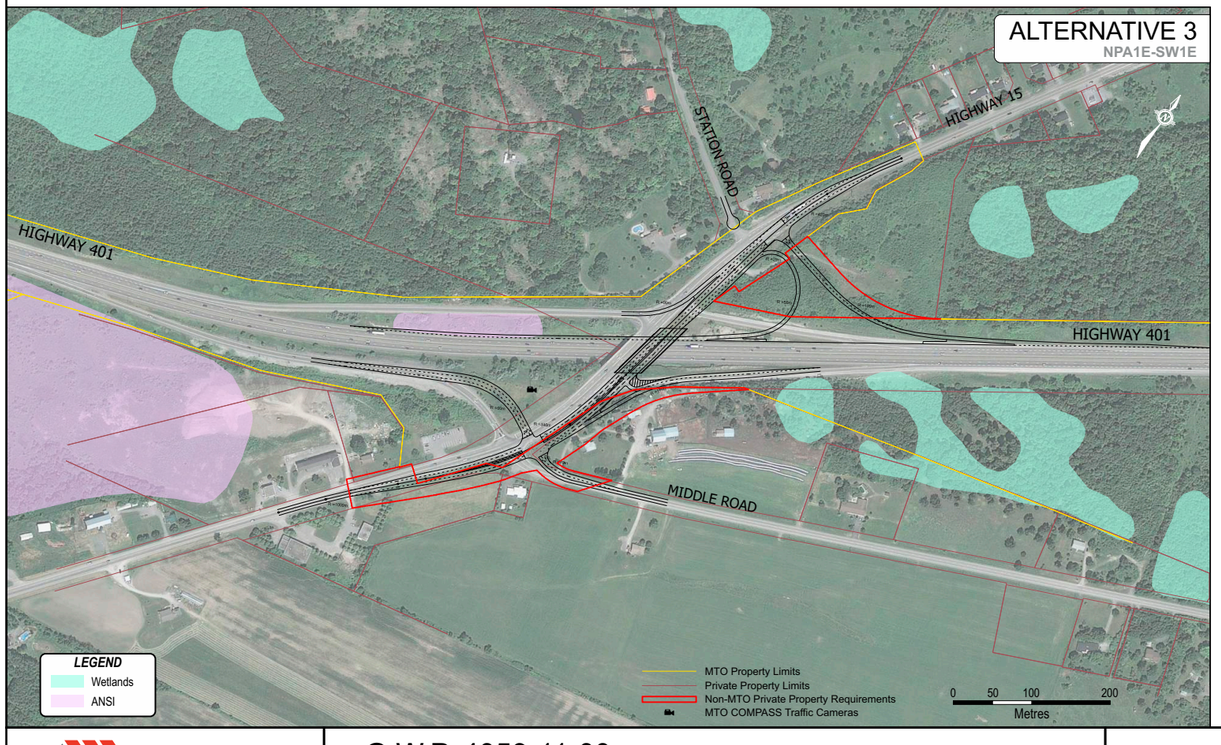
FACTOR AREAS		
TRANSPORTATION CONSIDERATIONS (50%)	**ENVIRONMENTAL CONSIDERATIONS (40%)**	**COST & CONSTRUCTABILITY (10%)**

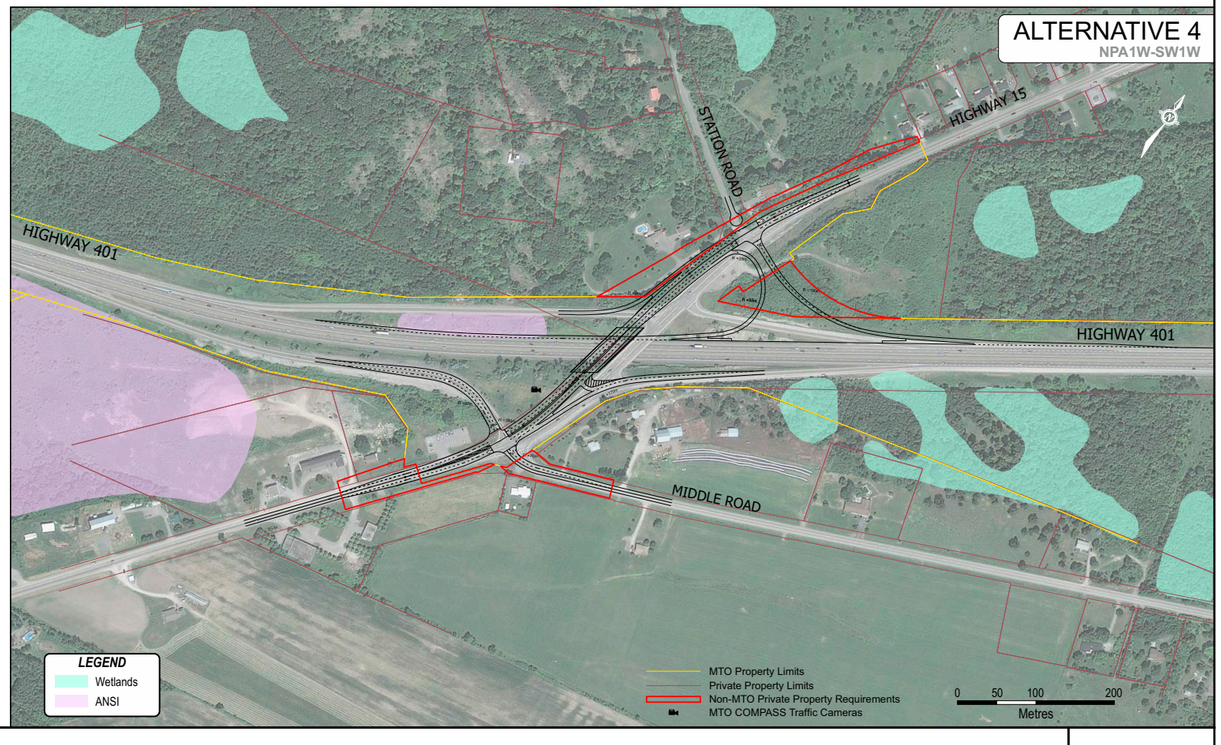
• Performance – total delay (AM & PM average)
• Potential to impact existing carpool lot and opportunities for improvement
• Improvement to ramp geometry
• Conflicts due to turning and weaving
	• Natural
	  ○ Impacts to designated natural areas
	  ○ Impacts to significant wildlife or wildlife habitat
	  ○ Impacts to vegetation communities
	  ○ Impacts to potentially contaminated properties
	• Social / Economic
	  ○ Impacts to businesses
	  ○ Impacts to private properties
	  ○ Increased noise levels at nearby properties
	  ○ Impact on emergency services
	• Cultural
	  ○ Displacement or disruption of built heritage features
		• Construction cost
		• Lifecycle cost
		• Potential utility conflicts (e.g. hydro lines)
		• Complexity of construction (e.g. requiring large cuts or fills)

Alternatives were assigned a score for each key measure ranging from 1 (most preferred or minimal impact) to 5 (least preferred or most significant impact). The Technically Preferred Alternative was identified based on a weighted sum of the overall factor area scores. The evaluation of alternatives is described in **Table 5-1**, **Table 5-2**, and **Table 5-3**. Detailed evaluation tables are provided in **Appendix I**.









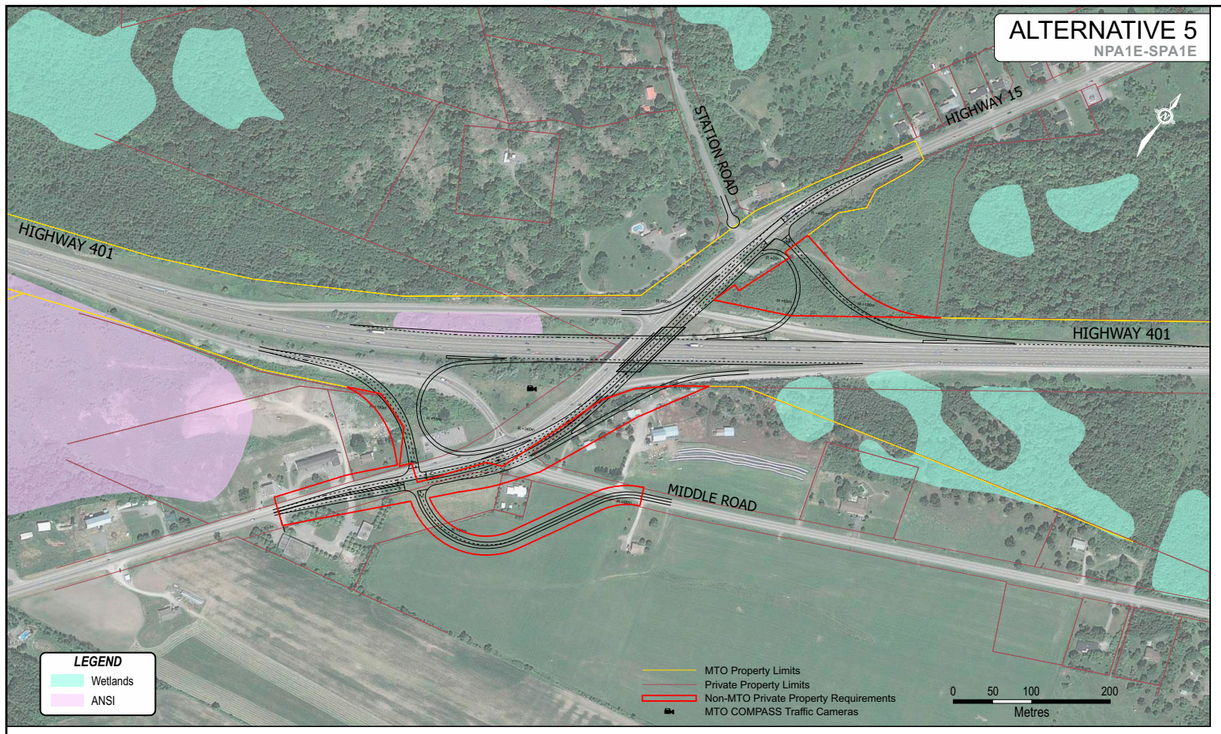
MMM GROUP

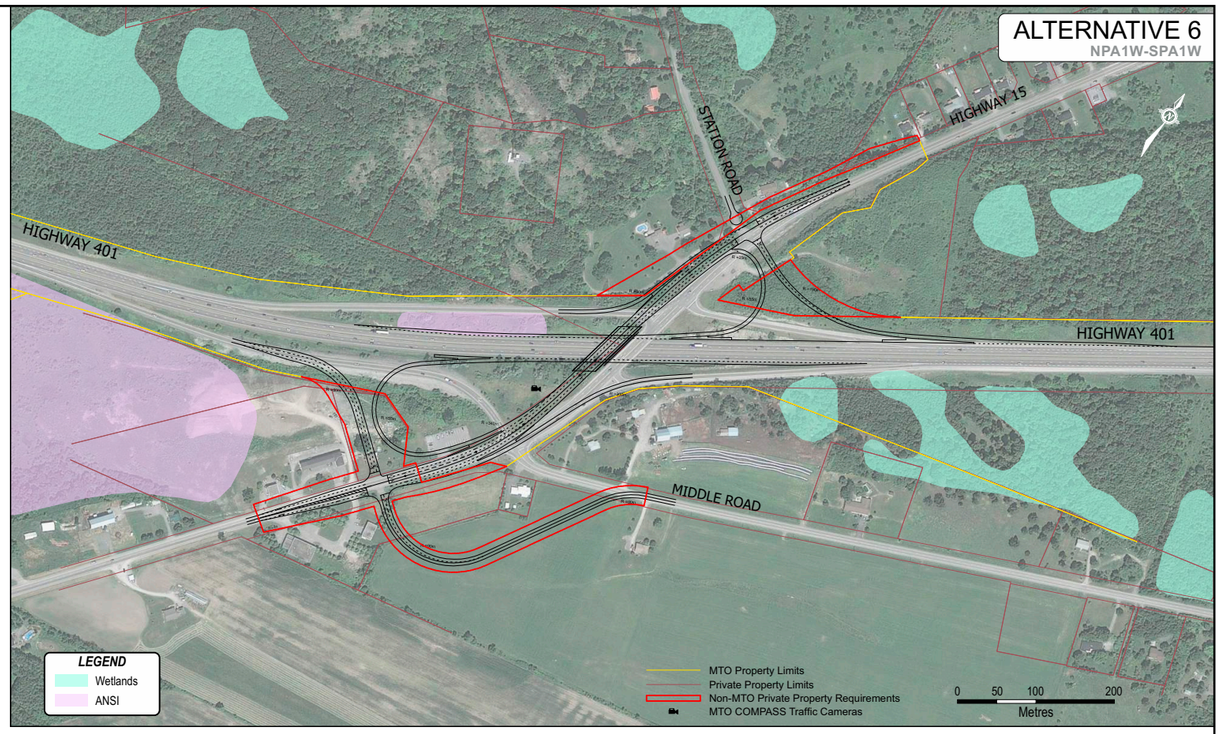
Ontario

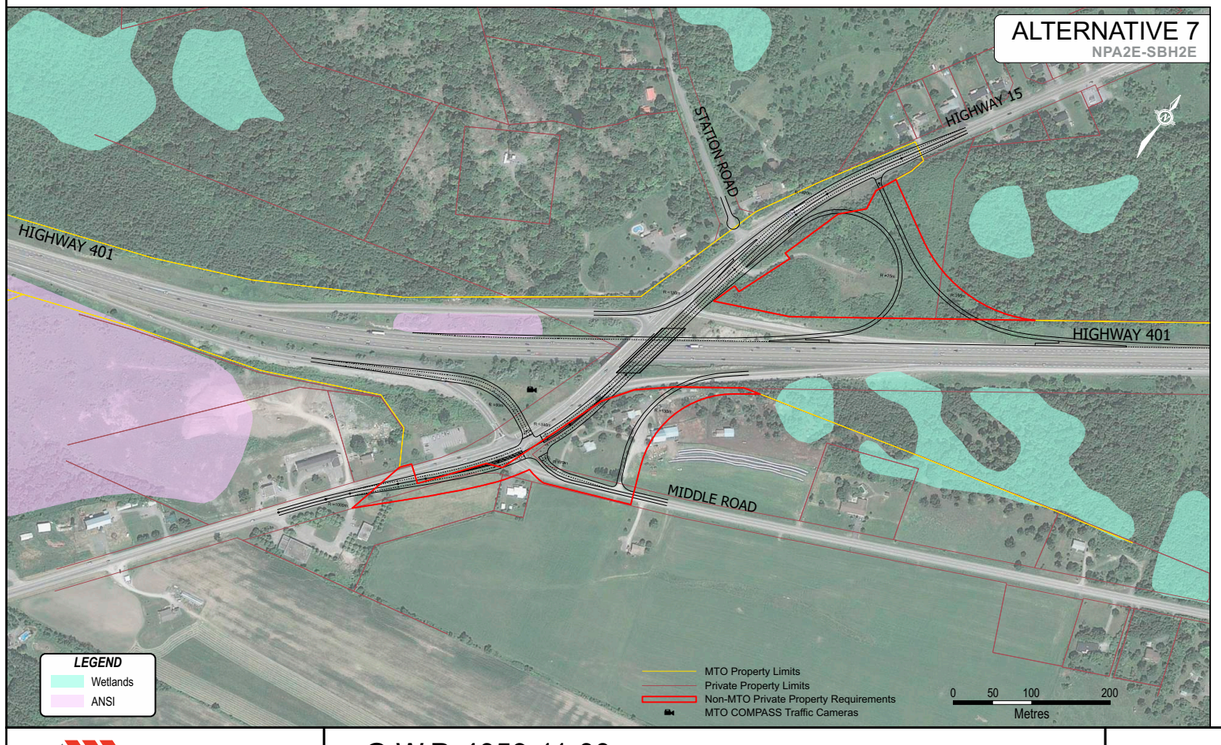
G.W.P. 4059-11-00
Highway 401 Interchange Improvements
Highway 15

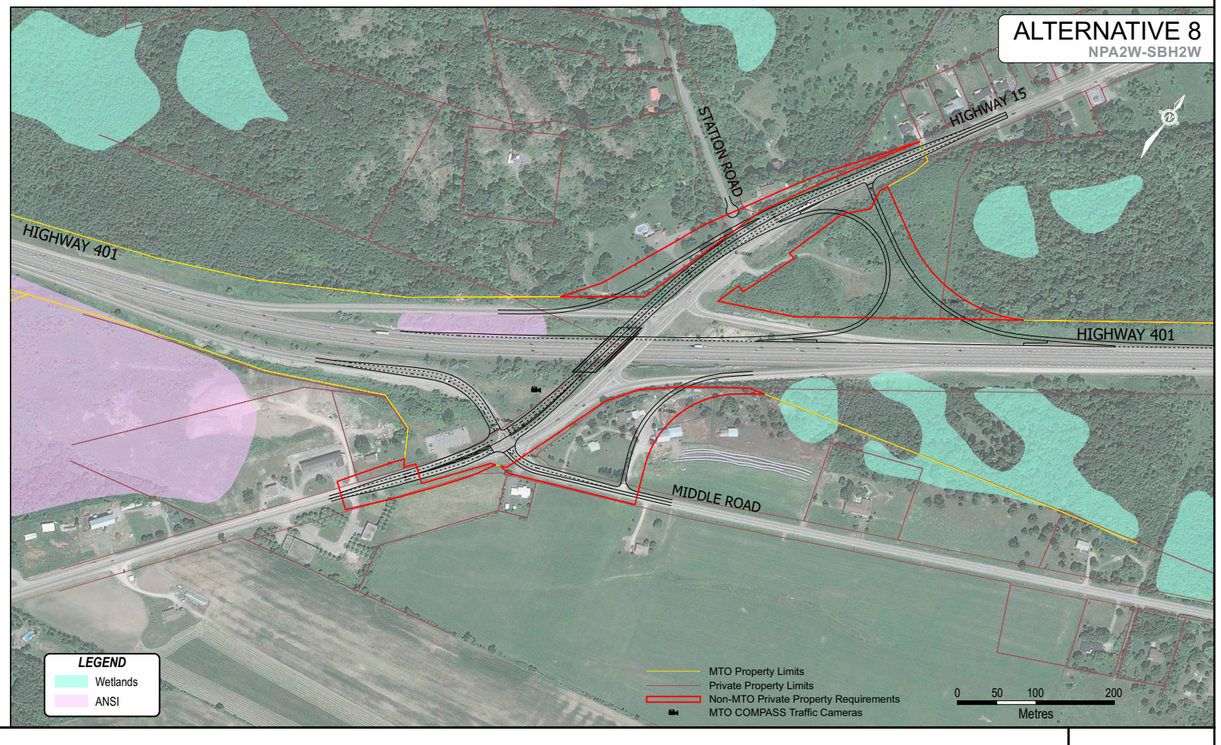
SHORT LIST ALTERNATIVES:
1, 2, 3 & 4

Figure
5-21









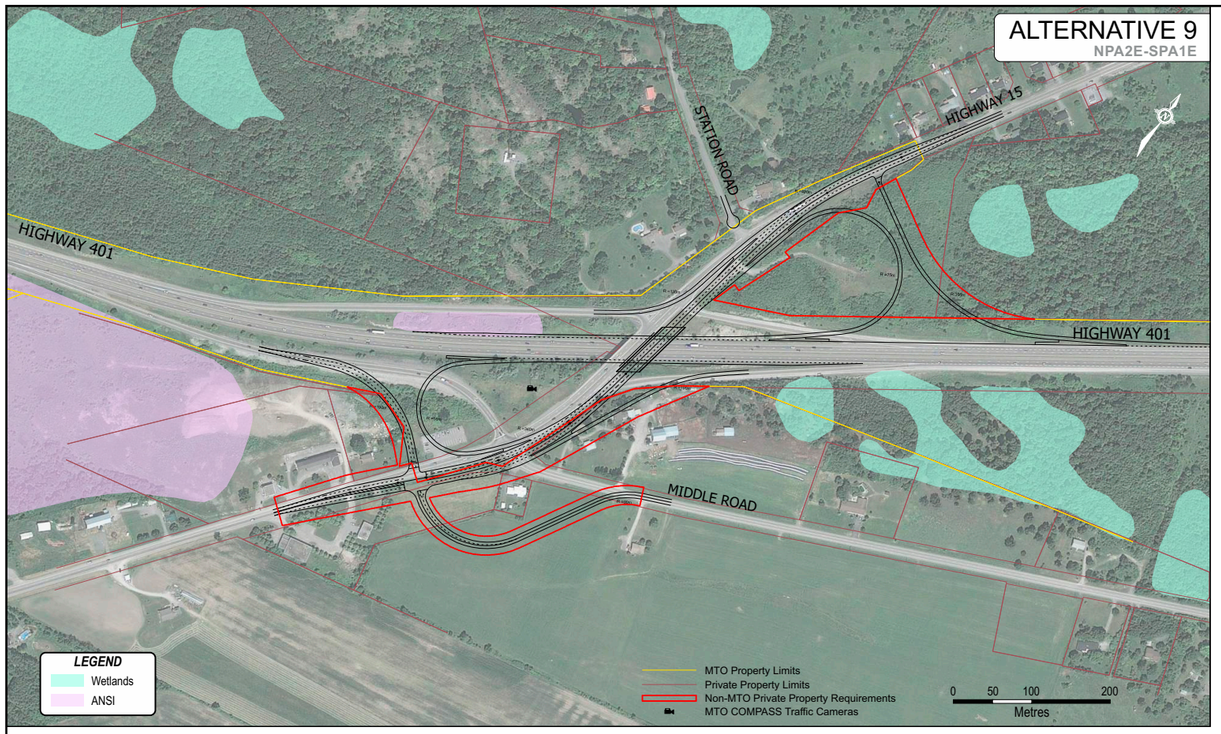
MMM GROUP

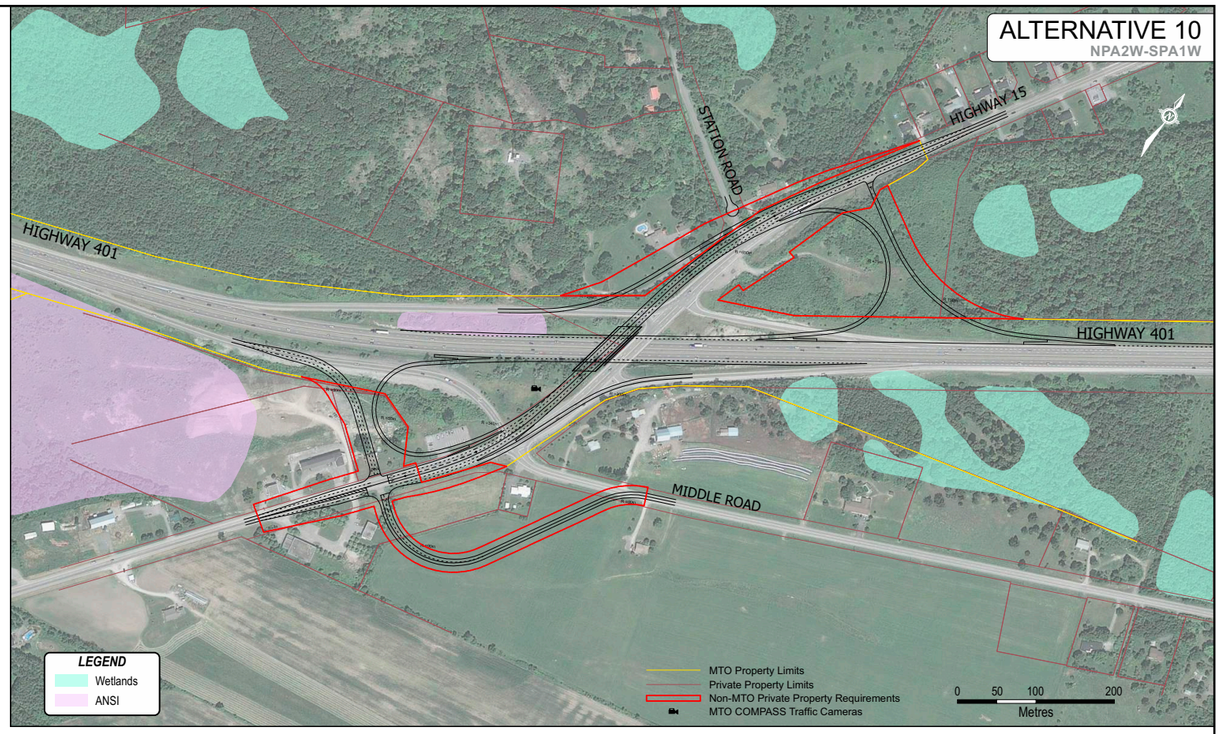
Ontario

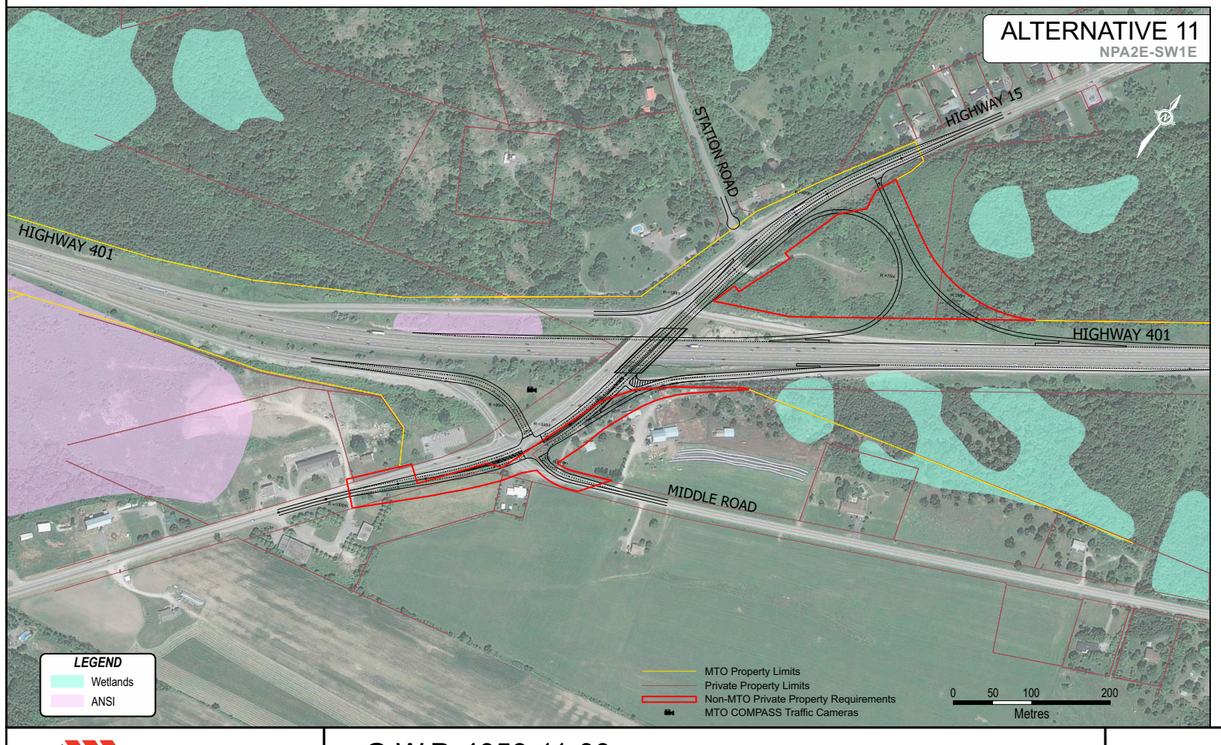
G.W.P. 4059-11-00
Highway 401 Interchange Improvements
Highway 15

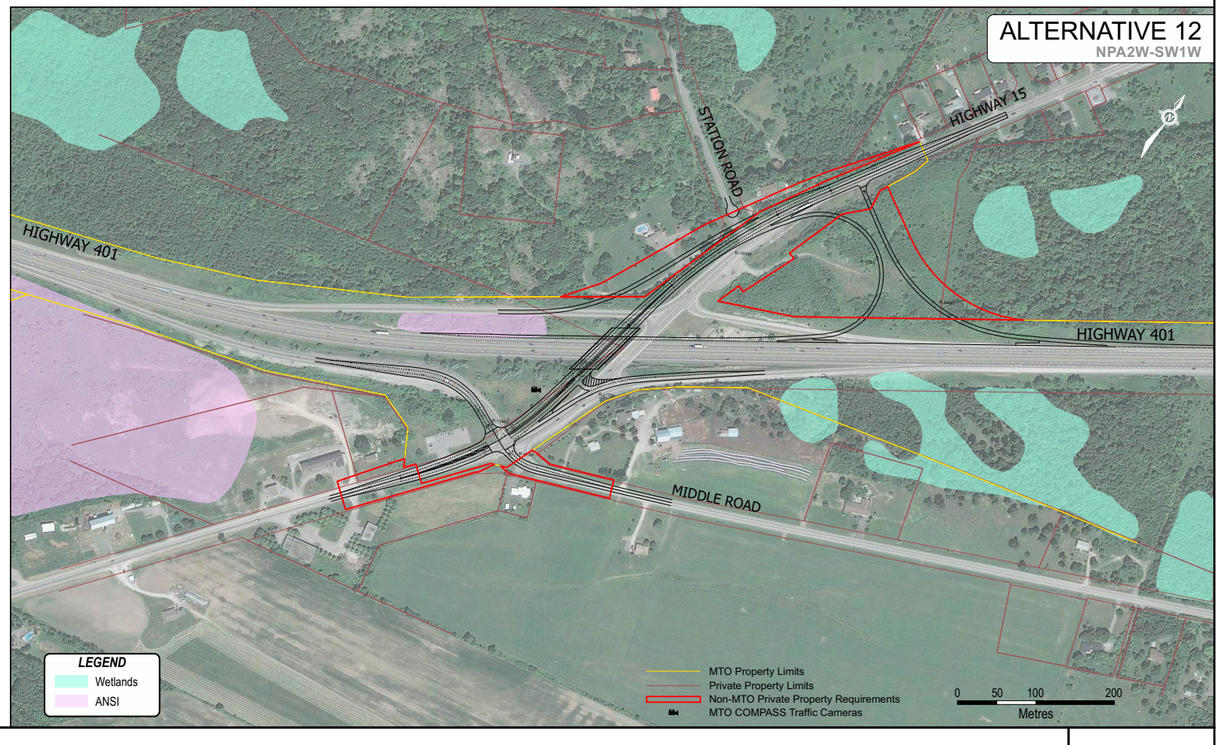
SHORT LIST ALTERNATIVES:
5, 6, 7 & 8

Figure
5-21









MMM GROUP

Ontario

G.W.P. 4059-11-00
Highway 401 Interchange Improvements
Highway 15

SHORT LIST ALTERNATIVES:
9, 10, 11 & 12

Figure
5-21

Table 5-1: Evaluation of Short List of Alternatives

5 → 3 → 1 (Poor → Good)			DO NOTHING (COMPARISON PURPOSES ONLY)	ALTERNATIVE 1 – NPA1E-SBH2E	ALTERNATIVE 2 – NPA1W-SBH2W	ALTERNATIVE 3 – NPA1E-SW1E	ALTERNATIVE 4 – NPA1W-SW1W
FACTOR AREA	**CRITERIA**	**KEY MEASURES**					
TRANSPORTATION (50%)	INTERCHANGE OPERATIONS AND GEOMETRY (50%)	Total Delay (40%)	5	1.5	1.5	1.5	1.5
		Impact to Carpool Lot (10%)	1	1	3	1	3
		Improvement to ramp geometry (35%)	5	3	3	5	5
		Conflicts due to turning and weaving (15%)	5	3	3	5	5
	Weighted sum of transportation key measures		4.60	2.80	3.00	3.60	3.80
ENVIRONMENTAL (40%)	NATURAL ENVIRONMENT (10%)	Impacts to designated natural areas (Areas of Natural and Scientific Interest, Provincially Significant Wetlands, significant woodlands) (40%)	0	0	0	0	0
		Impacts to significant wildlife or wildlife habitat (e.g., wetlands), including SAR and migratory birds (40%)	0	0	0	0	0
		Impacts to vegetation communities (5%)	0	1	1	1	1
		Impacts to potentially contaminated areas (15%)	0	0	0	0	0
	SOCIAL/ECONOMIC ENVIRONMENT (70%)	Impacts to businesses (45%)	0	5	5	5	1
		Impacts to private properties (45%)	0	3	5	3	4
		Increased noise levels at nearby properties (5%)	0	0	0	0	0
		Impact to emergency services (5%)	0	1	1	1	1
	CULTURAL ENVIRONMENT (20%)	Displacement or disruption of built heritage features (100%)	0	5	5	5	0
	Weighted sum of environmental key measures		0.0	3.56	4.19	3.56	1.62
COST AND CONSTRUCTABILITY (10%)	CONSTRUCTION COST AND CONSTRUCTABILITY (100%)	Construction cost (70%)	0	1	1	1	1
		Lifecycle cost (10%)	1	1	1	5	5
		Potential utility conflicts (5%)	0	3	1	3	1
		Complexity of construction (15%)	0	3	3	3	3
	Weighted sum of cost and constructability key measures		0.10	1.40	1.30	1.80	1.70
OVERALL ASSESSMENT			-	**OVERALL WEIGHTED SCORE: 2.96** NOT RECOMMENDED	**OVERALL WEIGHTED SCORE: 3.31** NOT RECOMMENDED	**OVERALL WEIGHTED SCORE: 3.40** NOT RECOMMENDED	**OVERALL WEIGHTED SCORE: 2.72** NOT RECOMMENDED

Table 5-2: Evaluation of Short List of Alternatives (continued, Part 2)

5 → 3 → 1 (Poor → Good)			ALTERNATIVE 5 – NPA1E-SPA1E	ALTERNATIVE 6 – NPA1W-SPA1W	ALTERNATIVE 7 – NPA2E-SBH2E	ALTERNATIVE 8 – NPA2W-SBH2W
FACTOR AREA	**CRITERIA**	**KEY MEASURES**				
TRANSPORTATION (50%)	INTERCHANGE OPERATIONS AND GEOMETRY (50%)	Total Delay (40%)	1.5	1.5	1	1
		Impact to Carpool Lot (10%)	5	5	1	3
		Improvement to ramp geometry (35%)	3	3	1	1
		Conflicts due to turning and weaving (15%)	1	1	3	3
	Weighted sum of transportation key measures		2.80	2.80	1.90	2.10
ENVIRONMENTAL (40%)	NATURAL ENVIRONMENT (10%)	Impacts to designated natural areas (Areas of Natural and Scientific Interest, Provincially Significant Wetlands, significant woodlands) (40%)	0	0	1	1
		Impacts to significant wildlife or wildlife habitat (e.g., wetlands), including SAR and migratory birds (40%)	0	0	0	0
		Impacts to vegetation communities (5%)	1	1	3	1
		Impacts to potentially contaminated areas (15%)	1	1	0	0
	SOCIAL/ECONOMIC ENVIRONMENT (70%)	Impacts to businesses (45%)	5	3	5	5
		Impacts to private properties (45%)	3	5	3	5
		Increased noise levels at nearby properties (5%)	5	5	0	0
		Impact to emergency services (5%)	1	3	1	1
	CULTURAL ENVIRONMENT (20%)	Displacement or disruption of built heritage features (100%)	5	0	5	5
	Weighted sum of environmental key measures		3.75	2.82	3.61	4.23
COST AND CONSTRUCTABILITY (10%)	CONSTRUCTION COST AND CONSTRUCTABILITY (100%)	Construction cost (70%)	3.5	4	2.5	2.5
		Lifecycle cost (10%)	3	5	3	1
		Potential utility conflicts (5%)	5	3	3	1
		Complexity of construction (15%)	5	5	3	3
	Weighted sum of cost and constructability key measures		3.75	4.20	2.65	2.35
OVERALL ASSESSMENT			**OVERALL WEIGHTED SCORE: 3.28** NOT RECOMMENDED	**OVERALL WEIGHTED SCORE: 2.95** NOT RECOMMENDED	**OVERALL WEIGHTED SCORE: 2.66** NOT RECOMMENDED	**OVERALL WEIGHTED SCORE: 2.98** NOT RECOMMENDED

Table 5-3: Evaluation of Short List of Alternatives (continued, Part 3)

5 → 1 (Poor → Good)			ALTERNATIVE 9 – NPA2E-SPA1E	ALTERNATIVE 10 – NPA2W-SPA1W	ALTERNATIVE 11 – NPA2E-SW1E	ALTERNATIVE 12 – NPA2W-SW1W
FACTOR AREA	**CRITERIA**	**KEY MEASURES**				
TRANSPORTATION (50%)	INTERCHANGE OPERATIONS AND GEOMETRY (50%)	Total Delay (40%)	1	1	1	1
		Impact to Carpool Lot (10%)	5	5	1	3
		Improvement to ramp geometry (35%)	1	1	5	5
		Conflicts due to turning and weaving (15%)	1	1	3	3
	Weighted sum of transportation key measures		1.90	1.90	3.10	3.30
ENVIRONMENTAL (40%)	NATURAL ENVIRONMENT (10%)	Impacts to designated natural areas (Areas of Natural or Scientific Interest, Provincially Significant Wetlands, significant woodlands) (40%)	1	1	1	1
		Impacts to significant wildlife or wildlife habitat (e.g., wetlands), including SAR and migratory birds (40%)	0	0	0	0
		Impacts to vegetation communities (5%)	3	3	1	1
		Impacts to potentially contaminated areas (15%)	1	1	0	0
	SOCIAL/ECONOMIC ENVIRONMENT (70%)	Impacts to businesses (45%)	5	3	5	1
		Impacts to private properties (45%)	3	5	3	4
		Increased noise levels at nearby properties (5%)	5	5	0	0
		Impact to emergency services (5%)	1	3	1	1
	CULTURAL ENVIRONMENT (20%)	Displacement or disruption of built heritage features (100%)	5	0	5	0
	Weighted sum of environmental key measures		3.80	2.87	3.60	1.66
COST AND CONSTRUCTABILITY (10%)	CONSTRUCTION COST AND CONSTRUCTABILITY (100%)	Construction cost (70%)	5	5	2.5	2
		Lifecycle cost (10%)	5	5	5	5
		Potential utility conflicts (5%)	5	3	3	1
		Complexity of construction (15%)	5	5	3	3
	Weighted sum of cost and constructability key measures		5.00	4.90	2.85	2.40
OVERALL ASSESSMENT			**OVERALL WEIGHTED SCORE: 2.97** NOT RECOMMENDED	**OVERALL WEIGHTED SCORE: 2.59** NOT RECOMMENDED	**OVERALL WEIGHTED SCORE: 3.28** NOT RECOMMENDED	**OVERALL WEIGHTED SCORE: 2.55** **RECOMMENDED**

5.1.5 PREFERRED INTERCHANGE CONFIGURATION

Alternative 12 (NPA2W-SW1W), a Parclo A4 / Diamond Hybrid interchange realigned to the west of the existing interchange, received the highest rating under the evaluation of alternatives and is the Technically Preferred Alternative. The Technically Preferred Alternative is described in detail in **Section 6.0**.

In terms of environmental criteria, Alternative 12 is among the most preferred alternatives as it avoids impacts to the dairy farm and heritage features (the most heavily weighted criteria in terms of the environmental factor area) in the southeast quadrant by replacing the Highway 15 underpass to the west of the existing structure. It does, however, result in direct impacts to three private properties in the northwest quadrant. Property impacts in the northwest quadrant result from all alternatives in which the Highway 15 underpass is replaced to the west of the existing alignment.

Alternative 12 has minor impacts to significant woodlands in the northeast quadrant; however, all alternatives impact the significant woodlands in the northeast quadrant to some degree.

In terms of transportation criteria, Alternative 12 scores lower than other alternatives that incorporate a loop ramp or button-hook ramp south of Highway 401. This is because, while operationally there is little difference between the alternatives, Alternative 12 maintains the existing configuration on the south side of Highway 401 which includes a left turn across oncoming traffic. However, improving upon this configuration would result in greater private property, agricultural and heritage impacts. Also, due to the low number of left-turns, the less desirable configuration does not diminish the overall interchange performance (LOS B).

Overall, Alternative 12 was selected as the Technically Preferred Alternative because it allows for the implementation of operational improvements (in particular north of Highway 401), while avoiding a number of significant environmental impacts (i.e., impacts to heritage features, impacts to businesses). While Alternative 12 only provides minor geometric improvements for the south ramp terminal, the volume of left turning vehicles is small and the interchange as a whole will operate at an acceptable level of service (LOS B).

A description of the rationale for the evaluation of the other alternatives follows.

Alternative 10

Overall – 2
Environmental – 4
Transportation – 1
Cost – 11

Similar to Alternative 12, this option avoids impacts to the dairy farm and heritage features in the southeast quadrant by replacing the Highway 15 underpass to the west of the existing structure. As with Alternative 12, there are private property impacts in the northwest quadrant as a result of the replacement of the bridge to the west. Three residential properties in the northwest quadrant are directly impacted, as well as portions of two private properties in the northeast quadrant (however no homes are removed in the northeast quadrant). The trade-off with this configuration is that to avoid impacts to the dairy farm and heritage features, three private properties in the northwest quadrant are impacted.

South of Highway 401, additional private property impacts result from the Parclo A configuration. A private residence in the southwest quadrant is potentially impacted, as well as a private property and agricultural land to the southeast. Alternative 10 is less preferred than other options that similarly avoid impacts to the dairy farm and heritage features (including the recommended Alternative 12), due to the additional private property impacts south of Highway 401.

As a full Parclo A configuration, Alternative 10 provides significantly improved operations and ranks first for transportation criteria (tied with Alternatives 7 and 9). The Parclo A configuration eliminates the left turn for traffic entering Highway 401 and promotes free-flow across the interchange.

	Although Alternative 10 performs better operationally than Alternative 12, it has greater impacts to private property in the southwest quadrant and to agricultural land in the southeast quadrant and is therefore less preferred. There are a low number of left-turns at the south terminal and so the greater impacts of a Parclo A configuration makes the Alternative 10 less desirable overall. Due to the improvements to interchange operations and geometry, while avoiding some of the most significant environmental impacts (impacts to heritage features and the dairy farm), Alternative 10 ranks second overall.
Alternative 7 Overall – 3 Environmental – 8 Transportation – 1 Cost – 7	Alternative 7 performs very well in terms of operations and geometry and, along with Alternatives 9 and 10, is most preferred in terms of transportation criteria. North of Highway 401, a Parclo A configuration is utilized, reducing delay by promoting free-flowing traffic and eliminating the left turn onto Highway 401 from Highway 15. The button-hook configuration south of the Highway 401 is not ideal, as it adds an additional intersection and an additional left turn. The button-hook is still preferred compared to the existing configuration and does not increase delay for the overall interchange, due to the low volumes of left-turns to eastbound Highway 401. The button-hook configuration also improves safety in comparison to the existing configuration. As a result, Alternative 7 has one of the highest transportation ratings. Alternative 7 is less preferred from an environmental perspective due to a combination of impacts to private property, heritage features and the dairy farm, all of which are criteria that are weighted heavily in the evaluation. The button-hook ramp and replacement of the Highway 15 underpass to the east of the existing structure result in direct impacts to two private residences, the dairy farm and heritage features in the southeast quadrant. Portions of two private properties in the northeast quadrant are also impacted. Alternative 7 provides significant improvements to the operation of the interchange, but results in significant environmental impacts. It ranks third overall and is preferred over other alternatives that avoid impacts to heritage features and the dairy farm (Alternatives 4 and 6), because Alternative 7 offers more significant improvements to the operations of the interchange.
Alternative 4 Overall – 4 Environmental – 1 Transportation – 12 Cost – 3	Alternative 4 is similar in configuration to Alternative 12, with slightly lesser environmental impacts due to a smaller loop ramp in the northeast quadrant that minimizes impacts to the significant woodlands. Impacts to heritage features and the dairy farm in the southeast quadrant are also avoided by replacing the Highway 15 underpass to the west of the existing structure. Alternative 4 is not without private property impacts. By avoiding impacts to the residences, dairy farm and heritage features in the southeast quadrant and private properties in the northwest quadrant are impacted, including three residential properties in the northwest quadrant due to the replacement of the bridge to the west of the existing structure. In addition, a portion of one private property in the northeast quadrant will be impacted (however no home is removed). South of Highway 401, one property is also impacted. Although Alternative 4 impacts private properties, it avoids impacts to agricultural operations and heritage features (which are among the most heavily weighted criteria in the environmental factor area). For these reasons, Alternative 4 is most preferred in terms of environmental criteria.

While the smaller loop ramp in the northeast quadrant reduces the environmental footprint of this alternative, the transportation performance of this option is the lowest ranked of all the alternatives (ranking 12th in terms of transportation criteria). In particular, the smaller loop ramp north of the Highway 401 requires traffic to navigate the ramp at lower speed than they would a larger loop ramp. As a consequence, the smaller loop results in slightly more delay. The alternative also rates relatively low in transportation as it maintains the existing configuration south of the Highway 401, which is undesirable from a transportation perspective.

In general, Alternative 4 results in only modest improvements to interchange operations, particularly south of Highway 401 where the existing configuration remains unchanged. Minimal modifications south of Highway 401 and a smaller loop ramp in the northeast quadrant minimizes the footprint of the reconfigured interchange and make this alternative the most preferred in terms of environmental criteria. As the top ranked alternative for environmental criteria but the lowest ranked alternative for transportation criteria, Alternative 4 ranks fourth overall. Despite having greater environmental impacts, Alternatives 12, 10 and 7 all rank higher overall than Alternative 4, as they offer more significant operational improvements.

Alternative 6

Overall – 5
Environmental – 3
Transportation – 5
Cost – 10

Alternative 6 is similar in configuration to Alternative 10, with slightly lesser environmental impacts due to a smaller loop ramp in the northeast quadrant that avoids significant woodlands. As with Alternative 12, 10 and 4, impacts to the dairy farm and heritage features in the southeast quadrant are avoided due to the replacement of the Highway 15 underpass to the west of the existing structure.

As with Alternative 10, there are private property impacts in the northwest quadrant that result from the replacement of the bridge to the west. Three residential properties in the northwest quadrant are directly impacted (as well as a portion of one private property in the northeast quadrant (however no home is removed in the northeast quadrant).

South of Highway 401, additional private property impacts result from the Parclo A configuration. A private residence in the southwest quadrant is directly impacted, as well as a private property and agricultural land to the southeast. Alternative 6 is less preferred than other options that similarly avoid impacts to the dairy farm and heritage features, due to these additional private property impacts south of Highway 401.

Similar to Alternative 4, due to the smaller loop ramp in the northeast quadrant, Alternative 6 has greater delay and less desirable geometry than the higher-ranked Alternatives 10 or 7. South of the Highway 401, a Parclo A configuration results in improved traffic performance and so Alternative 6 overall has a moderate transportation rating.

Overall, Alternative 6 ranks fifth due to a combination of factors. Alternatives 12 and 4 do not perform as well as Alternative 6 operationally, but rank higher overall since they have fewer private property impacts and avoid impacts to agricultural lands (criteria that are weighted heavily in the environmental factor area). Alternative 10 has similar environmental impacts as Alternative 6, yet ranks higher as it offers greater operational improvements than Alternative 6. Lastly, although Alternative 7 impacts both the dairy farm and heritage features, it is the most preferred alternative in terms of operational improvements and so ranks higher overall than Alternative 6 despite significant environmental impacts.

Alternative 1 Overall – 6 Environmental – 5 Transportation – 5 Cost – 2	With direct impacts to heritage features and to the dairy farm in the southeast quadrant, Alternative 1 has significant environmental impacts. The button-hook ramp in the southeast quadrant impacts two residential properties, in addition to a dairy farm and heritage features. There are additional private property impacts in the northeast quadrant (however no homes are directly impacted). The operational performance of the interchange is moderate. North of Highway 401, a Parclo A configuration is utilized, yet with the smaller loop ramp radius of 55 m. The smaller loop ramp requires traffic to navigate the ramp at lower speed than they would a larger loop ramp. As a consequence, the smaller loop results in slightly more delay. The button-hook configuration south of the Highway 401 is not ideal as it adds an additional intersection and an additional left turn. The button-hook is still preferred however as, due to the low volumes of left-turns to eastbound Highway 401, the configuration does not increase the overall delay for the interchange. The button-hook configuration also improves safety in comparison to the existing configuration. As a result, Alternative 1 has a moderate transportation rating. Alternative 1 provides similar operational improvements as Alternative 6, but with greater environmental impacts. For that reason, Alternative 1 ranks sixth overall.
Alternative 9 Overall – 7 Environmental – 10 Transportation – 1 Cost – 12	Alternative 9 has a similar interchange configuration as Alternative 10, but requires replacement of the Highway 15 underpass to the east of the existing structure rather than to the west. While replacing the bridge to the east avoids impacts to three residences in the northwest quadrant, it results in significant direct impacts to three private residences, heritage features, the dairy farm and agricultural land in the southeast quadrant. In addition, portions of two properties in the northeast quadrant will be impacted. As a full Parclo A configuration, Alternative 9 provides significantly improved operations and ranks first for transportation criteria (tied with Alternatives 7 and 10). The Parclo A configuration eliminates the left turn for traffic entering Highway 401 and promotes free-flow movement across the interchange. Alternative 9 is most preferred in terms of transportation criteria (along with Alternatives 10 and 7), but ranks seventh overall due to significant environmental impacts (including impacts to heritage features and the dairy farm). Alternatives 10 and 7 offer similar improvements to interchange operations, with fewer environmental impacts and are therefore more preferred than Alternative 9.
Alternative 8 Overall – 8 Environmental – 12 Transportation – 4 Cost – 5	Alternative 8 has a similar interchange configuration as Alternative 7, but requires replacement of the Highway 15 underpass to the west of the existing structure rather than to the east. Both Alternatives 7 and 8 incorporate a button-hook ramp in the southeast quadrant, which directly impacts two residences, the dairy farm and heritage resources. Furthermore, the replacement of the bridge to the west results in additional impacts to two homes in the northwest quadrant of the interchange, as well as one property in the southwest quadrant. Portions of two private properties in the northeast quadrant will also be impacted (although no homes are impacted). Due to the significant private property impacts coupled with direct impacts to the dairy farm and heritage features, Alternative 8 is least preferred in terms of environmental criteria. Alternative 8 has a similar transportation performance to Alternative 7; however it is less preferred in terms of transportation criteria than Alternative 7 as Alternative 8 directly impacts the carpool lot.

	In general, Alternative 8 provides similar operational improvements as Alternative 7, but results in greater environmental impacts. For this reason, Alternative 8 has a poor overall ranking.
Alternative 5 Overall – 9 Environmental – 9 Transportation – 5 Cost – 9	Alternative 5 has a similar interchange configuration as Alternative 6, but requires replacement of the Highway 15 underpass to the east of the existing structure rather than to the west. While replacing the bridge to the east avoids impacts to three residences in the northwest quadrant and one in the southwest quadrant, it results in significant direct impacts to three private residences, heritage features, the dairy farm and agricultural land in the southeast quadrant. Alternative 5 shares the same configuration and similar impacts to the carpool lot as Alternative 6. Both alternatives provide similar and moderate interchange improvements. Due to significant environmental impacts (including impacts to heritage features and the dairy farm), Alternative 5 is among the less preferred options in terms of environmental criteria. The transportation performance is moderate and similar to that of Alternative 6, resulting in a poor overall score for Alternative 5.
Alternative 11 Overall – 9 Environmental – 7 Transportation – 9 Cost – 8	Alternative 11 has a similar interchange configuration as Alternative 12, but requires replacement of the Highway 15 underpass to the east of the existing structure rather than to the west. While replacing the bridge to the east avoids impacts to three residences in the northwest quadrant, it results in significant direct impacts to three private residences, heritage features, the dairy farm and agricultural land in the southeast quadrant. As with Alternative 12, portions of two private properties in the northeast quadrant will also be impacted. Alternative 11 has a similar transportation performance to Alternative 12 (the preferred alternative); however it is less preferred than Alternative 12 in terms of transportation criteria, as Alternative 11 directly impacts the carpool lot. Alternative 11 provides similar operational improvements as Alternative 12, but with greater impacts private property, the dairy farm and heritage features, resulting in a poor overall score for Alternative 11.
Alternative 2 Overall – 11 Environmental – 11 Transportation – 8 Cost – 1	Alternative 2 has a similar interchange configuration as Alternative 1, but requires replacement of the Highway 15 underpass to the west of the existing structure rather than to the east. Both Alternatives 1 and 2 incorporate a buttonhook ramp in the southeast quadrant, which directly impacts two residences in the southeast quadrant, the dairy farm and heritage resources. As a result of replacing the bridge to the west, three additional properties in the northwest quadrant are impacted (when compared to Alternative 1). Due to significant private property impacts, impacts to businesses and impacts to heritage features, Alternative 2 is among the least preferred alternatives in terms of environmental criteria. Alternative 2 and Alternative 1 have similar transportation performance. Alternative 1 is slightly more preferred in terms of transportation criteria, as Alternative 2 directly impacts the carpool lot. The transportation performance of Alternative 2 is moderate. Alternative 1 offers similar operational improvements, but with fewer environmental impacts. For those reasons, Alternative 2 is among the least preferred options from an environmental perspective, and ranks eleventh overall.

Alternative 3 Overall – 12 Environmental – 5 Transportation – 11 Cost – 4	Alternative 3 has a similar interchange configuration as Alternative 4, but requires replacement of the Highway 15 underpass to the east of the existing structure rather than to the west. While replacing the bridge to the east avoids impacts to three residences in the northwest quadrant, there are significant environmental impacts resulting from the replacement of the structure to the east, including impacts to three private residences, heritage features and the dairy farm. As with Alternative 4, a portion of a private property in the northeast quadrant also must be acquired. Alternative 3 has a similar transportation performance to Alternative 4; however it is more preferred than Alternative 4 as Alternative 3 avoids direct impacts to the carpool lot. In general, Alternative 3 results in only modest improvements to interchange operations and is among the least preferred alternatives in terms of transportation criteria. The poor operational improvements and modest environmental impacts (including impacts to the dairy farm and heritage features) result in Alternative 3 ranking last overall.

6 TECHNICALLY PREFERRED ALTERNATIVE (LONG-TERM)

The Technically Preferred Alternative (shown in **Figure 6-1**) addresses the operational and geometric deficiencies of the interchange and enables efficient operation for the long term.

6.1 TECHNICALLY PREFERRED ALTERNATIVE (LONG-TERM)

The Technically Preferred Alternative includes the following operational improvements: a new interchange configuration north of Highway 401, replacement of the Highway 15 underpass on a new alignment, improvements to stormwater management infrastructure, widening of the eastbound off-ramp south of Highway 401 and realigning the Highway 15 / Middle Road / eastbound off-ramp intersection.

6.1.1 GEOMETRIC AND OPERATIONAL IMPROVEMENTS

Existing operational issues result from the less-than desirable geometry and lack of capacity found at the interchange. The close proximity of the ramp terminals results in the left-turn queuing having a large negative impact on operations at the intersections, as the queue for north ramp terminal backs up to the south ramp terminal. To address this issue, the Technically Preferred Alternative has been designed to remove the need for a left-turn to access westbound Highway 401. Preliminary design plates and profiles are included in **Appendix O**.

Traffic performance is measured by a 'Level of Service' (LOS) which acts as a measure of flow through the road network. Levels A - D are considered acceptable.

- LOS A = Light Traffic / Free Flow Speeds
- LOS B = Slightly Increased traffic levels / Still free flow speeds
- LOS C = Approaching moderate congestion levels / Speeds near free flow
- LOS D = Speeds Reduced / Lane changes restricted due to traffic
- LOS E = Congestion / Irregular traffic flow
- LOS F = Road at capacity / Gridlock with frequent stops

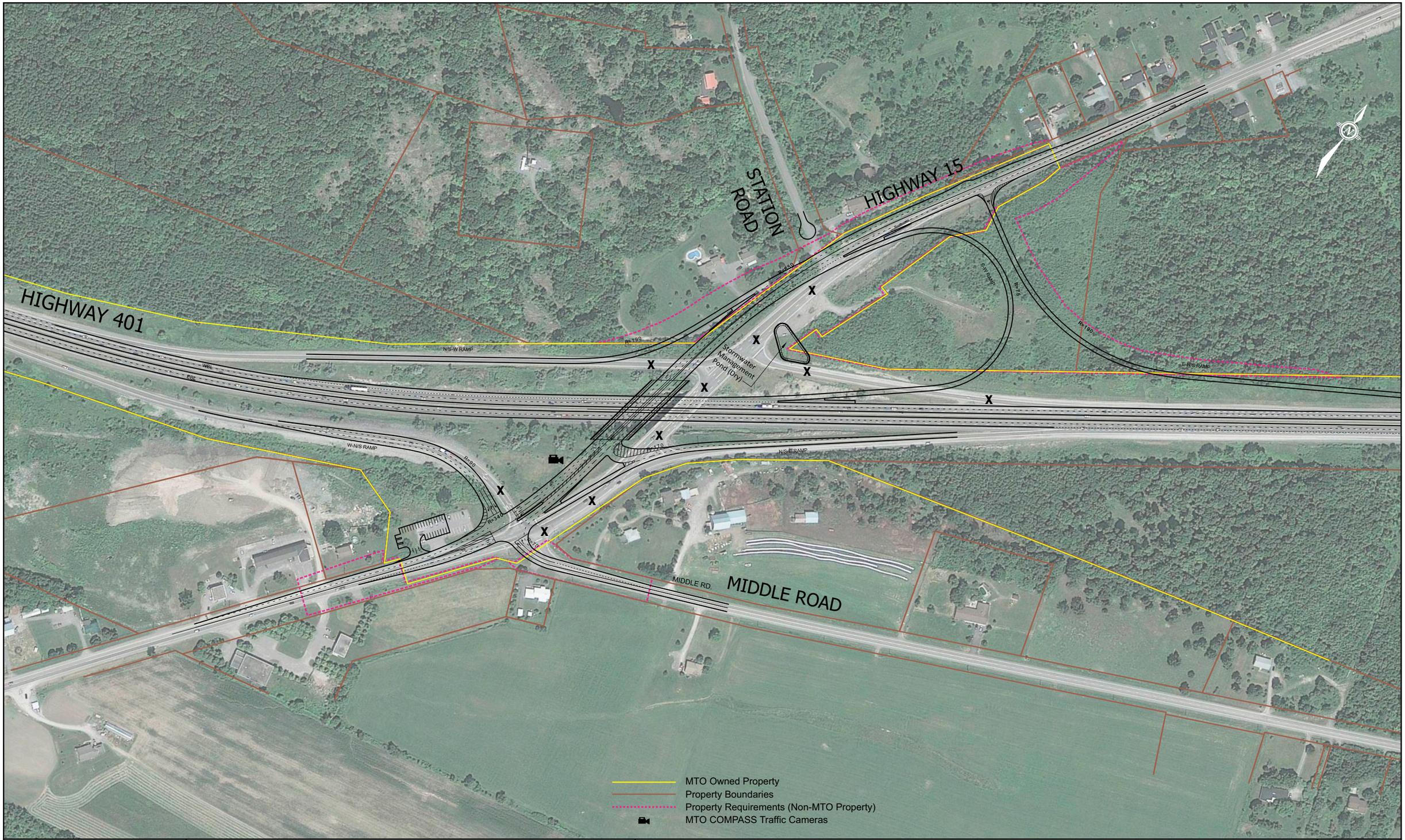
6.1.1.1 *North Ramp Terminal*

The existing westbound off-ramp will be removed, and a new loop westbound on-ramp (radius of 75 m) and a new westbound off-ramp will be constructed in the northeast quadrant. The north ramp terminal is shifted northwards to accommodate the new ramps. A new direct westbound on-ramp will be constructed in the northwest quadrant of the interchange and utilize the majority of the existing westbound on-ramp and its speed-change lane. The proposed new ramps will reconfigure the interchange, north of Highway 401, into a 'Parclo A' configuration and will improve the operational performance at the north ramp terminal to LOS C / D under future-year (2033) traffic conditions.

6.1.1.2 *South Ramp Terminal*

The south ramp terminal retains its existing configuration and is slightly realigned to the west to accommodate the new underpass and Highway 15 realignment. As the improvements to the north reduce queuing across the interchange, many of the overall operational issues are resolved. The existing left turn is retained for the southbound Highway 15 traffic accessing eastbound Highway 401; however, the addition of a left-turn lane will sufficiently provide for the low traffic volume making this movement, while not impeding southbound through traffic. It is expected that the south ramp terminal will have a LOS B / C by the year 2033.

The overall interchange is expected to have a LOS B by the year 2033



MMM GROUP Ontario	G.W.P. 4059-11-00 Highway 401 Interchange Improvements Highway 15	**HIGHWAY 15 TECHNICALLY PREFERRED ALTERNATIVE (LONG TERM PLAN)**	Figure **6-1**

6.1.1.3 *Highway 15 Realignment*

The Technically Preferred Alternative (TPA) proposes that Highway 15 be widened to five lanes through the interchange (four general purpose lanes and one speed-change lane), as detailed in **Exhibit 6-1**. To accommodate an additional left-turn lane on Highway 15, the underpass would have to accommodate five lanes of traffic across Highway 401. As detailed in **Section 5.1.3**, the existing underpass can only accommodate four lanes of traffic and an assessment undertaken recommended the replacement of the existing underpass with a new structure, resulting in the realignment of Highway 15 to the west. **Section 5.1.3** details the evaluation process and assessment undertaken to identify the alignment of Highway 15.

To achieve the TPA, the vertical profile of the realigned Highway 15, north of Highway 401, has to be lowered. This is achieved by shifting Highway 15 traffic via a temporary alignment east of the existing Highway 15 (as detailed in **Section 6.3**). The temporary alignment shift will be approximately 200 m long and will accommodate two lanes of traffic (one per direction). The lanes will have widths of 3.5 m and 0.5 m shoulders. The temporary alignment shift will require property acquisition additional to the existing and proposed Highway 15 ROW; it is assumed that this property would be obtained on the basis of a temporary limited interest.

6.1.2 STORMWATER MANAGEMENT PLAN

Figures 6-2(a-b) illustrate the proposed conditions drainage mosaic of the Technically Preferred Alternative. The proposed improvements of the drainage system include: four (4) new culverts (P1, P2, P3, and P4), three (3) replacement culverts (P5, P6, and P7), and one (1) SWM facility (SWM1). The drainage patterns remain the same. The Stormwater Management (SWM) plan for the Proposed Interim Improvements is detailed in **Section 6.2.2**.

Catchment 104 drains via a new Culvert P1 under the westbound inner-loop on-ramp to Catchment 102. The combined flows drain via a new Culvert P2 located under the realigned eastbound off-ramp just south of Highway 15 intersection. The combined flows from Culvert P2 and Catchment 100 drain in a north-east direction via the south ditch of Highway 15.

Runoff from Catchment 105 drains via a new Culvert P3 located under the new westbound inner-loop on-ramp to the proposed stormwater management (SWM) facility which is located in Catchment 110. Runoff from Catchment 110, which includes a portion of Highway 15, also drains to the SWM facility. The controlled outflow from the SWM facility will discharge to Catchment 120 via existing Culvert C1. The combined flows drain to a watercourse northwest of interchange.

Runoff from Catchments 130, 135, 140, 160, 170, 180, 190 and 200 retains the existing drainage pattern. A new Culvert P4 is required under the westbound inner-loop on-ramp to drain a portion of Catchment 130. A new Culvert P7 is proposed to replace the existing Culvert C2, because the existing Culvert C2 does not meet the current standard.

The drainage pattern of Catchments 210, 220, 230, 240 and 250 remains the same as existing conditions. However, Culverts C4 and C5 will be replaced by new Culverts P6 and P5, respectively, as the culverts do not meet the standards.

The information of the existing storm sewer along the Highway 401 median was not available. Therefore, the capacity analysis of the existing storm sewer was not carried out. It is recommended that a detailed survey of the existing storm sewers be carried out during the detailed design phase to allow the capacity assessment of the storm sewers.

A Drainage and Hydrology Report is included in **Appendix J**.

POND SWM-1: DRY SWM FACILITY TO PROVIDE PEAK FLOW CONTROL QUALITY TREATMENT WILL BE PROVIDED BY GRASSED SWALE
100-YEAR STORAGE VOLUME 450 m³
100-YEAR WATER LEVEL 111.70 m

102 1.00ha
104 1.60ha
100 0.70ha
120 2.69ha
110 2.20ha
105 1.31ha
160 0.45ha
130 1.04ha
140 1.47ha
170 0.28ha
135 1.65ha
220 1.20ha
240 0.50ha
210 2.72ha
230 3.60ha

P1 P2 P3 P4 P6 C1

S-W RAMP
E-N/S RAMP
N-W RAMP
S-E RAMP
HIGHWAY 401
HIGHWAY 15
MIDDLE ROAD
EX. C4 REPLACED

Metric Scale
25m 0 50m
Horizontal

LEGEND

- CATCHMENT BOUNDARY
- PROPOSED CULVERT
- EXISTING CULVERT
- WATERCOURSE
- FLOW DIRECTION
- P4 PROPOSED CULVERT ID
- C1 EXISTING CULVERT ID
- 165 / 0.04ha CATCHMENT ID / CATCHMENT AREA

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G.W.P. 4059-11-00
Highway 401 Interchange Improvements
Highway 15

PROPOSED (ULTIMATE) CONDITIONS DRAINAGE MOSAIC - SHEET 1 OF 2

Figure
6-2a

POND SWM-1: DRY SWM FACILITY TO
PROVIDE PEAK FLOW CONTROL
QUALITY TREATMENT WILL BE PROVIDED
BY GRASSED SWALE
100-YEAR STORAGE VOLUME 450 m³
100-YEAR WATER LEVEL 111.70 m

200
3.72ha

120
2.69ha

190
1.32ha

160
0.45ha

130
1.04ha

140
1.47ha

180
0.98ha

170
0.28ha

220
1.20ha

240
0.50ha

210
2.72ha

250
2.60ha

230
3.60ha

HIGHWAY 401

N-W RAMP

W-N/S RAMP

S-E RAMP

HIGHWAY 15

MIDDLE ROAD

TRIBUTARY OF ST.
LAWRENCE RIVER

EX. C4 REPLACED

EX. C5 REPLACED

Metric Scale
25m 0 50m
Horizontal

LEGEND

- CATCHMENT BOUNDARY
- PROPOSED CULVERT
- EXISTING CULVERT
- WATERCOURSE
- FLOW DIRECTION
- P4 — PROPOSED CULVERT ID
- C1 — EXISTING CULVERT ID
- 165 / 0.04ha — CATCHMENT ID / CATCHMENT AREA

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Highway 401 Interchange Improvements
Highway 15

PROPOSED (ULTIMATE) CONDITIONS DRAINAGE MOSAIC - SHEET 1 OF 2

Figure
6-2b

6.1.3 STRUCTURAL IMPROVEMENTS

The Technically Preferred Alternative (TPA) involves the replacement of the Highway 15 underpass to the west of the existing structure. The new Highway 15 underpass will be a two-span (39 m and 46 m) prestressed concrete I-girder structure. It will accommodate four general purpose lanes (3.75 m), one left-turn lane (3.5 m), paved shoulders (2 m) and a raised median. The bridge will be supported by a single reinforced concrete pier in the median of Highway 401 and reinforced concrete abutments. A General Arrangement (GA) drawing of the proposed underpass is shown in **Figure 6-3**. The new Highway 15 underpass will span the existing Highway 401 and a future widened (six lane) Highway 401, should capacity expansion be required.

6.1.4 CARPOOL LOT

The existing carpool lot is located southwest of the Middle Road / eastbound off-ramp / Highway 15 intersection. The carpool lot has 30 spaces and is accessed directly from Highway 15. The carpool lot is partially illuminated and utilizes two poles with High Pressure Sodium (HPS) luminaires.

The Technically Preferred Alternative (TPA) proposes to shift the existing carpool lot to the southwest and retain its current configuration and capacity. The shift is required to maintain sight lines of Highway 15 from the realigned and widened eastbound off-ramp. A carpool lot demand assessment was not included as part of this study and no capacity expansion is proposed as part of the proposed improvements. If an expansion is required in the future, it is feasible to expand the carpool lot to the northeast and remain within MTO property. The lot will retain partial illumination and utilise one pole with an LED luminaire to match the lighting proposed for Highway 15. For parking lots with less than 35 regularly parked vehicles, only one luminaire is required at the entrance of the parking lot as outlined in the Draft Guidelines for Lighting MTO Carpool / Commuter Parking Lots, December 2006.

6.1.5 FOUNDATIONS

A foundations investigation and design report was completed as part of this study. The stratigraphy at the interchange comprises limestone bedrock, overlain by a thin root mat and silty sand, pavement structure, or silty-clay fill.

The primary aim of the foundations investigation was to identify the preferred foundation type for the new underpass, proposed as part of the Technically Preferred Alternative (TPA). Consideration was given to the following foundation types for the new abutments and piers:

- Spread footings placed on limestone bedrock
- Spread footings placed on the granular pad
- Steel H-piles socketed into limestone bedrock, and
- Caissons socketed into bedrock.

Limestone bedrock underlies the bridge site at relatively shallow depths. Spread footings constructed directly on the bedrock surface or on granular pads placed on bedrock are expected to offer cost-effectiveness and relatively easy construction. A foundation consisting of H-piles socketed into bedrock is feasible and would permit design of integral abutments. Due to relatively shallow depth to bedrock, socketing piles in the bedrock would be required to meet the pile flexibility requirements. Caissons socketed into bedrock could be also considered at this site; although installation of caissons would require coring of large diameter holes in the hard limestone, which will be significantly less cost effective than spread footings.

Advantages and disadvantages of the feasible foundation alternatives were assessed and Spread Footings on Bedrock was identified as the preferred foundation type.

6.1.6 ILLUMINATION

There is currently no full, continuous illumination on Highway 401 within the limits of the interchange. There is however partial lighting for the exit and entrance ramps of the interchange and full continuous lighting on Highway 15 within the interchange. The existing lighting is all conventional poles with High Pressure Sodium (HPS) luminaires. The Highway 15 interchange met the warranting condition for full continuous illumination; however, the full lighting is optional based on the results of the benefit cost analysis. High mast lighting is the recommended lighting plan for the interchange if full continuous lighting is to be installed. Preliminary illumination plans are included in **Appendix K**. There will be light trespass with both high mast and conventional lighting arrangements along the Ministry's Right-of-Way. Mitigating measures such as shielded photo-metrics will be reviewed in an attempt to address the light trespass in the preliminary design report.

6.1.7 UTILITIES

As detailed in **Section 3.7**, the utilities in the area include infrastructure belonging to Hydro One, Bell and Union Gas. The proposed improvements aim to minimize impacts to the existing infrastructure where possible, and provide for the relocation and / or rehabilitation of the infrastructure subjected to unavoidable impacts. **Figure 6-4** details the utilities impacted by the Technically Preferred Alternative (TPA).

No significant impacts to utilities are anticipated apart from the Bell fibre-optic cable running through the Highway 15 underpass sidewalk. This cable would require relocation prior to the replacement of the bridge; details will be confirmed during detail design and through continued consultation with Bell.

It is highlighted that by the time that the TPA is realized, some utilities would likely have changed due to the Proposed Interim Improvements. It is recommended that prior to construction of the TPA, utility surveys and inventories should be conducted and relocations / mitigations identified.

6.1.8 PROPERTY

The Technically Preferred Alternative (TPA) requires approximately 4.8 ha of non-MTO property. Approximately 3.3 ha of property are required in the northeast quadrant to accommodate the new westbound on- and off-ramps. Approximately 0.71 ha is required in the northwest quadrant to accommodate the new westbound on-ramp. A total of approximately 0.78 ha of municipal right-of-way would need to be transferred to MTO jurisdiction.

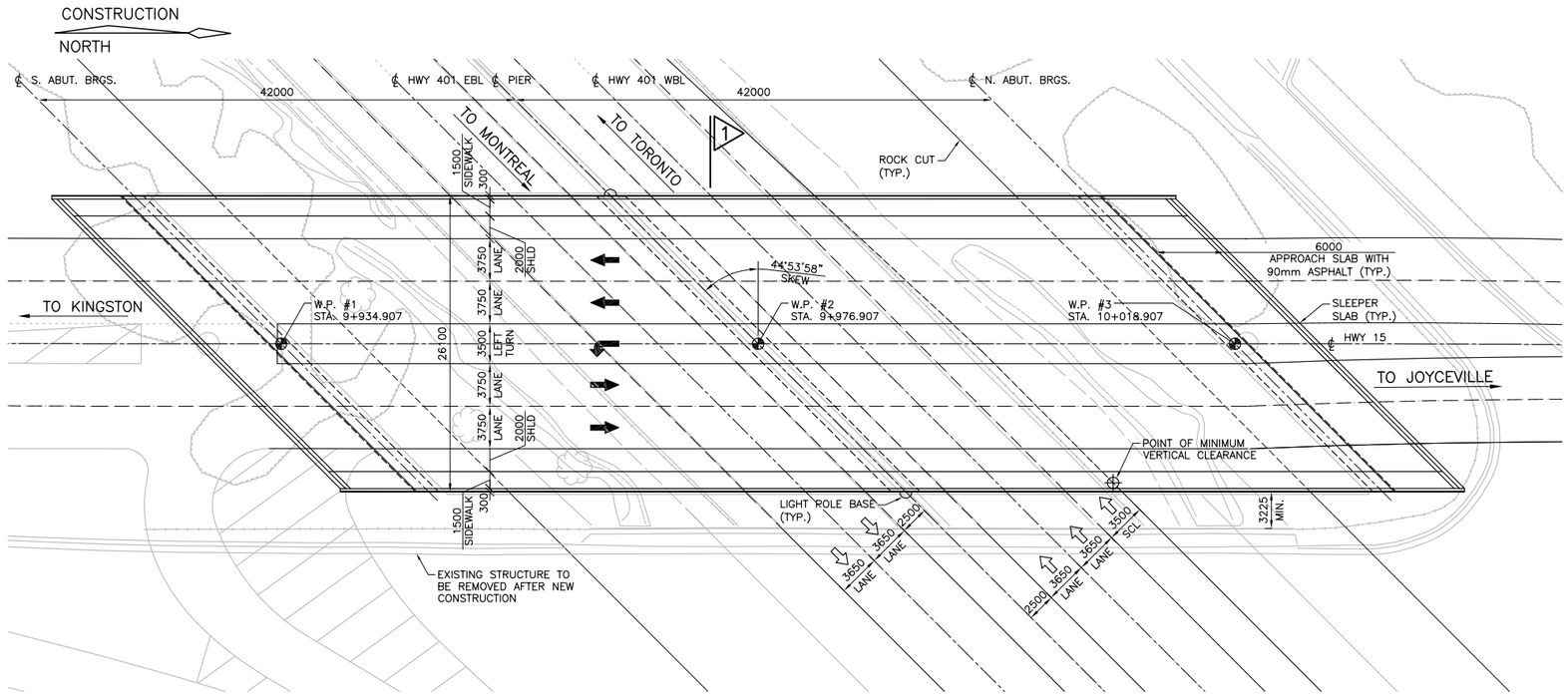
The new westbound on-ramp in the northwest quadrant will directly impact two residential properties and require some property from a third.

6.1.9 SIGNALS

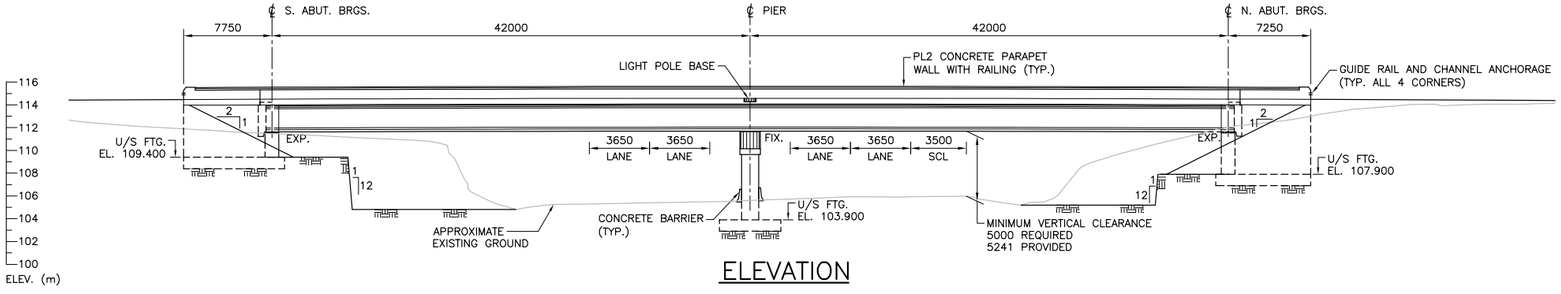
The signals utilized at the north ramp terminal, as part of the proposed interim improvements (detailed in **Section 6.2.7**) are removed as part of the Technically Preferred Alternative (TPA), with the removal of the existing Highway 15 alignment. The signals at the Middle Road / Highway 15 / eastbound off-ramp are retained yet shifted to the west with the realignment of Highway 15; the signal timings at this intersection could need optimising when the TPA is realised.

6.1.10 LOCAL ROADS

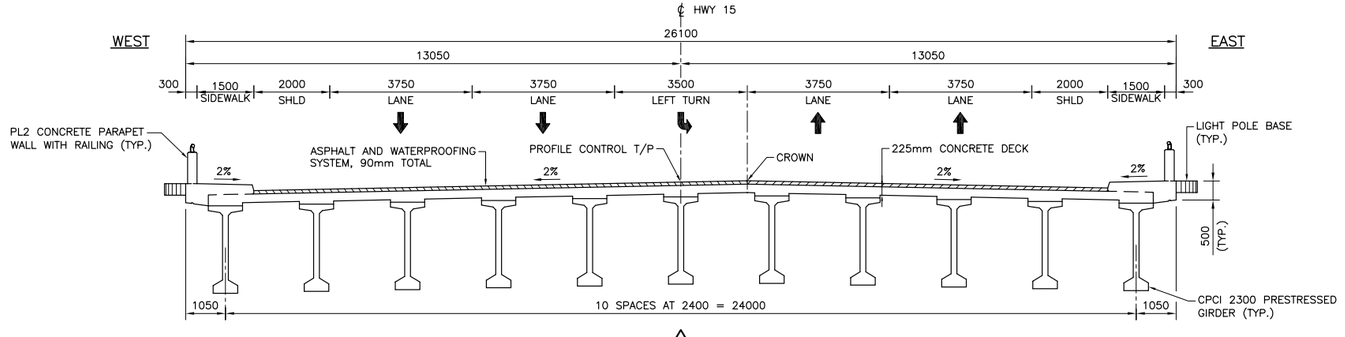
Station Road is closed at Highway 15, as the existing Station Road / Highway 15 intersection cannot be accommodated within the interchange configuration, and residents will be required to access Highway 15 via Kings Mill Road. Middle Road is slightly realigned on approach to the Highway 15 / Highway 401 eastbound off-ramp intersection.



PLAN



ELEVATION

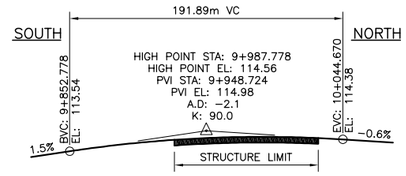


1

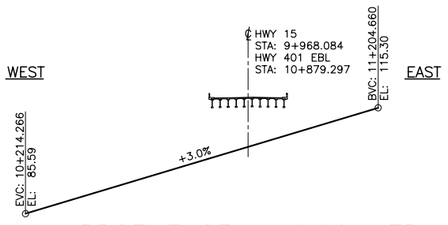
LIST OF ABBREVIATIONS:

SCL	DENOTES SPEED CHANGE LANE
SHLD	DENOTES SHOULDER
T/P	DENOTES TOP OF PAVEMENT
W.P.	DENOTES WORKING POINT

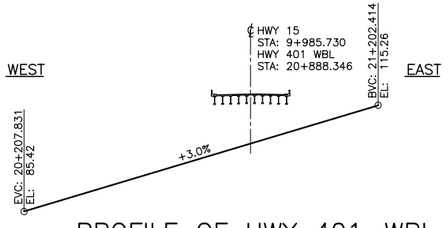
PRELIMINARY ONLY



PROFILE OF HWY 15
N.T.S.



PROFILE OF HWY 401—EBL
N.T.S.



PROFILE OF HWY 401—WBL
N.T.S.

DRAWING NOT TO BE SCALED
100mm ON ORIGINAL DRAWING

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Highway 401 Interchange Improvements
Highway 15

NEW HIGHWAY 15 UNDERPASS
GENERAL ARRANGEMENT DRAWING

Figure
6-3

STATION RD

E-N/S RAMP

S-W RAMP

N/S-W RAMP

HIGHWAY 401

HIGHWAY 15

N/S-E RAMP

W-N/S RAMP

MIDDLE RD.

25m 0 50m

LEGEND:
- BELL - HYDRO
- HYDRO POLE
- POLE - OTHER
- RELOCATION / MODIFICATION REQUIRED
- UNION GAS
- FIBER OPTIC
- HYDRO LINES (VARIOUS VOLTAGES)

NOTE: CABLE LOCATIONS ARE APPROXIMATE ONLY. PLEASE ENSURE LOCATES ARE DONE AT THE TIME OF CONSTRUCTION.

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Highway 15

HIGHWAY 15 UTILITY IMPACTS
TECHNICALLY PREFERRED ALTERNATIVE

Figure
6-4

6.2 INTERIM IMPROVEMENTS

Certain elements of the Technically Preferred Alternative can be implemented in the interim to provide operational benefits in the short term. Interim improvements are expected to be implemented within the next 5 - 10 years; however, implementation is dependent on provincial priorities and funding. The interim improvements are detailed in **Figure 6-5**. Preliminary design plates and profiles are included in **Appendix O.**

6.2.1 INTERIM GEOMETRIC AND OPERATIONAL IMPROVEMENTS

As part of the proposed interim improvements, the approaches to the north ramp terminal will be realigned slightly to enable the signalization of the intersection. The westbound on-ramp will also be widened at the north ramp terminal to accommodate two lanes of 3.75 m, which then merge into a single lane (4.75 m) prior to the speed-change lane at Highway 401, per the Geometric Design Standards for Ontario Highways (GDSOH) for single and multi-lane ramps.

The eastbound off-ramp widening to three lanes, on approach to the south ramp terminal, will be extended back towards Highway 401, providing the ramp with additional capacity. The three lanes will be designated left-turn, through and left and right turn, with widths of 3.5 m, 3.75 m and 3.5 m respectively. The south ramp terminal will remain in the existing configuration; however, Highway 15 will be widened to accommodate a left-turn lane (3.5 m) for southbound Highway 15 traffic to access Middle Road. Lane and road markings will be remarked to designate through and through/right movements for the northbound Highway 15 traffic.

6.2.2 INTERIM STORMWATER MANAGEMENT

Figures 6-6a to 6-6c detail the proposed interim improvement conditions drainage mosaics. All existing culverts are retained in the interim condition.

The outlet of Culvert C2 could not be located during the field investigation. It is recommended that the condition of Culvert C2 and its functionality be reviewed during the Detail Design. No SWM facilities are required under interim conditions.

6.2.3 INTERIM STRUCTURAL IMPROVEMENTS

Minor rehabilitation to the Highway 15 underpass is recommended in the short term. The rehabilitation will include patching of the soffit and substructure.

6.2.4 INTERIM CARPOOL LOT IMPROVEMENTS

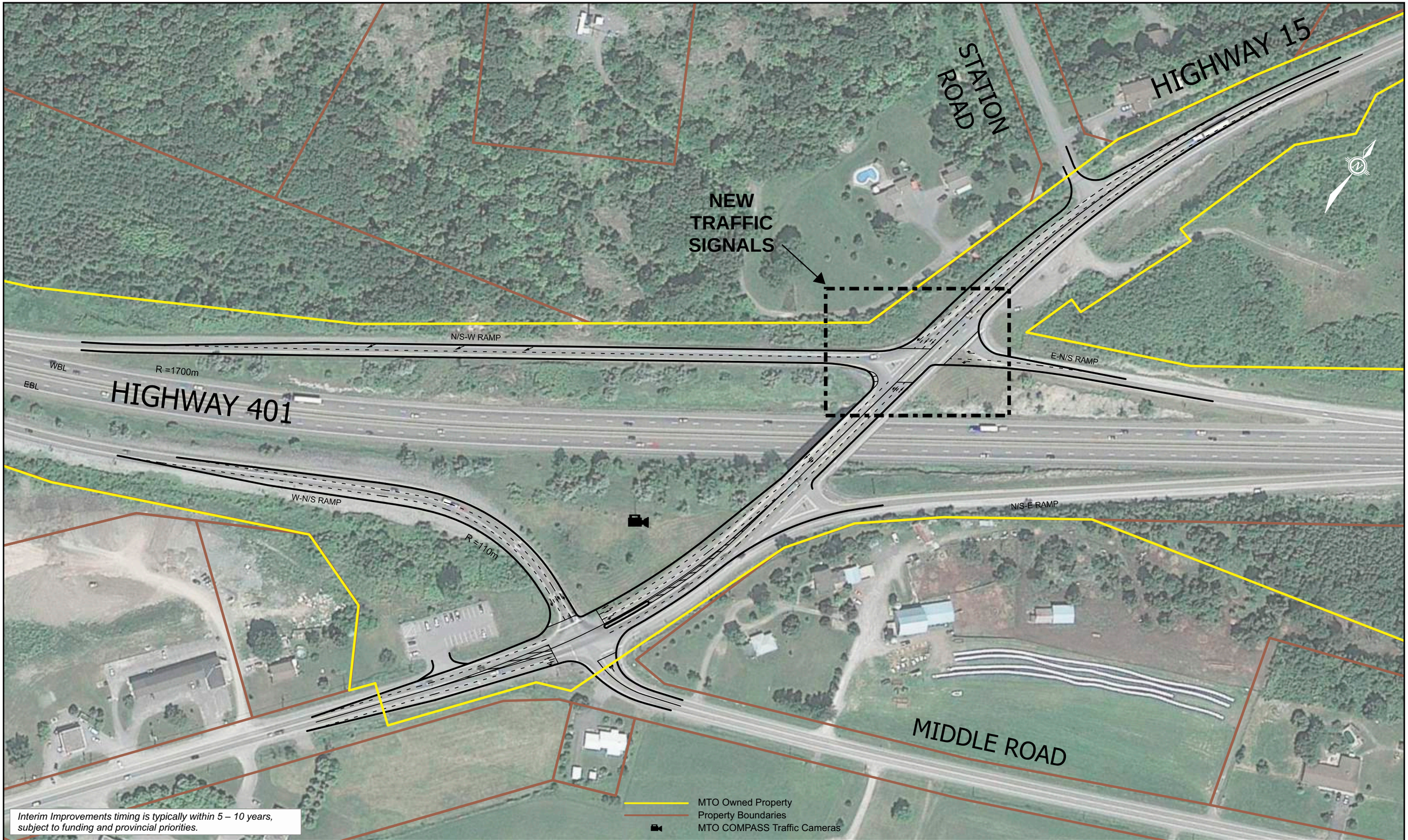
No improvements to the carpool lot are recommended in the short term.

6.2.5 INTERIM IMPROVEMENT FOUNDATIONS

No impacts or improvements to foundations are anticipated as part of the proposed interim improvements.

6.2.6 INTERIM ILLUMINATION IMPROVEMENT

There is currently no full, continuous illumination on Highway 401 within the limits of the interchange. There is however partial lighting for the exit and entrance ramps of the interchange and full continuous lighting on Highway 15 within the interchange. The existing lighting is all conventional poles with High Pressure Sodium (HPS) luminaires. The Highway 15 interchange met the warranting condition for full continuous illumination; however, the full lighting is optional based on the results of the benefit cost analysis. High mast lighting is the recommended lighting plan for the interchange if full continuous lighting is to be installed. Preliminary illumination plans are included in **Appendix K**.



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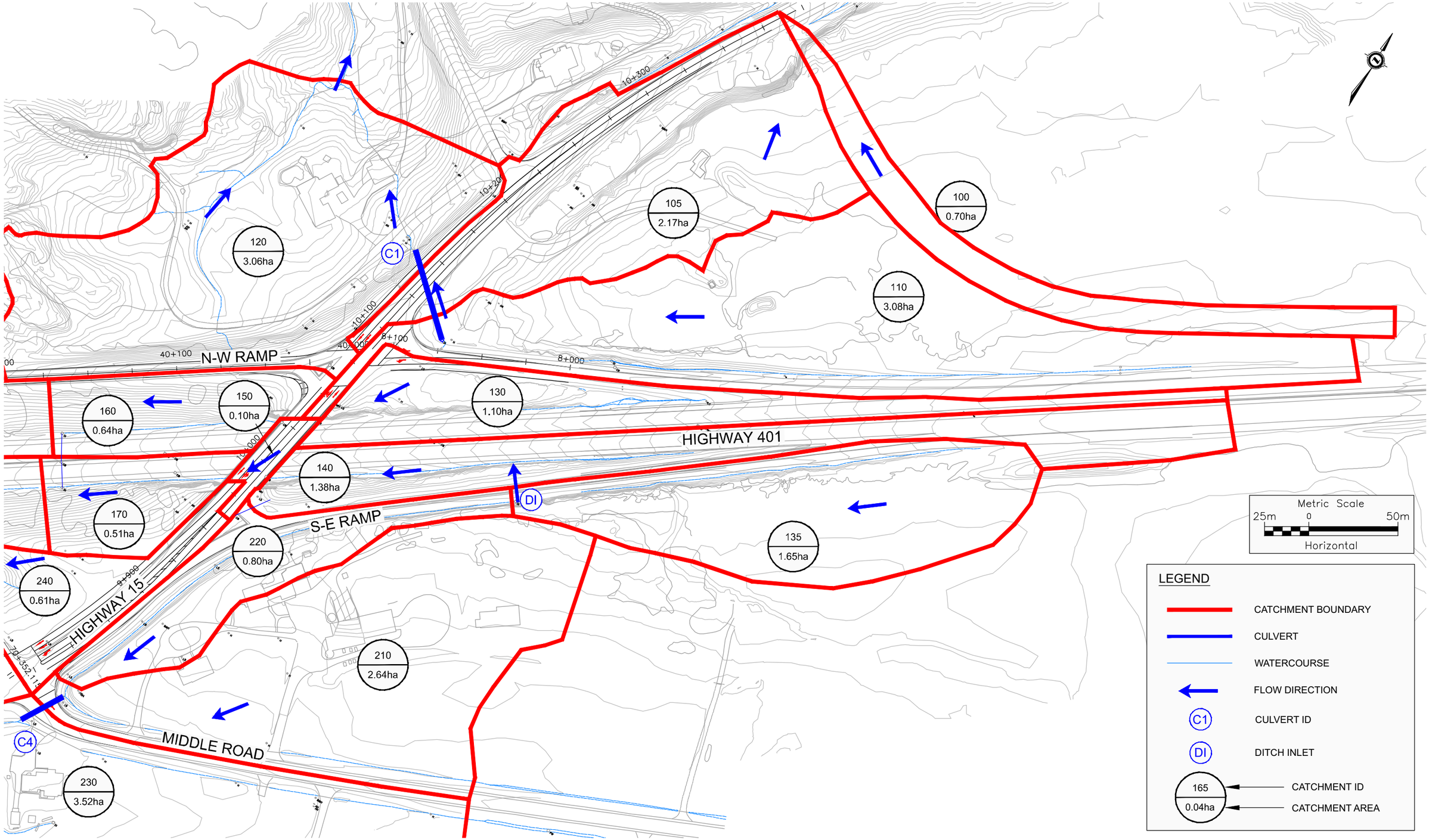
Highway 15

DRAFT

HIGHWAY 15 PROPOSED INTERIM IMPROVEMENTS

Figure
6-5



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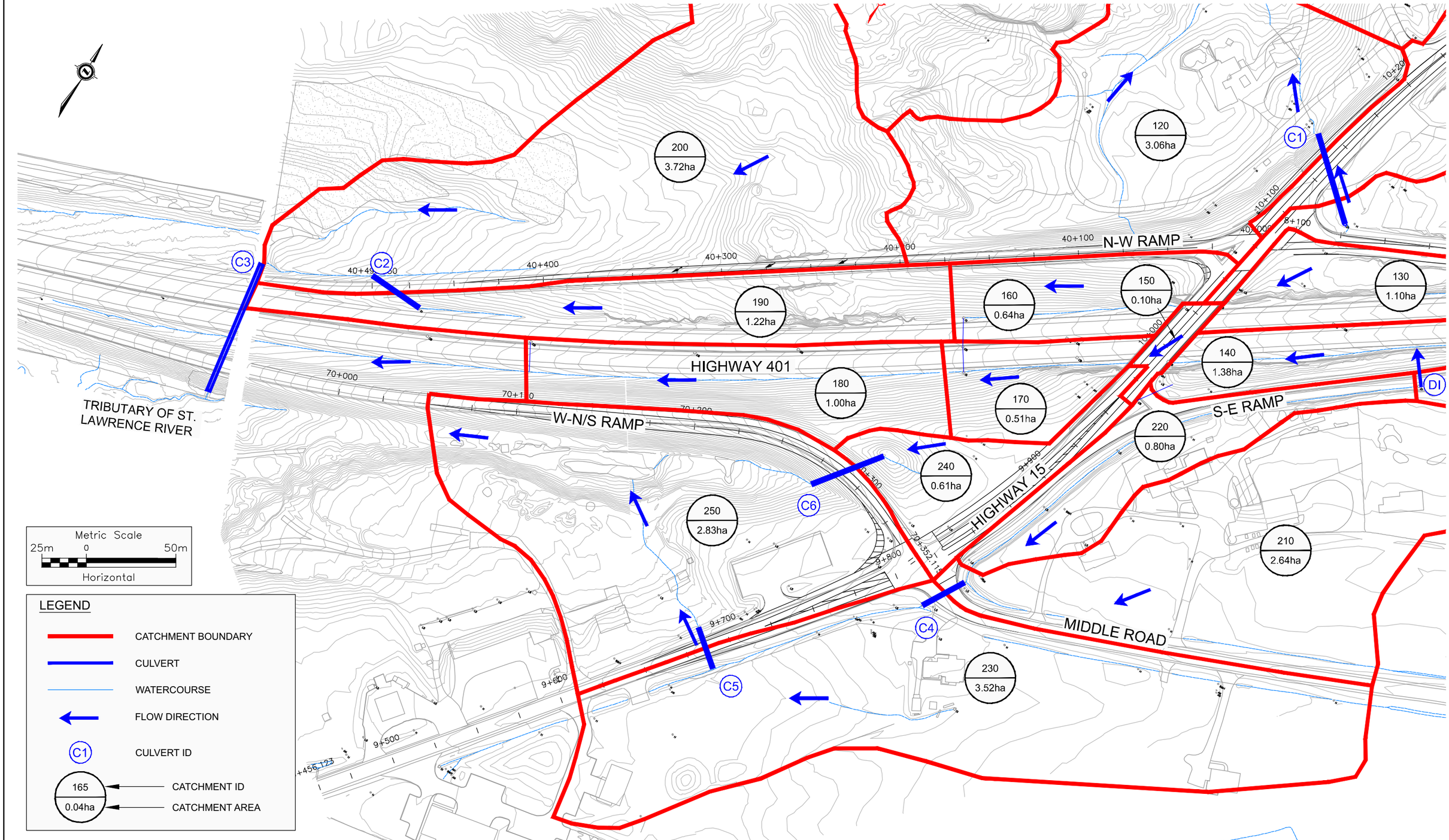
Highway 401 Interchange Improvements
Highway 15

PROPOSED (INTERIM) CONDITIONS DRAINAGE MOSAIC - SHEET 1 OF 2

Figure
6-6a



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Highway 15

PROPOSED (INTERIM) CONDITIONS DRAINAGE MOSAIC - SHEET 2 OF 2

Figure
6-6b

6.2.1 INTERIM IMPACTS TO UTILITIES

As detailed in **Section 3.7** and **Section 6.1.5**, the utilities in the area include infrastructure belonging to Hydro One, Bell and Union Gas. The proposed improvements aim to minimize impacts to the existing infrastructure where possible, and provide for the relocation and / or rehabilitation of the infrastructure subjected to unavoidable impacts. **Figure 6-7** details the utilities impacted by the proposed interim improvements.

No significant impacts to utilities are anticipated apart from the Bell fibre-optic cable north and south of the existing Highway 15 underpass. This cable would require relocation and / or mitigation; details will be confirmed during detail design and through continued consultation with Bell.

6.2.2 INTERIM PROPERTY IMPACTS

The Proposed Interim Improvements will not require any acquisition of non-MTO property.

6.2.3 INTERIM SIGNAL IMPROVEMENTS

The signal-warrant analysis undertaken as per Ontario Traffic Manual (OTM), Book 12 guidelines suggested that the traffic-signal justification criterions are nearly met (90%) at the north ramp terminal, based on 'The Delay to Cross Traffic Justification'. As such, the signalization of the terminal is recommended as part of the Proposed Interim Improvements. As per the OTM guidelines, 'The Delay to Cross Traffic Justification' is intended for applications where the traffic volume on the main road is so heavy that traffic on the minor road suffers excessive delay or hazard in entering or crossing the main road. The results of the signal warrant analysis are detailed in the Traffic Operations Report. The signals installed will utilize split-phase operation.

As the south ramp terminal will be reconfigured to accommodate the new left-turn lane for traffic entering Middle Road, the signals at the terminal will have to be optimized.

6.2.1 INTERIM LOCAL ROADS IMPACTS

No impacts to local roads are anticipated as part of the Proposed Interim Improvements.

STATION RD

E-N/S RAMP

N/S-W RAMP

HIGHWAY 401

HIGHWAY 15

N/S-E RAMP

W-N/S RAMP

MIDDLE RD.

25m 0 50m

LEGEND:
- BELL - HYDRO
- HYDRO POLE
- POLE - OTHER
- RELOCATION / MODIFICATION REQUIRED
- UNION GAS
- FIBER OPTIC
- HYDRO LINES (VARIOUS VOLTAGES)

NOTE: CABLE LOCATIONS ARE APPROXIMATE ONLY.

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Highway 15

HIGHWAY 15 UTILITY IMPACTS
PROPOSED INTERIM IMPROVEMENTS

Figure
6-7

6.3 TRAFFIC / CONSTRUCTION STAGING

The preliminary construction staging plan for both the proposed interim improvements and the Technically Preferred Alternative are illustrated and described in **Appendix L.** The operational impacts due to construction staging and further details are described in **Section 7.3.4**.

6.3.1 INTERIM IMPROVEMENTS STAGING

Implementation of the proposed interim improvements may require short-term lane or ramp closures. Temporarily reduced lane widths will be required to accommodate the Highway 15 widening at the north and south ramp terminals. Lane reduction is also anticipated on the east- and westbound ramps during their widening and realignment on approach to Highway 15. Staging details will be confirmed during Detail Design.

6.3.2 TECHNICALLY PREFERRED ALTERNATIVE STAGING

In summary, the Technically Preferred Alternative consists of realigning Highway 15 to the west with a new underpass, and reconfiguring the westbound on- and off-ramps into a 'Parclo A' configuration. The constrained location of the interchange and the proposed improvements result in a construction staging strategy that is slightly more complex than usual interchange improvements. Construction staging plan drawings for the proposed improvements are included in **Appendix L**.

To accommodate the inner-loop ramp of the proposed 'Parclo A' configuration, the north ramp terminal is shifted northwards along Highway 15. As Highway 15 has a steep grade north of Highway 401, the profile of the existing Highway 15 has to be lowered to accommodate the new ramp terminal. As a result, the first stage of the construction staging involves temporarily shifting the alignment of Highway 15, north of Highway 401, as well as constructing the new westbound off-ramp and part of the westbound inner-loop on-ramp. Minimal impact to traffic is anticipated at this stage.

The second stage would involve shifting the Highway 15 traffic east (onto the temporary alignment), opening the new westbound off-ramp to traffic and closing the existing westbound off-ramp. The Highway 15 realignment and new underpass will be constructed west of the existing alignment, north and south of the existing westbound on-ramp. The westbound on-ramp will be open to traffic throughout this stage. The remaining westbound inner-loop ramp will be constructed in this stage also, apart from a section directly underneath the existing bridge; the tight cross-section of the underpass precludes the inclusion of the ramp speed-change lane.

The third stage involves the demolition of the existing bridge. For the demolition, the interchange has to be closed for approximately 14 hours, with Highway 401 traffic being diverted through the interchange ramps (as detailed in Plate 3 of the Technically Preferred Construction Staging Plan, **Appendix L**). Highway 15 will be closed during this time and traffic detoured via Middle Road and John F. Scott Road for trips heading north / south on Highway 15, and diverted to the Joyceville Road interchange for trips heading east / west on Highway 401. As the bridge has a rigid frame, conventional demolition in halves is not feasible and rapid demolition of the bridge with short-term realignment of Highway 401 traffic is considered the most viable option with least impacts.

For minimal disruption, the closure and traffic realignment are recommended to occur over night (between 7 pm to 9 am) and during a weekend occurring between April and June. It is during this time that Highway 401 is normally subjected to flows that are less than 1000 vehicles per hour. As such, the diversion of Highway 401 traffic through the interchange ramps is anticipated to have small disruptive impacts. During the demolition, the realigned Highway 15 construction is completed through the existing westbound on-ramp and the westbound inner-loop on-ramp is completed underneath the existing Highway 15 alignment.

Once the realigned Highway 15 and new underpass are constructed, the fourth stage is implemented wherein traffic is shifted onto the new Highway 15 and the existing Highway 15 alignment and other infrastructure is removed. The Highway 15 exit terminal onto the westbound inner-loop ramp is also completed. Removal of the remaining existing infrastructure and the removal of the westbound inner-loop ramp construction staging access comprise the fifth and final stage.

7 ENVIRONMENTAL ISSUES AND COMMITMENTS

This section describes the direct and indirect environmental impacts and corresponding mitigation measures associated with the Technically Preferred Alternative. Mitigation includes planning decisions, design features, and detail design and construction requirements / constraints to avoid or minimize impacts for each identified environmental issue.

The environmental impacts and mitigation measures outlined in this section are based on the preliminary design for the bridge replacement and highway widening. They will be reviewed and refined during the Detail Design phase and will be documented in a Design and Construction Report (DCR).

7.1 IMPACTS TO THE TERRESTRIAL ENVIRONMENT

7.1.1 VEGETATION

7.1.1.1 *Realignment of Highway 15 and Extension of N-W ramp*

A slight re-alignment of Highway 15 to the west is planned from just south of Middle Road to just north of Station Road. Additionally, the existing N-W ramp will be re-aligned and extended northeast towards Highway 15 near Station Rd. Areas impacted by these works include portions of cultural meadow (CUM1-1, CUM2), cultural woodland (CUW1), and cultural thicket types (CUT1, CUT1-1, CUT2), with vegetation removals and disturbance required along the length of the realignments. None of these communities contain sensitive or rare flora, existing and adjacent flora is tolerant of disturbance, and these community types are widespread throughout the local area and the province. Furthermore, these areas are already subject to disturbance from existing highway maintenance and operations or residential use. The removals required to accommodate these works are considered minor and present no loss of ecological function.

7.1.1.2 *Installation of S-W Ramp and E-N/S Ramp*

Installation of two new ramps is required in the northeast quadrant of the study area. Vegetation removals, rock blasting, and contouring of adjacent slopes will be required for installation of the ramps, and temporary vegetation removal, re-seeding, and ongoing vegetation management for highway operations can be expected in the general vicinity.

Impacted communities associated with the S-W ramp include cultural meadow (CUM2) and Common Lilac dominated cultural thicket (CUT2). Impacted communities associated with the E-N/S ramp include cultural meadow (CUM1-1), Common Lilac dominated cultural thicket (CUT2), and a portion of the Dry-Fresh Sugar Maple – White Ash Deciduous Forest (FOD5-8). The thicket and forest communities are identified as ‘contributory’ and ‘significant woodlands’, respectively, in the City of Kingston Official Plan.

The impacts of vegetation removals, rock blasting, and slope contouring within the thicket and meadow communities near the S-W ramp are considered minor given the nature of these areas. No rare or sensitive flora were recorded in these communities. Additionally, the CUM2 communities are comprised of tolerant, common flora and portions are already subject to ongoing disturbance from road operations. The CUT2 bedrock thicket is a dense, virtually impassable monoculture of Common Lilac abutting the more open cultural meadow and mature forest communities. Fragmentation and disturbance of these communities due to the installation of the ramps is not considered to result in a significant loss of ecological function.

Impacts to the forest community (significant woodland) are restricted primarily to its edge, and include rock blasting for grading. Vegetation removal, rock blasting, and slope contouring can be expected in the general vicinity of the ramp. Hydrological changes can also be expected within the forest community as a result of the rock blasting, which may result in less water available for vegetation and resultant changes to forest composition.

7.1.2 WILDLIFE

Wildlife species inhabit all of the vegetation communities identified during the field surveys. Clearing and grubbing of vegetation may result in direct impacts to wildlife and nesting migratory birds protected by provincial and federal legislation.

7.1.2.1 *South Quadrants*

Works proposed in both southern quadrants would impact disturbed habitats adjacent to existing roadways. Although a turtle nest was found on the south side of the embankment of the E-N/S ramp, the proposed works at this location are limited to the existing road surface and impacts to nesting turtles can be avoided.

Highway 15 widening and realignment may result in permanent alteration of the hydrologic regime through removal of the seep adjacent to the Highway 401/Highway 15 intersection and the nearby pond. Habitats may be degraded and eliminated as a result and wildlife may be displaced. Open water is scarce in the study area and the pond's contribution to anuran breeding may be significant.

7.1.2.2 *North Quadrants*

Works proposed in both north quadrants impact disturbed areas, for the most part, but also forested habitats. A small portion of the forest in the northeast quadrant will be removed. Impacts to snakes may result from cuts into rock in the northeast quadrant.

7.1.3 SPECIES OF CONSERVATION CONCERN

Barn Swallow, Bobolink, Blanding's Turtle, Chimney Swift, Eastern Meadowlark, Eastern Ribbonsnake, Gray Ratsnake, Milksnake, and Snapping Turtle may occur in the vicinity of the interchange.

7.1.3.1 *South Quadrants*

Bobolink and Eastern Meadowlark may breed in the agricultural field in the southeast quadrant south of Middle Road, but this area is located well away from the proposed works and will not be impacted. Similarly, impacts to Barn Swallow, Chimney Swift, Gray Ratsnake, Eastern Ribbonsnake and Milksnake that may forage in these peripheral areas can be mitigated through the application of standard measures. Although a nest that could belong to Blanding's Turtle or Snapping Turtle was found on the south side of the embankment of the E to N/S ramp, proposed works at this location are limited and impacts to nesting turtles can be avoided.

7.1.3.2 *North Quadrants*

A small portion of the forest in the northeast quadrant will be removed. This forest contained the occasional large, dead tree, which may provide nesting habitat for Chimney Swift. As in the south quadrants, impacts to SAR species foraging along the roadways can be mitigated using standard measures. In the northeast quadrant where the proposed works involve cuts into rock, snakes including the Gray Ratsnake, Eastern Ribbonsnake and Milksnake may be impacted.

7.2 IMPACTS TO THE AQUATIC ENVIRONMENT

Widening of the eastbound Highway 401 off-ramp is the only aspect of the proposed works that may impact the aquatic habitat within the study area. The watercourse located within the study area is considered to be indirect fish habitat. It is located within 30 m of the potential work zone and with the application of standard mitigation measures during construction, it is anticipated that the project poses a low risk of causing serious harm to fish.

7.3 IMPACTS TO THE SOCIAL / CULTURAL ENVIRONMENT

7.3.1 LAND USE

Farming operations in the southeast quadrant will not be impacted by the operational improvements. However, the closure of Station Road at Highway 15 on the north side of the interchange will impact the movement of farming equipment. The closure of Station Road will impact cycling routes and potentially emergency response routes.

Property acquisitions in the northwest quadrant include portions of three rural residential properties. Additionally, a portion of the former gas station and motel property will need to be acquired for the long-term operational improvements, which may require modifications to the planned accesses to this site, currently undergoing redevelopment.

7.3.2 ARCHAEOLOGY

Stage 1 and 2 archaeological assessments have been conducted within the study area to assess the archaeological potential of the areas to be impacted by the interchange improvements and to identify any archaeological resources that may be present. The existing highway corridors have been disturbed due to previous roadway construction, utilities and ditching and are considered to be free of further archaeological concern.

All areas outside the existing highway or roadway corridor, however, have potential for the recovery of archaeological resources due to their proximity to waterways, heritage features and historic roadways. A Stage 2 assessment was completed in the areas to be impacted by construction activities.

Stage 2 archaeological investigations were undertaken in undisturbed areas of archaeological potential that are anticipated to be impacted during construction. Testing consisted of the excavation of test pits on a 5 m grid, with each test pit measuring approximately 30 cm by 30 cm. Areas that are steeply sloping, rocky or contain exposed limestone bedrock which are unsuitable for past human settlement were omitted from the assessment (approximately 5% of the area assessed).

No artefacts were recovered from the study area during the Stage 2 assessment. Provided that subsurface disturbances occur in areas that have been assessed as part of the archaeological assessment, no further assessment is required. If disturbances outside of the areas assessed as part of this assessment are anticipated in Detail Design, further investigation may be required.

7.3.3 CULTURAL HERITAGE

The Highway 15 underpass was assessed in accordance with the Ontario Heritage Bridge Guidelines but was found to not possess cultural heritage interest or value. The bridge may be replaced with no further study or mitigation. No direct impacts to cultural heritage resources are anticipated.

7.3.4 TRAFFIC OPERATIONS

The proposed interim improvements constitute signalizing the north ramp terminal and widening Highway 15 in select locations. It is anticipated that these improvements will require short-term lane width reductions however no lane closures.

The Technically Preferred Alternative (TPA) is a different configuration than that of the interim improvements north of Highway 401, while maintaining a similar configuration south of Highway 401. Similar to the interim improvements, long-term improvements south of Highway 401 are anticipated to require short-term lane width reduction at the south ramp terminal, however no lane closures. The improvements north of Highway 401 will require an alignment shift to complete construction.

To demolish the existing bridge, a short-term closure of Highway 401 will be required. The rigid-frame bridge type results in ‘demolition by halves’ being impractical and time-consuming. Another alternative for

a rigid-frame structure is to separate the deck from the abutments, hoist to a new location and then demolish it. However, there are no suitable areas in close proximity to the bridge to make this alternative feasible. Therefore a short-term closure (14 hrs.) of Highway 15 will occur and a temporary realignment of Highway 401 traffic is required, with traffic directed through the interchange ramps. For minimal disruption, the closure and traffic realignment are proposed to occur overnight (between 7 pm to 9 am) and during a weekend occurring between April and June. It is during this time that Highway 401 is normally subjected to flows that are less than 1000 vehicles per hour. As such, the diversion of Highway 401 traffic through the interchange ramps is anticipated to have small disruptive impacts. During the Highway 15 closure, traffic will be diverted via Middle Road and John F. Scott Road for trips heading north / south on Highway 15, and diverted to the Joyceville Road interchange for trips heading east / west on Highway 401.

7.3.5 NOISE

A noise assessment was completed to determine the potential noise impacts of the proposed improvements to the Highway 401 / Highway 15 interchange on nearby residences and to assess whether noise mitigation measures would be warranted based on the guidance provided in the Ministry of Transportation *Environmental Guide for Noise* (2006) (referred to as the MTO Noise Guide). The full Noise Assessment Report is provided in **Appendix M.**

A total of ten Noise Sensitive Areas (NSAs) were identified within the study area. These locations are critical in terms of noise exposure from the Highway 401 interchange ramps and Highway 15 noise sources. They are located on the most exposed side of each dwelling unit, three metres from the dwelling façade. The NSAs are identified in **Figure 7-1**.

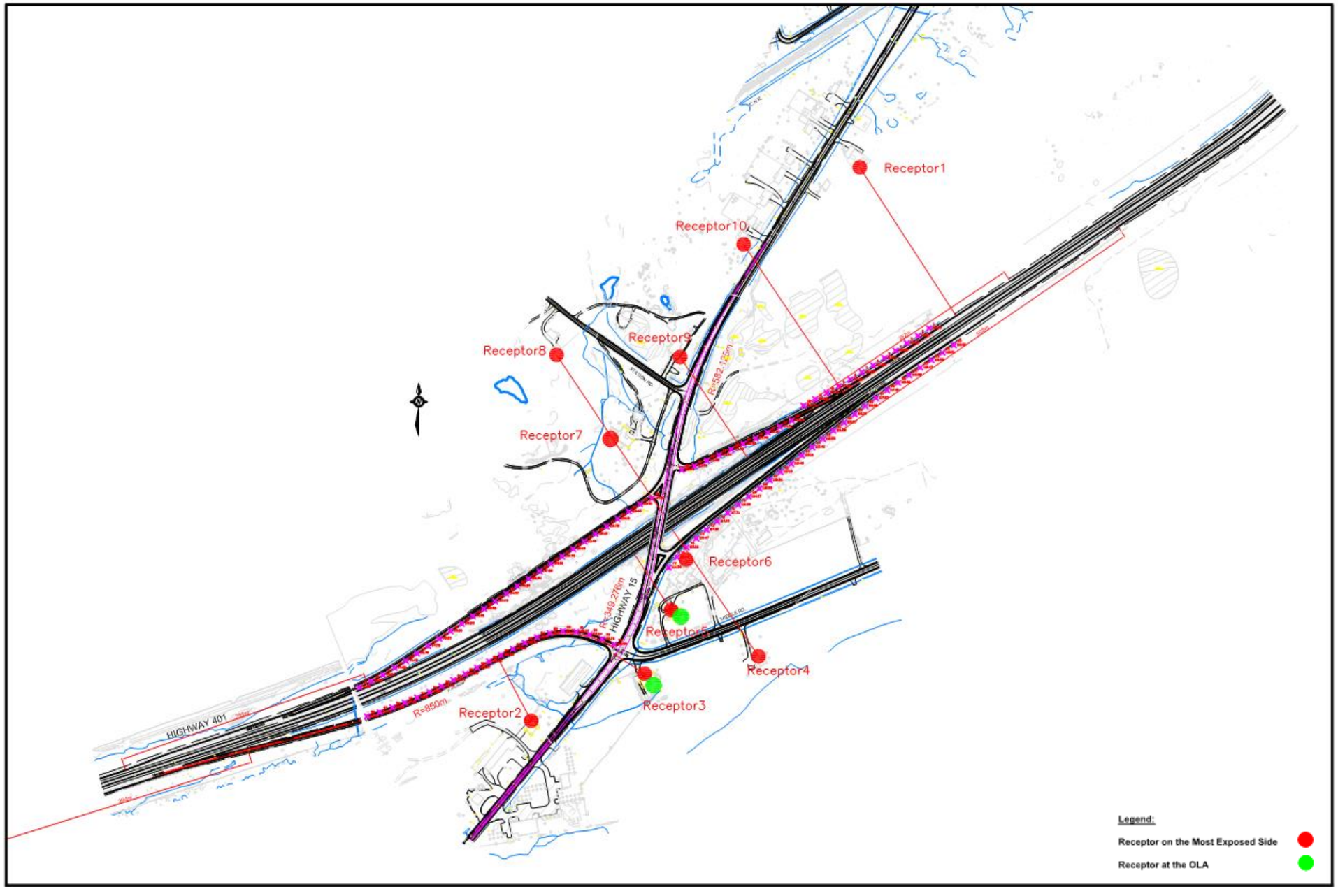

Figure 7-1: Noise Sensitive Areas

To determine the impact of the implementation of the interchange improvement alternatives on noise levels at the NSA locations, STAMINA 2.0, a computer noise modelling program, was used. Per the MTO Noise Guide, the noise levels at each of the NSAs 10 years after the anticipated construction of the interchange improvements were modelled. For the purposes of this study, 2033 is the assumed year of implementation; therefore the noise assessment examined future conditions in the year 2043. Future Highway 401 and Highway 15 traffic volumes were projected based on the traffic assessments performed as part of this study.

Two future scenarios were modelled using STAMINA 2.0: the first examined 2043 noise conditions at each NSA assuming no modifications to the interchange (i.e., the "do nothing" scenario) as a baseline; the second examined 2043 noise conditions with the implementation of the interchange improvements. The results are summarized in **Table 7-1**.

Table 7-1: Future Noise Level at Receptor Locations

Receptor Location	**Year 2043 Noise Level (dBA)** *"do nothing" scenario*	**Year 2043 Noise Level (dBA)** *With interchange improvements implemented*	**Change in Noise Level** *do nothing vs. implement interchange improvements*
1	61.9	61.7	-0.2
2	66.3	**68.3***	+2.0
3	66.5	**66.4***	-0.1
4	59.5	60.3	+0.8
5	67.4	**67.0***	-0.4
6	70.7	**70.8***	+0.1
7	65.2	**67.3***	+2.1
8	57.9	58.8	+0.9
9	66.4	**68.1***	+1.7
10	67.0	**67.0***	0

* meets conditions for review of noise mitigation per MTO Noise Guide (i.e., ≥65 dBA)

The MTO Noise Guide requires the consideration of noise mitigation measures when absolute noise levels of greater than or equal to 65 dBA are predicted or if the proposed improvements result in a change in noise level greater than 5 dBA. At seven receptors, the noise level is expected to exceed 65 dBA. No increases greater than 5 dBA are anticipated at any location.

The installation of a 5.0 m-high noise walls within the MTO right-of-way was reviewed to mitigate noise impacts at receptors R2, R3, R5, R6, R7, R9 and R10. The anticipated noise reductions as a result of the noise walls are summarized in **Table 7-2.** If a noise wall does not achieve a reduction of 5 dBA, it is not considered technically feasible per the MTO Noise Guide and no further consideration of noise mitigation is required.

Table 7-2: Predicted Noise Levels with 5 m High Noise Wall

Receiver	**Future Noise Level (dBA) with Hwy 401/Hwy 15 Improvement**	**Predicted Noise Level (dBA) with Hwy 401/Hwy 15 Improvement and 5 m Noise Walls along Right-of-Way**	**Noise Reduction (dBA)**	**Noise Wall Achieves Reduction of 5 dBA**
2	67.7	66.0	-1.7	No
3	60.5	60.2	-0.3	N/A
5	62.0	61.4	-0.6	No
6	70.8	64.6	**-6.2***	**Yes**
7	64.6	62.6	-2.0	No
9	57.1	57.1	0	N/A
10	56.9	56.9	0	N/A

* meets conditions for further review per MTO Noise Guide (i.e., noise reduction ≥5 dBA)

A 5.0 metre high noise wall along the N-W and W-NS ramp is not predicted to provide a 5 dBA reduction in sound levels at R2 and R7 and therefore is not considered to be a technically feasible option.

At R6, the noise wall provides a 6.2 dBA reduction in noise levels; therefore, a cost analysis of constructing this noise wall was prepared. The cost of the barrier is estimated to be $550,000. The MTO Noise Guide defines noise walls as economically feasible if the cost of the barrier is less than $100,000 per household. Because the noise wall would only address noise levels at one household (R6), it is not considered to be economically feasible.

Temporary noise associated with construction may be audible to adjacent residences. During construction, standard mitigation measures (e.g., minimizing equipment idling) should be implemented to address temporary impacts. If construction is to occur during the restricted hours of 7:00 pm to 7:00 am under the City of Kingston Noise By-law, an exemption to the by-law is recommended.

The use of pavement mixes that are specially designed to reduce noise levels produced by the interaction of tires with the pavement surfaces are another method of mitigating noise impacts. During Detail Design, consideration should be given to using a bituminous pavement in the vicinity of NSAs that are predicted to have an absolute noise level greater than or equal to 65 dBA.

7.3.6 PROPERTY

The Technically Preferred Alternative will require the acquisition of approximately 4.8.ha of non-MTO property. The majority of land required (4 ha) is located north of Highway 401. Two residential properties will be directly impacted as a result of the proposed improvements. The majority of improvements south of Highway 401 occur within MTO property.

All efforts have been made to minimize the property required and maximize opportunities for the use of the remaining lands. The Ministry will negotiate the transfer of all necessary properties once the EA has been approved. Standard mitigation/compensation measures for property impacts will be addressed on an individual property/land owner basis. If a property were to be displaced, mitigation and compensation measures will include the acquisition of the property at fair market value in accordance with Ministry policy and directives.

Access disruptions and nuisance impacts (e.g. noise, air quality) will be minimized during construction. A landscaping buffer will be provided, if warranted

7.3.7 CONTAMINANTS

Preliminary Site Screenings (PSS) were carried out in November 2014 for properties to be impacted by the proposed modifications to the Highway 401 / Highway 15 interchange. Phase One Environmental Site Assessments (Phase 1 ESAs) were completed for three contiguous properties southwest of the interchange due to their proximity to a former gas station. The objectives of the Phase 1 ESAs were to determine if Areas of Potential Environmental Concern (APECs) exist on the subject properties, and to identify details of potential contaminant pathways. The Phase 1 ESAs involved a records review, interviews and a site reconnaissance.

Three APECs were identified in the vicinity of the Phase 1 ESA study areas south of the interchange. These include a former gas station site, a stockpile of soil and crushed concrete associated with the former gas station, and a storage area for scrap metal and debris. The potential for contaminant migration from the APECs is considered low, as the APECs are hydraulically downgradient and not in close proximity to the subject properties. No further assessment is recommended south of the interchange.

The Preliminary Site Screening completed for the properties impacted in the northeast quadrant identified historic land uses that may indicate contamination, including use as an automobile junkyard between 1969 and 1976. A Phase 1 ESA was completed for the property located at 1851 Highway 15, currently owned by Cancoil Thermal Corporation.

Two APECs have been identified on the property based on the Phase One ESA site reconnaissance visit and background research. They include the previous use of the property as a salvage or junk yard operation and the household debris and disturbed soils observed in the central portion of the property. Based on the presence of these APECs, a Phase Two ESA is recommended to investigate subsurface conditions on the subject property.

7.3.8 UTILITIES

Existing utilities within the study area are summarized in **Section 3.7**, and **Section 6.16** details the impacted utilities due to the Technically Preferred Alternative. Minor impacts are anticipated due to the Proposed Interim Improvements, where Highway 15 south of Highway 401 is widened slightly to accommodate a left-turn lane. The impacts to/relocation of the existing utilities are anticipated to be minor and mitigation measures would be confirmed through consultation with the affected utility providers in the subsequent design phases.

7.3.9 LANDSCAPING

The implementation of the interchange improvements will result in impacts to the surrounding landscape through vegetation clearing and other construction disturbances. Opportunities to enhance landscaping in certain areas are also possible. A Landscape Technical Report (**Appendix N)** has been prepared to identify strategies and specific recommendations to mitigate impacts to the landscape surrounding the interchange. The Preliminary Landscape Plan shown in **Figure 7-2** outlines the recommended mitigation and enhancement measures.

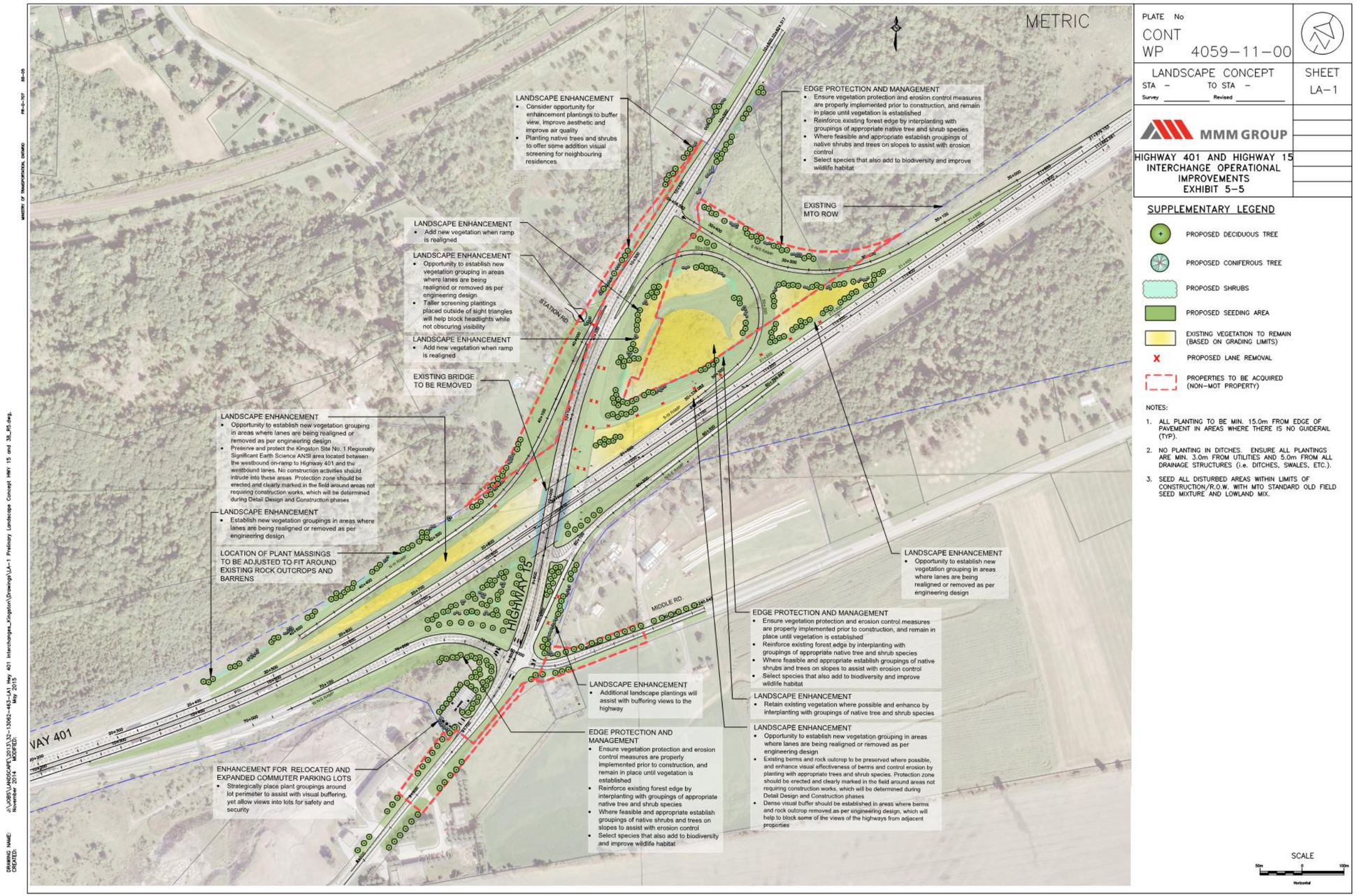

Figure 7-2: Preliminary Landscape Plan

7.4 ENVIRONMENTAL EFFECTS, PROPOSED MITIGATION AND COMMITMENTS TO FUTURE WORK

This section outlines the standard and project-specific mitigation measures to be implemented in Detail Design and construction that was developed to address the environmental impacts outlined in Section 7.3. Mitigation measures will require review and refinement during the Detail Design phase.

Preliminary mitigation measures are outlined in **Table 7-4**. A summary of the key timing windows applicable to certain construction activities and mitigation measures is provided in **Table 7-3**.

Mitigation measures for this project are related to:

- Vegetation;
- Wildlife and Species at Risk;
- Fisheries and aquatic habitat;
- Management of excess materials;
- Erosion and sediment control;
- Noise;
- Visual Impact;
- Archaeological resources;
- Traffic operations; and
- Landscaping.

The following commitments to future work during Detail Design are included in **Table 7-4**:

- A 3-season vegetation inventory should be carried out in and adjacent to potential work zones in order to identify the locations of any sensitive or rare plant species. If any are located, voucher specimens should be collected if possible. An updated environmental impact assessment and revised mitigation measures should incorporate new findings.
- The need for permanent fencing along the ramp in the southwest quadrant of the study area should be assessed to prevent any turtles that may use small ponded areas nearby or gravel shoulders for nesting from travelling onto the road surface.
- In-season breeding bird surveys following Ontario Breeding Bird Atlas protocol should be carried out within identified impact zones in order to better characterize the species assemblage and identify any sensitive species. Impact assessments and mitigation measures should be updated to incorporate new findings.
- The trunks of large (>50 cm diameter at breast height) standing dead trees proposed for removal should be examined for evidence of Chimney Swift nesting before removal of the tree of surrounding vegetation. If Chimney Swift are actively using the trunk, retain the tree and vegetation within 90 m until after the active season (approx. April 30 to October 15). If examined outside the active season and there is evidence of recent use, register the removal for Chimney Swift and install alternative nesting habitat as per MNRF guidelines.
- SAR screenings should be conducted for identified impact zones. Specific recommendations include screening for habitat for SAR bat species that may occur in the area (Myotis spp). Eastern Small-footed Myotis, Little Brown Bat, and Northern Long-eared Bat were added to the ESA Species at Risk in Ontario list in January 2013 and June 2014 and were not assessed for this stage of the project. Updated impact assessments, permitting requirements, and mitigation measures should incorporate any new findings.
- A revised noise assessment may be required if there are significant modifications to the Technically Preferred Alternative during Detail Design.

- During Detail Design, consideration should be given to using a bituminous pavement in the vicinity of Noise Sensitive Areas that are predicted to have an absolute noise level greater than or equal to 65 dBA.
- Any areas that are identified as requiring subsurface disturbances that are outside of the area assessed in the Stage 1-2 Archaeological Assessment Report may require further archaeological investigation.
- Landscaping requirements, in accordance with the Preliminary Landscape Plan, will be refined during Detail Design.
- A Phase Two ESA should be completed during Detail Design to investigate subsurface conditions on the Cancoil Thermal Corporation properties in the NE quadrant, which were formerly used as an automobile junk yard.

During the completion of Detail Design and prior to construction, the following documentation and authorizations are anticipated:

- As the demolition of the Highway 15 underpass is proposed to occur overnight, an exemption to the City of Kingston Noise By-law is suggested during the restricted hours of 7:00 pm to 7:00 am, Sundays and Statutory holidays.
- If subsurface disturbances are anticipated in areas that have not undergone assessment as part of the Stage 2 archaeological assessment, further archaeological investigations may be required. Any additional archaeological assessment reports should be submitted to the Ministry of Tourism, Culture and Sport.
- During Detail Design, any unanticipated impacts to fish habitat will require an assessment to determine whether the works can be considered low risk of causing serious harm to fish. If necessary, the DFO review process should be followed to determine if authorization under the *Fisheries Act* is required.
- Potential impacts to Species at Risk should be refined to determine if registration of the works and/or a permit under the *Endangered Species Act* is required.
- If new property requirements are identified, PSSRs and/or RSP should be undertaken.

Table 7-3: Timing Windows for Construction and Mitigation Measures

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
FISH												
No in-water work				←	—	→						
MIGRATORY BIRDS												
Vegetation clearing should be limited between April 1 and August 31. If clearing must occur during this period, it should be preceded by a survey for active nests.				←	—	—	—	→				
TURTLES												
Install silt fencing prior to May 1 and maintain until Oct 31*					←	—	—	—	—	→		

**if silt fencing cannot be installed prior to May 1, the construction zone should be monitored until October 31 by an Environmental Inspector twice daily to check for exposed eggs or turtle hatchlings.*

LEGEND:

mitigation measures required prior to certain activities

prohibition on certain activities applies

7.5 SUMMARY OF ENVIRONMENTAL EFFECTS, PROPOSED MITIGATION AND COMMITMENTS TO FURTHER WORK

Table 7-4: Summary of Environmental Concerns and Commitments

I.D. #	ISSUE / CONCERN / POTENTIAL EFFECTS	CONCERNED AGENCIES	I.D. #	PROPOSED MITIGATION / PROTECTION / MONITORING
1.0 General Environmental Protection Measures				
1.1	Mitigation measures must be properly implemented in order to minimize the environmental impacts of the bridge replacement.	MTO MOE MNRF DFO	1.1.1	• Environmental inspections should take place during construction to ensure that all mitigation measures are implemented properly, maintained and repaired and remedial measures are initiated in a timely manner where warranted.
2.0 Vegetation				
2.1	Construction requires removal of vegetation. Vegetation that does not require removal may be at risk of damage.	MTO MNRF	2.1.1	• During detail design, a 3-season vegetation inventory should be carried out in and adjacent to potential work zones in order to identify the locations of any sensitive or rare plant species. If any are located, voucher specimens should be collected if possible. An updated environmental impact assessment and revised mitigation measures should incorporate new findings.
			2.1.2	• During construction, ROW vegetation clearing zones and vegetation retention zones should be clearly delineated, and vegetation that does not require removal should be protected. Equipment, materials and other construction activities should not be permitted in vegetation retention zones.
			2.1.3	• Vegetation removal should be kept to the minimum required to perform the work, particularly in or adjacent to wetlands and significant woodlands.
			2.1.4	• Appropriate vegetation clearing techniques should be used (e.g., felling trees away from retained natural areas and watercourses), in accordance with OPSS 201, 801 and 805.
			2.1.5	• All unnecessary traffic, dumping and storage of materials over tree root zones adjacent to natural / semi-natural areas

I.D. #	ISSUE / CONCERN / POTENTIAL EFFECTS	CONCERNED AGENCIES	I.D. #	PROPOSED MITIGATION / PROTECTION / MONITORING
				should be avoided.
			2.1.5	• Cut and grubbed material should be disposed of through chipping or other appropriate means.
			2.1.6	• Exposed soils should be re-vegetated using a seed mix of native species, appropriate for the site conditions and in accordance with OPSS PROV 182 – Environmental Protection for Construction in Waterbodies and on Waterbody Banksand Operational Constraint (Environmental) NSP 001A820 – Erosion and Sedimentation Control.
3.0 Wildlife and Species at Risk (SAR)				

3.1	Turtles and turtle habitat may be impacted by construction activities (e.g., excavation, grading, blocking of passage, noise and vibration) and ongoing operations.	MNRF	3.1.1	• If construction occurs between April 1st and October 31st the following measures should apply:
				  • Install silt fencing at the limit of the construction zone by April 30th or by ground-thaw of any year, whichever comes last, to prevent turtles from nesting in the construction zone.
				  • If silt fencing is installed after April 30th or ground-thaw, monitor construction zones by an Environmental Inspector twice daily and with a reasonable interval to check for turtle laying, exposed eggs or emerging turtle hatchlings. Begin the monitoring as soon as possible and continue until October 31st, or if excavation or fill placement occurs before this date, when these activities occur.
				• These requirements should be outlined in Operational Constraint (Environmental) NSP 001A840 – Protection of Species at Risk

			3.1.2	• If active turtle or snake nests (with eggs or young) are encountered, appropriate measures should be taken to avoid disturbance to the nest and a Peterborough District MNRF Biologist should be contacted to discuss mitigation

I.D. #	ISSUE / CONCERN / POTENTIAL EFFECTS	CONCERNED AGENCIES	I.D. #	PROPOSED MITIGATION / PROTECTION / MONITORING
				options.
			3.1.3	• The need for permanent fencing along the ramp in the southwest quadrant of the study area should be assessed during Detail Design to prevent any turtles that may use small ponded areas nearby or gravel shoulders for nesting from travelling onto the road surface.
3.2	Wildlife may be disturbed by construction activities (e.g., blocking of passage, noise and vibration)	MNRF	3.2.1	• Wildlife incidentally encountered during construction should not knowingly be harmed and should be allowed to move away from the construction area on its own. • In the event that wildlife encountered during construction does not move from the construction zone, an Environmental Inspector should move the animal to a safe area.
3.3	Migratory birds may be impacted during construction.	MNRF	3.3.1	• In-season breeding bird surveys following Ontario Breeding Bird Atlas protocol should be carried out during detail design within identified impact zones in order to better characterize the species assemblage and identify any sensitive species. Impact assessments and mitigation measures should be updated to incorporate new findings.
			3.3.2	• If vegetation clearing or grubbing occurs during the breeding bird period (April 1st to August 31st), this activity should be preceded by a bird nest survey conducted by a qualified biologist to ensure no active nests (with eggs or young) are disturbed. This will be done in accordance with Operational Constraint NSP 001A870 – Migratory Bird Protection – General.
			3.3.3	• If an active nest is identified within or adjacent to the construction site, the nest should not be disturbed or destroyed. Clearing should not proceed until a qualified biologist defines and marks an appropriate setback within which no construction activities should occur.

I.D. #	ISSUE / CONCERN / POTENTIAL EFFECTS	CONCERNED AGENCIES	I.D. #	PROPOSED MITIGATION / PROTECTION / MONITORING
			3.3.4	• If the construction activities are such that continuing construction in that area would result in a contravention of the *Migratory Birds Convention Act*, all activities should stop and MNRF and Environment Canada should be contacted to discuss mitigation options.
3.4	Species at Risk may be present in the area and could be impacted by construction activities (e.g., grading that disturbs nesting habitat, blocking of passage, noise and vibration, blasting of rock)	MNRF	3.4.1	• During Detail Design, SAR screenings should be conducted for identified impact zones. Specific recommendations include screening for habitat for SAR bat species that may occur in the area (Myotis spp). Eastern Small-footed Myotis, Little Brown Bat, and Northern Long-eared Bat were added to the ESA Species at Risk in Ontario list in January 2013 and June 2014 and were not assessed for this stage of the project. Updated impact assessments, permitting requirements, and mitigation measures should incorporate any new findings.
			3.4.2	• All construction site staff should know how to identify SAR that could occur in the area (Barn Swallow, Chimney Swift, Bobolink, Eastern Meadowlark, Monarch, Gray Ratsnake, Eastern Ribbonsnake, Milksnake, Blanding's Turtle and Snapping Turtle) and follow the protocol established for addressing and reporting SAR species that are found in the construction area. • These requirements should be outlined in Operational Constraint (Environmental) – Protection of Species at Risk.
			3.4.3	• If a SAR is encountered within or adjacent to the construction site, the Contract Administrator should be advised and should contact MNRF. • These requirements should be outlined in Operational Constraint (Environmental) – Protection of Species at Risk.
			3.4.4	• The trunks of large (> 50 cm diameter at breast height) standing dead trees proposed for removal should be examined for evidence of Chimney Swift nesting before removal of the tree or surrounding vegetation. If Chimney

I.D. #	ISSUE / CONCERN / POTENTIAL EFFECTS	CONCERNED AGENCIES	I.D. #	PROPOSED MITIGATION / PROTECTION / MONITORING
				Swift are actively using the trunk, retain the tree and vegetation within 90 m until after the Chimney Swift active season (~April 30 to October 15). If examined outside the active season and there is evidence of recent use, register the removal for Chimney Swift and install alternative nesting habitat as per MNRF guidelines for altering structures that provide Chimney Swift habitat. • These requirements should be outlined in Operational Constraint (Environmental) – Protection of Species at Risk.
			3.4.5	• If construction activities are such that continuing construction in that area would result in a contravention of the ESA, all activities should stop and the Peterborough District MNRF SAR Biologist should be contacted to discuss mitigation options. • SAR or potential SAR should not be handled prior to consulting with the MNRF SAR Biologist, unless the handler has SAR training. • These requirements should be outlined in Operational Constraint (Environmental) – Protection of Species at Risk.
4.0 Fisheries and Aquatic Habitat				
4.1	Construction activities (e.g., excavation) and erosion may lead to the release of sediment into wetlands and watercourses.	MTO MNRF DFO	4.1.1	• Silt fencing should be installed and maintained for the duration of construction to prevent the movement of sediment and exclude wildlife from the construction zone.
			4.1.2	• Erosion and sediment controls (ESC) should be installed around the watercourse prior to construction works to prevent encroachment and the transfer of deleterious substances into the aquatic habitat. • All ESC will be installed in accordance with OPSS 805 – Temporary Erosion and Sediment Control Measures and Operational Constraint (Environmental) NSP 001A820 – Erosion and Sedimentation Control.

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			4.1.3	• All ESC measures should be inspected and maintained to ensure they are functioning as intended throughout construction and until such time that disturbed areas have been stabilized.
			4.1.4	• Exposed surfaces should be re-stabilized and re-vegetated as soon as possible following disturbance.
4.2	Fish and fish habitat may be impacted, directly and indirectly, during construction activities.	MTO MNRF DFO	4.2.1	• In-water work and work within wetlands should be avoided as much as possible. • No in-water work should be conducted within the warmwater timing window of March 15 to July 15. • All work in or near waterbodies will be conducted in accordance with OPSS PROV 182 – Environmental Protection for Construction in Waterbodies and on Waterbody Banks.
4.3	Debris and other deleterious substances may enter watercourses as a result of construction and in the event of spills.	MTO MNRF DFO	4.3.1	• Equipment maintenance and refueling should be conducted at designated and properly contained maintenance areas in the works yard or at commercial garages located at least 30m from the river banks and wetlands and outside retained vegetation areas in accordance with Operational Constraint (Environmental) NSP 001A850 – Equipment Refueling, Maintenance and Washing. • The Contractor should have a Spills Prevention Plan and required materials on site at all times in accordance with OPSS 100 and Operational Constraint (Environmental) NSP 001A880 – Spill Prevention and Response Contingency Plan.
			4.3.2	• Storage and stockpiling of soil and other fill material should be located a minimum of 30 m away from watercourses, drainage features and the top of steep slopes.
5.0 Contamination and Management of Excess Materials				

I.D. #	ISSUE / CONCERN / POTENTIAL EFFECTS	CONCERNED AGENCIES	I.D. #	PROPOSED MITIGATION / PROTECTION / MONITORING
5.1	Property in the northeast quadrant of the interchange that is required for interchange improvements was formerly used as an automobile junk yard and may have subsurface contamination.	MOE MTO	5.1.1	• A Phase Two ESA is recommended to investigate subsurface conditions on the Cancoil Thermal Corporation properties in the NE quadrant during Detail Design.
5.2	Construction waste has the potential to contaminate the surrounding environment if not managed properly.	MOE MNRF	5.2.1	• Construction waste should be removed off-site and managed by the Contractor in accordance with provincial standards (OPSS 180).
5.3	Dust emissions may result from construction activities	MTO	5.3.1	• Dust control should be completed using water, not chemical suppressants, and in accordance with MTO's general conditions.
6.0 Erosion and Sediment Control				
6.1	Exposed surfaces resulting from clearing and grading can lead to erosion.	MTO MNRF	6.1.1	• Temporary erosion and sediment control measures should be installed prior to construction and maintained throughout construction per Ontario Provincial Standard Specification (OPSS) 805.
			6.1.2	• Per OPSS 805, all temporary erosion and sediment control measures should be maintained in an effective, functioning, stable condition. This will require routine inspections, including after storm events, and repair as required.
7.0 Noise				
7.1	Increased noise impacts are anticipated for residents of Highway 15, Station Road, and Middle Road. In most cases, the increase is 2.2 dBA or less, although noise levels at seven residences are expected to exceed 65 dBA.	City of Kingston Local residents	7.1.1	• A noise assessment was completed and found that noise mitigation is either not required or is not technically feasible for any of the adjacent residences. A revised noise assessment may be required during Detail Design if there are significant modifications to the Technically Preferred Alternative.

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			7.1.2	• During Detail Design, consideration should be given to using a bituminous pavement designed to reduce noise levels in the vicinity of Noise Sensitive Areas (NSAs) that are predicted to have an absolute noise level greater than or equal to 65 dBA.
7.2	Temporary noise impacts are anticipated during construction. Night work is anticipated for the demolition of the Highway 15 underpass.	City of Kingston Local residents	7.2.1	• An exemption to the City of Kingston Noise By-law is suggested for night work.
			7.2.2	• Equipment should be maintained in good working order during construction and idling should be kept to a minimum in accordance with SSP 199F33 – Construction Noise Constraints.
8.0 Archaeological Resources				
8.1	Archaeological remains may be disturbed during construction. A Stage 1-2 Archaeological Assessment was completed. No artefacts were uncovered during Stage 2 investigations. No further assessment is required.	MTCS First Nations	8.1.1	• Should previously unknown or unassessed deeply buried archaeological resources be uncovered during development, they may be a new archaeological site and therefore subject to Section 48 (1) of the *Ontario Heritage Act*. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed archaeologist to carry out archaeological fieldwork. • In the event that human remains are encountered, both MTCS and the Registrar of Cemeteries (Ministry of Consumer Services) must be notified.
			8.1.2	• During Detail Design, any areas that are identified as requiring subsurface disturbances that are outside of the area assessed in the Stage 1-2 Archaeological Assessment Report may require further archaeological investigation.
9.0 Traffic Operations				

I.D. #	ISSUE / CONCERN / POTENTIAL EFFECTS	CONCERNED AGENCIES	I.D. #	PROPOSED MITIGATION / PROTECTION / MONITORING
9.1	During construction, traffic operations on Highway 401 and Highway 15 will be impacted. During removal of the existing Highway 15 underpass, short-term (14 hour) closures of Highway 401 and Highway 15 are recommended.	OPP Local Emergency Services Municipality	8.1.1	• Short-term closures of Highway 401 should be scheduled during overnight periods to minimize the impacts to traffic. • An Operational Constraint – Highway 401 Closure Schedule should be included in the contract package. Traffic control for all field work must be completed in accordance with Book 7 of the Ontario Traffic Manual. Timing for lane closures should be confirmed using form SP100F08. Details to be confirmed during Detail Design.
			8.1.2	• The general public, emergency services, school boards, the City of Kingston, and the Ontario Trucking Association should be notified in advance of any Highway 401 ramp or lane closures, in accordance with Operational Constraint – Notification to Emergency Service Providers and School Boards
9.2	The existing interchange is used by Long Combination Vehicles, which have particular geometric requirements (e.g., turning radius).	Ontario Trucking Association Local businesses MTO	9.2.1	• Considerations for the use of LCVs at the interchange during and after construction should be incorporated into the Detail Design.
10.0 Landscaping				
10.1	Vegetation removals and other construction activities will impact the existing landscape.	City of Kingston MTO Local residents	10.1.1	• Landscaping requirements, in accordance with the Preliminary Landscape Plan, will be refined during detail design and identified in contract documents.

8 REFERENCES

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