Ontario
MINISTRY OF TRANSPORTATION

TRANSPORTATION ENVIRONMENTAL STUDY REPORT
ADDENDUM

Highway 5 and Highway 6 Interchange and Associated Municipal Roads
City of Hamilton (Clappison's Corners)
G.W.P. 2112-05-00

Report

December 2013
ABR109.0080.00

IBI GROUP

Ontario

HIGHWAY 5 AND HIGHWAY 6
INTERCHANGE AND ASSOCIATED MUNICIPAL ROADS

PRELIMINARY DESIGN
G.W.P. 2112-05-00

TRANSPORTATION ENVIRONMENTAL STUDY REPORT ADDENDUM
Class Environmental Assessment (Group 'B')

Prepared for the Ministry of Transportation by IBI Group

Prepared and Reviewed by:

Audrey Steele, M.E.S
Consultant Environmental Planner
LGL Limited

Stephen Chiu, P.Eng.
Consultant Project Manager
IBI Group

Fouad Mustafa, MBA, P.Eng.
Consultant Quality Manager
IBI Group

Reviewed by:

Makael Kakakhel, P.Eng.
Senior Project Engineer
Ontario Ministry of Transportation

Chris Barber
Transportation Environmental Planner
Ontario Ministry of Transportation

Approved by:

Peter Verok, P.Eng.
Manager of Engineering Office
Ontario Ministry of Transportation

Barry Duffey
Manager of Planning and Environmental Office
Ontario Ministry of Transportation

December 2013
IBI Group Project ABR1090080

THE PUBLIC RECORD

A copy of this document has been submitted to the following office of the Ministry of the Environment to be placed in the Public Record:

Ministry of the Environment
Hamilton Region Office
Technical Support Section
Ellen Fairclough Building
12th Floor
119 King Street West
Hamilton, Ontario L8P 4Y7
Monday to Friday: 8:30 am to 4:30 pm

Copies of this Transportation Environmental Study Report Addendum are also available for review at the following locations:

Ministry of Transportation
Central Region, Planning and Environmental Office
Building D, 3rd Floor
1201 Wilson Avenue
Downsview, Ontario M3M 1J8
Monday to Friday: 8:30 am to 4:30 pm

City of Burlington
Clerk's Department
1st Floor, Burlington City Hall
426 Brant Street
Burlington, Ontario L7R 3Z6
Monday to Friday: 8:45 am to 4:30 pm

City of Burlington Public Library
Brant Hills Branch
2255 Brant Street
Burlington, Ontario L7P 5C8
Monday to Thursday: 9:00 am to 9:00 pm
Friday: 9:00 am to 6:00 pm
Saturday: 9:00 am to 5:00 pm
Sunday: Closed

City of Hamilton
Clerk's Department
1st Floor, Hamilton City Hall
71 Main Street West
Hamilton, Ontario L8P 4Y5
Monday to Friday: 8:30 am to 4:30 pm

City of Hamilton Public Library
Waterdown Branch
25 Mill Street North
Waterdown, Ontario L0R 2H0
Monday to Thursday: 10:00 am to 8:00 pm
Friday: Closed
Saturday: 10:00 am to 5:00 pm
Sunday: Closed

Ce document hautement spécialisé n'est disponible qu'en anglais en vertu du réglement 671/92, qui en exempte l'application de la Loi sur les services en français. Pour de l'aide en français, veuillez communiquer avec Heather Edwardson, ministère des Transports, au 905 704-2210.

TABLE OF CONTENTS

TABLE OF CONTENTS (CONT'D)

TABLE OF CONTENTS (CONT'D)

TABLE OF CONTENTS (CONT'D)

EXHIBITS

TABLE OF CONTENTS (CONT'D)

APPENDICES

LIST OF ACRONYMS

ANSI	Areas of Natural and Scientific Interest
BHR	Built Heritage Resources
CEAA	Canadian Environmental Assessment Act
CHL	Cultural Heritage Landscapes
COSSARO	Committee on the Status of Species at Risk in Ontario
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
DCR	Design and Construction Report
DFO	Fisheries and Oceans Canada
EA	Environmental Assessment
ELC	Ecological Land Classification
EMS	Emergency Medical Services
ESA	*Endangered Species Act*
ESA	Environmentally Significant Area
FWCA	*Fish and Wildlife Conservation Act*
HADD	Harmful Alteration, Disruption, or Destruction of fish habitat
LOS	Level of Service
MBCA	*Migratory Birds Convention Act*
MNR	Ministry of Natural Resources
MOE	Ministry of the Environment
MPP	Member of Provincial Parliament
MTO	Ministry of Transportation
N-E/W	From North to East-West Ramp
NE	Northeast
NHIC	Natural Heritage Information Centre
NSA	Noise Sensitive Area
NW	Northwest
OP	Official Plan
OPSS	Ontario Provincial Standard Specification
PDR	Preliminary Design Report
PIC	Public Information Centre
PSW	Provincially Significant Wetlands
PTTW	Permit to Take Water
ROW	Right-of-Way

LIST OF ACRONYMS (Cont'd)

S-E/W	From South to East-West Ramp
SARA	*Species at Risk Act*
SE	Southeast
SW	Southwest
SWM	Storm Water Management
TESR	Transportation Environmental Study Report
V/C	Volume to Capacity Ratio

EXECUTIVE SUMMARY

Introduction

MTO completed a Preliminary Design Study for the planned Highway 5/6 Interchange in 2004, following submission of a Transportation Environmental Study Report (TESR) in 2003, and obtained the appropriate environmental approvals at that time. The 2003 study examined the provision of a new interchange to replace the existing Highway 5 and Highway 6 intersection in order to accommodate future traffic demand. However, no environmental approvals for associated new municipal roads and a new commuter parking lot were obtained at that time. The 2003 TESR and Preliminary Design Study were carried out as a Group "B" project following the *Class Environmental Assessment for Provincial Transportation Facilities* (MTO 2000) (Class EA) as approved under the Ontario *Environmental Assessment Act*.

In accordance with the Class EA, an Addendum to the original TESR must be prepared if it is necessary to make significant changes to design concepts and project commitments documented in the original TESR. In addition, a review of the original 2003 TESR is required since the project documented in the 2003 TESR has not proceeded to construction within five years of issuing the Notice of Submission of the 2003 TESR. This is known as a "five-year review" which considers changes which have taken place since the submission of the original TESR. If significant changes are identified through the five-year review, then a TESR Addendum must be prepared. Since significant changes are proposed, this TESR Addendum has been prepared. The proposed changes have been discussed with the parties most affected by the proposal, as is further documented in Section 5 of this TESR Addendum. The Addendum also documents the circumstances or conditions that necessitated the proposed changes as further documented in Section 4 and the environmental effects of such changes and proposed mitigation associated with them as documented in Section 6.

Updated Problem Statement

Within the TESR Addendum study area (refer to Exhibit 1-3), the following corridor improvements are required to accommodate 2031 traffic demands. This is consistent with the findings of the Highway 5 and Highway 6 Interchange Transportation (Systems) Planning Report:

- Six (6) lanes are required along Highway 6 (three (3) northbound and three (3) southbound) extending northerly through the Parkside Drive intersection. Even with this configuration in place, the current westbound left turn at Parkside Drive and Highway 6 will operate at LOS F. This suggests a potential need for further improvements at Parkside Drive in 2031 which are beyond the scope of this TESR Addendum; and

- Six (6) lanes are required on Dundas Street East from Highway 6 (west of the northbound S-E/W ramp intersection) to Clappison Avenue. Due to the high turning movements to and from developments north and south of Dundas Street East, an extension of Road C to the north of Dundas Street East is also required (to take traffic volumes from Clappison Avenue). In regards to widening Dundas Street East, east of Highway 6, this TESR Addendum only seeks approval to widen Dundas Street East to west of Clappison Avenue as shown in Appendix 1, and does not seek approval for extension of Road C north of Dundas Street East as it is beyond the scope of this study and would be subject to a future study.

Based on the 2021 horizon (interim) analysis, the following assessments are made:

- Highway 6 will operate satisfactorily with two (2) lanes southbound between Highway 5 and Parkside Drive. This provides an opportunity to defer the third southbound lane along Highway 6 beyond 2021.

However, the Highway 6/Parkside Drive intersection is expected to experience operational issues and the third southbound lane may be required by 2031 (i.e. six lanes on Highway 6); and

- Highway 5/Dundas Street East will operate satisfactorily as four lanes to 2021, with the exception of the southbound approach at Clappison Avenue which may require improvement, depending on development levels. As part of the interim construction, it is recommended to limit widening of Dundas Street East to 6 lanes from Ramp S-E/W to east of Road C, matching the existing lane configuration on the west side of the Dundas Street East/Clappison Avenue intersection.

Therefore the Problem Statement updated from the 2003 TESR specifically addresses the need for a municipal road network to accommodate the new interchange, a new commuter carpool parking lot and modifications to the previously approved interchange design throughout the TESR Addendum study area as identified in Sections 1.5 and 4, and Appendix 1 of this TESR Addendum report. Some of the modifications to the previously approved interchange design were identified in the Transportation (Systems) Planning Report and Traffic Report conducted as part of this TESR Addendum study. Other improvements recommended in the aforementioned reports are not part of the scope of work for this TESR Addendum and/or are outside the TESR Addendum study area, and would be subject to a separate study in the future.

Preliminary Design Changes

This TESR Addendum describes the Preliminary Design changes made to Highway 6, Highway 5 and the planned interchange including the following major components:

- extension of the third northbound Highway 6 lane to north of Parkside Drive;
- a third southbound Highway 6 lane through the interchange area to north of Parkside Drive;
- Highway 6 shift of approximately 20 m to the east to minimize impacts on the Niagara Escarpment crossing;
- widening of Dundas Street East from four (4) to six (6) lanes east of Highway 6 to Clappison Avenue;
- addition of sidewalks and on-street bike lanes to Dundas Street East/Highway 5 within the project limits; and
- addition of turn lanes on Highway 5 and Dundas Street East for new commercial access in the southwest and southeast quadrants respectively and widening of the Dundas Street East/Highway 5 structure over Highway 6 to accommodate the Highway 6 widening.

For new municipal road access, the changes include:

- access alterations for businesses in the southwest quadrant and new Street ‘A’ to connect Highway 5 to South Drive;
- restricting access to right in/right-out for residential properties along the west side of Highway 6 in the northwest quadrant, north of Borer’s Creek, including closing the Garwood Avenue intersection and adding a turnaround bulb on the west side of the Highway 6/Parkside Drive intersection;
- extending a new municipal road south from Dundas Street East in the southeast quadrant to provide new access to the existing and planned commercial property plus Mountain Brow Road;
- municipal road changes in the northwest quadrant to provide property access south of Borer’s Creek; and

- improvements to Parkside Drive approaching Highway 6 in the northeast quadrant.

The Addendum also includes a new commuter parking lot located in the northeast quadrant of the new interchange, opposite the northbound S/E-W ramp terminal. This location was selected from three options with input from the City of Hamilton and Metrolinx/GO Transit.

Additional details are provided in Section 1, 4 and **Appendix 1** of this TESR Addendum report.

Environmental Impacts and Commitments

The TESR Addendum process included an update of all study area inventories and assessments to highlight areas of environmental sensitivity associated with the natural, social and cultural environments as documented in Section 3 of this TESR Addendum report. This report also documents numerous commitments in Section 6 addressing environmental effects and proposed mitigation for the detail design and construction phases of the interchange, municipal roads and commuter parking lot.

Consultation with External Agencies, Aboriginal Communities, Stakeholders and the Public

A Consultation Plan guided consultation with external agencies, Aboriginal Communities, stakeholder groups, and the public during the TESR Addendum preparation. The purpose of this consultation was to provide project information, solicit public feedback and identify and address issues associated with the preliminary design, potential environmental and property impacts and proposed mitigation measures. This consultation has been conducted in compliance with the requirements of a Group 'B' project under the MTO Class EA. Key components of the consultation activities have included formal notifications in local newspapers; correspondence and meetings with external agencies, the public and property owners; a Public Information Centre held on June 19, 2012; correspondence with Aboriginal Communities; and submission of the TESR Addendum for public review. Consultation feedback generated during the TESR Addendum preparation is included in **Appendix 2** of the TESR Addendum report, with **Appendix 3** containing the 2012 Public Information Centre Summary Report.

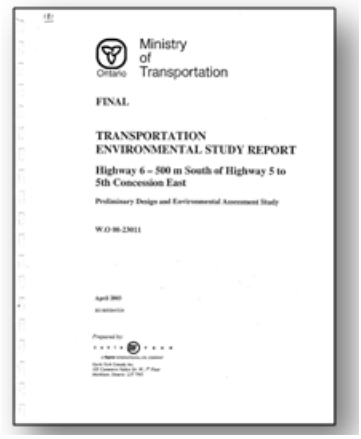
1. OVERVIEW OF THE PROJECT AND ENVIRONMENTAL ASSESSMENT PROCESS FOLLOWED

1.1 Introduction

The Ministry of Transportation (MTO) has completed a Preliminary Design and Transportation Environmental Study Report (TESR) Addendum for the future Highway 5/6 Interchange, Associated Municipal Roads and Commuter Parking Lot at Clappison's Corners in the City of Hamilton. The study area is located in the Cities of Hamilton and Burlington as further described in Section 1.3. The study was completed with MTO as the proponent, in partnership with the City of Hamilton.

1.2 Project Background

In 2004, MTO completed a Preliminary Design Study and prepared a Preliminary Design Report (PDR) for improvements to Highway 6, from south of Highway 5 to 5th Concession East, in the City of Hamilton. The PDR was based on a Group "B" Transportation Environmental Assessment Study Report (TESR) completed in 2003 which identified the need for a new interchange to replace the existing at-grade intersection of Highway 5 and Highway 6, to accommodate future traffic demands. It was classified as a Group "B" project under the Class Environmental Assessment for Provincial Transportation Facilities (MTO 2000) because it involved a major improvement to an existing transportation facility, namely the intersection of Highway 5 and Highway 6.


Ministry of Transportation

FINAL

TRANSPORTATION ENVIRONMENTAL STUDY REPORT

Highway 6 – 500 m South of Highway 5 to 5th Concession East

Preliminary Design and Environmental Assessment Study

W.O 00-23011

The 2003 TESR outlined the preliminary design components associated with the new interchange at Highway 5/Highway 6. However, no environmental approvals were obtained for the associated municipal roads and commuter parking lot discussed in Section 1.1 above. The TESR was made available in 2003 for a 30 day public review period, and received environmental clearance.

The preferred preliminary design alternative included in the 2003 TESR, and shown as Exhibit 1-1, included the following preliminary design components within the interchange limits:[1]

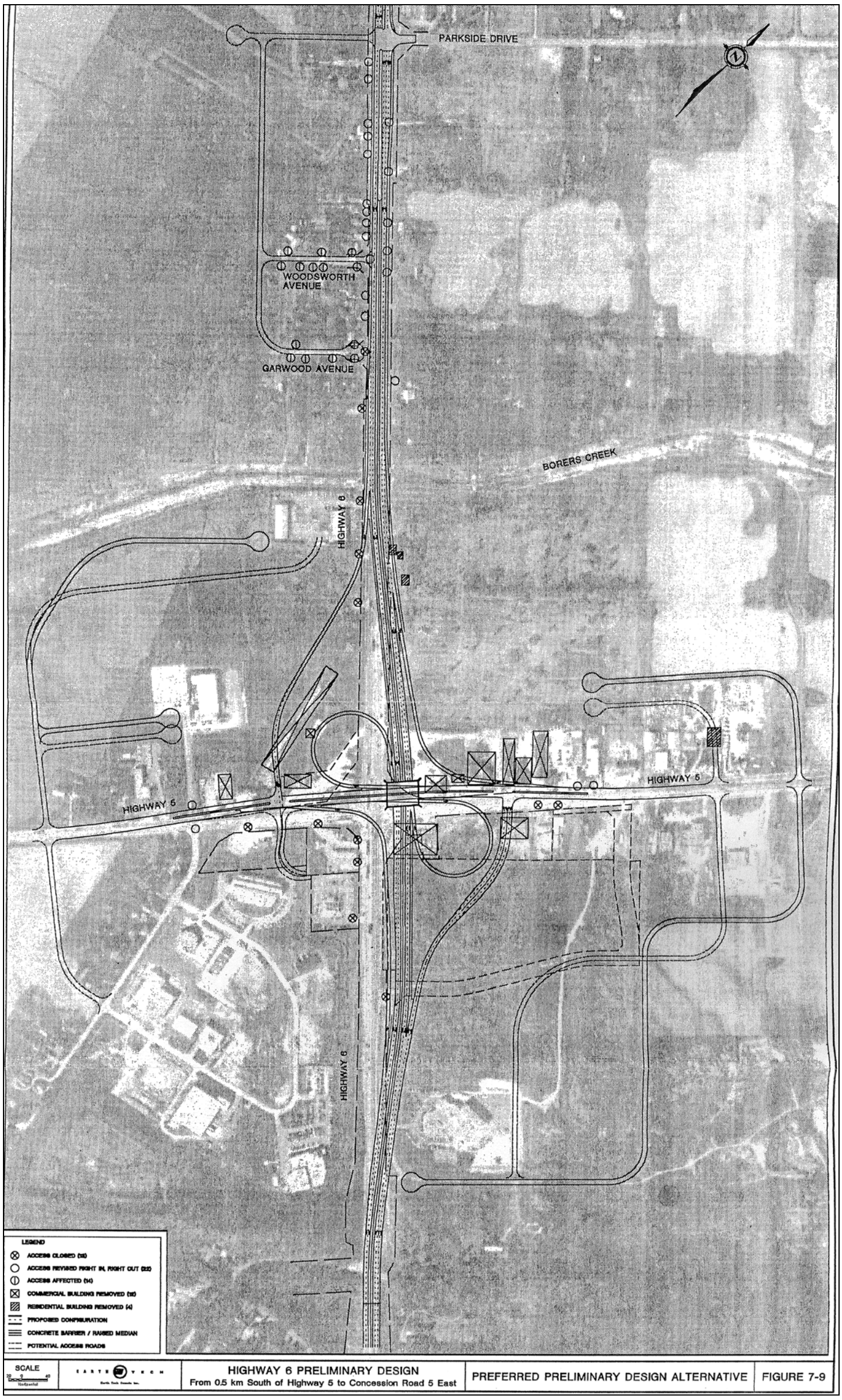
- Realign Highway 6 slightly to the east in the vicinity of the Highway 5 and Highway 6 intersection;
- Realign Highway 5 slightly to the north in the vicinity of the Highway 5 and Highway 6 intersection;
- Construct a Parclo A4 interchange in place of the existing Highway 5 and Highway 6 intersection including ramps and a Highway 5 bridge over Highway 6;
- Construct a concrete median barrier within the interchange limits;
- Provide full illumination within the interchange limits;
- Install two new traffic signals at each ramp terminus;
- Reconfigure the traffic signal at Parkside Drive;

[1]Transportation Environmental Study Report, Highway 6 – 500m South of Highway 5 to 5th Concession East, W.O. 00-23011, Earth Tech, April 2003

- Extend the twin 6.0 x 2.0 metre (m) concrete box and 4.27 x 1.56 m relief flow concrete box at Borer's Creek;
- Widen and fully pave shoulders within the interchange limits;
- Construct a concrete curb and gutter within the interchange limits; and
- Provide storm sewers for drainage within the interchange limits.

In order to document changes made to the preliminary design documented in the 2003 Transportation Environmental Study Report (TESR), an addendum to the TESR must be prepared and placed on the public record, in accordance with the Class Environmental Assessment for Provincial Transportation Facilities (MTO 2000).

Exhibit 1-1 2003 TESR Preliminary Design

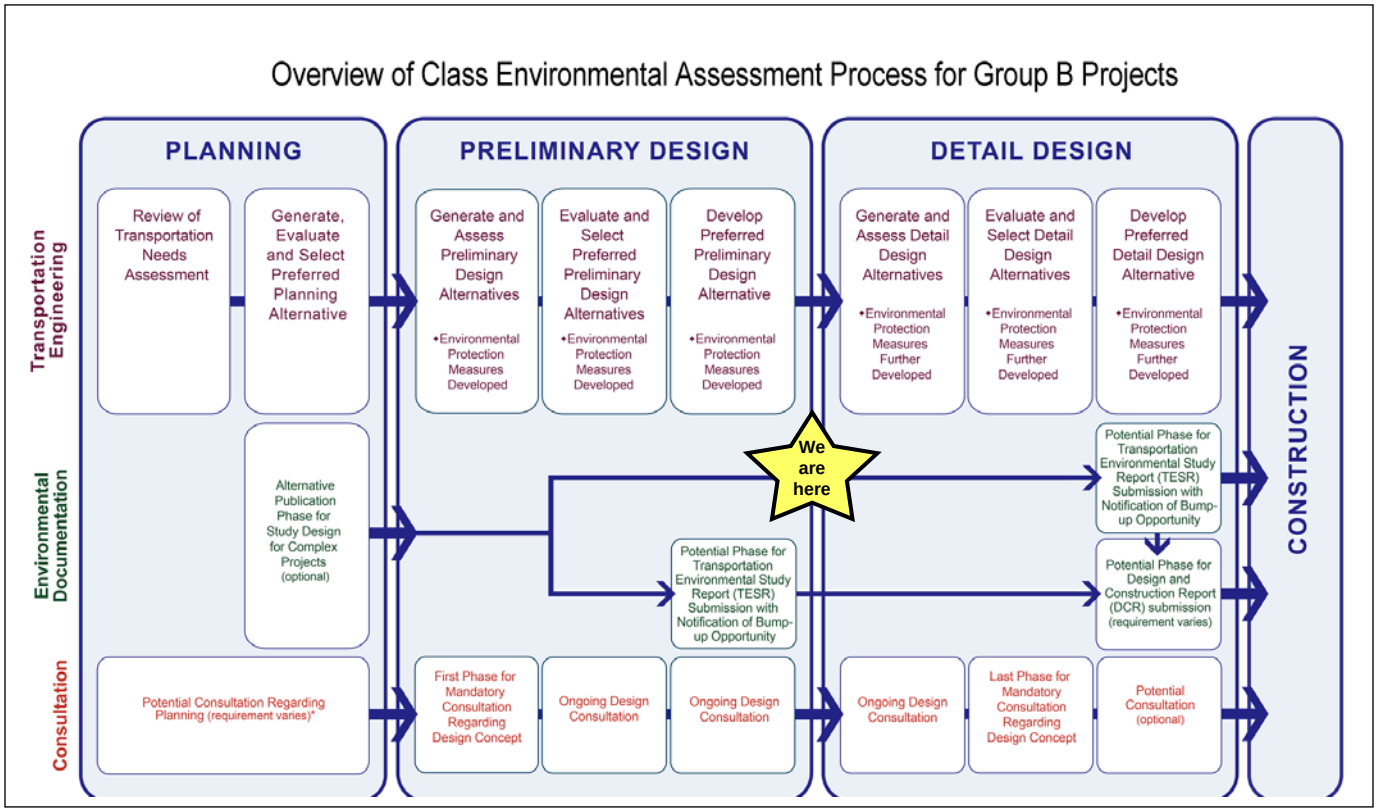


Note: EA approval was not sought for the potential access roads illustrated on this Exhibit as part of the 2003 TESR.

1.2.1 TESR ADDENDUM PROCESS

The 2003 Preliminary Design Study was carried out as a Group "B" project following the *Class Environmental Assessment for Provincial Transportation Facilities* (MTO 2000) (Class EA) as approved under the Ontario *Environmental Assessment Act,* and therefore a TESR was prepared. The general process to be followed for Group "B" projects, and where the current TESR Addendum process is in terms of this schedule, are shown on Exhibit 1-2.

Exhibit 1-2 Group "B" Project Process



In accordance with the *Class Environmental Assessment for Provincial Transportation Facilities,* (MTO 2000), an Addendum to the original TESR must be prepared if it is necessary to make significant changes to design concepts and project commitments documented in the original TESR. In addition, a review of the original 2003 TESR is required since the project documented in the 2003 TESR has not proceeded to construction within five years of issuing the Notice of Submission of the 2003 TESR. This is known as a "five-year review" which considers changes which have taken place since the submission of the original TESR. If significant changes are identified through the five-year review, then a TESR Addendum must be prepared. The proposed changes must be discussed with the parties most affected by the proposal, as is further documented in Section 5 of this TESR Addendum. The Addendum must also document the circumstances or conditions that necessitated the proposed changes as further documented in Section 4 and the environmental effects of such changes and proposed mitigation associated with them as documented in Section 6. This information is contained within this TESR Addendum.

It is important to note that the scope of a TESR Addendum only deals with changes to the TESR documentation and preliminary design scope of work that was documented in the original TESR

(2003 TESR). While all Group "B" TESRs are eligible for a Part II Order Request ("bump-up") that may be submitted to the Minister of the Environment (as per the Class EA), in the case of a TESR Addendum only the changes proposed to the original undertaking are eligible for a "bump-up" request. This completed TESR Addendum has been made available for a minimum 45-day public review period. During this review period, any person can make a request to the Minister of the Environment for a Part II Order.

Interested persons are encouraged to review the TESR Addendum and provide written comments to the MTO during the 45-day review period (ending January 27, 2014). If after consulting with MTO and Consultant staff, interested persons still have serious unresolved concerns, they have the right to request the Minister of the Environment (in writing to: **77 Wellesley Street West, 11th Floor, Ferguson Block, Toronto, Ontario M7A 2T5**) to issue a Part II Order (i.e. "bump up") for this project. A Part II Order may lead to the preparation of an Individual Environmental Assessment. A copy of the Part II Order request that is sent directly to the Minister of the Environment should also be forwarded to Ministry of Transportation and Consultant staff at the addresses listed below. If there are no outstanding concerns at the end of the 45-day review period (ending January 27, 2014) the project will be considered to have met the requirements of the Class EA.

Ministry of Transportation, IBI Group and LGL Limited Project Team members are available to discuss this information and can be contacted as follows:

Makael Kakakhel, P.Eng.
Senior Project Engineer
Ministry of Transportation, Central Region
Building 'D', 4th Floor
1201 Wilson Avenue
Downsview, Ontario, M3M 1J8
Tel: 416-235-4341
Fax: 416-235-3576
E-mail: makael.kakakhel@ontario.ca

Stephen Chiu, P.Eng.
Consultant Senior Project Manager
IBI Group
30 International Boulevard
Toronto, Ontario, M9W 5P3
Tel: 416-798-5521
Fax: 416-675-4620
E-mail: stephen.chiu@ibigroup.com

T. Audrey Steele, M.E.S.
Consultant Environmental Planner
LGL Limited
22 Fisher Street, P.O. Box 280
King City, Ontario, L7B 1A6
Tel: 905-833-1244 (collect)
Fax: 905-833-1255
E-mail: asteele@lgl.com

In 2008, the Ministry of Transportation (MTO) and the City of Hamilton entered into a legal agreement that resulted in the Ministry of Transportation leading the Preliminary Design Study for the interchange and any necessary municipal roads required to facilitate the new interchange. Therefore, the MTO Class EA process, as specified in the *Class Environmental Assessment for Provincial Transportation Facilities* (MTO 2000), has been followed for the development and documentation of the internal municipal road network and commuter parking lot. In addition, the TESR Addendum process has followed the intent and principals for Schedule "C" projects under the *Municipal Class Environmental Assessment* for changes to and development of the municipal road configuration in the southeast (SE), northwest (NW) and southwest (SW) quadrants of the new Highway 5/6 Interchange as well as the location of the commuter parking lot facility adjacent to the interchange.

1.2.2 THE CANADIAN ENVIRONMENTAL ASSESSMENT ACT

In July 2012, the Government of Canada released new regulations required to implement the *Canadian Environmental Assessment Act, 2012 (CEAA 2012)*. The *CEAA 2012* establishes a federal environmental assessment process focused on major projects that have a greater potential to have significant adverse effects on areas within federal jurisdiction. The types of activities to which the new *Act* applies ("designated projects") are identified in the regulations. The *Act* requires the proponent of a designated project to submit a description of the project to the *Canadian Environmental Assessment Agency (the Agency).* Upon receipt of a project description, the Agency has 45 days, including a 20-day public comment period, to determine whether a federal environmental assessment is required.

The proposed interchange, municipal roads and commuter parking lot that are the subject of this TESR Addendum are not listed as "designated projects" under the CEAA 2012, and therefore CEAA approvals are not required for this undertaking.

1.3 Revised Study Area

The study area established for the 2003 TESR extended along Highway 6 from 500m south of Highway 5, north to the 5th Concession East. In response to the design changes required for the planned Highway 5/6 Interchange, the TESR Addendum study area was modified to extend 300m further south on Highway 6; extend north of Parkside Drive to the 4th Concession West; and, include Highway 5/Dundas Street West from west of Highway 6 (Coreslab Drive) to Clappison Avenue. This area extends about one kilometre east and west of Highway 6 as shown on Exhibit 1-3.

Compared to the 2003 TESR study area, this new study area has been updated to allow for widening of Highway 6 to approximately 1.3 km south of Highway 5/Dundas Street West.

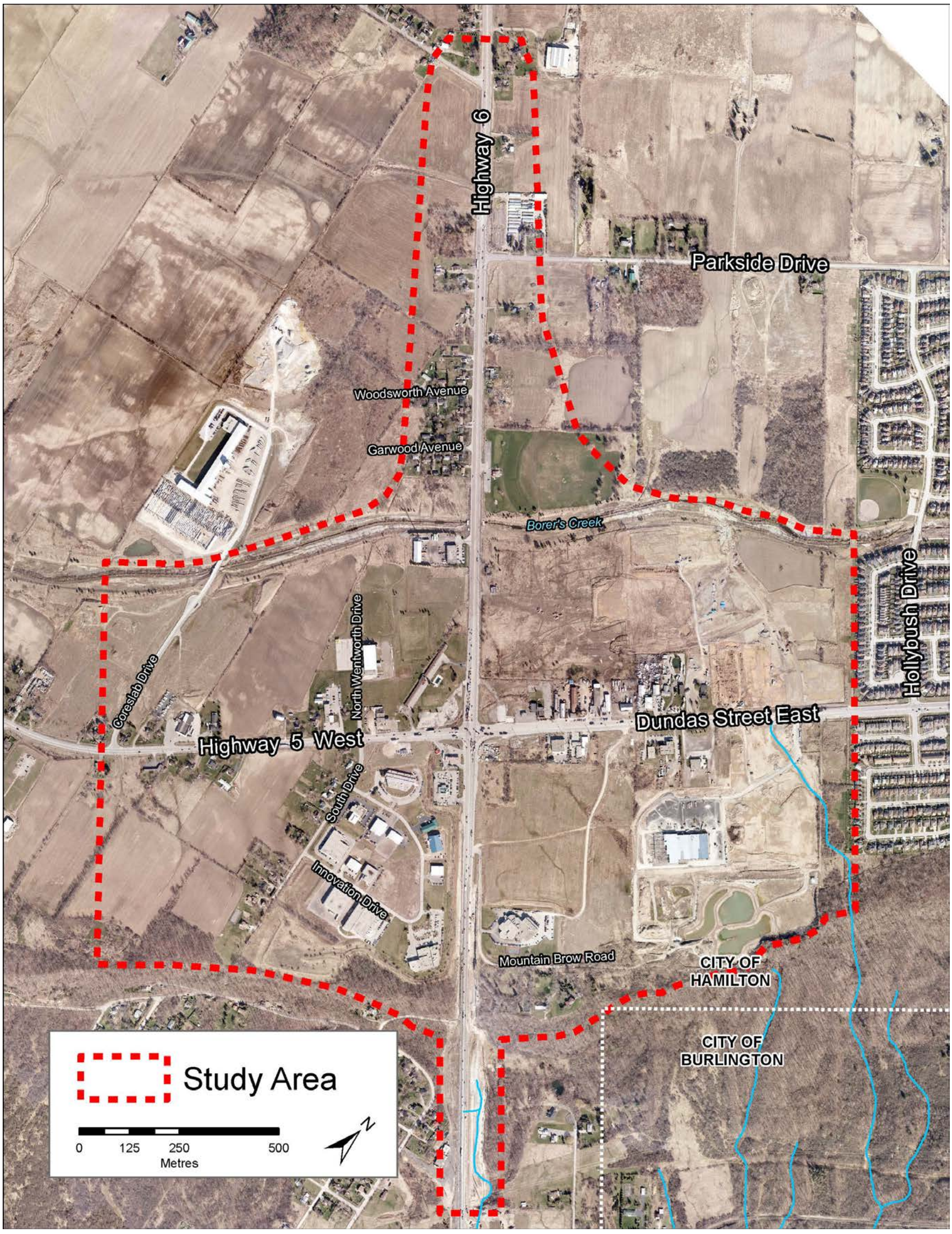
1.4 Addendum Purpose

The purpose of this TESR Addendum is to:

- Update the recommended plan for the future Highway 5/6 Interchange as reflected in the 2003 TESR based on updated traffic demands and engineering design requirements;
- Assess the requirements of associated municipal roads; and
- Determine the location for a new commuter parking lot in the vicinity of the interchange.

Changes to the preliminary design in the 2003 TESR are documented in this Addendum report.

Exhibit 1-3 Study Area



1.5 Project Item Changes Compared to 2003 TESR

Three types of changes have been made to the Preliminary Design of this project, as documented in the 2003 TESR, which are summarized in the following brief explanation of the rationale for the changes. Locations of the main changes are shown on Exhibit 1-4, and described further in Section 4 of this TESR Addendum, including the response to the five-year review.

1.5.1 MAJOR HIGHWAY PAVEMENT LAYOUT

Preliminary Design Change*	Rationale for the Change
Extension of the existing third northbound (truck climbing) lane from the northbound S-E/W ramp bullnose to north of Parkside Drive. On the escarpment incline, a fourth northbound lane would be provided for the northbound S-E/W ramp.	Speed differential between the truck climbing lane and general purpose lanes owing to the grade of Highway 6 at the escarpment. Also, the original termination point required trucks to pull into the second northbound lane before reaching full speed, causing a significant weaving conflict.
Include a future third Highway 6 southbound lane through the Preliminary Design project limits. Detail design of this southbound lane is currently planned to be completed under a future detail design study separate from the detail design study for the remainder of the interchange and municipal road network (to be confirmed during the detail design phase of the interchange). However, EA approval of the preliminary design of the third Highway 6 southbound lane is being sought as part of this TESR Addendum. It is currently proposed that the detail design study for the interchange include provisions for future widening for the third lane. These provisions include designing the ramp geometry to minimize future construction, adding an additional lane at the underpass structure, designing the culvert headwalls/lengths at Borer's Creek and Grindstone Creek Tributary 4 (labeled as Watercourse 2 on Exhibit 3-2) for the future third southbound lane, and associated required property.	Updated traffic volume projections indicate the third lane is warranted (see Section 2.5). Addition of the third southbound and northbound lanes requires extension of culverts under Highway 6 at the Grindstone Creek Tributary 4.
Adding the future third southbound and northbound lanes requires modifications to the existing Highway 6 twin cell Borer's Creek culvert crossing and the single cell culvert located approximately nine (9) m to the south.	The single cell culvert will need to be extended with headwalls to accommodate a third southbound and northbound lane. The twin cell box culvert cannot be extended owing to impacts on an existing watermain on the east side of Highway 6, and a sanitary sewer on the west side. To avoid these impacts, it is currently proposed to build headwalls to accommodate the northbound and southbound highway widening over Borer's Creek.

Preliminary Design Change*	Rationale for the Change
A Highway 6 realignment shift to the east that reduces the realignment required, in comparison to the 2003 PDR, by approximately 20 m. This minimizes Highway 6 impacts on the Niagara Escarpment crossing and maximizes the use of existing pavement.	Current bridge design options do not require construction of the structure to be completed fully off-line, which allows an alignment shift and reduced environmental impacts.
Addition of a third through/left turn lane to the N-E/W ramp terminal.	Updated traffic volume projections indicate the third lane is warranted (see Section 2.3).
Addition of sidewalks and on-street bike lanes to Dundas Street East and Highway 5 within the project limits.	Being proposed in response to City of Hamilton sidewalk guidelines and cycling master plan.
Widening of Dundas Street East from four (4) to six (6) lanes east of Highway 6 to Clappison Avenue, including turn lanes for new commercial access opposite the S-E/W ramp terminal and at the planned commuter carpool lot.	Updated traffic volume projections indicatthe additional lanes are warranted (see Section 2.3).
Widening of Highway 5 west of Highway 6 to four (4) lanes plus turn lanes, sidewalks and on-street bike lanes to the mid-point between Coreslab Drive and the new Street 'A'/Street 'B' intersection.	Required to provide efficient vehicle access and forecasted turning movements.
Widening of the Highway 5/Dundas Street East structure over Highway 6 to accommodate the Highway 5 and Dundas Street East road widening noted above.	To accommodate required widening of Highway 5 and Dundas Street East in proximity to Highway 6.

***Note: Compass Nomenclature** – In this report, northbound on Highway 6 refers to the direction towards Highway 401, and southbound to the direction towards Highway 403. Eastbound on Dundas Street East is towards the community of Waterdown, and westbound on Highway 5 is towards Paris/Brantford.

1.5.2 CHANGES TO ASSOCIATED MUNICIPAL ROADS (NOT INCLUDED IN 2003 TESR APPROVAL)

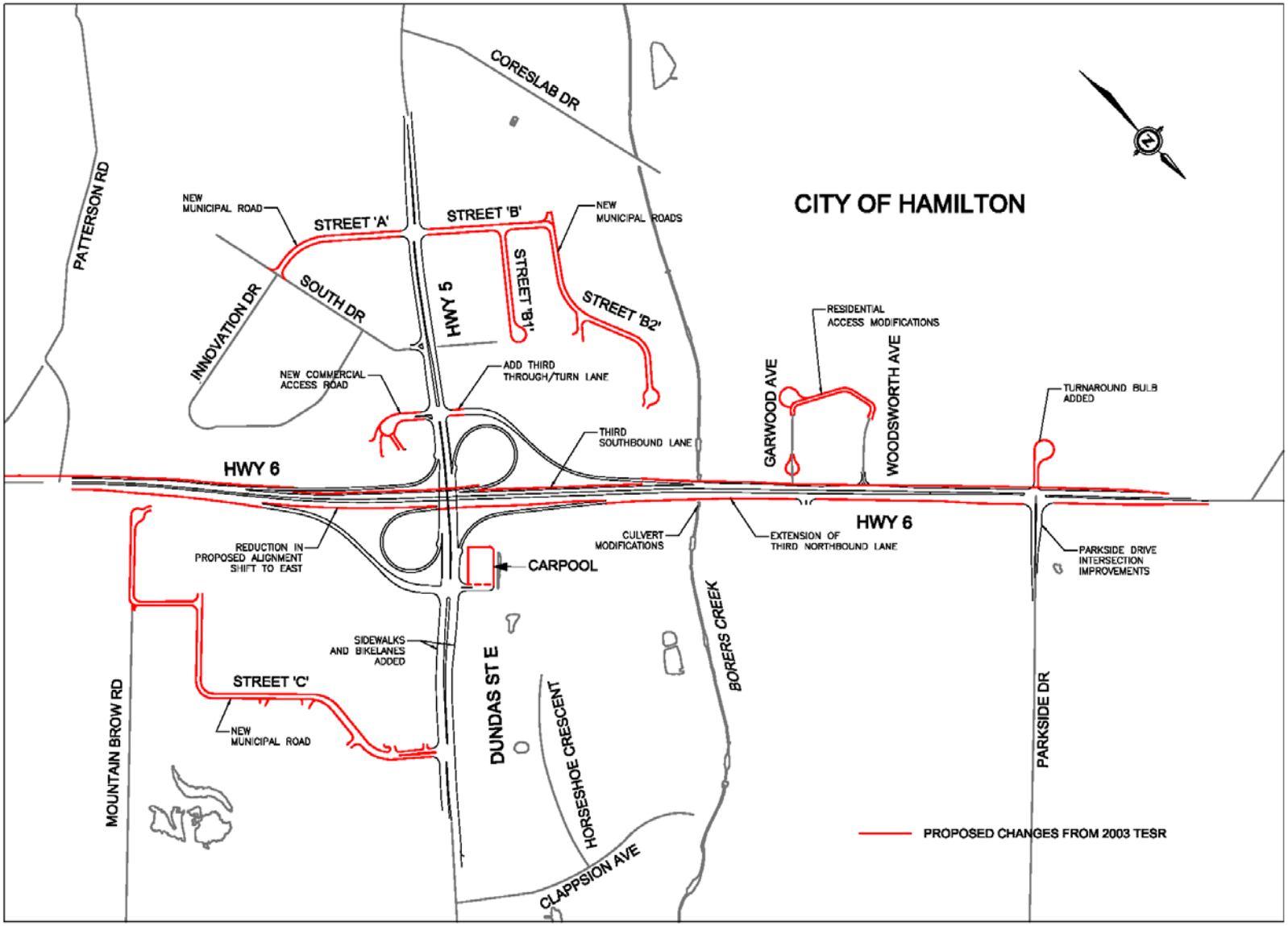
Design Change	Rationale for the Change
Slight modification to 2003 commercial area access road concepts in the SW Quadrant, which previously indicated a new access extending south of the N-E/W ramp terminal, and prohibited left turns onto Highway 5 westbound.	The 2003 TESR and 2004 PDR both indicate an island prohibiting the left turn at this location, therefore the design modification change is only minor.
Modifications to the municipal road and new road addition concepts in the NW Quadrant to access commercial property on the west side of Highway 6. North Wentworth Drive to be closed.	Updated to accommodate new North Wentworth Arena. North Wentworth Drive is functionally redundant.

Design Change	Rationale for the Change
Modifications to access for residential properties in the NW Quadrant by removing the Parkside Drive extension west of Highway 6 connecting to Woodsworth Avenue and Garwood Avenue. Note that a Parkside Drive extension was not previously approved in the 2003 TESR and was conceptual.	No development is permitted or planned west of Highway 6 at Parkside Drive, so future development access is not required. Also, some existing residential properties in the Woodsworth Avenue/Garwood Avenue area fronting onto Highway 6 must be acquired for highway access control. MTO has entered into discussions regarding property acquisition for the residential properties on Woodsworth Avenue and Garwood Avenue on a willing seller/willing buyer basis. Therefore, construction of a new access road connecting this residential area to the Parkside Drive intersection is not required in the long term. In the shorter term, right-in/right-out southbound access to/from Highway 6 will remain, and northbound Highway 6 access can be provided by the proposed turnaround bulb at Parkside Drive described next. The Garwood Avenue intersection with Highway 6 will also be closed.
Locate a turnaround bulb on the west side of the Highway 6/Parkside Drive intersection to allow northbound traffic, including Emergency Responders, to make a left turn into the turnaround bulb and then make a right turn to go southbound to access Woodsworth Avenue and Garwood Avenue.	The installation of a concrete centre barrier down the middle of Highway 6 will prevent northbound left turn access to Woodsworth Avenue and Garwood Avenue. Northbound traffic would have to turn southbound onto Highway 6 via a detour onto Parkside Drive to gain access to Woodsworth Avenue and Garwood Avenue. The turnaround bulb provides access to the northbound traffic turning left, and is supported by the Hamilton Fire Department.
New municipal road additions in the SE Quadrant providing access to Mountain Brow Road.	Eliminate the current temporary Highway 6 northbound access at Mountain Brow Road by connecting the existing road to Dundas Street East to access to existing business and residential properties. The alignment avoids an environmentally sensitive area and is coordinated with future development access.
Make improvements to the Parkside Drive leg of the Highway 6 / Parkside Drive intersection.	The addition of double westbound left turn lanes, an exclusive westbound right turn lane and double eastbound lanes at this intersection are required in response to the added lane configuration on Highway 6.

1.5.3 COMMUTER CARPOOL PARKING LOT

Design Change	Rationale for the Change
Construct a minimum 100 parking space commuter carpool parking lot opposite the S-E/W ramp on Dundas Street East in the NE Quadrant of the new interchange.	Three alternative locations were evaluated for this commuter parking lot, and the NE Quadrant location was selected as being preferred from a traffic operations perspective (see Section 4.3).

Exhibit 1-4 Key Plan – Main Changes from 2003 TESR



2. UPDATE OF THE PROBLEM STATEMENT

The Problem Statement reported in the original April 2003 TESR for this project concluded that:[2]

In terms of traffic at the Highway 5 and Highway 6 intersection, it was nearing capacity at that time, and was projected to reach capacity in the next 8 to 12 years (2011 – 2015). Furthermore, traffic volumes were anticipated to increase due to increasing area development and traffic growth along the corridor. In relation to the Highway 6 Corridor, through traffic volumes were expected to increase, thereby making the corridor less safe, especially when making left turns.

Therefore, the purpose of this study is to protect for the long-term transportation needs of the Highway 6 corridor while developing a strategy to enhance safety and address future capacity issues within the Study Area.

This Problem Statement has now been updated using new traffic and growth data available in 2011/2012, for application to this TESR Addendum. It is summarized as follows, with technical analysis and results reported in the following two technical reports prepared by IBI Group specifically for this TESR Addendum:

Report 1 – **Highway 5/6 Interchange Transportation (Systems) Planning** report dated March 24, 2011; and

Report 2 – **Highway 5/6 Interchange Traffic Report** dated September, 2012.

2.1 Transportation (Systems) Planning

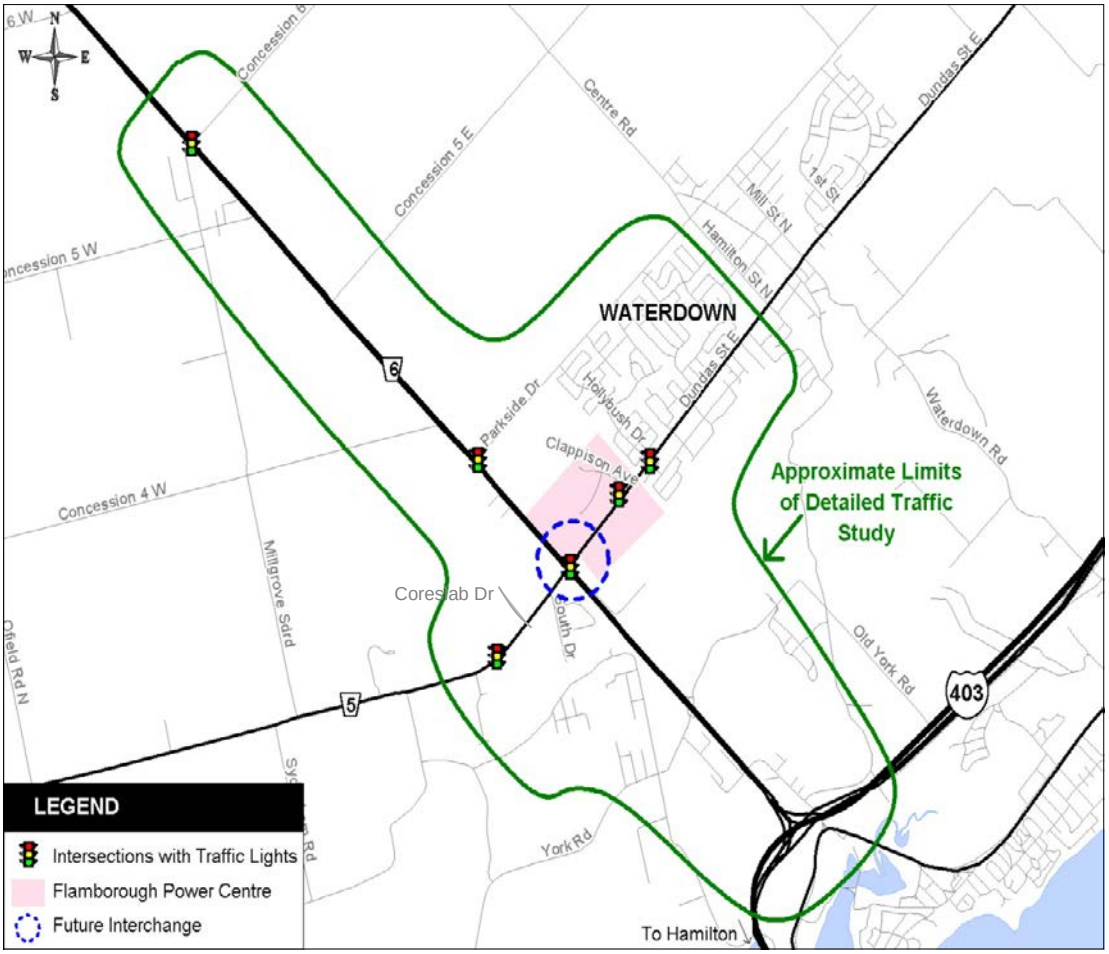
The **Transportation (Systems) Planning Report** (refer to Appendix 4) documents the development of new traffic forecasts and assessment of the Highway 6 corridor in the study area shown on Exhibit 2-1. These new forecasts are to year 2031, up from 2021 used in the original 2003 TESR. Updated forecasts are based on a new sub-area macro model and account for 2031 conditions, including significant development in and around Waterdown. Forecasts are significantly higher than reported in the 2003 TESR and used in the 2004 Preliminary Design Report (PDR) which only accounted for traffic conditions to 2021. Key results of this new report are:

- The higher 2031 forecasts suggest that the Highway 5/6 Interchange should ultimately accommodate six through lanes (three per direction) along Highway 6. On the escarpment incline, a fourth northbound lane would be provided for the northbound S-E/W ramp; and
- An interim 2021 horizon was explored to identify an implementation plan that could provide cost-savings while maintaining acceptable level of service through 2021. The resulting configuration would allow construction of a reduced number of lanes for intervening years. The bridge structure and associated alignments would be designed to accommodate the 2031 ultimate configuration. Between 2021 and 2031, operations along the corridor will deteriorate, warranting additional improvements. Most likely improvements will be required at Highway 6 and Parkside Drive first. However, such improvements are not part of the scope of this TESR Addendum, and would be subject to future study.

[2] TESR, Highway 6 – 500m South of Highway 5 to 5th Concession East, Earth Tech, April 2003

The configuration of municipal intersections including turning lane requirements were not reviewed in this broader Transportation (Systems) Planning Report, but are reported in the **Traffic Report** (refer to Appendix 4). It is noted that traffic forecasts are noticeably higher than PDR traffic forecasts from 2004, and therefore the newer forecasts are expected to lead to changes to the Highway 5 and Highway 6 lane and intersection requirements.

Exhibit 2-1 Detailed Traffic Study Area

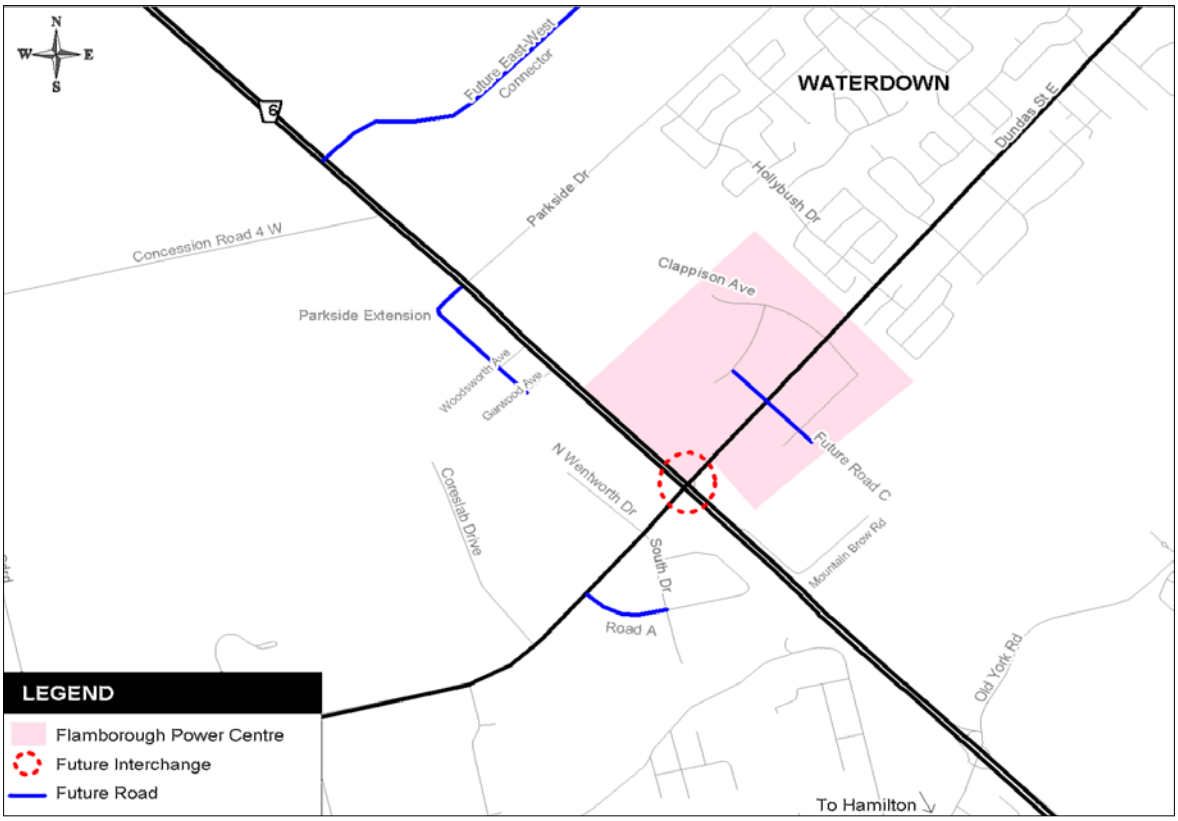


2.2 Existing Traffic Conditions

For the more specific intersection assessment, turning movements are based on the existing (2010) and forecasted corridor demands from the 2003 TESR and 2004 PDR shown on Exhibit 2-2. Intersection Analysis has been completed for the 2031 horizon, to establish the longer term corridor needs. As with the Highway 6 corridor, an interim 2021 horizon was assessed to identify the interim construction requirements. A phased approach to implement the widening along Highway 6 is recommended.

Exhibit 2-2 Highway 5 and Highway 6 Corridor Detail

Note: Schematic Concept Only
(does not represent subsequent alignment modifications in this TESR Addendum)



Existing traffic conditions were updated to document current operational deficiencies and constraints at intersections within the study area, providing a base against which future conditions can be compared. Extensive traffic count data was collected including turning movement counts at all study-area intersections. Existing weekday turning movement volumes are provided in Appendix A.1 through Appendix A.4 of the supplementary **Traffic Report**. Existing Saturday peak hour volumes are provided in Appendix A.5 and Appendix A.6 of the same report.

2.2.1 WEEKDAY TRAFFIC OPERATIONS

Traffic operations were assessed using Highway Capacity Software (HCS) signalized and un-signalized methodologies, within the Synchro 7 platform. Current lane configurations and existing signal timings were provided by the City of Hamilton, the City of Burlington, and MTO. Summary Level of Service (LOS) tables and diagrams are provided in Exhibit 2-3 to 2-6.

Traffic conditions represented by traffic Level-of-Service (LOS) can be summarized as follows:

A= Free flow	B=Reasonably free flow	C=Stable flow
D=Approaching unstable flow	E=Unstable flow	F=Forced or breakdown flow

Based on the analysis, the following is noted for existing operations:

- The Intersection of Highway 6 and Highway 5 is operating at overall LOS E in the AM peak hour and LOS F in the PM peak hour. Critical movements in the AM peak hour are westbound left turns and northbound left turns. In the PM peak hour, the eastbound left, westbound left, northbound left, and southbound left and through movements operate at LOS F. These results illustrate the requirement for a grade separation at this location in the short to medium term.
- Highway 6 at Parkside Drive operates at overall LOS B with the westbound left turn operating at LOS E in the AM peak hour and LOS F in the PM peak hour. This LOS suggests that turning lanes on the westbound approach may be required in the short to medium term horizon.
- Highway 5 at Clappison Avenue has overall LOS C, but left turns operate near capacity with westbound left at LOS E, northbound left at LOS F, and southbound left at LOS E in the PM peak hour. These results indicate that the intersection can support limited additional development levels north and south of Highway 5.
- Highway 5 at Hollybush Drive operates at overall LOS B. However, the eastbound left turn is over capacity in the PM peak hour with LOS F.
- Unsignalized intersections in the study area were also assessed. Generally, current operations are acceptable with the following two exceptions:
    - Highway 6 at Concession Road 5 experiences poor LOS in the PM peak hour when traffic has difficulty turning onto Highway 6. Westbound left and right turns operate at LOS E; and
    - Highway 5 at North Wentworth Drive / South Drive may have event traffic associated with the community arena that experiences delays. Traffic to and from the site during the roadway peak hours is extremely low, however the southbound approach movement operates at LOS F.

Exhibit 2-3 Highway 6 Signalized Overall Intersection Level of Service (LOS), 2010

Location		Base AM		Base PM	
ID	**Description**	**Delay (s)**	**LOS**	**Delay (s)**	**LOS**
4	Highway 6 and Highway 5	56	E	81	F
5	Highway 6 and Parkside Drive	10	B	13	B
10	Highway 6 and Millgrove Side Rd	14	B	17	B

s = seconds

Exhibit 2-4 Highway 5 Signalized Overall Intersection Level of Service (LOS), 2010

Location		Base AM		Base PM	
ID	**Description**	**Delay (s)**	**LOS**	**Delay (s)**	**LOS**
12	Highway 5 and Coreslab Drive	9	A	9	A
18	Highway 5 and Clappison Avenue	22	C	35	C
19	Highway 5 and Hollybush Drive	9	A	19	B

s = seconds

Exhibit 2-5 Intersection Level of Service, 2010 AM Peak Hour

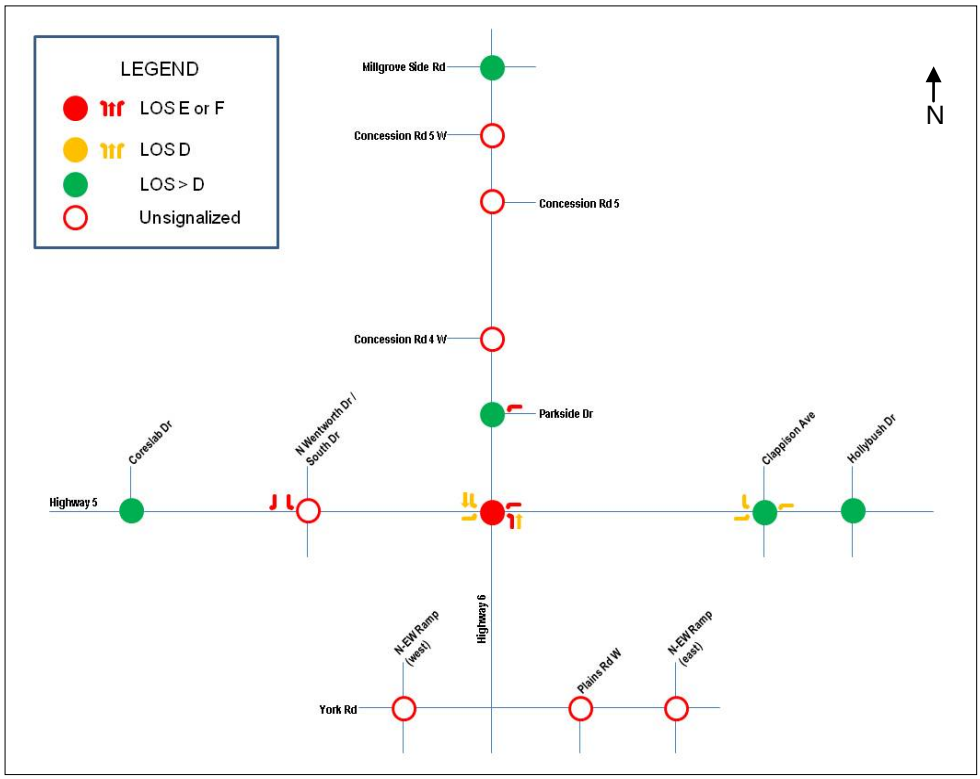
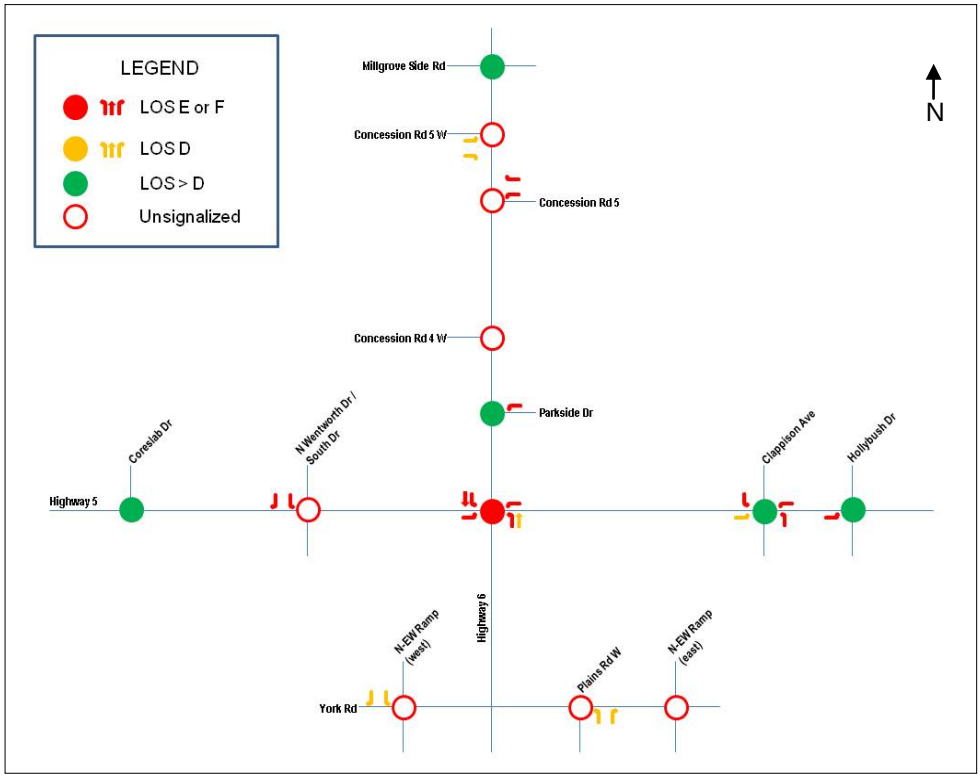


Exhibit 2-6 Intersection Level of Service, 2010 PM Peak Hour



2.3 2031 Traffic Conditions

Analysis of 2031 conditions includes intersection lane requirements within the Highway 5 and 6 corridors. Also assessed are the long term requirements for new signals, new interchanges along Highway 6, and other constraints and issues. Volume adjustments are included in the **Traffic Report.**

2.3.1 2031 WEEKDAY TRAFFIC OPERATIONS

The analysis resulted in several changes to the preliminary design included in the 2004 preliminary design report (PDR). Some of the significant changes in the recommended configuration to the interchange compared to the 2004 PDR configuration include the following:

- Providing six (6) lanes along Highway 5 from Highway 6 to east of Clappison Avenue, and four (4) lanes on Highway 5 west of Highway 6 to Street 'A';
- Providing three (3) lanes northbound and southbound along Highway 6;
- Providing additional left turn and through lane capacity at the southbound (N-E/W) ramp terminal; and
- Providing for an extension of proposed Road C north of Dundas Street East.

Exhibit 2-7 and Exhibit 2-8 illustrate the level of service for intersections and movements under the base 2004 PDR configuration at Highway 5/6 and under existing geometry at other locations. With the ultimate six-lane improvements on both Highway 6 and Highway 5 in the study area, intersection LOS will improve to levels as illustrated in Exhibit 2-9 and Exhibit 2-10 in the AM and PM peak hours respectively.

2.3.2 2031 SATURDAY TRAFFIC OPERATIONS

The Saturday peak scenario was modeled under the improved network configuration including the Road C extension north of Highway 5. The detailed model output is provided in Appendix A.24 of the **Traffic Report**. This analysis indicates the following:

- The intersection of the City of Hamilton's proposed East-West connector at Highway 6 operates at LOS E for the Saturday peak. The westbound right, northbound through and southbound left movements operate at LOS E, F, and F respectively. The geometry of this intersection and potential grade-separation were not reviewed in detail;
- Highway 5 at Road C operates at LOS D with the eastbound left, eastbound through and westbound left movements operating at LOS E; and
- Highway 5 at Clappison Avenue operates at overall LOS D. All left-turning movements operate at LOS E.

The Saturday figures do not present the critical case for 2031 traffic because they do not require any further improvements or changes to the study area network beyond those required by weekday volumes.

Exhibit 2-7 Intersection Level of Service – Base Scenario, 2031 AM Peak Hour

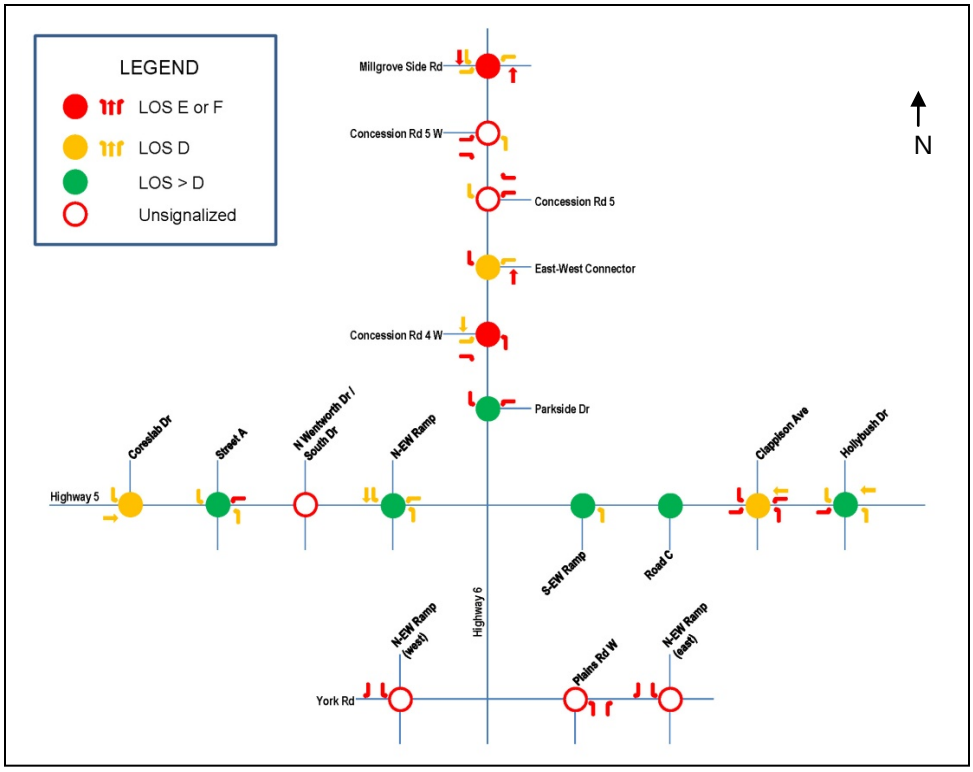


Exhibit 2-8 Intersection Level of Service – Base Scenario, 2031 PM Peak Hour

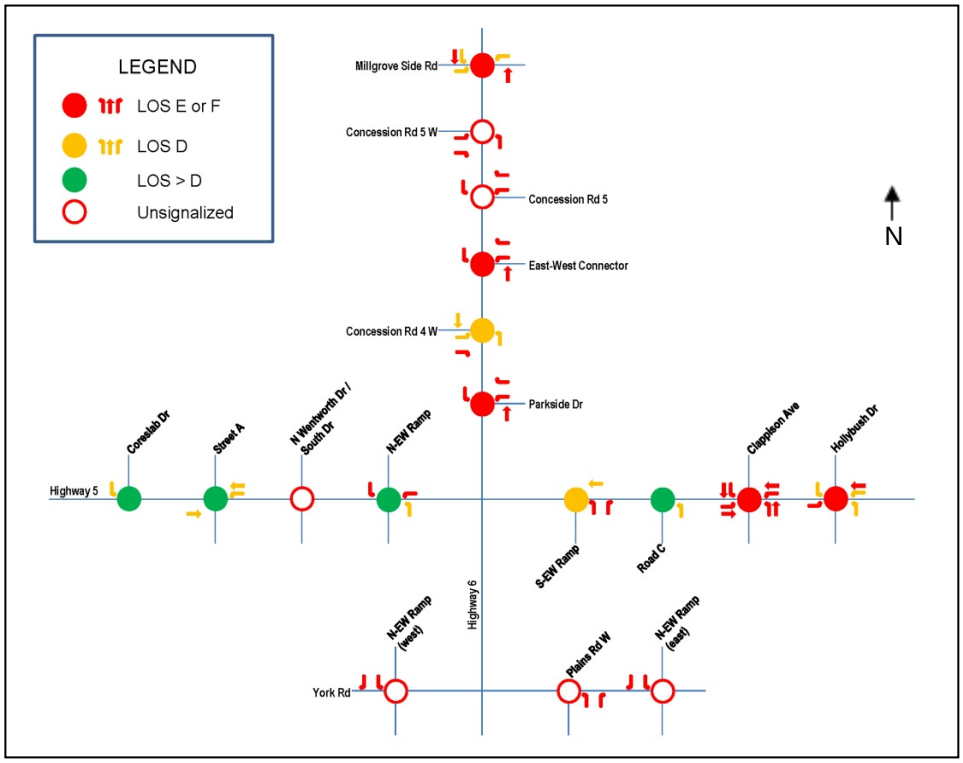


Exhibit 2-9 Intersection Level of Service – Improved Scenario, 2031 AM Peak Hour

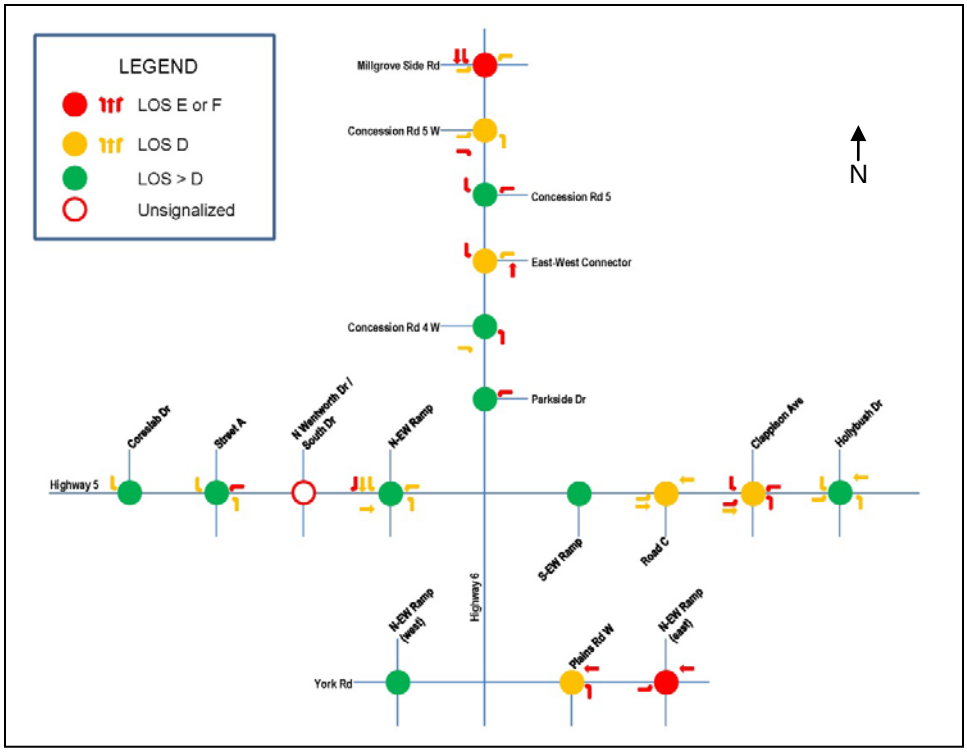
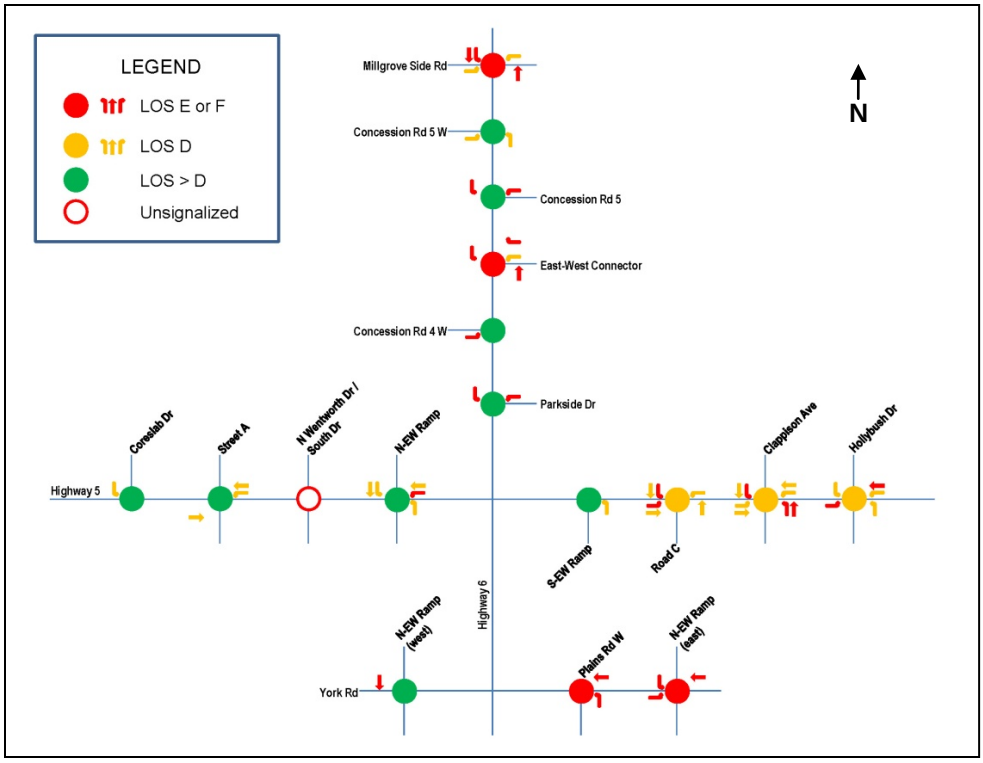


Exhibit 2-10 Intersection Level of Service – Improved Scenario, 2031 PM Peak Hour



2.3.3 2031 SIGNAL WARRANTS

Signal warrant analysis was completed for the following intersections:

- Highway 5 (Dundas Street West) and the southbound N-E/W ramp;
- Dundas Street East (Highway 5) and the northbound S-E/W ramp;
- Road C and Dundas Street East;
- Concession Road 4 West and Highway 6;
- Concession Road 5 and Highway 6; and
- Concession Road 5 West and Highway 6.

The signal warrants were completed following Ontario Traffic Manual (OTM) guidelines. Justification 2 was used, which is based on delay to cross traffic. For the year 2031, only the first three above-noted intersections were warranted for signals.

2.4 2021 Transportation Needs

The 2031 transportation assessment confirmed the need to widen Highway 6 to six lanes through the Parkside Drive intersection, and Highway 5/Dundas Street East to six lanes from Highway 6 (at the northbound S-E/W ramp) to east of Clappison Avenue. An interim 2021 horizon was developed to evaluate the following:

- Highway 6 lane requirements north of Highway 5 at the Parkside Drive, East-West Connector, Concession Road 4 West, Concession Road 5 and Concession Road 5 West intersections; and,
- Highway 5 lane requirements and the potential to maintain a four-lane cross section through 2021 and defer the Road C extension north of Highway 5.

For the intermediate 2021 horizon, traffic volumes were interpolated between 2010 and 2031 forecasted turning movements. Interpolation is acceptable for Highway 6 given that growth is expected to be relatively constant. Retail and commercial development immediately north and south of Highway 5 will occur before 2021, but further development including south of and north of Parkside Drive, and other residential developments are expected to grow through 2031. Weekday turning movements are provided in Appendix A.26 through A.29 of the **Traffic Report**. Saturday turning movement volumes were determined using the same methodology and are provided in A.30 and A.31 of the **Traffic Report**.

2.4.1 2021 WEEKDAY TRAFFIC OPERATIONS

The analysis for 2021 indicates that Highway 5/Dundas Street East will operate satisfactorily as four lanes to 2021, with the exception of the southbound approach at Clappison Avenue which may fail depending on development levels. As such, it is reasonable to limit widening of Dundas Street East to 6 lanes from the northbound S-E/W ramp to east of Road C, matching the existing lane configuration on the west side of the Dundas Street East/Clappison Avenue intersection.

Level of service analysis for the Parkside Drive intersection with Highway 6 indicates that in the PM peak hour the southbound and westbound left turns currently operate at LOS F, with the northbound through movement operating at LOS D. This indicates that intersection operation improvements are required before 2021. This includes double westbound left turn lanes and the southbound left turn lane at the intersection as shown on the preliminary design plan in Appendix 1. Adding a fourth leg to the intersection to the west would lead to level of service E and Volume/Capacity (V/C) ratios greater than 1.0 for either southbound left turns or northbound through movements.

2.4.2 2021 SATURDAY TRAFFIC OPERATIONS

In both the existing and 2031 traffic scenarios, the weekday PM case is the governing case for intersection operations. Since the 2021 volumes are determined by interpolation for every scenario, it follows that the 2021 Saturday numbers will not be critical as they are a subset of the 2021 weekday PM numbers. Therefore, Saturday traffic operations will require no further roadway network improvements beyond those already scheduled for or completed by the year 2021 to serve forecasted weekday demands. For the detailed Synchro model output of this scenario, see Appendix A.34 of the **Traffic Report**.

Exhibit 2-11 Intersection Level of Service – Base Scenario, 2021 AM Peak Hour

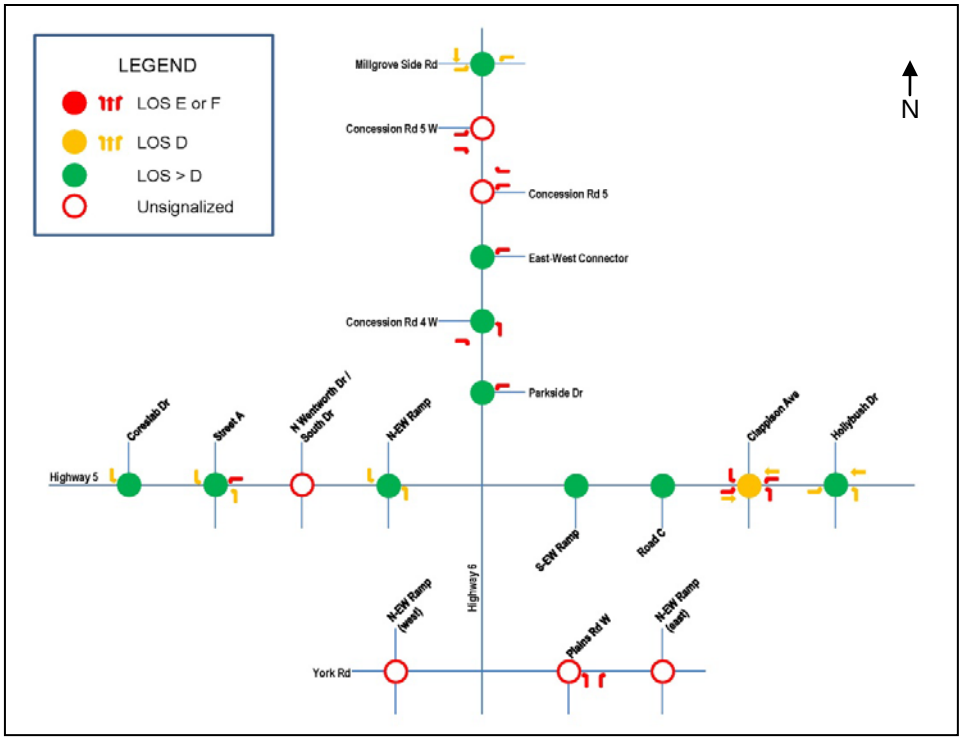
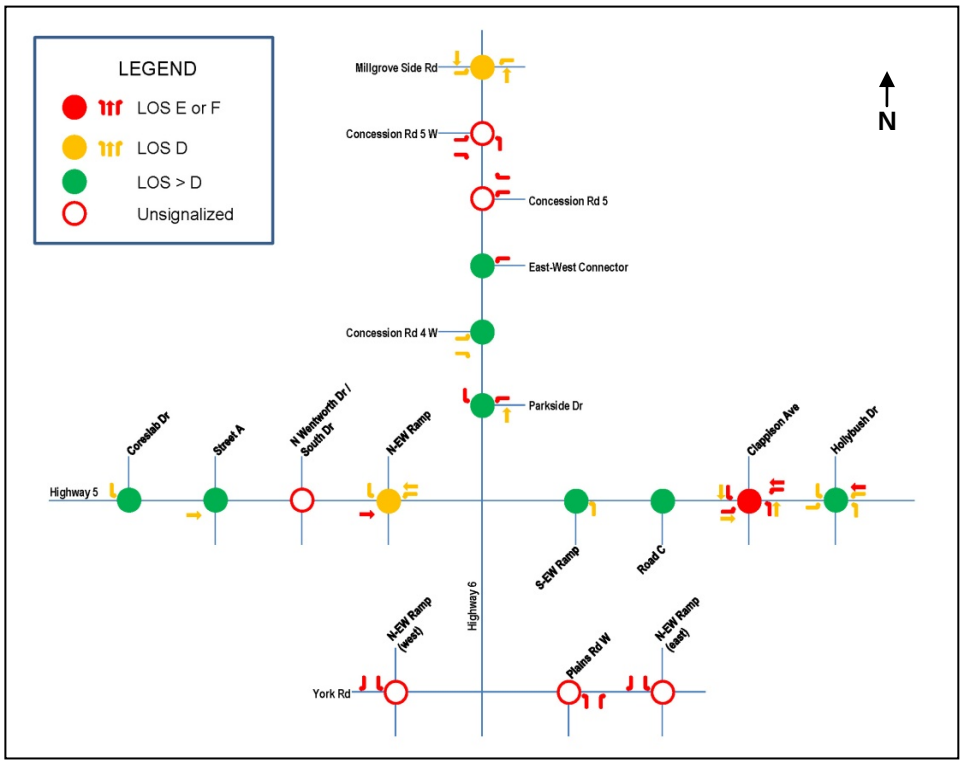


Exhibit 2-12 Intersection Level of Service – Base Scenario, 2021 PM Peak Hour



2.4.3 2021 SIGNAL WARRANTS

The signal warrants for the 6 intersections with proposed signals were completed for the 2021 horizon year. In 2021, only the intersections containing the Highway 6 ramps are warranted for signalization. The warrants can be found in Appendix A.35 of the **Traffic Report** with forecasted intersection level-of-service shown on Exhibit 2-11 and 2-12.

2.5 Updated Problem Statement Requirements

Within the TESR Addendum study area (refer to Exhibit 1-3), the following corridor improvements are required to accommodate 2031 traffic demands. This is consistent with the findings of the Highway 5 and Highway 6 Interchange Transportation (Systems) Planning Report:

- Six (6) lanes are required along Highway 6 (three (3) northbound and three (3) southbound) extending northerly through the Parkside Drive intersection. Even with this configuration in place, the current westbound left turn at Parkside Drive and Highway 6 will operate at LOS F. This suggests a potential need for further improvements at Parkside Drive in 2031 which are beyond the scope of this TESR Addendum; and

- Six (6) lanes are required on Dundas Street East from Highway 6 (west of the northbound S-E/W ramp intersection) to Clappison Avenue. Due to the high turning movements to and from developments north and south of Dundas Street East, an extension of Road C to the north of Dundas Street East is also required (to take traffic volumes from Clappison Avenue). In regards to widening Dundas Street East, east of Highway 6, this TESR Addendum only seeks approval to widen Dundas Street East to west of Clappison Avenue as shown in Appendix 1, and does

not seek approval for extension of Road C north of Dundas Street East as it is beyond the scope of this study and would be subject to a future study.

Based on the 2021 horizon (interim) analysis, the following assessments are made:

- Highway 6 will operate satisfactorily with two (2) lanes southbound between Highway 5 and Parkside Drive. This provides an opportunity to defer the third southbound lane along Highway 6 beyond 2021. However, the Highway 6/Parkside Drive intersection is expected to experience operational issues and the third southbound lane may be required by 2031 (i.e. six lanes on Highway 6); and

- Highway 5/Dundas Street East will operate satisfactorily as four lanes to 2021, with the exception of the southbound approach at Clappison Avenue which may require improvement, depending on development levels. As part of the interim construction, it is recommended to limit widening of Dundas Street East to 6 lanes from Ramp S-E/W to east of Road C, matching the existing lane configuration on the west side of the Dundas Street East/Clappison Avenue intersection.

Therefore the Problem Statement updated from the 2003 TESR specifically addresses the need for a municipal road network to accommodate the new interchange, a new commuter carpool parking lot and modifications to the previously approved interchange design throughout the TESR Addendum study area as identified in Sections 1.5 and 4, and Appendix 1 of this TESR Addendum report. Some of the modifications to the previously approved interchange design were identified in the Transportation (Systems) Planning Report and Traffic Report conducted as part of this TESR Addendum study. Other improvements recommended in the aforementioned reports are not part of the scope of work for this TESR Addendum and/or are outside the TESR Addendum study area, and would be subject to a separate study in the future.

3. DESCRIPTION OF THE STUDY AREA

3.1 Summary of Environmental Sensitivity / Significance

Information below summarizes the site conditions within the study area that must be addressed during the detail design phase of the study, and highlights the environmental sensitivity and areas of significance associated with each environmental discipline. Further details are provided in Section 3.2, 3.3 and 3.4, and Section 6 of this TESR Addendum.

Item	Environmental Sensitivity / Significance
Physiography and Soils	Within the study area, soils are well-drained or imperfectly drained in areas with gently sloping topography. The presence of a sensitive watercourse within the project limits will necessitate the implementation of an erosion and sedimentation control strategy during construction.
Groundwater	A *Groundwater Assessment* report was prepared by Golder Associates and dated January 2013. Although some properties in the study area are on municipal water supply, wells are still present. However, groundwater impacts from the planned interchange and municipal road construction are not expected to be significant.
Fish and Fish Habitat	Based on consultation with Ontario Ministry of Natural Resources (OMNR) staff, the only watercourse within the study area to contain fish habitat (Borer's Creek, refer to Exhibit 3-2) is a warmwater system with low sensitivity. OMNR's in-water works timing window for this watercourse is from July 1 to March 14 in order to protect spawning warmwater fish, incubating eggs and fry emergence. No fish species considered rare, threatened or endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) or the Committee on the Status of Species at Risk in Ontario (COSSARO)/OMNR, and no fish species regulated under the Ontario *Endangered Species Act* or Federal *Species at Risk Act* are known to inhabit the watercourses within the study area. This is reported in the *Summary of Environmental Conditions* report prepared by LGL Limited, dated April 2013.
Vegetation and Vegetation Communities	The vegetation communities within the study area are generally anthropogenic in origin. The southern edge of the study area is connected to natural lands along the Niagara Escarpment that contain higher quality vegetation communities. As such, the southern vegetation communities contain more significant flora than the remainder of the study area, which is primarily cultural in origin. **Highway 5/6 Interchange** All of the vegetation communities identified within the study area are considered to be widespread and common in Ontario and secure globally. The Highway 5/6 Interchange has the potential to impact vegetation communities directly adjacent to the existing highways, and at the intersection of the highways. The vegetation communities adjacent to the existing roads have a high proportion of non-native and invasive plant species. Overall, the plants along the edges of these vegetation communities are tolerant to disturbance and are able to recover quickly post disturbance. The wetland and forest communities are considered to be more sensitive than the cultural vegetation communities identified within the study area.

Item	Environmental Sensitivity / Significance
	Strategies will be developed during detail design and construction to avoid/minimize impacts to wetland and forest features, including the removal of vegetation, to the extent possible. Measures should be undertaken to avoid any species at risk, provincially rare plant species or locally significant plant species during construction. The butternut tree within the deciduous forest (FOD7c) will not be impacted by the proposed improvements, as no widening will occur adjacent to this forest edge. None of the species at risk or provincially rare species found in the Borer's Falls Rock Chappell ANSI and ESA or in the Clappison Escarpment Woodlot ANSI and ESA will be impacted by the proposed Highway 5/6 Interchange or the proposed municipal roads. The following vegetation communities contain rare plant species: FOD5-6, FOD7a, FOD7c, MAS2-1a, CUM1-1k, CUM1-1n, and CUS1b, and should be avoided, where possible. **Municipal Road Alternatives** Impacts to the Red Osier Mineral Thicket Swamp (SWT2-5) and Mineral Cultural Woodland (CUW1d and e) vegetation communities located in the northwest quadrant of the interchange have been minimized. There are no significant vegetation communities in the northeast or southwest quadrants of the interchange. In the southeast quadrant, the Fresh Moist Lowland Deciduous Forest (FOD7b and c) vegetation communities, as well as the butternut and its 25 m buffer, have been avoided. **Designated Natural Areas** The Clappison Escarpment Woods ANSI and ESA is located just south-east of the project limits and Borer's Falls Rock Chappell ANSI and ESA is located just south-west of the project limits. Both are located on the Niagara Escarpment and will not be impacted by the proposed Highway 5/6 Interchange or the proposed municipal roads. Millgrove Woodlot (Logie's Creek Swamp) ESA is located north of the study limits and will not be impacted by the proposed Highway 5/6 Interchange or the proposed municipal roads. Information on Vegetation and Vegetation Communities is reported in the *Summary of Environmental Conditions* report prepared by LGL Limited, dated April 2013.
Wildlife and Wildlife Habitat	As a result of the proposed project, wildlife habitat will be removed. However, since the study area has been subject to extensive development, the effects of the proposed improvements on wildlife will be minimal. The majority of species residing in habitats within or directly adjacent to the ROW are tolerant of human disturbances. Existing habitat within or adjacent to the intersection should be preserved to the extent possible to minimize loss of wildlife habitat. Two species at risk, Barn Swallow (*Hirundo rustica)* and Chimney Swift *(Chaetura pelagica)*, are present within the study limits. Since Barn Swallow nests were documented in a culvert that is proposed for improvements, strategies will be developed to avoid removal of these nests if possible, and to minimize disruption and disturbance to these nests. Breeding habitat was not documented for Chimney Swift. Advice was provided by the OMNR on September 18, 2012 to advise that provided that the existing nests be removed outside the breeding bird season, and that replacement nests are installed prior to the start of the next breeding season (in accordance with the Letter of Advice for Barn Swallow, April 23, 2012), the project should not result in adverse effects to

Item	Environmental Sensitivity / Significance
	Barn Swallow. However, since the project is not currently scheduled for construction in the next five years, the OMNR must be contacted for updated advice when details regarding construction timing are available. The most significant area of wildlife habitat and movement corridor within the study area (Borer's Creek and associated habitat) is set back far enough from any highway construction to have minimal, if any, deleterious effects on habitat function. No other significant corridors used by mammals or herpetofauna were documented within the study area. Works involving disturbance or obstruction to culvert openings may cause minor disturbance to movement of mammal and/or herpetofauna species, resulting in increased vehicle related mortalities. To the extent possible, culverts should not be restricted during construction. Emphasis should also be placed on minimizing movement restriction where natural habitat corridors are found on both sides of existing ROWs. Information on Wildlife and Wildlife Habitat is reported in the *Summary of Environmental Conditions* report prepared by LGL Limited, dated April 2013.
Existing and Planned Land Use	The primary concern with respect to existing and planned land use within the study area will be to ensure that the proposed highway improvements conform to the planned land use designations prescribed under the official plans for the City of Hamilton and the policies of the Niagara Escarpment Plan and Greenbelt Plan. It will also be important for the design of the interchange to maintain access to businesses where possible, and to coordinate the municipal road network with ongoing development applications. With the exception of natural areas (e.g., Niagara Escarpment), land use within and adjacent to the study area is generally compatible with highway development. Strategies will be developed to minimize or avoid impacts of construction in environmentally sensitive areas, particularly within the 'Escarpment Natural Area' or Greenbelt Plan 'Natural Heritage System'.
Residences and Communities	Since residences and residential businesses are located along Highways 5 and 6 within the study area, there is potential for these residences to be impacted by the footprint of the new interchange and municipal roads, as well as additional traffic volumes during construction activities. Strategies and plans will be developed to minimize impacts to the residences and residential businesses. Potential impacts during construction activity include temporary noise, and pollutant emissions. During construction, strategies will be developed to minimize traffic delays, construction noise and the emission of pollutants.
Businesses	Considering the location of the businesses located within the study area, there is potential for these businesses to be impacted by reductions in access, loss of property or additional disturbance (e.g., noise, dust) associated with the interchange ramps. Businesses may also be impacted during construction. However, strategies will be developed to minimize impacts to businesses. Potential impacts during construction periods include temporary noise, and pollutant emissions. During construction, strategies will be developed to minimize traffic delays, construction noise and the emission of pollutants.

Item	Environmental Sensitivity / Significance
Community and Recreational Facilities	One of the key community facilities within the study area is the North Wentworth Arena. The detail design should consider options to reduce impacts to access and use of this facility. Consideration of the effect of highway and municipal road improvements on local trails should also be considered during detail design. During construction, the primary concern with respect to the community and recreational facilities in the study area will be maintaining access and reducing traffic delays during construction periods. Access should be maintained at all times during construction for emergency service providers however details of this will be confirmed during the detail design phase of the project. Strategies will be developed to minimize impacts during construction periods including traffic delays, construction noise and the emission of pollutants.
Agriculture	Given the presence of agricultural operations in the study area, consideration was given to reducing impact to prime agricultural lands (Classes 1 to 3) during the evaluation of municipal road alternatives. Although the interchange design was determined during the 2003 Class EA Study, opportunities to refine the design of the interchange to minimize impacts to prime agricultural lands were considered, where feasible. During construction, the primary concern with respect to agriculture will be reducing traffic delays and maintaining access to agricultural fields during construction periods. Construction activities should be staged to avoid/minimize traffic delays to agricultural related traffic travelling through the study area and to maintain access to agricultural fields at all times, to the extent possible.
Property Waste and Contamination	A *Contamination Overview Study* was prepared by Golder Associates, dated March 2013 to provide an initial screening and assessment of property waste and contamination issues in the study area. It concludes that based on the results of additional site reconnaissance, waste expected to be generated by the project will generally consist of: i) contaminated soil and/or groundwater, ii) reclaimed asphalt pavement from milling of existing asphalt surfaces, iii) concrete, likely reinforced, from the removal of pavement structures, iv) manufactured wood waste from guide rail removals, and v) scrap metal such as wire and corrugated steel pipe from culverts. Impacted soils and groundwater should be assessed by a qualified person and disposed of off-site as directed.
Noise	A *Noise Impact Assessment* report was prepared by Valcoustics Canada Limited, dated February 25, 2013 to summarize the expected noise impact from the proposed improvements. The requirements of the Ministry of Transportation (MTO) Environmental Guide for Noise (2006, version 1.1 July 2008) were used in the noise assessment. The existing sound exposures at the facade most exposed to either Highway 5 or 6 is at or above 65 dBA at many of the dwellings within the study area. The existing sound exposures in Outdoor Living Areas (OLAs) are at or above 65 dBA at a few receptors within the study area. Thus, noise mitigation has been considered as part of the detailed noise impact assessment of the proposed improvements. It was concluded that the improvement of the Highway 5/6 intersection will have minor noise impacts on sensitive receptors. Since sound exposure changes are less than 5 dBA and the resultant sound exposures are below 65 dBA in the OLAs, noise mitigation is not required for receptors along Highway 5. For the dwellings on Old Guelph Road backing towards Highway 6 southbound, a sound barrier will be constructed as part of the widening of the adjacent portion of Highway 6. However, although a sound

Item	Environmental Sensitivity / Significance
	barrier is proposed at this location, it is not planned for construction until the third southbound lane on Highway 6 is constructed. This is because widening of the highway platform is necessary in order to position the sound barrier in the MTO right-of-way. Also, actual construction of this third southbound lane is not expected to take place until or after it is warranted by traffic volumes, which is currently identified as the year 2031. Even though sound exposures above 65 dBA are predicted in the OLAs of receptors in the Garwood/Woodsworth development along Highway 6 north of Highway 5, noise mitigation is not required as measures were investigated and found that they could not meet the MTO requirement that they be implemented within the right-of-way and provide at least 5 dBA of attenuation.
Archaeology	A Stage 1 Archaeological Assessment: *Stage 1 Background Study and Property Inspection* report was prepared by Archeological Services Inc., dated January 12, 2012 to review the archaeological potential in the study area. Background research on existing conditions determined that 10 archaeological sites are registered within one kilometre of the study area, and that potential for identification of archaeological sites exists. However, portions of the study area are heavily disturbed, while other portions have archaeological potential and require a Stage 2 Archaeological Assessment to be completed during the detail design phase of the project.
Built Heritage and Cultural Heritage Landscapes	A *Cultural Heritage Assessment* report: *Built Heritage Resources and Cultural Heritage Landscapes* was prepared by Archeological Services Inc., dated January 2013 to document existing conditions and assess impacts associated with the proposed improvements on built heritage and cultural heritage landscapes. Based on the study results, existing conditions include two (2) built heritage resources (BHR) and two (2) cultural heritage landscapes (CHL), which were identified as an auto repair shop (BHR 1), a dwelling (BHR 2), and two farm complexes (CHL 1 and CHL 2) within the study area.
Aesthetics, Existing Vegetation and Landscape Planting Assessment	An *Existing Landscape/Aesthetics Assessment r*eport was prepared by McWilliam & Associates, dated May 08, 2013 and provides a description of the results of the landscape assessment including further discussion of landscapes and aesthetics. Most of the existing mature trees in the vicinity of the proposed interchange will require removal. Impacts on any areas of undisturbed woodlands are not anticipated however the trees that will require removal are typically scattered specimen trees that were once associated with structures that have been removed over the years or more recently landscaped areas. A landscape planting plan is to be prepared and implemented to the extent possible, to address the loss of existing vegetation, restore disturbed areas, buffer the new highway from sensitive land uses, and generally improve the aesthetics of the interchange area and associated access roads.
Air Quality	An *Air Quality Impact Assessment* report was prepared by SENES Consultants Limited, dated May 2013 which shows that within the study area, when compared to future no-build scenarios, the proposed new interchange will generally result in less than a 5% increase in pollutant concentrations at receptor locations.

3.2 Natural Environment

3.2.1 PHYSIOGRAPHY AND SOILS

The study area is located immediately northwest of the Niagara Escarpment within the Norfolk Sand Plain physiographic region. This region is comprised of sand and silts that were deposited as a delta in glacial Lakes Whittlesey and Warren (Chapman and Putnam 1984). The area just west of the Niagara Escarpment consists of shale overlain with Halton Till, which has a topography that is gently undulating to rolling, and in places the till can be up to 12 m in depth (Marich 2010). A series of narrow ridges composed of Halton Till, referred to as the Waterdown moraines, are located west and parallel to the escarpment. These moraines are overlain by sand deposits that formed as a result of re-working of the till by glacial lake shoreline processes (Marich 2010).

The soils present in the study area are predominantly Oneida loam, with a large area at the intersection consisting of Chinguacousy loam. Within the study area, soils are well-drained or imperfectly drained in areas with gently sloping topography. The presence of a sensitive watercourse within the project limits will necessitate the implementation of an erosion and sedimentation control strategy during construction.

Information on Physiography and Soils is reported in the **Summary of Environmental Conditions** report prepared by LGL Limited, dated April 2013.

3.2.2 GROUNDWATER

Sensitive groundwater features within the study area, reported in the **Groundwater Assessment** report prepared by Golder Associates, dated January 2013 are associated with wells with limited overburden thickness and high static water level generally located in the Garwood and Woodsworth Avenue areas. Although some of the properties in the study area are on municipal water supply, some wells may still be present and used for other purposes throughout the study area (e.g. the three residential properties along the Niagara Escarpment on Mountain Brow Road still use wells or trucked water). However, groundwater impacts from the planned interchange construction and associated municipal road construction are not expected to be significant.

3.2.3 FISH AND FISH HABITAT

Information on Fish and Fish Habitat is reported in the **Summary of Environmental Conditions** report prepared by LGL Limited, dated April 2013.

A review of secondary source data was undertaken to identify fish and fish habitat within the study limits. The only fish-bearing watercourse within the study area is Borer's Creek, which is located within the Borer's Creek sub-watershed of the Spencer's Creek Watershed and is under the jurisdiction of the Hamilton Conservation Authority (HCA). The Borer's Creek sub-watershed drains an area of 19.5 km^2 and is comprised of 5 catchment basins. The headwaters originate to the north of Concession 5 East, between Millgrove Sideroad to the west and Centre Road to the east.

The Ontario Ministry of Natural Resources (OMNR) indicated, in an e-mail dated February 1, 2011, that Borer's Creek is a warmwater stream, with low sensitivity. With a warmwater designation, the OMNR permitted in-water works timing window is from July 1 to March 14 in order to protect spawning warmwater fish, incubating eggs and fry emergence. The Hamilton Conservation Authority (HCA) also considers Borer's Creek to be warmwater, although many coolwater species still occupy the habitat (Lisa Jennings, Assistant Ecologist, HCA, pers. comm. February 3, 2011). All other watercourses/drainage features within the study area drain in a south-westerly direction over the Niagara Escarpment and do not directly support fish.

The majority of the study area lies within North Cootes Paradise Watershed, under the jurisdiction of Conservation Halton (CH). Watercourses 2, 3, 4 and 5 (see Exhibit 3-2) drain directly into

Cootes Paradise, which is part of Hamilton Harbour. These watercourses constitute indirect fish habitat as they drain over the Niagara Escarpment into direct fish habitat further downstream.

Critical Fish Habitat
The study limits were reviewed for the potential presence of critical habitat (i.e. spawning areas, groundwater discharge, nursery habitat, seasonal refugia, etc.). No evidence of critical habitat was observed during field investigations.

Thermal Regime
The thermal regime of one of the watercourses, Borer's Creek, was confirmed by the MNR as warmwater. The thermal regime for the remaining watercourses identified in the study area was not provided by the MNR. However, due to the nature of the surrounding land (flat, agricultural) and lack of any observed groundwater inputs, it is likely that the remaining four would be considered warmwater. Fish were neither observed nor captured at/in Watercourses 2-5.

Species at Risk
A search of the Natural Heritage Information Centre (NHIC) database revealed no rare fish or other aquatic species at risk within the study area.

Field Assessment
A fish habitat assessment of the watercourses within the study area was completed by LGL Limited on October 15 and 27, 2010, and May 30, 2011 in accordance with the Environmental Guide for Fish and Fish Habitat (MTO 2009). Weather conditions during the October field visits were generally good, with mainly clear skies, moderate winds and mean air temperatures of approximately 13°C and 17°C, respectively. The weather conditions during the May site visit were mainly sunny skies, with an air temperature of 25°C and light wind. It had rained the days preceding all site visits.

Borer's Creek
Borer's Creek crosses under Highway 6 approximately 520 m northwest of the Highway 5 and Highway 6 intersection through a two cell open bottomed concrete culvert, flowing from east to west. The northern cell conveys the entire watercourse during low flow conditions while the southern cell receives water only during flood events. Borer's Creek is managed as a warmwater system.

The watercourse consists of a permanently flowing channel that occupies a wide, straight, "stepped" floodplain/valley area that has been cut through the existing bedrock. Channel morphology is mainly narrow (1 m) runs interspersed with short, narrower (0.5 m) riffles and large, wide (6 m) pools. Within the area examined (approximately 200 m upstream and 375 m downstream) three of the large pools existed (one upstream, two downstream), measuring approximately 25 m in length and between 5 m and 7 m wide. Two riffles occur upstream and four occur in the downstream section of this watercourse within the study area. The riffles are short (3 m to 5 m) and narrow (0.5 m) and appear to have been created as transitions from pools to runs or at wet crossings (there is one concrete crossing upstream and an ATV crossing downstream). Substrates are comprised mainly of silt and detritus with small areas of boulder (including pieces of bedrock), cobble, gravel and sand. Instream cover is provided by in stream woody debris and overhanging plants. Instream vegetation is limited to several patches of watercress *(Nasturtium officinale)* which is an indicator of groundwater input growing in riffles and runs. Cattails *(Typha spp.)* occur in the watercourse along the perimeter of the pools. The riparian vegetation consists of small trees and shrubs with much herbaceous vegetation growth lining the banks. Canopy cover is generally low (30 – 60%).

As mentioned above, the valley is stepped with the bottom step occupied by the watercourse, a narrow riparian step adjacent to the watercourse (approximately 4 m wide on both sides of the

watercourse) in which almost all of the vegetation is growing and then next, a wider (approximately 10 m) step on which a road/trail occurs on both sides and a final step farthest from the watercourse. In total, the valley is approximately 50 m wide. The road/trail appears to be heavily used by ATVs and is comprised of dirt/gravel and some areas of bare bedrock. No bank erosion appears to occur within the area.

Fish Community

Fish sampling was not completed during this study. However, historical data indicate that both a warmwater and a coolwater fish community are supported in Borer's Creek in the vicinity of the Highway 6 crossing. Sampling data from 1996 (Earth Tech 2002) and 1999 and 2005 (HCA 2011) reported ten species. A summary of the fish community within the vicinity of the study area is presented in Exhibit 3-1.

Exhibit 3-1 Fish Collected Historically in Borer's Creek Within the Vicinity of the Study Area

Scientific Name	Common Name	Earth Tech	Hamilton Conservation	OMNR	COSEWIC	SARA	MNR	Provincial
Cyprinus carpio	Common Carp	-	x		-	-	-	SNA
Semotilus atromaculatus	Creek Chub	x	x		-	-	-	S5
Rhinichthys atratulus	Blacknose Dace	-	x		-	-	-	S5
Pimephales promelas	Fathead Minnow	x	-		-	-	-	S5
Ameiurus nebulosus	Brown Bullhead	-	x		-	-	-	S5
Esox Lucius	Northern Pike	-	x		-	-	-	S5
Umbra limi	Central Mudminnow	-	x		-	-	-	S5
Culaea inconstans	Brook Stickleback	x	-		-	-	-	S5
Micropterus salmoides	Largemouth Bass	x	x		-	-	-	S5
Lepomis gibbosus	Pumpkinseed	x	x		-	-	-	S5

Note: Station Data provided by HCA from correspondence (HCA, 2012). Sampling years (1999, 2005) Data from Natural Environment report (Earth Tech, 2002) Earth Tech sampling year 1996

Constraints and Opportunities

The purpose of identifying constraints and opportunities is to show biological and physical constraints (i.e., fish and fish habitat) to highway development. The study area was reviewed to identify opportunities and constraints for each watercourse crossing, using the criteria outlined in the MTO Environmental Guide for Fish and Fish Habitat (MTO 2009). Exhibit 3-2 presents the opportunities and constraints for each watercourse crossing, and the limits of all designated natural areas (i.e., ANSIs, PSWs or ESAs) within the study area.

Due to the presence of fish habitat within Borer's Creek, there is a moderate constraint to development within and in close proximity to this watercourse.

Watercourses 2-5 (Tributaries of North Cootes Paradise) do not constitute direct fish habitat within the study area, but can be considered indirect fish habitat. As such, there are no constraints or opportunities identified for these drainage features.

Potential Enhancement/Compensation Measures
A potential enhancement opportunity for Borer's Creek includes an increase in the shading of the stream banks with native tree and shrub species to moderate stream temperatures. Variable water temperature and flows have been recorded for this creek upstream of the escarpment due to the increasing urbanized surroundings (HCA 2009).

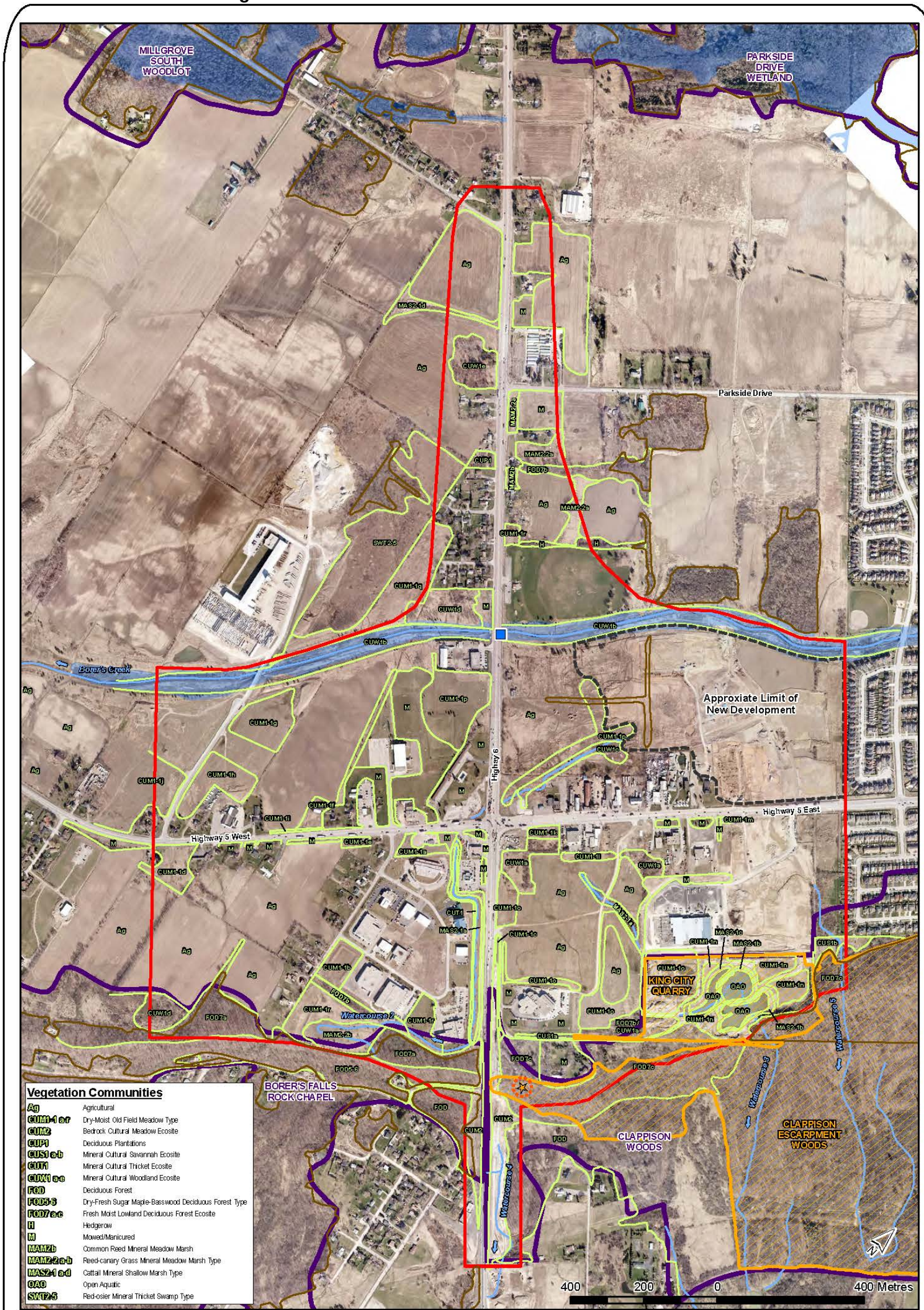
Enhancement opportunities for Watercourses 2 and 3 could include the removal of the foreign debris currently within the channel, and planting riparian vegetation along the watercourse banks. Site visits identified highly disturbed conditions, including exposed soils, low riparian cover, and foreign debris in the watercourse that includes garbage, check flow dams and sandbags. Riparian plantings along the banks of Watercourse 2 could contribute to cooled water temperatures in downstream fish habitat.

3.2.3.1 Sensitivity / Significance

Based on consultation with Ontario Ministry of Natural Resources (OMNR) staff, the only watercourse within the study area to contain fish habitat (Borer's Creek) is a warmwater system with low sensitivity. OMNR's in-water works timing window for this watercourse is from July 1 to March 14 in order to protect spawning warmwater fish, incubating eggs and fry emergence (Art Timmerman, OMNR Guelph, Pers. Comm. February 1, 2011).

No fish species considered rare, threatened or endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) or the Committee on the Status of Species at Risk in Ontario (COSSARO)/OMNR, and no fish species regulated under the Ontario *Endangered Species Act* or Federal *Species at Risk Act* are known to inhabit the watercourses within the study area.

Exhibit 3-2 Natural Heritage



Highway 5 & 6 Interchange

Natural Heritage Existing Conditions

- Endangered Butternut (*Juglans cinerea*)
- Endangered Butternut 25 metre Buffer
- Watercourse Flow Direction
- Watercourse
- Vegetation Community Boundary
- Study Area
- Approximate Limit of New Development

Fish & Fish Habitat Opportunities and Constraints

- Fisheries - Moderate Constraint With Opportunities for Enhancement

Note: All watercourses with the exception of Borer's Creek have no constraints.

Natural Areas

- Woodlands
- Area of Natural and Scientific Interest
- Environmentally Significant Area
- Wetland

Note: Due to ongoing development in the area, vegetation communities may be subject to change.

Data Sources: LGL Field Investigations (September 24, 29, 30 2010 and October 1 2010), Ministry of Natural Resources, City of Hamilton.

LGL LIMITED environmental research associates

Project:	TA4958	**Figure:**	2
Date:	February 2013	**Prepared By:**	KC
Scale:	1 : 10,000	**Checked By:**	KSM

C:_TA\TA4958 - Highway 5 and 6 Interchange\Figures\Fig_NH_Feb2013.mxd

3.2.4 VEGETATION AND VEGETATION COMMUNITIES

Information on Vegetation and Vegetation Communities is reported in the Supplementary Report entitled **Summary of Environmental Conditions** report prepared by LGL Limited, dated April 2013.

The geographical extent, composition, structure and function of vegetation communities were identified through air photo interpretation and field investigations. Air photos were interpreted to determine the limits and characteristics of vegetation communities. A field investigation of natural/semi-natural vegetation was conducted within the study area by LGL Limited on September 24, 29, 30 and October 1, 2010. Follow up investigations were also undertaken on May 12, July 11 to 13, August 18, September 9 and 16, 2011.

Vegetation communities were classified according to the *Ecological Land Classification for Southern Ontario: First Approximation and Its Application* (Lee *et al.* 1998). The community was sampled using a plotless method for the purpose of determining general composition and structure of vegetation. Plant species status was reviewed for Ontario (Oldham 1999), for Hamilton-Brantford (Riley 1989), Hamilton (Goodban 2003), Halton Region (Conservation Halton 2006) and for the Royal Botanical Garden (Smith 2003). Vascular plant nomenclature follows Newmaster *et al*. (1998) with a few exceptions that have been updated to Newmaster *et al.* (2005).

Designated Natural Areas
Based on a review of the OMNR Natural Heritage Information Centre, there are no Provincially Significant Wetlands (PSWs) or Areas of Natural and Scientific Interest (ANSIs) located within the project limits. However, immediately adjacent to the south limit of the project limits there is the Clappison Escarpment Woods ANSI and Environmentally Significant Area (ESA) and the Borer's Falls Rock Chappell ANSI and ESA. Both are located south east and south west respectively on the Niagara Escarpment (see previous Exhibit 3-2).

The City of Hamilton Urban Official Plan (OP) identifies regionally or locally significant natural heritage features. The following features are identified:

1) Borer's Creek is identified as a 'Key Natural Heritage and Key Hydrologic Feature Wetlands' on OP Schedule B4, 'Key Hydrologic Feature Streams' on Schedule B-8, and 'Core Area' of the Natural Heritage System on Schedule B;
2) a small wetland in the south-east quadrant is identified as a 'Key Natural Heritage and Key Hydrologic Feature Wetlands' on OP Schedule B4;
3) woodlands in the Niagara Escarpment just south of the study limits are designated as 'Local Natural Area Environmentally Significant Area' on OP Schedule B6 and 'Core Areas' of the Natural Heritage System on OP Schedule B;
4) woodlands north of Borer's Creek and east of Highway 6 are designated as 'Key Natural Heritage Feature Significant Woodlands' on OP Schedule B-2;
5) Borer's Falls Rock Chappell is identified as a Regional Life and Earth Science ANSI and ESA in the Hamilton Natural Areas Inventory (Dwyer 2003);
6) Clappison Escarpment Woods is identified as a Regional Life Science ANSI, a Provincial Earth Science ANSI and ESA in the Hamilton Natural Areas Inventory (Dwyer 2003); and,
7) Millgrove South Woodlot (Logie's Creek Swamp) is identified as an Environmentally Significant Area and locally significant wetland in the Hamilton Natural Areas Inventory (Dwyer 2003).

Vegetation Communities
Vegetation communities within the study area consist of a mixture of cultural, forest, and wetland communities. The study area is dominated by abandoned or active agricultural fields and manicured areas with planted trees and mown grass. In addition, the land adjacent to Highway 5 and Highway 6 within the study area has been cleared of original forest cover to accommodate agricultural, industrial and residential land uses. To the south east of the intersection at Clappison Corners there are a few large storm water drainage ponds associated with a former quarry.

Thirteen ELC vegetation community types were identified within the study area during LGL's botanical surveys. These community types include: Deciduous Forest (FOD), Dry- Fresh Sugar Maple- Basswood Deciduous Forest (FOD5-6), Fresh- Moist Lowland Deciduous Forest (FOD7a to c), Red Osier Mineral Thicket Swamp (SWT2-5), Common Reed Mineral Meadow Marsh (MAM2b), Reed-canary Grass Mineral Meadow Marsh (MAM2-2), Cattail Mineral Shallow Marsh (MAS2-1a to d), Dry- Moist Old Field Meadow (CUM1-1a to r), Bedrock Cultural Meadow Ecosite (CUM2), Deciduous Plantation (CUP1), Mineral Cultural Savannah (CUS1a and b), Mineral Cultural Thicket (CUT1) and Mineral Cultural Woodland (CUW1a to e). These vegetation communities are considered widespread and common in Ontario and secure globally (see Exhibit 3-2).

Flora
A total of 232 plant species have been recorded within the study area. Two of these plants could only be identified to genus and as such are not included in the following calculations. Of the 230 plants identified to species, 147 (64%) plant species identified are native to Ontario and 84 (36%) plant species are considered introduced and non-native to Ontario. A list of vascular plants is presented in the Summary of Environmental Conditions report and identifies which species are of provincial, regional and local concern.

Species at Risk
One butternut (Juglans cinerea) tree, which is regulated under the Ontario Endangered Species Act (ESA) and the Federal Species at Risk Act, was encountered within the deciduous forest (FOD7c) during LGL's botanical investigation. A 25 m buffer surrounding retainable butternut trees is required, and the limits of this buffer are presented on Exhibit 3-2. Since the impact zone of the project is not within, or close to, the 25 m buffer of the butternut tree, a permit under the Ontario Endangered Species Act is not likely to be required.

During the Class EA Study (2003), a specimen thought to be a Red Mulberry *(Morus rubra)* was identified at a location approximately 600 m south of Highway 5, east of Highway 6 (MTO 2003). Red Mulberry is regulated as 'Endangered' under the Ontario ESA and the Federal Species at Risk Act (SARA). An extensive survey was carried out as part of this study in suitable Red Mulberry habitat throughout the 2011 growing season. No Red Mulberry trees were found within the study area, but five populations of white X red mulberry hybrids (Morus alba X rubra) were found within or immediately adjacent to the study area. Hybrid red mulberry trees are not regulated as 'Threatened' or 'Endangered' under the ESA and as such, a permit for the removal of these trees is not required.

No additional plant species that are regulated under the Ontario ESA or the Federal SARA (plant species regulated as Special Concern, Threatened and Endangered), were encountered during LGL's botanical investigation within the study area.

3.2.4.1 Sensitivity / Significance

The vegetation communities within the study area are generally anthropogenic in origin. The southern edge of the study area is connected to natural lands along the Niagara Escarpment that contain higher quality vegetation communities. As such, the southern vegetation communities contain more significant flora than the remainder of the study area, which is primarily cultural in origin.

All of the vegetation communities identified within the study area are considered to be widespread and common in Ontario and secure globally. The Highway 5/6 Interchange has the potential to

impact vegetation communities directly adjacent to the existing highways, and at the intersection of the highways. The vegetation communities adjacent to the existing roads have a high proportion of non-native and invasive plant species. Overall, the plants, along the edges of these vegetation communities, are tolerant to disturbance and are able to recover quickly post disturbance.

The wetland and forest communities are considered to be more sensitive than the cultural vegetation communities identified within the study area. Strategies will be developed during detail design and construction to avoid/minimize impacts to wetland and forest features, including the removal of vegetation, to the extent possible.

During construction measures should be undertaken to avoid any species at risk, provincially rare plant species or locally significant plant species. The butternut tree, within the deciduous forest (FOD7c), will not be impacted by the proposed improvements, as no widening will occur adjacent to this forest edge. None of the species at risk or provincially rare species found in the Borer's Falls Rock Chappell ANSI and ESA or in the Clappison Escarpment Woodlot ANSI and ESA will be impacted by the proposed Highway 5/6 Interchange or the proposed municipal roads. The following vegetation communities contain rare plant species: FOD5-6, FOD7a, FOD7c, MAS2-1a, CUM1-1k, CUM1-1n, and CUS1b, and should be avoided, where possible.

Impacts to the Red Osier Mineral Thicket Swamp (SWT2-5) and Mineral Cultural Woodland (CUW1d and e) vegetation communities located in the northwest quadrant of the interchange have been minimized. There are no significant vegetation communities in the northeast or southwest quadrants of the interchange. In the southeast quadrant, the Fresh Moist Lowland Deciduous Forest (FOD7b and c) vegetation communities, as well as the butternut and its 25 m buffer, have been avoided.

The Clappison Escarpment Woods ANSI and ESA are located just southeast of the project limits and Borer's Falls Rock Chappell ANSI and ESA are located just south-west of the project limits. Both are located on the Niagara Escarpment and will not be impacted by the proposed Highway 5/6 Interchange or the proposed municipal roads. Millgrove Woodlot (Logie's Creek Swamp) ESA is located north of the study limits and will not be impacted by the proposed Highway 5/6 Interchange or the proposed municipal roads.

3.2.5 WILDLIFE AND WILDLIFE HABITAT

Information on Wildlife and Wildlife Habitat is reported in the **Summary of Environmental Conditions** report prepared by LGL Limited, dated April 2013.

Field investigations at the intersection of Highways 5 and Highway 6 were conducted on October 6, 2010, June 30, 2011, July 5, 2011 and June 14, 2012. Since field investigations were conducted outside the breeding bird window in 2010, follow up field investigations were conducted during the breeding bird window in 2011 and 2012. Prior to field investigations, secondary source data from the OMNR Natural Heritage Information Centre (NHIC) was reviewed to screen for the presence or absence of wildlife species at risk within or adjacent to the study area.

The study area consists of highly disturbed and human impacted lands. The majority of the study area is composed of commercial development, fallow field, and agricultural lands. This urban setting supports minimal natural heritage features, resulting in the presence of few wildlife species.

Wildlife and wildlife habitat was found to be distributed across the entire study area, however given the urban nature of the study area, natural heritage features were generally restricted to several areas. Borer's Creek and two other small watercourses comprise aquatic habitats for wildlife species within the lands examined. Aquatic habitats would be considered low to moderate quality for wildlife species. Riparian habitats and old field habitats provide the most conducive natural heritage features for wildlife. Agricultural lands found within the study area provide habitat for a limited number of wildlife species. Habitats in the study area are largely fragmented from

surrounding natural areas by the presence of roads and development. The wildlife species present are predominately considered urban or tolerant of human presence and disturbance.

Fauna

Based on field observations, 36 species of wildlife could be verified in the study area and the majority of these recordings came from mammalian signs or identification (through calls and sightings) of bird species. However, by comparing the natural heritage features found in the study area with secondary source information that describes wildlife previously recorded within this region, there is potential for a total of 63 wildlife species.

A total of 29 species of birds were observed in the study area during field investigations. Based on the habitat types present in the study area and secondary source information, an additional 20 species of birds are likely to inhabit the study area. Aquatic habitats such as creeks and ditches within the study area provide habitat for birds such as Mallard *(Anas platyrhynchos)* and Red-winged Blackbird *(Agelaius phoeniceus).* Old field meadow habitats provide features suitable to support bird species such as American Goldfinch *(Carduelis tristis)*, Black-capped Chickadee *(Poecile atricapiilla)* and Song Sparrow *(Melospiza melodia)*. Highly anthropogenic communities, such as manicured grass and agricultural lands, provide habitat for highly adaptable species such as European Starling *(Sturnus vulgaris)*, Ring-billed Gull *(Larus delawarensis)* and House Sparrow *(Passer domesticus)*.

A number of priority species for conservation were identified based on field observation or secondary source review, including Black-capped Chickadee, Savannah Sparrow *(Passerculus sandwichensis)*, and Eastern Kingbird *(Tyrannus tyrannus)*. Generally, these species are found within old field meadow habitats such as those found within the study area.

Five mammal species were directly observed or confirmed during field investigations in the study area, based on evidence from signs such as tracks, scats, and runways. These included: Meadow Vole *(Microtus pennsylvanicus)*; Eastern Cottontail *(Sylvilagus floridanus*); Gray Squirrel *(Sciurus carolinensis)*; American Mink *(Mustela vison;* and White-tailed Deer (*Odocoileus virginianus*)*.* Based on the habitat types present and secondary source information, five additional species are likely to inhabit the study area. The mammal species documented represent an assemblage that readily utilizes human influenced landscapes. No significant wildlife movement corridors were identified within the study area.

Two herpetofauna species, Green Frog *(Rana clamitans)* and Leopard Frog *(Rana pipiens)*, were observed in the study area during investigations. Based on the habitats present and secondary source information, an additional three species of herpetofauna are likely to inhabit the study area. Borer's Creek and associated riparian lands serve as habitat for frog species, such as the Green Frog and breeding habitat for American Toad *(Bufo americanus)*. Riparian vegetation provides habitat for terrestrial snake species, such as the Eastern Gartersnake *(Thamnophis sirtalis)*.

A summary of wildlife species documented in the study area during field investigations and through secondary source information is presented in the **Summary of Environmental Conditions** report.

Species at Risk

Background information indicated that two of the wildlife species recorded within the study area are regulated under the Ontario Endangered Species Act (ESA). Forty recorded species of bird are protected under the Migratory Birds Convention Act (MBCA) and two bird species are protected under the Fish and Wildlife Conservation Act (FWCA). Seven bird species found within the study area are recommended by Bird Studies Canada as priority species for conservation. Eight of ten species of mammal are offered protection under the FWCA.

The Ontario Ministry of Natural Resources (OMNR) provided input on species at risk in the study area on May 9, 2011. The OMNR indicated that the NHIC database should be used to screen for species at risk (see below for the results of the NHIC database search), but that the study area should also be screened for species at risk based on existing habitat and site conditions. A list of potential species at risk in the City of Hamilton was also provided.

Based on a review of the Natural Heritage Information Centre (NHIC), there are historic occurrence records of Timber Rattlesnake *(Crotalus horridus)* and Northern Bobwhite *(Colinus virginianus)*. The Timber Rattlesnake is regulated 'Extirpated' under the ESA and the Federal Species at Risk Act, while the Northern Bobwhite is ranked as 'Endangered' under both Acts. NHIC lists the last element occurrence of Timber Rattlesnake in 1950 and the last element occurrence of Northern Bobwhite in 1904. Historically, Timber Rattlesnake was found along the Niagara Escarpment but the species is considered extirpated from Ontario. The Ontario Breeding Bird Atlas (2007) does not have any records of Northern Bobwhite in the vicinity of the study area. It is LGL's professional opinion that habitat for Northern Bobwhite does not exist within or adjacent to the study area.

Preliminary evaluation of the study area revealed habitat suitable for several species at risk including Barn Swallow *(Hirundo rustica)*, Eastern Meadowlark *(Sturnella magna)*, and Bobolink *(Dolichonyx oryzivorus)*. Therefore, special focus was placed during the surveying of areas where these species could likely occur. This included the screening of features like culverts, bridges, old fields, and agricultural lands.

During the 2012 breeding bird survey, two species at risk were observed within the study area namely Barn Swallow *(Hirundo rustica)* and Chimney Swift *(Chaetura pelagica)*. The single pair of Chimney Swift noted above the ponds southeast of the Highway 5 and Highway 6 Intersection appeared to be passing overhead and did not seem to be actively using the area for breeding as there was a lack of suitable breeding requirements in the location where they were documented. The Barn Swallows, however, were noted in multiple areas throughout the site, including active nesting sites. These birds are listed as 'Threatened' under the Ontario Endangered Species Act and also by the federal COSEWIC. These aerial foragers were seen in areas south of the intersection along the edge of the study area, just east and directly adjacent to the intersection, and also north of the intersection in open spaces along Highway 6.

Two active Barn Swallow nests were found in a culvert approximately 520 m from the main intersection, and where Borer's Creek intersects Highway 6. This site had two active nests within old, broken lighting fixtures. The adults were observed feeding young and becoming agitated and giving anxiety calls. This nesting location also serves as a walking path for pedestrians and cyclists along the creek edge with the culvert being divided and the creek running on the opposite side of the nesting birds. There were also old, inactive swallow nests within most other lighting fixtures, likely indicating returning breeding Barn Swallows to that same area. In other areas that Barn Swallows were documented, they were primarily seen foraging above open areas such as manicured lawn, cultural meadows, marshes, and agricultural fields. They were also often in the company of other swallow species such as Cliff Swallow *(Petrochelidon pyrrhonota)* or Northern Rough-winged Swallow *(Stelgidopteryx serripennis)*.

3.2.5.1 Sensitivity / Significance

As a result of the proposed project, wildlife habitat will be removed. However, since the study area has been subject to extensive development, the effects of the proposed improvements on wildlife will be minimal. The majority of species residing in habitats within or directly adjacent to the ROW are tolerant of human disturbances. Existing habitat within or adjacent to the intersection should be preserved, to the extent possible, to minimize loss of wildlife habitat.

Two species at risk, Barn Swallow and Chimney Swift, are present within the study limits. Since Barn Swallow nests were documented in a culvert that is proposed for improvements, strategies will be developed to avoid removal of these nests if possible, and to minimize disruption and disturbance to these nests. Breeding habitat was not documented for Chimney Swift. Consultation

with the Ministry of Natural Resources was undertaken to determine requirements under the Ontario Endangered Species Act. On September 18, 2012 OMNR advised that provided the existing nests be removed outside the breeding bird season, and that replacement nests are installed prior to the start of the next breeding season (in accordance with the Letter of Advice for Barn Swallow, April 23, 2012), the project should not result in adverse effects to Barn Swallow. However, since the project is not currently scheduled for construction in the next five years, the OMNR must be contacted for updated advice when details regarding construction timing are available.

The most significant area of wildlife habitat and movement corridor within the study area (Borer's Creek and associated habitat) is set back far enough from any highway construction to have minimal, if any, deleterious effects on habitat function. No other significant corridors used by mammals or herpetofauna were documented within the study area. Works involving disturbance or obstruction to culvert openings may cause minor disturbance to movement of mammal and/or herpetofauna species, resulting in increased vehicle related mortalities. To the extent possible, culverts should not be restricted during construction. Emphasis should also be placed on minimizing movement restriction where natural habitat corridors are found on both sides of existing ROWs.

3.3 Social Environment

Information on Existing and Planned Land Use, Residences and Communities, Businesses, Community and Recreational Facilities, and Agriculture is reported in the **Summary of Environmental Conditions** report prepared by LGL Limited, dated April 2013.

3.3.1 EXISTING AND PLANNED LAND USE

The study area is located within the City of Hamilton urban area, and as such, the Urban Official Plan applies. However, since the Urban Official Plan has been appealed to the Ontario Municipal Board, this document is not yet in effect, and the former Town of Flamborough and Regional Municipality of Hamilton-Wentworth Official Plans currently apply to the study area. A summary of both these Official Plan policies are provided below.

The former Hamilton-Wentworth Official Plan identifies the study area as being located within the Niagara Escarpment Plan area and Parkway Belt West Plan area south of Highway 5, 'Business Park' at the intersection, and 'Rural' north of Parkside Drive (Hamilton Wentworth 2005). Refer to Exhibit 3-3 for land uses.

In the former Town of Flamborough Official Plan, the Secondary Plan for the Clappison Corners Industrial-Business Park (Amendment 1 to the former Town of Flamborough Official Plan) applies to the study area. The Secondary Plan outlines the policies intended to establish a prestige industrial-business park at Clappison's Corners with the following land use designations and permitted uses:

Prestige Industrial – Business
Manufacturing, processing, assembling, packaging, fabricating, warehousing and storage within wholly enclosed buildings; office space associated with an industrial-business activity; a business, professional, administrative office building; research and development facilities; hotel/motel; government service buildings such as fire halls and ambulance stations; exhibition and conference halls; and, public and private sports facilities.

Prestige Industrial – Commercial
Include the same uses as 'Prestige Industrial-Business', as well as wholesale and/or retail warehouses, home improvement, household furniture and/or appliance outlet and/or lawn and garden centre; financial institution, personal service shop, convenience store and restaurant, provided that the use serves businesses and employees of the business park and residents and the travelling public; and, an automobile service station and bar.

General – Industrial and Commercial
Manufacturing, processing, assembling, packaging, fabricating, repairing, construction, warehousing; office space associated with an industrial-business activity; limited retail sale of goods produced on the premises; public garages and body shops; product showroom and display centres; and operations such as structural steel and plate fabricating, lumber yards, cartage and transportation terminals, public utility installations, government uses and work yards.

Major Open Space
Sanitary sewerage trunk servicing; flood reduction and stormwater management; landscaped buffering strips; and active and/or passive recreational activities.

Minor Open Space
Landscaped buffering strips primarily associated with existing vegetation, ornamental landscaping areas produced in conjunction with development, preserved existing vegetation; minor open space is to vary in size from a minimum of 15 m to 30 m.

Special Treatment Areas
Intensive vegetation planting (trees and shrubs); visual screening, decorative walls, fencing and berms.

The limits of these land uses within the study area are presented in Schedule A-1 of the Flamborough Business Park Secondary Plan. The policies of this Secondary Plan apply to the study area, until the City of Hamilton Urban Official Plan is in effect.

City of Hamilton Urban Official Plan
The study area is located within the 'urban area' of the City of Hamilton. The Urban Official Plan was approved with modifications by the Ministry of Municipal Affairs and Housing in March 2011. This Official Plan designates the lands east of Highway 6 as 'District Commercial', Borer's Creek and Watercourse 2 (North Cootes Paradise Tributary 1) as 'Open Space' and the remaining lands as 'Business Park'. A description of each land use designation is provided below:

- *District Commercial* – areas are to provide a range of retail stores and services that cater to weekly and daily shopping needs for residents. This designation applies to the lands formerly part of the Clappison Corners Secondary Plan.
- *Open Space* – includes public or private areas where the predominant use of or function of the land is for recreational activities, conservation management and other open spaces. This designation applies to areas with a size of 4 hectares (ha) or greater. The designation also includes parkland, which is defined as containing both active and passive recreational uses, community/recreational facilities and other open space uses. In the study area, two watercourses (described above) are designated as open space.
- *Business Park* – includes an array of employment uses that are compatible with the design policies for business parks. Generally, these areas are well served by the road network and are more able to accommodate buffering from sensitive land uses.

Development within each of these land use designations should be in conformity with the policies of the Urban Official Plan.

The lands east of Highway 6 within the study area are also subject to Flamborough Area Specific Policies (Volume 3, Chapter B). These policies provide site specific details on the requirements for development within this area.

Provincial Policies
The Transportation Environmental Study report (2003) indicates that the study area also contains lands subject to the policies of the Parkway Belt West Plan and Niagara Escarpment Plan. The Greenbelt Plan came into effect in 2005.

- *Parkway Belt West Plan* – In 2008, the Ministry of Municipal Affairs and Housing undertook a review to consolidate the amendments that have been made to the Plan area, in order to provide updated mapping of the Parkway Belt West Plan boundary. Based on a review of this revised Plan boundary, it was confirmed that the study area does not contain lands subject to the Parkway Belt West Plan (MMAH 2008). Mapping is available on the Ministry of Municipal Affairs website.
- *Greenbelt Plan* – The study limits are located within the Greenbelt Plan, which is comprised of three main areas, the Greenbelt 'Protected Countryside', Niagara Escarpment Plan area and Oak Ridges Moraine Conservation Plan area. Lands that are designated as 'Protected Countryside' are subject to the policies of the Greenbelt Plan, while the Niagara Escarpment Plan and Oak Ridges Moraine Conservation Plan applies to their respective plan areas. Based on a review of Greenbelt Plan mapping, the study limits are located within the Niagara Escarpment Plan area and Greenbelt Plan 'Protected Countryside', and as such, the policies of both plans apply (see Exhibit 3-3).

  Section 4 of the Greenbelt Plan provides general policies for the Protected Countryside designation. The Greenbelt Plan states in section 4.2.1 (General Infrastructure Policies) that existing, expanded or new infrastructure subject to and approved under the *Canadian Environmental Assessment Act* or the Ontario *Environmental Assessment Act* is permitted within the Protected Countryside, subject to the policies of this section and provided it meets one of these two objectives:

  a) It supports agriculture, recreation and tourism, rural settlement areas, resource use or the rural economic activity that exists and is permitted within the Greenbelt; or

  b) It serves the significant growth and economic development expected in southern Ontario beyond the Greenbelt by providing the appropriate infrastructure connections among urban growth centres and between these centres and Ontario's borders.

  Section 4.2.1.2 of the Greenbelt Plan also states that the location and construction of infrastructure and expansions, extensions, operations and maintenance of infrastructure in the Protected Countryside are subject to the following:

  a) Planning, design and construction practices shall minimize, wherever possible, the amount of the Greenbelt, and particularly the Natural Heritage System, traversed and/or occupied by such infrastructure;

  b) Planning, design and construction practices shall minimize, wherever possible, the negative impacts and disturbance of the existing landscape, including, but not limited to, impacts caused by light intrusion, noise and road salt;

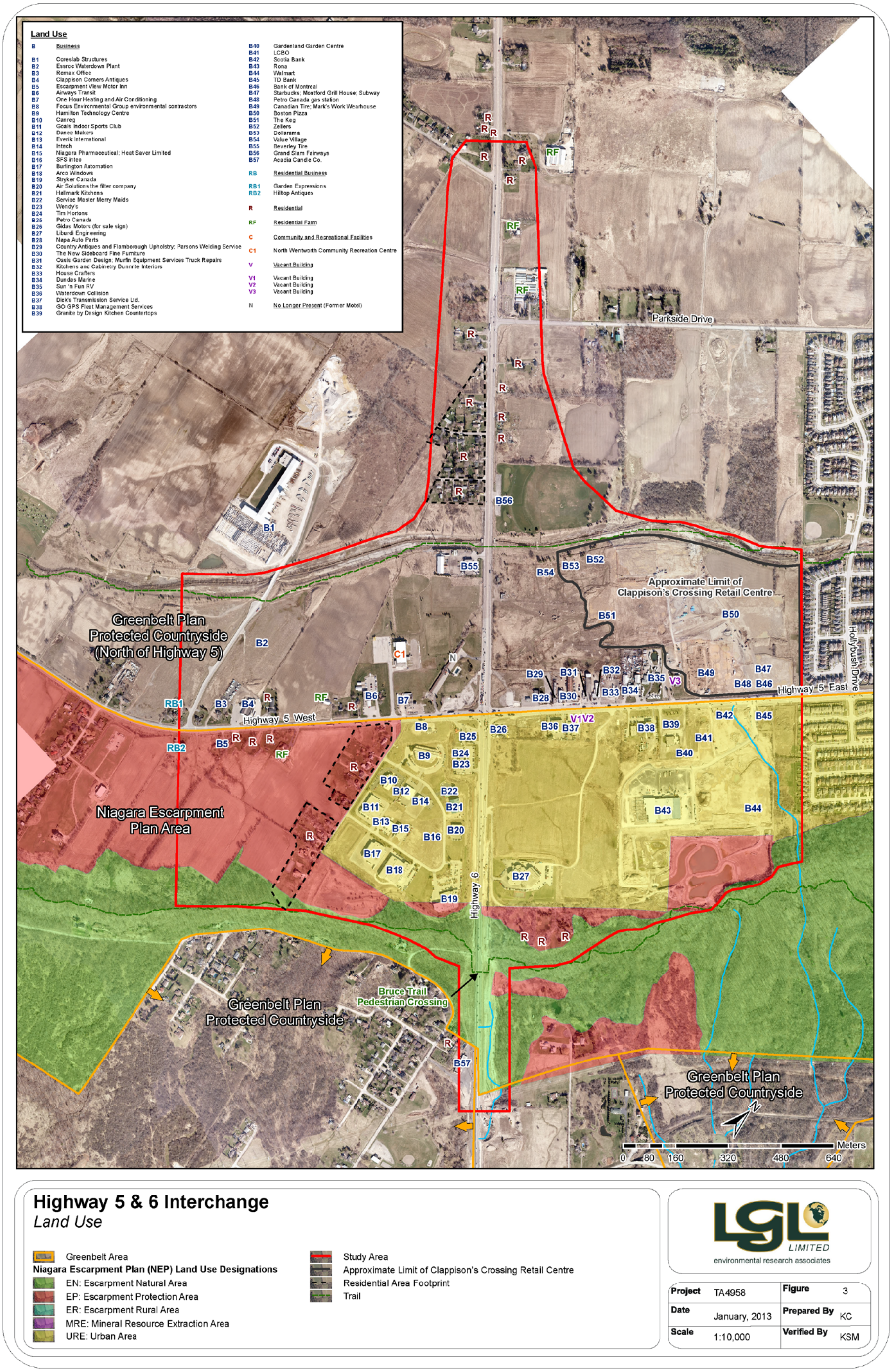
  c) Where practicable, existing capacity and coordination with different infrastructure services is optimized so that the rural and existing character of the Protected Countryside and the overall urban structure for southern Ontario established by the Greenbelt and any provincial growth management initiatives are supported and reinforced;

  d) New or expanding infrastructure shall avoid key natural heritage features or key hydrological features unless need has been demonstrated and it has been established that there is no reasonable alternative; and,

  e) Where infrastructure does cross the Natural Heritage System or intrude into or result in the loss of a key natural heritage feature or key hydrological feature, including related landform features, planning, design and construction practices shall minimize negative impacts and disturbance on the features or their related functions, and where reasonable, maintain or improve connectivity.

  The Highway 5/6 Interchange is needed to address the second criteria under Section 4.2.1 of the Greenbelt Plan, as it will serve significant economic growth that is projected for the area. The planning, design and construction practices described above have been considered in this preliminary design study and will be considered by the study team during detail design.

Exhibit 3-3 Land Use



- *Niagara Escarpment Plan* – The purpose of the Niagara Escarpment Plan is to "provide for the maintenance of the Niagara Escarpment and land in its vicinity substantially as continuous natural environment, and to ensure only such development occurs as is compatible with that natural environment" (NEC 2012). The Plan identifies seven land use designations to implement the goal and objectives of the plan: Escarpment Natural Area, Escarpment Protection Area, Escarpment Rural Area, Minor Urban Area, Urban Area, Escarpment Recreation Area, and Mineral Resource Extraction Area.

  All of the lands south of Highway 5 within the study limits are located within the Niagara Escarpment Plan area. Within this area, lands east of South Drive are designated as 'Urban Area' and lands west of South Drive are designated as 'Escarpment Protection Area'. In addition, the lands along the Niagara Escarpment feature are designated as 'Escarpment Natural Area'. Exhibit 3-3 presents the limits of the Niagara Escarpment Plan area.

  The majority of the Niagara Escarpment Plan lands within the study limits are designated as 'Urban Area'. Permitted uses within this area include: new uses and the creation of new lots subject to conformity with Part 2 (Development Criteria) of the Plan, the 'Urban Area' development objectives, and zoning by-laws that are not in conflict with the Niagara Escarpment Plan. An amendment to the Plan is not required for changes to permitted uses, expansions and alterations of existing uses or the creation of new lots within the 'Urban Area' land use designation.

  The lands designated as 'Escarpment Protection Area' contain rural land uses such as residences, residential business and residential farming operations. The Niagara Escarpment Plan identifies these areas as being important due to their visual prominence and environmental significance. These areas are also often modified by land use activities, and serve as a buffer for significant Escarpment Natural Areas. Subject to Part 2 (Development Criteria) of the Plan, transportation and utility land uses are permitted within this land use designation. However, it is noted that only linear facilities are permitted within prime agricultural areas and specialty crop areas.

  The south limit of the study area along the brow of the escarpment is designated as 'Escarpment Natural Area'. Given the sensitivity of the escarpment natural features, only essential transportation and utility facilities are permitted within the 'Escarpment Natural Area'.

  The Niagara Escarpment Plan indicates that new and reconstructed transportation and utility facilities must be designed and located to minimize impact on the Escarpment environment and be consistent with the objectives of the Plan. New transportation and utility facilities should avoid Escarpment Natural Areas, prime agricultural and specialty crop areas. Site and design guidelines are provided, including:

  a) Minimize blasting, grading and tree removal through alignment selection;
  b) Maximize utilization of curbs and gutters, retaining walls and tree wells;
  c) Slopes should be graded to a 2:1 slope minimum and planted;
  d) Site rehabilitation should include native species of vegetation and blend into the surrounding landscape;
  e) Apply the use of vegetation screenings where appropriate;
  f) Design the transportation or utility facility to minimize visual impact; and,
  g) Minimize impacts on parks and open space, and the Bruce Trail.

  Consideration of the above policies has been taken into account during the development and selection of the municipal road alternatives, and will be considered during the completion of the Highway 5/6 Interchange detail design.

Status of Current Development Applications
The City of Hamilton has provided continual development planning information for the study area during the TESR Addendum preparation. This included the status of development applications within the study area. The purpose of this information is to determine the type and scale of proposed development that may be impacted by the planned Highway 5/6 Interchange construction. The status of development applications have been considered throughout this study.

3.3.1.1 Sensitivity / Significance

The primary concern with respect to existing and planned land use within the study area will be to ensure that the proposed highway improvements conform to the planned land use designations prescribed under the official plans for the City of Hamilton and the policies of the Niagara Escarpment Plan and Greenbelt Plan. It will also be important for the design of the interchange to maintain access to businesses where possible, and to coordinate the municipal road network with ongoing development applications. With the exception of natural areas (e.g., Niagara Escarpment), land use within and adjacent to the study area is generally compatible with highway development. Strategies will be developed to minimize or avoid impacts of construction in environmentally sensitive areas, particularly within the 'Escarpment Natural Area' or Greenbelt Plan 'Natural Heritage System'.

3.3.2 RESIDENCES AND COMMUNITIES

The community of Flamborough is located at the north-east end of the City of Hamilton, bordering the City of Burlington. Based on a review of the Canadian Census (2006), the area surrounding the existing Highway 5 and Highway 6 Intersection has a population of approximately 7,700 persons.

The intersection of Highway 5 and Highway 6 is located within the Flamborough Business Park, and therefore contains a number of industrial and commercial business land uses (see Exhibit 3-3). Residences are located in small clusters within the study area. West of the intersection, residences are located in close proximity to business/industrial land uses. For example, the west side of South Drive is lined with single family residential dwellings while the east side of South Drive consists of industrial facilities. Further west of South Drive, residences are located directly adjacent to Highway 5 on the south side.

North of the intersection, a number of residential dwellings are located adjacent to Highway 6 especially on the west side on Woodsworth and Garwood Avenue. East of the intersection consists of commercial and industrial businesses until the Clappison Corners Plaza at Clappison Avenue after which are a series of residential subdivisions.

The only residences located at the south limit of the study area are three homes off Mountain Brow Road in the City of Burlington close to the Niagara Escarpment. These residential properties and the adjacent business require a new access from Dundas Street East since the existing Highway 6 northbound right-in/right-out access will be closed as part of the highway improvements.

3.3.2.1 Sensitivity / Significance

Since residences and residential businesses are located along Highways 5 and 6 within the study area, there is potential for these residences to be impacted by the footprint of the new interchange and municipal roads, as well as additional traffic volumes during construction activities. Strategies and plans will be developed to minimize impacts to the residences and residential businesses. Potential impacts during construction activity include temporary noise, and pollutant emissions. During construction, strategies will be developed to minimize traffic delays, construction noise and the emission of pollutants.

3.3.3 BUSINESSES

Businesses in the study area were identified as businesses or residential businesses. The following rationale was used to determine the appropriate grouping for a business:

- Properties with a building structure and a business sign were classified as businesses; and,
- Properties with a dwelling unit and a business sign were classified as residential businesses.

The study area is located in an area designated as 'Business Park', which supports a range of commercial, industrial and other associated land uses.

The study area is also designated as 'District Commercial' east of Highway 6, between Borer's Creek and north of the Niagara Escarpment. Land uses within this designation are intended to provide retail and service commercial uses to the immediate neighbourhood (e.g., daily and weekly shopping needs of nearby residents).

There are approximately 64 businesses located within the study area, including 37 commercial businesses, 25 industrial businesses, and 2 residential businesses. A summary is presented in the following Exhibit 3-4, including the reference code (e.g., B1) for the location of each business as shown in Exhibit 3-3.

Exhibit 3-4 Summary of Businesses Located Within the Study Area

Commercial Businesses		**Industrial Businesses**		**Residential Business**	
B3	Remax Office	B1	Coreslab Structures	RB1	Hilltop Antiques
B4	Clappison Corners Antiques	B2	Essroc Waterdown Plant	RB2	Garden Expressions
B5	Escarpment View Motor Inn	B6	Airways Transit		
B11	Goals Indoor Sports Club	B7	One Hour Heating and Air Conditioning		
B12	Dance Makers	B8	Focus Environmental Group environmental contractors		
B22	Service Master Merry Maids	B9	Hamilton Technology Centre		
B23	Wendy's	B10	Canreg		
B24	Tim Horton's	B13	Everik International		
B25	Petro Canada	B14	Intech		
B27	Liburdi Engineering	B15	Niagara Pharmaceutical		
B29	Country Antiques and Flamborough Upholstery	B15	Heat Saver Limited		
B30	The New Sideboard Fine Furniture	B16	SFS intec		
B31	Oasis Garden Design	B17	Burlington Automation		
B32	Kitchens and Cabinetry Dunnrite Interiors	B18	Arco Windows		
B33	House Crafters	B19	Stryker Canada		
B34	Dundas Marine	B20	Air Solutions the filter company		
B35	Sun 'n Fun RV	B21	Hallmark Kitchens		
B39	Granite by Design Kitchen Countertops	B26	Gidas Motors (for sale sign)		
B40	Gardenland Garden Centre	B28	Napa Auto Parts		

Commercial Businesses			**Industrial Businesses**			**Residential Business**	
B41 -54	Clappison Crossing Retail Centre: LCBO; Scotia Bank; Walmart; Rona; TD Bank; Canadian Tire; Mark's Work Wearhouse; Petro Canada gas station; Bank of Montreal; Starbucks; Montford Grill House; Subway; Boston Pizza; The Keg; Zellers; Dollarama; and Value Village.		B29	Parsons Welding Service			
			B31	Murfin Equipment Services Truck Repairs			
			B36	Waterdown Collision			
			B37	Dick's Transmission Service Ltd.			
			B28	GO GPS Fleet Management Services			
B56	Grand Slam Fairways		B55	Beverley Tire			
Total Commercial Businesses		**37**	***Total Industrial Businesses***		**25**	***Total Residential Businesses***	**2**

Businesses within the study area are concentrated in a number of clusters. A number of businesses that are low to medium rise and are accessed directly from the highway are located along Highway 5 East and cater to the industrial sector, providing motor vehicle repairs, equipment, garden supplies, antiques, fleet management services and related services.

The Clappison Crossing Retail Centre is a new big-box development further east of the intersection of Highway 5 and Highway 6 on both the north and south sides of the highway. This development is underway, as some buildings that are not visible on the study's aerial photography were under construction during the site visit. This centre provides goods and services to the local community, including: hardware and lumber, banking, food (restaurants), and department/retail store products.

In the southwest quadrant, a business park is accessed from Highway 5 on South Drive. The types of services that these businesses provide include: research and technology, pharmaceutical, consulting, manufacturing (metal fabrication, kitchens, medical supplies, roofing), distributors, cleaning services and an online publishing company. In addition, Wendy's, Tim Horton's and Petro Canada are directly accessed from Highway 6 at the southwest quadrant.

To the west of the intersection of Highway 5 and Highway 6 are individual businesses that are accessed directly from Highway 5. These include: auto services, real estate services, antique and garden suppliers, and a motel. Also accessed from this section of Highway 5 are a number of heavy industrial businesses that manufacture pre-cast concrete structures and materials, including: the Coreslab Structures plant and Essroc Waterdown Plant. There are also two businesses on Highway 6 north of Highway 5 that have direct highway access.

Given the changes in land use within the study area, there are some buildings that have signs of being inactive (e.g., boarded up windows). These buildings have been noted on Exhibit 3-3 as 'vacant/no longer present'. The northwest quadrant used to be the site of a motel, which has been removed. This is also noted as 'vacant/no longer present' on Exhibit 3-3.

3.3.3.1 Sensitivity / Significance

Considering the location of the businesses located within the study area, there is potential for these businesses to be impacted by reductions in access, loss of property or additional disturbance (e.g., noise, dust) associated with the interchange ramps. Businesses may also be impacted during construction. However, strategies will be developed to minimize impacts to businesses. Potential impacts during construction periods include temporary noise, and pollutant emissions. During construction, strategies will be developed to minimize traffic delays, construction noise and the emission of pollutants.

3.3.4 COMMUNITY AND RECREATIONAL FACILITIES

There is one community/recreational facility within the NW Quadrant of the study area constructed since completion of the 2003 TESR, namely the North Wentworth Arena. Currently, this arena complex is accessed from Highway 5 using a temporary access road. A new access will be provided for this facility as part of the interchange design.

School Boards and Municipal Service Providers
The Hamilton-Wentworth Student Transportation Services and Halton Student Transportation Services provide student transportation services for the following school boards: Hamilton-Wentworth District School Board, Hamilton-Wentworth Catholic District School Board, Halton District School Board, Halton Catholic District School Board, Le conseil scolaire de district Catholique Centre-Sud, and Le conseil scolaire du district du Centre Sud-Ouest. Several of these school boards have school bus routes within the study area, including school bus routes that use Highway 5 and Highway 6.

Hamilton Emergency Services, which includes Hamilton Fire Services and Hamilton Emergency Medical Services (EMS), also use the Highway 5 and Highway 6 intersection as a main point of access to and from emergencies in the area and to rapidly transport injured persons to a hospital.

The study area is close to the municipal border with the Regional Municipality of Halton. As a result, Halton EMS vehicles sometimes use Highways 5 and 6 to access emergencies near the municipal border. Halton EMS vehicles are also occasionally dispatched to this area of Hamilton if no Hamilton EMS vehicle is available. In these cases, the Halton EMS vehicle would likely use Highway 5 and Highway 6.

Similarly, Highway 5 and Highway 6 are generally used as a route for police and other municipal service providers to travel to and from communities in the City of Hamilton (e.g., between the community of Waterdown and downtown Hamilton).

Recreational Facilities
While there are no Ontario Federation of Snowmobile Club designated trails within the study area, there are unofficial trails that may be used within the study area, along Borer's Creek. In a customized Google Map, an unofficial snowmobile trail is recorded and is noted as being heavily used (Google Maps 2009). This area is also used as a pedestrian trail, along the bank of Borer's Creek, providing a west-east trail connection. The trail goes through a concrete culvert under Highway 6.

The Bruce Trail is located along the Niagara Escarpment, and crosses Highway 6 through a concrete box culvert, accessible by stairs on either side. This culvert crossing connects pedestrians across the brow of the escarpment.

3.3.4.1 Sensitivity / Significance

One of the key community facilities within the study area is the North Wentworth Arena. The detail design should consider options to reduce impacts to access and use of this facility. Consideration of the effect of highway and municipal road improvements on local trails should also be considered during detail design. During construction, the primary concern with respect to the community and recreational facilities in the study area will be maintaining access and reducing traffic delays during construction periods. During construction, access should be maintained at all times for emergency service providers however details of this will be confirmed during the detail design phase of the project. Strategies will be developed to minimize impacts during construction periods including traffic delays, construction noise and the emission of pollutants.

3.3.5 AESTHETICS, EXISTING VEGETATION AND LANDSCAPE PLANTING

An **Existing Landscape/Aesthetics Assessment** report was prepared by McWilliam & Associates, dated May 08, 2013, and presents a description of the results of the existing landscape assessment. The natural/cultural landscape is a mix of agricultural fields, rural residences, commercial and industrial development, and vacant lands. Views are typically limited to the immediate area, however there are extensive views to the south down the Highway 6 escarpment 'cut' over the City of Hamilton basin. The report recommends that a landscaping planting plan be prepared to mitigate the loss of existing vegetation.

3.3.6 AGRICULTURE

According to the Canada Land Inventory for Agricultural Land Capability, the study area is dominated by Class 1 soils, with a small linear area of Class 3 soils along Borer's Creek, and Class 6 and 7 soils along the Escarpment. Class 1 soils are defined as having no significant limitations for crop production. Soil capability Classes 1 to 3 are considered prime agricultural lands and should be avoided where possible. However, it should be noted that some of the areas identified as Class 1 or 3 are now developed, reducing the total area of prime agricultural land within the study area. In addition, the preliminary design of the Highway 5/6 Interchange was determined during the 2003 Class EA study, during which a number of alternative interchange configurations were assessed.

A total of five active residential farms are located within the study limits. Farming activities include but are not limited to: crop farming, greenhouse operations, and specialist farming (mushroom cultivation). Two of these farms are located on Highway 5, and are within proximity to the interchange. There is potential for these agricultural operations to be impacted by the proposed municipal road alternatives, or by widening of Highway 5 to accommodate the interchange ramps. The remaining residential farms are located at the northerly limit of the study area, and will not be displaced by the proposed interchange and/or associated municipal roads. Any potential impacts will be limited to minor widening of Highway 6. No municipal road alternatives have been proposed in the vicinity of these farms. However, one municipal road (Street 'A') is proposed to cross one property that is currently farmed. This property is immediately adjacent to the urban boundary of the City of Hamilton (west of the Highway 5/6 intersection). Given that the majority of the study area is designated as 'Business Park' or 'District Commercial' in the City of Hamilton Urban Official Plan, the farms directly within the study area will likely face increasing pressures for development. During detail design, consideration will be given to refining the current proposal to the extent possible to limit impact on this property. All lands that will be directly impacted by construction works are within the current urban development area of the city of Hamilton, with the exception of the lands through which Street 'A' is proposed.

Since the study area is located at the fringe of the urban area, there are a number of agricultural operations in the larger area. As such, minimizing temporary impacts during construction (e.g., traffic delays, access restrictions) will be considered during the detail design phase of the project.

3.3.6.1 Sensitivity / Significance

Given the presence of agricultural operations in the study area, consideration was given to reducing impact to prime agricultural lands (Classes 1 to 3) during the evaluation of municipal road alternatives. Although the interchange design was determined during the 2003 Class EA Study, opportunities to refine the design of the interchange to minimize impacts to prime agricultural lands were considered, where feasible. During construction, the primary concern with respect to agriculture will be reducing traffic delays and maintaining access to agricultural fields during construction periods. Construction activities should be staged to avoid/minimize traffic delays to agricultural related traffic travelling through the study area and to maintain access to agricultural fields at all times, to the extent possible.

3.3.7 PROPERTY WASTE AND CONTAMINATION

A **Contamination Overview Study** was prepared for the study area by Golder Associates, dated March 2013. Based on this preliminary assessment there are approximately fifty-three (53) properties within the study area with issues of potential environmental concern. An additional six (6) properties in the study area are former orchards and may have issues of potential environmental concern.

Some of the properties in the study area require further assessment to determine whether subsurface investigations are warranted. Such assessment could include Preliminary Site Screening (PSS) and, if determined necessary through the completion of the PSS, completion of a Phase I Environmental Site Assessment (ESA). Some of the properties could require subsurface environmental investigations to determine if soil and/or groundwater impacts exist. This investigation could consist of the completion of Phase I and/or Phase II ESAs.

Eleven (11) registered spills have also been documented within the study area.

3.3.8 ENVIRONMENTAL NOISE

A Noise Impact Assessment of the study area was prepared by Valcoustics Canada Limited, dated February 25, 2013. Noise mitigation measures need to be considered for projects where the predicted sound exposure change due to the undertaking is 5 dBA or greater, or the predicted future sound exposure with the proposed undertaking is 65 dBA or greater.

Land uses designated as noise sensitive areas (NSAs) by MTO consist of residential developments (owned or rented single family homes, townhouses or multiple unit buildings), hospitals and nursing/retirement homes. Exhibit 3-5 identifies the 30 receptor locations (identified as R1 to R30) which were analyzed in detail as part of the noise impact assessment. These residential dwellings are representative of the NSAs within the study area, in accordance with the MTO Environmental Guide for Noise (October 2006, version 1.1 July 2008).

Where the predicted sound exposure change is less than 5 dBA and the future sound exposure is less than 65 dBA, noise mitigation is not required and further consideration of mitigation is not needed. The MTO Environmental Guide for Noise (October 2006, version 1.1 July 2008) requires an initial screening assessment at the most exposed side of the dwelling at receptor locations. However, mitigation is only required if the above criteria are exceeded in the Outdoor Living Area (OLA) of the receptor locations.

Noise effects and proposed mitigation are further discussed in Section 6.7.3.

3.3.9 AIR QUALITY

An **Air Quality Impact Assessment** report was prepared by SENES Consultants Ltd., dated May 2013 to establish the air quality effects that may arise due to the proposed Highway 5/6 Interchange. Vehicular traffic produces a variety of air contaminants because of fuel combustion inside the engine, evaporation of fuel from the tank, brake and tire wear, and re-suspension (also known as re-entrainment) of loose particles on the road surface (silt) as the vehicle travels over the road surface. The selected contaminants of interest include nitrogen dioxide (NO_2), carbon monoxide (CO), Total Suspended Particulate (TSP), particulate matter (PM_{10} and $PM_{2.5}$), key volatile organic compounds (benzene, 1,3-butadiene, formaldehyde, acetaldehyde and acrolein), and Greenhouse Gases including carbon dioxide (CO_2), nitrous oxide (N_2O) and methane (CH_4).

The Ontario Ministry of the Environment (MOE) measures air contaminants at various locations throughout Ontario, and reports data on an annual basis. To assess the current air quality in the study area, historical air quality monitoring data from three MOE monitoring stations near the study area were considered, including recent measurement history (2007 to 2011) at the Burlington (MOE 44008), Hamilton Downtown (MOE 29000) and Hamilton West (MOE 29118) monitoring locations.

Environment Canada operates the National Air Pollution Surveillance (NAPS) Network which measures various VOCs in addition to other common air contaminants. To assess the current air quality in the study area, the most recently available monitoring data from the closest NAPS stations were considered and the most recent available data for 1,3-butadiene and benzene were obtained from the NAPS Hamilton Downtown Station (60512). Acetaldehyde, acrolein and formaldehyde are not monitored at the Hamilton Downtown station, but were monitored during the period 2002-2006 at the NAPS Toronto station (60418) located approximately 55 kilometres northeast of the study area.

Air quality effects and proposed mitigation are further discussed in Section 6.7.3.

3.4 Cultural Environment

3.4.1 ARCHAEOLOGY

A **Stage 1 Archaeological Assessment: Stage 1 Background Study and Property Inspection** report was prepared by Archaeological Services Inc., dated January 12, 2012 to review the archaeological potential in the study area. Background research on existing conditions determined that 10 archaeological sites are registered within one kilometre of the study area, and that potential for identification of archaeological sites exists. However, portions of the study area are heavily disturbed, while other portions have archaeological potential and require a Stage 2 Archaeological Assessment to be completed during the detail design phase of the project.

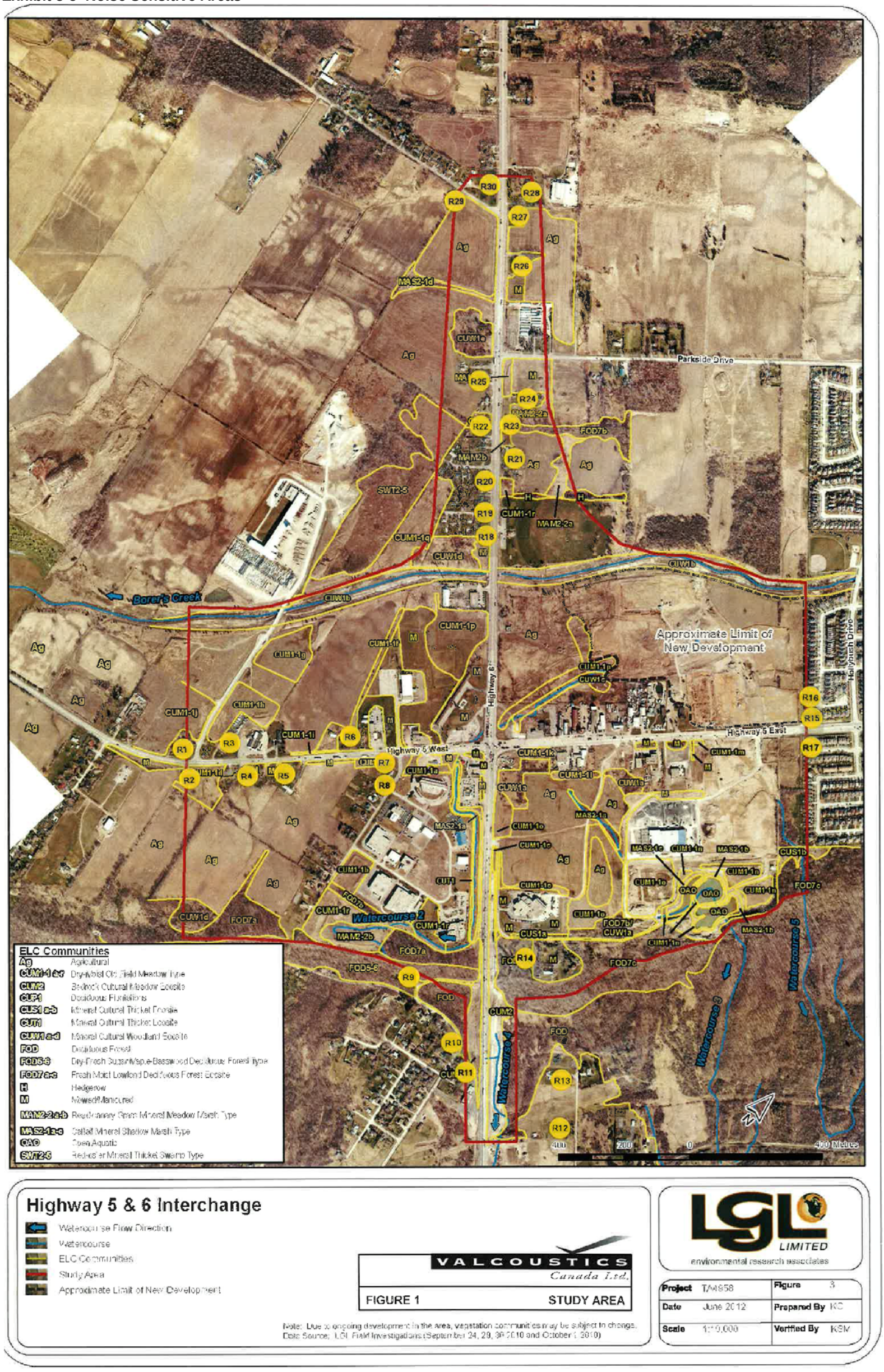
3.4.2 BUILT HERITAGE AND CULTURAL HERITAGE LANDSCAPES

The **Cultural Heritage Assessment** report: **Built Heritage Resources and Cultural Heritage Landscapes** was prepared by Archeological Services Inc., dated January 2013 and presents a detailed description of the results of the built heritage and cultural heritage landscape assessment. The following provides a summary of the existing conditions.

- A total of two (2) built heritage resources and two (2) cultural heritage landscapes were identified including an auto repair shop (BHR 1), a dwelling (BHR 2), and two farm complexes (CHL 1 and CHL 2); and
- None of the identified cultural heritage resources are designated under Part IV or V of the *Ontario Heritage Act*, nor are any listed on the City of Hamilton's *Inventory of Buildings of Architectural and/or Historical Interest.*

Potential impacts to built heritage resources and cultural heritage landscapes are discussed in Section 6.13.2.

Exhibit 3-5 Noise Sensitive Areas



Highway 5 & 6 Interchange

- Watercourse Flow Direction
- Watercourse
- ELC Communities
- Study Area
- Approximate Limit of New Development

VALCOUSTICS Canada Ltd.

FIGURE 1 STUDY AREA

Note: Due to ongoing development in the area, vegetation communities may be subject to change.
Data Source: LGL Field Investigations (September 24, 29, 30 2010 and October 1, 2010)

LGL LIMITED environmental research associates

Project	TAS58	**Figure**	3
Date	June 2012	**Prepared By**	KC
Scale	1:10,000	**Verified By**	KSM

4. PROPOSED PRELIMINARY DESIGN CHANGES / RESULTS OF FIVE-YEAR TESR REVIEW

The following section summarizes the preliminary design changes being proposed in this TESR Addendum and the reason for these changes, as well as the associated impacts and the expected significance of these changes. **Appendix 1** of this document includes the associated preliminary design plans.

4.1 Summary of Proposed Preliminary Design Changes

DESCRIPTION / REASON FOR CHANGE	IMPACT / SIGNIFICANCE OF CHANGE
1. Changes to Major Highway Pavement Layout and Structural Design and Related Mitigation Commitments in the 2003 TESR	
1.1 Extension of the third northbound (truck climbing) lane from the northbound S-E/W ramp bullnose to north of Parkside Drive to eliminate traffic weaving concern relating to the speed difference between automobiles and trucks on the hill. On the escarpment incline, a fourth northbound lane would be provided for the northbound S-E/W ramp.	Additional property required on east side of Highway 6. Limit of construction extended north by approximately 300m. Increased Highway 6 opening width at the Highway 5/Dundas Street East underpass structure. Increased underpass structure width and Grindstone Creek Tributary 4 culvert lengths. Additional headwall requirement at Borer's Creek.
1.2 Preliminary design of a future third Highway 6 southbound lane through the project limits is included in this TESR Addendum for EA approval. Detail design of this third lane is currently planned to be completed under a future detail design study separate from the detail design study for the remainder of the interchange and municipal road network. It is currently proposed that the detail design study for the interchange will accommodate the third southbound lane by positioning the ramp geometry to minimize future construction, increasing the underpass structure opening to accommodate the future additional lane, designing the culvert headwalls/lengths at Borer's Creek and Grindstone Creek Tributary 4 (labeled as Watercourse 2 on Exhibit 3-2) for the future third southbound lane, and associated property requirements. Traffic projections currently indicate this will be warranted to accommodate future volumes	Additional property required on west side of Highway 6. Increased Highway 6 opening width at the Highway 5/Dundas Street East underpass structure. Increased underpass structure width and Grindstone Creek Tributary 4 culvert lengths. Additional headwall requirement at Borer's Creek.

DESCRIPTION / REASON FOR CHANGE	IMPACT / SIGNIFICANCE OF CHANGE
by 2031.	
1.3 Highway 6 realignment shift to the east reduced by approximately 20 m compared to the 2003 preliminary design, to minimize impacts on the Niagara Escarpment crossing, and to maximize use of existing pavement.	Reduces original impact on the Niagara Escarpment compared to the 2003 preliminary design and maximizes the use of existing pavement, thereby reducing cost, environmental impacts and property requirement for the northbound S-E/W ramp.
1.4 Add a third through/left turn lane to the southbound N-E/W ramp terminal.	Accommodates updated traffic volumes. Impact is minor.
1.5 Add sidewalks and on-street bike lanes to Dundas Street East / Highway 5 within the project limits.	Supports the use of environmentally friendly alternative modes of transportation, and City of Hamilton active transportation plans and policies. Impact is minor.
1.6 Widen Dundas Street East from four (4) to six (6) lanes east of Highway 6 to Clappison Avenue, and Highway 5 west of Highway 6 to serve forecasted traffic and turning movement volumes in the vicinity of the new Highway 5/6 Interchange.	Additional property requirement on north side of Dundas Street East.
1.7 Widen Highway 5 west of Highway 6 to four (4) lanes plus turn lanes, sidewalks and on-street bike lanes to the mid-point between Coreslab Drive and the new Street 'A' and Street 'B' intersection.	Additional property required from north and south sides of Highway 5 with minor impacts on remaining property.
1.8 Make improvements to the Parkside Drive leg of the Highway 6 / Parkside Drive intersection.	Additional property required from north and south sides of Parkside Drive with very minor impacts on the abutting properties.
1.9 Add the future third southbound and northbound lanes to Highway 6.	Requires modifications to existing Highway 6 twin cell Borer's Creek culvert crossing and single cell culvert located approximately nine (9) m to the south.
1.10 Addition of turn lanes on Highway 5 at the intersection of the N-E/W ramp terminal and commercial access road to the south for new commercial access, and on Dundas Street East at the intersection of the northbound S-E/W ramp terminal and planned access/egress to the commuter carpool parking lot.	No significant impact other than additional road cost.
1.11 Widen the Dundas Street East/Highway 5 structure over Highway 6 to accommodate the road widening noted above in Item 1.6 and 1.10.	No significant impact, other than additional road construction cost.
2. Changes to Municipal Roads	
2.1 Minor changes to the commercial area access road concept in the SW Quadrant that was documented in the 2003 TESR,	Preliminary design developed from changes in the commercial area access road alignment at the planned southbound N-E/W ramp terminal on

DESCRIPTION / REASON FOR CHANGE	IMPACT / SIGNIFICANCE OF CHANGE
which previously indicated a new access extending south of the N-E/W ramp terminal. Approval of the 2003 TESR did not include EA approval of municipal road and access changes.	Highway 5. See Section 4.2.1 for a description of options, evaluation and preferred alignment.
2.2 Changes to the conceptual layout identified in the 2003 TESR for residential properties in the NW Quadrant north of Borer's Creek. Municipal road access for residential properties from Highway 6, Woodsworth Avenue and Garwood Avenue in the NW Quadrant are required in order to conform to Ministry of Transportation policy for access onto restricted access provincial highways. Right-in/right-out access will be provided at Highway 6 and the Woodsworth Avenue intersection, with extension of Woodsworth to Garwood and closure of the Garwood intersection at Highway 6. For northbound vehicles to go southbound to access Woodsworth, a turnaround bulb will be located on the west side of the Highway 6/Parkside Drive signalized intersection to facilitate this movement.	The planned centre median along Highway 6 will restrict access to the abutting west side residential properties to southbound right-in/right-out only. Highway 6 northbound left turns will be required at the signalized Highway 6/Parkside Drive intersection to access these properties including those on Woodsworth Avenue and Garwood Avenue. Northbound Highway 6 traffic would turn left into the turnaround bulb at the Parkside Drive signalized intersection, and make a right-turn to exit the bulb and go southbound to access the residential properties. Turning left at Parkside Drive under signal control is preferred compared to the current northbound left turn movement to these properties. See Section 4.2.3 for a description of options, evaluation and preferred alignments.
2.3 Extend a new municipal road alignment from Dundas Street East in the SE Quadrant to provide new access to Mountain Brow Road, with the existing temporary access to/from Highway 6 closed as previously planned. Approval of the 2003 TESR did not include approval of this municipal road	Two alignment options were evaluated to extend Mountain Brow Road north to Dundas Street East. See Section 4.2.2 for the description and evaluation of options. The preferred alignment along the east side of the Liburdi property avoids direct impact on the woodlot located east of Mountain Brow Road on the Niagara Escarpment edge. The Niagara Escarpment Commission (NEC) and Conservation Halton (CH) have recommended avoiding this woodlot, if possible. Directional and "No Trucks" signage to promote use of the easterly access to Liburdi Engineering for employees and trucks will be required.
2.4 Minor adjustments to the concepts shown in the 2003 TESR for access to business properties in the NW Quadrant located south of Borer's Creek, This includes three new municipal roads (see Preliminary Design Plates in **Appendix 1**): ▪ New Street 'B' extending north from Highway 5 into the NW Quadrant; ▪ New Street 'B1' extending from Street 'B' to access the original North Wentworth Community Centre. It replaces access from North Wentworth	The planned new signalized intersections on Highway 5 at future Street 'A' and 'B' will provide full movement access to all lands on the north and south sides of Highway 5 in this area. Access is maintained for all involved business properties without any significant impact. As a result of concerns raised at the June 19, 2012 Public Information Centre, planned Street 'B1' has been shifted north so that no land will be required from the rear of properties to the south. More information on the evaluation, selection and operation of these new municipal roads is

DESCRIPTION / REASON FOR CHANGE	IMPACT / SIGNIFICANCE OF CHANGE
Drive to be closed at Highway 5 because it would be too close to the future Highway 6 southbound N-E/W ramp terminal at Highway 5 to operate safely; and ▪ New Street 'B2' extending from new Street 'B' to access the new North Wentworth Arena and 2 other properties fronting onto Highway 6, one with commercial businesses and the other currently vacant. Approval of the 2003 TESR did not include approval of these municipal road modifications.	included in Section 4.2.3 of this TESR Addendum.
2.5 The proposed alignment of new Street 'A' in the SW Quadrant extending south of Highway 5 to link with the existing South Drive/Innovation Drive intersection remains essentially unchanged from the conceptual alignment shown in the 2003 TESR. Approval of the 2003 TESR did not include approval of the municipal road modifications.	Street 'A' was not included in the 2003 TESR, and so its impacts were not evaluated. The alignment from the South Drive/Innovation Drive intersection north to the intersection of Highway 5 and the proposed Street 'B' to the north would bisect an existing rural parcel. The rural residential dwelling associated with this parcel is located west of Street 'A' and would not be directly impacted, but the existing agricultural operation would be bisected. Also, a rural residential dwelling is located in the northwest quadrant of the South Drive/Innovation Drive intersection and would be in close proximity to Street 'A'. More information on Street 'A' is included in Section 4.2.1 of this TESR Addendum.
3. Addition of Commuter Carpool Parking Lot	
3.1 Construct a minimum 100-space commuter carpool parking lot opposite the northbound S-E/W ramp terminal on Dundas Street East in the NE Quadrant of the new interchange. The location provides adequate space to include bus turn around capability within the lot.	Necessity was established based on the MTO Central Region Carpool Lots Opportunity Study (December 2007), as well as long term City of Hamilton municipal transit and GO Transit regional transit opportunities for the Clappison's Corners area. See Section 4.3 for a description of options, evaluation and discussion of the preferred location.
4. Changes to Environmental Conditions Identified in the TESR	
4.1 The 2003 TESR noted the presence of Red Mulberry (*Morus rubra*) trees within the study area. Red Mulberry is regulated as 'Endangered' under the Ontario *Endangered Species Act* (ESA). The Project Botanist identified five populations of white X red mulberry hybrids (*Morus alba X rubra*) within or immediately adjacent to the study area, based on DNA	Hybrid red mulberry trees are not regulated as 'Threatened' or 'Endangered' under the ESA and as such, a permit for the removal of these trees is not required.

DESCRIPTION / REASON FOR CHANGE	IMPACT / SIGNIFICANCE OF CHANGE
testing.	
4.2 A breeding bird survey documented the presence of two species at risk birds: Barn Swallow (*Hirundo rustica*) and Chimney Swift (*Chaetura pelagica*), both Threatened under the Ontario ESA. Two Barn Swallow nests were discovered in broken light fixtures within the Borer's Creek culvert. Discussions with MNR will be ongoing regarding these nests. No evidence of Chimney Swift breeding was documented within the study area.	The pedestrian tunnel at Borer's Creek that contained Barn Swallow nests is not proposed for replacement. However, some modifications at the ends of the culvert are proposed, to extend and install headwalls on the east and west sides of Highway 6 to accommodate highway widening both northbound and southbound. Assuming that the lighting fixtures are repaired (where the Barn Swallow nests are present), discussions will be ongoing with the MNR to determine any requirements under the Ontario ESA.
5. Changes to Environmental Constraints / Mitigation identified in the TESR	
5.1 The 2003 TESR recommended replacing the nationally threatened Red Mulberry with a nursery grown Red Mulberry.	Since the Red Mulberry was tested and confirmed to be a white X red mulberry hybrid, no planting of Red Mulberry trees is required.
5.2 The 2003 TESR recommended inventory of hibernacula during detail design and application of appropriate mitigation should any be found.	In the 2003 TESR, it was recommended that a reptile and amphibian hibernacula screening be completed. During the TESR Addendum field investigation of the study area, no features that were considered suitable for reptile and amphibian hibernacula (e.g. rocky outcrops and expansive wetlands) were identified within the study area.
5.3 As per the 2003 TESR, construction activities requiring in-water works permitted only during the warmwater fisheries window from July 1 to March 31, prohibiting in-water work between April 1 and June 30.	In response to the fisheries data request to MNR, as outlined in the MTO *Environmental Guide for Fish and Fish Habitat*, the MNR Biologist confirmed that the warmwater timing window prohibits in-water work between March 15 and June 30.
5.4 The 2003 TESR noted a requirement to preserve the vertical rock face of the Escarpment and retain the forested edge to the brow of the escarpment.	The new preliminary design lessens the amount of rock cut proposed in the 2003 preliminary design. The proposed rock face will have a slope with a ratio of 1:4 as per design standards. However, this design does not "preserve" the rock face in its existing untouched condition since a rock cut is required to implement the project.
5.5 The 2003 TESR committed to undertaking appropriate mitigation measures during construction (i.e. maintaining a minimum of two lanes of traffic in each direction during peak periods, providing temporary accesses as required, etc.)	Construction staging and lane/ramp closures will be confirmed during the detail design stage of the project, and communicated to the travelling public and local stakeholders.

4.2 Municipal Roads

The 2003 TESR documented the need to replace the existing Highway 5/6 Intersection with a Parclo A4 style interchange. In conjunction with these improvements, there is also a need to reconfigure the access to a number of properties which will be directly impacted by the proposed interchange configuration. To this end, an initial Municipal Access Road concept was developed as part of the 2003 TESR. However, no EA approval for these Municipal Access Roads was sought at that time. This configuration is illustrated in Exhibit 1-1 based on Municipal Access Road concepts in the 2003 TESR to accommodate the interchange improvements.

The supplementary **Municipal Road and Commuter Parking Lot Evaluation of Alternatives** report prepared by IBI Group dated September 2012 (refer to Appendix 4) summarizes the development and evaluation of alternatives, and selection of the preferred alternative to provide access to properties impacted by the proposed interchange configuration and to provide a commuter parking lot in the vicinity of the interchange. Municipal road alternatives were developed within the northwest, southwest, and southeast quadrants of the proposed Highway 5/Highway 6 interchange. Only those alternatives which were deemed to be feasible were carried forward for evaluation. In cases where the alternative could not be clearly eliminated due to impacts or failure to meet the study requirements, it was carried forward for further evaluation.

The Project Team assigned weights to each criteria group based on the importance of those criteria in the overall decision-making. These weights were then assigned to the items within each criteria group and used for the baseline analysis. The typical criteria and the assigned percentage weighting are illustrated in Exhibit 4-1.

Exhibit 4-1 Evaluation Criteria Summary (with representative weightings)

CRITERIA (% Weighting)			CRITERIA INDICATORS	UNIT OF MEASURE
Transportation /Technical (30%)	10%	Network Capacity and Level of Service	*Ability to accommodate traffic demands*	*Level of Service, Delays*
	15%	Traffic Safety	*Compliance with geometric standards; number of intersection driveway conflicts*	*Number/Type of Conflicts*
	3%	Emergency Response	*Access for emergency vehicles; potential impact to EMS response times*	*Additional km's travelled*
	2%	Flexibility	*Ability to accommodate future traffic growth, accommodate pedestrian/ cyclists*	*Subjective*
Socio-Economic and Cultural Environment (30%)	5%	Property Requirements	*Removal of residences, businesses, and/or community facilities*	*Number of displacements*
			Amount of land required	*Hectares of land required*
	10%	Accessibility to Properties	*Adverse impacts to existing property access (i.e. right-in/right-out restriction)*	*Number/Type of Access Restrictions*
			Amount of 'out-of-way' travel	*Additional km's travelled*
	5%	Property Severance	*Potential for property severances to adversely affect current/future land use*	*Number of sites and Hectares*
	3%	Redevelopment Potential	*Impacts to current development applications; reduction in developable land*	*Number of sites and Hectares*
	2%	Agricultural Land	*Loss of agricultural land*	*Number of Hectares*
	3%	Noise	*Potential for significant noise increases*	*Number of receivers affected*
	2%	Archaeology and Built Heritage	*Potential for loss of archaeological resources or displacement of built heritage features*	*Area/number/type of sites affected*
Natural Environment (20%)	5%	Terrestrial Resources	*Impacts on terrestrial species and habitats (i.e. trees, shrubs, vegetation, wildlife)*	*Number, area and type of species/ habitats impacted/ Subjective*
	5%	Aquatic Species/ Watercourses	*Impacts on water crossings within project area (i.e. fisheries and aquatic ecosystems)*	*Number, area and type of species/ habitats impacted/ Subjective*
	5%	Surface Drainage and Groundwater	*Potential for alteration to / construction related effects on water quality and quantity*	*Pavement area, SWM facilities, impacted field tiles/ wells*
	5%	Environmentally Sensitive Features	*Potential for encroaching upon environmentally sensitive features*	*Area of encroachment*
Cost (20%)	15%	Capital Cost	*Capital Construction Cost (including roadway, utilities)*	*Present Value (Dollars)*
	5%	Maintenance Costs	*Estimated Annual Road Maintenance Cost*	*Present Value (Dollars)*

Potential impacts associated with each alternative are summarized in a matrix format in the **Evaluation of Alternatives** report**,** and the preferred alternative selected based on the evaluation summary. The final step in the evaluation consisted of completing a sensitivity analysis by modifying weightings for criteria or criteria groups to better reflect key issues and sensitivities within each quadrant. This included an assumption that all criteria are weighted equally, or equivalently, by not applying any weightings. The alternatives evaluated and the resulting preferred municipal road alternatives by study area quadrant are summarized as follows.

4.2.1 SOUTHWEST QUADRANT

A total of eight alternatives (Alternatives A to H) summarized as follows and shown in Exhibit 4-2 and Exhibit 4-3 were developed to access properties in the southwest quadrant and carried forward for evaluation:

- ***Alternative 'A'*** – Provide a 0.1 km cul-de-sac which intersects Highway 5 at the signalized N-E/W ramp terminal. This cul-de-sac will provide access to the Suncor (Petro-Canada) and Tim Horton's/ Wendy's properties. Due to its proximity to the W-S ramp, the northbound right turn movement at this intersection will be signal controlled and restricted to 'No Right Turn on Red'. Based on MTO's "Access Roads at Freeway Ramp Terminals (January 2005)" design guidelines, the northbound left turn opposite the N-E/W ramp is prohibited;

- **Alt*ernative 'B'*** – Provide a 0.2 km cul-de-sac which intersects Highway 5 at the signalized N-E/W ramp terminal. This is similar to Alternative A, however the cul-de-sac is extended to accommodate a second driveway to the Tim Horton's/Wendy's site (to improve site circulation). As with Alternative A, the northbound right turn movement at Highway 5 will be signal controlled and restricted to 'No Right Turn on Red', and the northbound left turn opposite the N-E/W ramp is prohibited;

- ***Alternative 'C'*** – Provide a new access road which intersects Highway 5 at the signalized N-E/W Ramp terminal, and a municipal road connection to South Drive. As with Alternatives A & B, the northbound right turn movement at Highway 5 is signal controlled and restricted to 'No Right Turn on Red', and the northbound left turn opposite the N-E/W ramp is prohibited;

- ***Alternative 'D'*** – Similar to Alternative 'C', however the south leg of the Highway 5 and N-E/W ramp signalized intersection is one-way (southbound) only. This southbound movement is stop controlled at a new 'T' intersection located 80m south of Highway 5. All exit movements from the Suncor (Petro-Canada) and Tim Horton's/Wendy's properties will need to utilize Innovation Drive and/or South Drive to exit the site;

- ***Alternative 'E'*** – Provide a new municipal road connection between Highway 5 and Innovation Drive. The south leg of the Highway 5 and N-E/W ramp signalized intersection is one-way (southbound) only. All exit movements from the Suncor (Petro-Canada) and Tim Horton's/ Wendy's properties need to utilize Innovation Drive and/or South Drive to exit the site;

- ***Alternative 'F'*** – Provide a 0.2 km cul-de-sac from Innovation Drive to provide access to the Suncor (Petro-Canada) and Tim Horton's/Wendy's properties. All entry and exit movements from the Suncor (Petro-Canada) and Tim Horton's/Wendy's properties need to utilize Innovation Drive and/or South Drive. No connection is provided to the signalized N-E/W ramp terminal on Highway 5;

- ***Alternative 'G'*** – Provide a new municipal road connection between Highway 5 and Innovation Drive. Similar to Alternative 'E', however it maintains two-way traffic flow on the south leg of the Highway 5 and N-E/W ramp signalized intersection. As with Alternatives A, B and C, the northbound right turn movement at Highway 5 will be signal controlled and restricted to 'No Right Turn on Red', and the northbound left turn opposite the N-E/W ramp will be prohibited; and

- ***Alternative 'H'*** – Provide a 0.2 km cul-de-sac from South Drive to provide access to the Suncor (Petro-Canada) and Tim Horton's/Wendy's properties. All entry and exit movements from these properties will need to utilize Innovation Drive and South Drive. No connection is provided to the signalized N-E/W ramp terminal on Highway 5.

With each alternative, Innovation Drive is extended to the west to connect South Drive to Highway 5 as shown in Exhibit 4-4, introducing a new signalized intersection on Highway 5 located approximately 360m west of the proposed southbound N-E/W ramp terminal.

Alternative A shown in Exhibit 4-2 was selected as the preferred configuration for a municipal road in the southwest quadrant**,** balancing the need to ensure appropriate access to properties with costs and environmental impacts. Alternative A provides a short 0.1 km cul-de-sac which intersects Highway 5 at the signalized southbound N-E/W ramp terminal. This cul-de-sac will provide access to the Suncor (Petro-Canada) and Tim Horton's/Wendy's properties. Due to its proximity to the N-E/W ramp, the northbound right turn movement out of the commercial area at Highway 5 will be signal controlled and restricted to 'No Right Turn on Red'. Based on MTO's "Access Roads at Freeway Ramp Terminals (January 2005)" design guidelines, the northbound left turn from the N-E/W ramp will be prohibited.

In comparing this Alternative A to the two other finalists in the top three, namely Alternative C and G, Alternative A provides the following advantages:

Compared to Alternative C – 2nd ranked alternative (see Exhibit 4-2)

- Avoids potential need to buy-out more of the Focus Environmental lands given the right-of-way requirements from this property (i.e. two-thirds (2/3) of the property required, 0.27 ha of 0.81 ha remain versus 0.51 ha remaining with Alternative A);
- Clearer jurisdiction limits for the municipal road; and
- Avoids northbound right turn queues extending beyond the roadway connecting to Street 'A' (with the proposed single lane configuration).

Compared to Alternative G – 3rd ranked alternative (see Exhibit 4-3)

- Limits impacts and costs associated with enclosing the exiting drainage channel (a 30m long, 4.5 x 2.0m culvert is required for Alternative A compared to a 120m long culvert required for Alternative G). This provides a capital cost saving;
- Preferable design standards (avoids 6% downgrade and K-4 sag curve approach to stop condition at Innovation Drive, associated with Alternative G); and
- Limits the number of parking spaces lost from the City of Hamilton Innovation Drive facility (less than 10 spaces will be lost compared to 30 spaces required with Alternative G).

These advantages, of Alternative A, outweigh the following concerns associated with it:

- Potentially limits access opportunity in the event of increased traffic volumes or lane blockages; and
- Increases the potential of eastbound 'U' turns at the Dundas Street East and northbound S-E/W ramp signalized intersection (potentially required with Alternative A).

Exhibit 4-2 Southwest Quadrant Municipal Road Alternatives A-D

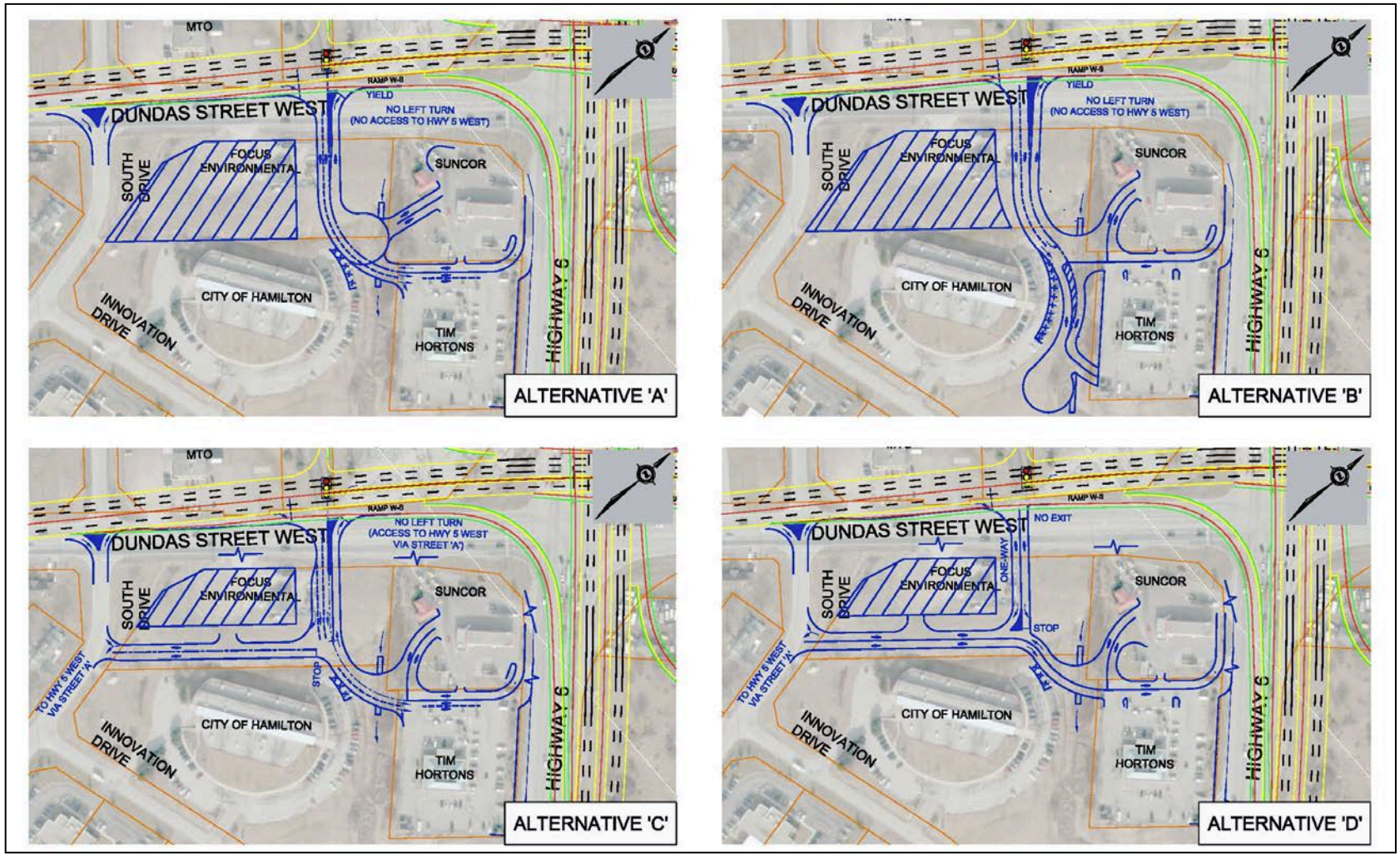
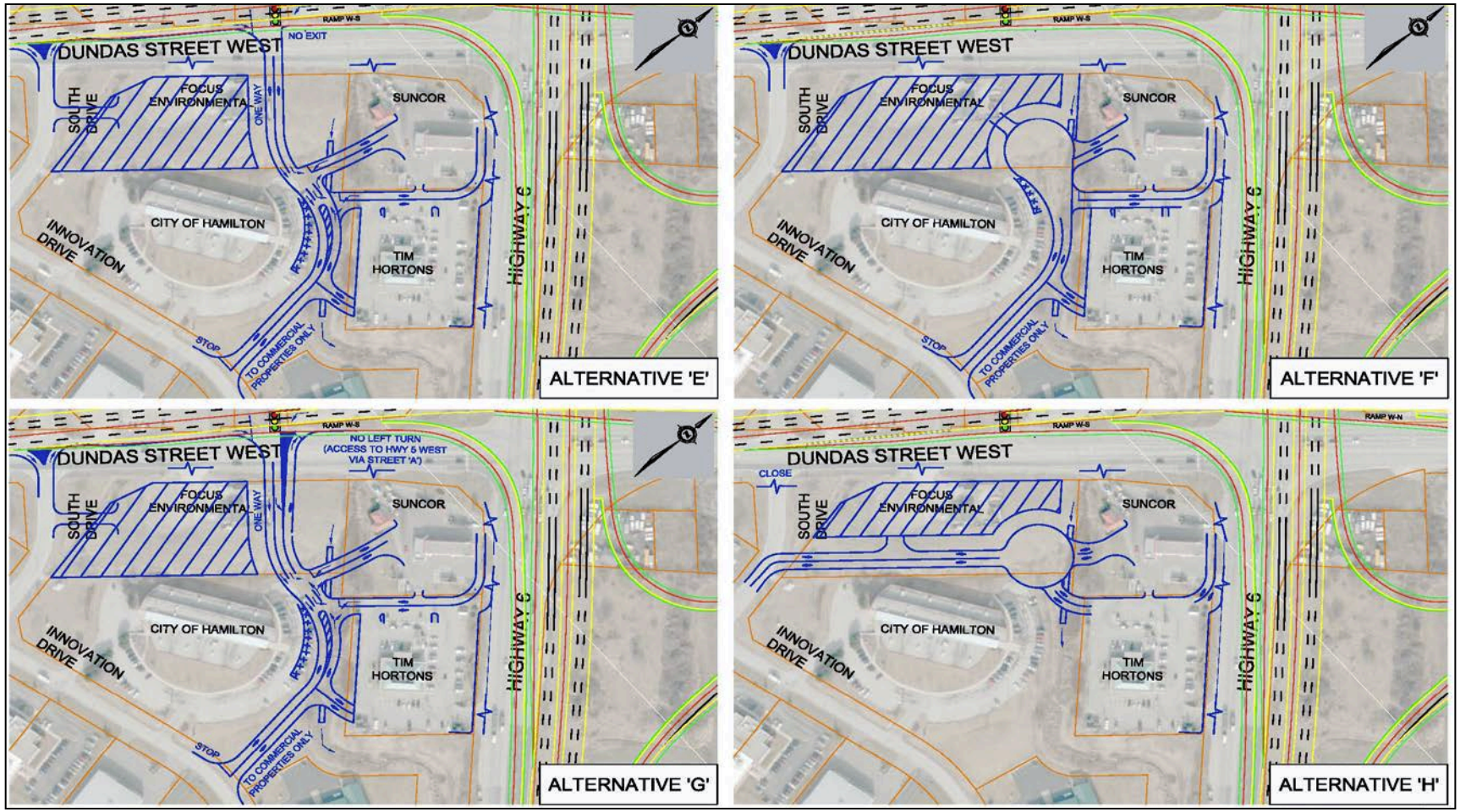


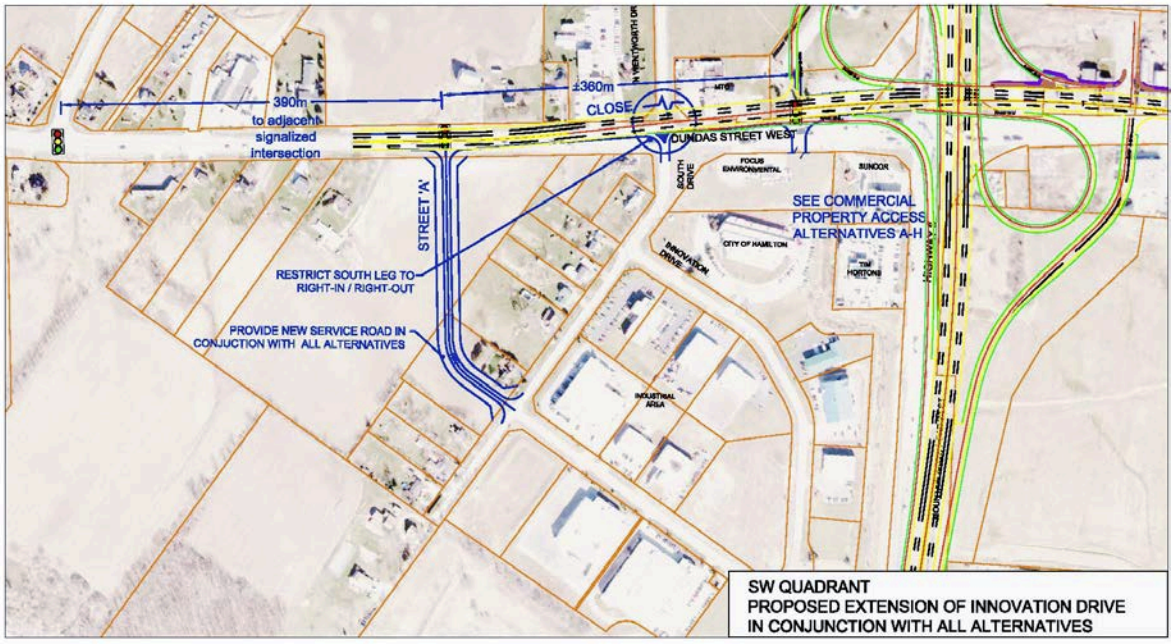
Exhibit 4-3 Southwest Quadrant Municipal Road Alternatives E-H



The Suncor (Petro-Canada) and Tim Horton's/Wendy's commercial properties have expressed concerns regarding changes to their operations resulting from the Highway 5/6 Interchange construction and operation. Based on the level of detail that will be available during the detail design stage, it is appropriate to address concerns at that time, if possible, through negotiations with the property owners.

The preferred plan for the southwest quadrant also includes extending Innovation Drive to the west to connect with Highway 5 as shown in Exhibit 4-4 as Street 'A'. This introduces a new signalized intersection on Highway 5 located approximately 360m west of the proposed southbound N-E/W ramp terminal.

Exhibit 4-4 Innovation Drive Extension (Street 'A'), Southwest Quadrant



4.2.2 SOUTHEAST QUADRANT

As part of the approved interchange design, the existing temporary access to/from Mountain Brow Road at Highway 6 will be closed. This municipal road currently provides access to Liburdi Engineering and three residential lots located along the escarpment. It is a dead end road that does not extend to serve any additional property. It is also a boundary road between the City of Hamilton and City of Burlington and as such the municipalities have a shared agreement for ownership and maintenance of the roadway.

To maintain access to these four properties, the existing portion of Mountain Brow Road along the south edge of the Liburdi Engineering property will be upgraded to City of Hamilton standards and extended north to Dundas Street East. This new roadway will also provide access to other property within the southeast quadrant planned for future commercial development.

Two key considerations affecting the location of the new roadway intersection at Dundas Street East are:

- In anticipation of a future roadway to serve development within the southeast quadrant, the City of Hamilton has protected for a 13 m allowance (representing ½ of a proposed 26 m right-of-way width) adjacent to the RONA site with the expectation that the balance of the right-of-way will be secured from the property developer in the future; and

- Clappison Avenue currently serves as the primary access to the development within the Flamborough Power Centre, both north and south of Dundas Street East. The intersection is located approximately 621 m east of the proposed signalized northbound S-E/W ramp terminal, and provides for 4 through lanes (plus right turn and dual left turn lanes) along Dundas Street East. Up to 55,000 square metres of development may proceed north of Dundas Street East based on this configuration. Any development beyond these levels is expected to require a second connection to Dundas Street East (to date commonly been referred to as Street 'C'). The potential impacts associated with Street 'C' north of Dundas Street East were considered as part of the evaluation of alternatives, since there is a need to consolidate the north and south legs of this intersection.

The five municipal road alternatives developed for this quadrant, as shown on Exhibit 4-5, build upon the concept of connecting a new access road with the existing Mountain Brow Road, and extend it north to Dundas Street East at a new intersection located between the northbound S-E/W ramp terminal and the Clappison Avenue signalized intersection. The five new municipal access road alternatives shown in Exhibit 4-5 are described as follows:

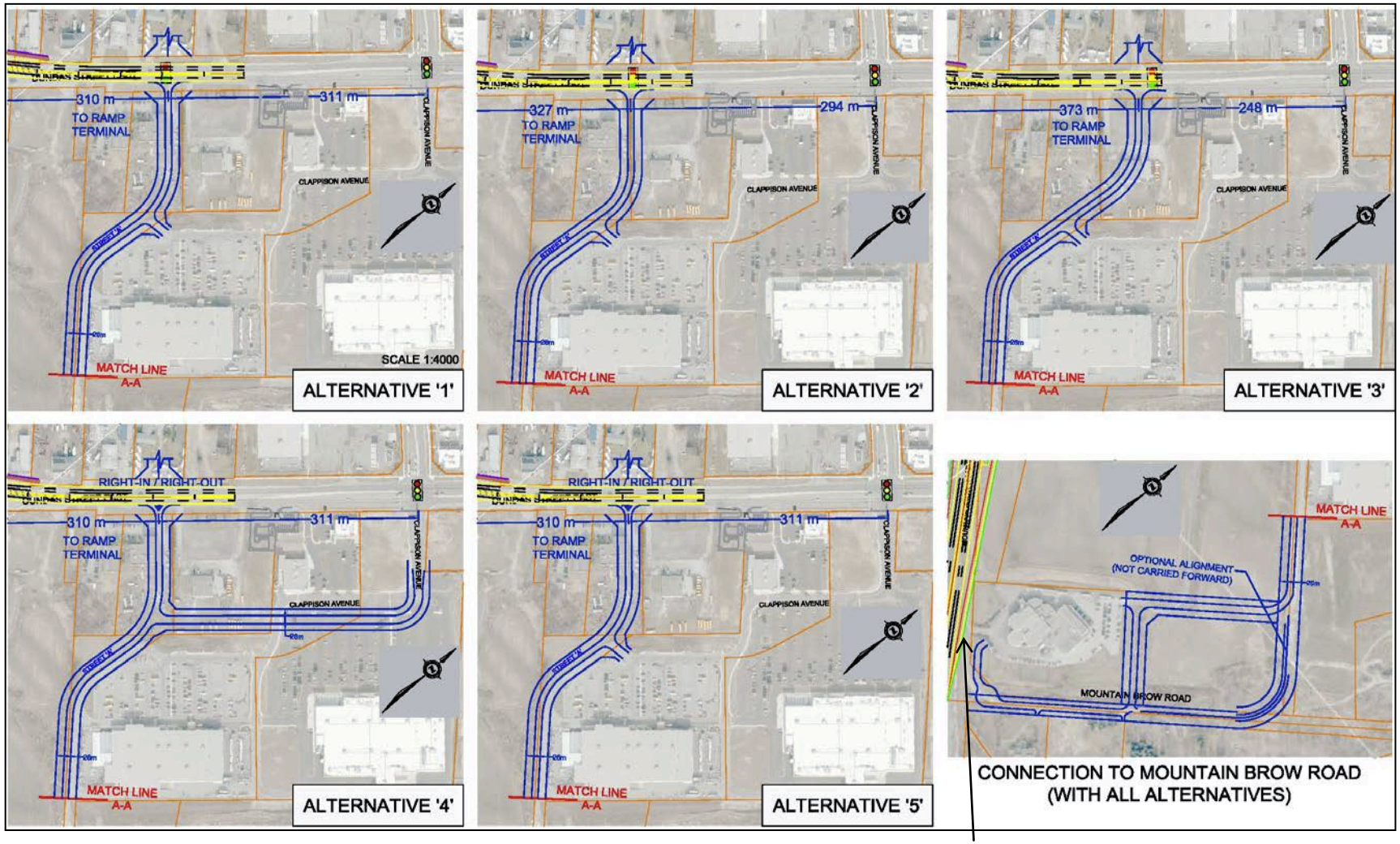
- ***Alternative '1' –*** Provide a new full moves signalized access located 310 m east of the proposed northbound S-E/W ramp terminal, and 311 m from the Clappison Avenue intersection;
- ***Alternative '2' –*** Provide a new full moves signalized access located 327 m east of the proposed northbound S-E/W ramp terminal, and 294 m from the Clappison Avenue intersection;
- ***Alternative '3' –*** Provide a new full moves signalized access located 373 m east of the proposed northbound S-E/W ramp terminal, and 248 m from the Clappison Avenue intersection;
- ***Alternative '4' –*** Provide an eastbound right-in/right-out onto the new access road from Dundas Street East, with an internal connection to the existing signalized intersection at Clappison Avenue; and
- ***Alternative '5' –*** Same as Alternative 4 but with no internal connection to Clappison Avenue to provide access from Dundas Street westbound.

Alternatives '4' and '5' were screened out from further consideration mainly due to access limitations onto Dundas Street East, and extensive property and building impacts on the south side of Dundas Street East. An evaluation of Alternatives '1', '2', and '3' was then undertaken based on the following evaluation cases:

- Case I - Seventeen (17) general criteria weightings as previously outlined on Exhibit 4-1. Given the similarities between alternatives, the results of the evaluation were largely based on a comparison of two criteria; 1) Network Capacity and Level of Service versus 2) Property Requirements; and
- Case II - Modified criteria weightings, with a higher degree of importance assigned to the Network Capacity and Level of Service, Traffic Safety and Property Requirements criteria based on conditions specific to the southeast quadrant.

Based on the weighted evaluation for Case I, Alternative '2' scores are equal to Alternative '1'. However, Alternative '2' is superior to Alternative '1' if property costs are considered or the evaluation criteria are given equal weighting. Based on the numeric evaluation for Case II, **Alternative '2'** shown in Exhibit 4-5 is preferred, as it best balances the need to provide access to residential/commercial properties, with property impacts and costs. The marginal benefits of Alternative '1' from a traffic standpoint are outweighed by the business impacts/costs associated with removal of the office building on the south side of Dundas Street East.

Exhibit 4-5 Southeast Quadrant Municipal Road Alternatives



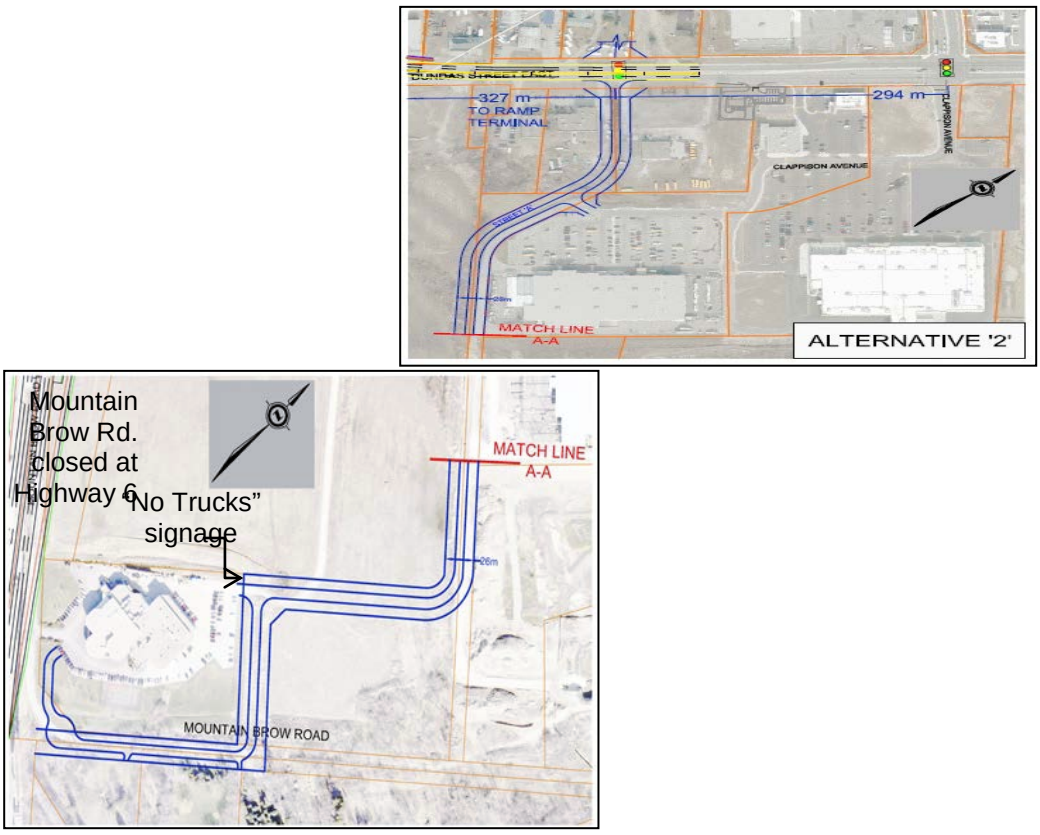
NOTE: Mountain Brow Rd. closed between Liburdi Engineering driveway entrance and Highway 6

As also shown in Exhibit 4-5, each Southeast Quadrant alternative reflects a jogged alignment extending directly south of Street 'C' at Dundas Street East to Mountain Brow Road. This new road provides a second access to the Liburdi Engineering property, and connects to existing Mountain Brow Road to serve the three residential properties. This preferred access configuration offers a more direct route for employees and trucks to enter/exit the Liburdi site from the east, and therefore is expected to minimize the amount of commercial traffic in front of the three residential properties located on the south side of Mountain Brow Road. Based on a review of truck turning templates, a 16m (53') truck will be able to access the existing Liburdi loading docks from the north side of the building. Exiting to the north will require a two stage turn.

The three involved residential property owners requested an alternative alignment which would provide an exclusive residential access for their properties. The new road would extend directly south to the existing Mountain Brow Road with no jog to the west, and with an added road section to access the east side of the Liburdi property. This alternative is not preferred because it would directly impact the woodlot located east of Mountain Brow Road on the Niagara Escarpment edge, while the preferred alignment avoids impacting this area. Staff of the Niagara Escarpment Commission (NEC) and Conservation Halton (CH) advised that they prefer an alignment that avoids any direct impact on the woodlot. Resident concerns about night time headlight glare can be addressed through the addition of more vegetation along the potential affected property edge. The City of Hamilton also agrees to install *'No Trucks'* signage south of the new east side Liburdi property access as shown in Exhibit 4-6.

To implement this preferred alternative, the City of Hamilton and City of Burlington will be required to ratify their current maintenance agreement for Mountain Brow Road as it functions as a boundary road. Both parties are in agreement with the selected alternative.

Exhibit 4-6 Southeast Quadrant Preferred Alternative '2'



4.2.3 NORTHWEST QUADRANT

North of Borer's Creek

The interchange design included in the 2003 TESR recommends that a concrete barrier/raised median be constructed along the centre of Highway 6 south of Parkside Drive. As such, access to residential properties on Garwood Avenue and Woodsworth Avenue, as well as those properties fronting onto Highway 6 will be affected. To minimize the number of potential conflicts on Highway 6 and mitigate the impacts to these residents, a new municipal road extension to the Parkside Drive/Highway 6 intersection was conceptually included in the 2003 TESR.

Since the 2003 TESR was completed, consideration of the following two key issues has influenced the development and evaluation of design alternatives:

- Maintaining direct access to residents on Highway 6, south of Parkside Drive, would be located in proximity to the proposed interchange. On a short-term basis (assuming two lanes southbound on Highway 6) a 3.5 m driveable shoulder was proposed along Highway 6 in front of these properties. Longer term (i.e. in conjunction with providing three lanes along Highway 6, as noted next) it is desirable to remove these driveways from Highway 6 due to the close proximity to the interchange, and in many cases the lack of opportunity for homeowners to turn around on their property (forcing drivers to back out of their driveway onto the highway); and
- Based on traffic projections developed as part of this study, it is expected that prior to 2031, Highway 6 will either need to be a four lane (controlled access) free flow facility from Highway 5 to north of Parkside Drive, or a six lane facility with signalized access control.

The four municipal road alternatives developed for this quadrant are summarized as follows and shown on Exhibit 4-7:

- ***Alternative '1'*** - Garwood Avenue is closed at Highway 6 and connected to Woodsworth Avenue, which is to be restricted to right-in/right-out access at Highway 6;
- ***Alternative '2'*** – Both Woodsworth Avenue and Garwood Avenue are closed at Highway 6, and connected to the Parkside Drive intersection by a new municipal road located immediately west of the existing residents;
- ***Alternative '3'*** – Both Woodsworth Avenue and Garwood Avenue are closed at Highway 6 and a new municipal road is proposed to connect both roads to Highway 5. This alternative introduces a new bridge/culvert crossing of Borer's Creek; and
- ***Alternative '4'*** – Shift the alignment of Highway 6 approximately 18m to the east to accommodate a new frontage road along Highway 6 which connects both Woodsworth Avenue and Garwood Avenue to the signalized intersection at Parkside Drive.

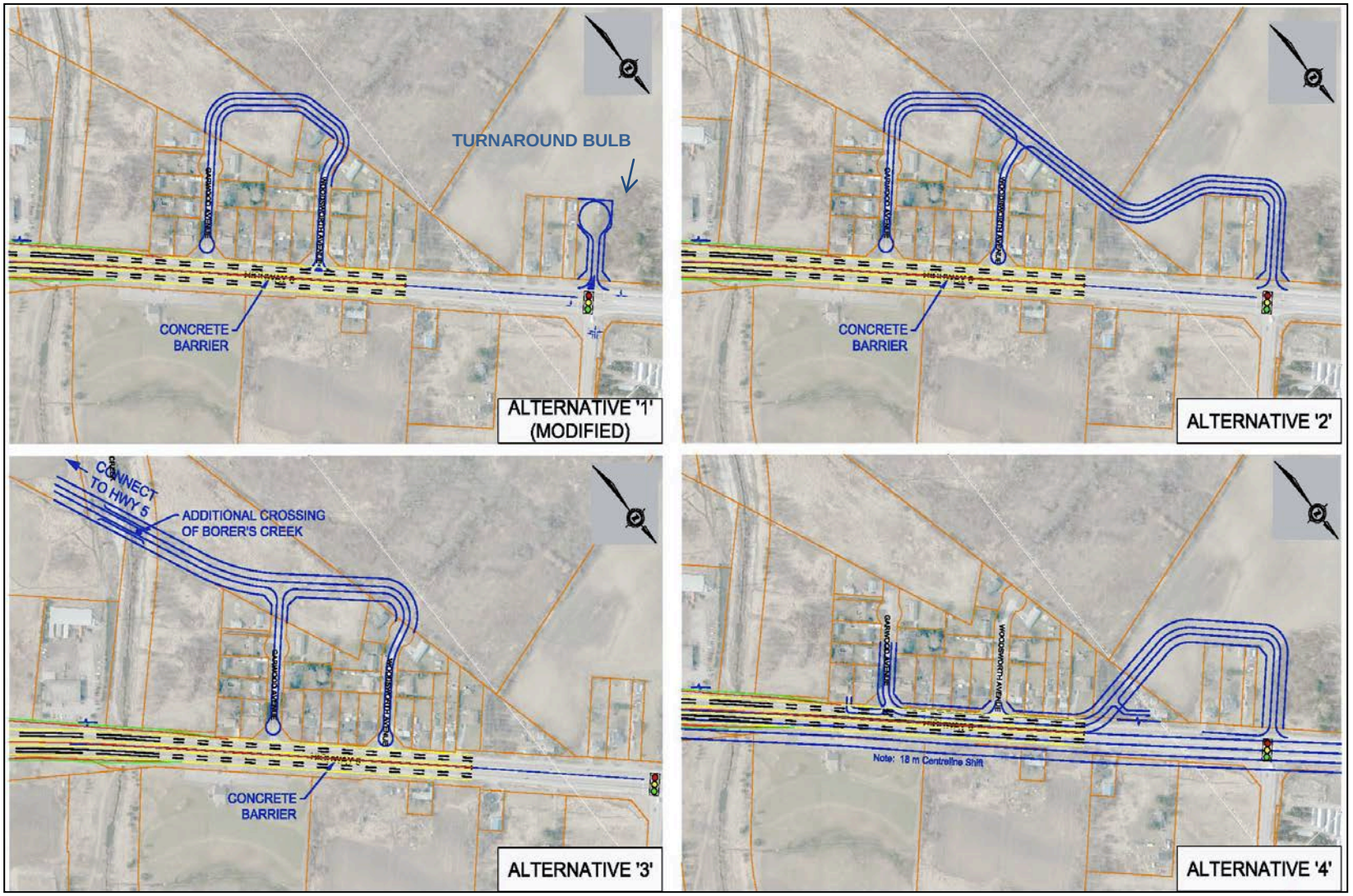
Each of these alternatives provides access to Woodsworth Avenue and Garwood Avenue. This was then compared against a potential buy-out of all homes within this quadrant. These homes are located outside of the City's urban development limits and as such no additional development is planned in this area.

The preliminary evaluation of these alternatives indicates that some alternatives scored equally as the best from a technical perspective (excluding property costs). As such, a comparison was also undertaken accounting for estimated property costs, as well as capital construction and maintenance costs. The results indicated Alternative '1' in Exhibit 4-7 as having the lowest overall cost, and therefore was presented to the public at the June 19, 2012 Public Information Centre as the preliminary preferred solution, but without the turnaround bulb. Since Garwood Avenue intersects Highway 6 within the limits of the interchange, this intersection will need to be closed. Therefore a new road extension was included between Garwood Avenue and Woodsworth Avenue.

Since the required centre median along Highway 6 will prevent northbound left turns onto Woodsworth Avenue, and left turns from Woodsworth Avenue onto Highway 6, in Alternative '1' northbound motorists would have to detour and find a location to turn south onto Highway 6 to access Woodsworth Avenue. As a result of the public response to this detouring, this alternative was subsequently modified to include a turnaround bulb on the west side of the Highway 6/Parkside Drive intersection as shown in Exhibit 4-7 – Alternative '1' (Modified). MTO and the City of Hamilton have agreed that the bulb will be built by MTO, and owned and maintained by the City of Hamilton. It will include an approximately 19 m radius to accommodate emergency vehicles including fire truck turning movements as required by the Hamilton Fire Department. This represents a capital cost saving compared to extending a new road from Garwood/Woodsworth to the Parkside Drive intersection.

In light of the above, input received from the public at the June 19, 2012 Public Information Centre and the conceptual design of the turnaround bulb at Parkside Drive shown on Exhibit 4-7 as **Alternative '1' (Modified**), this alternative is now preferred to provide access to residential properties on the west side of Highway 6 in the northwest quadrant.

Exhibit 4-7 Northwest Quadrant Residential Access Alternatives



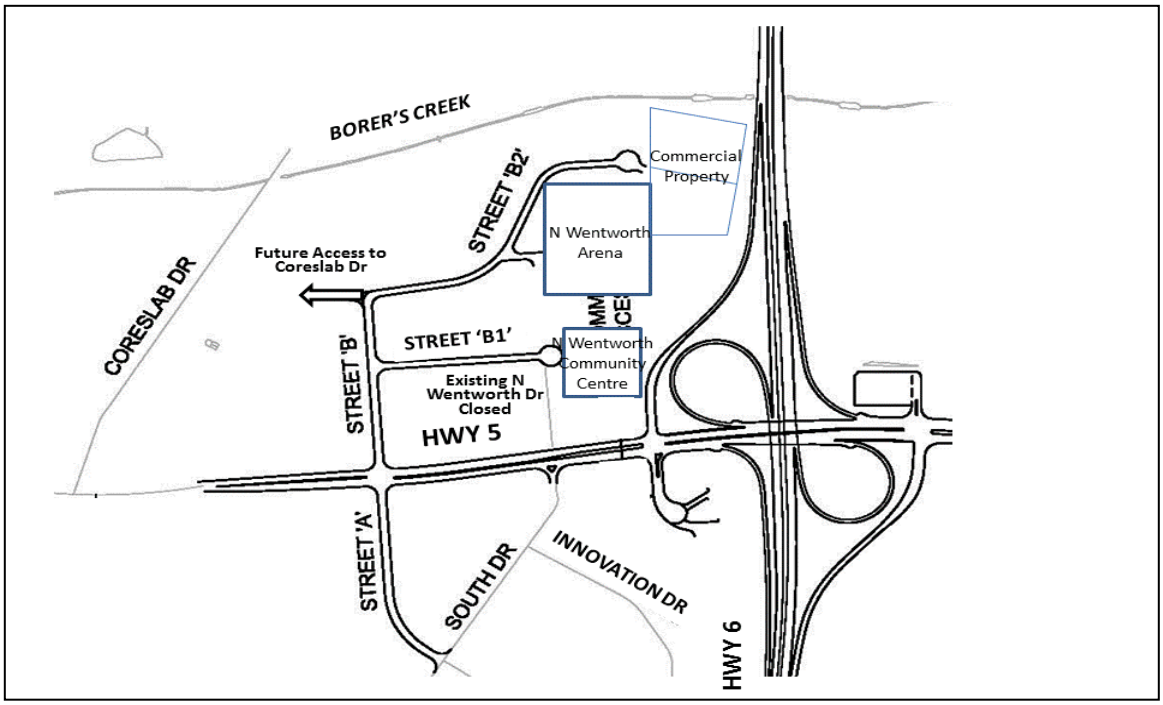
In the future, should all residential property owners in the Garwood Avenue/Woodsworth Avenue area on the west side of Highway 6 and north of Borer's Creek decide to sell their properties to the Ministry, the City of Hamilton will address the closure and removal of the municipal turnaround bulb.

South of Borer's Creek
On the south side of the Borer's Creek, lands in the northwest quadrant are to be accessed by new municipal road connections to Highway 5 labelled Street 'B', 'B1' and 'B2' on Exhibit 4-8. These alignments each provide access to specific properties, and therefore evaluation of alternative alignments was not required.

Street 'B' intersects Highway 5 approximately 360m west of the proposed southbound N-E/W ramp terminal at a new signalized intersection with Street 'A' into the southwest quadrant. It extends north to first connect with new Street 'B1' providing access to the North Wentworth Community Centre. Further north, new Street 'B2' provides internal roadway access to the new North Wentworth Arena and business properties on the west side of Highway 6. New Street 'B2' also provides a new link to Coreslab Drive to the west via the existing internal road allowance.

North Wentworth Drive will be closed at the existing Highway 5 intersection, and any accesses on Highway 5 between this intersection and the southbound N-E/W ramp terminal will be eliminated. Access to existing properties on Highway 5, west of North Wentworth Drive, will remain unrestricted until they are redeveloped and access is provided internally off new Street 'B'.

Exhibit 4-8 New Northwest Quadrant Streets South of Borer's Creek



4.3 Commuter Carpool Parking Lot

Subsequent to the approval of the TESR in 2003, the Ministry identified an opportunity to provide a Commuter Parking Lot in the vicinity of the Highway 5/6 Interchange. The rationale for such a

facility is documented in the MTO Central Region Carpool Lots Opportunity Study, dated December 2007.

Based on that MTO study, this lot was classified as a King's Highway commuter parking lot, which generally serves a small travel market. Specifically, it is intended to service demands within the Hamilton North coverage area, and as such the target users are primarily drivers travelling north-south on Highway 6 and east-west on Highway 5. Since the development of a reliable forecasting model was not possible from the available data, no demand estimates were provided specifically for this lot. It was further suggested that the northeast quadrant (opposite the northbound S-E/W ramp) of the proposed Highway 5/6 interchange may provide a suitable location for the lot given the availability of undeveloped land (at the time of the 2007 study), and ability to accommodate 100+ parking spaces.

For the purposes of this TESR Addendum, it was expected that the Ministry would prefer to own and operate the commuter parking lot, and that this lot utilize existing or surplus MTO property. Although less desirable, opportunities to lease or acquire property on a willing seller basis adjacent to the MTO right-of-way and/or jointly operate the lot with the City of Hamilton (if deemed appropriate) were also considered.

The selection of a preferred site was based on evaluation criteria that included property ownership, traffic operations and safety, accessibility, flexibility, security and serviceability, environmental setting and cost. The following minimum Design Criteria were also used for the facility:

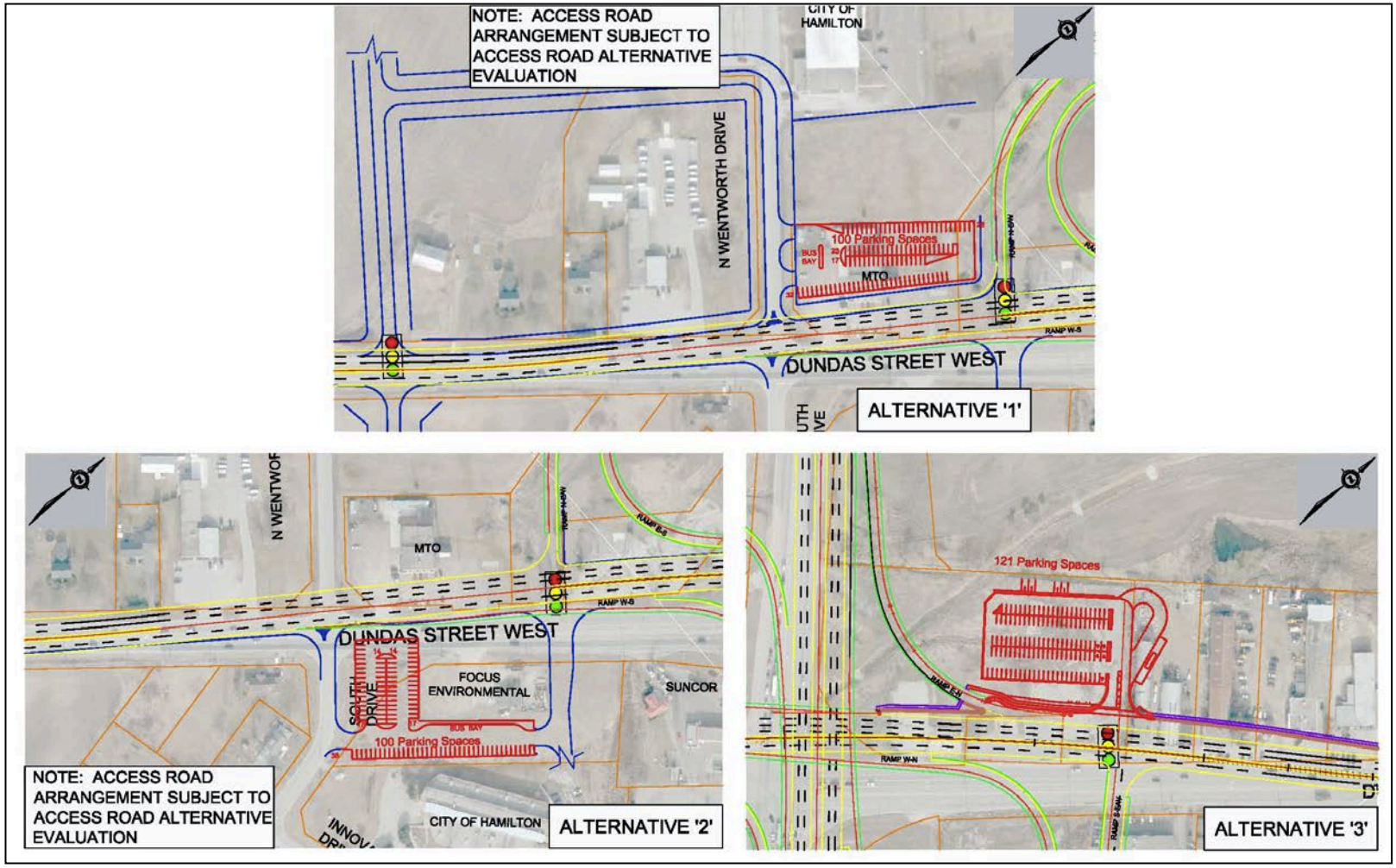
- Paved lot sized to accommodate 100 spaces (i.e. approximately 3500 m^2, based on a standard parking space of 2.75 x 5.75 m; aisle width of 7.5 m);
- Configured to accommodate snowploughs and buses, and to discourage use by longer commercial vehicles/trucks;
- Flexibility to accommodate future bus service (Local and Regional Transit). Currently, no GO Transit service is proposed along Highway 5 or Highway 6 however may become a possibility in the future; and
- Potential for future expansion.

Three finalist alternative locations for the parking lot as shown on Exhibit 4-9 were evaluated:

- ***Alternative '1' –*** Construct an exclusively owned MTO lot or shared City of Hamilton/MTO lot in the northwest quadrant, utilizing the surplus property on the north side of Highway 5 between the proposed southbound N-E/W ramp and North Wentworth Drive. This alternative requires that North Wentworth Drive remain open as a right-in/right-out municipal road and connect to Street 'B1' and 'B' in the northwest quadrant;
- ***Alternative '2' –*** Construct a new lot in the southwest quadrant. Requires that significant property be secured from Focus Environmental or potential buy-out of the entire property; and
- ***Alternative '3' –*** Construct an exclusively owned MTO lot within the northeast quadrant, outside of the E-N ramp as shown on Exhibit 4-9. The lot would be constructed based on a standard layout (adjacent to a Parclo A4 interchange) and be accessed from Dundas Street East at the signalized northbound S-E/W ramp terminal.

Based on the evaluation of these commuter parking lot alternatives, **Alternative 3**, constructing a new lot in the northeast quadrant opposite the S-E/W ramp of the interchange is preferred. This alternative is the most desirable from a transit location perspective, as it is highly visible, accessible to commuters and minimizes the amount of out-of-way travel. It will also best serve potential GO Transit operations along Highway 6 in the future.

Exhibit 4-9 Commuter Parking Lot Location Alternatives

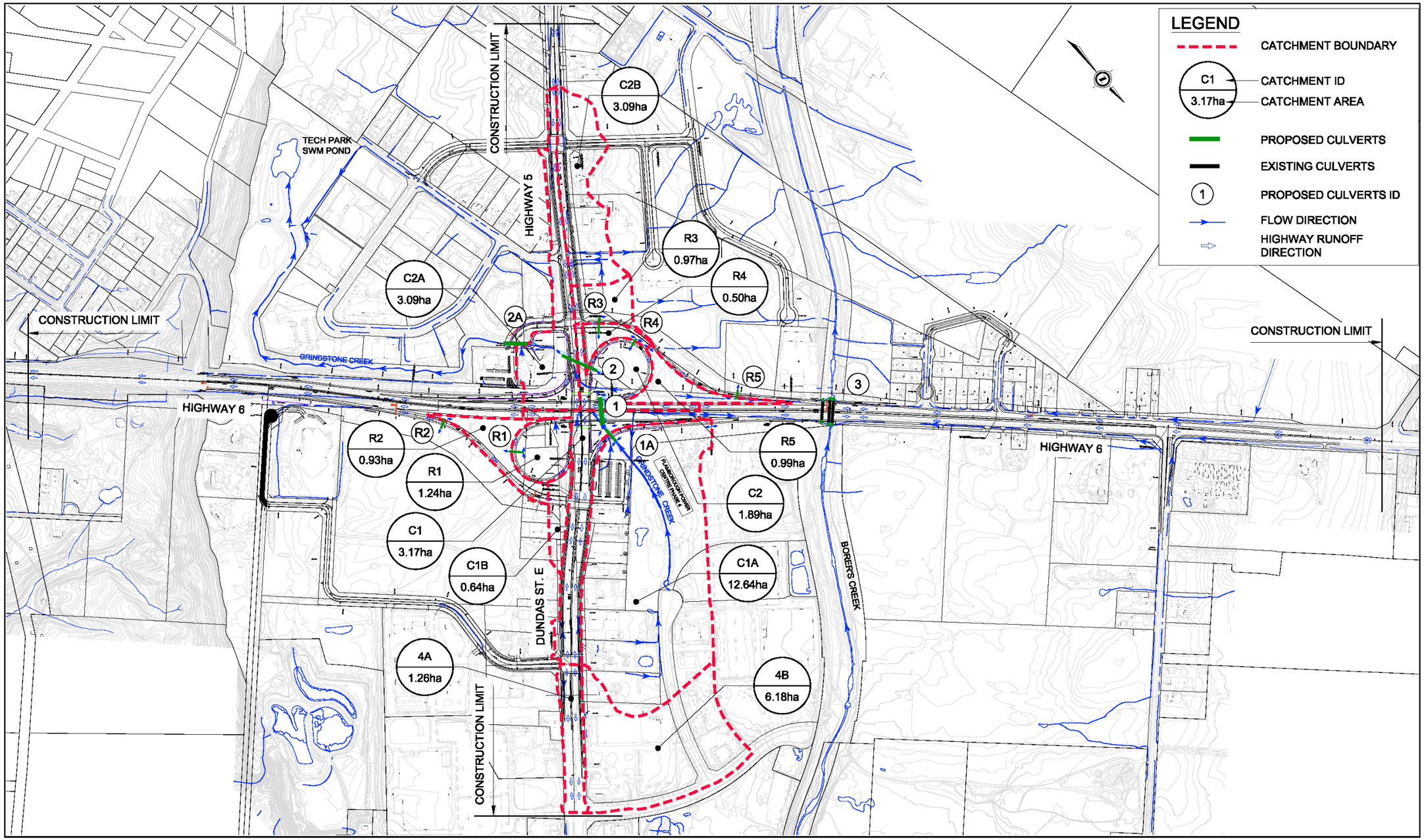


4.4 Drainage and Stormwater Management

The drainage and stormwater management aspects associated with the Highway 5/6 Interchange are documented in the **Drainage and Stormwater Management** report (June 2013) prepared by IBI Group (refer to Appendix 4) and is provided under separate cover. It outlines the proposed stormwater management strategy adopted for this project. Hydrological and hydraulic analyses were undertaken to determine the design features of all required drainage elements. A detailed presentation of the features of the recommended stormwater management system is provided in the Drainage and Stormwater Management report. Recommendations for this study are as follows:

- Where possible, Highway 6 drainage will be conveyed to roadside ditches/grassed swales via catchbasin leads and / or storm sewers. The proposed ditch system will take the form of flat bottom swales, as space and grading constraints allow. Storm sewer systems will be installed to capture inside lanes draining to the median and convey minor system drainage to swales rather than directly to culverts / receiving drainage systems;
- Install new culverts 1A, 1, 2 and 2A as shown on Exhibit 4-10, to provide sufficient hydraulic capacity. Culvert sizing is based on the 50-year design storm with full development of Highway 5/6 but 34% imperviousness in external catchments, assuming that the external catchments were controlled to pre-development level;
- Remove existing Culverts 1 and 2;
- At Borer's Creek, if feasible, widen Highway 6 without extending two north cells to avoid instream works. Otherwise, extend Culverts at Borer's Creek as shown on Exhibit 4-10, to the east and west due to fill resulting from Highway 6 widening;
- Install new ramp culverts R1, R2, R3, R4 and R5 as shown on Exhibit 4-10;
- At Highway 5 and Highway 6, storm sewer systems will be installed to convey minor system drainage to culverts / receiving drainage system; and
- Existing Stormwater Management ("Tech Park") Pond located behind Technology Park will continue to provide quality and quantity controls to runoff water resulting from the interchange area.

Exhibit 4-10 Proposed Drainage Conditions



4.5 Utilities

Existing utilities located within the project limits are as follows:

- Bell Canada;
- Cogeco Cable;
- Union Gas;
- Horizon Utilities;
- Rogers Cable; and
- Municipal services (water and sanitary).

Relocation requirements will be confirmed during detail design, and are expected to be substantial. Conflicts will be identified and mitigation/relocation will be coordinated as required at that time.

5. CONSULTATION WITH EXTERNAL AGENCIES, ABORIGINAL COMMUNITIES, STAKEHOLDERS AND THE PUBLIC

A Consultation Plan was prepared at the start of this project to guide consultation with external agencies, Aboriginal Communities, stakeholder groups and the public during the TESR Addendum process. The purpose of this consultation was to provide project information, solicit public feedback and identify and address issues associated with the preliminary design, potential environmental and property impacts and proposed mitigation measures. This consultation has been conducted in compliance with the requirements of a Group 'B' project under the MTO Class EA. Key components of the consultation plan to date have included:

- Formal notifications in local newspapers;
- Correspondence and meetings with external agencies;
- Correspondence and meetings with the public and property owners;
- Public Information Centre (PIC) #1;
- Correspondence with Aboriginal Communities; and
- Submission of the TESR Addendum for public review.

5.1 Formal Notifications in Local Newspapers

5.1.1 NOTICE OF STUDY COMMENCEMENT

The Notice of Study Commencement for this TESR Addendum study was posted in the *Hamilton Spectator* and *Burlington Post* in January 2011. Copies are included in **Appendix 2** of this TESR Addendum. The Notice briefly described the study purpose, its components, the study process and how comments and information can be sent to MTO for consideration throughout the study.

On January 20, 2011 the notice included in **Appendix 2** was also mailed to Members of Parliament (MP) and Members of Provincial Parliament (MPP) representing the study area, as well as Aboriginal Communities, external provincial and federal agencies, stakeholders, municipalities and property and business owners located within the study area. All feedback from these contacts has been recorded in the project file, and responses were sent where required or requested. Selected correspondence is included in **Appendix 2**.

5.1.2 NOTICE OF PUBLIC INFORMATION CENTRE #1

The study Consultation Plan for this project included a Public Information Centre (PIC) that would be held during the development of the TESR Addendum and final preliminary design (PIC #1). A second PIC will be held in the future during the detail design phase of the project (PIC #2).

PIC #1 was held on June 19, 2012 and is further discussed in Section 5.4. The Public Information Centre #1 Summary Report is included in **Appendix 3** of this TESR Addendum.

5.1.3 NOTICE OF TESR ADDENDUM SUBMISSION

The Notice of TESR Addendum Submission was advertised in local newspapers and mailed to those on the study contact list. The notice provided details about the study, identified locations where copies of the TESR Addendum are available for review, identified the public review period, and listed the persons to contact for further information. In addition, the public was informed that if they still have, after consulting with MTO's consultants and staff, serious unresolved concerns, they have the right to request the Minister of the Environment to issue a Part II Order (i.e. "bump up") for this TESR Addendum.

5.2 Correspondence and Meetings with External Agencies

In addition to receiving the Notice of Study Commencement, to date the following meetings have been held with involved external agencies regarding this project:

- August 9, 2011 – Environmental Agencies (Conservation Halton, City of Burlington, Niagara Escarpment Commission (NEC), City of Hamilton, Hamilton Conservation Authority);
- August 23, 2011 – Cootes to Escarpment Parks System Project representatives; and
- April 3, 2013 – Presentation to Hamilton City Council.

5.3 Correspondence and Meetings with the Public and Property Owners

This project has maintained open dialogue with the public and involved property owners since the Notice of Study Commencement was issued. All contacts with the public via phone calls, e-mails and letters have been recorded in the project file. The following 15 meetings with specific property owners and/or businesses have been held to date:

- February 22, 2011 – SE Quadrant property / business owner;
- February 23, 2011 – SW Quadrant property / business owners;
- February 28, 2011 – NW Quadrant property owner / business operator;
- February 28, 2011 – SE Quadrant property owner;
- April 11, 2011 – information meeting with potentially affected property owners;
- May 26, 2011 – commercial property owners, east side of Highway 6;
- June 21, 2011 – SW Quadrant property / business owners;
- August 9, 2011 – SE Quadrant property owners;
- August 9, 2011 – other SE Quadrant property owner;
- October 26, 2011 – SE Quadrant property owner;
- January 12, 2012 – Highway 6 west side business owner/operator;
- May 9, 2012 – City of Hamilton Councillor, city staff and NE Quadrant business owner;
- October 11, 2012 – SE Quadrant property / business owners;
- October 25, 2012 – City of Burlington Councillor and SE Quadrant property owners; and
- November 27, 2012 – City of Burlington Councillor, staff and SE Quadrant property owners.

5.4 Public Information Centre (PIC #1)

5.4.1 PURPOSE AND DETAILS OF PIC #1

The purpose of PIC #1 was to present the preliminary design for the Highway 5/6 Interchange, municipal roads and commuter parking lot. This PIC provided opportunities for public involvement and comment.

PIC #1 was held at the St. Thomas the Apostle Church (715 Centre Road, Waterdown, Ontario) on Tuesday June 19, 2012. The PIC was open to agencies from 3:00 p.m. to 4:00 p.m., and open to the public from 4:00 p.m. to 8:00 p.m. Participants were encouraged to sign-in so that the study

team could ensure that the study mailing list is up to date with the most recent contact information. Comment forms were available for participants to provide written comments using the forms provided at the PIC.

5.4.2 NOTIFICATION TO MEMBERS OF THE PUBLIC AND PROPERTY OWNERS

The Notice of PIC #1 was advertised in the *Burlington Post* and *Hamilton Spectator* on June 13, 2012. In addition, a copy of the Notice was advertised in the *Flamborough Review* on June 14, 2012. In addition, a digital copy of the Notice of PIC #1 was posted on the project website on June 15, 2012. A copy of the Notice of PIC #1 is included in the Public Information Centre #1 Summary Report included in **Appendix 3** of this TESR Addendum**.**

A series of customized letters were prepared for members of the public and property owners. A general invitation letter was sent to members of the general public on the contact list. Property owners whose property has been identified as being impacted (acquisition) were notified by a customized letter, which was sent by registered mail. A Permission to Enter Form was also sent to those property owners whose property had been identified as being impacted but had not yet granted permission for environmental specialists to enter their property to do their assessments. Property owners that have been identified as being affected by changes in access were notified by the customized letter, which was sent by addressed mail.

A PIC #1 Brochure was also mailed to residential communities located in proximity to the study area. Additional copies of the Brochure were available at the PIC. A copy of the Brochure is presented in **Appendix 3** along with a copy of the customized letters.

The PIC #1 Brochure and/or PIC Invitation Letter were distributed to approximately 1,380 points of call (residents, businesses and facilities) located within or in the vicinity of the study limits.

5.4.3 NOTIFICATION TO AGENCIES, ABORIGINAL COMMUNITIES AND MPs/MPPs

Project stakeholders, including Aboriginal Communities and organizations, municipal staff, elected officials, government agencies, and other interested agencies were invited by letter to attend PIC #1 from 3:00 p.m. to 4:00 p.m. Invitations to the pre-PIC meeting were mailed on June 4, 2012 to Aboriginal Communities, Members of Parliament (MP) and Members of Provincial Parliament (MPP), and other agencies on June 13, 2012. A copy of the invitation letter to external agencies/stakeholders, Aboriginal Communities, and the MPs/MPPs is presented in **Appendix 3**.

The purpose of this pre-PIC meeting was to provide an opportunity for affected stakeholders to review the preliminary design study prior to the public and to communicate any issues or concerns to the study team in a candid manner.

5.4.4 INFORMATION PRESENTED AT PIC #1

A series of display panels were presented at PIC #1, providing information regarding:

- Study purpose and MTO Class EA process;
- Existing conditions within the study area;
- Evaluation of the Municipal road alternatives;
- Evaluation of the commuter parking lot location alternatives;
- Information regarding refinements to the Highway 5/6 Interchange Preliminary Design;
- Preliminary design drawings for the study area;
- Visual simulation of driving through the Highway 5/6 Interchange preliminary design; and
- Conceptual landscape plan for the Highway 5/6 Interchange.

Copies of the PIC brochure were available for members of the public/PIC attendees to take with them. PIC participants were advised that the project website would have digital copies of the display materials for download. A copy of the display panels is presented in **Appendix 3**.

5.4.5 PIC #1 ATTENDANCE

Representatives from the Ministry of Transportation and their consultants, and the City of Hamilton were in attendance at PIC #1 to present materials and answer questions. A list of these representatives is presented in Exhibit 5-1.

A total of 165 people attended the PIC (161 members from the general public, and four representatives from agencies). Agency staff included representatives from Halton Region, City of Burlington (two representatives), and the Office of MPP Ted McMeekin.

Exhibit 5-1 PIC #1 Study Team Representatives

Organization	Staff	Study Role
Ministry of Transportation	Makael Kakakhel Chris Barber Shelley Miller Mark Patterson Earl Tucker Astrid Poei	Senior Project Engineer Environmental Planner Property Property Property Communications
City of Hamilton	Diana Morreale Sally Yong-Lee Tanya McKenna	Senior Project Manager Infrastructure Planning Public Works
IBI Group	Stephen Chiu Fouad Mustafa Don Drackley Allan Ortlieb Steven Broe	Project Manager Project Director/ Quality Manager Transportation Planner Transportation Engineer Transportation Engineer
LGL Limited	Audrey Steele Katherine Mitchell	Environmental Planner Environmental Planner

5.4.6 PIC #1 KEY ISSUES

Comment sheets were available at the PIC for participants to record their questions, ideas, issues and concerns. Participants were encouraged to complete the comment sheets at the PIC, or mail the comment sheets to the study team by July 20, 2012. As of that date, a total of 24 comment sheets were received by the study team. After the PIC, an additional 15 follow-up comment e-mails were received/sent by the study team during the comment period, totalling 39 formal comments. These comments sheets and Study Team responses are included in **Appendix 3.**

Most of the PIC #1 attendees were interested in reviewing and gaining an understanding of the preliminary design. The major issues/concerns in the written comments were related to:

- Property impacts including property acquisition;
- Effects of interchange design on existing businesses;
- The alignments of the municipal road network;
- Changes to property access;
- Recreation (pedestrians and cyclists) opportunities; and
- Noise impacts and attenuation.

Most of the questions regarding property impacts were to clarify how the preliminary design would affect private property. MTO Property Staff were on-hand to explain the Ministry's process for property acquisition associated with highway projects. MTO Property Staff were able to clarify for residents and business owners the type of impact associated with the Preliminary Design, and in some cases confirmed that no impacts would result. Property impacts range from minor property acquisition along the edge of an existing property line to severance of a lot (i.e. to accommodate a new municipal road) and complete property acquisition.

Some residents and business owners expressed concern over how the preliminary design would affect access to and from Highway 5 and 6. In some locations, turning movements will be restricted to 'right-in, right-out'. There was concern from some business owners that this would affect the likelihood of customers accessing their business. Due to the municipal road alternative selected for the northwest quadrant, access to the residential community on the west side of Highway 6 would be restricted by a centre median. A number of these residents indicated concern regarding how to access their property when travelling northbound on Highway 6.

A few participants commented on recreational concerns, including a request that the Bruce Trail pedestrian access under Highway 6 be maintained, and that a bicycle lane be added on the west side of Highway 6.

A number of participants noted their concerns regarding noise on Highway 6, particularly as trucks travel south and need to use their brakes. A number of requests for a noise barrier were made.

Specific responses to all formal comments received at PIC #1 and during the subsequent comment period were prepared by the Study Team and forwarded to the commenting party. These responses are included in **Appendix 3** of this report.

5.5 Aboriginal Community Consultation

The following Aboriginal Communities and associated government agencies were notified of study commencement in January 2011 and were notified during the study at each of the key milestones including Notice of PIC #1 in June 2012 and the Notice of TESR Addendum Submission:

Aboriginal Communities

- Mississaugas of the New Credit First Nation;
- Six Nations of the Grand River;
- Six Nations Haudenosaunee Chiefs Confederacy Council;
- Mississaugas of Scugog Island First Nation;
- Chippewas of Georgina Island First Nation;
- Chippewas of Rama First Nation;
- Hiawatha First Nation;
- Beausoleil First Nation;
- Alderville First Nation;
- Curve Lake First Nation; and
- Métis Nation of Ontario.

Aboriginal Agencies

- Union of Ontario Indians;
- Aboriginal Affairs and Northern Development Canada; and

- Ministry of Aboriginal Affairs.

These Aboriginal communities and agencies were encouraged to provide input throughout the study and to attend PIC #1 and provide any input to the Project Team with their views and comments so that they could be addressed during the study. Project Team correspondence with Aboriginal Communities is included in **Appendix 2 and 3** of this report. To date, the following responses have been received:

- Chippewas of Georgina Island First Nation – acknowledgement of information provided;
- Hiawatha First Nation – wish to remain informed about the study. Interested in information relating to the TESR report, archaeological assessment reports and any updates;
- Chippewas of Rama First Nation – acknowledgement as a member of the Williams Treaties First Nations;
- Alderville First Nation – project is deemed a level 3, having minimal potential to impact their First Nations' rights. Therefore, keep Alderville apprised of any archaeological findings, burial sites or any environmental impacts, should they occur; and
- Curve Lake First Nation – project area is situated within the Traditional Territory of Curve Lake First Nation. Not currently aware of any issues that would cause concern with respect to their Traditional, Aboriginal and Treaty rights. Must be notified of any excavation that unearths bones, remains or other such evidence of a native burial site or any Archaeological findings.

6. SUMMARY OF ENVIRONMENTAL EFFECTS AND PROPOSED MITIGATION / COMMITMENTS TO FUTURE WORK

This Section focuses on the specific direct and indirect effects on environmental features and highlights the environmental protection/mitigation measures proposed to manage adverse environmental effects related to natural sciences, socioeconomic and cultural resources. Environmental effects are identified based on issues/concerns raised by the public, external agencies and the study team. The environmental protection/mitigation measures proposed will be refined during the detail design phase of the project.

MTO's environmental protection practices seek to avoid potential adverse environmental effects where possible. For situations where avoidance is not environmentally, technically or economically feasible, MTO has developed, or adopted, environmental protection/mitigation measures that are incorporated into construction contracts to bind the contractor to implement such measures during construction. The mitigation measures described below represent a combination of specific provisions/standards, and commitments MTO is making during the preliminary design study to carry forward to the detail design and construction phases of the project.

A summary of environmental concerns/potential effects, associated mitigation and monitoring requirements is included in Exhibit 6-1.

6.1 Soils, Surface Water, and Erosion and Sedimentation

6.1.1 POTENTIAL EFFECTS

Soil disturbance associated with Highway 5/6 interchange, associated roads and commuter parking lot may result in erosion and sedimentation, potentially impacting sensitive receiving watercourses and water bodies.

6.1.2 PUBLIC AND AGENCY CONCERNS

The potential for soil erosion resulting from this project was identified by the Study Team. The Ministry of the Environment (MOE), Ministry of Natural Resources (MNR) and the Department of Fisheries and Oceans Canada (DFO) are mandated to protect water quality and quantity in relation to flood potential, contamination and resulting impacts on fish habitat.

6.1.3 IMPACT ASSESSMENT AND MITIGATION – EROSION AND SEDIMENTATION

Standard erosion and sedimentation control practices will be followed during construction, in accordance with Ontario Provincial Standard Specification (OPSS) 805, to minimize construction-related impacts on fish habitat and water quality. Erosion and sedimentation control measures will be implemented prior to construction. The duration that soils are exposed during construction will be minimized.

The erosion and sedimentation control measures identified for "surface water" will address potential impacts on soils. An erosion and sedimentation control plan will be prepared during the detail design phase and incorporated into contract documents. Temporary control measures may include the following:

- Straw bale flow checks placed at regular intervals in roadside ditches down gradient from areas of soil disturbance;
- Silt fence placed along stream margins and shorelines in areas of soil disturbance; and,
- Conventional seeding and mulching and/or erosion control blanket placed in areas of soil disturbance to provide adequate slope protection and long-term slope stabilization.

6.2 Groundwater

6.2.1 POTENTIAL EFFECTS

There is potential for impacts to the area's groundwater regime resulting from construction activities. Further hydro-geological studies will be conducted as required prior to construction at locations where dewatering is necessary. If dewatering is necessary, a Permit to Take Water (PTTW) will be obtained from the Ministry of the Environment (MOE) if the amount of water taken exceeds 50,000 litres per day. The permit will be acquired by following procedures in Ontario's Water Taking Regulation (Ontario Regulation 387/04 made under the Ontario Water Resources Act). This will be confirmed during the detail design stage of the project.

As discussed in Section 3.2.2, groundwater impacts from the planned interchange construction and associated municipal road construction are not expected to be significant.

A pre-construction drinking water well survey will be conducted within the study area, to document the baseline conditions of wells. In addition, consideration will be given to developing a monitoring program for active water supply wells in the vicinity of the construction activities prior to construction, if deemed necessary. Water well surveys and activities related to a monitoring program can only be undertaken if permission to enter properties is provided by property owners.

6.3 Fish and Fish Habitat

6.3.1 POTENTIAL EFFECTS

The construction of new watercourse crossings, modifications to existing crossings and general drainage improvements have the potential to result in the harmful alteration, disruption or destruction (HADD) of fish habitat.

Modifications to existing crossings, including replacement, extension, repair and clean-out, and any associated watercourse diversions/realignments, have the potential to result in the loss of site-specific habitat or create barriers to fish movement.

6.3.2 PUBLIC AND AGENCY CONCERNS

The *MTO/DFO/OMNR Protocol for Protecting Fish and Fish Habitat on Provincial Transportation Undertakings, 2013* developed jointly by MTO, DFO and OMNR forms the basis for the approach taken to assess impacts to fish and fish habitat. This protocol was developed in order to assure that fish and fish habitat receive the appropriate level of consideration and protection while enabling highway developments in a timely and cost effective manner. One of the main features of the protocol is the ability of MTO and their consultants to self screen if a HADD is likely to occur as a result of the project. DFO ultimately reviews the assessment made by MTO. Where it is not feasible to avoid a HADD, the project will be sent to DFO for review and approval under Section 35 (2) of the federal *Fisheries Act.* The OMNR serves as a resource for background information and for sensitivity rankings for the aquatic habitat within a project's limits.

6.3.3 IMPACT ASSESSMENT

Borer's Creek

There is only one fish-bearing watercourse within the study area which is Borer's Creek (refer to Exhibit 3-2) that passes under Highway 6 through a two cell open bottomed concrete culvert, flowing from east to west approximately 520 m north of Highway 5. The currently proposed works include the provision of extensions and the construction of headwalls at both ends of the existing culverts to accommodate the new interchange and additional lanes on Highway 6.

The mitigation measures presented below in Section 6.3.4 apply mainly to the only fish-bearing watercourse within the study area which is Borer's Creek. However, with the exception of the in-water works timing window, the mitigation measures should also be applied as best management practices to all other watercourses within the study area where possible (refer to Exhibit 3-2).

Watercourse 2 (Grindstone Creek) – North Cootes Paradise Tributary 1

Watercourse 2 appears to originate as a storm water outfall at the end of Horseshoe Crescent in the northeast quadrant. Here it was found to be an intermittent, cattail-dominated swale with three large pools that contained submerged vegetation indicating permanent water. These pools were formed from three very large rock checks across the channel. Riparian habitat was comprised of old field vegetation. This watercourse passes under Highway 6 approximately 45 m north of the intersection through a concrete (upstream)/corrugated steel pipe (CSP; downstream) culvert.

In the northwest quadrant, the channel is less than 50 m long and is deeply incised. It curves close to the roadway and crosses under Highway 5 through a corrugated plastic pipe approximately 80 m west of Highway 6. The feature basically consists of a roadside ditch partially lined with cattails, herbaceous vegetation and small trees and shrubs.

In the southwest quadrant, the watercourse parallels the businesses at the corner of Highways 5 and 6 and then travels along Highway 6 at the top of the Niagara Escarpment to the east of the commercial buildings along Innovation Drive. Close to Highway 5, the ditch is densely vegetated with *Phragmites*. Further downstream, the ditch is almost entirely lined with cattails. The watercourse remains parallel to Innovation Drive and curves to the west prior to reaching the edge of the Escarpment. It then enters a large, bermed retention area which occupies an area of approximately 17,000 m^2 located south of Innovation Drive and east of South Drive. This area was mostly dry at the time of the site visit. Water from here can exit the retention area via two routes. The first is a pipe structure through the berm at the east end of the facility. The second is an overflow spillway located in the same general area. As the facility contains mainly upland grasses, it does not appear to be inundated very often. From the exit of the facility, the water proceeds into a very small ditch and over the Escarpment edge. The drop in this area is significant.

Because of all of the barriers to fish passage (Escarpment face, rock checks, berms, etc.), this watercourse does not constitute fish habitat. However, it does contribute flows and nutrients to downstream fish habitat and thus should be considered indirect fish habitat.

Watercourse 2 (Grindstone Creek) in the north-east quadrant will be realigned through the Highway 5 and 6 interchange though a new culvert system under the interchange to the south-west quadrant of the interchange. In the south-west quadrant a new culvert will be constructed along the current watercourse to carry traffic over the watercourse for a new entrance road to adjacent businesses. Refer to Exhibit 4-2 Alternative A, Exhibit 4-9 Alternative 3, Exhibit 4-10 and Appendix 1.

Watercourse 3 (Grindstone Creek) – North Cootes Paradise Tributary 2

Watercourse 3 raises in the southeast quadrant as a small swale conveying surface drainage in a south-easterly direction through agricultural fields. In some areas, cattails exist within the swale and in others herbaceous species. At the downstream end of the swale, a berm has been constructed adjacent to a commercial building. From here water, when high enough, enters a perforated pipe and travels underground for approximately 250 m and is discharged into a rehabilitated quarry. The quarry has been turned into wetland ponds/cells and contained much water and both submerged and emergent vegetation at the time of the site visit. From the quarry, water exits into a watercourse over a spillway. From there the water travels down the Escarpment face.

This watercourse/drainage feature does not constitute fish habitat as no fish can navigate the Escarpment or the inflow pipe into the quarry, which is located several metres above the water level. The section of channel which occurs to the south (outside) of the study area is unlikely to

constitute direct fish habitat as its gradient is very steep. It does, however, contribute to downstream direct habitat and thus should be considered indirect fish habitat.

A new culvert will be placed along the swale portion (north of the quarry) of Watercourse 3 in order to provide a crossing of Watercourse 3 for the new municipal road that will service Mountain Brow Road. Refer to Exhibit 4-5 and Appendix 1.

Watercourse 4 and Watercourse 5

Watercourse 4 and Watercourse 5 are not anticipated to be impacted by the proposed improvements to the Highway 5/6 Interchange.

6.3.4 MITIGATION

The following mitigation measures will be undertaken, as necessary:

- The contractor will be confined to the minimum area necessary to perform the work;
- No in-water work will occur from March 15 to June 30 to protect the spawning, incubation and emergence of warmwater fish species in Borer's Creek (refer to Exhibit 3-2 in Section 3);
- In-water construction/demolition will commence only when all materials required for construction are at hand to minimize the duration of in-water work;
- Construction will be staged to minimize the duration of in-water work;
- All equipment maintenance and refuelling will be controlled to prevent any discharge of petroleum products. Vehicular maintenance and refuelling will be conducted at least 30 m away from the watercourse and watercourse banks;
- Prevent debris from falling into active channel;
- Construction material, excess material, construction debris, and empty containers will be stored at least 30 m away from the watercourse and watercourse banks to prevent their entry into the watercourses;
- A "Spill Response Plan" and the appropriate contingency materials to absorb or contain a spill will be on the site at all times;
- All works will be performed "in the dry";
- Construction will be completed in a manner that will control sediment release with duration of in-water work kept to a minimum;
- Fish trapped behind cofferdams or erosion and sediment control measures will be netted by a Fisheries Contracts Specialist and released to the water immediately up or downstream of the work area;
- No heavy equipment (wheeled or tracked) will be permitted to enter the wetted area at any time pre-, during or post-construction;
- Erosion and sediment control measures will be installed prior to ground breaking as per the requirements of Ontario Provincial Standard Specification (OPSS) 805 – Construction Specification for Temporary Erosion and Sediment Control Measures;
- Erosion and sediment control measures will be monitored and maintained as per OPSS 805;
- Storage, stockpiling and staging areas will be delineated prior to construction and inspected in accordance with the MTO Construction Administration and Inspection Task (CAIT) Manual;
- Sediment control measures (i.e. silt fence) will be installed along the channel margins to prevent the entry of sediment into the watercourse;
- Dewatering will have discharge directed to a sediment containment system (e.g. sediment basin, sediment bag, etc.) prior to release to the watercourse;

- Flow checks will be placed at appropriate intervals in lateral ditches to trap suspended sediments and reduce the erosive force of runoff;
- Following construction, once disturbed areas have stabilized, all temporary erosion and sedimentation control measures will be removed;
- Trees/shrubs to be retained will be clearly identified in the field by the installation of tree/shrub protection barrier in accordance with OPSS 801 (Construction Specification for the Protection of Trees); and
- In areas where riparian vegetation removal is necessary to accommodate construction, measures to protect the local fish communities should include the following: no felling of trees into the watercourse; minimize the amount of debris produced from entering the watercourse; and only clear the vegetation required to complete the necessary works.

These measures are designed to reduce the likelihood and significance of potential adverse effects on fish habitat as a result of culvert modifications. Culvert/channel modifications have the potential to create barriers to fish movement. No temporary or permanent barriers to fish movement will be created through culvert construction.

The mitigation measures outlined in this report will prevent and/or negate negative impacts to the local fisheries. Mitigation measures mainly pertaining to erosion and sediment control and isolation of work areas will be implemented to prevent sedimentation and other negative impacts to fish or fish habitat.

A Harmful Alteration, Disruption or Destruction (HADD) of fish habitat is not anticipated to occur as a result of this project. At the detail design phase of this project, the Study Team in consultation with DFO and OMNR will confirm if a HADD to fish habitat will occur within the study area, in accordance with the *MTO/DFO/OMNR Protocol for Protecting Fish and Fish Habitat on Provincial Transportation Undertakings* (2013) and the *Environmental Guide for Fish and Fish Habitat (June 2009, or as amended).*

Work activities will be undertaken in accordance with the *MTO/DFO/OMNR Protocol for Protecting Fish and Fish Habitat on Provincial Transportation Undertakings (2013)* and the *Environmental Guide for Fish and Fish Habitat (June 2009, or as amended)*. This includes work associated with Borer's Creek and Watercourses 2 to 5 as shown on Exhibit 3-2.

6.4 Vegetation and Vegetation Communities

6.4.1 POTENTIAL EFFECTS

The Highway 5/6 Interchange; widening Highway 5 and 6; the construction and reconstruction of municipal roads to provide access to properties in the south-west, north-west and south-east quadrants of the new interchange; and, the creation of a new commuter parking lot in the north-east quadrant of the interchange have the potential to displace or disturb vegetation and vegetation communities and designated natural areas. Effects on vegetation related to the proposed development may include:

- Removal of vegetation to accommodate highway facilities and municipal roads;
- Fragmentation of vegetation communities;
- Edge effects including windthrow, sunscald and changes in light conditions;
- Invasion by exotic species;
- Disturbance or displacement of rare, threatened or endangered vegetation species, and provincially and locally significant vegetation species;
- Damage to vegetation by heavy equipment (root exposure, soil compaction, girdling, etc.);

- Changes in local drainage and soil moisture regime by cut/fill activities and ditching; and,
- Dieback as a result of salt spray.

Over time, these disturbances may alter vegetation community structure, composition and function. Effects are generally most prominent in areas that have not been previously disturbed or recently disturbed.

6.4.2 PUBLIC AND AGENCY CONCERNS

The study team identified the potential for disturbance or displacement of vegetation and vegetation communities and designated natural areas as a concern.

6.4.3 IMPACT ASSESSMENT AND MITIGATION – HIGHWAY 5 / HIGHWAY 6, AND THE COMMUTER PARKING LOT

The proposed improvements at the Highway 5 and Highway 6 intersection will occur primarily within the existing cleared right-of-way. However, some property will also be acquired for the new right-of-way of Highway 5 and Highway 6 and for road facilities including the commuter parking lot. The Highway 5/6 Interchange will primarily impact the vegetation communities directly adjacent to the existing highways, and at the intersection of the highways. The vegetation communities adjacent to existing roads are mainly cultural in origin.

The vegetation communities adjacent to the existing roads include: Deciduous Forest (FOD), Dry-Fresh Sugar Maple-Basswood Deciduous Forest (FOD5-6), Fresh-Moist Lowland Deciduous Forest (FOD7a to c), Red Osier Mineral Thicket Swamp (SWT2-5), Common Reed Mineral Meadow Marsh (MAM2b), Reed-canary Grass Mineral Meadow Marsh (MAM2-2), Cattail Mineral Shallow Marsh (MAS2-1a to d), Dry- Moist Old Field Meadow (CUM1-1a to r), Bedrock Cultural Meadow Ecosite (CUM2), Deciduous Plantation (CUP1), Mineral Cultural Savannah (CUS1a and b), Mineral Cultural Thicket (CUT1) and Mineral Cultural Woodland (CUW1a to e) (refer to Exhibit 3-2). The cultural communities contain a high proportion of non-native and invasive plant species.

These vegetation communities are considered to be widespread and common in Ontario and secure globally. Overall, the plants along the edges of these vegetation communities are tolerant to disturbance and are able to recover quickly post disturbance.

Two wetland vegetation communities on the east side of Highway 6, north of Highway 5 will be impacted. The two wetland vegetation communities are found within ditches on the side of Highway 6 and in the adjacent properties (i.e. future commuter parking lot). These wetland vegetation communities are CUM1-1p (Dry Moist Old Field Meadow Type), and CUW1c (Mineral Cultural Woodland Ecosite). These ditch wetlands provide corridors for wildlife movement. The wetlands within the ditches dry out in the summer as sediment loads fill them in or when the primary source of water is from surface runoff. Therefore, the only types of plants that are present are species tolerant of short term flooding and the species diversity is very low. Given the vegetation and wildlife function of these wetland vegetation communities, it is likely that similar habitats will form adjacent to the new roadway edge, and thus, the significance of the removal of this habitat is low.

6.4.4 IMPACT ASSESSMENT AND MITIGATION – NEW MUNICIPAL ROADS

Vegetation and vegetation community impacts outlined above do not account for the additional impacts that will be caused by the associated Municipal road improvements. The proposed Municipal roads are new alignments that will occur beyond the existing cleared right-of-way. The vegetation communities that will be impacted by the Municipal roads are mainly cultural in origin, including Dry-Moist Old Field Meadows. One wetland vegetation community; a Red-osier Mineral Thicket Swamp (SWT2-5) will be impacted. This wetland vegetation community is the most diverse that was encountered within the study area. Clearing of trees and shrubs may facilitate the introduction of invasive plant species, may cause siltation, polluted water runoff and change the drainage patterns.

A new road connection between Garwood Avenue and Woodsworth Avenue is planned as well as a turn around on the west side of Highway 6 at the intersection of Highway 6 and Parkside Drive. These improvements will impact a small portion (along the edge) of the following communities: thicket swamp (SWT2-5); Dry-Moist Old Field Meadow (CUM1-1) and Mineral Cultural Woodland (CUW1) vegetation communities. In addition it is proposed to implement new road alignments called Streets 'B', 'B1' and 'B2' in the northwest quadrant of the interchange. These new roads will affect Old Field Meadows (CUM1-1) vegetation communities. Street 'A' which is proposed to be located in the southwest quadrant of the Highway 5 and Highway 6 intersection will not impact any vegetation communities. A new road connection from Mountain Brow Road to Highway 5 proposed in the southeast quadrant will impact CUM1-1, CUW1, CUS1 and MAS2-1 vegetation communities (refer to Exhibit 3-2 for vegetation communities). During detail design, further analysis of vegetation impacts associated with the new municipal roads will be carried out. With the exception of the SWT2-5 vegetation community, the remaining impacts will mainly be to culturally influenced meadows, which are tolerant to disturbance and are able to recover quickly post disturbance. Vegetation removals for the new interchange will be required to achieve MTO design standards.

The following environmental protection measures will be incorporated into the highway design to minimize the vegetation impacts:

- Erosion and sediment control measures will be installed prior to ground breaking as per the requirements of Ontario Provincial Standard Specification (OPSS) 805 – Construction Specification for Temporary Erosion and Sediment Control Measures;
- Erosion and sediment control measures will be monitored and maintained as per OPSS 805;
- Vegetation removals within the new right-of-ways will be minimized to the extent possible;
- To the extent possible, vegetation clearing from the edge of the new road platform to the limits of the new right-of-way along the new highway and municipal roads will be done by close cut clearing with no grubbing to leave some of the vegetation root structures intact for soil stabilization and vegetation regeneration; and,
- Tree protection barriers will be installed around trees to remain in accordance with OPSS 801-Construction Specification for the Protection of Trees. OPSS 801 describes protective measures required to safeguard trees from construction operations, equipment and vehicles where such trees are not designated for removal as part of the project, and covers the proper installation of protective barriers. Prior to construction, trees to be protected will be clearly identified in the field by the contract administrator and a protection barrier will be installed.

Dieback may occur along the new roadway edge of vegetation communities as a result of sunscald and windthrow. The effects of salt spray on roadside vegetation are considered minor and unavoidable. Vegetation dieback is typically limited to the outermost edge of vegetation communities and varies based on the orientation of the highway, the direction of the prevailing winds, and the frequency and volume of salt applied.

No rare, threatened or endangered vegetation or vegetation communities will be impacted by the proposed works. There will be no impacts on designated natural heritage areas.

6.5 Wildlife and Wildlife Habitat

6.5.1 POTENTIAL EFFECTS

Highway improvements have the potential to result in the displacement of and disturbance to wildlife and wildlife habitat. Effects on wildlife related to highway improvements may include:

- Habitat removals within the existing right-of-way;
- Habitat removals beyond the existing right-of-way;
- Wildlife passage/barrier effects;

- Disturbance to wildlife from noise, lights and visual intrusion;
- Displacement of rare, threatened or endangered wildlife species and habitat; and,
- Impacts to migratory birds.

6.5.2 PUBLIC AND AGENCY CONCERNS

The Study Team identified wildlife habitat removals within the study limits as a concern.

6.5.3 IMPACT ASSESSMENT AND MITIGATION – HABITAT REMOVALS WITHIN THE EXISTING RIGHT-OF-WAY

The existing Highway 5 and 6 right-of-way consists of previously modified/disturbed terrestrial wildlife habitat with limited habitat capability. The improvements to Highway 5 and 6 within the existing ROW, for the most part, will have a limited impact on wildlife and wildlife habitat. However, two active Barn Swallow nests were identified within the pedestrian tunnel at Borer's Creek (see *Displacement of Rare, Threatened or Endangered Wildlife and Wildlife Habitat* section below for a discussion of these nests). In general, the improvements to Highway 5 and 6 within the existing ROW will have limited and site specific impacts on wildlife and its habitat.

In the 2003 TESR, it was recommended that a reptile and amphibian hibernacula screening be completed. During the field investigation of the study area, no features that were considered suitable for reptile and amphibian hibernacula (e.g. rocky outcrops and expansive wetlands) were identified within the study area.

6.5.4 IMPACT ASSESSMENT AND MITIGATION – HABITAT REMOVALS BEYOND THE EXISTING RIGHT-OF-WAY

New Interchange and Commuter Parking Lot
The construction of the interchange and commuter parking lot will result in the loss of wildlife habitat. The aquatic/riparian areas associated with Borer's Creek provide the most naturalized wildlife habitat within the impact area. Other habitats occupied by wildlife will be displaced/disturbed as a result of the new interchange and the construction of the commuter parking lot; however, these impacts are considered minor because of the highly disturbed nature of the lands. The incremental loss of habitat associated with construction of the interchange and commuter parking lot is considered minor; this loss will have a site specific impact on wildlife and wildlife habitat. Potential impacts to species at risk are further described in the Displacement of Rare, Threatened or Endangered Wildlife and Wildlife Habitat section below.

Construction of New Municipal Roads
Construction of new municipal roads at the northwest, southwest and southeast quadrants of the Highway 5 and Highway 6 intersection will result in removal of wildlife habitat. However, most wildlife habitat being removed is highly disturbed and contains limited functionality. These include the following: agricultural, manicured, cultural meadow and cultural thicket habitat. These habitats provide limited habitat capacity for wildlife and generally only wildlife species considered tolerant of human disturbance would be present. Removal of these habitats will have minimal impacts on the wildlife composition of the study area.

6.5.5 IMPACT ASSESSMENT AND MITIGATION – WILDLIFE PASSAGE / BARRIER EFFECTS

New Interchange and Commuter Parking Lot
The Highway 5/6 Interchange will result in an increased risk of mortality for wildlife that choose to cross the roads within the study area. While the increased highway footprint associated with the Interchange will not prohibit crossing of the roads within the study area by amphibians, reptiles, small and large mammals and birds, it poses an incremental hazard to these species by increasing the duration of exposure to these risks. The habitat found within and adjacent to the existing Highway 5 and Highway 6 intersection is highly disturbed in nature. The increase in wildlife mortality above existing conditions as a result of the intersection improvements is considered minor.

The complete blocking of wildlife corridors (specifically culverts) during the construction period may cause an increase in the number of road mortalities. Culverts should not be entirely blocked, or if blockage of a culvert is necessary the blockage period should be kept to the shortest duration possible to minimize discouragement of the natural movements of wildlife species and to reduce potential road mortality.

Construction of New Municipal Roads

Construction of new municipal roads in the northwest, southwest and southeast quadrants of the Highway 5 and Highway 6 intersection will result in increased fragmentation of wildlife habitat and increase the hazard to wildlife from crossing the new roads. However, wildlife habitat in the vicinity of the study area is already highly fragmented by existing infrastructure. As stated above these habitats provide limited habitat capacity for wildlife and generally only wildlife species considered tolerant of human disturbance would be present. Additional fragmentation of these habitats will have limited negative effects on wildlife composition. The increase in wildlife mortality above existing conditions as a result of the introduction of the new municipal roads is considered minor.

6.5.6 IMPACT ASSESSMENT AND MITIGATION – DISTURBANCE TO WILDLIFE FROM NOISE, LIGHT AND VISUAL INTRUSION

Noise, light and visual intrusion may alter wildlife activities and patterns. In urban settings, such as the study area, wildlife has become acclimatized to urban conditions and only those fauna that are tolerant of human activities tend to persist. Given that wildlife are acclimatized to the presence of the existing right-of-way and surrounding development, the tolerance of the wildlife assemblage to human activities and the limited increased zone of influence due to the proposed improvements, disturbance to wildlife from noise, light and visual intrusion are not expected to have any significant adverse effects.

6.5.7 IMPACT ASSESSMENT AND MITIGATION – DISPLACEMENT OF RARE, THREATENED OR ENDANGERED WILDLIFE AND WILDLIFE HABITAT

Two species at risk have been observed within the study area: Barn Swallow and Chimney Swift. Both species, their respective legal status, potential impacts and mitigation within the study area, is discussed below.

As of January 14, 2012, Barn Swallow became provincially regulated as ‘Threatened’ under the Ontario *Endangered Species Act* (ESA). Two active Barn Swallow nests were found in broken lighting fixtures, within the Borer’s Creek pedestrian tunnel. There were also old, inactive Barn Swallow nests within most other lighting fixtures. In other areas that Barn Swallow were documented, they were primarily seen foraging above open areas such as manicured lawn, cultural meadows, marshes, and agricultural fields.

The pedestrian tunnel at Borer’s Creek that contains Barn Swallow nests is not proposed for replacement. However, some modifications at the ends of the culvert are currently proposed by extending headwalls on the east and west side to accommodate widening on Highway 6, and repair of the lighting fixtures where Barn Swallows nests were encountered may be required. Requirements under the ESA will be determined during the detail design phase of the project.

Chimney Swifts are generally found in urbanized areas nesting and roosting on man-made structures such as chimneys. Foraging for food generally takes place over open water. The Chimney Swift is regulated as ‘Threatened’ under the Ontario ESA. A single pair of Chimney Swift noted above the ponds southeast of the Highway 5 and Highway 6 intersection appeared to be passing overhead and did not seem to be actively using the area for breeding as there was a lack of suitable breeding requirements in the location where they were documented. Based on the results of LGL’s 2012 survey, no impacts to Chimney Swift or their nesting habitat is anticipated; consequently a requirement to obtain an ESA permit for Chimney Swift is not anticipated. However, requirements under the ESA will be determined during the detail design phase of the project.

6.5.8 IMPACT ASSESSMENT AND MITIGATION – IMPACTS TO MIGRATORY BIRDS

Numerous bird species located within the study area are listed under the *Migratory Birds Convention Act* (MBCA). The MBCA prohibits the killing, capturing, injuring, taking or disturbing of migratory birds (including eggs) or the damaging, destroying, removing or disturbing of nests. To comply with the requirements of the MBCA, vegetation clearing will not be permitted from April 1 to August 31 to avoid the breeding season for the majority of the bird species, unless a pre-clearing nest search is undertaken to confirm the absence of bird nests. This timing restriction will avoid the destruction or disturbance of bird species covered under the regulations of the MBCA. During the detail design phase, additional alternatives to address this issue will be considered such as installing bird nesting preventative measures prior to April 1 or conducting a bird nest search by a qualified expert, prior to any proposed construction impacts being undertaken. The environmental protection measures recommended for vegetation and vegetation communities will also protect the most sensitive wildlife and wildlife habitat.

6.6 Existing and Planned Land Use

6.6.1 POTENTIAL EFFECTS

The Highway 5/6 Interchange preliminary design has been modified from that approved under the 2003 TESR, and now includes in general the following major components which are described in detail in Sections 1 and 4 of this TESR Addendum: a decrease in the amount the Highway 6 alignment will be shifted easterly; extension of the third northbound (truck climbing) lane to north of Parkside Drive; provisions for a future third Highway 6 southbound lane through the project limits; widening of Dundas Street East and Highway 5 within the project limits; and, provision of sidewalks and on-street bike lanes on Dundas Street East/Highway 5 within the project limits.

In addition, the provision of a commuter parking lot in the north-east quadrant of the new Highway 5/6 Interchange, and a series of municipal roads are proposed throughout the study limits. The proposed design could result in changes to land uses that are not consistent with:

- Planned land uses (e.g., *Official Plan* policies);
- The *Greenbelt Plan* (Protected Countryside); and
- The *Niagara Escarpment Plan*.

6.6.2 PUBLIC AND AGENCY CONCERNS

The potential for changes to existing and planned land uses were identified by the study team based on existing City of Hamilton and provincial planning policies, and known development proposals and plans.

6.6.3 IMPACT ASSESSMENT AND MITIGATION

Official Plan
Hamilton's Urban Official Plan designates the lands east of Highway 6 as 'District Commercial', Borer's Creek and Watercourse 2 (North Cootes Paradise Tributary 1, refer to Exhibit 3-2) as 'Open Space' and the remaining lands as 'Business Park'. The lands outside the urban area are designated as 'Rural Settlement' in the Rural Official Plan.

In general, the Highway 5/6 Interchange, municipal roads and commuter parking lot are compatible with the designated land uses within the study area. The interchange would be located within the 'Business Park' and 'District Commercial' land use designations, and would be compatible with the permitted land uses within these designations. The Municipal road network will result in changes to land uses in each of the quadrants surrounding the interchange, and could require an amendment to the Official Plan. However, the road network would provide access to businesses and residences within this area, which are compatible with the surrounding land uses. Any amendments to the Official Plan will be undertaken separately from this study.

Greenbelt Plan – (refer to Exhibit 3-3)
The study area north of Highway 5 is located within the Greenbelt Plan, 'Towns and Villages' and 'Protected Countryside' designated lands. Extensions or expansions of services to settlement areas within the Protected Countryside are subject to the infrastructure policies of the Greenbelt Plan, including the requirements regarding environmental assessments. As required in Section 4.2.1 of the Plan, this project meets the objective of serving "the significant growth and economic development expected in Southern Ontario beyond the Greenbelt by providing for the appropriate infrastructure connections among urban growth centres and between these centres and Ontario's borders." Efforts have been made to limit environmental impacts associated with the proposed improvements on the land within the Greenbelt Plan.

Niagara Escarpment Plan – (refer to Exhibit 3-3)
All of the lands located south of Highway 5 within the study limits are located within the Niagara Escarpment Plan area. Within this area, lands east of South Drive are designated as 'Urban Area' and lands west of South Drive are designated as 'Escarpment Protection Area'. In addition, the lands along the Niagara Escarpment feature are designated as 'Escarpment Natural Area'. Transportation infrastructure is permitted within these areas, provided that it meets the policies of the Niagara Escarpment Plan.

Street 'A' is located in a portion of the Niagara Escarpment Plan area designated as 'Escarpment Protection Area', while the remainder of the proposed improvements are within a portion of the Niagara Escarpment Plan area designated as 'Urban Area'. Niagara Escarpment Plan site and design guidelines for transportation infrastructure development are as follows:

- Minimize blasting, grading and tree removal through alignment selection;
- Maximize utilization of curbs and gutters, retaining walls and tree wells;
- Slopes should be graded to a 2:1 slope minimum and planted;
- Site rehabilitation should include native species of vegetation and blend into the surrounding landscape;
- Apply the use of vegetation screenings where appropriate;
- Design the transportation or utility facility to minimize visual impact; and,
- Minimize impacts on parks and open space, and the Bruce Trail.

Plans and strategies will be developed to incorporate the above guidelines into the detail design for the proposed improvements. No increase in the width of the current rock cut through the Niagara Escapement face is anticipated (east and west) to accommodate the improvements along Highway 6. However, there will be a need to widen the current east face of the Highway 6 roadway cut, north of the Niagara Escapement face near Highway 5, in order to accommodate the new south to east-west ramp to Dundas Street East.

6.7 Residences, Businesses, Community & Recreational Facilities

6.7.1 POTENTIAL EFFECTS

The following potential effects are associated with the changes to the Highway 5/6 Interchange from the approved 2003 TESR, i.e., modifications to the interchange preliminary design, the municipal road network and the commuter parking lot:

Permanent Impacts

- The proposed improvements have the potential to displace businesses and residences;
- The proposed improvements have the potential to change access to residences, businesses, and community & recreational facilities within the study area;

- The proposed improvements have the potential to move traffic closer to receptors, which could result in an increase in traffic noise levels;
- The proposed improvements may result in potential changes in air quality by bringing traffic closer to receptors.

Temporary Impacts During Construction Activities

- Construction/demolition activities involving heavy machinery could generate noise that may pose a nuisance to local residents;
- Construction emissions have the potential to contribute pollution, including dust into the atmosphere; and
- Construction operations have the potential to create road closures and reduce access to entrances/exits in the study area.

6.7.2 PUBLIC AND AGENCY CONCERNS

Construction emissions and noise were identified as potential effects by the study team. The potential inconvenience to residents, businesses, and the travelling public, related to entrance closures and reduced access to local entrances/exits were also identified by the study team.

6.7.3 IMPACT ASSESSMENT AND MITIGATION

Displacement (Permanent)
Based on a review of existing land use information, it is anticipated that businesses and residences will be displaced by the proposed improvements. In addition, some properties will be impacted by widening at the property frontage. These impacts were unavoidable, given the constraints at the existing intersection of Highway 5 and Highway 6. Plans and strategies will be developed to minimize impacts to residences and businesses, to the extent possible. During the detail design phase of the project, the Ministry will finalize property requirements and proceed with the property acquisition process, as needed, in accordance with MTO policy.

Changes in Access (Permanent)
The implementation of the interchange improvements will affect access to driveways and roads in close proximity to the interchange, including the Garwood Avenue, Mountain Brow Road, North Wentworth Drive and South Drive intersections. To mitigate for this impact, a municipal road network is proposed that provides alternative access to existing businesses and residences. A series of alternative municipal roads were identified and evaluated based on a range of considerations, and an effort was made to select the alignments that had the least overall impact as previously reported in Section 4.2. Where alternative access cannot be provided to a property due to changes resulting from the planned interchange construction, consideration will be given to purchasing the affected property.

Noise Impacts (Operational)
A **Noise Impact Assessment** report was prepared by Valcoustics Canada Limited, dated February 25, 2013 to summarize the expected noise impact from the proposed improvements. The requirements of the Ministry of Transportation (MTO) Environmental Guide for Noise (2006, version 1.1 July 2008) were used in the noise assessment. The existing sound exposures at the facade most exposed to either Highway 5 or 6 is at or above 65 dBA at many of the dwellings within the study area. The existing sound exposures in Outdoor Living Areas (OLAs) are at or above 65 dBA at a few receptors within the study area. Thus, noise mitigation has been considered as part of the detailed noise impact assessment of the proposed improvements.

It was concluded that the improvement of the Highway 5/6 intersection will have minor noise impacts on sensitive receptors. Since sound exposure changes are less than 5 dBA and the resultant sound exposures are below 65 dBA in the OLAs, noise mitigation is not required for receptors along Highway 5.

Even though sound exposures above 65 dBA are predicted in the OLAs of receptors in the Garwood/Woodsworth development along Highway 6 north of Highway 5, noise mitigation is not required as measures were investigated and found that they could not meet the MTO requirement that they be implemented within the right-of-way and provide at least 5 dBA of attenuation.

For the dwellings on Old Guelph Road backing towards Highway 6 (southbound), an approximately 4.0 m high sound barrier for a length of approximately ± 500 metres will be constructed as part of the widening of the adjacent portion of Highway 6 (refer to **Appendix 1**). The analysis indicates this sound barrier can be implemented to provide at least the minimum noise reduction required by MTO and will attenuate the noise levels to below 65 dBA. However, although a sound barrier is proposed at this location, it is not planned for construction until the third southbound lane on Highway 6 is constructed. This is because widening of the highway platform is necessary in order to position the sound barrier in the MTO right-of-way. The sound barrier height and length will be further determined based on site conditions and road traffic volumes at the time the sound barrier is proposed to be constructed. Also, actual construction of this third southbound lane is not expected to take place until or after it is warranted by traffic volumes, which is currently identified as the year 2031.

Noise Impacts during Construction (Temporary)
When construction is occurring in relatively close proximity to a noise sensitive area, noise impacts are expected as the sound level from construction will be above the ambient and will be clearly audible. To mitigate the construction noise impacts, the following mitigation measures will be implemented during construction, as required:

- Equipment used for construction must be in good state of repair with all noise muffling devices in good working order;
- Equipment will be maintained in an operating condition that prevents unnecessary noise, including but not limited to non-defective muffler systems, properly secured components, and the lubrication of moving parts;
- Idling of equipment will be restricted to the minimum necessary to perform the specified work; and,
- The Contractor will be required to be available to address any concerns that may arise with respect to noise during construction. Noise complaints during construction will be investigated according to the provisions of the MTO *Environmental Guide for Noise (October 2006)*. Any initial complaint from the public requires verification by MTO that the general noise control measures agreed to are in effect. If not, MTO will advise the Contractor of any problems, and enforce its contract.

In addition, should night time construction be required in order to minimize impacts to traffic operations a noise by-law exemption permit will be pursued from the local municipalities.

Air Quality Impacts (Operational)
An **Air Quality Impact Assessment** report was prepared by SENES Consultants Ltd., dated May 2013 to establish the air quality effects that may arise due to the proposed Highway 5/6 Interchange.

The results of the Air Quality Impact Assessment determined that with the exception of benzene, there are no model predicted exceedances of applicable contaminant criteria at sensitive receptor locations for either existing conditions or the three future year (2016, 2026 and 2036) no-build and new interchange scenarios. Exceedances of 24-hour and annual benzene Ontario MOE Ambient Air Quality Criteria (AAQC) are predicted at many receptor locations for existing conditions and all future scenarios assessed, and are due to the 24-hour background benzene concentration of 2.01 $\mu g/m^3$ that is 87% of the AAQC. This suggests that model predicted exceedances of benzene criteria are largely attributable to background benzene concentrations within the Hamilton area.

The study also identifies that compared to existing conditions (2010) for all future scenarios (no-build and new interchange), air quality will improve for NO_x and slightly deteriorate for all other gaseous pollutants despite significant increases in traffic due to population growth. This improvement or only slight deterioration is due to future low emission engine technologies and fuels.

Air quality at sensitive receptor locations will generally deteriorate in the future for particulate matter-based compounds, primarily due to increased traffic volumes. Additionally, the annual pollutant burden of carbon dioxide equivalent (CO_2e) is expected to increase in the future as a result of increased population growth and traffic within the study area.

However, the study shows that within the study area, when compared to future no-build scenarios, the proposed new interchange will generally result in less than a 5% increase in pollutant concentrations at receptor locations.

Air Quality Construction Emissions (Temporary)
The proposed Highway 5/6 Interchange has the potential to affect the air quality in the study area during the construction phase. As with any construction site, these emissions will be of relatively short duration and are unlikely to have any long-lasting effect on the surrounding area. Dust impacts should be mitigated through the use of proper controls, such as:

- Periodic watering of unpaved (non-vegetated) areas;
- Periodic watering of material stockpiles;
- Limiting the speed of construction vehicular travel;
- Use of water sprays during the loading, unloading of materials; and
- Sweeping and/or water flushing of the entrances to the construction zones.

These types of controls will help in minimizing the impacts on the environment during the construction phase.

Access Modifications during Construction (Temporary)
Road improvements will be staged to the extent possible to avoid closure, or to reduce the duration of closures, of entrances/exits. Alternate access to residences, businesses and community and recreational facilities will be provided where feasible to maintain access/egress.

Construction will be staged to minimize traffic delays to residents, businesses and facility operators and their visitors. Signage and temporary traffic signals will be used to maintain traffic flow. It is anticipated that emergency vehicle access and school bus routes will be maintained at all times throughout construction however this will be confirmed during the detail design phase of the project.

It is anticipated that during construction it will be necessary to implement lane, ramp, and road closures. During the development of the detail design construction staging plan consideration will be given to limiting the duration and frequency of closures to the extent possible. The Construction Staging plan will be presented to the public for comment at a Public Information Centre.

6.8 Agricultural Resources

6.8.1 POTENTIAL EFFECTS

The following potential effects are associated with the changes to the Highway 5/6 Interchange (from the approved 2003 TESR), the municipal road network and the commuter parking lot:

- The proposed improvements have the potential to displace prime agricultural land; and
- The proposed improvements have the potential to disrupt agriculture related traffic.

6.8.2 PUBLIC AND AGENCY CONCERNS

The study team identified removal of prime agricultural land as an issue.

6.8.3 IMPACT ASSESSMENT AND MITIGATION

Displacement/Disturbance (Permanent)
To accommodate the improvements, there will be some displacement of agricultural lands directly adjacent to the highway. Although the lands within the study limits are classified as prime land, the lands that will be developed to accommodate the interchange and commuter parking lot are already highly disturbed and contained within the urban growth area of the City of Hamilton, with the exception of Street 'A'. Efforts were made to avoid prime agricultural land during the evaluation of municipal road network alternatives. However, in order to accommodate access to residences and businesses within the study area the displacement of prime agricultural land for the location of Street 'A' was unavoidable.

Machinery Movements (Temporary)
Agriculture related traffic likely travels through the study limits, and could be affected by traffic delays and access restrictions during construction. Road improvements will be staged to avoid closure, or reduce the duration of closures, of entrances/exits to the extent possible. Alternate access to residences and farm facilities will be provided where feasible to maintain access/egress. Signage and temporary traffic signals will be used to maintain traffic flow.

6.9 Aesthetics, Existing Vegetation and Landscape Planting

Most of the existing mature trees in the vicinity of the proposed interchange will require removal. Impacts on any areas of undisturbed woodlands are not anticipated however the trees that will require removal are typically scattered specimen trees that were once associated with structures that have been removed over the years or more recently landscaped areas. A landscape planting plan is to be prepared and implemented to the extent possible, to address the loss of existing vegetation, restore disturbed areas, buffer the new highway from sensitive land uses, and generally improve the aesthetics of the interchange area and associated access roads.

6.10 Property Waste and Contamination

As indicated in Section 3.3.7, some of the properties in the study area require further assessment to determine whether subsurface investigations are warranted. Such assessment could include Preliminary Site Screening (PSS) and, if determined necessary through the completion of the PSS, completion of a Phase I Environmental Site Assessment (ESA). Some of the properties could require subsurface environmental investigations to determine if soil and/or groundwater impacts exist. This investigation could consist of the completion of Phase I and/or Phase II ESAs.

Eleven (11) registered spills have also been documented within the study area. Where highway improvement work (i.e. excavation) is conducted in the vicinity of the spill locations, special attention will be paid to the soil and groundwater in the area for any visual evidence of contamination (i.e. discoloration, odour or free product). If visual evidence of contamination is noted, further investigation work in the area will be required.

Based on the results of site reconnaissance, waste expected to be generated by the project will generally consist of: i) contaminated soil and/or groundwater, ii) reclaimed asphalt pavement from milling of existing asphalt surfaces, iii) concrete, likely reinforced, from the removal of pavement structures, iv) manufactured wood waste from guide rail removals, and v) scrap metal such as wire and corrugated steel pipe from culverts. Impacted soils and groundwater should be assessed by a qualified person and disposed of off-site as directed.

Excess materials will be managed in accordance with OPSS 180 – General Specification for the Management of Excess Materials.

6.11 Illumination

The effect of the Highway 6 alignment shift at the Highway 6 and Highway 5 intersection was examined from an electrical perspective. The existing illumination will be impacted by the Highway 6 realignment within the intersection area. The existing highway lighting system will be replaced with high mast illumination. Luminaries in close proximity to residential dwellings will be shielded, and any further impacts will be investigated during detail design.

New municipal roads will be provided with illumination as per City of Hamilton standards and practices. Any potential impacts from this new lighting will be identified and further investigated during detail design.

Underpass illumination will be provided at the pedestrian crossing at Borer's Creek, and under the Highway 5/6 Interchange bridge structure. The underpass illumination details will be determined during detail design.

6.12 Drainage and Stormwater Management

Recommendations for mitigation measures associated with drainage and stormwater management in the study area include:

- Sediment and erosion control measures will be installed prior to construction;
- Mitigation measures are proposed to be implemented to offset the negative impacts of the project on terrestrial and aquatic features in the study area; and
- Inspections are recommended to be conducted during all stages of construction to assess the performance of erosion and sedimentation control measures.

6.13 Cultural Environment

6.13.1 ARCHAEOLOGY

A Stage 1 Archaeological Assessment was prepared to review the archaeological potential in the study area. Background research on existing conditions determined that the potential for identification of archaeological sites exists. However, portions of the study area are heavily disturbed, while other portions have archaeological potential and require a Stage 2 Archaeological Assessment to be completed during the detail design phase of the project.

Prior to construction, the Contractor will be notified of the following:

- Should previously undocumented archaeological resources be discovered, 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 consultant archaeologist to carry out archaeological fieldwork, in compliance with sec. 48 (1) of the *Ontario Heritage Act*; and
- The *Cemeteries Act*, R.S.O. 1990 c. C.4 and the *Funeral, Burial and Cremation Services Act*, 2002, S.O. 2002, c.33 (when proclaimed in force) require that any person discovering human remains must notify the police or coroner and the Registrar of Cemeteries at the Ministry of Consumer Services.

6.13.2 BUILT HERITAGE AND CULTURAL HERITAGE LANDSCAPES

The **Cultural Heritage Assessment** report: **Built Heritage Resources and Cultural Heritage Landscapes Existing Conditions – Impact Assessment** report was prepared by Archeological Services Inc. dated January 2013 and determined the following:

- Construction and staging activities will temporarily alter the setting of the farm complex (CHL 2). Measures should be undertaken to ensure that vibration impacts of construction activities do not prematurely damage structures and that construction staging activities are planned to minimize construction-related effects on these resources. This will be addressed during the detail design phase of the project.
- Direct impacts to BHR 1 through removal of the resource are expected as a result of the preferred design. A heritage impact assessment (HIA) will be undertaken by a qualified heritage consultant during the detail design phase of the project. An HIA involves site-specific research and additional field review to determine the heritage values of the site, and the development of mitigation measures to minimize negative impacts to the heritage features of the site.

6.14 Next Steps

Following the release of this TESR Addendum and environmental clearance, MTO may proceed to the next steps of the project as outlined in the MTO *Class Environmental Assessment for Provincial Transportation Facilities* (2000).

During the detail design phase, the Study Team will address all issues, which were outstanding at the end of preliminary design. Design and Construction Reports (DCRs) will be prepared during the detail design phase to document the results and made available for a 30-day public review period.

A Public Information Centre (PIC) will also take place during the detail design phase of the project to present detail design plans, planned construction methods, construction period staging, property access, and construction impact mitigation measures and communication plans.

6.15 Monitoring

During construction, a Contract Administrator will be responsible for monitoring the Contractor's operations on a day-to-day basis to ensure compliance with the environmental requirements of the Contract. The Contract Administrator will be responsible for maintaining an environmental diary, which will include daily recording of activities related to the environment such as grading activities, the condition and effectiveness of erosion and sedimentation control measures, and weather conditions.

An emphasis will be placed on monitoring work conducted near watercourses and residences. Consultant environmental staff will be available to provide site-specific monitoring and corrections, where required. Following construction, the contractor will monitor the effectiveness and performance of newly seeded areas, rip-rap installations, and vegetation plantings, as applicable and will take remedial actions where necessary. Work performed by contractors is warranted for a certain period following construction to ensure that seeding, and other restoration measures, become established.

Exhibit 6-1
Summary of Environmental Concerns/Potential Effects,
Associated Mitigation and Monitoring Requirements Identified During Preliminary Design

I.D.#	Environmental Issues/Concerns/Potential Effects		Mitigation/Protection/Commitments/Monitoring Requirements
	Issues/Concerns/ Potential Effects	**Concerned Agencies**	
1.	Soils, Surface Water, and Erosion and Sedimentation	Study Team MOE, MNR, and DFO	• Implement standard erosion and sedimentation control practices during construction, in accordance with Ontario Provincial Standard Specification (OPSS) 805 or current specification in place at the time of construction; • Minimize construction-related impacts on fish habitat and water quality; • Minimize the duration that soils are exposed during construction; • Prepare an Erosion and Sedimentation Control Plan during Detail Design; • Monitor measures during construction to ensure their effectiveness; and, • A Permit to Take Water (PTTW) will be secured from the MOE prior to groundwater dewatering or surface water pumping operations, as required.
2.	Groundwater Resources	MOE, Study Team	• Abandon unused wells in accordance with Ontario Regulations; • Carry out further hydrogeological studies prior to construction, as required; • A Permit to Take Water (PTTW) will be secured from the MOE prior to groundwater dewatering or surface water pumping operations, as required; • Minimize the disturbance of any discovered septic beds and take appropriate action should any be disturbed; and, • Consider developing a monitoring program for active water supply wells in the vicinity of the construction activities prior to construction.
3.	Fish and Fish Habitat	MNR and DFO	• No in-water work will occur from March 15 to June 30 to protect the spawning, incubation and emergence of warmwater fish species in Borer's Creek; • A "Spill Response Plan" and the appropriate contingency materials to absorb or contain a spill will be on the site at all times; • An Erosion and Sedimentation Control Plan will be prepared during Detail Design; • Erosion and sediment control measures will be installed prior to ground breaking as per the requirements of Ontario Provincial Standard Specification (OPSS) 805 – Construction Specification for Temporary Erosion and Sediment Control Measures or the current specification in place at the time of construction; • Erosion and sediment control measures will be monitored and maintained as per OPSS 805 or the specification in place at the time of construction; • Storage, stockpiling and staging areas will be delineated prior to construction and

I.D.#	Environmental Issues/Concerns/Potential Effects		Mitigation/Protection/Commitments/Monitoring Requirements
	Issues/Concerns/ Potential Effects	**Concerned Agencies**	
			inspected in accordance with the MTO Construction Administration and Inspection Task (CAIT) Manual; • Sediment control measures (i.e. silt fence and flow checks) will be installed along the channel margins to prevent the entry of sediment into the watercourse; • Dewatering will have discharge directed to a sediment containment system (e.g. sediment basin, sediment bag, etc.) prior to release to the watercourse; and, • Flow checks will be placed at appropriate intervals in lateral ditches to trap suspended sediments and reduce the erosive force of runoff.
4.	Vegetation and Vegetation Communities	MNR, HCA, CH, and Study Team	The following environmental protection measures will be incorporated into the highway design to minimize the vegetation impacts: • Erosion and sediment control measures will be installed prior to ground breaking as per the requirements of Ontario Provincial Standard Specification (OPSS) 805 – Construction Specification for Temporary Erosion and Sediment Control Measures; • Erosion and sediment control measures will be monitored and maintained as per OPSS 805; • Vegetation removals within the new right-of-ways will be minimized to the extent possible; • To the extent possible, vegetation clearing from the edge of the new road platform to the limits of the new right-of-way along the new highway and municipal roads will be done by close cut clearing with no grubbing to leave some of the vegetation root structures intact for soil stabilization and vegetation regeneration; • Tree protection barriers will be installed around trees to remain in accordance with OPSS 801 - Construction Specification for the Protection of Trees. OPSS 801 describes protective measures required to safeguard trees from construction operations, equipment and vehicles where such trees are not designated for removal as part of the project, and covers the proper installation of protective barriers. Prior to construction, trees to be protected will be clearly identified in the field by the contract administrator and a protection barrier will be installed; and, • Prepare a Landscaping Planting Plan during Detail Design.
5.	Wildlife and Wildlife Habitat	MNR, HCA, CH, and Study Team	• Culverts should not be entirely blocked, or if blockage of a culvert is necessary the blockage period should be kept to the shortest duration possible to minimize discouragement of the natural movements of wildlife species and to reduce potential road mortality; • To comply with the requirements of the *Migratory Birds Convention Act* (MBCA),

I.D.#	Environmental Issues/Concerns/Potential Effects		Mitigation/Protection/Commitments/Monitoring Requirements
	Issues/Concerns/ Potential Effects	**Concerned Agencies**	
			vegetation clearing should not be permitted between April 1 to August 31 to avoid the breeding season for the majority of the bird species, unless a pre-clearing nest search is undertaken to confirm the absence of bird nests; • During the detail design phase of the project, additional measures should be considered such as installing bird nesting preventative measures prior to construction, where necessary; • The pedestrian tunnel at Borer's Creek that contains Barn Swallow nests is not proposed for replacement. However, some modifications at the ends of the culvert are currently proposed by extending headwalls on the east and west side to accommodate widening on Highway 6, and repair of the lighting fixtures where Barn Swallow nests were encountered may be required. Requirements under the Ontario *Endangered Species Act* (ESA) will be determined during the detail design phase of the project; • Based on the results of LGL's 2012 survey, no impacts to Chimney Swift or their nesting habitat is anticipated; consequently a requirement to obtain an ESA permit for Chimney Swift is not anticipated. However, requirements under the ESA will be determined during the detail design phase of the project; and, • Monitor measures during construction to ensure their effectiveness.
6.	Existing and Planned Land Use	NEC, City of Hamilton and Study Team	• Consider appropriate buffers and buffer widths for Environmentally Significant Areas (ESAs) and Protection Areas; • Undertake standard tree protection and erosion and sedimentation control measures; • Prepare a Landscaping Planting Plan during Detail Design; and, • Monitor measures during construction to ensure their effectiveness. In regards to the Niagara Escarpment Plan, strategies will be developed to incorporate the guidelines noted below into the detail design for the proposed improvements. No increase in the width of the current rock cut through the Niagara Escapement face is anticipated (east and west) to accommodate the improvements along Highway 6. However, there will be a need to widen the current east face of the Highway 6 roadway cut, north of the Niagara Escapement face near Highway 5, in order to accommodate the new south to east-west ramp to Dundas Street East. • Minimize blasting, grading and tree removal through alignment selection; • Maximize utilization of curbs and gutters, retaining walls and tree wells; • Slopes should be graded to a 2:1 slope minimum and planted; • Site rehabilitation should include native species of vegetation and blend into the surrounding landscape;

I.D.#	Environmental Issues/Concerns/Potential Effects		Mitigation/Protection/Commitments/Monitoring Requirements
	Issues/Concerns/ Potential Effects	**Concerned Agencies**	
			• Apply the use of vegetation screenings where appropriate; • Design the transportation or utility facility to minimize visual impact; and, • Minimize impacts on parks and open space, and the Bruce Trail.
7.	Residences, Businesses, Community and Recreational Facilities	City of Hamilton and Study Team	**Displacement of Private Property (Permanent)** • During the detail design phase of the project, the Ministry will finalize property requirements and proceed with the property acquisition process, as needed, in accordance with MTO policy. **Changes to Access (Permanent)** • Where alternative access cannot be provided to a property due to changes resulting from the planned interchange construction, consideration will be given to purchasing the affected property. **Noise Impacts (Operational)** • For the dwellings on Old Guelph Road backing towards Highway 6 (southbound), an approximately 4.0 m high sound barrier for a length of approximately ± 500 metres will be constructed as part of the widening of the adjacent portion of Highway 6 (refer to **Appendix 1**). The analysis indicates this sound barrier can be implemented to provide at least the minimum noise reduction required by MTO and will attenuate the noise levels to below 65 dBA. However, although a sound barrier is proposed at this location, it is not planned for construction until the third southbound lane on Highway 6 is constructed. This is because widening of the highway platform is necessary in order to position the sound barrier in the MTO right-of-way. The sound barrier height and length will be further determined based on site conditions and road traffic volumes at the time the sound barrier is proposed to be constructed. Actual construction of this third southbound lane is not expected to take place until or after it is warranted by traffic volumes, which is currently identified as the year 2031. **Noise Impacts (Temporary)** To mitigate construction noise the following mitigation measures will be implemented during construction, as required: • Equipment used for construction will be in good state of repair with all noise muffling devices in good working order; • Idling of equipment will be restricted to the minimum necessary to perform the specified work; • Noise complaints during construction will be investigated according to the provisions of the MTO *Environmental Guide for Noise (October 2006)*. Any initial complaint from the

I.D.#	Environmental Issues/Concerns/Potential Effects		Mitigation/Protection/Commitments/Monitoring Requirements
	Issues/Concerns/ Potential Effects	**Concerned Agencies**	
			public requires verification by MTO that the general noise control measures agreed to are in effect; and, • Should night time construction be required in order to minimize impacts to traffic operations a noise by-law exemption permit will be obtained from the local municipalities. **Air Quality Construction Emissions (Temporary)** Dust impacts should be mitigated through the use of proper controls, such as: • Periodic watering of unpaved (non-vegetated) areas; • Periodic watering of material stockpiles; • Limiting the speed of construction vehicular travel; • Use of water sprays during the loading, unloading of materials; and, • Sweeping and/or water flushing of the entrances to the construction zones. **Traffic/Access Modifications during Construction (Temporary)** • Construct proposed access roads to existing business/residences prior to closure of existing commercial or private driveway; • During Detail Design prepare a Traffic Management/Construction Staging Plan; • Provide signage and temporary traffic signals to maintain traffic flow; • Monitor traffic flows during construction to prevent undue delays; and • During the development of the detail design construction staging plan consideration will be given to limiting the duration and frequency of closures to the extent possible.
8.	Agricultural Resources	Study Team	• Stage road improvements to avoid closure, or reduce the duration of closures, of entrances/exits; • Provide alternate access to residences and farm facilities where feasible to maintain access/egress; • Provide signage and temporary traffic signals to maintain traffic flow; and • During Detail Design prepare a Traffic Management/Construction Staging Plan.
9.	Aesthetics, Existing Vegetation and Landscape Planting	Study Team	• Prepare a Landscape Planting Plan, to address the loss of existing vegetation, and restore disturbed areas; • Provide buffers to screen the new highway from sensitive land uses; and • Improve the aesthetics of the interchange area and associated access roads.
10.	Property Waste and Contamination	Study Team	• Undertake additional soils investigations on affected properties, as required, prior to construction; and • Manage excess materials (e.g. asphalt, concrete, earth, rock, etc.) in accordance with the appropriate OPSS.

I.D.#	Environmental Issues/Concerns/Potential Effects		Mitigation/Protection/Commitments/Monitoring Requirements
	Issues/Concerns/ Potential Effects	**Concerned Agencies**	
11.	Illumination	Study Team	• Provide high mast illumination. Luminaries in close proximity to residential dwellings will be shielded, and any further impacts will be investigated during detail design; • New municipal roads will be provided with illumination as per City of Hamilton standards and practices. Any potential impacts from this new lighting will be identified and further investigated during detail design; and • Underpass illumination will be provided at the pedestrian crossing at Borer's Creek, and under the Highway 5/6 Interchange bridge structure. The underpass illumination details will be determined during detail design.
12.	Archaeology	Ministry of Tourism, Culture and Sport (MTCS), and Study Team	• Portions of the study area are heavily disturbed, while other portions have archaeological potential and require a Stage 2 Archaeological Assessment to be completed during the detail design phase of the project; • Should previously undocumented archaeological resources be discovered, 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 consultant archaeologist to carry out archaeological fieldwork, in compliance with sec. 48 (1) of the *Ontario Heritage Act*; and • The *Cemeteries Act*, R.S.O. 1990 c. C.4 and the *Funeral, Burial and Cremation Services Act*, 2002, S.O. 2002, c.33 (when proclaimed in force) require that any person discovering human remains must notify the police or coroner and the Registrar of Cemeteries at the Ministry of Consumer Services.
13.	Built Heritage and Cultural Heritage Landscapes	MTCS, and Study Team	• Construction and staging activities will temporarily alter the setting of the farm complex (CHL2). Measures should be undertaken to ensure that vibration impacts of construction activities do not prematurely damage structures and that construction staging activities are planned to minimize construction-related effects on these resources. This will be addressed during the detail design phase of the project; • Direct impacts to BHR 1 through removal of the resource are expected as a result of the preferred design. A heritage impact assessment (HIA) will be undertaken by a qualified heritage consultant during the detail design phase of the project. An HIA involves site-specific research and additional field review to determine the heritage values of the site, and the development of mitigation measures to minimize negative impacts to the heritage features of the site.