



**The Regional Municipality of Peel
Class Environmental Assessment for
Steeles Avenue from Chinguacousy / Mavis Road to
Winston Churchill Boulevard
City of Brampton**

ENVIRONMENTAL STUDY REPORT

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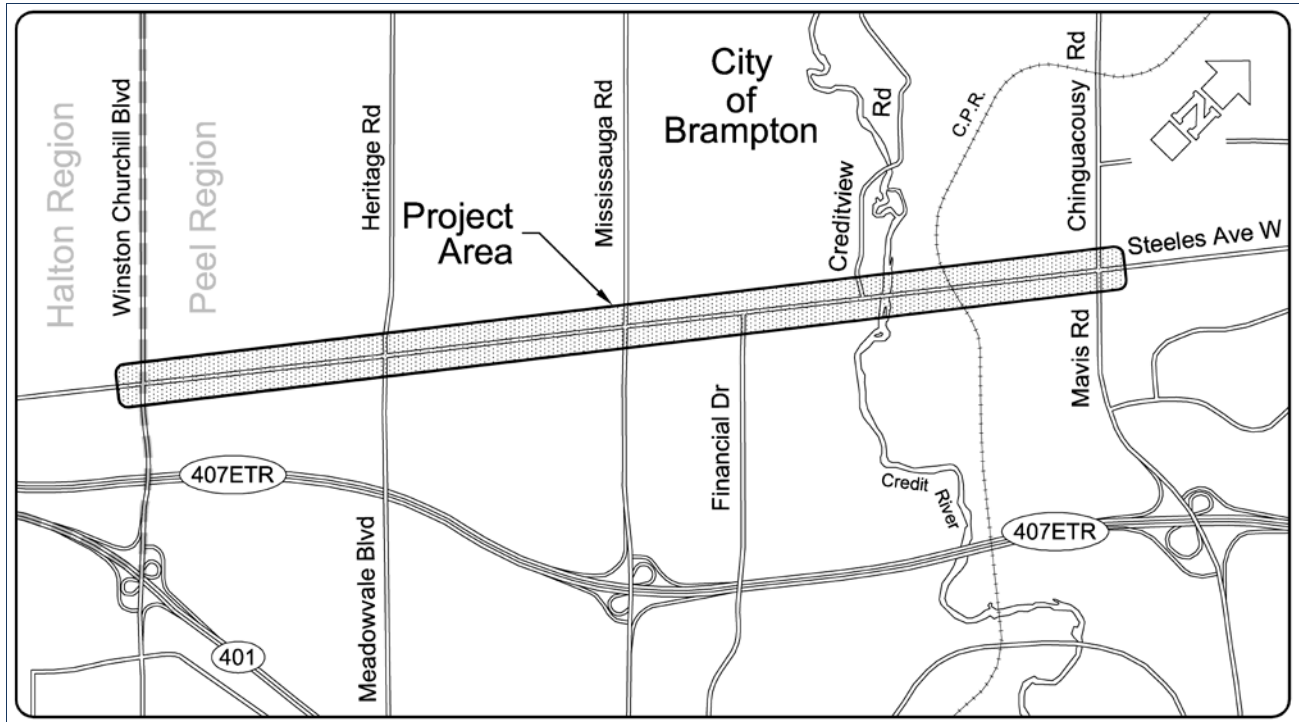
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EXECUTIVE SUMMARY

Environmental Study Report

The Regional Municipality of Peel has completed a Schedule C Municipal Class Environmental Assessment (Class EA) Study for planned transportation corridor improvements to satisfy future travel demands on Steeles Avenue from Chinguacousy/Mavis Road to Winston Churchill Boulevard. This Environmental Study Report (ESR) documents the rationale for the project, the background to the study, existing and future conditions within the study area, the planning, design and consultation process leading to the preferred alternative, anticipated positive and negative impacts, and proposed mitigation measures.

This project is planned in accordance with the requirements of the Municipal Class Environmental Assessment (October 2000, as amended 2011), Schedule C.

Background to the Study

Steeles Avenue is an east-west major arterial corridor in the City of Brampton. The portion of Steeles Avenue being studied has varied characteristics. Steeles Avenue is generally two lanes in each direction with turning lanes at various intersections. The Region of Peel's Long Range Transportation Plan identified the need for capacity improvements along this section of Steeles Avenue. The Long Range Transportation Plan suggests widening this section of Steeles Avenue to six (6) lanes.

There are a number of recent studies and other documents which were reviewed by the Study Team because of their significance to the Steeles Avenue Class EA study area. These include:

- Region of Peel Long Range Transportation Plan;
- City of Brampton's Transportation and Transit Master Plan;
- Halton-Peel Boundary Area Transportation Study (HPBATS);
- Region of Peel Official Plan, Office Consolidation, and
- GTA West Corridor Environmental Assessment Study Transportation Development Strategy Report

Generally, these studies project significant increases in population and traffic in Brampton and indicate that the Steeles Avenue corridor in its current state will be inadequate to support projected development and increased traffic.

Existing and Future Conditions

As part of the study, a review of existing and future conditions was completed. The objective of the review was to confirm the need and justification for improvement and expansion of the roadway, as well as identify environmental constraints and sensitivities. Investigations have been completed for the following:

- land use
- roadway geometric design
- traffic volume/congestion
- utilities
- geotechnical/pavement
- hydrogeology/well water
- stormwater drainage
- natural environment
- archaeology
- built heritage
- pedestrian/cyclist access
- traffic noise
- structures

Problem/Opportunity Definition

Based on a review of existing and future conditions, as well as preliminary consultation with stakeholders, it has been determined that improvements are needed along the Steeles Avenue corridor to address/accommodate:

- Existing and future traffic demand;
- Future transportation network improvements including BramWest Parkway;
- Transit system expansion along the corridor;
- Aesthetics and streetscaping through the corridor;
- Pedestrian and cyclist movements through the corridor, and
- Drainage deficiencies and opportunities for stormwater management.

Development and Evaluation of Alternative Planning Solutions

The following planning alternatives have been identified for consideration in addressing the problems and opportunities discussed above:

Alternative 1: Do Nothing: Maintain Steeles Avenue in its present configuration with no improvements other than to continue regular maintenance.

Alternative 2: Improve other Roads: Improve adjacent parallel roads to accommodate the projected future traffic demand for Steeles Avenue.

Alternative 3: Transit Infrastructure Improvements: Improve transit infrastructure to support Brampton Bus Rapid Transit (BRT) Plans and address capacity requirements.

Alternative 4: Travel Demand Management (TDM): Encourage and support change in travel behaviour to reduce peak travel demand:

- Promoting car-pooling and possible HOV lanes to reduce single auto occupancy trips
- Promoting flexible work hours, work from home or tele-working etc. at work places to reduce travel needs for work, and
- Increasing active transportation trips (biking/walking) share in peak travel demands

Alternative 5: Widen Steeles Avenue with Intersection Improvements: Addition of through-traffic lanes including intersection improvements, to increase traffic capacity of the corridor.

Alternative 6: A combination of 3, 4 and 5: Combine alternatives 3-5 as mentioned above to increase the overall effectiveness of individual alternatives and reduce environmental impacts.

Summary of EA Process and Consulting Activities

Consistent with the Municipal Class EA, the study approach has been designed to meet the following objectives:

- i. Protection of the environment, including natural, social and economic components of the environment.
- ii. Participation of a broad range of stakeholders in the study process to allow for sharing of ideas, education, testing of creative solutions and developing alternatives.
- iii. Documentation of the study process in compliance with all phases of the Municipal Class EA process.

This project is being completed under the requirements of a Schedule 'C' Municipal Class EA. The following Schedule 'C' trigger applies to this project:

- Reconstruction or widening where the reconstructed road will not be for the same purpose, use or capacity or at the same location as the facility being reconstructed and the estimated cost is greater than \$2.2 million.

The Municipal Class EA requires notification of, and consultation with, relevant stakeholders. The Project Team has ensured that stakeholders were notified early in the planning process, and throughout the study. The following is a summary of the consultation completed for the various phases of the Class EA process:

Phase 1 - A Notice of Study Commencement, detailing the study area, summarizing the objectives of the study and requesting comments, was submitted to relevant stakeholders, property owners and organizations by mail, in November 2011. In addition, a Notice of Study Commencement (ref. Appendix 'A' – Notice of Study Commencement) was published in the Brampton Guardian. Responses were received from several stakeholders and agencies. Copies of the newspaper advertisement, letters to stakeholders and agencies and copies of all comments received and written responses are contained in Appendix 'A'.

Phase 2 - A Technical Advisory Committee (TAC) meeting was held on September 6, 2012 with representatives from the Region of Peel, the City of Brampton, Ministry of Natural Resources, the Credit Valley Conservation, Ministry of the Environment, and Hydro One Brampton (ref. Appendix 'L' – Meeting Minutes). The purpose of the meeting was to present preliminary information on the study to date, including the need and justification for improvements and an assessment of planning alternatives. The meeting also provided an avenue for feedback on the background studies and preliminary design alternatives, and allowed agencies to voice any concerns with the project or the Class EA process.

The first Public Information Centre (PIC) was held on Wednesday November 7, 2012 at the Copeland Public School. Notification of the PIC was sent to stakeholders, including local
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residents, agencies and municipal staff by mail, and notices were placed in the Brampton Guardian and the Georgetown Independent on October 29, 2012. A copy of the PIC notice and all the comments received are provided in Appendix 'M' (ref. Appendix 'M' – Notice of Public Information Centre No. 1).

Phase 3 - The second Technical Agency Committee (TAC) meeting was held on April 29, 2013 with representatives from the Region of Peel, the City of Brampton, Region of Halton, Ministry of Natural Resources, the Credit Valley Conservation, Ministry of the Environment, Hydro One Brampton, Enbridge and Region of Peel (ref. Appendix 'L' – Meeting Minutes). The purpose of the meeting was to present the work that has been completed since the first TAC meeting in September 2012 and the next steps leading to PIC No.2 that was scheduled for June 5, 2013. The meeting also provided an avenue for feedback on the design alternatives for Steeles Avenue including the alternatives for Mullet Creek crossing, Levi's Creek crossing, BramWest Parkway intersection, Churchill Heritage District and #1556 Steeles Avenue. Other issues including stormwater management and pavement design were also discussed.

The second Public Information Centre (PIC) was held on Wednesday June 5, 2013 at the Roberta Bondar Public School. Notification of the PIC was sent to stakeholders including local residents, agencies and municipal staff, by mail and notices were placed in the Brampton Guardian and the Georgetown Independent. A copy of the PIC notice and all the comments received is provided in Appendix 'N' (ref. Appendix 'N' –Public Information Centre No. 2). PIC No.2 provided the general public with an opportunity to ask questions of the Project Team, review the preferred alternative, and discuss issues related to the project, including traffic and environmental considerations. Letters to stakeholders and agencies, a copy of the presentation, and copies of all comments received and written responses regarding PIC No. 2 are contained in Appendix 'N'

Based on input provided by stakeholders including representatives of the new developments, technical agencies, and public participants, as well as based on a formal assessment by the study team, the preferred planning alternative is Alternative 6: A combination of Alternative 3-5. This alternative will address the problem statement developed for the Steeles Avenue corridor, while minimizing environmental impacts.

Description of Preferred Design

The preliminary design is documented in detail in Section 6 of this report. The following is a brief summary of some key aspects of the preferred alternative:

- Key elements of the proposed cross-section of Steeles Avenue include the following:
 - Concrete curb and gutter;
 - Six (6) – 3.65 m lanes (3.75 m adjacent to curb) through lanes;
 - 5.50 m raised median island midblock, tapering to 2.0 m at intersections;
 - 3.0 m multi-use path – north and south side of Steeles Avenue;
 - 1.0 m splash strip;
 - 3.50 m left and right turn lanes as required at all intersections, and
 - Illumination on both sides.

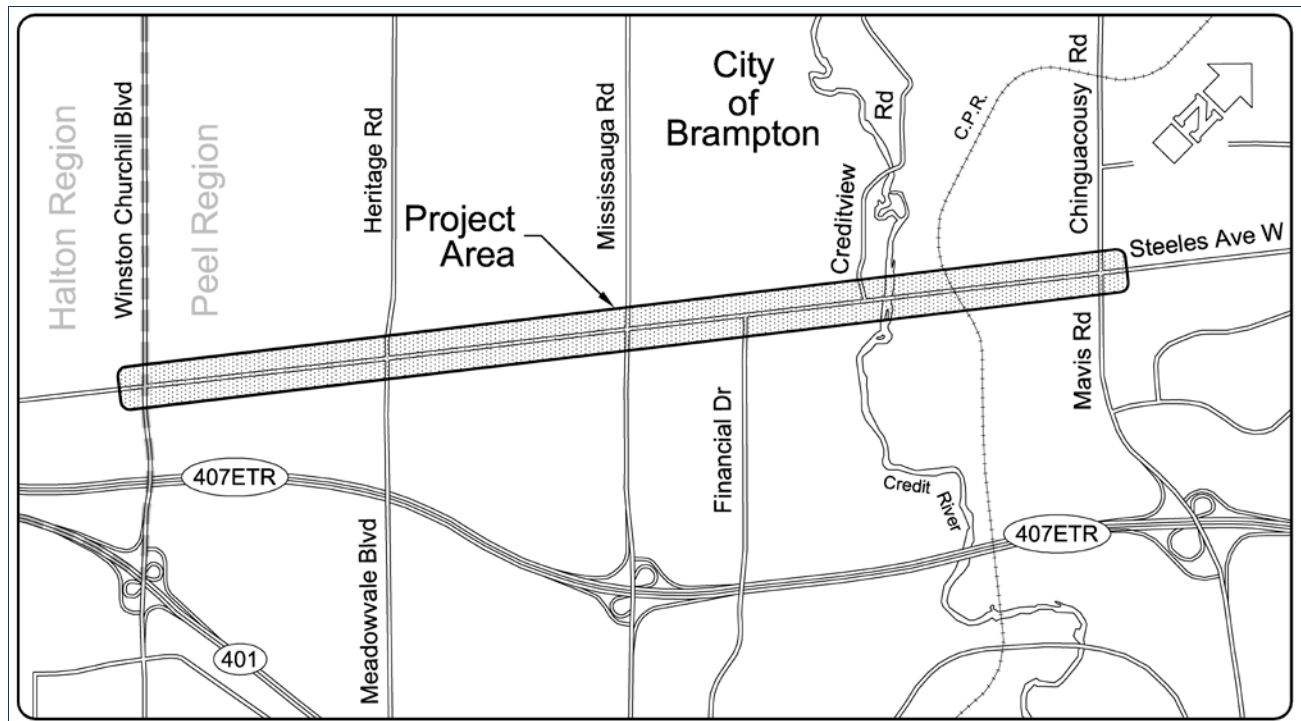
- The new BramWest Parkway is proposed to intersect Steeles Avenue between Winston Churchill Boulevard and Heritage Road, just east of the existing Mullet Creek crossing.
- Steeles Avenue will be realigned to the north at the future intersection with BramWest Parkway in order to protect the above-ground maintenance facilities for Enbridge and TransCanada, which are located immediately south of the existing road right-of-way.
- The Mullet Creek crossing will be replaced with a 12m span x 2.0m high x 51.0m long precast concrete span arch. A permit from Credit Valley Conservation will be required for this culvert.
- The Levi's Creek crossing will be replaced with a 20m span x 2.9m high x 39.5m long concrete girder structure. A similar sized structure has recently been completed immediately downstream of the crossing location.
- A portion of Levi's Creek parallels Steeles Avenue from the existing crossing to approximately Station 9+640 will be relocated. The property limits for this relocation have been determined to ensure the area is protected from development.
- At the Credit River crossing, fill necessary to support the widening would adversely affect the floodplain during major regional storm events. As a result, slope stabilization will be used to eliminate the need to place fill material within the floodplain.

1.0 INTRODUCTION AND BACKGROUND

1.1 Introduction

The Region of Peel has completed a Municipal Class Environmental Assessment (Class EA) Study to consider a wide range of options for transportation corridor improvements to satisfy future travel demands on Steeles Avenue, from Chinguacousy/Mavis Road to Winston Churchill Boulevard in the City of Brampton (ref. Figure 1.1). AMEC Environment & Infrastructure (AMEC) was retained by the Region of Peel to complete the study.

Figure 1.1 – Key Plan



The study examined the need and feasibility for widening and improvements on Steeles Avenue to address short term and long term issues related to planned future growth, operational, geometric, capacity and storm drainage deficiencies for the horizon year of 2031. In order to best address these deficiencies, the study explored a number of road improvement alternatives, including the widening of the roadway and transit improvements, as well as the impact of such improvements on the social and natural environments.

1.2 Environmental Study Report

This Environmental Study Report (ESR) documents the rationale for the project, the background to the study, existing and future conditions within the study area, the planning, design and consultation process leading to the preferred alternative, anticipated positive and negative impacts, and proposed mitigation measures.

1.3 Purpose of the Project

The purpose of this project is to examine existing and future deficiencies along Steeles Avenue within the study limits, and evaluate options to address the deficiencies identified. A major objective of the study is to undertake consultation with a wide range of stakeholders in order to identify and resolve or mitigate issues of concern, while meeting the requirements of the Municipal Class EA process to permit the Region of Peel to proceed to detail design, and ultimately, construction.

A number of factors have influenced the need to undertake a Municipal Class EA Study for this corridor. The study addresses the following specific deficiencies and concerns:

- Accommodating existing and future traffic demands;
- Accommodating future transportation network improvements including BramWest Parkway;
- Accommodating transit system expansion along the corridor;
- Aesthetics and streetscaping through the corridor;
- Addressing drainage deficiencies and opportunities for stormwater management, and
- Accommodating pedestrian and cyclist movements through the corridor.

The need and justification for roadway improvements is discussed in detail in Section 4 of this report.

1.4 Project Background

Steeles Avenue is an east-west major arterial corridor in the City of Brampton. The portion of Steeles Avenue being studied has varied characteristics. Steeles Avenue is generally two lanes in each direction with turning lanes at various intersections. The Region of Peel's Long Range Transportation Plan identified the need for capacity improvements along this section of Steeles Avenue. The Long Range Transportation Plan suggests widening this section of Steeles Avenue to six (6) lanes.

There are a number of recent studies and other documents which were reviewed by the Study Team because of their significance to the Steeles Avenue Class EA study area. These include:

- Region of Peel Long Range Transportation Plan;
- City of Brampton's Transportation and Transit Master Plan;
- Halton-Peel Boundary Area Transportation Study (HPBATS);
- Region of Peel Official Plan, Office Consolidation, and
- GTA West Corridor Environmental Assessment Study Transportation Development Strategy Report

Generally, these studies project significant increases in population and traffic in Brampton and indicate that the Steeles Avenue corridor in its current state will be inadequate to support projected development and increased traffic.

1.5 Adjacent Road Projects

Mississauga Road Widening Highway 407 to Queen Street, Environmental Study Report Addendum, Regional Municipality of Peel, July 2011

The Environmental Study Report Addendum assessed the widening of Mississauga Road from two (2) lanes (rural) to six (6) lanes (urban) from Steeles Avenue northerly to Financial Drive. The preferred design includes a six (6) lane urban cross-section including a 5.5 m median. Reconstruction of Mississauga Road to the width recommended by this study has recently been completed.

Financial Drive Improvements from Steeles Avenue to Casablanca Circle, Environmental Study Report, City of Brampton, February 2011

The improvements to Financial Drive include widening of Financial Drive from Steeles Avenue to Casablanca Circle to four (4) through-lanes plus a centre turning lane including a multi-use path, bus stops and intersection improvements. The bridge over Highway 407 will be widened. Financial Drive and Steeles Avenue intersection improvements includes northbound, southbound and westbound dual left turn lanes, queue jump lanes and bus bays. Detailed design of Financial Drive to the recommended alternative is currently underway.

Steeles Avenue ZUM/Acceleride Expansion from Winston Churchill Boulevard to Malta Avenue, City of Brampton, Ongoing

The City of Brampton has commenced the detailed design to expand the ZUM network along Steeles Avenue. Work will include a variety of intersection improvements, including the construction of ZUM station stops at the intersection of Steeles Avenue with Winston Churchill Boulevard, Heritage Road, Hereford Road, Mississauga Road, and Chinguacousy Road. Detailed design at the time of completion of this report has entered the 60% design phase.

BramWest Parkway Class EA, City of Brampton, Ongoing

The City of Brampton has commenced a Class EA study for a new six-lane roadway crossing Steeles Avenue between Winston Churchill Boulevard and Heritage Avenue. The study has recently completed Phase 2 of the Class EA study, and will be completing PIC #2 in the near future. Timing for completion of the study is not known.

Mavis Road Municipal Class Environmental Study Steeles Avenue West to Highway 407, Environmental Study Report, Regional Municipality of Peel, December 2009

The recommended design for Mavis road includes:

- Widening of Mavis Road to six (6) lanes;
- ZUM Bus Rapid Transit infrastructure at the intersection of Steeles Avenue West and Mavis Road;
- A multi-use path along the west side of Mavis Road;
- Sidewalk extension along the east side of Mavis Road south of Ray Lawson Boulevard;
- Modification to the existing storm sewer system between Steeles Avenue West and Ray Lawson Boulevard and a new storm sewer system south of Ray Lawson Boulevard to Highway 407, and
- A noise wall on the east side of Mavis Road from Steeles Avenue West to Ray Lawson Boulevard.

The recommended design is to widen to the east for the section of Mavis Road from 200 m south of Steeles Avenue West to Ray Lawson Boulevard, and to widen to the west for the section of Mavis Road from Ray Lawson Boulevard to Highway 407. Reconstruction to the recommended design is underway, with a scheduled completion of late 2013.

Steeles Avenue Class Environmental Assessment Winston Churchill Boulevard to Mississauga Road and Chinguacousy Road to Hurontario Street, Environmental Study Report, Region of Peel, January 2002

The recommended interim design for Steeles Avenue from Winston Churchill Boulevard to Mississauga Road included:

- Widening of Steeles Avenue from Winston Churchill Boulevard to Mississauga Road to a rural cross section with granular shoulders on both sides and four (4) through lanes.
- Widening of Steeles Avenue from Chinguacousy Road to west of Hurontario Street to an urban cross section with curb and gutter and six (6) through lanes with a raised concrete median.

Widening to four (4) lanes from Winston Churchill Boulevard to Mississauga Road was completed in 2011. As part of the Steeles Avenue widening to four (4) lanes, a ZUM station has been constructed on the northwest corner of Mississauga Road and Steeles Avenue.

2.0 CLASS ENVIRONMENTAL ASSESSMENT APPROACH

2.1 Class Environmental Assessment Process

The Municipal Class EA process is a mechanism by which the provision of municipal servicing is provided in an efficient, timely, economical and environmentally responsible manner. It represents a consistent, streamlined and easily understood process for planning and implementing municipal infrastructure projects. Under the Provincial Environmental Assessment Act, projects are classified as approved, subject to screening, subject to a Class Environmental Assessment (Class EA), or subject to a full Environmental Assessment. This project is classified as being subject to the Class EA process. It is being conducted according to the requirements outlined in the Municipal Engineers Association document titled *Municipal Class Environmental Assessment (October 2000, as amended 2007 and 2011)*.

Consistent with the Municipal Class EA, the study approach has been designed to meet the following objectives:

- i. Protection of the environment, including natural, social and economic components of the environment.
- ii. Participation of a broad range of stakeholders in the study process to allow for sharing of ideas, education, testing of creative solutions and developing alternatives.
- iii. Documentation of the study process in compliance with all phases of the Municipal Class EA process.

The Class EA process classifies projects according to their level of complexity and potential environmental impacts. These are termed "Schedules" and are summarized below:

- **Schedule 'A' and 'A+'** projects involve minor modifications to existing facilities. Environmental effects of these projects are generally small; therefore, the projects are considered pre-approved.
- **Schedule 'B'** includes improvements and minor expansion to existing facilities. There is a potential for some adverse environmental impacts and, therefore, the proponent is required to proceed through a screening process, including consultation with those affected. Schedule 'B' projects are required to proceed through Phases 1, 2 and 5 of the Municipal Class EA process.
- **Schedule 'C'** includes the construction of new facilities and major expansion of existing facilities. These projects proceed through the environmental assessment planning process outlined in the Municipal Class EA document. These projects are required to fulfill the requirements of all five phases of the Municipal Class EA process.

This project is being completed under the requirements of a Schedule 'C' Municipal Class EA. The following Schedule 'C' trigger applies to this project:

- Reconstruction or widening where the reconstructed road will not be for the same purpose, use or capacity or at the same location as the facility being reconstructed and the estimated cost is greater than \$2.2 million.

The Municipal Class EA requires notification of, and consultation with, relevant stakeholders. The Project Team has ensured that stakeholders were notified early in the planning process,

and throughout the study. Should stakeholders raise issues that cannot be resolved through discussion, these concerns would be referred to the Ministry of Environmental for resolution.

Figure 2.1 illustrates a simplified version of the Municipal Class EA process for this project.

2.2 Infrastructure Ontario Class Environmental Assessment Process

As part of the standard agency notification undertaken for this project through the Municipal Class Environmental Assessment process (MEA Class EA process), Infrastructure Ontario was circulated a Notice of Study Commencement (ref. Appendix 'A' – Notice of Study Commencement), as well as notification for PIC No.1 and No.2. As a result of correspondence received from Infrastructure Ontario it was determined that the proposed design for Steeles Avenue may impact Infrastructure Ontario owned or managed property. All correspondence with Infrastructure Ontario can be found in Appendix 'S'.

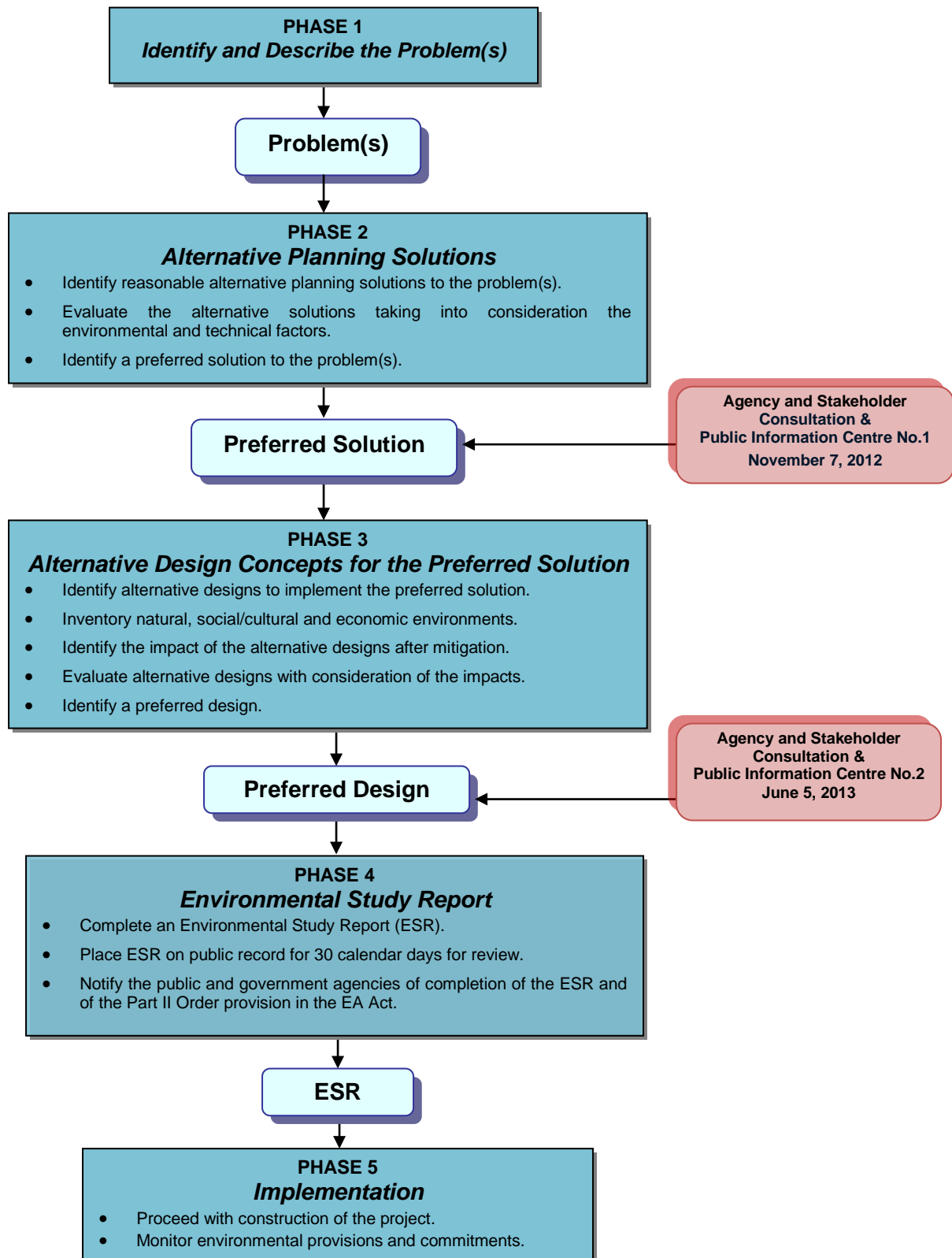
Along the Steeles Avenue corridor there are three properties that were identified to be owned or managed by Infrastructure Ontario as shown in Figure 1 to 3 in Appendix 'S'. One of the properties (ref. Figure 1 Appendix 'S' – Infrastructure Ontario Correspondence) will be directly impacted by the proposed design for Steeles Avenue, and therefore it will be necessary to ensure that the requirements of the Ministry of Infrastructure's (MOI) Class EA are met either within the current MEA Class EA process, or prior to construction as a separate IO Class EA.

According to Infrastructure Ontario's Category Listing Matrix as well as the Environmental Assessment (EA) Category Identification Table of the Ministry of Infrastructure's (MOI) Class EA document this project would be categorized as a Category B undertaking. Undertakings in Category B have some potential for adverse environmental effects but are well understood from a technical perspective and are minor in nature. The following is required for a Category B Undertaking: direct consultation with affected parties, seven point site-specific analysis, record of consultation activities, issues identified and resolved, environmental effects and any necessary mitigation measures. The Seven Point Site-Specific Analysis includes the following:

- Existing land use status, including official plan designation and zoning by-law designations including floodplain zone, specialty croplands and prime agricultural lands and existing land use.
- Environmental Condition of the Property.
- Environmentally Significant Areas.
- Distinctive environmental features such as floodplain, high groundwater level, groundwater wells, streams, rivers natural corridor, woodlots, wetlands, springs, water bodies, topography, prevailing slope direction, steep slopes, ravines and rock outcrops.
- Servicing capacity of the surrounding infrastructure or where on-site servicing is being considered, the feasibility of on-site sewage disposal and access to adequate supply of potable water.
- Cultural Heritage Resources.
- Social and Economic Effects.

Further discussion on the outcome of this process is deferred to Section 6.

Figure 2.1 – General Municipal Class Environmental Assessment Process



The Municipal Class EA has many of the same features and requirements as stated in the Infrastructure Ontario EA guidelines. As a result, the study team has determined that a separate EA meeting the Infrastructure Ontario EA reporting requirements is not necessary, and the requirements for the Infrastructure Ontario EA will be addressed in the various sections of this report.

2.3 Schedule

The study was initiated in November 2011. Project milestones are as follows:

July 2012	Completion of traffic study, profile of study area and identification of need and justification for improvements.
November 2012	Identification of planning alternatives and hosting of Public Information Centre No.1.
December 2012	Completion of environmental inventories.
January 2013	Identification of design alternatives.
June 2013	Evaluation and selection of design alternatives, including hosting of Public Information Centre No.2.
February 2014	Documentation of preferred design and filing of Environmental Study Report (ESR).

2.4 Project Organization

The Project Team consisted of staff from the following organizations:

Proponent:	Region of Peel Gino Dela Cruz, <i>Project Manager</i>
Prime Consultant:	AMEC Environment & Infrastructure David Sinke, <i>Project Manager</i> Jason Stahl, <i>Roadway Design Engineer</i> Steven Chips, <i>Drainage Engineer</i> Derk Meyer, <i>Structural Engineer</i> Barbara Slim, <i>Archaeologist</i> Linda Axford, <i>Built Heritage</i> Daryl Rideout, <i>Terrestrial and Fisheries</i> Dirk Gevaert, <i>Hydrogeologist</i> Shami Malla, <i>Geotechnical Engineer</i> Mohammed Salim, <i>Traffic Noise Assessment</i> Steve Lamming, <i>Air Quality Assessment</i> Heather Dearlove, <i>Environmental Planner</i> Danny Stone, <i>Environmental Planner</i>

Sub Consultants: *Paradigm Transportation Solutions Limited*, Phil Grubb and Adam Makarewicz
Intus Road Safety Engineering Inc., Gerry Forbes
Parish Geomorphic, John Parish
McWilliam & Associates, James McWilliam

2.5 Stakeholder and Agency Consultation

2.5.1 Phase 1 Consultation

A Notice of Study Commencement, detailing the study area, summarizing the objectives of the study and requesting comments, was submitted to relevant stakeholders, property owners and organizations by mail, in November 2011. In addition, a Notice of Study Commencement was published in the Brampton Guardian.

Responses were received from several stakeholders and agencies. Copies of the newspaper advertisement, letters to stakeholders and agencies and copies of all comments received and written responses are contained in Appendix 'A'.

The following agency or stakeholder representatives have provided comments on the study:

Agency Representatives:

Richard Cuddy, The Credit River Metis Council
Allison Berman, Aboriginal Affairs and Northern Development Canada
Antonietta Minichillo, City of Brampton – Brampton Heritage Board
Compton Bobb, City of Brampton
Tony Bosco, City of Brampton
Peter Dundas, Peel Regional Paramedic Services
Don Boswell, Specific Claims Branch – Indian and Northern Affairs Canada
Chief Tracy Gauthier, Mississaugas of the Scugog Island
Lisa Myslicki, Infrastructure Ontario
Robert Evangelista, Hydro One Brampton
Alicia Jakatis, Region of Halton
Laurielle Brooks, Region of Halton
Mark Heaton, Ministry of Natural Resources
Jakub Killis, Credit Valley Conservation Authority
Liam Marray, Credit Valley Conservation Authority
Darlene Presley, Trans Canada Pipelines
Jim Arnott, Enbridge Pipelines
Rosi Zirger, Ministry of Tourism and Culture
Chief Sharon Stinson Henry, Chippewas of Rama First Nation
Stephanie Cox, Dufferin-Peel Catholic District School Board
Dorothy Moszynski, Ministry of the Environment
Dave Simpson, Alderville First Nation
Paul Mountford, Peel District School Board

2.5.2 Phase 2 and 3 Consultation

Consultation with agencies and the public in Phases 2 and 3 of the Class EA process has included several meetings with stakeholders and agencies and two Public Information Centres. Stakeholders were notified of the opportunity for consultation by letter and/or newspaper advertisement. Results of the consultation with various stakeholders are discussed in Section 4 and Section 5 of this report.

2.5.3 Filing of the ESR

All parties having expressed an interest in the project will be notified by letter, regarding the completion of the project and filing of the ESR. In addition, a Notice of Completion will be placed in the local newspaper, Brampton Guardian, in accordance with the requirements of the Class EA.

Copies of the Environmental Study Report will be made available at the following locations:

**Region of Peel
Regional Clerk's Office**
10 Peel Centre Drive, Suite A
Brampton, ON L6T 4B9

**Brampton City Hall
Clerk's Department**
2 Wellington Street West
Brampton, ON L6Y 4R2

**City of Brampton Public Library
South Fletchers Branch**
500 Ray Lawson Boulevard
Brampton, ON L7A 0G2

Hours:
Mon - Fri:
8:30 a.m. to 4:30 p.m.

Hours:
Mon - Fri:
8:30 a.m. to 4:30 p.m.

Hours:
Mon - Thurs: 10 a.m. to 9 p.m.
Fri: 10 a.m. to 6 p.m.
Sat: 10 a.m. to 5 p.m.
Sun: 1 p.m. to 5 p.m.

A review period of not less than thirty (30) days will be provided, during which comments will be received from stakeholders and agencies. Should stakeholders raise issues that cannot be resolved through discussion with Region and Consultant staff, the stakeholder may request the Minister to require the Region of Peel to complete an individual EA in accordance with Part II of the Environmental Assessment Act, R.S.O. 1990. This is known as a "Part II Order" (formerly called a 'Bump-up'). However, it is anticipated that all concerns will be resolved through discussion between the Region of Peel and the concerned party.

3.0 EXISTING AND FUTURE CONDITIONS

The existing conditions for Steeles Avenue are documented on Drawing 1 – Existing Conditions (ref. rear pocket).

3.1 Study Area

The study area for this Class Environmental Assessment (Class EA) is located within the City of Brampton, in the Region of Peel, and extends along Steeles Avenue from Chinguacousy/Mavis Road to Winston Churchill Boulevard (ref. Figure 1.1).

3.2 Land Use and Development Plans

3.2.1 Existing Land Use

The land use adjacent to Steeles Avenue in the study area is a combination of residential, commercial and new development. The following is a breakdown of the major land uses along the study corridor:

- *Winston Churchill Boulevard to Heritage Road* – currently used for agriculture but designated for development in the near future and includes the proposed location for the BramWest Parkway.
- *Heritage Road to Financial Drive* – commercial and industrial development predominantly on the south side of Steeles Avenue with natural areas on the north side of Steeles Avenue.
- *Financial Drive to Mavis Road/Chinguacousy Road* – residential development backing onto Steeles Avenue intermixed with commercial development as well as two large churches including St. Dimitar Bulgarian Eastern Orthodox Church and St. Eugene de Mazenod Polish Roman Catholic Church.

3.2.2 Existing Land Use Designation

City of Brampton Official Plan

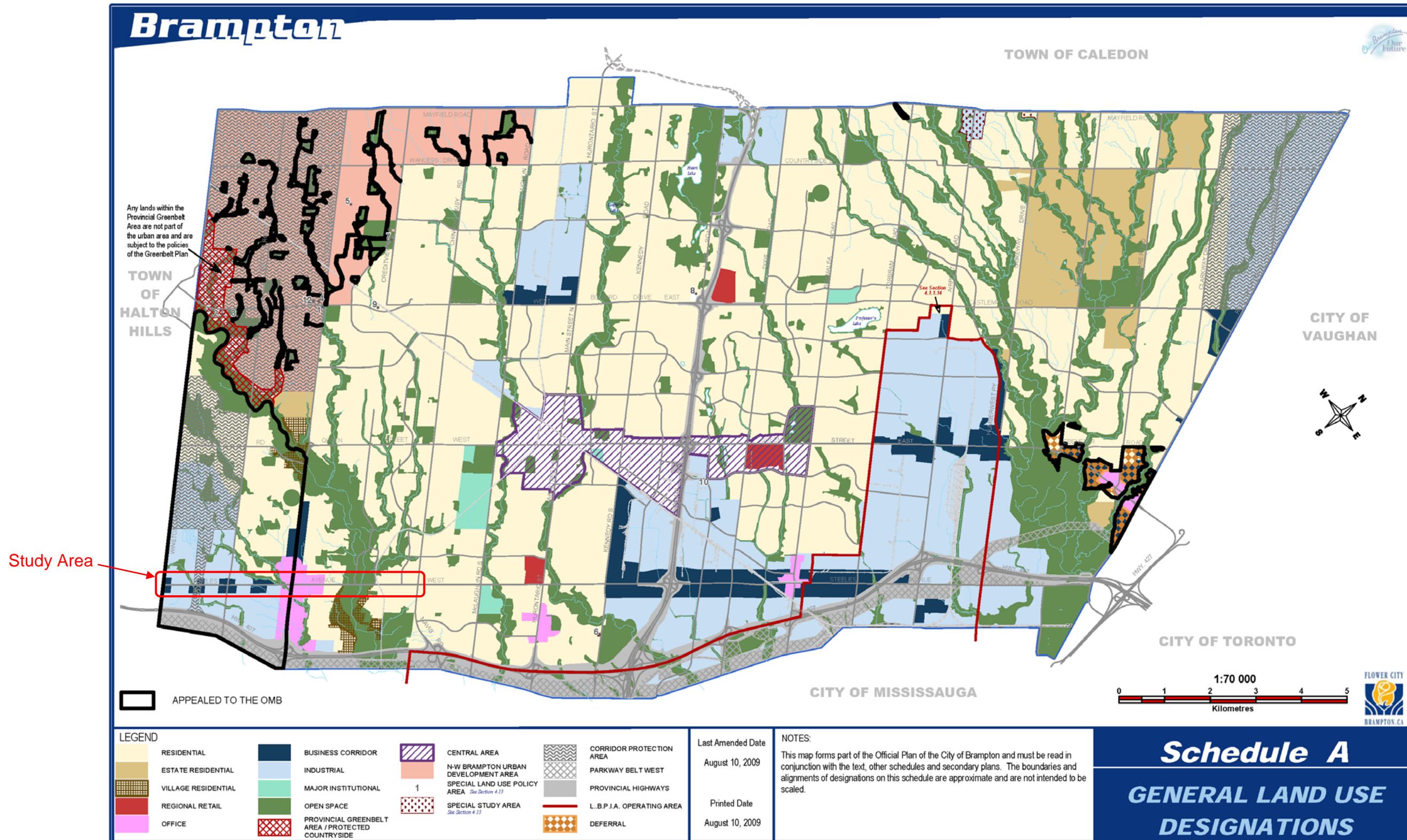
The City of Brampton Official Plan designates lands along the Steeles Avenue study corridor as a mixture of residential, open spaces, industrial, office and business corridor area. There is also a Corridor Protection Area to ensure future ability to construct a north-south transportation corridor in the west end of the City (ref. Figure 3.1).

The Official Plan also classifies Steeles Avenue as an Intensification Corridor (major arterial and adjoining areas that provides linkages between communities/districts), a Primary Corridor (defines streetscaping and gateway requirements), and a Brampton Bus Rapid Transit Corridor, and designates the intersection of Steeles Avenue and Mississauga Road as a Major Transit Node.

Region of Peel Official Plan

The Region of Peel Official Plan projects a 40 percent growth in population for the City of Brampton between 2011 and 2031. The Official Plan also supports the protection of the western portion of the study area for a future north-south transportation corridor.

Figure 3.1 – General Land Use Designations Brampton Official Plan, 2006



3.3 Transportation

Paradigm Transportation Solutions Ltd., a sub-consultant of AMEC, has completed a Traffic Study to investigate the existing and future traffic conditions in the study corridor, to assess the need for improvements to accommodate traffic in a safe and efficient manner, to provide a traffic analysis of alternative improvements and to provide recommendations for future geometric improvements to existing and future intersections. (ref. Appendix 'B' – Traffic Study). Additionally, Intus Road Safety Engineering Inc has completed an In-service Road Safety Review of the subject corridor to examine the facility's safety performance, and to identify and recommend solutions to any engineering related factors that may lead to collision risks (ref. Appendix 'C' – In-service Road Safety Review).

3.3.1 Existing Roadway Network

Steeles Avenue is classified as an arterial roadway and is under the jurisdiction of the Region of Peel. Its full extents stretch from Milborough Townline in Halton Region to the Scarborough - Pickering limit. Interchanges are provided with Highways 410, 427, 400, and Highway 404 east of the study area. Presently, Steeles Avenue has a four-lane cross-section between Winston Churchill Boulevard and Chinguacousy/Mavis Road with additional turn lanes at intersections within this segment. The posted speed limit of Steeles Avenue is 80 km/h within the study area.

The existing roadways connecting with Steeles Avenue within the study area include Winston Churchill Boulevard, Heritage Road, Hereford Street, Mississauga Road, Financial Drive, Creditview Road/Churchville Road, Polonia Avenue, James Potter Road/Clementine Drive and Chinguacousy/Mavis Road. The characteristics of the crossing intersections are described below and illustrated in Figure 3.2.

Winston Churchill Boulevard has a rural four (4) lane cross-section. It is under the jurisdiction of the Region of Peel. The posted speed limit along Winston Churchill Boulevard is 60 km/h within the study area.

Heritage Road has an urban four (4) lane cross-section and is under the jurisdiction of the City of Brampton. The posted speed limit along Heritage Road is 60 km/h.

Hereford Street has an urban four (4) lane cross-section and is under the jurisdiction of the City of Brampton. The posted speed limit along Hereford Street is 50 km/h.

Mississauga Road has an urban six (6) lane urban cross section that transitions into a four (4) lane rural cross-section south of Steeles Avenue and a two (2) lane rural cross section north of Steeles Avenue, and is under the jurisdiction of the Region of Peel. The posted speed limit along Mississauga Road is 70 km/h.

Financial Drive has an urban two (2) lane cross-section and is under the jurisdiction of the City of Brampton. The posted speed limit along Financial Drive is 50 km/h.

Creditview Road & Churchville Road have rural two (2) lane cross-sections north and south of Steeles Avenue and are under the jurisdiction of the City of Brampton. The posted speed limit along Creditview Road & Churchville Road is 50 km/h.

Polonia Avenue has an urban two-lane cross section north of Steeles Avenue and is under the jurisdiction of City of Brampton. The posted speed limit along Polonia Avenue is 50 km/h.

James Potter Road/Clementine Drive is under the jurisdiction of the City of Brampton. James Potter Road has a four (4) lane urban cross-section providing access to a residential subdivision to the north of Steeles Avenue. Clementine Drive is a two lane urban road that extends south of Steeles Avenue. Additional auxiliary lanes are provided on both James Potter Road and Clementine Drive at its intersection with Steeles Avenue. The posted speed limit along James Potter Road/Clementine Drive is 50 km/h.

Chinguacousy Road/Mavis Road prior to recent reconstruction, had an urban four (4) lane cross-section, but has recently been reconstructed to six (6) lanes. The roadway is under the jurisdiction of the Region of Peel. The posted speed limit along Chinguacousy Road/Mavis Road is 60 km/h.

3.3.2 Halton-Peel Boundary Area Transportation Study

The Region of Peel and Halton in conjunction with the local municipalities of Brampton, Caledon, and Halton Hills recently completed the Halton-Peel Boundary Area Transportation Study (HPBATS). The study area extended from west of Trafalgar Road in the Town of Halton Hills to east of Chinguacousy Road in the City of Brampton, and from north of King Street in the Town of Caledon to south of Highways 401 and 407 in Mississauga (ref. Figure 3.3 and Figure 3.4). The key findings of the HPBATS relevant to this study were:

- There is a lack of east-west connections and continuity. East-west capacity improvements will be required
- There are north-south capacity deficiencies in Halton Hills and West Brampton. A North-South Transportation Corridor (NSTC) will be needed to support continued development in the study area.
- A new six lane road (currently named the BramWest Parkway) is required to accommodate projected demands between Winston Churchill Boulevard and Heritage Road.
- Suitable corridors for truck routes are required.
- More connections to freeways are needed.

Figure 3.2 – Steeles Avenue Existing Lane Configuration

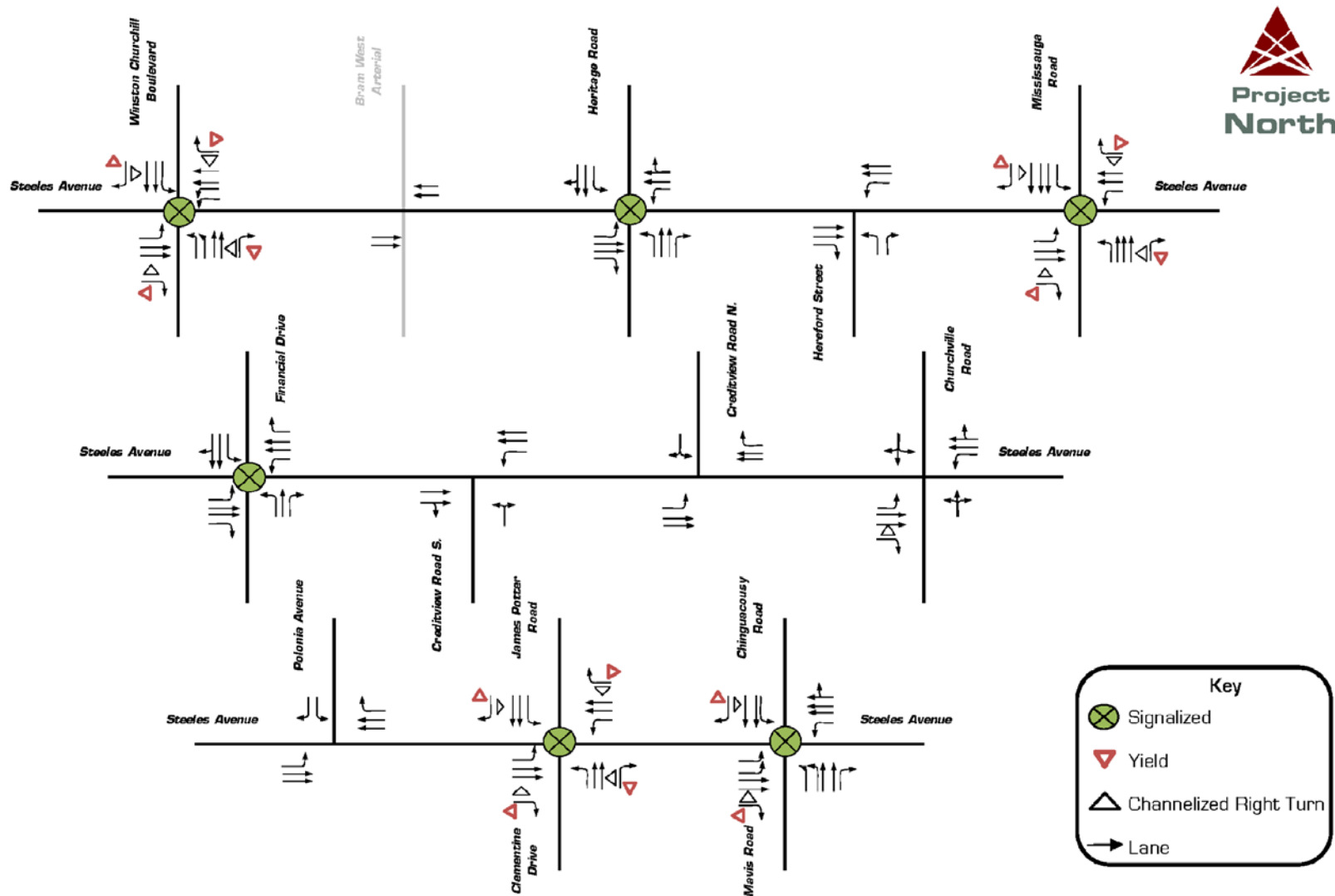


Figure 3.3 - Study Area: Halton-Peel Boundary Area Transportation Study

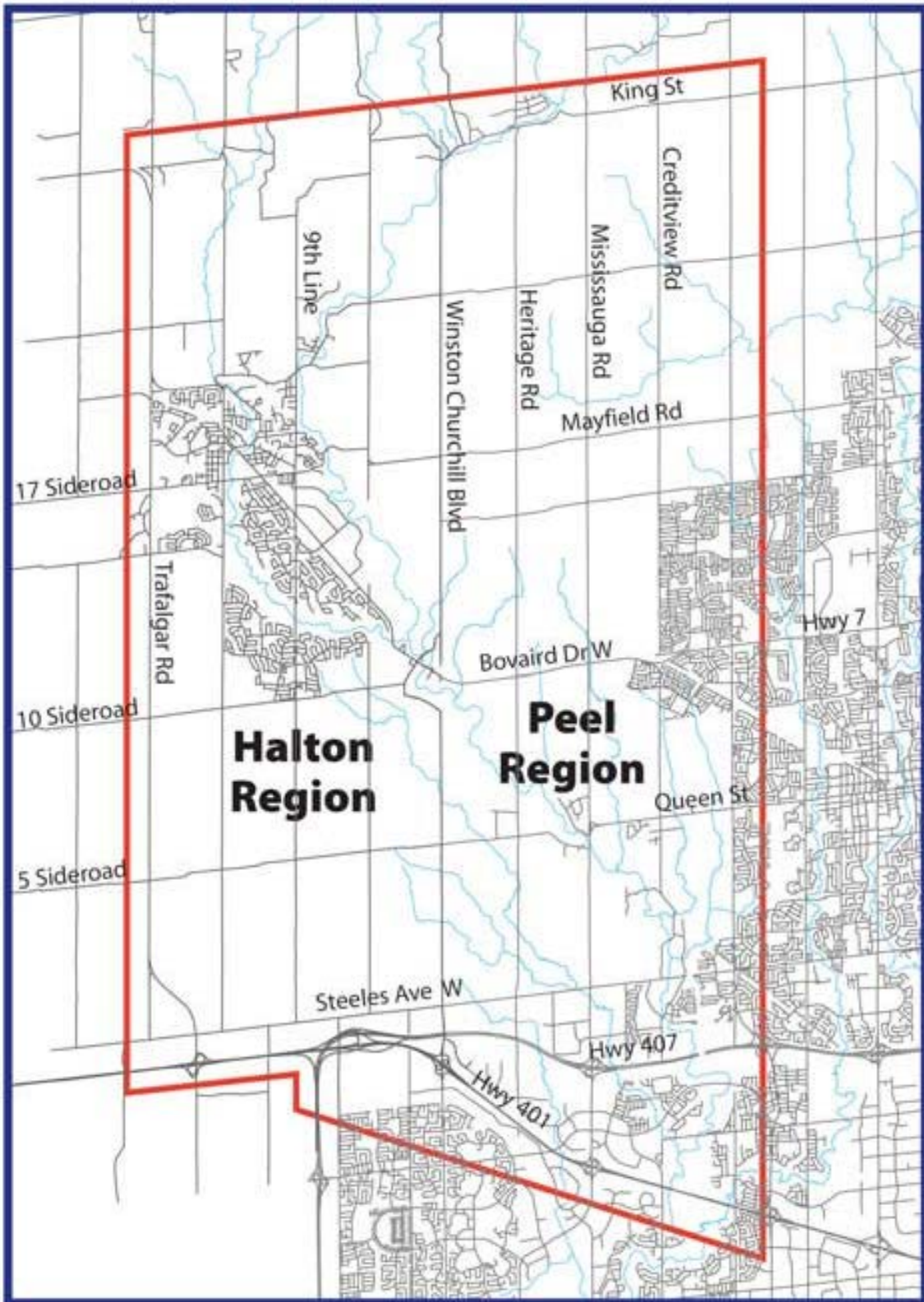
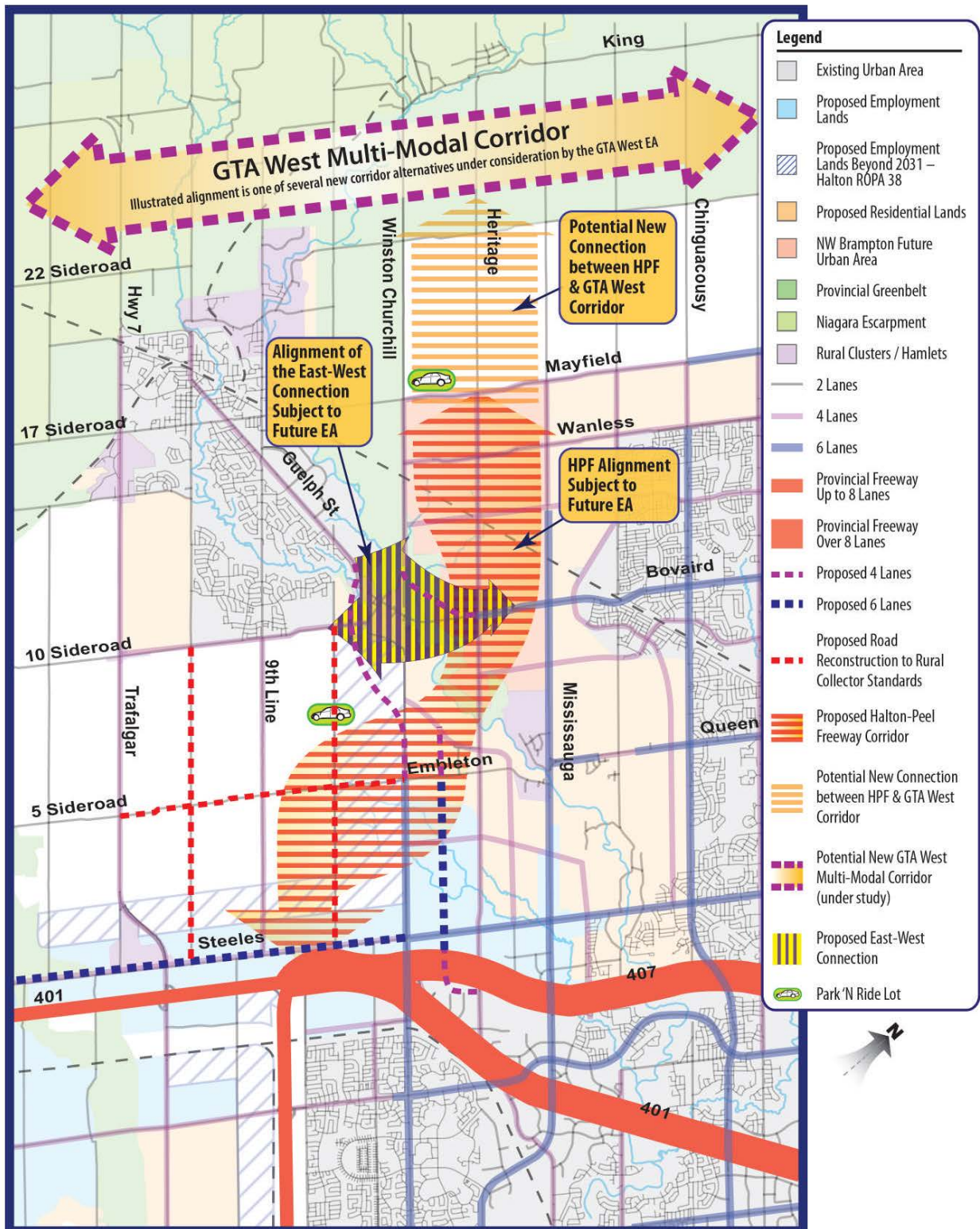


Figure 3.4 – HPBATS Recommended BramWest Corridor Road Network, 2031



Subject to future Environmental Assessment studies

3.3.3 Existing Traffic Conditions

The existing traffic volumes were established based on weekday traffic turning movement counts provided by the Region of Peel and City of Brampton.

3.3.4 Traffic Operations

Intersection level of service is a recognized method of quantifying the efficiency of traffic flow at intersections. It is based on the delay experienced by individual vehicles executing the various movements. The delay is related to the number of vehicles desiring to make a particular movement, compared to the estimated capacity for that movement.

For the Steeles Avenue study area, the following is noted:

- The signalized intersection of Steeles Avenue and Winston Churchill Boulevard is operating with acceptable levels of service during the AM peak hour. During the PM peak hour the westbound and southbound left turn movements experience moderate delay.
- The signalized intersection of Steeles Avenue and Heritage Road is operating with satisfactory levels of service during the AM and PM peak hours with the possible exception of the westbound left turn movement which experiences moderate delay.
- The unsignalized intersection of Steeles Avenue and Hereford Street is operating with acceptable levels of service during the AM peak hour. During the PM peak hour, the stop controlled northbound left turn movement experiences moderate delay.
- The signalized intersection of Steeles Avenue and Mississauga Road is operating with some delays overall during the AM and PM peak hours with the westbound left turn movement experiencing moderate delay.
- The signalized intersection of Steeles Avenue and Financial Drive is operating with acceptable levels of service during the AM and PM peak hours with the possible exception of the westbound left turn movement which operates with moderate delay during the AM and PM peak hour.
- The unsignalized intersection of Steeles Avenue and Creditview Road South is operating with acceptable levels of service during the AM and PM peak hours.
- The unsignalized intersection of Steeles Avenue and Creditview Road North is operating with satisfactory levels of service during the AM and PM peak hours with the possible exception to the stop controlled southbound approach which experiences moderate delay during the AM peak hour.
- The unsignalized intersection of Steeles Avenue and Churchville Road is operating with satisfactory levels of service overall during the AM and PM peak hours with the possible exception to the southbound approach which is operating with moderate delay during the AM peak hour.
- The unsignalized intersection of Steeles Avenue and Polonia Avenue is operating with acceptable levels of service overall during the AM and PM peak hours.
- The signalized intersection of Steeles Avenue and James Potter Road/Clementine Drive is operating with acceptable levels of service overall during the AM and PM peak hours.

3.3.5 Future Traffic Conditions

The Region of Peel provided AM peak hour and the City of Brampton provided PM model forecasts for 2011, 2021 and 2031 to assist with the development of future forecasts along Steeles Avenue. Both models essentially excluded development growth between 2011 and 2021/2031 in the BramWest Secondary Plan Area. Both models also assumed the BramWest Arterial and its proposed connection to Hwy. 407. Upon review of these forecasts, it was noted that the 2011 Brampton model volumes projected existing 2011 volumes on the road network to a greater degree of accuracy due to its more detailed network (i.e. Regional model is more strategic). Accordingly the Brampton model was the primary source of the traffic forecasts developed in the traffic report. It is noted that the City of Brampton also provided model forecasts with full development of the BramWest area. A 2031 and 2021 trip table from the model which showed the generation and distribution of traffic used in the model.

The following is noted:

- The projections show an average 60% increase in traffic along the corridor.
- The BramWest Parkway contributes to a significant increase in traffic in the west end of the corridor, between Winston Churchill Boulevard and the Parkway.
- Several sections of roadway experience directional volumes of 2700 vehicles per hour (vph) in the PM peak hour which is close to the capacity of a six lane roadway (generally considered to be 2700 vph per direction).
- Heavy turning movements occur at Winston Churchill Boulevard, Financial Drive, BramWest Parkway, Heritage Road, and Mavis Road.
- Collector roadways such as Clementine Drive, Herford Street and Meadowvale Boulevard. Will experience increased traffic due to left turn capacity restrictions on other roadways.

The estimates of the future traffic volumes on Steeles Avenue clearly indicate that with build-out of local area development, there will be a considerable volume of weekday peak hour traffic on Steeles Avenue from Winston Churchill Boulevard to Chinguacousy Road/Mavis Road. The future traffic volumes on Steeles Avenue are likely to require additional through lanes to accommodate the future traffic.

Goods Movement

The Region of Peel Strategic Goods Movement Network Study was reviewed to determine the truck movement guidelines in place for the Steeles Avenue study area. The Goods Movement study provides an overview of goods movement in the Region by truck, rail, air and pipeline. This study has identified Steeles Avenue as a 'Primary Truck Route'. The report defines a 'Primary Truck Route' as follows:

"Route designed, maintained and operated to facilitate general mixed traffic, while supporting significant truck movements, particularly related to movements connecting major trucking activity clusters with Strategic Truck Routes that form the core of the inter-regional transportation network."

As a result, this study will factor truck movements into the ultimate recommendation.

3.3.6 Transit and Active Transportation

Transit

Brampton Transit currently operates three (3) services along this stretch of the Steeles Avenue corridor as follows:

- Route 51 Steeles Avenue West (15 minute peak service, 15 minute mid-day service, 30 minute off peak service)
- Route 51A Steeles Avenue West – Lisgar GO (60 minute peak service, 60 minute mid-day service)
- Route 58 Financial Drive (30 minute peak service only)

According to the 2009 Brampton Transportation and Transit Master Plan (TTMP), Brampton Transit is expected to expand its services substantially. The proposed expansion includes the Steeles Avenue Bus Rapid Transit (BRT) Corridor, otherwise known as ZUM, from Lisgar GO Station in Mississauga along Argentia Road, Winston Churchill Boulevard, and Steeles Avenue and connecting with Steeles Avenue rapid transit service in Toronto / York (ref. Figure 3.5). The Mississauga Road and Steeles Avenue intersection will be a Major Transit Station Area that will be a gateway to the City of Mississauga's Transit planned BRT along Erin Mills Parkway/Mississauga Road.

The ZUM infrastructure necessary for this expansion is scheduled to be constructed in 2014/2015 at the following intersections:

- Steeles Avenue and Mavis Road
- Steeles Avenue and Financial Drive
- Steeles Avenue and Mississauga Road
- Steeles Avenue and Hereford Street
- Steeles Avenue and Heritage Road
- Steeles Avenue and Winston Churchill Boulevard

Active Transportation

Active Transportation is a key component of the City of Brampton's Transportation and Transit Master Plan. In addition, the City of Brampton's Pathways Master Plan, developed in 2002 and subsequently updated in 2006, sets out an ambitious implementation plan for a city-wide pathway system. Another objective set through the TTMP was to promote bicycle use beyond recreational trips, such as work, shopping, and entertainment.

The City of Brampton is currently developing an action plan to integrate a safe and efficient city-wide pathway system into future road widening and rehabilitation projects. The current existing facilities within the study area include the following:

- Heritage Road, south of Steeles Avenue – 1.5 m wide bike lane in the boulevard
- Creditview Road North, south of Steeles Avenue – Paved Multi-Use Trail
- Creditview Road South, south of Steeles Avenue – Paved Multi-Use Trail

- Southeast quadrant of Steeles Avenue and Chinguacousy/Mavis Road, Paved Multi-Use Trail

The Region of Peel also has outlined parameters for active transportation with the Peel Active Transportation Study – Walk and Roll Peel (2012). The Plan provides a framework for how the Region will increase the share of trips by walking and cycling, linking with transit, and creating a pedestrian and cycling friendly environment. The Plan sets out policies that direct the practices of the Region to support more walking and cycling; recommends active transportation improvements to the existing cycling and pedestrian networks, and recommends strategies/programs to shift travel behaviour.

The recommendations from the Peel AT study apply to the study area as follows:

- Steeles Avenue, From Winston Churchill Boulevard to Heritage Road – Complete network for 2021 with boulevard trail one side / sidewalk other side. Where development exists on both sides of the road, consider long term application of potential policy regarding provision of boulevard trails on both sides of the road
- Steeles Avenue, From Heritage Road to Mississauga Road – Complete network for 2021 with boulevard trail one side / sidewalk other side. Where development exists on both sides of the road, consider long term application of potential policy regarding provision of boulevard trails on both sides of the road
- Steeles Avenue, From Mississauga Road to Chinguacousy/Mavis Road – Complete network for 2018 with boulevard trail one side / sidewalk other side. Where development exists on both sides of the road, consider long term application of potential policy regarding provision of boulevard trails on both sides of the road

There is generally a low level of cycling and pedestrian activity within the study area. The highest pedestrian volumes during the weekday afternoon peak hour were observed at the intersection of Steeles Avenue with Chinguacousy/Mavis Road and James Potter Road/Clementine Drive. All other intersections experienced very low pedestrian activity. The intersections that have the highest pedestrian activity have sidewalks on either side of the roadway as well as pedestrian signal heads to facilitate safe crossings.

Figure 3.5 – Brampton Transit Network (2031 Projection)



3.3.7 Traffic Safety

A Road Safety Performance Review was prepared by Intus Road Safety Engineering. The goal of the safety review was to examine the facility's safety performance, to identify engineering-related factors that may be leading to an increased collision risk, and to recommend solutions to these problems (if any). The safety assessment followed a systematic process to review physical, traffic, and collision characteristics in order to identify safety problems and issues that may be used by the design team in the Class EA process (ref. Appendix 'C' – In-Service Road Safety Review).

The study area experienced 406 reported collisions from January 1, 2005 to December 31, 2009, for an average of 81.2 collisions per year. Taking into account the volume and distribution of traffic in the study area the overall safety performance of the intersections and road segments in the study area are acceptable except for the intersection of Steeles Avenue West and Mississauga Road.

The following collision trends and patterns were noticeable:

- Higher than expected numbers of collisions are occurring at the study intersections, hence long-term efforts to improve road safety should be focused on managing access and improving intersection safety in general.
- At the intersection of Steeles Avenue and Mississauga Road the collisions are overrepresented in the AM peak period. This may be attributed to a deteriorating level of service.

3.3.8 Geotechnical Investigation

AMEC conducted a geotechnical investigation that included a pavement investigation, as well as a foundation investigation for culverts and storm sewer within the study limits and the approach embankments at the Credit River Bridge (ref. Appendix 'D' – Geotechnical Investigation Report).

3.3.9 Existing Pavement Conditions

Winston Churchill Boulevard to 100 m West of Mississauga Road

This section of Steeles Avenue is rated in good condition due to the recent 4-lane widening that occurred in 2011.

Mississauga Road to Heritage Road

The existing pavement is considered to be in 'Fair Condition' with intermediate to extensive ravelling and aggregate loss, wheel track rutting, and various cracks of 'slight' to 'severe' severity.

100 m West of Mississauga Road to Chinguacousy Road

This section of Steeles Avenue is rated in fair to poor condition.

3.3.10 Structures

A total of three (3) major structures and twelve (12) minor structures along the Steeles Avenue corridor were reviewed by the AMEC team. The structures consist of a concrete bridge, a concrete culvert and several steel CSPs. The results of the inspection are presented in the Structural Inspection Report (ref. Appendix 'E' - Structural Inspection Report).

The Structural Inspection Report recommends the replacement of the elliptical CSP at the Mullett Creek crossing and rehabilitation of the Levi's Creek crossing. The various minor crossings should be replaced with storm sewer when the study area is urbanized. A summary of the findings is outlined in the table below.

Table 3.1 Summary of Structural Report				
No.	Structure Location	Span/Type	Observation	Recommendation
Structures				
C1	Steeles Avenue, 0.6 km east of Winston Churchill Boulevard at Mullett Creek.	3.23 m elliptical CSP	Fair to poor condition	Replace CSP
C2	Steeles Avenue, 150 m east of Heritage Road	0.67 m dia. concrete pipe. Concrete headwall at south	Replaced by storm sewer under 2011 construction	None
C3	Steeles Avenue, 0.2 km west of Mississauga Road at Levi's Creek.	9.22 m open footing culvert	Fair condition	Rehabilitation required
C4	Steeles Avenue, 360 m East of Mississauga Road	3600 x 1200 concrete box culvert	Buried and plugged due to development	Confirm continuity of crossing with ultimate (fully developed) conditions
B1	Steeles Avenue, 1.5 km east of Mississauga Road over Credit River	70 m three span concrete deck on CPCI girders. Concrete abutments and piers.	Good condition	Existing structure adequate
N/A	Mississauga Road, 160 m south of Steeles Avenue	Precast box beams on concrete abutments	Good condition	Further study required if widening is required
Culverts				
2210	Steeles Avenue, 80 m East of Winston Churchill Boulevard	CSP	Replaced by storm sewer under 2011 construction	None
2212	South side of Steeles Avenue, 250 m East of Winston Churchill Boulevard	1.04 m dia. concrete pipe	Good condition. Outlets east to ditch on south side of Steeles	None
2216	Under Heritage Road on south side of intersection with Steeles Avenue	0.6 m dia. poly pipe	Replaced by storm sewer under 2011 construction	None
2226	Under Heritage Road on north side of intersection with Steeles Avenue	0.6 m dia. poly pipe	Replaced by storm sewer under 2011 construction	None

Table 3.1 Summary of Structural Report

No.	Structure Location	Span/Type	Observation	Recommendation
2219	Steeles Avenue, 475 m east of Heritage Road	0.6 m dia. concrete pipe. Concrete headwalls at both ends.	Removed and replaced under 2011 construction. Present culvert in good condition.	None
2207	Under Financial drive on north side of intersection with Steeles Avenue	0.6 m dia. CSP	Small diameter	Replace with storm sewer
2205	Under Creditview Road on north side of intersection with Steeles Ave	1.0 m dia. CSP	Small diameter	Remove and replace
2201	Under Polonia Avenue on north side of intersection with Steeles Avenue	0.7 m dia. CSP	Small diameter	Replace with storm sewer
2189	Under James Potter Road on north side of intersection with Steeles Avenue	0.8 m dia. CSP	Small diameter	Replace with storm sewer
2198	Under James Potter Road on south side of intersection with Steeles Avenue	0.8 m dia. CSP	Small diameter	Replace with storm sewer

3.4 Natural Environment

3.4.1 Terrestrial Resources

A Natural Environment Existing Conditions Report was prepared (ref. Appendix 'F' – Natural Environment Existing Conditions Report). The assessment is based on available background data, mapping data and a reconnaissance visit to the study area for vegetation and wildlife.

Vegetation

The Credit Valley Conservation Authority has identified agriculture, residential, commercial, industrial and other cultural land communities within the study area. The study area has also been heavily influenced by human activity and is mainly comprised of cultural land use. The ecological classification of the study area is summarized in Table 3.2. No rare or SAR plants species were observed within the study area.

Table 3.2 Ecological Land Classification

Habitat Type	Code	ELC Classification	Area (ha)	% of Study Area
Cultural	CUM	Cultural Meadow	10.9	8.1
	CUM1-1	Dry-Moist Old Field Meadow	10.1	7.5
	CUP1	Deciduous Plantation	1.0	0.7
	CUT1	Mineral Cultural Thicket	1.6	1.2

Table 3.2 Ecological Land Classification

Habitat Type	Code	ELC Classification	Area (ha)	% of Study Area
	CUT1-1	Dogwood Cultural Thicket	1.1	0.8
	CUW1	Mineral Cultural Woodland	1.2	0.9
	CVC	Commercial and Institutional	19.8	14.7
	CVI	Transportation and Utilities	3.0	2.2
	CVR	Residential	24.2	18.1
	OAG	Open Agriculture	22.5	16.8
<i>Cultural 71.1% of study area</i>				
Deciduous Forest	FOD	Deciduous Forest	0.2	0.1
	FOD5-3	Dry-Fresh Sugar Maple – Oak Deciduous Forest	0.4	0.3
	FOD5-6	Dry-Fresh Sugar Maple – Basswood Deciduous Forest	0.6	0.5
	FOD5-8	Dry-Fresh Sugar Maple – White Ash Deciduous Forest	0.3	0.2
<i>Deciduous Forest 1.2% of study area</i>				
Mixed Forest	FOM	Mixed Forest	1.5	1.2
<i>Mixed Forest 1.2% of study area</i>				

Designated Natural Areas

The project lies partially within the Region of Peel Greenlands System which is regionally designated as a significant natural area (ref. Figure 3.7). The Greenlands System contains many different kinds of environmental features, such as woodlands, valley and stream corridors, and other natural areas like ESAs and ANSIs. The Greenlands which fall within the study area are designated as Core Areas and are protected by the Region of Peel Official Plan (Official Plan Working Draft Office Consolidation, Region of Peel, 2012).

In addition to these Core Areas the proposed works cross three permanent watercourses: the Credit River; Levi's Creek; and Mullet Creek. In close proximity to these watercourses lie three significant natural areas:

- The Credit River valley;
- Churchville-Norval Provincially Significant Wetland (PSW) complex; and
- Levi's Creek PSW complex.

The Credit River valley is designated as a regional Life Science ANSI and falls within the Region of Peel's Greenlands System as a Core Area. Credit River valley is an undeveloped valley that crosses Steeles Avenue near Creditview Road (ref. Figures 3.6).

Provincially significant Churchville-Norval wetland complex is comprised of over 20 wetlands which lie within the vicinity of the Credit River and its tributaries. This PSW complex covers

approximately 75 ha and falls to the north and south of Steeles Avenue and is within 5 km of the study area (NHIC database – Biodiversity Explorer, MNR, 2012a).

Wetland complexes associated with Levi's Creek corridor fall within 5 km of the study area. Levi's Creek PSW complex is comprised of three types of wetlands – open water, marsh, and swamp. The wetland complex is primarily located north of Steeles Avenue, with two wetland areas within the study area south of Steeles Avenue, west of Mississauga Road. As a whole, Levi's Creek wetland complex covers a total of 47 ha (NHIC database – Biodiversity Explorer, MNR, 2012a).

Wildlife

Of the 113 bird species recorded, 36 were identified during the breeding bird point count survey. With the exception of Barn Swallow, all recorded species are considered common. An additional five common species were observed during vegetation mapping. Ring-billed Gull (*Larus delawarensis*) was observed throughout the study area at all point count locations. Song Sparrow (*Melospiza melodia*), Red-winged Blackbird (*Agelaius phoeniceus*) and American Robin (*Turdus migratorius*) were also observed at all point count locations. Fifteen Red-winged Blackbirds and approximately 20 Canada Geese (*Branta Canadensis*) were observed. Six American Kestrels (*Falco sparverius*) were also observed. Cliff Swallows (*Petrochelidon pyrrhonota*) were observed flying overhead and it is assumed that they are nesting at the Credit River Bridge, as Cliff Swallow nests were located under the bridge.

A review of mapping indicated 13 species of amphibians and 10 species of reptiles have been observed within the greater region (Oldham and Weller 2000, MNR 2012). Green Frog (*Rana clamitans melanota*) and Eastern Gartersnake (*Thamnophis sirtalis sirtalis*) were observed during field investigations, in the area of the south corner of Steeles Avenue and Mississauga Road. While wetland/marsh areas fall within the study area, they are very limited - only 5% of total study area. Therefore, with no standing snags, woody debris or vernal pools, and a limited amount of wetland habitat, there is little potential wildlife habitat for feeding and nesting within the study area for amphibians and reptiles.

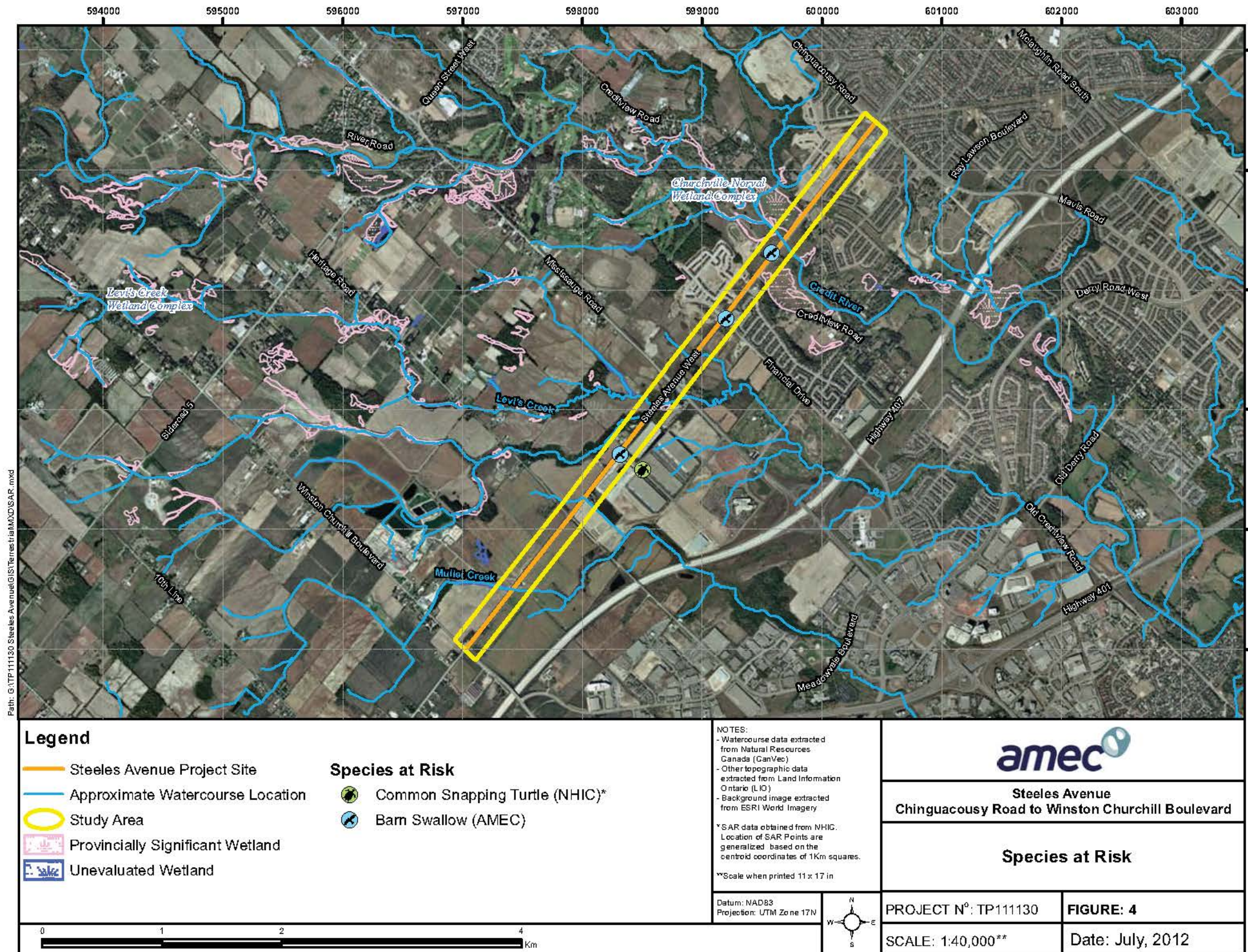
Six butterfly species were identified during field investigations: Cabbage White (*Pieris rapae rapae*), Clouded Sulphur (*Colias philodice philodice*), Common Wood-Nymph (*Cercyonis pegala*), Eyed Brown (*Satyroides eurydice eurydice*), Mourning Cloak (*Nymphalis antiopa antiopa*), and Red Admiral (*Vanessa atalanta*). All of the species are common.

Common Snapping Turtle (designated as Special Concern) was identified within the area between Heritage Road and Mississauga Road in 2010 but was not observed during AMEC field observations.

Barn Swallow (designated as Threatened) was recorded at three breeding bird point count locations. No nests were identified during inspections of nearby bridges and culverts (ref. Figure 3.6).

No mammal, amphibian, reptile or invertebrate species at risk were observed within the study area.

Figure 3.6 – Terrestrial Species at Risk



3.4.2 Fisheries

A Fish and Fish Habitat Existing Conditions Report was completed (ref. Appendix ‘G’ – Fish and Fish Habitat Existing Conditions Report) as a component of the Steeles Avenue Class Environmental Assessment.

Aquatic Species at Risk

Records of historic Redside Dace (*Clinostomus elongates*, designated provincially as “Endangered” and federally as “Schedule 3 – Special Concern”) were revealed during a review of element occurrences in the NHIC database (NHIC database – Biodiversity Explorer, MNR, 2012a) (ref. Table 3.3). Based on MNR correspondence, Redside Dace are expected to occur in Levi’s Creek with a possibility of occurrence in the unnamed tributary to Levi’s Creek. Additionally, DFO SAR distribution mapping for Credit Valley Conservation Authority, indicate Lake Sturgeon (*Acipenser fulvescens*) and Redside Dace as potentially present within segments of Credit River north of Steeles Avenue (2011 Aquatic Species at Risk: DFO Mapping, Conservation Ontario, 2011). The historical status of the NHIC Lake Sturgeon record indicates that the species is unlikely to currently inhabit the area, and correspondence from MNR did not report their presence however, MNR records of Redside Dace, as well as designated Redside Dace habitat occur within the study area.

Name	Provincial Designation	Federal Designation	Probability of Occurrence within the ROW and Study Area
Lake Sturgeon ^{2,3} (<i>Acipenser fulvescens</i>) Great-Lakes-Upper St. Lawrence River population	Threatened	Threatened	Low - Historical NHIC record. Last observed date within 10 km of study area was 1931.
Redside Dace ^{1,2,3} (<i>Clinostomus elongates</i>)	Endangered	Endangered	Moderate – High – Last observed within vicinity of study area was 1999. MNR correspondence indicates records of Redside Dace and designated habitat within study area.

¹ MNR indicated as known, suspected, presumed or historically present

² DFO Species at Risk mapping (2011 Aquatic Species at Risk: DFO Mapping, Conservation Ontario, 2011)

³ NHIC Element Occurrence (NHIC database – Biodiversity Explorer, MNR, 2012a)

Designated Redside Dace habitat has been identified within the study area in Levi’s Creek (Crossing C3) and the small tributary (Churchville Tributary 8B of the Credit) northeast of crossing B1. Additionally the unnamed tributary of Levi’s Creek (Crossing C4) and the Credit River (Bridge Crossing B1) have also been identified as possible Redside Dace habitat as reported by the MNR, however, based on the observed existing conditions Crossing C4 is unlikely to support fish directly, and the Credit River is considered too large of a waterbody to provide preferred Redside Dace habitat (Habitat Regulations under the ESA: Redside Dace Habitat, MNR, 2012b).

Mixed cool/warmwater habitat is utilized by migratory trout and salmon in the lower reaches of the watershed including Levi's and Mullet Creek. The cool/warmwater habitat extends to upper reaches of Levi's and Mullet Creeks but due to agricultural land use and on-line ponds, existing fish communities more closely reflect a warmwater fish community (Credit River Fisheries Management Plan: A Cooperative Management Planning Initiatives for the Credit River Fishery, MNR and CVC, 2002). Sunfish (*Lepomis* spp.), Perch (*Perca* spp.) and Bullhead Catfish (*Ameiurus* spp.) are primarily more common in large warmwater pond habitats Credit River Fisheries Management Plan: A Cooperative Management Planning Initiatives for the Credit River Fishery, MNR and CVC, 2002).

AMEC has determined fish habitat sensitivities based on field investigations and known fish species within the watercourses. Sensitivity rankings assist in directing planning, design, and construction considerations with respect to the potential impact on fish habitat under the policies of the *Federal Fisheries Act*. Crossings with High sensitivities have a greater possibility of resulting in an impact. The existing crossings along the study area have a range of sensitivities from Low to High and are provided in Table 3.4.

Table 3.4 Existing Fish and Fish Habitat Conditions Summary Table

Watershed	Crossing No & Watercourse Name (where applicable)	Flow ¹	Thermal Regime ¹	Substrate Type ¹ (distribution over investigated reach)	Aquatic Vegetation ¹	Supports a Fishery ¹	Fish Species Present	Fish Habitat Sensitivity
Credit River	C1 (Mullet Creek)	Permanent	Warmwater	55% Muck 20% Grasses 10% Silt 10% Sand 5% Cobble	Grasses Cattails Algae	Directly	⁷ Blacknose Dace ⁷ Brook Stickleback ^{6,7} Longnose Dace ⁷ Pumpkinseed	³ Low
	C2	Ephemeral	None (dry)	Dry channel	Grasses	No	None	None
	C3 (Levi's Creek)	Permanent	Coolwater	30 % Gravel 30% Sand 25% Cobble 5% Silt 5% Muck 3% Boulder 2% Detritus	Grasses Cattails Sedges Canadian Water Weed	Directly	¹ Minnow sp. ³ Redside Dace	High
	C4	Ephemeral	None (dry)	Dry channel	None	No	³ Possibly Redside Dace (downstream only not at crossing)	*Moderate

Source: ¹ AMEC field investigation (April 18, 2012)

² CVC (2009 - upstream of Old Derry Road)

³ MNR Aurora

⁴ CVC (2005 - at Hwy 401)

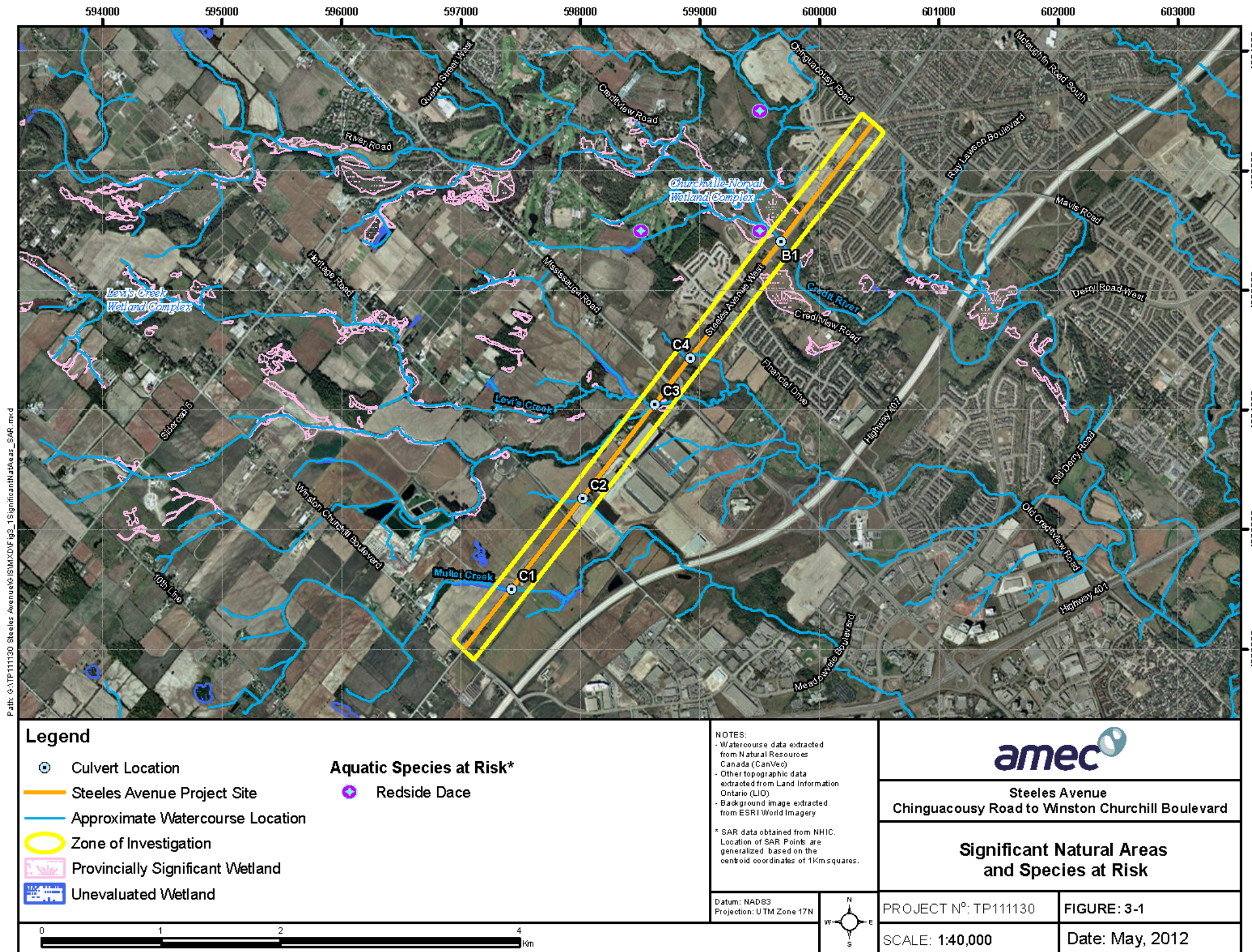
⁵ CVC (2000 - upstream of Hwy 401)

⁶ MNR and CVC, 2002

⁷ AMEC, 2012

*Moderate sensitivity reflects downstream fish habitat. No discernable fish habitat was identified at the crossing location itself, but MNR has identified that the tributary may be Redside Dace habitat.

Figure 3.7 – Steeles Avenue Significant Natural Areas and Aquatic Species at Risk



3.4.3 Stormwater

AMEC prepared a Stormwater Management Report (ref. Appendix 'H' - Stormwater Management Report). Within the study area, three creeks, the Mullet Creek, Levi's Creek, and the Credit River, as well as one unnamed tributary on Mullet Creek and Levi's Creeks are conveyed under the Steeles Avenue within 5 culverts (Culverts Crossings C1 to C4, and B1). Both Mullet Creek and Levi's Creek are tributaries of the Credit River with Mullet Creek discharging to the Credit River south of Burnhamthorpe Road and Levi's Creek confluencing with the Credit River south of Derry Road.

The existing roadway drains to Mullet Creek, Levi's Creek, and the main Credit River mostly through roadside ditches and local storm sewer systems. To establish a baseline condition, drainage for the existing roadway has to be assessed by determining peak flows from the right-of-way. External hydrology for Levi's and Mullet Creek has been provided by the Credit Valley Conservation (CVC). The existing creek crossings have been assessed to determine hydraulic performance of each crossing. For the future widened and urbanized road, stormwater quantity and quality management would have to be provided, thus an inventory of the existing stormwater management facilities the road drains to has been provided herein.

3.4.4 Existing Stormwater Management Facilities

The existing stormwater management facilities along the Steeles Avenue corridor have been designed in accordance with the 1999 Gateway West Subwatershed Study. The subwatershed study provides requirements for water quality, erosion and quantity controls for Mullet Creek, Levi Creek and areas draining directly to the Credit River. Stormwater management criteria as stipulated within the subwatershed study is as per the following:

Mullet Creek:	Quality Control – Level 1 Enhanced Erosion Control – 250 m ³ / Imp.ha, 1.6 L/s/Imp.ha Quantity Control – 2-100 Year and Regional Storm post to pre-development
Levi Creek:	Quality Control – Level 1 Enhanced Erosion Control – 300 m ³ / Imp.ha, 1.5 L/s/Imp.ha Quantity Control – 2-100 Year post to pre-development
Credit River:	Quality Control – Level 1 Enhanced Erosion Control – 25 mm storm event detained for 24 hours Quantity Control – 2-100 Year post to pre-development

Sections of the existing Steeles Avenue right-of-way drain to stormwater management facilities. There are currently only three (3) stormwater management facilities that receive drainage from the Steeles Avenue right-of-way with the remaining facilities providing stormwater management for development located either side of the right-of-way but with no consideration for Steeles Avenue drainage.

Drainage Catchments 3 and 4 (3.02 ha) located just east of the Mullet Creek crossing to the east side of Heritage Road drain to stormwater management facility M4 located south of Steeles Avenue and east of Heritage Road/ Meadowvale Boulevard. Drainage is directed to the stormwater management facility via an existing ditch at crossing C2, but will ultimately be conveyed by a storm sewer system south of Steeles Avenue. The facility discharges to Mullet

Creek. The facility has been designed using a 60% impervious coverage for Steeles Avenue right-of-way, representative of existing conditions.

Drainage Catchments 5 and 6 located east of Hereford Street drain to facility L1 located south of Steeles Avenue and west of Mississauga Road. The drainage from Steeles Avenue is conveyed via a storm sewer system south along Hereford Street and then east to the facility. The facility has been designed to provide quality, erosion and water quantity controls for the ultimate Steeles Avenue right of way. The facility discharges indirectly to Levi Creek west of Mississauga Road.

The third stormwater management facility is the Credit Manor Subdivision facility No. 1 located south of Steeles Avenue, east of Levi Creek and west of Financial Drive. The stormwater management facility was constructed in 2012. The facility provides stormwater management for development both north and south of Steeles Avenue. Drainage across the Steeles Avenue right of way north to south is provided by Crossing C4. Steeles Avenue Drainage Catchments 9, 10, 37 and 38 drain to the stormwater management facility via Crossing C4. The facility will provide water quality, erosion and quantity controls for the ultimate Steeles Avenue right of way. The stormwater management facility discharges directly to Levi Creek.

Criteria for the Hydraulic analysis

As per the Region of Peel design requirements, culverts are to convey the Regional Storm. Should the existing culverts not meet this criterion and are not structurally deficient, the Ministry of Natural Resources guidelines for vehicle ingress and egress should be evaluated, which note that the flow depth velocity product should be less than $0.4 \text{ m}^2/\text{s}$. Other flow depth criteria include:

Private Vehicle Access:

- $d < 0.3 \text{ m}$, $v > 4.5 \text{ m/s}$
- $0.3 < d < 0.4$, $v > 3 \text{ m/s}$
- $d > 0.4$, $v > 0.3 \text{ m/s}$

Emergency Vehicle Access:

- $d > 0.9 \text{ m}$, $v > 4.5 \text{ m/s}$ diesel fire trucks

For 100 year and the Regional Storm event, based on Ministry of Natural Resources of Ontario (MNR) Vehicle Ingress and Egress requirements, the maximum overtop depth should be less than 0.3 m with the velocity no greater than 4.5 m/s, and for a product of depth and velocity should be less than 0.4.

Existing Culvert Capacity

Within the study area, the Credit River, Levi's Creek and the Mullet Creek cross Steeles Avenue. Table 3.5 summarized the crossings details.

Table 3.5 Summary of Existing Culvert Capacity

Structure No.	Creek	Structure Location	Drainage Area (ha)	Size/Type
C1	Mullet	Steeles Avenue, 0.6 km east of Winston Churchill Boulevard.	489	39.3 m long 3.23 m span by 2.16 m rise elliptical CSP
C2	Mullet	Steeles Avenue, 150 m east of Heritage Road	6.8	0.45 m dia. inlet with headwall to MH to 0.67 m dia. concrete pipe. Headwall at outlet
C3	Levi's	0.2 km west of Mississauga Road	714	10.62 m long 9.22 m span by 2.6 m rise (1.7) ¹ m open footing culvert
C4	Levi's	360 m East of Mississauga Road	80.6	3600 x 1200 concrete box culvert (buried with 4 ditch inlets for Steeles Avenue right-of-way drainage)
B1	Credit River	1.5 km east of Mississauga Road		30.70 m length by 70m span by 4.59 m rise (2.7 m) ¹ Three concrete deck sections on CPCI girders. Concrete abutments and piers.

¹The rise noted is from the water surface to the oververt.

Considering the Region of Peel's requirements for the Regional Storm to be conveyed by each crossing, the following can be concluded:

- i. Mullet Creek Culvert 1 is considered borderline adequate as the Regional Storm only overtops by 0.08 m, but has been noted deficient from a stream morphology perspective as it should be 12 m in span.
- ii. Mullet Creek Culvert 2 currently provides adequate flow conveyance.
- iii. Based on the hydraulic modelling results using the CVC's 2012 GAWSER peak flows the Levi's Creek culvert is considered inadequate and is overtopped by the 25 year storm event.
- iv. Culvert 4 has not been assessed due to the lack of information.
- v. The Credit River Bridge is be sized adequately as it conveys the Regional Storm peak flows without overtopping Steeles Avenue.

3.4.5 Fluvial Geomorphological Assessment

PARISH Geomorphic Ltd. completed a Fluvial Geomorphological Assessment for three stream road crossings in the Steeles Avenue study Area (ref. Appendix 'I' – Fluvial Geomorphological Assessment). The Fluvial Geomorphological Assessment and crossing evaluation were undertaken in order to identify long-term improvements for the 2021 to 2031 planning time frame.

Mullet Creek Crossing

The current crossing structure is slightly undersized (3.3 m), and does not accommodate the average bankfull width of the channel of 4.0 m. An opening width of 8.0 m or greater would

allow clear passage of all flow events and reduce the risk of sediment transport issues that are typically associated with undersized structures.

Levi's Creek Crossing

Steeles Avenue currently accommodates Levi's Creek via a 7.0 m wide open-bottom concrete arch culvert. The crossing structure is oriented at a slight skew to the watercourse; however, the channel displays a fairly straight planform. Although an increase in the crossing structure size would be beneficial, the current 7.0 m width appears to be adequate in accommodating the watercourse.

Credit River

The Credit River crosses Steeles Avenue via an 80.0 m, 3-span bridge. The bridge is well-oriented to the watercourse, which is fairly straight and crosses at a minimal skew. The current bridge spanning the Credit River at Steeles Avenue accounts for the channel bankfull width and does not appear to be causing any hydraulic concerns.

3.4.6 Air Quality Assessment

AMEC completed an Air Quality Assessment for the study area (ref. Appendix 'Q' – Air Quality Assessment Report). The study was completed to:

- Provide estimates of the air emissions resulting from vehicular traffic;
- Predict the resulting air quality effects on ambient air, with consideration of existing background air quality, and
- Provide a qualitative discussion of the significance of potential effects and a quantitative comparison of the future air quality effects to the current scenario.

The conclusions reached in this report are summarized in Section 6.2.3.

3.5 Socio-Economic Environment

3.5.1 Utilities

At present, there are various utilities present within the Steeles Avenue right-of-way. In addition, it is anticipated that new or updated utility plant will be required along the corridor as development proceeds. The following is an outline of the utility information known to date.

Bell Canada – Bell has buried lines and conduit buried throughout the study area. In general, these lines are located:

- On the south side of Steeles Avenue from Winston Churchill Boulevard to Heritage Road, and from Financial Drive to Churchville Road
- On the north side of Steeles Avenue from Mississauga Road to Chinguacousy/Mavis Road
- On all side roads approaching the study area

Enbridge (local) – An 8 inch diameter service line is in place on the south side of Steeles Avenue from Winston Churchill Boulevard to Chinguacousy/Mavis Road.

Enbridge (distribution) – An 24 inch diameter distribution line runs north/south between Winston Churchill Boulevard and Heritage Road. The pipeline crosses Steeles Avenue, and is protected by a 30 inch steel casing. An above ground maintenance facility is located immediately south of the road right-of-way where the pipeline crosses Steeles Avenue. The pipeline is regulated by the National Energy Board, and a crossing permit will be required for reconstruction of Steeles Avenue.

TransCanada – An 36 inch diameter crossing occurs immediately adjacent to the 24 inch Enbridge pipeline. Similar to Enbridge, an above ground maintenance facility is located immediately south of the road right-of-way where the pipeline crosses Steeles Avenue. The pipeline is regulated by the National Energy Board, and a crossing permit will be required for reconstruction of Steeles Avenue.

Hydro One – Hydro One has a large overhead distribution network which crosses the Steeles Avenue and Chinguacousy/Mavis Road intersection diagonally from northwest to southeast.

Rogers Cable – No Rogers Cable plant was reported in the study area

Brampton Hydro – Heavy overhead hydro exists along the north side of Steeles Avenue from Winston Churchill Boulevard to 150m west of Chinguacousy/Mavis Road. From 150m west of Chinguacousy/Mavis Road to the eastern study limit, the cable dips and is buried on the north side of Steeles Avenue.

3.5.2 Archaeology

Stage 1 Archaeological Assessment

A Stage I Archaeology Assessment was completed for the study area (ref. Appendix 'J' – Stage 1 Archaeological Assessment). The study area consists of the 100-metre corridor for Steeles Avenue from 200 m west of the Winston Churchill Boulevard and Steeles Avenue section extending approximately 6.08 kilometres to 200 m to the east of Chinguacousy Road/Mavis Road.

The objectives of a Stage 1 background study are: 1) to provide information about the property's geography, history, previous archaeological fieldwork and current land condition; 2) to evaluate in detail the property's archaeological potential which will support recommendations for Stage 2 property assessment for all or parts of the property if warranted; and, 3) to recommend appropriate strategies for Stage 2 property assessment if warranted.

Background Review

The study corridor is situated directly adjacent to a major historical transportation route, the Village of Churchville, and "Whaley's Corner" all established by at least 1859. In addition, a school, a blacksmith shop, a cemetery and residential dwellings, barns and orchards were formerly located within or adjacent to the study corridor. Proximity to this historically important transportation route suggests that the study corridor has early Euro-Canadian archaeological potential.

On the basis of a search of the OASD, 81 registered archaeological sites are located within a two kilometre radius of the study corridor.

The study corridor is transected by the Credit River, Levi's Creek and their associated tributaries. It is crucial to consider the proximity of water sources in any evaluation of archaeological potential because the availability of water is arguably the single most important determinant of human land use, past and present. In summary, the undeveloped land within the study corridor meets the conditions outlining archaeological potential in the proximity to water model. Therefore, there is potential for encountering archaeological sites.

Property Inspection

The Stage 1 property inspection was conducted on February 18th, 2012 and on March 12th, 2012, to confirm archaeological site potential and to determine the degree to which development and landscape alteration have affected that potential. The focus of the Stage 1 property inspection was to concentrate on any areas that may be impacted by development outside the existing disturbed right-of-way ("ROW").

The Stage 1 property inspection and aerial photograph investigation concludes that Steeles Avenue has been substantially widened over time and has undergone typical road construction, exhibiting ditching and grading in the current ROW. Steeles Avenue, as a former historical rural transportation route has been widened from two lanes width to a minimum of four lanes. Steeles Avenue is now considered a suburban road. Recent road improvements have been required to accommodate increased traffic flow brought about by urban development in and around the City of Brampton. During the Stage 1 property inspection it was observed that within the current ROW, areas of the study corridor have undergone recent construction, with evidence of new ditching and culverts, since the aerial photography. These lands are mapped as disturbed and do not warrant further archaeological assessment.

Overall, the Stage 1 property inspection revealed that the Steeles Avenue study corridor is characterized by a mixture of residential, commercial, vacant and industrial structures with some residual agricultural and rural land use. There is little visible evidence of extant historical structures within the study. The sections of the study corridor which seem undisturbed remain primarily agricultural landscapes with some woodlots and grassy floodplains that buffer the Credit River, tributaries to Credit River and Levi's Creek. The low-lying and perennially wet floodplains and steeply sloped areas, do not warrant Stage 2 assessment. All of the other undisturbed areas observed during the Stage 1 property inspection require Stage 2 Archaeological Assessment.

In summary, approximately 80 percent of the study corridor does not require Stage 2 Archaeological Assessment as it is either perennially wet, steeply sloped or has had archaeological potential removed by recent earth moving activities related to development within and adjacent to the existing ROW. The examination of aerial photographs and the Stage 1 property inspection indicate that all undeveloped lands that are not perennially wet or steeply

sloped (approximately 20 percent of the study corridor) have archaeological potential and warrant a Stage 2 Archaeological Assessment.

3.5.3 Built Heritage and Cultural Landscape

A Built Heritage Property (BHP) and Cultural Heritage Landscape (CHL) assessment was completed for the study area (ref. Appendix 'K' – Built Heritage and Cultural Heritage Landscape Assessment). An inventory and preliminary evaluation of BHP and CHL is a systematic qualitative process carried out to assess the potential heritage value of a given property based on its physical and design characteristics, historical use and associations, and context, both social and environmental. All visual assessment was conducted from the roadways. This work was conducted on February 21, 2012. Weather during the field study portion of this assessment was cool and overcast and did not impede the assessment in any way.

Key issues to be considered are three previously identified cultural heritage resources in the immediate vicinity:

- The Creditview Road Corridor Cultural Landscape (listed in 2006 by the Brampton Municipal Register of Cultural Heritage Resources as most significant and worthy of preservation/designation under the *Ontario Heritage Act*);
- Creditdale Farm (designated under the *Ontario Heritage Act*, Part IV), and;
- The Churchville Heritage Conservation District (designated under the *Ontario Heritage Act*, Part V).

Projected effects of the widening and improvement of Steeles Avenue within the study area are assumed not to include the removal of buildings, but may include:

- Property encroachment;
- Contextual disruption, including the removal of vegetation and alteration of physical settings;
- Visual effects, including the alteration of viewscales; and
- Audible effects, including an increase in traffic noise.

Findings

The following table (ref. Table 3.6) is a list of project effects with respect to the recorded built heritage property, heritage conservation district and cultural heritage landscape and the anticipated magnitude of these effects on the resources. The magnitude is evaluated with respect to the setback of the property from Steeles Avenue, the value of the resource, and existing conditions.

Table 3.6 Steeles Avenue: Built Heritage Properties and Cultural Landscape Properties

Record Number	Address/Description	Existing Conditions Affecting Heritage Context	Anticipated Project Effects	Magnitude of Effects	Recommendations
BHP1	Creditdale Farm 8028 Creditview Road Neo Classical red-brick farmhouse	noise; heritage context altered	contextual, visual, audible effects	high	Ensuring existing Conservation Plan and Heritage Conservation Easement with the City of Brampton are followed; avoidance protocols to minimize impacts
HCD1	Churchville Heritage Conservation District Rural hamlet in the south-west corner of Brampton	noise; heritage context altered	contextual, visual, audible effects	moderate	Alternative engineering approaches to conserve and enhance the heritage resource
CHL1	Creditview Road Corridor between Steeles Avenue West and Queen Street West	noise; heritage context altered	alteration of roadway contextual, audible, visual effects	high	Alternative engineering approaches to conserve and enhance the heritage resource

4.0 DEVELOPMENT AND EVALUATION OF ALTERNATIVE PLANNING SOLUTIONS

4.1 Problem/Opportunity Definition

Based on a review of existing and future conditions, as well as preliminary consultation with stakeholders, it has been determined that improvements are needed along the Steeles Avenue corridor to address/accommodate:

- Existing and future traffic demand;
- Future transportation network improvements including BramWest Parkway;
- Transit system expansion along the corridor;
- Pedestrian and cyclist movements through the corridor, and
- Drainage deficiencies and opportunities for stormwater management.

Existing and Future Traffic Demand

Steeles Avenue is currently operating at a moderate level of service, with congestion at intersections during the peak hours. Improvements to the corridor are required to address existing traffic congestion. With anticipated growth in the area, Steeles Avenue will not be able to support future traffic volumes if no improvements are made to the corridor, and significant levels of congestion will occur.

Future Transportation Network Improvements

Various roads intersecting Steeles Avenue are being studied for expansion to accommodate the future traffic demand. Neighbouring ongoing Class Environmental Assessment studies include the new BramWest Parkway (between Winston Churchill Boulevard and Heritage Road), and Heritage Road. A Class EA has been completed for Financial Drive at Steeles Avenue and the project has entered the detailed design phase. The intersection of Chinguacousy/Mavis Road with Steeles Avenue has recently been reconstructed and widened. Improvements to Steeles Avenue must accommodate the additional traffic demand to and from the expanded transportation network.

Accommodation of Transit System Expansions

Both Brampton Transit and GO Transit propose increases in the frequency of their transit services along Steeles Avenue. Plans are currently underway for a Bus Rapid Transit (BRT) facility along Steeles Avenue.

Accommodation of Pedestrians and Cyclists

The City of Brampton's Transportation and Transit Master Plan affirms walking and cycling as key elements of the City's integrated, intermodal transportation system. Existing and future residential development in the area will generate both cyclist and pedestrian traffic along the Steeles Avenue corridor. Brampton's Transportation and Transit Master Plan (TTMP) also identifies a need to better accommodate pedestrians and/or cyclists.

Drainage Deficiencies and Stormwater Management

Stormwater management is to be assessed in the subsequent study phases. Both stormwater quantity and quality management will have to be assessed for the road widening. The potential provision of stormwater management within existing facilities will have to be established. Where existing facilities have not been designed to accommodate the proposed Steeles Avenue works, other alternatives such as stormwater management facilities within the Region's lands and/or

integration with proposed private development facilities should be assessed. Alternatives such as oil/grit chambers, enhanced grass swales and others will be considered.

4.2 Identification of Planning Alternatives

The following planning alternatives have been identified for consideration in addressing the problems and opportunities discussed above:

Alternative 1: Do Nothing: Maintain Steeles Avenue in its present configuration with no improvements other than to continue regular maintenance.

Alternative 2: Improve other Roads: Improve adjacent parallel roads to accommodate the projected future traffic demand for Steeles Avenue.

Alternative 3: Transit Infrastructure Improvements: Improve transit infrastructure to support Brampton Bus Rapid Transit (BRT) Plans and address capacity requirements.

Alternative 4: Travel Demand Management (TDM): Encourage and support change in travel behaviour to reduce peak travel demand:

- Promoting car-pooling and possible HOV lanes to reduce single auto occupancy trips
- Promoting flexible work hours, work from home or tele-working etc. at work places to reduce travel needs for work, and
- Increasing active transportation trips (biking/walking) share in peak travel demands

Alternative 5: Widen Steeles Avenue with Intersection Improvements: Addition of through-traffic lanes including intersection improvements, to increase traffic capacity of the corridor.

Alternative 6: A combination of 3, 4 and 5: Combine alternatives 3-5 as mentioned above to increase the overall effectiveness of individual alternatives and reduce environmental impacts.

4.3 Preliminary Assessment of Planning Alternatives

In assessing planning alternatives, a range of environmental issues has been addressed and potential avoidance or mitigation of negative effects has been considered. As a key part of assessing planning alternatives, this study has identified evaluation criteria that reflect the concerns of various stakeholders, as communicated through preliminary consultation. Table 4.1 provides a description of the evaluation criteria used.

Table 4.1 Evaluation Criteria for Planning Alternatives

Component	Evaluation Criteria	Description
Natural Environment	Wetlands and Vegetation	Potential adverse effects on terrestrial species and habitats
	Wildlife Habitat	Potential adverse effects on existing wildlife due to disturbance or loss of habitat
	Species at Risk	Potential effects on Species at Risk identified in the study area
	Groundwater/ Surface Water/Drainage	Potential adverse affect on groundwater, wells, surface water quality and flood potential
	Fisheries and Water Quality	Potential to minimize impact on aquatic features
	Flooding	Potential to minimize flooding impacts due to potential improvements
Social, Cultural & Economic Environment	Land Use	Presence, number and characteristics of residences, community facilities, public parks, institutions or businesses within or adjacent to the study corridor
	Noise	Ability to minimize noise after construction
	Archaeology and Cultural Heritage Resources	Potential adverse effects on archaeological and built heritage resources
	Agricultural	Potential adverse effects on agricultural lands
	Access Considerations	Ability to maintain/maximize access
	Utilities	Ability to minimize effects on existing and proposed utilities
	Construction Disruptions	Ability to minimize construction constraints and complexity
Transportation	Safety	Ability to improve vehicular safety
	Travel Delay/ Traffic Capacity	Potential to address existing and future capacity and operational needs
	Transit	Potential to address transit needs for future planned transit initiatives
	Active Modes of Transportation	Potential to address requirements for active modes of transportation
Costs	Capital Cost	Capital costs of the proposed improvements
Transportation Plans & Policies	Compatibility with Regional and City Transportation Plans and Policies	Compatibility with Regional and Municipal Official Plans and Policies

4.4 Evaluation of Alternatives

The preliminary recommended planning alternative developed in consultation with agencies is Alternative 6 (A combination of alternatives 3-5). This combination of Transit service improvements, Travel Demand Management, and Widening Steeles Avenue with intersection improvements, will address the stated problems on the Steeles Avenue corridor while minimizing environmental impacts. Table 4.2 shows the evaluation considerations for each alternative relative to the criteria being considered.

Table 4.2 Evaluation of Planning Alternatives

Category	Criteria	Criteria Indicator	Alternative 1 Do Nothing	Alternative 2 Improve Other Roads	Alternative 3 Transit Infrastructure Improvements	Alternative 4 Travel Demand Management	Alternative 5 Widen Steeles Avenue with Intersection Improvements	Alternative 6 A Combination of 3, 4 and 5
Natural Environment	Wetlands and Vegetation	Potential adverse effects on terrestrial species and habitats	Green	Green	Yellow	Yellow	Orange	Yellow
	Wildlife Habitat	Potential adverse effects on existing wildlife due to disturbance or loss of habitat.	Green	Green	Yellow	Yellow	Orange	Yellow
	Species at Risk	Potential effects on Species at Risk identified in the study area	Green	Green	Yellow	Yellow	Orange	Yellow
	Groundwater/ Surface Water/Drainage	Potential adverse affect on groundwater, wells, surface water quality and flood potential.	Yellow	Yellow	Yellow	Yellow	Orange	Yellow
	Fisheries and Water Quality	Potential to minimize impact on aquatic features	Green	Green	Yellow	Yellow	Orange	Yellow
	Flooding	Potential to minimize flooding impacts due to potential improvements.	Green	Green	Yellow	Yellow	Orange	Yellow
Social, Cultural & Economic Environment	Land Use	Presence, number and characteristics of residences, community facilities, public parks, institutions or businesses within or adjacent to the study corridor.	Red	Yellow	Yellow	Yellow	Yellow	Yellow
	Noise	Ability to minimize noise after construction.	Green	Green	Yellow	Yellow	Yellow	Yellow
	Archaeology and Cultural Heritage Resources	Potential adverse effects on archaeological and built heritage resources.	Green	Green	Yellow	Yellow	Orange	Yellow
	Agricultural	Potential adverse effects on agricultural lands.	Green	Green	Yellow	Yellow	Orange	Yellow
	Access Considerations	Ability to maintain/maximize access.	Red	Red	Orange	Orange	Yellow	Yellow
	Utilities	Ability to minimize effects on existing and proposed utilities.	Green	Green	Yellow	Yellow	Orange	Yellow
	Construction Disruptions	Ability to minimize construction constraints and complexity.	Green	Yellow	Yellow	Yellow	Orange	Yellow
Transportation	Safety	Ability to improve vehicular safety.	Red	Red	Orange	Orange	Green	Green
	Travel Delay/ Traffic Capacity	Potential to address existing and future capacity and operational needs.	Red	Red	Orange	Orange	Yellow	Green
	Transit	Potential to address transit needs for future planned transit initiatives.	Orange	Orange	Green	Orange	Orange	Green
	Active Modes of Transportation	Potential to address requirements for active modes of transportation	Orange	Orange	Orange	Orange	Yellow	Green
Costs	Capital Cost	Green	Green	Yellow	Yellow	Orange	Yellow	
Transportation Plans & Policies	Compatibility with Regional and City Transportation Plans and Policies	Green	Green	Yellow	Yellow	Orange	Orange	
Natural Environment	Wetlands and Vegetation	Potential adverse effects on terrestrial species and habitats	Red	Orange	Yellow	Yellow	Yellow	Green



4.5 Public Consultation

4.5.1 Meetings

A meeting was held with representatives from the Orlando Corporation to discuss this project and the on-going Orlando site development on the south side of Steeles Avenue, between Heritage Road and Winston Churchill Boulevard. The main issue discussed was the stormwater management requirements for Steeles Avenue widening and potential utilization of the proposed stormwater management pond as an outlet for the adjacent road drainage.

A Technical Advisory Committee (TAC) meeting was held on September 6, 2012 with representatives from the Region of Peel, the City of Brampton, Ministry of Natural Resources, the Credit Valley Conservation, Ministry of the Environment, and Hydro One Brampton (ref. Appendix 'L' – Meeting Minutes). The purpose of the meeting was to present preliminary information on the study to date, including the need and justification for improvements and an assessment of planning alternatives. The meeting also provided an avenue for feedback on the background studies and preliminary design alternatives, and allowed agencies to voice any concerns with the project or the Class EA process. Details of the specific concerns and opportunities discussed in the meeting are recorded in the Meeting Minutes.

4.5.2 Public Information Centre No. 1

The first Public Information Centre (PIC) was held on Wednesday November 7, 2012 at the Copeland Public School. Notification of the PIC was sent to stakeholders, including local residents, agencies and municipal staff by mail, and notices were placed in the Brampton Guardian and the Georgetown Independent on October 29, 2012. A copy of the PIC notice and all the comments received are provided in Appendix 'M' (ref. Appendix 'M' – Notice of Public Information Centre No. 1).

4.6 Preferred Planning Solution

The preliminary recommended planning alternative confirmed in consultation with agencies and stakeholders subsequent to PIC No. 1 is Alternative 6: A combination of alternatives 3 to 5:

3. Transit service improvements;
4. Travel Demand Management; and
5. Widen Steeles Avenue with intersection improvements to increase capacity.

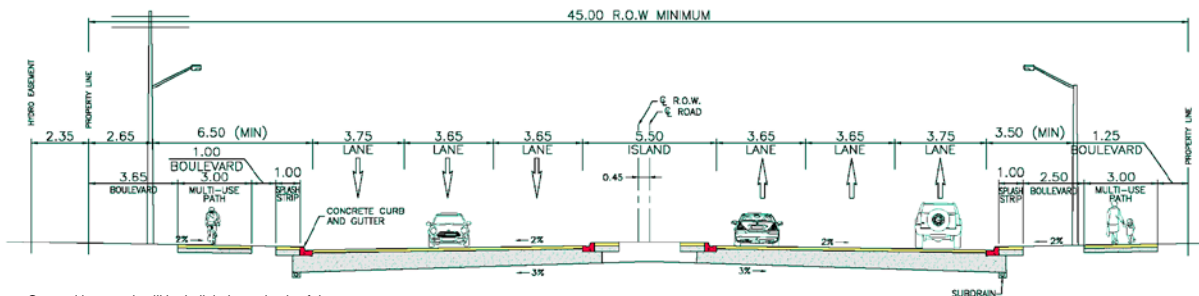
The preferred planning alternative has been carried forward for consideration of Alternative Design Concepts, as discussed in the following sections.

5.0 ALTERNATIVE DESIGN CONCEPT AND ASSESSMENT

5.1 Cross Section Alternatives

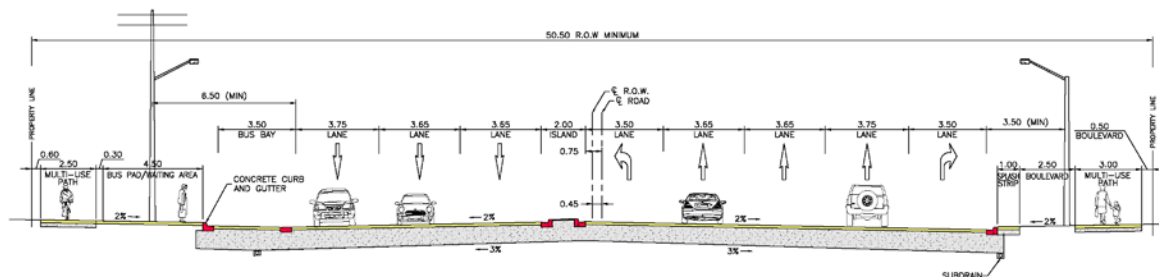
Proposed cross sections were considered for Steeles Avenue, consistent with the Region of Peel standards, as depicted in Figure 5.1.

Figure 5.1 – Typical Cross Sections



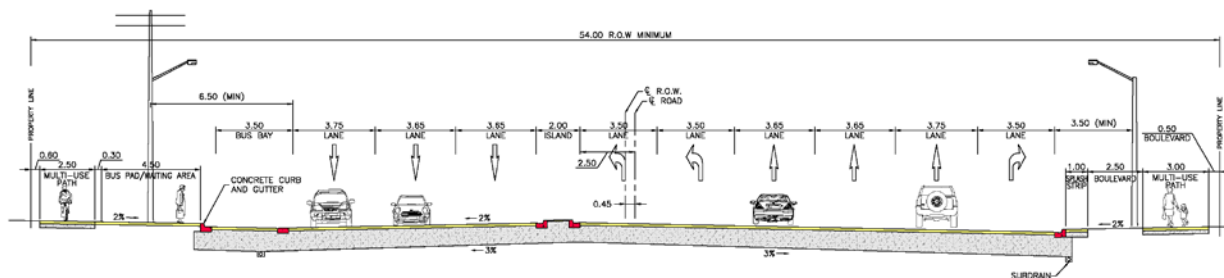
One multi-use path will be built independently of the proposed Steeles Avenue road widening

Typical Midblock Cross Section



One multi-use path will be built independently of the proposed Steeles Avenue road widening

Single Left Turn Lane at Intersection



One multi-use path will be built independently of the proposed Steeles Avenue road widening

Dual Left Turn Lane at Intersection

5.2 Horizontal Alignment Alternatives

The following horizontal alignment alternatives were considered:

Alternative 1: Widen Steeles Avenue to the north.

Alternative 2: Widen Steeles Avenue around the centreline.

Alternative 3: Widen Steeles Avenue to the south.

Alternative 4: Widen Steeles Avenue using a hybrid approach (combination of alternatives 1 and 3) based on the existing alignment with minor modification at intersections to accommodate turning lanes.

After considering all issues in relation to each other, **Alternative 4:** Widen Steeles Avenue using a hybrid approach (combination of alternatives 1 and 3) based on the existing alignment with minor modification at intersections to accommodate turning lanes was chosen as it reduces the impact on the greatest number of properties in regards to access considerations, property requirements, and offset to the roadway. A detailed assessment of the horizontal alignment alternatives can be found in Table 5.1.

Table 5.1 Assessment of Horizontal Alignment Alternatives

Category	Criteria	Criteria Indicator	Alternative 1 Widen to the North	Alternative 2 Widen around the Centreline	Alternative 3 Widen to the South	Alternative 4 A hybrid Approach (a combination of alternatives 1 and 3)
Natural Environment	Terrestrial Features	Adverse effects on terrestrial species and habitats	Orange	Orange	Yellow	Yellow
		Potential to enhance local terrestrial communities	Yellow	Yellow	Yellow	Yellow
	Aquatic Features	Adverse effects on Levi's and Mullet Creek	Red	Orange	Yellow	Light Green
		Potential to minimize impact on aquatic features	Red	Orange	Yellow	Light Green
	Drainage	Potential to minimize infringement into floodplain	Orange	Orange	Orange	Orange
Socio-Economic Environment	Property Requirements	Amount of property required (hectares)	Green	Green	Green	Green
	Accessibility to Properties	Ability to maintain/maximize access	Yellow	Yellow	Yellow	Yellow
		Ability to accommodate future development	Light Green	Light Green	Light Green	Light Green
	Business Operations	Ability to minimize adverse effects on businesses	Yellow	Yellow	Yellow	Yellow
		Ability to enhance business attractiveness	Light Green	Light Green	Light Green	Light Green
	Active Transportation	Ability to maximize sidewalks and a multi-use trail	Light Green	Light Green	Light Green	Light Green
		Ability to meet pedestrian requirements	Light Green	Light Green	Light Green	Light Green
	Noise	Ability to minimize noise after construction	Orange	Orange	Orange	Orange
Cultural Environment	Archaeological Resources	Potential for disruption of archaeological resources	Yellow	Yellow	Yellow	Yellow
	Built Heritage and Cultural Landscapes	Potential disruption of heritage/cultural landscapes	Yellow	Yellow	Yellow	Yellow
Engineering	Constructability	Ability to minimize construction constraints and complexity	Orange	Orange	Orange	Green
		Ability to facilitate phasing requirements	Yellow	Yellow	Yellow	Yellow
	Transportation	Ability to maximize road capacity	Green	Green	Green	Green
	Overall Safety	Ability to improve vehicular safety along corridor	Yellow	Yellow	Yellow	Yellow
	Stormwater Management	Ability to address water quantity and quality in the right-of-way	Orange	Orange	Orange	Orange
	Utility Conflicts	Ability to minimize effects on utilities within the right-of-way	Orange	Orange	Orange	Light Green
Costs	Capital and Operating Cost	Cost of construction and operating costs	Orange	Orange	Orange	Orange



5.4 Design Alternatives for Levi's Creek

As part of the design for Steeles Avenue various alternatives were assessed for the crossing of Levi's Creek. The following alternatives were developed and assessed as part of the study:

Do Nothing Alternative: Maintain Existing Culvert with Existing Road Width.

Alternative 1: Full Road Widening to Regional Standards, and lengthening of Levi's Creek Structure by 5.7 m north and 6.7 m south.

Alternative 2: Reduce Roadway Platform Width with No Impact to North Side of Steeles Avenue, and lengthen Levi's Creek Structure by 6.6 m to South.

Alternative 3: Maintain Existing Structure Length with Reduced Standard Roadway Elements and Separate Pedestrian Crossings of Levi's Creek.

Alternative 4: Reduce Roadway Platform Width with no Impact to North Side of Steeles Avenue. Replace Existing Levi's Creek Structure to 2.6 m x 20.0 m x 3.9 m Box Beam Bridge.

As a result of the assessment, the preferred alternative is Alternative 4, as it addresses the need to improve the conveyance of water to accommodate the Regional Storm event, while also improving geomorphic function and animal/fish passage. The full assessment is presented in Table 5.2.

The assessment was presented to key stakeholders, MNR and CVC for approval. Through various rounds of consultation and meetings, the agencies verified that the selected alternative was acceptable.

5.5 Design Alternatives for Mullet Creek

Additional assessment was completed for the crossing of Mullet Creek. The following alternatives were developed and assessed as part of the study:

Do Nothing Alternative: Maintain Existing Culvert with Existing Road Width.

Alternative 1: Extend Existing Culvert to Accommodate Road Widening.

Alternative 2: Replace Existing Mullet Creek Structure with Precast Arch Structure.

As a result of the assessment the preferred alternative is Alternative 2, as it addresses both the structural condition and provides the conveyance for the Regional Storm event. The full assessment is presented in Table 5.3.

The assessment was presented to key stakeholders, MNR and CVC for approval. Through various rounds of consultation and meetings, the agencies verified that the selected alternative was acceptable.

Table 5.2 Assessment of Alternatives for the Levi's Creek Crossing

Category	Criteria	Do Nothing Option: Maintain Existing Culvert with Existing Road Width	Alternative 1: Full Road Widening to Regional Standards, and lengthen Levi's Creek Structure by 5.7m north and 6.7m south	Alternative 2: Reduced Roadway Platform Width with No Impact to North Side of Steeles Avenue, and lengthen Levi's Creek Structure by 6.6m to South	Alternative 3: Maintain Existing Structure Length with Reduced Standard Roadway Elements and Separate Pedestrian Crossings of Levi's Creek	Alternative 4: Reduced Roadway Platform Width with No Impact to North Side of Steeles Avenue, Replace Existing Levi's Creek Structure to 2.6m x 20.0m x 39.5m Box Beam Bridge
NATURAL ENVIRONMENT	Wetlands and Vegetation	<p>Surrounding land includes cultural land uses and developed lands. No additional loss of natural areas, terrestrial ecosystems or wetland areas.</p> <p>No impact on mixed forest riparian vegetation along Levi's Creek south of Steeles Avenue.</p> <p>Levi's Creek Provincially Significant Wetland Complex is primarily located north of Steeles Avenue, but with two wetland areas south of Steeles Ave. The two wetlands south of Steeles Ave. are within 15-30m of Steeles Avenue</p>	<p>Impact to/loss of approximately: 4,173 m² of Cultural Thicket 726 m² of Cultural Woodland 458 m² Agricultural Lands</p> <p>Disturbance would occur to channel banks. Vegetation removal would be required on the north and south side to accommodate crossing extension.</p> <p>Impact to approximately 971 m² of Mixed Forest riparian vegetation along Levi's Creek south of Steeles Avenue.</p> <p>Opportunity for improvement of riparian vegetation.</p> <p>Levi's Creek Provincially Significant Wetland Complex is primarily located north of Steeles Avenue, but with two wetland areas south of Steeles Ave. Distance to closest wetland south of Steeles Ave. would decrease to 6.5 m.</p>	<p>Impact to/loss of approximately: 3,098 m² of Cultural Thicket 261 m² of Cultural Woodland 288 m² Agricultural Lands</p> <p>Disturbance would occur to channel banks. Vegetation removal would be required on the south side to accommodate crossing extension.</p> <p>Impact to approximately 971 m² of Mixed Forest riparian vegetation along Levi's Creek south of Steeles Avenue.</p> <p>Opportunity for improvement of riparian vegetation.</p> <p>Levi's Creek Provincially Significant Wetland Complex is primarily located north of Steeles Avenue, but with two wetland areas south of Steeles Ave. Distance to closest wetland south of Steeles Ave. would decrease to 6.5 m.</p>	<p>Impact to/loss of approximately: 3,597 m² of Cultural Thicket 583 m² of Cultural Woodland 472 m² Agricultural Lands</p> <p>The channel banks would not be impacted by the installation of spanning pedestrian bridges. Vegetation removal would be required at a distance further back from the immediate banks. The narrow design of the pedestrian bridge will have minimal impact on vegetation die-off under the structure due to shade.</p> <p>Impact to approximately 709 m² of Mixed Forest riparian vegetation along Levi's Creek south of Steeles Avenue.</p> <p>Opportunity for improvement of surrounding vegetation.</p> <p>Levi's Creek Provincially Significant Wetland Complex is primarily located north of Steeles Avenue, but with two wetland areas south of Steeles Ave. Distance to closest wetland south of Steeles Ave. Would decrease to 5.4 m.</p>	<p>Impact to/loss of approximately: 4,173 m² of Cultural Thicket 726 m² of Cultural Woodland 458 m² Agricultural Lands</p> <p>Disturbance would occur to channel banks. Vegetation removal would be required on the north and south side to accommodate crossing extension.</p> <p>Impact to approximately 971 m² of Mixed Forest riparian vegetation along Levi's Creek south of Steeles Avenue.</p> <p>Opportunity for improvement of riparian vegetation.</p> <p>Levi's Creek Provincially Significant Wetland Complex is primarily located north of Steeles Avenue, but with two wetland areas south of Steeles Ave. Distance to closest wetland south of Steeles Ave. would decrease to 6.5 m.</p>
	Wildlife Habitat	<p>Limited presence of habitat within vicinity of Levi's Creek crossing. Area includes cultural land uses and developed lands; common species observed.</p> <p>Great Blue Heron and a large number of Red-winged Blackbirds and Canada Geese were observed in the area of the crossing, indicating presence of wetland habitat.</p>	<p>Limited habitat would be lost. Opportunity for improvement of wildlife wetland, riparian habitat.</p> <p>Barn Swallow was recorded 0.5 km from the crossing; no nests were identified during inspections of nearby culverts and bridges</p>	<p>Limited habitat would be lost. Opportunity for improvement of wildlife wetland, riparian habitat.</p> <p>Barn Swallow was recorded 0.5 km from the crossing; no nests were identified during inspections of nearby culverts and bridges</p>	<p>Limited habitat would be lost. Opportunity for improvement of wildlife wetland, riparian habitat.</p> <p>Barn Swallow was recorded 0.5 km from the crossing; no nests were identified during inspections of nearby culverts and bridges</p> <p>Installation of pedestrian crossings would not result in loss of potential habitat to this species.</p> <p>Pedestrian bridges may provide additional potential habitat.</p>	<p>Limited habitat would be lost. Opportunity for improvement of wildlife wetland, riparian habitat.</p> <p>Barn Swallow was recorded 0.5 km from the crossing; no nests were identified during inspections of nearby culverts and bridges</p> <p>Widening of the culvert structure would provide a greater openness ratio and potential passage improvement for small mammals and other wildlife (reptiles and amphibians).</p>
	Surface Water	<p>No impacts to surface water from additional paved area.</p> <p>Culvert would convey the 10 year storm.</p>	<p>Increased runoff due to road widening, therefore quality, erosion, and flow impacts would require mitigation.</p> <p>Extended culvert would continue to convey 10 year storm.</p>	<p>Reduced water quality, erosion, and flow impacts compared to Alternative 1, based on proposed paved width being reduced.</p> <p>Extended culvert would continue to convey the 10 year storm.</p>	<p>Alternative with the least impacts to water quality, erosion, and peak flows. Pavement width is less than Alternative 1, but is wider than the existing roadway east and west of the existing culvert.</p> <p>Paved multi-use path in the floodplain would impact flows and erosion.</p>	<p>Reduced water quality, erosion, and flow impacts compared to Alternative 1, based on a reduced pavement width.</p> <p>The existing culvert would be replaced with a 20.0m wide structure, which would convey the Regional storm.</p>

Table 5.2 Assessment of Alternatives for the Levi's Creek Crossing

Category	Criteria	Do Nothing Option: Maintain Existing Culvert with Existing Road Width	Alternative 1: Full Road Widening to Regional Standards, and lengthen Levi's Creek Structure by 5.7m north and 6.7m south	Alternative 2: Reduced Roadway Platform Width with No Impact to North Side of Steeles Avenue, and lengthen Levi's Creek Structure by 6.6m to South	Alternative 3: Maintain Existing Structure Length with Reduced Standard Roadway Elements and Separate Pedestrian Crossings of Levi's Creek	Alternative 4: Reduced Roadway Platform Width with No Impact to North Side of Steeles Avenue, Replace Existing Levi's Creek Structure to 2.6m x 20.0m x 39.5m Box Beam Bridge
	Fluvial Geomorphology	Limited Disturbance to existing channel conditions	Opportunity for improvement upstream and downstream. Channel realignment away from Steeles Ave upstream.	Less disturbance to creek than Alternative 1 and 3. Opportunity to address pooling and minor erosion downstream of crossing	Extended culvert would continue to convey the 10 year storm.	Opportunity to address pooling and minor erosion downstream of crossing.
		No opportunity for improvement of existing upstream channel alignment.	Further encroachment of Steeles into channel corridor of LC-1A	No opportunities to realign channel upstream of Steeles Ave within corridor of LC-1A.	Create trail network within valley lands.	Allows for natural channel migration through the structure.
Fisheries		No impact on fish or fish habitat.	Levi Creek - Disturbance will occur to the channel banks for 5.7m on the north side and 6.7 m on the south side. Vegetation removal will be required on both north and south side to accommodate the culvert extensions.	Levi's Creek - Disturbance will occur to channel banks for 6.6 m on the south side. Vegetation removal will be required on the south side to accommodate culvert extension.	Pedestrian bridges and paths create more channel disturbance, requiring multiple locations of channel hardening, and pose potential for debris jam occurrence. This is the least preferable alternative from a geomorphic perspective.	Most preferable alternative from a geomorphic perspective.
			Levi's Creek Unnamed Tributary - Disturbance will occur to approximately 150 m of channel banks, including the removal of riparian vegetation and possible required realignment of the watercourse.	Levi's Creek Unnamed Tributary - No disturbance will occur to the tributary.	No opportunities exist to realign channel upstream.	Temporary vegetation disturbance would occur upstream and downstream of the culvert to install the culvert. Temporary inwater works would be required for the removal and installation of a new culvert. Improved flow conditions would decrease scour downstream of the culvert. An increased culvert size could potentially provide improved fish passage during high water flow events.
SOCIAL, CULTURAL & ECONOMIC ENVIRONMENT	Land Use	Reduced opportunity for growth of the surrounding community.	Road widening will improve goods movement through the study area.	Road widening will improve goods movement through the study area.	Road widening will improve goods movement through the study area.	Road widening will improve goods movement through the study area.
		No impact to the existing property.	Widening will allow for adjacent lands to be developed (outside protected natural areas).	Widening will allow for adjacent lands to be developed (outside protected natural areas).	Widening will allow for adjacent lands to be developed (outside protected natural areas).	Widening will allow for adjacent lands to be developed (outside protected natural areas).
					Pedestrian path through natural area will allow for community to enjoy nature in an urban setting.	

Table 5.2 Assessment of Alternatives for the Levi's Creek Crossing

Category	Criteria	Do Nothing Option: Maintain Existing Culvert with Existing Road Width	Alternative 1: Full Road Widening to Regional Standards, and lengthen Levi's Creek Structure by 5.7m north and 6.7m south	Alternative 2: Reduced Roadway Platform Width with No Impact to North Side of Steeles Avenue, and lengthen Levi's Creek Structure by 6.6m to South	Alternative 3: Maintain Existing Structure Length with Reduced Standard Roadway Elements and Separate Pedestrian Crossings of Levi's Creek	Alternative 4: Reduced Roadway Platform Width with No Impact to North Side of Steeles Avenue, Replace Existing Levi's Creek Structure to 2.6m x 20.0m x 39.5m Box Beam Bridge
TRANSPORTATION	Noise	With increase in traffic volumes and no expansion of existing facilities, congestion will increase. This will further increase the noise levels through this area.	Widening reduces buffer to residences adjacent to Steeles Avenue, resulting in increased traffic noise levels at the outdoor living area.	Widening reduces buffer to residences adjacent to Steeles Avenue, resulting in increased traffic noise levels at the outdoor living area.	Widening reduces buffer to residences adjacent to Steeles Avenue, resulting in increased traffic noise levels at the outdoor living area.	Widening reduces buffer to residences adjacent to Steeles Avenue, resulting in increased traffic noise levels at the outdoor living area.
	Archaeology and Cultural Heritage Resources	No impact to archaeology and cultural heritage resources.	Potential for impact to archaeological and cultural heritage resources.	Potential for impact to archaeological and cultural heritage resources.	Potential for impact to archaeological and cultural heritage resources.	Potential for impact to archaeological and cultural heritage resources.
	Access Considerations Utilities	No impact to existing entrances.	Reconfiguration of access will be required to single unit home on the southwest corner of Steeles Avenue and Mississauga Road.	Reconfiguration of access will be required to single unit home on the southwest corner of Steeles Avenue and Mississauga Road.	Reconfiguration of access will be required to single unit home on the southwest corner of Steeles Avenue and Mississauga Road.	Reconfiguration of access will be required to single unit home on the southwest corner of Steeles Avenue and Mississauga Road.
		No impact on existing utilities, however, opportunity missed to expand facilities for potential development in the community.	Relocation of utilities as necessary for widening.	Relocation of utilities as necessary for widening.	Relocation of utilities as necessary for widening.	Relocation of utilities as necessary for widening.
	Construction Disruptions	No impact to community from construction.	Disruptions to traffic patterns and dust would occur but can be mitigated during construction.	Disruptions to traffic patterns and dust would occur but can be mitigated during construction.	Disruptions to traffic patterns and dust would occur but can be mitigated during construction.	Disruptions to traffic patterns and dust would occur but can be mitigated during construction.
						Culvert replacement would require traffic staging.
	Safety	Increase in traffic volumes with no expansion of the corridor will increase the potential for collisions.	Safety related factors of proposed configuration meets necessary roadway design criteria.	Slight deviation from the Region of Peel standards will be required (reduction in median width).	Locally reduced lane widths exceed minimum standards defined in TAC manual, but are less than Region of Peel standards.	Slight deviation from the Region of Peel standards will be required (reduction in median width).
	Travel Delay/ Traffic Capacity	Future capacity issues will not be addressed, causing an increase in congestion and traffic delays.	Existing and future capacity issues will be addressed with the proposed widening.	Existing and future capacity issues will be addressed with the proposed widening.	Existing and future capacity issues will be addressed with the proposed widening.	Existing and future capacity issues will be addressed with the proposed widening.
	Transit	No potential to address future transit needs.	Future transit needs will be addressed with the proposed widening.	Future transit needs will be addressed with the proposed widening.	Future transit needs will be addressed with the proposed widening.	Future transit needs will be addressed with the proposed widening.
	Active Modes of Transportation	No potential to address requirements for active modes of transportation.	The need for facilities to allow for pedestrian and cycling requirements will be addressed.	The need for facilities to allow for pedestrian and cycling requirements will be addressed.	The need for facilities to allow for pedestrian and cycling requirements will be addressed.	The need for facilities to allow for pedestrian and cycling requirements will be addressed.
Incremental Capital Cost	No incremental cost for this option.	12.4m Culvert Extension - \$600,000	6.6m Culvert Extension - \$400,000	3 Pedestrian Bridges @ \$225,000 each - \$675,000	Culvert Replacement - \$4.6 million	
Compatibility with Regional and City Transportation Plans and Policies	Not compatible with Region's Official Plans, Long Range Transportation Plan, Transportation and Transit Master Plan.	The proposed widening meets the Region's Official Plans, Long Range Transportation Plan, Transportation and Transit Master Plan.	The proposed widening meets the Region's Official Plans, Long Range Transportation Plan, Transportation and Transit Master Plan.	The proposed widening meets the Region's Official Plans, Long Range Transportation Plan, Transportation and Transit Master Plan.	The proposed widening meets the Region's Official Plans, Long Range Transportation Plan, Transportation and Transit Master Plan.	
Compatibility with Regional and City Transportation Plans and Policies	Not compatible with Region's Official Plans, Long Range Transportation Plan, Transportation and Transit Master Plan.	The proposed widening meets the Region's Official Plans, Long Range Transportation Plan, Transportation and Transit Master Plan.	The proposed widening meets the Region's Official Plans, Long Range Transportation Plan, Transportation and Transit Master Plan.	The proposed widening meets the Region's Official Plans, Long Range Transportation Plan, Transportation and Transit Master Plan.	The proposed widening meets the Region's Official Plans, Long Range Transportation Plan, Transportation and Transit Master Plan.	

Table 5.3: Assessment of Design Alternatives for Steeles Avenue At Mullet Creek Crossing

Component	Area of Study	Do Nothing Alternative: Maintain Existing Culvert with Existing Road Width	Alternative 1: Extend Existing Culvert to Accommodate Road Widening	Alternative 2: Replace Existing Mullet Creek Structure with Precast Arch Culvert
NATURAL ENVIRONMENT	Wetlands and Vegetation	Surrounding lands includes cultural land uses and developed lands. No additional loss of natural areas, terrestrial ecosystems, or wetland areas.	Disturbance would occur to channel banks. Vegetation removal would be required on the south side. Opportunity for improvement of riparian vegetation.	Disturbance would occur to channel banks. Vegetation removal would be required on the south side. Opportunity for improvement of riparian vegetation.
	Wildlife Habitat	Limited presence of wildlife habitat within the vicinity of the Mullet Creek crossing.	Limited habitat would be lost. Opportunity for improvement of wildlife wetland and riparian habitat.	Limited habitat would be lost. Opportunity for improvement of wildlife wetland and riparian habitat. Widening culvert structure would provide a greater openness ratio and potential passage improvements for small mammals and other wildlife.
	Surface Water	No impacts to surface water from additional paved area. Culvert would convey the 100 year storm	Increased runoff due to road widening, therefore quality, erosion, and flow impacts would require mitigation Culvert would convey the 100 year storm	Increased runoff due to road widening, therefore quality, erosion, and flow impacts would require mitigation Culvert would be sized to convey the Regional storm
	Fluvial Geomorphology	Reduced disturbance to existing channel morphology. No opportunity to realign channel upstream.	Opportunity for realignment of channel, addressing minor erosion within vicinity of road. Greater enclosure of Creek, and restriction to natural channel migration.	Opportunity to address minor erosion. Allows natural channel migration through the structure.
	Fisheries	No impact on fish or fish habitat	Vegetation removal would be required on the south side.	Temporary vegetation disturbance would occur to install the new structure. Temporary in-water works would be required for the removal and installation of a new culvert. Improved flow conditions would decrease scour downstream of the culvert. An increased culvert size could potentially provide improved fish passage during high water flow events.
SOCIAL, CULTURAL & ECONOMIC ENVIRONMENT	Land Use	Reduced opportunity for growth of the surrounding community. No impact to the existing property.	Road widening will improve goods movement through the study area. Widening will allow for adjacent lands to be developed (outside protected natural areas).	Road widening will improve goods movement through the study area. Widening will allow for adjacent lands to be developed (outside protected natural areas).
	Noise	With increase in traffic volumes and no expansion of existing facilities, congestion will increase. This will further increase the noise levels through this area.	Widening reduces buffer to residences adjacent to Steeles Avenue, resulting in increased traffic noise levels at the outdoor living area.	Widening reduces buffer to residences adjacent to Steeles Avenue, resulting in increased traffic noise levels at the outdoor living area.
	Archaeology and Cultural Heritage Resources	No impact to archaeology and cultural heritage resources.	Potential for impact to archaeological and cultural heritage resources.	Potential for impact to archaeological and cultural heritage resources.
	Access Considerations	No impact to existing entrances.	No impact to existing entrances.	No impact to existing entrances.
	Utilities	No impact on existing utilities, however, opportunity missed to expand facilities for potential development in the community.	Relocation of utilities as necessary for widening.	Relocation of utilities as necessary for widening.
TRANSPORTATION	Construction Disruptions	No impact to community from construction.	Disruptions to traffic patterns and dust would occur but can be mitigated during construction.	Disruptions to traffic patterns and dust would occur but can be mitigated during construction. Culvert replacement would require extensive staging.
	Safety	Increase in traffic volumes with no expansion of the corridor will increase the potential for collisions.	Safety related factors of proposed configuration meets necessary roadway design criteria.	Safety related factors of proposed configuration meets necessary roadway design criteria.

Table 5.3: Assessment of Design Alternatives for Steeles Avenue At Mullet Creek Crossing

Component	Area of Study	Do Nothing Alternative: Maintain Existing Culvert with Existing Road Width	Alternative 1: Extend Existing Culvert to Accommodate Road Widening	Alternative 2: Replace Existing Mullet Creek Structure with Precast Arch Culvert
			Culvert would require rehabilitation to improve lifespan	
Travel Delay/ Traffic Capacity		Future capacity issues will not be addressed, causing an increase in congestion and traffic delays.	Existing and future capacity issues will be addressed with the proposed widening.	Existing and future capacity issues will be addressed with the proposed widening.
Transit		No potential to address future transit needs.	Future transit needs will be addressed with the proposed widening.	Future transit needs will be addressed with the proposed widening.
Active Modes of Transportation		No potential to address requirements for active modes of transportation.	The need for facilities to allow for pedestrian and cycling requirements will be addressed.	The need for facilities to allow for pedestrian and cycling requirements will be addressed.
Incremental Capital Cost		No incremental cost for this option.	25.0m Culvert Extension – \$80,000	Culvert Replacement - \$1.4 million
Compatibility with Regional and City Transportation Plans and Policies		Not compatible with Region's Official Plans, Long Range Transportation Plan, Transportation and Transit Master Plan.	The proposed widening meets the Region's Official Plans, Long Range Transportation Plan, Transportation and Transit Master Plan.	The proposed widening meets the Region's Official Plans, Long Range Transportation Plan, Transportation and Transit Master Plan.

5.6 BramWest Parkway at Steeles Avenue

Two maintenance facilities for the 24 inch diameter 36 inch diameter crossing for Enbridge and TransCanada respectively are immediately south of the existing right-of-way for Steeles Avenue at the future BramWest Parkway intersection. These facilities are important for the projected growth for Brampton, and have the potential to be expanded to accommodate the increased demand. On the north side lies agricultural lands used by Maple Lodge Farms. In order to determine the best alternative for the intersection, a number of alternatives were explored as follows:

Alternative 1: Widen Steeles Avenue to the North.

Alternative 2: Widen from the Centreline.

Alternative 3: Widen Steeles Avenue to the South.

As a result of the assessment of the alternatives above, the preferred Alternative is Alternative 1 as it eliminates the need to relocate the Enbridge and TransCanada maintenance facilities. The full assessment is presented in Table 5.4.

Table 5.4 – Assessment of Alternatives for Steeles Avenue at the BramWest Parkway

Category	Criteria	Criteria Indicators	Alternative 1 Widen to the North	Alternative 2 Widen from the Centreline	Alternative 3 Widen to the South
Engineering	Constructability	Ability to minimize construction constraints & complexity	Widening would be limited to the north side of Steeles Avenue	Balances impact to both sides of roadway	Widening would be limited to the south side of Steeles Avenue
		Ability to facilitate phasing requirements	Extensions or lengthening of new Mullet Creek crossing would be limited to the north side	Extensions or lengthening of new Mullet Creek crossing would be required on both sides of roadway	Extensions or lengthening of new Mullet Creek crossing would be limited to the south side
	Transportation	Ability to maximize road capacity	Road capacity would be maximized	Road capacity would be maximized	Road capacity would be maximized
	Overall Safety	Ability to improve vehicular safety along corridor	Large radius curves would be required at west and east sides of the intersection	Tangent alignment	Large radius curves would be required at west and east sides of the intersection
	Stormwater Management	Ability to address water quantity and quality in ROW.	Water quality and quantity would be addressed	Water quality and quantity would be addressed	Water quality and quantity would be addressed
	Utility Conflicts	Ability to minimize effects on utilities within ROW	Heavy hydro lines along Steeles Avenue would need to be relocated Enbridge gas facilities west of Bramwest Parkway would not be impacted Area potentially available for Enbridge expansion 775 m ²	Heavy hydro lines along Steeles Avenue would need to be relocated Enbridge gas facilities west of BramWest Parkway would be impacted Area potentially available for Enbridge expansion 683 m ²	No heavy hydro lines along Steeles Avenue would need to be relocated Enbridge gas facilities west of BramWest Parkway would need to be relocated
Natural Environment	Terrestrial Features	Adverse effects on terrestrial species and habitats	Impact to Mullet Creek would be limited to the north side	Impact on Mullet Creek would be balanced to both sides of the roadway	Impact to Mullet Creek would be limited to the south side
		Potential to enhance local terrestrial communities.	Potentially wider structure at Mullet Creek would improve animal passage	Potentially wider structure at Mullet Creek would improve animal passage	Potentially wider structure at Mullet Creek would improve animal passage
	Aquatic Features	Adverse effects on watercourses	Same increased length of Mullet Creek would be enclosed by the extended culvert	Same increased length of Mullet Creek would be enclosed by the extended culvert	Same increased length of Mullet Creek would be enclosed by the extended culvert
		Potential to minimize impact to aquatic features	Similar impact would occur on features within Mullet Creek	Similar impact would occur on features within Mullet Creek	Similar impact would occur on features within Mullet Creek

Table 5.4 – Assessment of Alternatives for Steeles Avenue at the BramWest Parkway

Category	Criteria	Criteria Indicators	Alternative 1 Widen to the North	Alternative 2 Widen from the Centreline	Alternative 3 Widen to the South
Socio-Economic Environment	Drainage	Ability to minimize infringement into floodplain	Road widening would require fill material be placed in the floodplain	Road widening would require fill material be placed in the floodplain	Road widening would require fill material be placed in the floodplain
	Property Requirements	Amount of property required (hectares)	Property requirements would be limited to Maple Lodge Farms (0.96 Ha)	Property requirements would be required from Maple Lodge Farms (0.57 Ha) and Orlando (0.48 Ha)	Property requirements would be limited to Orlando (1.0 Ha)
	Accessibility to Properties	Ability to maintain/maximize access	Full moves access would be maintained for all access points	Full moves access would be maintained for all access points	Full moves access would be maintained for all access points
		Ability to accommodate future development.	Future development would be accommodated	Future development would be accommodated	Future development would be accommodated
	Business Operations	Ability to minimize adverse effects on businesses	Effect on business would occur on the north side the roadway	Effect on business would be balanced to both sides of the roadway	Effect on business would occur on the south side the roadway
		Ability to enhance business attractiveness	Businesses would benefit from the improved roadway facilities	Businesses would benefit from the improved roadway facilities	Businesses would benefit from the improved roadway facilities
	Active Transportation	Ability to maximize sidewalks and a multi-use trail	Multi-use trail would occur on both sides of the roadway	Multi-use trail would occur on both sides of the roadway	Multi-use trail would occur on both sides of the roadway
		Ability to meet pedestrian requirements	Pedestrian requirements would be met	Pedestrian requirements would be met	Pedestrian requirements would be met
	Noise	Ability to minimize noise after construction.	Roadway proximity to north side properties would be reduced	Ultimate noise levels would be balanced to both sides of the roadway	Roadway proximity to south side properties would be reduced
	Cultural Environment	Archaeological Resources	Potential for disruption of archaeological resources.	Disruption would only occur on the north side of the roadway	Overall likelihood of disruption would increase as both sides of the road would be impacted
Built Heritage & Cultural Landscapes		Potential disruption of heritage/cultural landscapes	No impact	No impact	No impact
Cost	Capital and Operating Costs	Cost of construction and operating costs	Minimizes Enbridge relocation cost	Full Enbridge relocation cost	Full Enbridge relocation cost

5.7 Stormwater Management Opportunities

Stormwater management will be provided for the road improvements. Under existing road and drainage conditions, the roadside swale system is recognized as providing stormwater quality treatment. In addition to the roadside swale systems, three (3) stormwater management facilities currently receive drainage from Steeles Avenue. Based on the increase in pavement for the ultimate Steeles Avenue right-of-way, and the removal of the existing ditch system for the proposed urbanized roadway, stormwater controls are required, in accordance with the Gateway West Subwatershed Study.

5.7.1 General Stormwater Management Opportunities

Stormwater Management practices (SWMPs) for the management of roadway runoff generally fall into two categories: those that address water quantity and those that manage quality of surface runoff. Water quantity management issues relate to properly sizing watercourse crossings, as well as the conveyance of roadway runoff along the roadway corridor for minor and major storm events. In addition, water quantity management strategies can include the need for facilities to address downstream flood and erosion potential resulting from the expansion of the roadway right-of-way.

In terms of water quality, the SWMPs relate to the treatment of new pavement, and where possible, the treatment of existing pavement; however, current legislation solely relates to the former. Typically, the treatment level is related to the standards defined in the watershed or subwatershed planning study, which are dependent on the quality and sensitivity of the receiving stream system (i.e. Type 1, Type 2, etc.). For the Credit River Tributaries, the standard is Type 1 as required by CVC, therefore requiring enhanced water quality control.

Various Best Management Practices or Stormwater Management practices are available to address both the quantity and quality of runoff from roadways. Due to the linear nature of roadway corridors, however, the full spectrum of stormwater management practices is typically not appropriate.

5.7.2 Alternative Stormwater Management Practices

Quantity Management

For watercourse crossings of roadway corridors, typical management opportunities include:

- i. Controlling or reducing upstream flows to the capacity of existing crossings.
- ii. Increasing the capacity of the existing crossing to the appropriate runoff standard.
- iii. Developing optimized diversions between subcatchments to facilitate and/or reduce hydraulic crossings.

The decision process to control upstream flows or increase roadway infrastructure largely relates to environmental impacts, economics, timing and future required gradients. Given that the roadway is planned for reconstruction, the need or warrant for upgrading hydraulic capacity of culverts needs to be co-ordinated with the structural assessment of the respective culverts. Flood and erosion impacts due to increased runoff from expanded paved surfaces can be mitigated by on-site storage techniques and/or off-site mitigation measures, such as flood proofing, regulation or stream stabilization.

Quality Management

There are numerous stormwater management practices, which can be used to treat contaminated stormwater runoff from roadway surfaces. These include the following:

- i. Wet ponds/wetlands/hybrids (generally linear facilities)
- ii. Enhanced grass swales
- iii. Filter Strips
- iv. Bioretention Systems
- v. Oil and grit separators
- vi. Off-site stormwater management facilities
- vii. Cash-in-lieu of on-site treatment

The respective characteristics, advantages and disadvantages of the foregoing have been well documented in previous municipal and provincial literature and hence this information has not been repeated within this document. Some brief advantages and disadvantages, though, are discussed in the following section.

5.7.3 General Assessment

The advantages and disadvantages of the various Best Management Practices associated with both quantity and quality control measures are as follows:

Quantity and Erosion Control

Controlling runoff in stormwater management facilities upstream of crossings requires land and future management/maintenance by municipal forces. The advantages relate to maintaining existing sizing of drainage infrastructure or smaller infrastructure across the roadway, as well as downstream. Disadvantages include the cost of land, infrastructure and maintenance. Increasing the size of drainage infrastructure, while somewhat more costly to the roadway authority, reduces the need for future maintenance and eliminates the need for the dedication of stand-alone land for surface controls. Inter-subcatchment diversions can be effective on a minor scale in optimizing and/or reducing the number of crossings and are typically followed to address both major and minor runoff conditions.

For flood and erosion control, on-site measures to reduce peak flow impacts can be highly constraining due to the general lack of properly configured land. Roadway corridors, due to their inherent linear nature, can only effectively manage relatively small volumes of increased runoff (peak flows), in the absence of stand-alone land acquisition. Combination of measures to mitigate impacts through some on-site storage, along with off-site upgrades as necessary, is often the 'best' approach, where impacts exceed allowable minimums.

Quality Control

Wet ponds, Wetlands, Hybrids

These systems generally require the dedication of land that most often is not available in linear corridors for roadway projects. Most often when applied to roadway runoff, these SWMP's are located adjacent to creek crossings. For Steeles Avenue, this particular opportunity is

considered extremely limited. Typically these systems provide an excellent level of treatment and as end-of-pipe systems, the management and performance is more visible, hence less prone to failure.

Enhanced Grassed Swales

Grassed swales designed with a trapezoidal geometry and flat longitudinal profiles with largely un-maintained turf can provide excellent filtration and treatment for storm runoff from roadways. It is generally conceded that treatment levels are at a minimum, Normal (formerly Level 2) treatment, and combined with other practices can provide Enhanced treatment. Their application in linear corridors is also particularly appropriate and can be further enhanced through the introduction of check dams to provide additional on-line storage. The application in urbanized roadway cross-sections (i.e. curb and gutter) often requires alternative grading and roadway configurations which can compromise the function of the roadway itself, and are therefore typically not preferred. Notwithstanding, gutter outlets along outside lanes have functioned effectively in the past where the right-of-way can accommodate the design.

Filter Strips

Filter strips typically are designed for small drainage areas less than 2 ha, and are applied as part of a treatment train. Filter strips require flat areas with slopes ranging from 1 to 5% and are usually in the range of 10 to 20 m in length in the direction of flow. Flow leaving filter strips should be a maximum of 0.10 m depth, based on a 10 mm storm event.

Bioretention Systems

Bioretention systems are used in treatment train process to provide water quality control and infiltration. Bioretention systems should be situated within flat areas with slopes ranging from 1 to 5 %. Bioretention systems require 5 to 10 % of the contributing drainage area and as such cannot typically service large drainage areas. Where groundwater contamination could be an issue, bioretention systems should be lined to prevent infiltration.

Oil and Grit Separators

These systems tend to serve limited drainage areas and provide levels of treatment (less than Enhanced, formerly Level 1). They are typically encouraged as part of a "treatment train" approach. Disadvantages include the need for frequent maintenance, as well as relatively high capital costs and the ability to serve small drainage areas.

Off-Site Stormwater Management Facilities

While facilities can often not be constructed within roadway right-of-way lands, roadway runoff can be directed towards subdivisions, which would have their runoff managed by future stormwater management facilities. The BramWest development lands located north of Steeles Avenue east of Winston Churchill Boulevard would require stormwater management facilities prior to discharging to Mullet Creek

Cash-in-Lieu of On-Site Treatment

Often, due to the sensitivity of downstream systems (i.e. low habitat potential) and the difficulty of providing affordable and effective stormwater management on-site, roadway authorities have proposed the contribution of cash-in-lieu of on-site stormwater management, to be directed towards other environmental enhancement projects. These can either be identified in subwatershed planning studies or addressed on a site-specific basis. The priority of application

usually relates first to improving watershed conditions in the directly affected watershed. This approach is supported by both Provincial and Municipal policy.

5.8 Potential Posted Speed Reduction

At present, the posted speed within the study area is 80 km/h. The roadway is generally a four lane rural arterial. The posted speed east of Mavis Road/Chinguacousy Road is 70 km/h, where the roadway is a six lane urban arterial.

The subject section of roadway is proposed to be widened to six lanes, and urbanized. In addition, ongoing development along the corridor has recently, and is continuing to change the adjacent land use, from mainly rural to residential (reverse frontage) and service retail, east of Mississauga Road, and mainly industrial/warehousing west of Mississauga Road. Given the change in roadway design and land use, consideration of a reduction in posted speed is warranted.

AMEC has reviewed the following documents:

- Region of Peel Regional Road Characterization Study, Draft, December 19, 2012
- TAC Geometric Design Guide for Canadian Roads, 1999

The Region's Draft Road Characterization Study identifies segments of Regional Roads and associated typologies. The Road Character Map identifies Steeles Avenue as a Suburban Connector east of Mississauga Road and an Industrial Connector west of Mississauga Road. The Draft Road Characterization Study also provides a table, which identifies certain characteristics and desired elements for each roadway type. The table identifies desired operating speeds as follows:

Suburban Connector Road:	50 to 70 kph
Industrial Connector:	60 to 80 kph

TAC provides guidelines on the selection of appropriate design and posted speeds. TAC states that it is important to provide a reasonable degree of uniformity for a given roadway classification. Steeles Ave is currently posted 70 kph from Mavis Road/Chinguacousy Road to east of Hurontario Street.

The levels of service at the intersections will not change significantly with a reduction in the posted speed limit. With a reduced lower speed limit, the potential to improve left-turning and right turning traffic may result, as greater gaps will be created within the traffic stream given. The use of a lower speed limit along Steeles Avenue may also result in increased pedestrian and cycling activities.

At the time of writing this report, the Region was still considering the speed reduction for this section of Steeles Avenue. Further discussion on the speed reduction is deferred to a later date.

5.9 Public Consultation

5.9.1 Agency and Stakeholder Consultation

Meetings were held with representatives from the Ministry of Natural Resources and the Credit Valley Conservation Authority on April 11 and April 12, 2013 to discuss the alternatives completed for Levi's Creek Crossing (ref. Appendix 'L' – Meeting Minutes). Both agencies provide initial comments and concerns with the proposed alternatives for Levi's Creek which were taken into consideration by the Project Team. Additional analysis was required for the design alternatives at Levi's Creek, based on the comments received.

The second Technical Agency Committee (TAC) meeting was held on April 29, 2013 with representatives from the Region of Peel, the City of Brampton, Region of Halton, Ministry of Natural Resources, the Credit Valley Conservation, Ministry of the Environment, Hydro One Brampton, Enbridge and Region of Peel (ref. Appendix 'L' – Meeting Minutes). The purpose of the meeting was to present the work that has been completed since the first TAC meeting in September 2012 and the next steps leading to PIC No.2 that was scheduled for June 5, 2013. The meeting also provided an avenue for feedback on the design alternatives for Steeles Avenue including the alternatives for Mullet Creek crossing, Levi's Creek crossing, BramWest Parkway intersection, Churchill Heritage District and #1556 Steeles Avenue. Other issues including stormwater management and pavement design were also discussed. Details of the specific concerns and opportunities discussed in the meetings are recorded in the Meeting Minutes.

5.9.2 Infrastructure Ontario – Agency Consultation

As part of the Ministry of Infrastructure (MOI) Class EA process, direct consultation with affected parties was completed. This includes the Ministry of Natural Resources, City of Brampton, the Conservation Authority and additional agencies (i.e. First Nations) as indicated by Infrastructure Ontario. The consultation completed was directly related to the property being impacted and not just general consultation carried out as part of the MEA Class EA process.

All of the agencies contacted responded, and nothing of significance was noted. A copy of the received correspondence is included in Appendix 'S'.

5.9.3 Public Information Centre No. 2

The second Public Information Centre (PIC) was held on Wednesday June 5, 2013 at the Roberta Bondar Public School. Notification of the PIC was sent to stakeholders including local residents, agencies and municipal staff, by mail and notices were placed in the Brampton Guardian and the Georgetown Independent. A copy of the PIC notice and all the comments received is provided in Appendix 'N' (ref. Appendix 'N' –Public Information Centre No. 2). Table 5.5 is a summary of comments received through consultation to date.

PIC No.2 provided the general public with an opportunity to ask questions of the Project Team, review the preferred alternative, and discuss issues related to the project, including traffic and environmental considerations. Letters to stakeholders and agencies, a copy of the presentation, and copies of all comments received and written responses regarding PIC No. 2 are contained in Appendix 'N'

Table 5.5: Summary of Public / Agency Consultation

Comment / Question Received from Stakeholders	Response / Commitments
Consider street lighting should be "International Dark Sky Association" approved	The Project Team will document the recommendation in this report and if technically feasible, integrated into the illumination design completed during detailed design.
Accommodate cyclists and elderly Pedestrians	A multi-use path will be provided on both sides of the roadway for the full length of the study area.
Safe pedestrian crossing with signal or overpass	Based on the existing and proposed conditions, a overpass is not warranted. Pedestrian crossings will be directed to existing signalized intersections.
Intersection sightlines and signalization at Churchville Road	Based on a separate study, the Region has determined that the intersection does not meet the technical justification to warrant signalization of the intersection. Additionally the existing sight lines at this location were found to be sufficient (with the exception of the southbound direction looking east) based on the TAC guidelines.
Flooding concerns at Mullet Creek Crossing	A Stormwater Drainage Report completed for this project has determined that the existing crossing is undersized, and recommends that the crossing be replaced with a larger culvert.
Equal taking of land should occur at the intersection of Steeles Avenue with the proposed BramWest Parkway	Based on the assessment completed for this study, the preferred alternative is to shift Steeles Avenue to the north to avoid the above ground gas facilities for TransCanada and Enbridge.
A mid-block intersection is requested between Winston Churchill Boulevard and the proposed BramWest Parkway	The Region policy for Class EA's is to only include entrances that are approved by the Region's Development Section.

6.0 DESCRIPTION OF PREFERRED DESIGN

6.1 Major Features of the Recommended Plan

6.1.1 Design Criteria

The proposed design criteria for the reconstruction of Steeles Avenue, based on a design speed of 90 km/h is shown in Table 6.1 to 6.6, based on the TAC Geometric Design Guide for Canadian Roads and the Region of Peel Building Industry Liaison Team (BILT) standards:

Table 6.1. Design Criteria – Steeles Avenue from Winston Churchill Boulevard to Future BramWest Parkway

	Present Conditions	Design Standards	Actual Proposed
HIGHWAY CLASSIFICATION	RAU	UAU	UAU
NUMBER OF LANES	4	6	6
POSTED SPEED (kph)	80	80	80
DESIGN SPEED (kph)	90	90	90
MINIMUM STOPPING SIGHT DISTANCE (m)	>170	170	>170
MINIMUM 'K' FACTOR	CREST – 80 SAG – 50	CREST – 53 SAG – 20	CREST – 80 SAG – 50
GRADES MAXIMUM	2%	8%	2%
SUPERELEVATION MAXIMUM	N/A	6%	N/A
MINIMUM RADIUS (m)	N/A	340	N/A
LANE WIDTH - through (m)	3.75	3.7	3.75
SHOULDER WIDTH (m)	1.0 (PAVED) 2.0 (GRAVEL)	N/A	N/A
MEDIAN WIDTH (m)	0	5.0 – 6.0	5.5
R.O.W. WIDTH (m)	36 +/-	N/A	45.0 (MIDBLOCK) 50.5 – 54.0 (INT)

Table 6.2. Design Criteria – Steeles Avenue from Future BramWest Parkway to Heritage Road

	Present Conditions	Design Standards	Actual Proposed
HIGHWAY CLASSIFICATION	RAU	UAU	UAU
NUMBER OF LANES	4	6	6
POSTED SPEED (kph)	80	80	80
DESIGN SPEED (kph)	90	90	90
MINIMUM STOPPING SIGHT DISTANCE (m)	>170	170	>170
MINIMUM 'K' FACTOR	CREST – 75 SAG – N/A	CREST – 53 SAG – 20	CREST – 75 SAG – N/A
GRADES MAXIMUM	2%	8%	2%
SUPERELEVATION MAXIMUM	N/A	6%	N/A

Table 6.2. Design Criteria – Steeles Avenue from Future BramWest Parkway to Heritage Road

	Present Conditions	Design Standards	Actual Proposed
MINIMUM RADIUS (m)	N/A	340	N/A
LANE WIDTH - through (m)	3.75	3.7	3.75
SHOULDER WIDTH (m)	1.0 (PAVED) 2.0 (GRAVEL)	N/A	N/A
MEDIAN WIDTH (m)	0	5.0 – 6.0	5.5
R.O.W. WIDTH (m)	36 - 42	N/A	45.0 (MIDBLOCK) 50.5 – 54.0 (INT)

Table 6.3. Design Criteria – Steeles Avenue from Heritage Road to Mississauga Road

	Present Conditions	Design Standards	Actual Proposed
HIGHWAY CLASSIFICATION	RAU	UAU	UAU
NUMBER OF LANES	4	6	6
POSTED SPEED (kph)	80	80	80
DESIGN SPEED (kph)	90	90	90
MINIMUM STOPPING SIGHT DISTANCE (m)	>170	170	>170
MINIMUM 'K' FACTOR	CREST – 50 SAG – 50	CREST – 53 SAG – 20	CREST – 53 SAG – 50
GRADES MAXIMUM	3%	8%	3%
SUPERELEVATION MAXIMUM	N/A	6%	N/A
MINIMUM RADIUS (m)	N/A	340	N/A
LANE WIDTH - through (m)	3.75	3.7	3.75
SHOULDER WIDTH (m)	1.0 (PAVED) 2.0 (GRAVEL)	N/A	N/A
MEDIAN WIDTH (m)	0	5.0 – 6.0	5.5
R.O.W. WIDTH (m)	36 – 48	N/A	45.0 (MIDBLOCK) 50.5 – 54.0 (INT)

Table 6.4. Design Criteria – Steeles Avenue from Mississauga Road to Creditview Road (South Leg)

	Present Conditions	Design Standards	Actual Proposed
HIGHWAY CLASSIFICATION	RAU	UAU	UAU
NUMBER OF LANES	4	6	6
POSTED SPEED (kph)	80	80	80
DESIGN SPEED (kph)	90	90	90
MINIMUM STOPPING SIGHT DISTANCE (m)	>170	170	>170

Table 6.4. Design Criteria – Steeles Avenue from Mississauga Road to Creditview Road (South Leg)

	Present Conditions	Design Standards	Actual Proposed
MINIMUM 'K' FACTOR	CREST – 50 SAG – 50	CREST – 53 SAG – 20	CREST – 53 SAG – 50
GRADES MAXIMUM	5.0%	8%	5%
SUPERELEVATION MAXIMUM	N/A	6%	N/A
MINIMUM RADIUS (m)	N/A	340	N/A
LANE WIDTH - through (m)	3.75	3.7	3.75
SHOULDER WIDTH (m)	1.0 (PAVED) 2.0 (GRAVEL)	N/A	N/A
MEDIAN WIDTH (m)	6.0	5.0 – 6.0	5.5
R.O.W. WIDTH (m)	43-50	N/A	45.0 (MIDBLOCK) 50.5 – 54.0 (INT)

Table 6.5. Design Criteria – Steeles Avenue from Creditview Road (South Leg) to Churchville Road

	Present Conditions	Design Standards	Actual Proposed
HIGHWAY CLASSIFICATION	RAU	UAU	UAU
NUMBER OF LANES	4	6	6
POSTED SPEED (kph)	80	80	80
DESIGN SPEED (kph)	90	90	90
MINIMUM STOPPING SIGHT DISTANCE (m)	>170	170	>170
MINIMUM 'K' FACTOR	CREST – N/A SAG – 50	CREST – 53 SAG – 20	CREST – N/A SAG – 50
GRADES MAXIMUM	4%	8%	4%
SUPERELEVATION MAXIMUM	N/A	6%	N/A
MINIMUM RADIUS (m)	N/A	340	N/A
LANE WIDTH - through (m)	3.75	3.7	3.75
SHOULDER WIDTH (m)	3.0	N/A	N/A
MEDIAN WIDTH (m)	6.0	5.0 – 6.0	5.5
R.O.W. WIDTH (m)	32-74	N/A	45.0 (MIDBLOCK) 50.5 – 54.0 (INT)

Table 6.6. Design Criteria – Steeles Avenue from Churchville Road to Mavis/Chinguacousy Road

	Present Conditions	Design Standards	Actual Proposed
HIGHWAY CLASSIFICATION	RAU	UAU	UAU
NUMBER OF LANES	4	6	6
POSTED SPEED (kph)	80	80	80

Table 6.6. Design Criteria – Steeles Avenue from Churchville Road to Mavis/Chinguacousy Road

	Present Conditions	Design Standards	Actual Proposed
DESIGN SPEED (kph)	90	90	90
MINIMUM STOPPING SIGHT DISTANCE (m)	>170	170	>170
MINIMUM 'K' FACTOR	CREST – 75 SAG – 75	CREST – 53 SAG – 20	CREST – 75 SAG – 75
GRADES MAXIMUM	3%	8%	3%
SUPERELEVATION MAXIMUM	N/A	6%	N/A
MINIMUM RADIUS (m)	N/A	340	N/A
LANE WIDTH - through (m)	3.75	3.7	3.75
SHOULDER WIDTH (m)	1.0 (PAVED) 2.0 (GRAVEL)	N/A	N/A
MEDIAN WIDTH (m)	2.0	5.0 – 6.0	2.0
R.O.W. WIDTH (m)	50	N/A	45.0 (MIDBLOCK) 50.5 – 54.0 (INT)

6.1.2 Horizontal Alignment

The proposed horizontal alignment is a hybrid of alternatives as evaluated in Section 5. The alignment closely follows the existing centreline, except at the intersection of Steeles Avenue and BramWest Parkway, where the alignment deviates to the north approximately 10m from the existing centreline. Additionally, the alignment shifts by approximately 2m to the south at the Levi's Creek crossing to ensure that grading on the north side does not impact the east-west portion of Levi's Creek.

The proposed alignment is shown in detail on the preliminary design drawings (ref. Sheets 1-26: Plan and Profile)

6.1.3 Vertical Alignment

The vertical alignment for Steeles Avenue was developed, and will be refined in detail design based on the following criteria:

- Meet the design criteria for vertical alignment specified above;
- Match the existing centreline profile at key locations;
- Match existing boulevards, commercial properties, entrances, and sideroads as closely as possible, and
- Accommodate the preferred pavement rehabilitation approach (i.e. partial depth removal and resurfacing).

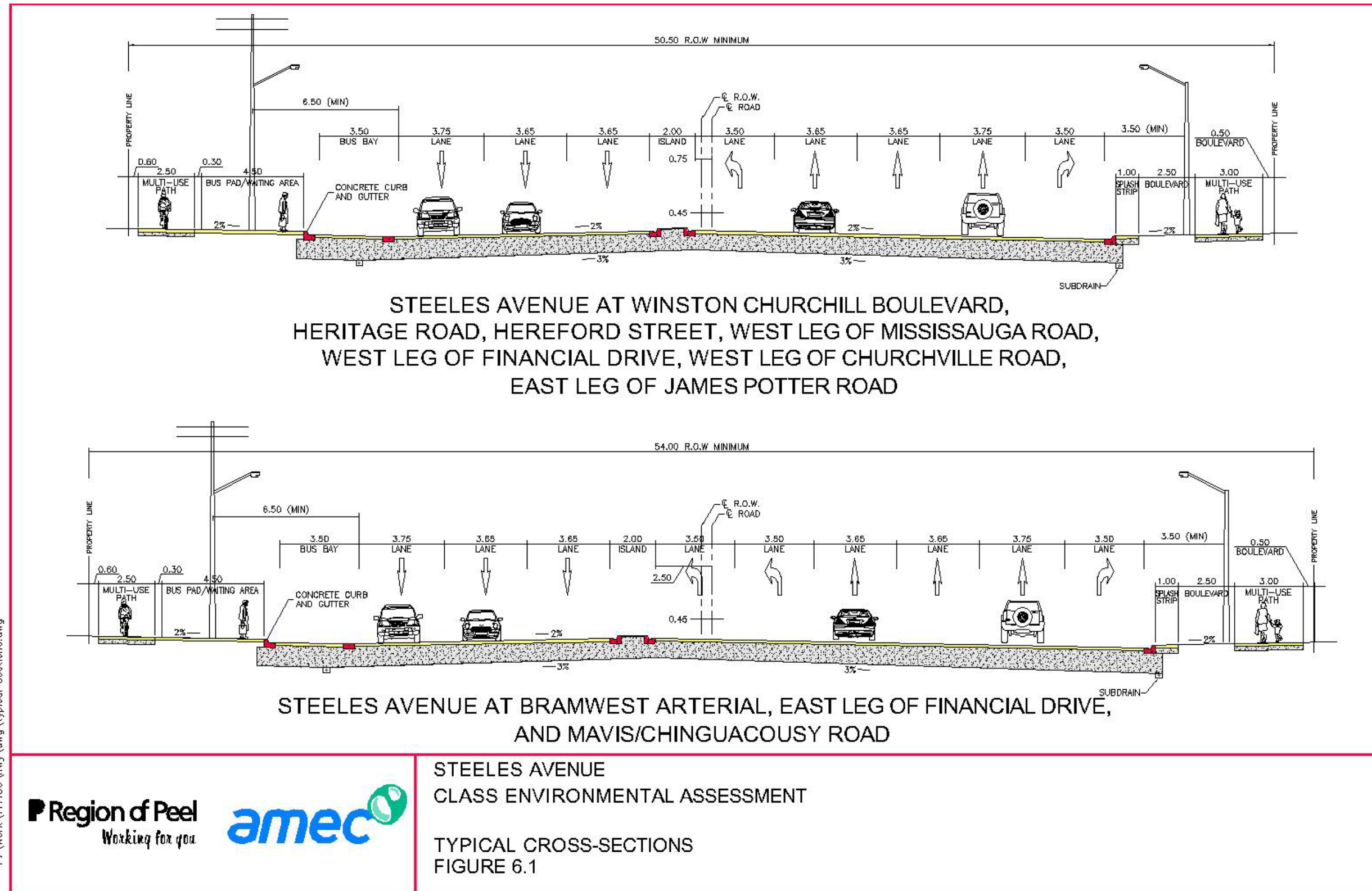
6.1.4 Typical Cross Section

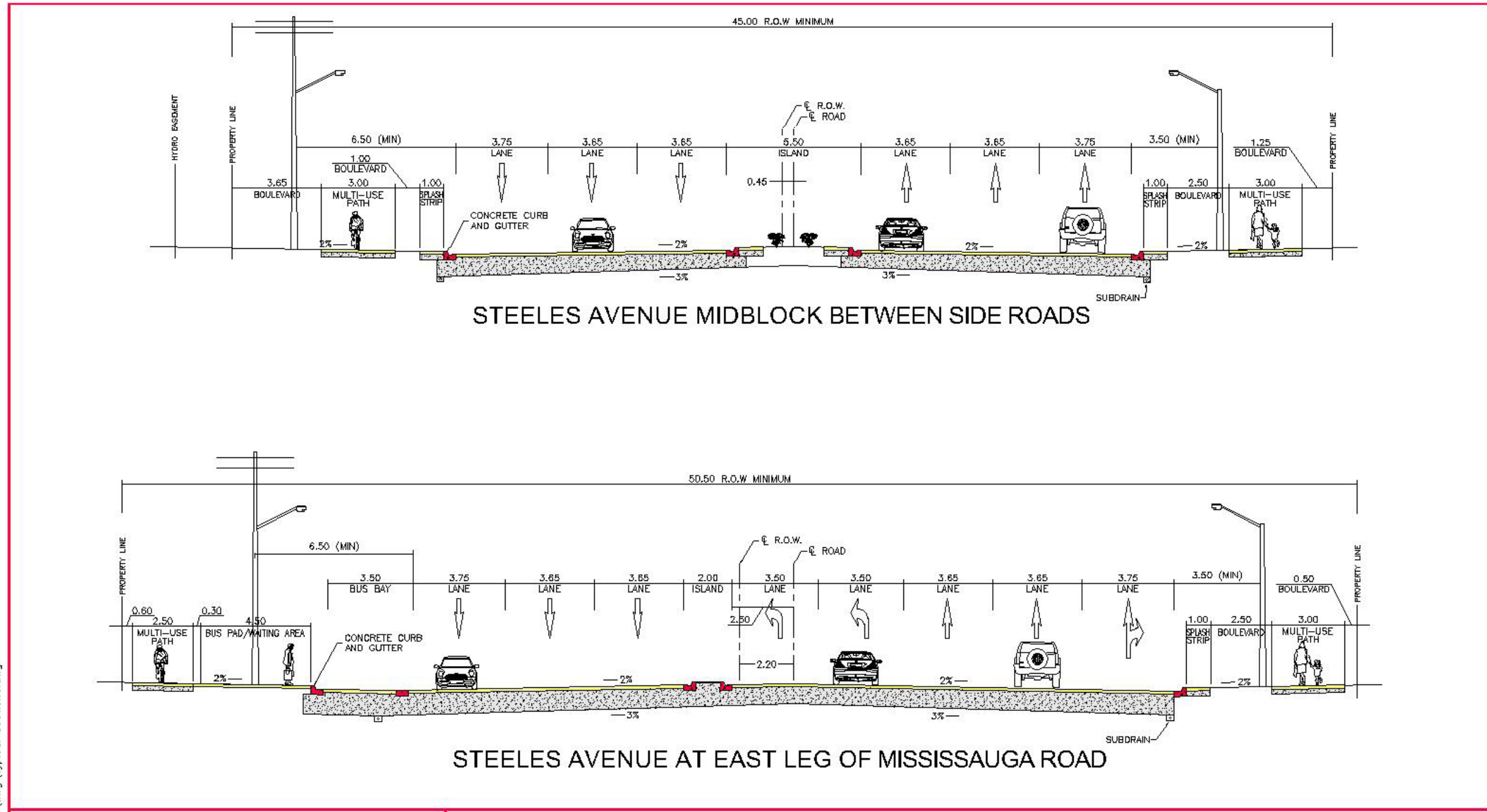
The typical cross sections proposed are illustrated in Figure 6.1 – 6.5. Key elements of the proposed cross-section of Steeles Avenue include the following:

- Concrete curb and gutter;

- Six (6) – 3.65 m lanes (3.75 m adjacent to curb) through lanes;
- 5.50 m raised median island midblock, tapering to 2.0 m at intersections;
- 3.0 m multi-use path – north and south side of Steeles Avenue;
- 1.0 m splash strip;
- 3.50 m left and right turn lanes as required at all intersections, and
- Illumination on both sides.

The cross-sections were developed based on BILT standards, and approved by Region of Peel staff. In addition, the cross section over the Credit River structure, shown in Figure 6.5, deviates from the Region's standard lane and multi-use path widths in order to eliminate the need to widen the existing structure. The proposed cross-section will be reviewed during detailed design to verify the assumed platform width.



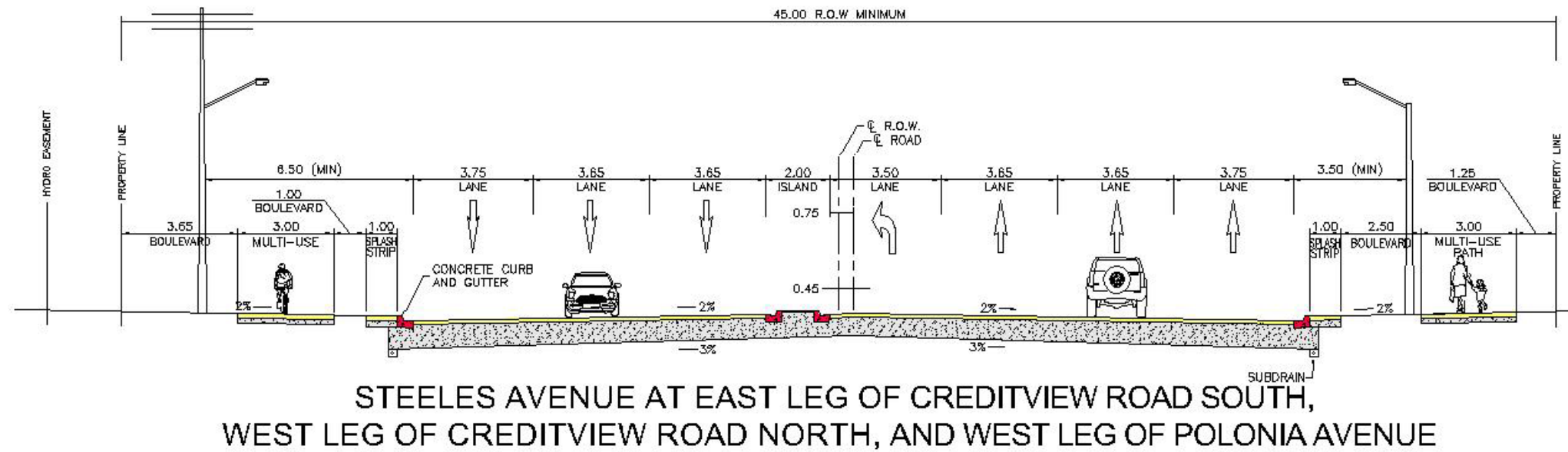
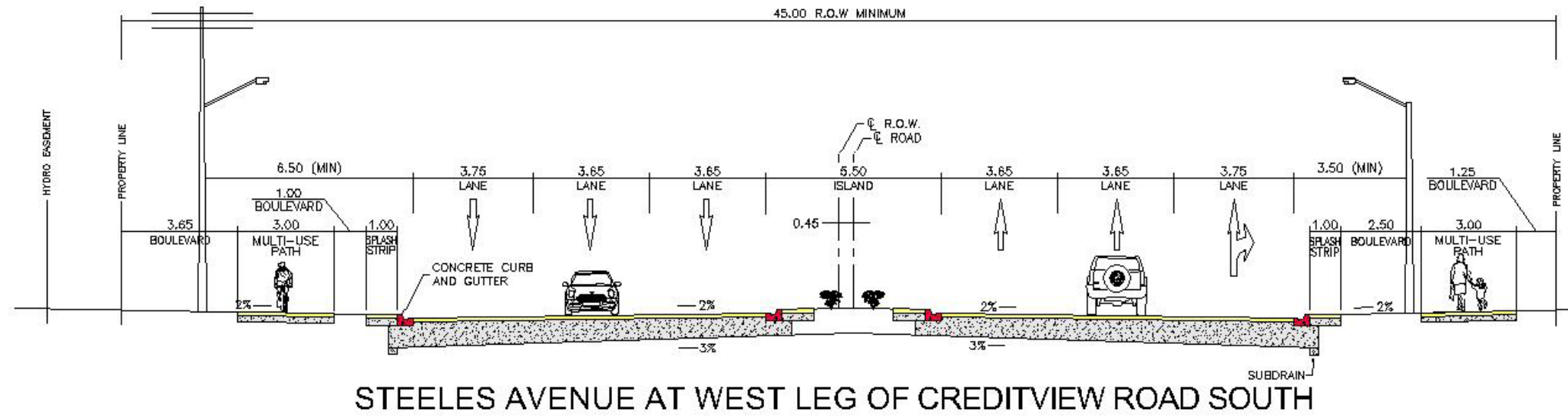


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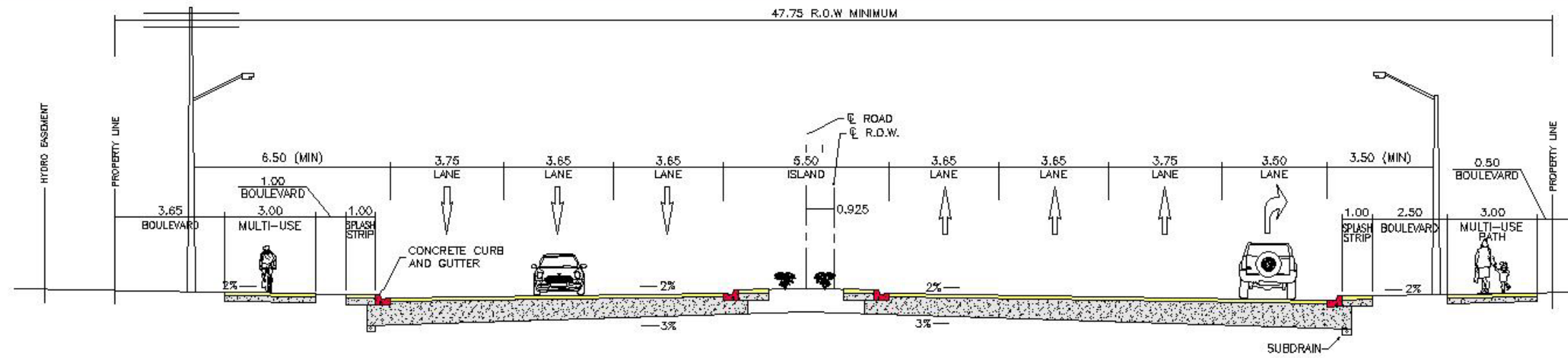


STEELES AVENUE
 CLASS ENVIRONMENTAL ASSESSMENT

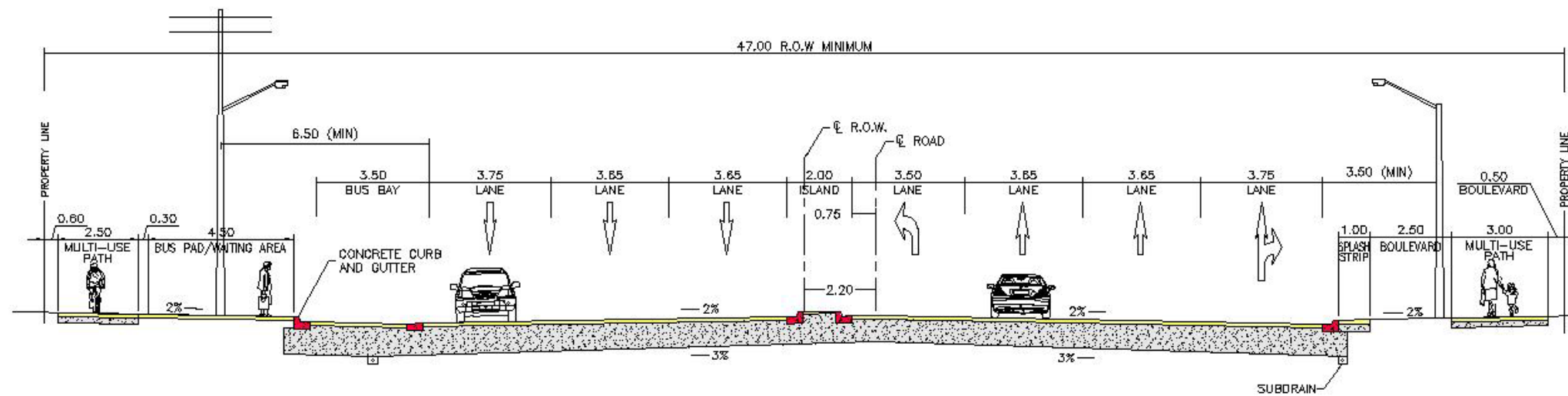
TYPICAL CROSS-SECTIONS
 FIGURE 6.2



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STEELES AVENUE AT EAST LEG OF CREDITVIEW ROAD NORTH
 AND EAST LEG OF POLONIA AVENUE



STEELES AVENUE AT EAST LEG OF CHUCHVILLE ROAD
 AND WEST LEG OF CLEMENTINE DRIVE

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STEELES AVENUE
 CLASS ENVIRONMENTAL ASSESSMENT

TYPICAL CROSS-SECTIONS
 FIGURE 6.4

6.1.5 Intersections and Side Roads

Intersection designs have been developed to provide an acceptable level of service at each intersection. Turning lane lengths are based on the Ontario Geometric Design Standards Manual for a 90 km/h design, and consist of a taper and storage lane component. Storage lengths were calculated based on 95th percentile queue lengths (ref. Appendix 'B' - Traffic Study). Required turning lanes and corresponding storage lengths are shown on the preliminary design drawings (ref. Sheets 1-26 – Plan and Profile).

Smart Channelization (all intersections)

Smart channels allow for better sight lines for right turning vehicles, of pedestrians and oncoming traffic, by reducing the approach angle to the cross road. Smart channels are to be installed at the main intersections throughout the study corridor. During detailed design, the design team will discuss the implementation of smart channels, and confirm the locations where smart channels are required.

BramWest Parkway

Coordination with the BramWest Parkway Class EA, being completed by the City of Brampton, has been undertaken by the study team. Of importance is the predicted intersection point with Steeles Avenue. The new BramWest Parkway corridor is proposed to connect to Steeles Avenue between Winston Churchill Boulevard and Heritage Road, just east of the existing Mullet Creek crossing.

At the time of writing this report, the BramWest Parkway study had not completed Phase 3 of the Class EA process. *As a result, the design of Steeles Avenue at BramWest Parkway is required to be re-evaluated by the detailed design team to determine the status of the BramWest Parkway Class EA, and ensure the configuration of the intersection matches the approved alternative.*

Heritage Road

A Class EA for Heritage Road from Steeles Avenue to Riverview Heights Road is currently being completed by the City of Brampton. This study has recently completed Phase 2 of the Class EA process. *As a result, the design of Steeles Avenue at Heritage Road is required to be re-evaluated by the detailed design team to ensure the configuration of the intersection matches the approved alternative.*

Lightbeam Terrace

A new roadway is planned between Heritage Road and Hereford Street. The design shown on the attached preliminary design drawings is based on preliminary information received from the developer.

At the time of writing this report, approvals for the development utilizing Lightbeam Terrace were not issued. *As a result, the preferred alternative should be re-examined by the detailed design team to confirm the configuration fulfills the agreements made through the development approval process.*

Hereford Street

Hereford Street will be extended northward, with the extension named Rivermount Road. The design shown on the attached preliminary design drawings is based on preliminary information received from the developer.

At the time of writing this report, approvals for the development utilizing Rivermount Road were not issued. *As a result, the preferred alternative should be re-examined by the detailed design team to confirm the configuration fulfills the agreements made through the development approval process.*

Financial Drive

As of completion of this report, the Financial Drive intersection has reached the 60% detailed design phase. Coordination should take place during the detailed design phase to ensure the configuration of Steeles Avenue meets the most recent design of Financial Drive.

Additionally, the multi-use paths on the north and south sides of the intersection of Steeles Avenue with Financial Drive are not planned to be constructed by the City of Brampton as determined by the 60% detailed design. The Region is responsible to construct the multi-use path through the intersection when Steeles Avenue is widened.

Churchville Road

Churchville Road residents have advised that movements onto Steeles Avenue are challenging. In particular, the northbound movement from the Churchville Village to Steeles Avenue westbound was flagged due to delay experienced by the residents.

To address this concern, the Class EA study team investigated each approach on Churchville Road to verify the existing sight distance meets the Transportation Association of Canada (TAC) guidelines. The following is a summary of the investigation.

As stated in the TAC manual, departure sight distance for a stopped vehicle is based on the following three manoeuvres (Source, TAC Geometric Design Guide, Sept 1999, page 2.3.3.5):

- i. To travel across the intersecting roadway by clearing traffic on both the left and right of the crossing vehicle without interfering with the passage of the through traffic.
- ii. To turn left onto the intersecting roadway by first clearing traffic approaching from the left, and then accelerate to the normal running speed of the vehicles from the right, without interfering with the passage of through traffic.
- iii. To turn right onto the intersecting roadway by entering the traffic stream approaching from the left and accelerate so as not to cause interference with the through traffic stream.

The TAC manual continues by determining through empirical study a relationship between the design speed, type of movement, and the sight distance required. Given that the design speed is 90 kph based on the design criteria, and utilizing Figure 2.3.3.4 from the TAC manual, the following is determined:

Table 6.7 Sight Distance

Turning Movement	Minimum Sight Distance as defined by TAC	Actual Sight Distance
Northbound Left	195 m*	>300 m
Northbound Right	300 m**	>300 m
Southbound Left	195 m*	115 m
Southbound Right	300 m**	115 m

*based on Scenario B-1-4 lane + median

**based on Scenario Cb

As noted above, the sight distance for the southbound left and right do not meet TAC guidelines. A growth of trees immediately east of Churchville Road restricts motorists' vision to the east. Additionally based on this analysis, there are no significant obstructions to prevent turning movements from the north approach to Steeles Avenue.

Under future conditions when the road is widened, the minimum sight distance would exceed the guidelines, as the corridor will be cleared of obstructions to allow for construction of the wider road platform. Prior to the widening commencing, the Region's maintenance operations should verify the sight distance for the southbound approach, and ensure adequate clearing operations are completed to improve the sight distance to the east.

6.1.6 Transit

Throughout the corridor, transit use will increase as development progresses. To accommodate the increase in demand, the City of Brampton requires ZUM bus stops be installed both eastbound and westbound at the following intersections:

- Steeles Avenue and Winston Churchill Boulevard
- Steeles Avenue and Heritage Road
- Steeles Avenue and Hereford Street
- Steeles Avenue and Mississauga Road
- Steeles Avenue and Financial Drive
- Steeles Avenue and Mavis Road

In addition, traditional bus stops are required at the following locations:

- Northbound and Southbound Heritage Road at Steeles Avenue West.
- Eastbound and Westbound, Steeles Avenue West at Rivermount Road
- Eastbound and Westbound, Steeles Avenue West at Lightbeam Terrace.
- Eastbound and Westbound, Steeles Avenue West at Future Road, centreline intersection station 10+330.
- Eastbound and Westbound, Steeles Avenue at Churchville Road

- Eastbound and Westbound, Steeles Avenue at Creditview Road (north leg)
- Eastbound and Westbound, Steeles Avenue at Polonia Avenue
- Eastbound and Westbound, Steeles Avenue at Clementine Drive / James Potter Road
- Northbound and Southbound Clementine Drive / James Potter Road at Steeles Avenue West.

The exact location of the transit bus stops will be confirmed during detailed design.

6.1.7 Vehicle Turning Movements

Turning movement wheel tracking was reviewed at all intersections using opposing WB-20 design vehicles. For intersections where dual left turns occur, a WB-19 vehicle and WB-20 vehicle turning simultaneously with an opposing WB-20 vehicle was simulated. The median locations were then positioned to accommodate the simulated movements.

6.1.8 Private Entrances

In general, existing private entrances will be reconstructed based on the following criteria:

- Asphalt aprons between the curb and sidewalks;
- Match original driveway material at the property line;
- Driveway grades in accordance with municipal standards, and
- Permission to enter required for re-grading of driveways beyond the limit of the right-of-way.

In addition, gaps in the raised median will be provided to allow for full vehicular movements only where it is deemed safe.

There are a number of locations where the Region and adjacent developers have agreed to an access point for the future development. The known locations are identified on the plan view of Sheets 1 – 26. The locations indicated are based on information provided by the Region of Peel planning department.

At the time of writing this report, approvals for the development access points were not complete. *As a result, the preferred alternative should be re-examined by the detailed design team to confirm the location of access points fulfills the agreements made through the development approval process.*

6.1.9 Property Requirements

Purchase of property will be required along both sides of Steeles Avenue and the intersecting side roads throughout the project limits. Preliminary property requirements are shown on Sheets 1 – 26 – Plan and Profile Drawings. Property requirements will be confirmed during the detail design phase. Table 6.8 summarizes the property requirements.

Table 6.8 Property Requirements

Type	Location	Area (m2)
Rural Agricultural	West of Winston Churchill Boulevard	183
Rural Residential	16824 Steeles Avenue	765
Rural Commercial	16863 Steeles Avenue	574
Rural Commercial	16917 Steeles Avenue	2486
Rural Commercial	Southwest corner of Steeles Avenue and Winston Churchill Boulevard	125
Rural Residential	Northeast corner of Steeles Avenue and Winston Churchill Boulevard	1296
Rural Agricultural	East of Winston Churchill Boulevard	6826
Right-of-way	South of Steeles Avenue on Winston Churchill Boulevard	3556
Future Industrial	East of Winston Churchill Boulevard	2893
Future Industrial	West of Heritage Road	1759
Rural Agricultural	West of Heritage Road	6289
Rural Agricultural	West of Heritage Road	2322
Future Commercial/Residential	East of Heritage Road	5081
Future Commercial/Residential	East of Heritage Road	2466
Existing Industrial	2 Hereford Street	1640
Future Residential	2228 Steeles Avenue	522
Existing Industrial	1 Hereford Street	1472
Rural Residential	2194 Steeles Avenue	129
Rural Residential	2000 Steeles Avenue	337
Future Commercial/Residential	Northwest corner of Steeles Avenue and Mississauga Road	212
Floodplain	Southwest corner of Steeles Avenue and Mississauga Road	1469
Existing Commercial	7929 Mississauga Road	850
Future Residential/Commercial	East of Mississauga Road	2646
Existing Residential	East of Mississauga Road	579
Existing Residential	East of Mississauga	550
Future Residential/Commercial	East of Mississauga	2230
Future Commercial	Northeast corner of Steeles Avenue and Financial Drive	778
Existing Residential	1556 Steeles Avenue	825
Existing Residential	8028 Creditview Road	150

Table 6.8 Property Requirements

Type	Location	Area (m2)
Existing Residential	8027 Churchville Road	85
Existing Residential	Northwest corner of Steeles Avenue and James Potter Drive	122
Existing Commercial	70 Clementine Drive	71

6.1.10 Infrastructure Ontario Owned Property

A Phase 1 Environmental Site Assessment and Stage I/II Archaeological Assessment/Cultural Heritage Assessment is a requirement under the Ministry of Infrastructure’s (MOI) Class EA process. As noted above, one parcel of Infrastructure Ontario property crosses into an area that is impacted by the preferred alternative. A copy of the Phase 1 ESA is included in Appendix ‘S’.

The Phase 1 Environmental Site Assessment concluded that there is evidence of potentially contamination based on the following:

- 2982 Steeles Ave. West, located approximately 75 m northwest of the Phase One Property, is listed as having three (3) active, 50,000 L gasoline USTs and appears to have operated as an automotive repair facility. This property is inferred to be hydraulically upgradient to the Phase One Property and may represent an environmental concern with respect to the Phase One Property; and,
- Runoff from Winston Churchill Blvd. into the road side drainage ditch and de-icing activities (i.e. application of road salt) on Winston Churchill Blvd. may represent an environmental concern with respect to the Phase One Property.

Given the above, if a Record of Site Condition is required, a Phase Two ESA would be required.

The Stage 1 Archaeological Assessment has been completed for this project and has determined that the area associated with Infrastructure Ontario has no archaeological potential. As a result, a Stage 2 Archaeological Assessment is not required. As well, a Built Heritage Property and Cultural Heritage Landscape Assessment was completed as part of the current project. No built heritage or cultural heritage elements were identified at this location.

6.1.11 Pedestrian Facilities

Pedestrian facilities proposed for Steeles Avenue include a multi-use pathway on both sides of the corridor. These pathways will connect to the crossroads at the intersections. Pedestrians will be guided to cross at the intersections where traffic control will be in place to allow for safe movements.

Within the corridor there is a location where the multi-use pathway crosses the Orangeville-Brampton Railway. This location is recommended for a pedestrian crossing gate. There are many measures and devices available which can be applied at this location. As a result, the detailed design team will evaluate the various options and determine a solution for implementation at this location.

Some residents expressed concern that crossing of Steeles Avenue to the St. Eugene de Mazenod Church is difficult due to the lack of traffic control. With the proposed widening of Steeles Avenue to six lanes, the crossing will become more difficult. An investigation of this crossing has been completed, as follows:

Existing Conditions

St Eugene de Mazenod Polish Roman Catholic Church is located on the northwest corner of the intersection of Steeles Avenue and Polonia Avenue. This large institutional facility holds events at various times throughout the week, with the main events scheduled for the weekends (Source http://www.demazenod.org/mass_schedule_0.aspx). Approximately 13,500 people are members of the parish which utilize the facility (Source http://www.gsai.ca/pdf/Polonia_Millennium_2000.pdf).

The current configuration of the intersection of Steeles adjacent to this facility includes four through lanes and auxiliary lanes for the left turn lane to both Polonia Avenue to the east, and Churchville Road to the west. A 2.0 m raised center median controls left turn movements out of the facility. All eastbound traffic is directed towards the intersection of Polonia Avenue with Steeles Avenue. There are no pedestrian facilities (sidewalk/multi-use path) parallel to Steeles Avenue at this location.

The intersection of Polonia Avenue is currently unsignalized, with a stop control condition for traffic approaching Steeles Avenue from the north. The intersection lies 160 m east of the Orangeville/Brampton Railway, and 320 m west of the intersection of Steeles Avenue with James Potter Road / Clementine Drive.

To the south is a low density residential development bordered by the Orangeville / Brampton Railway and James Potter Road / Clementine Drive. The pedestrian development is contained within the development and directed to utilize Clementine Drive with one exception. A mid-block connection allows pedestrians to enter the Steeles Avenue right-of-way from Charcoal Way.

Guidelines for Pedestrian Crossings

The MTO has created a manual in the 'Ontario Traffic Manual' series which is dedicated to this topic. A summary of the sections of Book 15 – Pedestrian Crossing Facilities which relate to this scenario is provided below.

Figure 2 from the manual provides a decision process which determines the need for traffic control devices in the context of pedestrian crossings.

In addition, the City of Brampton provides specifics in regarding to the pedestrian controls that are utilized within the city limits. The 'Pedestrian Safety Plan' document states that mid block traffic control through the use of flashing yellow beacons are "no longer being used in Brampton" (Source: Pedestrian Safety Plan, page 21). Additionally, the document states that intersection pedestrian signals, which utilize a traffic signal for the main road (to provide a pedestrian crossing phase) and a stop control for the smaller crossroad, "are considered to be confusing for motorist, particularly on the side street. As such, this configuration is no longer used. Instead, if pedestrians warrant signals, the intersection is fully signalized in accordance with standard installation practices". (Source: Pedestrian Safety Plan, page 23). Essentially based on the City of Brampton criteria, full signalization *if warranted* should be utilized to protect pedestrians at conflict locations.

Proposed Conditions

The MEA Class EA process has determined through consultation with the public, agencies, and the consultant team that urbanization of Steeles Avenue to six lanes (plus auxiliary lanes at intersections), a raised median which varies in width along the corridor, plus a multi-use path on each side is necessary to address the problems identified by the study team. However, based on the projected traffic volumes, the Steeles Avenue and Polonia Avenue intersection will operate at a satisfactory level of service with the intersection remaining unsignalized. (Source: Steeles Avenue Preliminary Design Traffic Study, July 2013, page 43).

The traffic study also identified the number of pedestrians at Steeles Avenue and Polonia Avenue at 0-10 during the peak traffic hour. (Source: Steeles Avenue Preliminary Design Traffic Study, July 2013, page 16).

Site Analysis

Following the flowchart provided in Book 15, Justification 1-5 for the signal warrants are not met at this location, which places the potential for signalization based on Justification 6 – Pedestrian Warrant. Assuming a net 8 hour pedestrian volume of 160 (10 persons/hour x 8 hours x 2 (to assume the worst case where all pedestrians are either elderly or young children) = 160) and utilizing Figure 6.7 and 6.8 from Book 15, Justification 6 is not met.

Figure 6.6 – Decision Process for Pedestrian Crossing Control

Source: Ontario Traffic Manual Book 15, December 2010, page 17

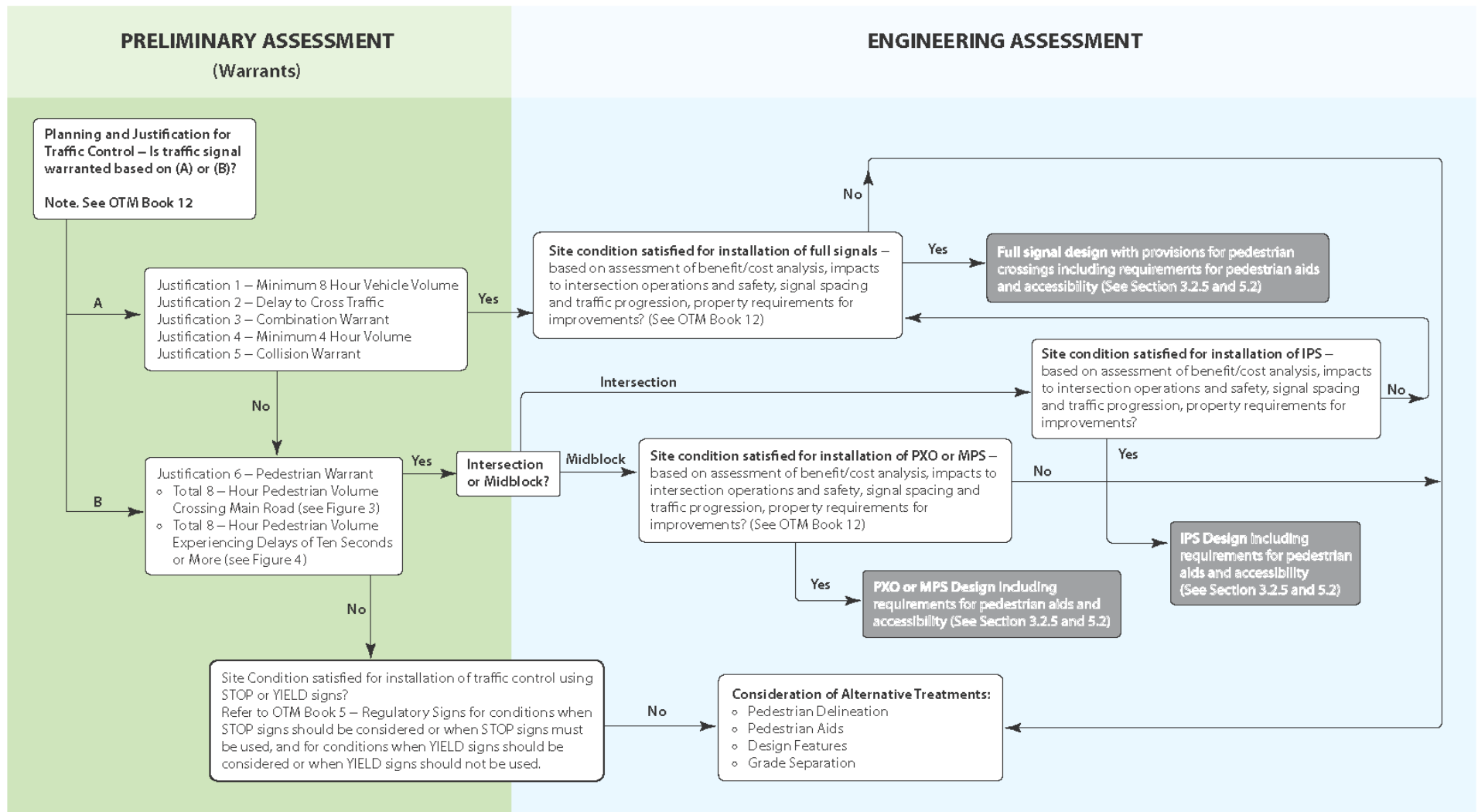


Figure 6.7 – Justification 6 – Pedestrian Volume

Source: Ontario Traffic Manual Book 15, December 2010, page 19

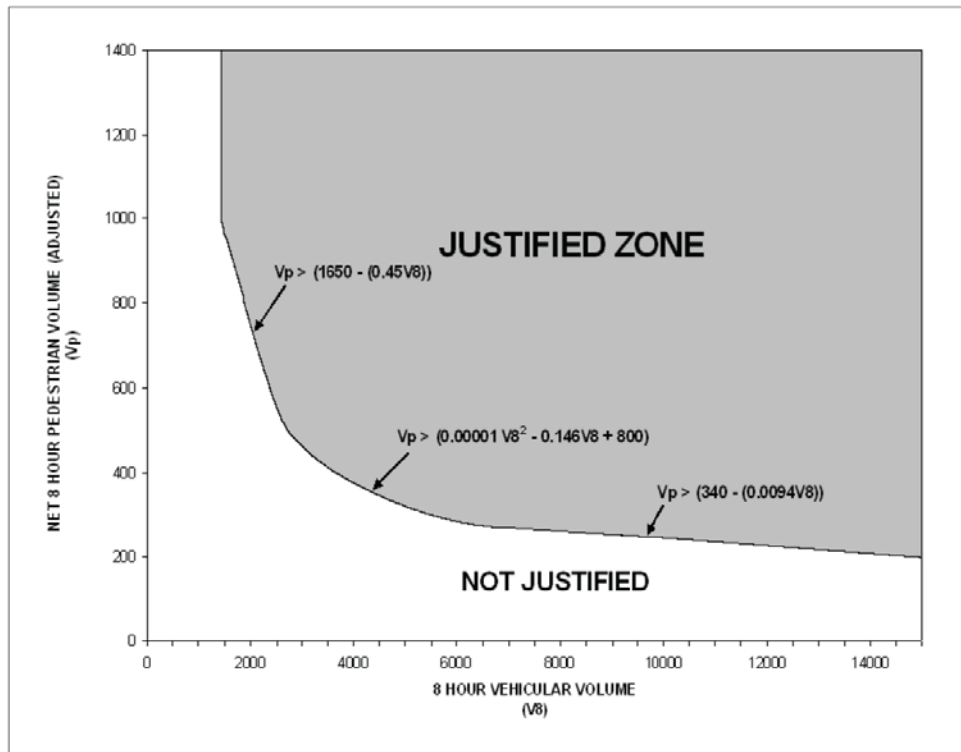
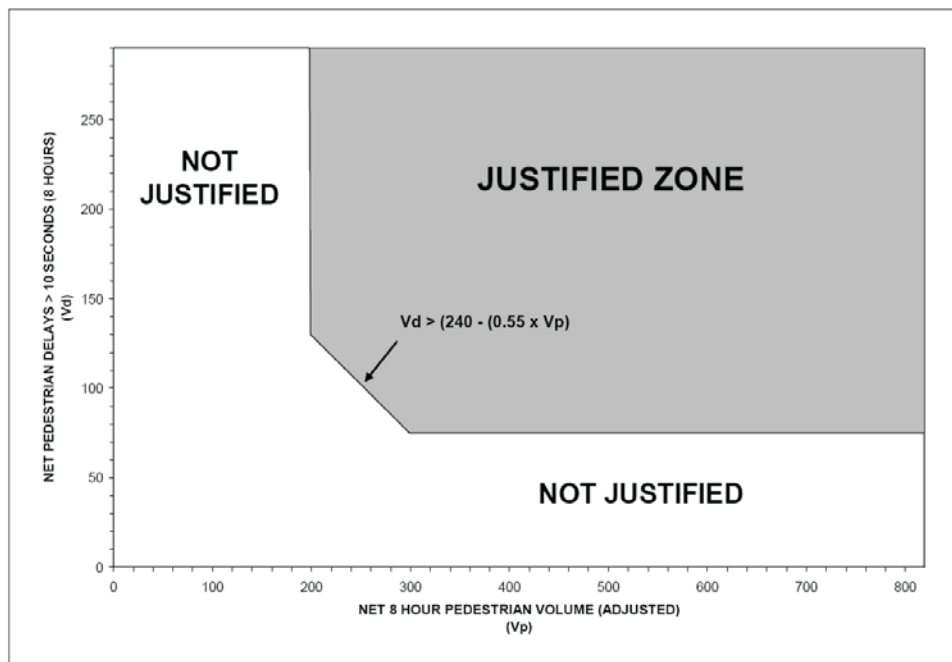


Figure 6.8 – Justification 6 – Pedestrian Delay

Source: Ontario Traffic Manual Book 15, December 2010, page 19



Given the above and the flowchart (ref. Figure 6.6) from Book 15, there should be the consideration of alternate treatments such as:

- Pedestrian Delineation
- Pedestrian Aids
- Design Features
- Grade Separation

Grade Separation

Some residents requested that a grade separation be considered at this location. This would physically separate the pedestrians from the roadway, allowing for unobstructed crossing of Steeles Avenue. As stated in Book 15, “the overall costs of a (grade separation) are significantly higher”. Additionally, “pedestrians tend to follow the path of least resistance, and when faced with the need to use stairs or a steep grade to walk up to an overpass, the extra effort could dissuade pedestrians into choosing a more direct route”. (Source: Ontario Traffic Manual Book 15, December 2010, page 59).

Given the relatively low volume of pedestrian crossing at this location, the tight quarters that the approaches to the overpass would need to be constructed in, and the high cost to construct an overpass/underpass, a grade separation is deemed not feasible. An alternate at-grade solution should be pursued as described below.

At-Grade Solution

There are a number of solutions which utilize measures to minimize the conflicts between pedestrians and vehicles while maintaining traffic flow. From all the potential solutions, the best alternative is to install a refuge island within the limits of the 5.5 m wide raised median on the east leg of the intersection of Steeles Avenue and Polonia Avenue. Book 15 provides an outline for various design considerations for a pedestrian refuge island. The below outlines how each of these considerations can be met at this location:

- Size and Dimension** – The proposed median island is 5.5m wide for approximately 120m east of the intersection. This potentially provides approximately 660 m² for pedestrians to wait for a gap in traffic, which is above the minimum 20 m² recommended by Book 15.
- Sight Distance** – Sight distance available is greater than the stopping sight distance specified by the design criteria for the Steeles Avenue study, which is 170m.
- Illumination** –The Steeles Avenue corridor will be illuminated during the urbanization of the corridor, which will improve visibility of pedestrians to the road users.
- Parking** – No on-street parking is proposed at this location.
- Road Alignment** – The horizontal and vertical alignment are long and flat at this location. No lane shifting is required to accommodate the pedestrian island.
- Signs** – Signs will be important to warn road users of the pedestrian crossing and the refuge island. The Region could supplement the signage with flashing warning lights activated during high crossing timeframes.

- vii. **Pavement Markings** – Lane marking will be utilized to direct traffic. Pedestrian crossing markings are not recommended in order to ensure the pedestrians do not expect the road users will stop as they cross the road.
- viii. **Accessibility** – Part of the median island can be constructed with a concrete pad and curb cuts in order to accommodate the potential for wheelchairs. Additionally the multi-use paths should connect to the roadway with a concrete pad and curb cuts of similar width to the elements on the median to delineate where the pedestrians are expected to cross.

The 'Pedestrian Safety Plan' provided by the City of Brampton identifies the benefit of the pedestrian refuge island when the following conditions are met (Source: Pedestrian Safety Plan, page 35).

- i. Wide two-way streets (four lanes or more) with high traffic volumes, high travel speeds, and large pedestrian volumes
- ii. Wide streets where the elderly, people with disabilities, and children cross regularly

The plan also identifies that “pedestrian refuge islands will be considered when there is a significant presence of pedestrian crossing activity but less than that required to warrant pedestrian traffic signals”. (Source: Pedestrian Safety Plan, page 36).

Conclusion

Based on the above, the pedestrian refuge island is recommended at the east leg of the intersection of Steeles Avenue with Polonia Drive to address the local concern with crossing to the church. Additionally, it is recommended that the pedestrian access off Charcoal Way be closed, and a new pedestrian access be provided at the end of Buster Drive, which will direct people towards the pedestrian refuge crossing area.

6.1.12 Accessibility for Ontarians with Disabilities Act Measures

The Accessibility for Ontarians with Disabilities Act (AODA) requires that all barriers in the built environment (public spaces and buildings) be removed. The Integrated Accessibility Standards Regulation identifies the specific requirements that must be implemented for public spaces and the associated timelines. For designated public sector organizations shall meet the requirements of the Act and Regulations by January 1, 2016. During the Detail Design phase the Region will need to confirm that the design for Steeles Avenue meet the minimum requirements under the AODA.

6.1.13 Pavement Design

A preliminary pavement investigation was completed by AMEC (ref. Appendix 'D' - Geotechnical Investigation Report). The pavement design recommendations contained in this report were used for preliminary design and estimating purposes.

Rehabilitation Strategies for Existing Pavement

Given that Steeles Avenue will be widened from 4 to 6 lanes, rehabilitation of the existing platform was completed based on AMEC's geotechnical investigation and analysis, visual pavement condition assessment, subgrade condition, laboratory test results and calculated ESALs. Consideration was also given to user delay, cost and/or disruption of traffic. The recommendations for rehabilitation are presented below in Table 6.9

Table 6.9 Rehabilitation of Steeles Avenue

Section	Recommendation
Winston Churchill Boulevard to 100m West of Mississauga Road	Do Nothing – Existing pavement is in good condition
100m West of Mississauga Road to Chinguacousy Road	Partial Depth Reconstruction – partially remove existing asphalt to a depth of 70mm and replace with 100mm of new asphalt

Widening of Steeles Avenue

A wider roadway platform is required to accommodate the preferred alternative. Widening recommendations for the Steeles Avenue platform are presented below in Table 6.10

Table 6.10 Widening of Steeles Avenue

HMA		PGAC	Traffic Category
Type	Thickness (mm)		
HL 1 or SP 12.5 FC2	50 mm	64-28	C
HL 8 or SP 19.0 mm	60 mm	58-28	C
HL 8 or SP 19.0 mm	60 mm	58-28	C
Total HMA	170 mm		
Granular A	200 mm		
Granular B	450 mm		
Total Pavement Structure	820 mm		

Tie-In between Steeles Avenue with Sideroads

The shoulder boreholes advanced on three (3) sideroads; Churchville Road, Creditview Road North and Creditview Road South revealed that the existing granular is sufficient to tie-in with Steeles Avenue widening with these sideroads. Consequently, it is recommended to remove the top 150 mm of granular and add 150 mm of new Granular A and repave with 170 mm (50+60+60 mm) of hot mix. However, BH16 located 20 m south of Steeles Avenue and 19 m west of Churchville Road encountered 100 mm of asphalt and 100 mm of buried topsoil that should be removed (total of 200 mm).

Also, the shoulder boreholes advanced on two (2) sideroads; Financial Drive (BH28 and BH29), and Heritage Road (BH66 and BH67), revealed that the existing granular is insufficient to tie-in with the widening of Steeles Avenue. Therefore, it is recommended full depth excavation, commencing from the existing edge of pavement, to accommodate the proposed design thickness as detailed above.

6.1.14 Storm Drainage

The widening of Steeles Avenue would increase the amount of impervious coverage within the roadway corridor. This would increase the peak flows, total runoff and mass loading of pollutants, including the concentrations of contaminants within the runoff, thereby affecting the quality of runoff. Based on the stormwater management requirements of the Gateway West Subwatershed,

the following stormwater management approach is preferred for each main and sub drainage outlets:

Crossing C1 – Mullet Creek Crossing:

Winston Churchill North of Steeles Avenue: An increase in impervious cover from 0.45 ha to 0.55 ha for a 0.93 ha drainage area. The road drains easterly overland to Steeles Avenue. The roadside swale systems either side of Winston Churchill will be rebuilt to provide quality controls.

Winston Churchill South of Steeles Avenue: This area will drain to the stormwater management facility currently under construction south of Steeles Avenue as part of the Orlando Development Corporation industrial development, as such no additional stormwater management is required.

Steeles Avenue: Two right-of-way areas drain to Crossing C1, located west and east of C1. The west drainage area of 3.96 ha impervious coverage increases from 2.65 ha to 4.4 ha, while the east 1.49 ha (proposed area 2.19 ha) impervious coverage increases from 1.32 ha to 2.17 ha. Under current land use, there are no stormwater management facilities that receive Steeles Avenue drainage, therefore erosion and quantity controls would be required within the right-of-way in the form of underground storage tanks. West of C1 erosion and 100 year control volumes of 438 m³ and 1660 m³ would be required. East of C1 erosion and 100 year Storm control volumes of 330 m³ and 825 m³ would be required. Quality control on the west side would be provided by an STC14000 oil/grit chamber then a vegetative filter strip within the creek block. Quality control on the east side would be provided by an STC 6000 oil/grit chamber then a vegetative filter strip within the creek block.

Under ultimate land use conditions, with development proceeding north of Steeles Avenue and the BramWest Parkway Transportation Corridor being constructed, the opportunity for stormwater management with stormwater management facilities north of Steeles Avenue should be investigated.

Crossing C2 – Tributary to Stormwater Management Facility M4:

Steeles Avenue including Heritage Road: Steeles Avenue and Heritage Road all drain indirectly to stormwater management facility M4 located south of Steeles Avenue and east of Heritage Road. The stormwater management facility has been constructed based on 60% impervious coverage for the road right-of-ways. The total right-of-way drainage area to the facility is 3.74 ha at a proposed 60 % impervious. Based on the Gateway West Subwatershed Study the following storage volumes are required, versus additional volume available within the facility.

Permanent Pool Quality Control Volume Required/ Available: 644/33 m³

Erosion Control Volume Required/ Available: 260/430 m³

Quantity Control Volume (100 Year) Required/ Available: 1030/392 m³

Quantity Control Volume (Regional Storm): Required 0/717 m³ (100 year is controlling)

Based on the above, the existing stormwater management facility would require minor alterations to accommodate the additional storage volumes resulting from the proposed paved area on Steeles Avenue. Based on the required (1934 m³) versus the available storage volume (1572 m³)

there would be a volume shortage of 362 m³ which would require less than 0.05 m increase in the maximum stormwater management facility depth. The facility's outlet would require alteration by the way of elevation adjustments and potentially sizing modifications.

Catchment 16 (1.11 ha) located north of Steeles Avenue will ultimately drain to the Riverview Heights L5 stormwater management facility that drains to Levi Creek. As such, all stormwater management for this section of roadway would be provided within the future stormwater management facility.

Stormwater Management Facility L1

Existing drainage Catchments 5 and 6, totaling 1.82 ha, drain to existing stormwater management facility L1. All stormwater management for proposed increases in pavement area for these catchments would be provided by the stormwater management facility.

Crossing C3 – Levi's Creek Crossing:

Mississauga Road: An increase in impervious cover from 1.04 ha to 1.07 ha for a 1.28 ha drainage area (Catchments 7, 18 and 19). The road drains southerly to Levi Creek. Based on 0.03 ha of additional pavement, peak flows only increase 3% which is considered negligible and quantity controls are not considered required. Quality control would be provided by an oil/grit chamber STC300 in line with either an enhanced swale or filter strip on the east side of the roadway.

Steeles Avenue: Two right-of-way areas drain to Crossing C3, located west and east of C3. The west drainage area of 2.03 ha impervious coverage increases from 1.05 ha to 1.7 ha, while the east 1.71 ha impervious coverage increases from 1.00 ha to 1.38 ha. Under current land use, there are no stormwater management facilities that receive Steeles Avenue drainage, therefore erosion and quantity controls would be required within the right-of-way in the form of underground storage tanks. West of C3 erosion and 100 year control volumes of 195 m³ and 670 m³ would be required. East of C3 erosion and 100 year control volumes of 114 m³ and 400 m³ would be required. Quality control on the west side would be provided by an oil/grit chamber STC6000 then vegetative filter strips within the creek block, with the same approach used on the east side of the crossing.

Crossing C4 – Tributary to Stormwater Management Facility:

Existing drainage Catchments 8, 9, 10, 37 and 38, totaling 3.96 ha, drain to existing stormwater management facility for the Credit River Subdivision. All stormwater management required for the proposed increases in pavement area for these catchments would be provided by the stormwater management facility.

Crossing B1 – Credit River Crossing:

Financial Drive. North and south of Steeles Avenue, Catchments 20 and 21 respectively, there would be slight increases in impervious coverage (0.25 ha, 0.01ha). Financial Drive north side of Steeles will drain to the Noranda Heights stormwater management facility located east of Creditview Road. South of Steeles Avenue, Financial Drive will drain to Streetsville Glen

stormwater management facility, as noted within the 2011 ESR for Financial Drive Improvements from Steeles Avenue West to Casablanca Circle.

Steeles Avenue west of the Credit River Crossing B1: The increase in pavement for existing drainage Catchments 11, 12, 13 and 22 would be 0.96 ha or 27% based on a total drainage area of 5.47 ha. As no existing stormwater management facility receives the Steeles Avenue drainage, erosion and quantity controls would be required within the right-of-way in the form of underground storage tanks. Erosion and 100 year control volumes of 1070 m³ and 1007m³ would be required (100 year is not in addition to erosion). In addition, quality control on the west side of the river would be provided by oil/grit chamber – STC6000, then vegetative filter strips within the floodplain area.

Catchment 22, 0.27 ha, Creditview Road north of Steeles Avenue would have an increase in impervious coverage of 144 m² (0.10 ha to 0.11 ha). The rural road would continue to drain to the vegetated swale systems which is 135m in length; greater than 60m required for water quality treatment. The 25mm storm event peak flow of 0.02 m³/s would be conveyed at a maximum velocity of 0.41 m/s at a 0.04 m depth through the trapezoidal channel with 2:1 side slopes, a 1.0m flat bottom width and a slope between 0.75% to 1.50%. The surface water collected in the existing swale system will travel through the existing vegetation within the swale, followed by overland flow across the Credit River floodplain prior to discharge into the Credit River. As a result of the long drainage path through the existing vegetation, an Enhanced level of treatment is considered to be achieved.

Given the small increase in impervious area, the associated peak flow change between post development and pre-development condition has been calculated to be a maximum of 6.0 L/s for the 100 year storm event. As this peak flow change is negligible, quantity controls for this catchment are not considered required.

Steeles Avenue east of the Credit River Crossing B1: Existing drainage Catchments 33, 34, 35, 39, 40 41, and 42 drain west to east along Steeles Avenue to the Credit River with a total drainage area of 9.63 ha at 67 % impervious. The impervious coverage will increase to 80% and will require water quality, erosion and quantity control. The erosion control volume of 1642 m³ and 100 year quantity control volume of 1020 m³ (100 year not in addition to erosion), would have to be provided within underground pipes or tanks as no stormwater management facilities receive Steeles Avenue drainage.

Catchment 23, 0.15 ha, Churchville Road south of Steeles Avenue, would not incur an increase in impervious coverage, therefore no stormwater quantity controls are being proposed.

Drainage Catchment 25 (0.28 ha) drains south along Clementine Drive to the stormwater management facility located off Clementine Drive, west of Bellamy Court. As per the 2001 Stormwater Management Report Brampton West 1-2 Limited, Draft Plan of Subdivision 21T-01013B and Paradise Homes Draft Plans of Subdivision 21T-01012B and 21T-01013B, erosion

and flood control for the 4% increase in impervious coverage would be provided for road improvements south of Steeles Avenue.

Drainage Catchment 24 drains (0.18 ha) north of Steeles Avenue on James Potter Road, drains to the stormwater management facility located off Polonia Avenue, therefore the 7% increase in impervious coverage would receive water quality, erosion and flood control within the facility.

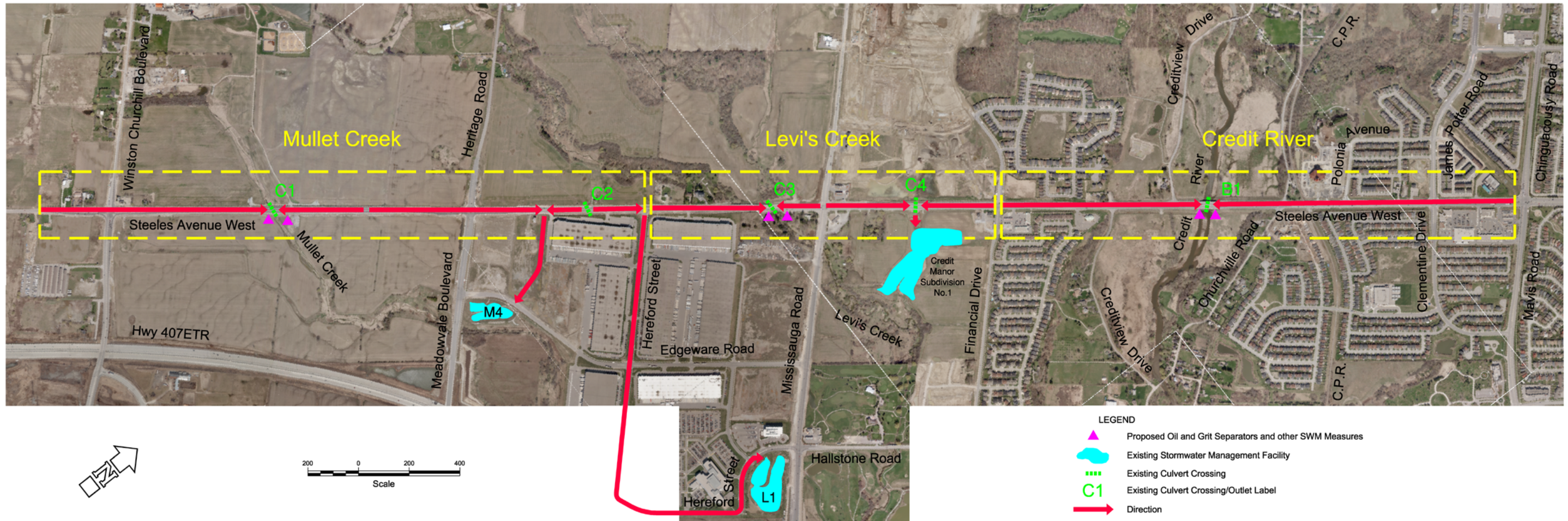
Mavis Road Intersection

Drainage Catchments 26, 36, 40, 41 and 42 will not have increased impervious coverage, and therefore do not require stormwater management.

Conclusion

A simplified drawing showing the recommendations above is shown in Figure 6.9. Additionally, a full stormwater management report specific to the detailed design process is required to confirm the conclusions made above.

Figure 6.9 – Simplified Stormwater Drainage Plan



6.1.15 Utilities

Utility companies were contacted at the commencement of the study and invited to participate. A response was received from Hydro One Brampton, Bell Canada, Enbridge Gas, and TransCanada Pipelines.

Based on preliminary review, relocation or protection of various utilities will be required, as follows:

Hydro One Brampton

- Relocation of overhead hydro line along the north side of Steeles Avenue from Winston Churchill Boulevard to 300m east of Hereford Street
- Relocation of overhead hydro line along the north side of Steeles Avenue from 100m west of Mississauga Road to 150m west of Chinguacousy/Mavis Road. Relocation of the buried section of hydro line may be required. Daylighting of the line is recommended to confirm depth.

Bell

- The majority of the underground cable and pedestals both on the north and south sides of Steeles Avenue will need to be relocated where determined by the detailed design team to be in conflict with the underground work.

Enbridge

- The 8 inch line on the south side of Steeles Avenue will need to be relocated where determined by the detailed design team to be in conflict with the underground work.

Pipeline Crossings

Existing transmission pipelines exist at the following locations:

- TransCanada Pipeline Stn. 7+920
- Enbridge Gas Stn. 7+900

No direct conflict with the roadway construction will occur with either of the pipeline crossings. However, ground cover over the pipelines could potentially change, subject to the final vertical alignment, and protection may be required. Storm sewer is proposed to cross over the pipelines at each location. Potential conflict between the storm sewer and the pipelines may likely be dealt with by modification of the storm sewer profile. Verification of location in the field, preparation of pipeline crossing drawings, and submission of crossing applications will be required at the detail design stage for all pipeline crossings.

6.1.16 Agency Approvals

Agency approvals are required before construction can begin. Approval requirements are summarized in Table 6.11.

Table 6.11 Required Agency Approvals

Agency	Approval Required
Ministry of the Environment	Approval of Sewage Works (C of A), Permit To Take Water (if required)
TransCanada Pipeline	Pipeline Crossing Agreement
Enbridge	Pipeline Crossing Agreement
Credit Valley Conservation	Permit for Approval for culvert extension/replacement, work in regulated area, and storm outlets
Ministry of Natural Resources	Permit for Approval for Activities that may affect Species or Habitat protected under the Endangered Species Act (17C) Possible Fisheries Act Authorization

6.1.17 Traffic Signals and Illumination

Traffic signals will be replaced at all intersections along Steeles Avenue. Full illumination will be provided along Steeles Avenue within the limits of construction.

The existing street lighting system from Mavis Road to Winston Churchill Boulevard is fed from the main hydro line on the north side, with a number of underground crossings of Steeles Avenue throughout the corridor. The Region of Peel is responsible to keep the existing street lighting operational at all times during construction, and will notify the City of Brampton before making changes to the existing lighting system during the detailed design phase.

Traffic signal installation at the currently unsignalized intersection of Steeles Avenue with Churchville Road is currently under review, independent of this study, by the Region of Peel. If the review concludes that signals will be installed at this intersection, the signals should be positioned to account for the widening of Steeles Avenue as defined by this report.

6.1.18 Structural Design

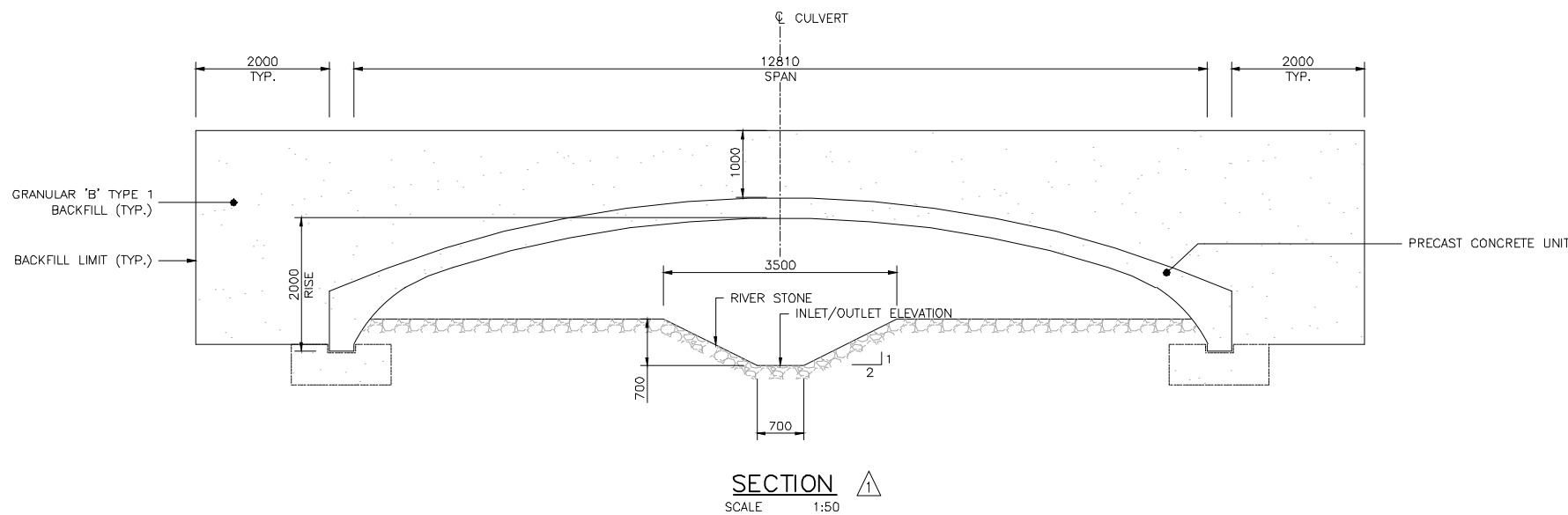
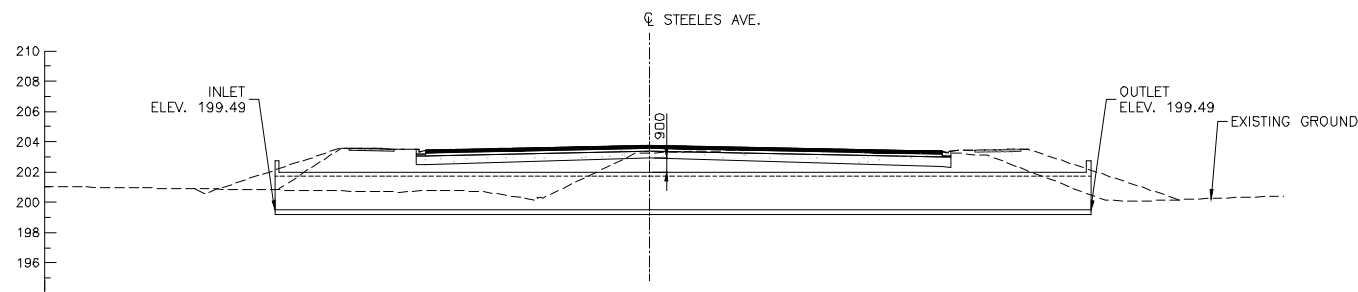
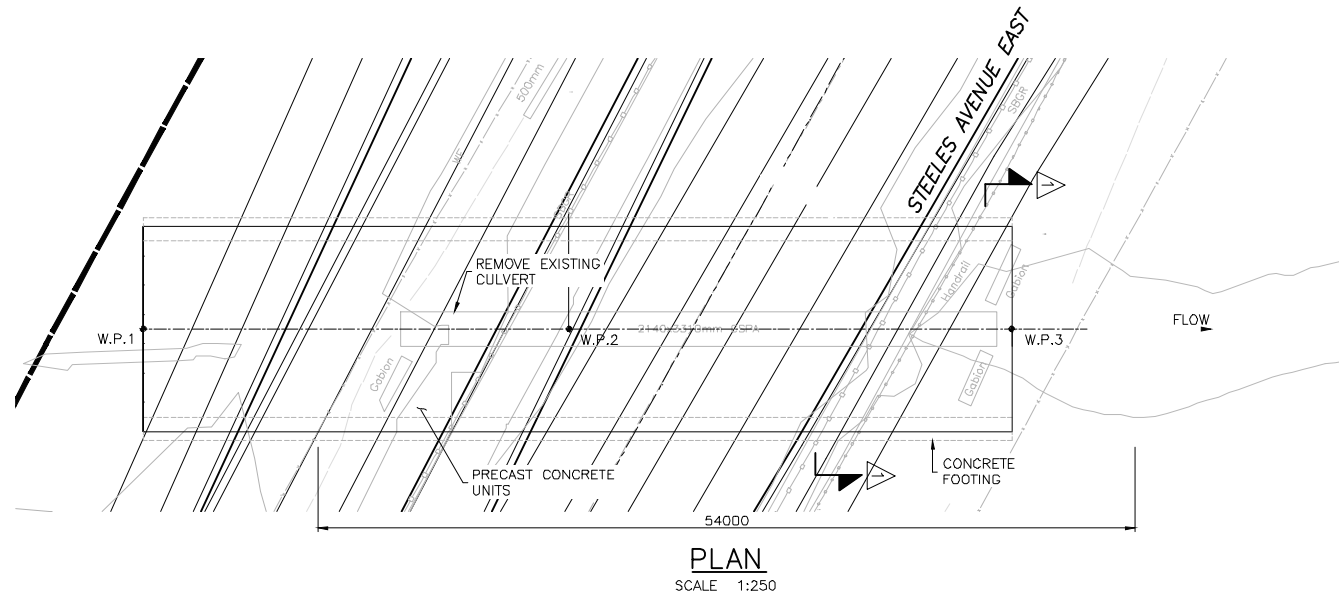
Crossing C1 – Mullet Creek Crossing

The existing 3.23m x 2.16m Elliptical Corrugated Steel Pipe has been determined by the drainage study to be insufficient for the Regional storm event. Also, the culvert is a constriction point for fluvial geomorphology, and is structurally deficient.

To address these issues, the existing pipe will be replaced with a 12 m span x 2.0 m high x 51.0 m long precast concrete arch. A permit from Credit Valley Conservation will be required for this culvert. A preliminary general arrangement drawing of the proposed structure is shown in Figure 6.10.



WORKING POINT DATA			
W.P.	STATION	EASTING	NORTHING
1	7+806.50	597379.881	4829504.583
2	7+820.20	597407.701	4829500.153
3	7+834.50	597436.604	4829495.551



GENERAL NOTES

- EARTH FILL AS SHOW
WEIGHT OF FILL 22.0kN/cu.m
- CLASS OF CONCRETE
CULVERT UNITS.....40 MPa
HEADWALLS & WINGWALLS.....35 MPa
FOOTINGS/REINFORCING.....35 MPa
- CLEAR COVER TO REINFORCING STEEL
PRECAST UNITS.....40 ± 10
CAST-IN-PLACE FOOTING.....100 ± 25
- REINFORCING STEEL:
REINFORCING STEEL SHALL BE GRADE 400W UNLESS OTHERWISE SPECIFIED.
- TENSION LAP LENGTHS SHALL BE CLASS B UNLESS SHOWN OTHERWISE.
- BAR HOOKS SHALL HAVE STANDARD HOOK DIMENSIONS USING MINIMUM BEND DIAMETERS, WHILE STIRRUPS AND TIES SHALL HAVE MINIMUM HOOK DIMENSIONS. ALL HOOKS SHALL BE IN ACCORDANCE WITH THE STRUCTURAL STANDARD DRAWINGS SS12-1 UNLESS INDICATED OTHERWISE.
- RETAINED SOIL SYSTEM WALLS SHALL HAVE THE FOLLOWING ATTRIBUTES:
APPLICATION: WALL
PERFORMANCE: HIGH
APPEARANCE: HIGH

CONSTRUCTION NOTES

- CONTRACTOR SHALL PROVIDE A PRECAST CULVERT TO MEET THE FOLLOWING REQUIREMENTS:

CULVERT IS SHOWN SCHEMATICALLY		
CULVERT	DIMENSIONS	
	MIN.	MAX.
SPAN		
RISE		
END AREA		

- CONTRACTOR SHALL LOCATE FOOTINGS, ADJUST OVERALL LENGTH OF FOOTINGS AND MODIFY FOOTINGS/UNITS CONNECTION TO SUIT PRECAST CULVERT SELECTED.
- BACKFILL SHALL BE PLACED SIMULTANEOUSLY BEHIND BOTH ABUTMENTS KEEPING THE HEIGHT OF THE BACKFILL APPROXIMATELY THE SAME, AT NO TIME SHALL THE DIFFERENCE IN ELEVATION BE GREATER THAN 500mm.
- PROVIDE TEMPORARY RESTRAINT DURING INSTALLATION TO ENSURE THAT TO DIFFERENTIAL MOVEMENT (LATERAL OR VERTICAL) OCCURS AT ONE SUPPORT POINT RELEVANT TO OTHER.
- AFTER INSTALLATION, ENSURE THAT THE UNITS ARE LEVEL AND THE CLEAR DISTANCE BETWEEN THE LEGS IS A SUPPLIER'S SPECIFICATIONS.
- FOR STAGING REQUIREMENTS SEE DWG. ____
- ALL JOINTS TO BE COVERED BY 600mm WIDE NON-WOVEN CLASS 1 GEOTEXTILE.
- CONTRACTOR IS RESPONSIBLE FOR DESIGN OF COFFERDAM.

FOOTING DESIGN

GEOTECHNICAL RESISTANCE	
SLS (kPa)	ULS (kPa)
200	300

PRELIMINARY NOT
TO BE USED FOR
CONSTRUCTION

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					APPROVALS				Design	K.A.	Checked	K.S.	MULLET CREEK CULVERT	GENERAL ARRANGEMENT		Consultant File No.
					Municipal	Regional	Drawn	B.L.	Checked			TP111130				
					Engineer	Engineer	Scale	AS SHOWN				Drawing No.				
					Date	Date	Date	JULY 2013				FIGURE 6.10				
No.	DATE	BY	REVISIONS	MAN	CAD											

Crossing C2 – Tributary to Stormwater Facility M4

The existing watercourse north of Crossing C2 enters a storm sewer. Prior to development, the connection of the watercourse to the storm sewer should be maintained. The storm sewer outlets to an open ditch just east of the inlet point. The outlet point is to remain under pre-development conditions. Under post-development conditions, the storm sewer will be extended through the site to stormwater management facility M4.

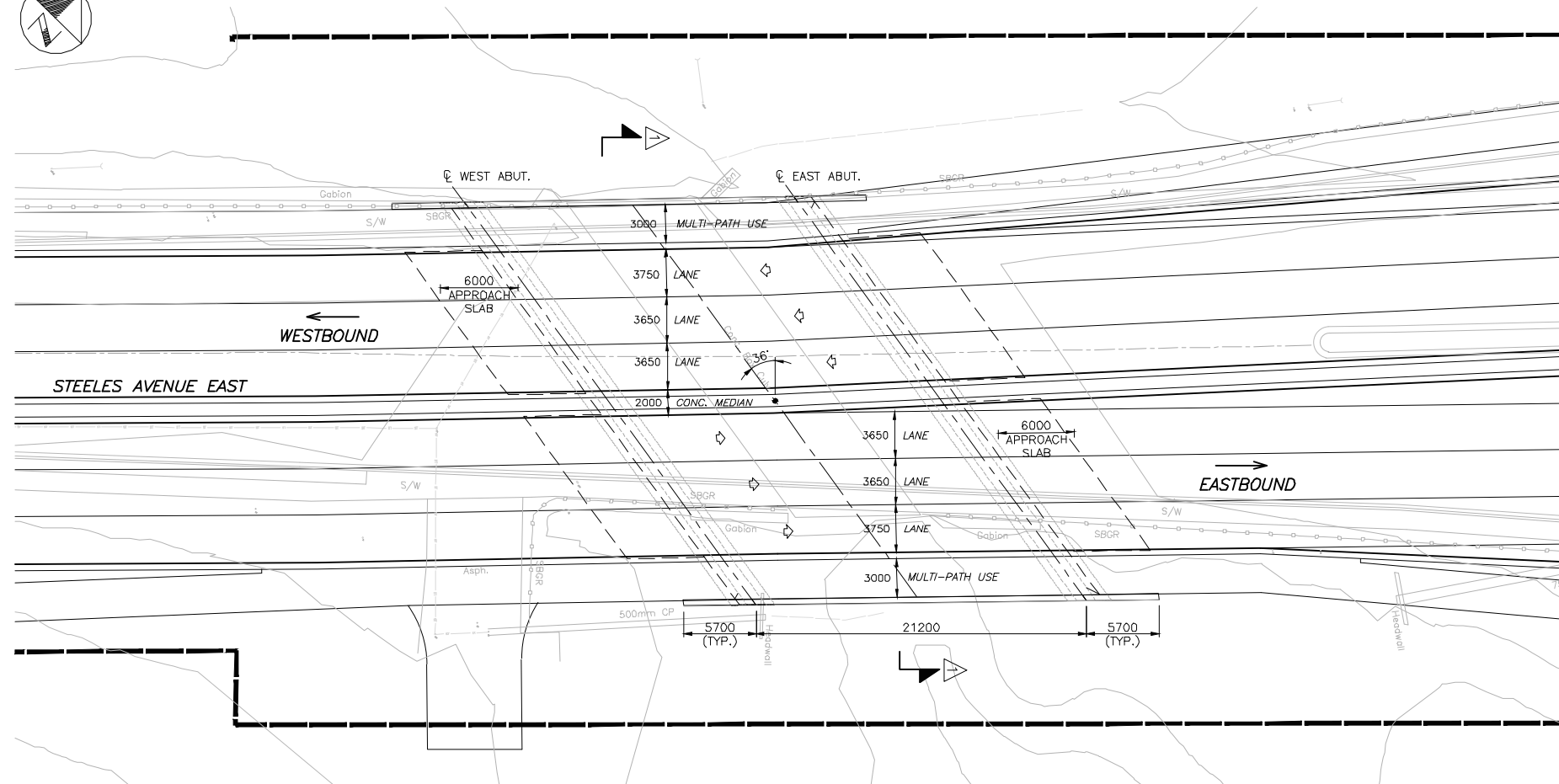
Crossing C3 – Levi's Creek Crossing

Crossing C3 currently consists of a 9.2 m x 2.6 m open footing box culvert. According to the hydraulic modelling and fluvial geomorphology, the culvert is inadequately sized.

To address these issues, the crossing will be replaced with a 20 m span x 2.9 m high x 39.5 m long concrete girder structure. A similar sized structure has recently been completed immediately downstream of the crossing location. A preliminary general arrangement drawing of the proposed structure is shown in Figure 6.11.

The structure will be subject to review and approval by the MNR under the Endangered Species Act and by Credit Valley Conservation. Conversation with MNR and CVC should begin early in the detailed design process to ensure timeframes for construction of this structure are maintained.

Additionally, the gabion wall completed in 2011 from the existing culvert to the western limit of the creek was identified by CVC as an interim solution. As a result, the gabion wall is required to be replaced by a more permanent design. Additional encroachment into the creek will not be permitted, and the detailed design team should ensure the proposed toe of the new retaining wall matches or has reduced encroachment than existing. The details of the wall will be confirmed with CVC during the detailed design phase.



PLAN
SCALE 1:250

GENERAL NOTES

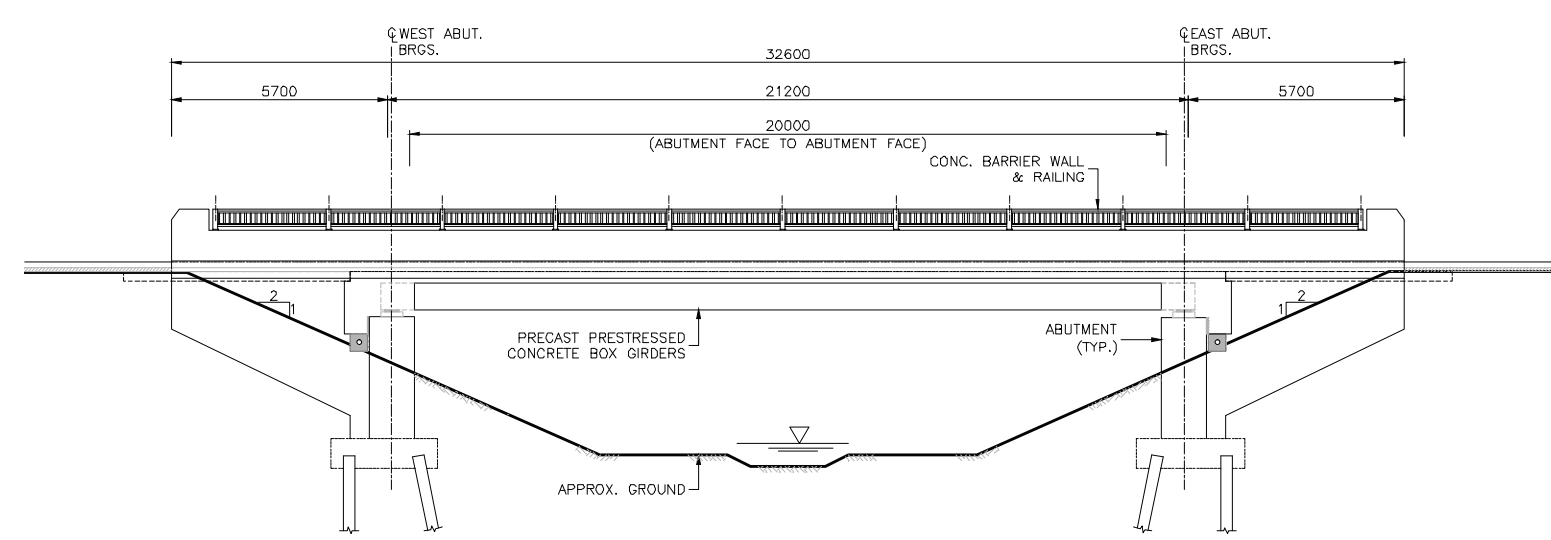
- CLASS OF CONCRETE**
 PRECAST GIRDER.....50 MPa
 REMAINDER.....35 MPa
- CLEAR COVER TO REINFORCING STEEL**
 FOOTINGS 100 ±25
 DECK TOP 70 ±20
 BOTTOM 40 ±10
 REMAINDER 70 ±20 UNLESS NOTED
- REINFORCING STEEL**
 REINFORCING STEEL SHALL BE GRADE 400 UNLESS OTHERWISE SPECIFIED.

GFRP:

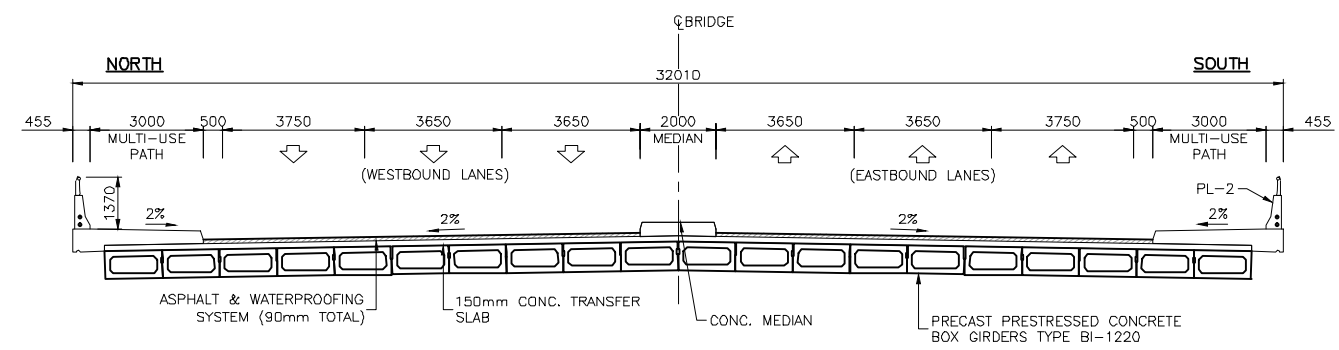
- GLASS FIBRE REINFORCED POLYMER (GFRP) REINFORCING BARS SHALL BE GRADE I, GRADE II, OR GRADE III AS SPECIFIED IN THE CONTRACT DOCUMENTS.
- THE NOMINAL DIAMETER, TENSILE MODULES OF ELASTICITY AND STRENGTH SHALL BE AS SPECIFIED IN THE CONTRACT DOCUMENTS
- BAR MARKS WITH PREFIX GI DENOTE GRADE I GFRP BARS, BAR MARKS WITH PREFIX GII DENOTE GRADE II GFRP BARS, BAR MARKS WITH PREFIX GIII DENOTE GRADE III GFRP BARS.

MIN. GUARANTEED TENSILE MODULUS	
GRADE I	40 GPa
GRADE II	60 GPa

- UNLESS SHOWN OTHERWISE, TENSION LAP SPLICES SHALL BE CLASS B.
- BAR HOOKS SHALL HAVE STANDARD HOOK DIMENSIONS USING MINIMUM BEND DIAMETERS, WHILE STIRRUPS AND TIES SHALL HAVE MINIMUM HOOK DIMENSIONS. ALL HOOKS SHALL BE IN ACCORDANCE WITH THE STRUCTURAL STANDARD DRAWINGS SS12-1.



ELEVATION
SCALE 1:100



TYPICAL BRIDGE SECTION
SCALE 1:100

PRELIMINARY NOT
TO BE USED FOR
CONSTRUCTION

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APPROVALS					Design	K.A.	Checked	K.S.	STEELES AVENUE LEVI'S CREEK CROSSING	GENERAL ARRANGEMENT		Consultant File No.
Municipal		Regional		Drawn	B.L.	Checked		TP111130				
Engineer		Engineer		Scale				Drawing No.				
Date		Date		AS SHOWN				FIGURE 6.11				
No.	DATE	BY	REVISIONS	MAN	CAD	Date	JULY 2013					

Crossing C4 – Tributary to Stormwater Management Facility

The existing crossing has recently been replaced by a 3.6m x 1.2m storm sewer due to development occurring on the north and south sides of Steeles Avenue. No changes are proposed for this structure.

Crossing B1 – Credit River Crossing

The existing 70.0m span bridge structure can accommodate the proposed widening. No other environmental or socio-economic issues were identified. As a result, no changes are proposed for this structure.

However, the embankment to this structure will require widening for an additional lane in both directions along with urbanization of the boulevard to a multi-use path. In consultation with the Credit Valley Conservation authority, it was determined that fill necessary to support the widening would adversely affect the floodplain during major regional storm events. As a result, Mechanically Stabilized Earth Fill (MSE) will be used to eliminate the need to place fill material within the floodplain. The limits of the MSE are shown on Sheets 1 – 26.

6.1.19 Levi's Creek Realignment

A portion of Levi's Creek parallels Steeles Avenue from the existing crossing to approximately Station 9+640, where it bends to the north. The study team identified that the portion of creek in conflict with the road embankment should be shifted away from its existing location. The exact configuration of the creek realignment is to be determined by the detailed design team.

However, the property limits for the relocation of the creek have been determined to ensure land is protected, as shown on Sheet 1-26. The design of the creek relocation is subject to CVC and MNR approval.

6.1.20 Construction Staging and Phasing

Construction of the Mullet Creek Crossing will require staging. The crossing will be constructed in two or three stages, with the north half of the crossing under construction while traffic is diverted to the south. The crossing will likely be constructed while maintaining the existing channel and culvert.

Similarly the construction of the Levi's Creek Crossing will require staging. Temporary lane closures to limit traffic to one lane in either direction are likely. Additionally, temporary diversion of the creek with a dam and pump operation will be required to control flow and sediment through the construction zone.

The horizontal and vertical profile of Steeles Avenue is largely maintained for the length of the project. Widening can take place while maintaining traffic on the existing platform. Traffic would then shift to the new platform, allowing for rehabilitation of the existing platform, and construction of the raised median.

6.1.21 Preliminary Cost Estimate

The preliminary cost estimate for the project, not including utility relocation, is provided in Appendix 'O' – Preliminary Cost Estimate.

6.2 Environmental Issues and Commitments

6.2.1 Land Use

The proposed reconstruction and widening of Steeles Avenue will result in the roadway and associated traffic being brought closer to existing residential and rural land uses. The following impacts to property have been documented within the project limits, and will be reviewed during the detail design process:

- Purchase of property along both sides of Steeles Avenue: Purchase will be completed in accordance with Region policy.
- Driveway reconstruction/grading (both asphalt and gravel): Driveways will be reconstructed to match existing materials.
- Impact to landscape features (fencing, gates and retaining walls): Landscape features will be modified and/or reconstructed as indicated on the preliminary design drawings.
- Impact to or removal of trees and residential landscape planting at various properties along Steeles Avenue: A tree preservation plan and landscape planting plan will be prepared in detail design.
- Coordination with development plans.
- Coordination with detailed design of Financial Drive.
- Coordination with preliminary design of BramWest Parkway and Heritage Road.

6.2.2 Noise

A Traffic Noise Impact Assessment was prepared with the objective to predict future “build” and future “no-build” sound levels from road traffic noise sources in the area (i.e., noise levels with and without the proposed project taking place); to use these predictions to assess potential impacts according to the applicable guidelines; to specify mitigation measures where required; and to assess the potential for construction noise and provide a Code of Practice to minimize potential construction noise impacts (ref. Appendix ‘P’ – Traffic Noise Impact Assessment).

Twenty three (23) representative Noise Sensitive Areas (NSAs) within the study area were assessed including, ten single family houses, two shared family houses (semi-detached), two townhouses and nine future land uses. The sound levels at all receptors are expected to meet the MTO limits, except for two future land uses (NR02 and NR22) as the assessment does not include any noise barrier. However, the Region’s criterion is exceeded at eleven receptors, including future receptors (NR01, NR02, NR03, NR04, NR06, NR07, NR08, NR10, NR11, NR19 and NR22).

Existing Barriers

A review of acoustic reports for the subdivisions on either side of Steeles Avenue indicates that the barriers erected are for noise mitigation purposes. A site visit by AMEC staff confirmed that these barriers have no structural issues or no gaps or cracks that need to be addressed at this time. The modelled sound levels at receptors NR10, NR11 and NR19 exceed the Region’s

criteria by 1 dB with the existing barriers and that at NR07 and NR08 exceed by 3 and 4 dB respectively. However, they all meet the MTO limits.

Recommended Barriers (New)

Based on this assessment, eleven representative receptors required noise barriers and seven of them are proposed developments. Detailed design of the subdivision and/or acoustic assessment for the subdivisions with NR01 through NR04, NR22 were not available. Recommended noise barrier locations, characteristics and effectiveness are evaluated in Table 6.12 below:

Table 6.12: Recommended Noise Barrier Locations, Characteristics and Effectiveness

Barrier ID	Affected Modelled Receptor	No of Affected Residences [1]	Average Reduction (dB)	Barrier Height (m)	Barrier Length (m)	Approx. Barrier Cost Per Receptor (\$) [3]	Economically Feasible? [4]	Technical Feasible?
Bar1a, 1b	NR01, 02, 03	Unknown	7.0	2.2 ^[2]	1,530	N/A	N/A	Unknown
Bar2a, 2b	NR04	Unknown	6.0	2.2 ^[2]	1,080	N/A	N/A	Unknown
Bar3	NR07, NR08	Unknown	4.5	5.0	340	N/A	N/A	Yes
Bar4	NR22	Unknown	8.0	3.0	180	N/A	N/A	Unknown
Bar5	NR06	1	6.0	2.2	45	49,500	Yes	No
Bar6	NR10	22	2.0	3.0	320	21,818	Yes	No
Bar7	NR11	16	2.0	4.0	270	33,750	Yes	No
Bar8	NR19	10	1.5	2.5	90	11,250	Yes	No

- Notes:
- [1] The number of affected residences in the first row of houses which will be protected by the noise barrier.
 - [2] Barrier height may increase to 3.7 m depends on the orientation of the receptor.
 - [3] Based on a barrier cost of \$500 per m² of face area, divided by the number of affected residences and it is applicable for existing receptors only.
 - [4] "Yes" if barrier costs is less than \$75,000 per receptor; else, "No."

Barriers Bar1a, 1b, 2a, 2b, 3 and 4 are for new subdivisions and they should be incorporated in the design and/or land use planning approval. The affected receptor NR06 is an abandoned house and therefore, barrier Bar5 is not warranted. Barriers Bar6, Bar7 and Bar8 are also technically not feasible as they provide only 2 dB additional reduction if the existing barriers are replaced. As per MTO guidelines, mitigation measures should achieve at least 5 dB of attenuation over the first row of affected receivers or 3 dB of attenuation over the first row of affected receivers for upgrading existing barriers.

Construction Noise Impacts

Construction noise impacts are temporary in nature, and largely unavoidable. With adequate controls, impacts can be minimized. However, for some periods of time and types of work, construction noise will be noticeable. This section of the report provides an evaluation of noise

impacts from construction resulting from the undertaking, and discusses guideline and Code of Practice requirements to minimize impacts

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

- All equipment should be properly maintained to limit noise emissions. As such, all construction equipment should be operated with effective muffling devices that are in good working order.
- There should be explicit indication that Contractors are expected to comply with all applicable requirements of the contract and local noise by-laws. Enforcement of noise control by-laws is the responsibility of the Municipality for all work done by Contractors.
- The Contract documents should contain a provision that any initial noise complaint will trigger verification that the general noise control measures agreed to above are in effect.
- In the presence of persistent noise complaints, all construction equipment should be verified to comply with MOE NPC-115 guidelines.
- In the presence of persistent complaints and subject to the results of a field investigation, alternative noise control measures may be required, where reasonably available. In selecting appropriate noise control and mitigation measures, consideration should be given to the technical, administrative and economic feasibility of the various alternatives.

6.2.3 Air Quality

An Air Quality Assessment report (ref. Appendix 'Q' – Air Quality Assessment Report) concluded:

- In the case of Steeles Avenue, it was noted that passenger vehicles comprise the majority of the traffic, with the average fleet profile consisting of 95% passenger cars and 5% heavy duty diesel vehicles (HDDV);
- The potential effect associated with air emissions is an increase in the airborne concentrations of the key pollutants NO_x, PM_{2.5}, PM₁₀, CO, and SO₂, in the vicinity of the project;
- The incremental (project) effects for NO_x, PM_{2.5}, PM₁₀, CO, and SO₂ were predicted to be below the respective ambient air quality criteria;
- Highest effects located proximate to intersections, most significantly Steeles Avenue and Financial Drive;
- Small increment compared with existing baseline;
- Mobile 6.2C considers the gradual fleet replacement as the higher polluting vehicles are removed from service;
- The predicted effects for NO_x were highest for the 2011 scenario, as the NO_x emissions reductions achieved as older vehicles are removed from service were significant and off-set the increased traffic volumes for 2031. Although the emission factors for the other target

pollutants (PM_{2.5}, PM₁₀, CO, SO₂) also decreased over time, the reductions were not as significant as for NO_x and the increased traffic volumes resulted in higher impacts on air quality in 2021 and 2031, but still being in compliance limits;

- The cumulative effects of the roadway PM_{2.5}, NO_x, CO, and SO₂ emissions within the study area and the background concentrations were below the respective ambient air quality criteria for all averaging times under each scenario; and
- The only cumulative effect of the roadway PM₁₀ emissions within the study area and the background concentrations were found to be slightly higher than the respective ambient air quality criteria for the 24-hour averaging times.

Based upon these findings, the future traffic volumes along Steeles Avenue are not expected to have a significant negative cumulative effect on local air quality

6.2.4 Archaeology

A Stage 1 Archaeological Assessment was completed for the study area. It recommended that approximately 80 percent of the study area does not require a Stage 2 Archaeological Assessment as it is either perennially wet, steeply sloped or has had archaeological potential removed by recent earth moving activities related to development within and adjacent to the existing right-of-way. All undeveloped lands that are not perennially wet or steeply sloped (approximately 20 percent of the study corridor) have archaeological potential and warrant a Stage 2 Archaeological Assessment.

The Stage 2 Archaeological Assessment has been initiated, but has yet to be completed. Completion of this additional study will be subsequent to completion of this report.

6.2.5 Built and Cultural Heritage

A Built Heritage Property (BHP) and Cultural Heritage Landscape (CHL) assessment was completed for the study area and determined that three properties that exhibit cultural heritage potential:

- The Creditview Road Corridor Cultural Landscape (listed in 2006 by the Brampton Municipal Register of Cultural Heritage Resources as most significant and worthy of preservation/designation under the *Ontario Heritage Act*);
- Creditdale Farm (designated under the *Ontario Heritage Act*, Part IV), and;
- The Churchville Heritage Conservation District (designated under the *Ontario Heritage Act*, Part V).

Based on the results of the built heritage and cultural heritage landscape assessment of the study area, the following recommendations are made to mitigate project effects on heritage resources:

- i. The Steeles Avenue intersections at Creditview Road and Churchville Road should be engineered to ensure that the heritage character of the Creditview Road Corridor Cultural

Landscape and the Churchville Heritage Conservation District is not removed or unduly impacted. Roadside facilities that would obstruct visibility, such as curbing, sidewalks, traffic lights, noise abatement barriers and so forth, should be avoided or minimized in these two locations, and post-construction landscaping there should employ heritage plants, and heritage themes to help conserve and enhance the heritage resource.

- ii. With respect to the Creditdale Farm property, construction activities should conform to the existing Conservation Plan and respect the Heritage Conservation Easement with the City of Brampton. Roadway improvement activities should minimize any disturbance to the Creditdale Farm property. Roadside facilities that would obstruct visibility, such as curbing, sidewalks, noise abatement barriers and so forth, should be avoided or minimized in this location, and post-construction landscaping there should employ heritage plants, and heritage themes to help conserve and enhance the heritage resource.

An Heritage Impact Assessment (HIA) has been initiated to determine if the proposed design has a negative impact on the areas identified above. The HIA has commenced but is ongoing. Completion of the HIA will be subsequent to completion of this report. After completion, the recommendations of the HIA will be presented to the Churchville Heritage Committee and the City of Brampton Heritage committee for approval. The detailed design team is to verify the recommendations accepted by the various Heritage Committees.

6.2.6 Natural Environment

An Aquatic and Terrestrial Impact Assessment Report (ref. Appendix 'R' – Combined Aquatic and Terrestrial Impact Assessment Report) was completed to document any impacts associated with the proposed design and any proposed mitigation measures.

Vegetation Impacts

The terrestrial impacts are primarily associated with agricultural and developed lands, as well as thicket and meadow communities resulting from, or maintained by, human disturbance. Vegetation within the impact areas is generally herbaceous species, such as grasses and "weedy" non-native plant species. There are some trees which will also be impacted by the proposed works, most of which have been planted.

The Levi's Creek Provincially Significant Wetland Complex is primarily located north of Steeles Avenue, with two wetland areas south of Steeles Avenue. Review of the preliminary design indicates that the edge of one of those wetland areas may be temporarily impacted by grading. However as discussed in Section 6.1.14, a portion of Levi's Creek to the north of Steeles Avenue has the potential to be realigned to the north. If this occurs, the detailed design team should pursue a shift which will eliminate the temporary grading impact to the PSW.

The proposed works transect through the Credit River Valley and cross the River at Crossing C5. The Credit River Valley is designated as a regional Life Science ANSI and is an undeveloped valley that crosses Steeles Avenue near Creditview Road. The preliminary design does not include modifying the Credit River Bridge and will not have inwater works scheduled. Fill associated with the roadway widening will be placed along both north and south ROW's with the Credit River Valley.

Provincially Significant Churchville-Norval Wetland Complex is comprised of several wetlands which lie within vicinity of the Credit River. This PSW complex is located to the north and south of Steeles Avenue. The proposed permanent Steeles Avenue road works will encroach the south edge of one of the wetlands associated with the Churchville-Norval Wetland Complex.

Overall, the project will result in a temporary disturbance of 46,775 m² (4.7 ha) and permanently impact 50,198 m² (5.0 ha) of vegetated land (ref. Table 6.13).

Table 6.13 Vegetation Impacts

ELC Code	Vegetative Community / Land Use	Approximate Area to be Temporarily Impacted (i.e. grading) (m ²)	Approximate Area to be Permanently Impacted (m ²)
Cultural			
OAG	Open Agriculture	12,589	14,858
CUM	Cultural Meadow	4,448	6,595
CUP1	Cultural Plantation	0	17
CUT1	Cultural Thicket	2,288	1,222
CUW	Cultural Woodland	1,128	12
CVC	Commercial and Institutional	7,626	8,443
CVI	Transportation and Utilities	723	1,910
CON	Under Development / Construction	8,198	5,949
CVR	Residential	8,710	10,539
Forest			
FOM	Mixed Forest	1,069	653

Wildlife Impacts

The project area includes cultural land uses and developed lands where common wildlife species were observed. The area has a significant amount of habitat for open country bird species (i.e. those that inhabit/utilize grasslands, fields, agricultural lands for nesting and/or foraging), however the proposed Steeles Avenue improvement works would have a limited impact on habitat for open country species and a large amount of surrounding habitat would remain with no loss or impact.

The proposed road improvements are expected to include culvert extensions along Steeles Avenue. Urban tolerant wildlife species (Cliff Swallow, Barn Swallow) frequently nest in culverts and on bridges and buildings. The proposed culvert works associated with the Steeles Avenue improvements may therefore impact breeding birds.

An impact assessment of the proposed culvert replacement and extension works also indicates possible impact to the Levi's Creek PSW Complex. The two wetlands located south of Steeles Avenue are approximately within 15 to 30 m of current Levi's Creek crossing. Proposed roadway improvement works would decrease the distance to these wetlands. Great Blue Heron (*Ardea herodias*) and a large number of Red-winged Blackbirds (*Agelaius phoeniceus*) and

Canada Geese (*Branta canadensis*) were observed in the area of the Levi's Creek crossing, as well as Green Frog (*Rana clamitans melanota*), all species which prefer wetland habitat. Similarly, Ring-billed Gull (*Larus delawarensis*), Red-winged Blackbird, Canada Goose and Mallard (*Anas platyrhynchos*) were observed in the area of the Mullet Creek crossing, indicating presence of wetland habitat. Limited wetland habitat would be impacted at these locations; the areas may be temporarily impacted by grading.

The Credit River Valley is designated as a regional Life Science ANSI and is located within Peel's Greenlands System as a Core Area. The Credit River Valley crosses Steeles Avenue near Creditview Road and provides significant wildlife habitat for mammals, birds and fish. The preliminary design does not include widening of the Credit River Bridge, however, infilling of the ROW shoulders will impact the Credit River Valley.

Aquatic

The proposed culvert works were assessed to determine project risk of impacts to fish and fish habitat. Preliminary assessment is based on the proposed works and existing fish and fish habitat conditions. Overall, the proposed works planned for Steeles Avenue improvements will result in the removal of commonly planted vegetation species and temporary impacts to wildlife and will likely not result in impact to fish habitat.

Mitigation

Significant Wetlands

An assessment of the proposed works indicates possible impact to wetlands associated with the Levi's Creek Provincially Significant Wetland (PSW) Complex and the Churchville-Norval Wetland Complex as road improvements are located within or adjacent to portions of the PSW. The Credit Valley Conservation Authority (CVC) regulates development and activities in or adjacent to watercourses, wetlands and PSWs. Prior to the detailed design stage, it is recommended that the evaluated and unevaluated wetland boundaries be flagged for confirmation by CVC staff. The identification of these boundaries will allow for an accurate assessment and quantification of impacts in addition to identifying mitigation and restoration opportunities.

Birds

In order to minimize the potential for incidental take of any nesting migratory birds, clearing of vegetation and any proposed work activities in migratory bird habitat must be undertaken outside of the active breeding season (May 1 to August 1 for Southern Ontario). In the event clearing (or other work) is required during the nesting season, a nest survey must be conducted by a qualified avian biologist immediately (i.e., within 2 days) prior to commencement of the works to identify and locate active nests of species covered by the Migratory Bird Convention Act.

Barn Swallow is provincially designated as Threatened and is therefore protected under the provincial species at risk legislation, which prohibits destroying critical or essential habitat for threatened and endangered SAR. In order to avoid adverse affects to Barn Swallow and its habitat, mitigation measures for Barn Swallow should be applied where feasible including adhering to breeding bird season restrictions. Buildings, bridges, culverts and other structures

which will be affected by construction, should be inspected for nests by a qualified biologist prior to any construction activity commences. Preventative measures to prevent bird access to the structures prior to nesting season may include physical obstructions such as netting. Additionally, if vegetation clearing is kept outside of the breeding bird season, effects to ground nesting species will be minimal. All areas should be surveyed for nests prior to any clearing.

Fish

In-water construction scheduling should consider timing restrictions for fish habitat where appropriate; warmwater habitat present at Crossing C1 would require in-water construction to be completed within the window of July 1 to March 31. Coolwater habitat present at the Credit River Bridge crossing B1 would require in-water construction to be completed within the window of June 15 to September 15. Redside Dace protection requires timing restrictions for Crossings C3, and the west branch of Levi's Creek (north of Steeles Avenue) and Churchville Tributary 8B of the Credit, where in-water construction must be completed between July 1 and September 15.

More stringent Erosion and Sediment Control (ESC) measures are to be applied at Redside Dace protected watercourses. The ESC measures which will be applied include:

- Installation of a double row of heavy duty silt fencing;
- Use of combined filter socks and filter rings for discharge from dewatering activity; and,
- Any additional special requirements which would be included and an ESA 17(2)(c) permit.

The Ministry of Natural Resources (MNR) has reported Levi's Creek (C3 and the west branch of Levi's Creek (north of Steeles Avenue)) as designated Redside Dace 'Recovery' habitat under Endangered Species Act 2007 (ESA). Redside Dace is protected provincially as "Endangered" and federally as "Schedule 3 – Special Concern". Additionally, the Churchville Tributary 8B of the Credit, a permanent braided channel within a wetland located north of Steeles Avenue, has been designated by MNR as Redside Dace 'Occupied' habitat, which is protected under ESA. ESA 17 (2)(c) permits will be required to complete work in Redside Dace protected habitat watercourses.

The disturbance or removal of riparian vegetation is to be minimized in order to maintain shading on the watercourses. In riparian and aquatic habitats, all temporarily disturbed areas will be reinstated to original condition, or better, upon completion of works.

Vegetation

An assessment of the preliminary design indicates that the proposed works are primarily within the existing ROW, with the majority of vegetation clearing involving herbaceous plants, such as grasses and "weedy" non-native plant species. There are also trees which will be impacted by the proposed works, most of which are planted exotic and/or invasive species. The removal of these species is not of conservation concern.

The following mitigation measures are identified to limit impacts on any trees or forests close to project works: tree protection fencing should be installed (where possible) beyond the forest drip edge to be retained; herb and shrub layer should be left intact whenever possible; temporarily disturbed areas should be restored; and, where applicable, disturbance widths are to be minimized by reducing temporary work areas, limiting equipment storage areas and vehicle

turning points. Operational Provincial Standard Specification (OPSS) 801 (November 2010) identifies specification for the protection of trees.

Temporarily disturbed areas (i.e., those to be graded) should be restored and include seeding/planting with appropriate native species consistent with Credit Valley Conservation Authority restoration requirements.

Erosion and Sediment Control (ESC)

During construction, standard ESC measures (e.g., silt fence, silt curtain, sedimentation basins, etc.) should be applied consistent with Best Management Practices OPSS, and MOE Guideline B-6. These measures will be taken to prevent erosion, and to reduce the release of sediment entering a watercourse and surrounding environment. All reasonable preventative measures are to be taken to control erosion at the source.

Appropriate ESC measures are to be implemented prior to the removal of vegetation, particularly near watercourses. Standard ESC measures will be applied which meet or exceed Ontario Provincial Standards and Specifications (OPSS). Stringent ESC measures are to be applied at watercourses which are Redside Dace protected. The control measures shall be implemented prior to work and be maintained during construction and until disturbed areas have been effectively stabilized with permanent vegetation cover.

6.2.7 Landscape Features

An aesthetic/streetscaping plan and associated report (ref. Appendix 'T' – Streetscaping Report) was completed by McWilliam and Associates, which is summarized below:

The undertaking will have some impacts on existing trees along Steeles Avenue. The impacts will be limited to a few trees that appear to be remnants of woodlots located close to the exiting roadway. It is anticipated that the landscaped strips that have been installed along the frontages of the new subdivisions, institutional and commercial developments along Steeles Avenue should not be impacted by the undertaking.

It is noted that none of the trees observed along this section of the Steeles Avenue corridor are identified as significant specimen trees or rare species. Although the proposed undertaking will require the removal of some existing trees, the reconstruction of this portion Steeles Avenue will provide an opportunity to improve the overall aesthetics of this major thoroughfare, with a comprehensive streetscaping/tree planting plan.

For detailed design, a vegetation assessment, tree preservation and protection plan, and a planting/streetscaping plan should be completed for detailed design to the guidelines outlined in Appendix 'T'.

6.3 Monitoring

During construction, the Region of Peel will review the implementation of mitigation measures and key design features, to confirm that they are consistent with the contract and with commitments made. All Region of Peel construction projects are subject to daily on-site inspection. Additionally, the crossings are to be monitored post-construction for wildlife passage. Further remediation may be required if steps taken to direct wildlife towards the crossing are not successful.

7.0 SUMMARY OF ENVIRONMENTAL EFFECTS, PROPOSED MITIGATION, COMMITMENTS TO FURTHER WORK

Table 7.0. Summary of Environmental Effects, Proposed Mitigation, Commitments To Further Work

ID	Details	Expressed By	ID	Details
1	Air Quality	Region	1.1	The contractor will be required to limit and control dust during construction
2	Surface Water Quality	Ministry of the Environment CVC Region	2.1	Mitigation measures for erosion and sedimentation from construction operations will be included in the contract and implemented. An erosion and sedimentation control plan will be submitted to the CVC during detail design. Work will be controlled to prevent the entry of any deleterious materials to watercourses and located downstream of the study area. Refuelling of all vehicles and equipment will be conducted away from the watercourse to prevent any material from entering the watercourse. Any material (excavated soil, sediment, and backfill material) that is removed during construction will be placed above the high water mark and contained in a manner to ensure sediment will not enter the watercourse.
			2.2	All spills that could potentially cause damage to the environment will be reported to the Spills Action Centre of the Ministry of the Environment. A detailed protocol will be developed during detailed design to be implemented during construction if an incidence should occur.
			2.3	Stormwater management (quality control) will be implemented as per recommendations in this report. All recommendations are required to be confirmed in a stormwater management report completed during detailed design.
3	Fisheries/Watercourse	CVC MNR DFO	3.1	A Fisheries Act authorization may be required, and an Endangered Species Act 17C permit will be required, for the Levi's Creek crossing and at the Churchville Tributary 8B of the Credit. The 17C permit, which is issued by the Ministry of Natural Resources, will require that a Redside Dace Overall Benefit proposal be developed prior to its issue.
			3.2	A small section of Levi's Creek from the crossing westerly to the end of the existing gabion wall is to be shifted northerly. The detailed design team shall determine the exact configuration of the channel using the parameters outlined in this report.
			3.3	The existing gabion wall is to be replaced with a permanent retaining structure.
			3.4	The proposed design encroaches onto the Levi's Creek Wetland Complex and the Churchville-Norval Wetland Complex. An investigation in consultation with CVC will be completed during detailed design to determine the exact limits of the wetland complexes, and the associated impact limits and mitigation plan.
4	Property Impacts	Residents Region City	4.1	All impacts to private property will be mitigated where appropriate as documented within this report.
5	Landscaping and Vegetation		5.1	Removal of vegetation and disturbance of soils will be minimized.
			5.2	A Landscape/Streetscaping Planting Plan and Tree Preservation Plan will be prepared during detail design.
			5.3	All tree and shrub plantings within the corridor are to be salt-tolerant, non-invasive, low maintenance, disease/pest resistant and drought resistant
			5.4	The planting of new trees along the corridor is to be coordinated with existing and proposed utility corridors and light standards
			5.5	Proposed boulevard trees are to be planted within the Region's right-of-way. Compensation planting on private property, if required, will be coordinated with the land owner.
			5.6	Construction impacts at stream crossing areas are to be mitigated with the planting of riparian vegetation. This vegetation should be native, non-invasive, riparian vegetation, as approved by CVC.
			5.7	Trees to be planted near overhead utilities to be selected to conform to mature height limitations (Hydro approved species)
			5.8	New street trees to be installed as per the Region of Peel 'Regional Streetscape Policy'
6	Traffic and Access	Residents Region	6.1	A construction staging plan will be prepared at the detail design stage.
			6.2	Access to existing residential and business entrances will be maintained during construction.
			6.3	All entrances will be reconstructed with similar material as existing conditions.
7	Pedestrians/Cyclists	Residents	7.1	A multi-use path on both sides of the road will be constructed along Steeles Avenue

Table 7.0. Summary of Environmental Effects, Proposed Mitigation, Commitments To Further Work

ID	Details	Expressed By	ID	Details
8	Utilities	Utility Companies	8.1	Conflicts with utilities will be reviewed during the detail design phase. Relocation or protection of utilities will be required.
9	Noise	Region Residents	9.1	No traffic noise mitigation measures are required along Steeles Avenue
			9.2	Construction noise control measures to be implemented in accordance with Region bylaws. General noise control measures to be referred to, or placed into the contract documents.
10	Property Requirements	Region	10.1	Property purchase requirements to be minimized where possible. Compensation for property purchase in accordance with the Regional policy.
11	Archaeology	Ministry of Culture, Citizenship and Recreation	11.1	A Stage 1 Archaeological Assessment was completed for this project and a Stage 2 Archaeological Assessment is warranted on sections of the proposed works located beyond the road right-of-way. The Stage 2 Archaeological Assessment will be completed subsequent to this study.
			11.3	If any archaeological artefacts are located during construction, work in the area will cease and the Ministry of Culture will be contacted. The Ministry of Culture and the Registrar of the Cemeteries Regulation Unit will be contacted in the event that human remains are encountered during construction.
12	Wildlife	CVC MNR	12.1	Removal of trees is limited to outside the nesting period of April 15 to July 15, or completion of a nesting survey by a qualified avian ecologist will be required, to identify and temporarily protect active nests.
			12.2	Locally rare/uncommon species were identified. Opportunities to relocate or to avoid are required.
			12.3	Barn Swallows were observed in the area. Protection of habitat is required.
			12.4	The crossings are to be monitored post-construction for wildlife passage. Further remediation may be required if steps taken to direct wildlife towards the crossing are not successful.