HARVIE ROAD / BIG BAY POINT ROAD / HIGHWAY 400
TRANSPORTATION IMPROVEMENTS (BRYNE DRIVE TO
BAYVIEW DRIVE) MUNICIPAL CLASS ENVIRONMENTAL
ASSESSMENT, PHASES 3 AND 4

ENVIRONMENTAL STUDY REPORT

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EXECUTIVE SUMMARY

A. Introduction

Purpose of Study

The Corporation of the City of Barrie is undertaking this Study that is consistent with the Municipal Class Environmental Assessment (Class EA) Schedule C process to identify and assess the required transportation improvements to Harvie Road and Big Bay Point Road in the area of Highway 400.

Study Area

The study area includes Harvie Road/Big Bay Point Road from Bryne Drive to Bayview Drive, the Essa Road interchange, the proposed Harvie / Big Bay / 400 Crossing interchange, and the Mapview Drive interchange.

Study Organization

A consultant team led by Morrison Hershfield Limited carried out the Environmental Assessment Study, on behalf of the City of Barrie. MTO, LSRCA, other agencies and the public were extensively consulted throughout this process.

B. Background Information

In December 2013, the City of Barrie approved the Multi-Modal Active Transportation Master Plan (MMATMP) which serves as the City's roadmap in developing a well-balanced transportation network to serve its future needs and development. A new highway crossing at Harvie Road / Big Bay Point Road was recommended as a high priority for implementation. In addition, the TMP recommends a new Highway 400 interchange at Big Bay Point Road. The needs/justification and property requirements for a potential interchange will be established/refined through a future Class EA study. The micro modeling completed as part of Phase 1 and 2 report by Delcan was updated by WSP as part of the MMATMP. The MMATMP recommendations differed from previous recommendations as follows:

- 3 lanes on Harvie Road between Essa Road and Veterans Drive
- 5 lanes on Harvie Road between Veterans Drive and Bryne Drive
- Buffered bike lanes on Harvie Road/Big Bay Point Road between Essa Road and Bayview Drive
- Partial Interchange (no north bound on ramps)

C. Phase 1 and 2 of the Class EA

Alternative Solutions

The following alternative solutions were developed during Phase 2 of the Class EA:

Alternative Solution 1 – Do Nothing Alternative
Alternative Solution 2 – Build a Highway 400 Crossing Connecting Harvie Road and Big Bay Point Road
Alternative Solution 3 – Implement a New Highway 400 Interchange at Harvie Road and Big Bay Point Road
Alternative Solution 4 – Limit Future Growth and Development
Alternative Solution 5 – Transportation Demand Management
Alternative Solution 6 – Update Other Roadways

Selection of the Preferred Planning Solution

Following the first Public Information Centre (PIC) that was held on Wednesday November 17, 2010 and in consideration of all concerns and comments raised by the reviewing agencies and public, Alternative Solution 2 with property protection for a future interchange was selected as the preferred alternative and endorsed by Council through motion 12-G-049.

D. Phase 3 and 4 of the Class EA

The following design alternatives were developed during Phase 3 and 4 of the Class EA:

Design Alternative 1 – Do Nothing Alternative
Design Alternative 2a – Harvie Road / Big Bay Point Road Crossing Over Highway 400 & Over Railway Crossing & Standard Geometrics
Design Alternative 2b – Harvie Road / Big Bay Point Road Crossing Over Highway 400, Remove Railway Crossing & Reduced Geometrics
Design Alternative 3a – Harvie Road / Big Bay Point Road Crossing Under Highway 400, At Grade Railway Crossing & Standard Geometrics
Design Alternative 3b – Harvie Road / Big Bay Point Road Crossing Under Highway 400, At Grade Railway Crossing & Reduced Geometrics
Design Alternative 3c – Harvie Road / Big Bay Point Road Crossing Under Highway 400, Raising Highway 400, At Grade Railway Crossing & Reduced Geometrics

Public Information Centre (PIC #2)

The second Public Information Centre (PIC #2) was held on Thursday April 23, 2015, from 4:00pm to 7:00pm, at Holly Community Centre, 171 Mapleton Ave., Barrie, ON in the Multi-Purpose Room on the 2nd Floor. Ninety-two (92) people signed the attendance register at the PIC.

The PIC #2 presented the alternative designs and evaluation to the public to obtain comments and suggestions received from the public and agencies. The public preferred the design alternative Highway Crossing over Highway 400.

Evaluation and Assessment of the Design Alternative

The design alternatives developed to correct the deficiencies were screened with respect to their impact on the technical, physical, social/cultural, natural, and economic environments. The assessment process compares various alternatives to the undertaking in a comprehensive manner by ensuring that the conclusions and recommendations are reached in a clear and logical fashion, and that all environmental issues sensitive to each undertaking are given thorough consideration. The design alternatives were assessed under each criterion individually and the overall effectiveness of the alternative was determined.
E. Selection of the Preferred Design Alternative.

In consideration of all concerns and comments raised by the reviewing agencies and public, the alternative designs were evaluated and assessed by the Project Team in order to identify a preferred design. The evaluation concluded that a modified implementation of Alternative 2b as the preferred design alternative.

The preferred design alternative for the Harvie Road / Big Bay Point Road Crossing includes the following:

- Harvie Road / Big Bay Point Road Crossing Over Hwy 400
- Removal of the existing railway crossing on Big Bay Point Road between Bayview Road and Fairview Road
- Reduced Geometrics west of Bryne Drive to be considered as part of the update to the Harvie Class EA between Veteran’s Drive and Bryne Drive and standard geometrics elsewhere.
- Buffered bike lanes and sidewalks on both sides
- 5 lanes in the interim and 7 lanes ultimate between Bryne Drive and Bayview Drive
- protection of land for a potential future Highway interchange

F. Construction Staging

The following options were assessed from a staging and cost perspective in part to document the decision making process:

<table>
<thead>
<tr>
<th>Options</th>
<th>Stage 1</th>
<th>Stage 2</th>
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<td>Option 1</td>
<td>5 lane crossing over 6 lane Hwy 400</td>
<td>7 lane crossing and interchange ramps over 10 lane Hwy 400</td>
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<td>7 lane crossing over 10 lane Hwy 400</td>
<td>Interchange ramps</td>
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Recommended Construction Staging Strategy

The recommended construction staging strategy is Option 1 due to the lowest net present value and benefits from not building a structure that will not be required for at least 25 years until Hwy 400 is widened. Option 1 includes the following components:

- Relocation of above and underground utilities in conflict with the proposed road widening. This will include relocation of above ground utility pole, and other above and underground utility services;
- Stage 1 Construction – interim 5 Lane Harvie Road-Big Bay Point Road Crossing over the existing 6 lane Highway 400 or realigned six lane Highway 400 approximately 3.4m to the east.
• Stage 2 Construction - ultimate 7 Harvie Road-Big Bay Point Road Crossing over the widened 10 lane Highway 400 and interchange ramps.

The construction staging will be further developed during the detail design stage of the project. The crossing will be designed for the ultimate 7 lane configuration but constructed for 5 lanes in the interim.

G. Preferred Design Alternative Cost Estimates

The construction is anticipated to be undertaken in two phases. Phase 1 would be the interim 5 Lane Harvie Road-Big Bay Point Road Crossing over the existing or realigned 6 lane Highway 400. Phase 2 would be the ultimate 7 Harvie Road-Big Bay Point Road Crossing over the widened 10 lane Highway 400 and interchange ramps.

The total cost of constructing the interim 5 Lane Harvie Road-Big Bay Point Road Crossing over the existing 6 lane Highway 400 is estimated to be approximately $24 million.

The total additional cost of constructing the ultimate 7 Harvie Road-Big Bay Point Road Crossing and interchange over 10 lane Highway 400 including interchange ramps is estimated to be approximately an additional $31 million.

Due to the shifting of Highway 400 at McKay, additional cost for highway realignment may be required and it will be confirmed at detail design.

The estimated cost includes 15% Design, 10% utility relocation, 30% Contingency, and 1.76% HST. The costs are based on Barrie road costs and 2011 MTO Parametric Estimating Guide. These figures are expressed in 2015 dollars and do not carry any escalation allowance for work undertaken in future fiscal periods.

Detail design is required to assess and provide additional detailing to provide a more accurate cost estimate based on a final detailed design. Details of the cost estimates for the preferred alternative design are provided in Appendix G. The recommended construction staging strategy is Option 1. A lifecycle cost analysis comparing cost for each staging option is provided in Appendix H. Option 1 has the lowest net present value and benefits from not building a structure that will not be required for at least 25 years until Highway 400 is widened.

The Table below summarizes the total 2015 cost including the interim and ultimate construction stages.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Cost ($ millions)</th>
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<tr>
<td>Stage 1 - Interim</td>
<td>$24 M</td>
</tr>
<tr>
<td>Stage 2 - Ultimate</td>
<td>$29 M + $2 M Staging Cost on Harvie Road</td>
</tr>
<tr>
<td>Total</td>
<td>$55 M</td>
</tr>
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</table>

H. Property Impacts

Property takings will be required to implement the Highway 400 crossing and it is based on the ultimate 7 Harvie Road-Big Bay Point Road Crossing over 10 lane Highway 400 design. Outside of the existing ROW’s property is privately owned exception of the parcel south of the Highway 400 Service Centre, east of Highway 400, west of Fairview Road and north of the Big Bay Point Road ROW which is owned by MTO.
Additional property will be required for the future interchange. Since the interchange configuration will not be finalized until after completion of the Highway 400 TESR Update, it is important that a conservative approach be taken to protect for a potential future interchange, which will be subject to future Class EA. The City may seek to acquire the lands impacted by the future interchange as part of development approval on the affect properties. Refer to Appendix B for the property to be protected associated with the proposed interchange.

The final property required to implement the interchange will be dependent on the proposed ramp design which will require confirmation through an update to the Traffic Report and additional weaving and safety analysis.

I. Permits and Approvals

Whiskey Creek has been identified as supporting a sensitive cold water fishery in its downstream reaches but is considered degraded within the project area with a SWM Pond recently built immediately upstream of the study area. All proposed project work has to follow the timing windows identified by LSRCA, as well as the mitigation measures listed in this report, in order to mitigate impacts to Whiskey Creek. Further assessment of the preferred alternative at detailed design is required, to determine if “serious harm” to fish and fish habitat will result under Section 35 of the Fisheries Act.

A permit from Lake Simcoe Region Conservation Authority will be required, under the regulation Development, Interference with Wetlands and Alterations to Shorelines and Watercourses”

Potential habitat exists within the study area for four species protected under the Endangered Species Act. Vegetation removals should be assessed for bird nesting habitat and/or bat maternity colonies prior to removal and, in the instance that a nest or maternity colony is encountered, consultations with Ministry of Natural Resources should be undertaken to determine the need for a permit or approval.

The removal or destruction of any nest of a migratory bird protected under the Migratory Birds Convention Act may require approval from Environment Canada – Canadian Wildlife Service.

As part of the detailed design phase of this project, permit from Ministry of the Environment and Climate Change (MOECC) will be required to Take Water, Certificate of Approval for Storm, Sanitary and Watermain construction.

As part of the detailed design phase of this project, permit from the Ministry of Transportation of Ontario (MTO) will be required for any works within the CAH limits.

J. Conclusions

This Environmental Study Report presents the results of the Environmental Assessment Study and concluded that Harvie Road / Big Bay Point Road Crossing linking Harvie Road to Big Bay Point Road shall go over the existing Highway 400 and also recommended removing the existing railway spur (modified version of Alternative 2b).

The project was found to be feasible with no major impediments or unacceptable environmental impacts. It conforms to the requirements for Schedule ‘C’ projects, in accordance with the Municipal Engineers Association, Municipal Class Environmental Assessment (October 2000, as amended in 2007 and 2011).
Next Steps

Following the completion of the PIC, and in consideration of all concerns raised through review agency and public comment, the preferred alternative design solution was identified and appropriately documented in the ESR. The ESR and accompanying recommendations will then be presented to the City of Barrie General Committee of Council for endorsement. Those individuals and parties that requested to be kept informed of the Class EA process will be notified of the date that Council may approve the preferred alternative design solution so that deputations to Council can be made.

Following approval by Barrie City Council, the Final Draft ESR will be placed on the public record for a period of at least 30 calendar days and be available for review by the public or any other interested parties with a Notice of Completion being issued.

If concerns are raised during the Class EA process which cannot be resolved in discussion with the Corporation of the City of Barrie, the Ministry of the Environment may be requested to make an Order for the project to comply with Part II of the Environmental Assessment Act (referred to as a Part II Order). Requests for a Part II Order must be received by the Ministry of the Environment within 30 days of the publication of the Notice of Completion. A copy of the request must also be sent to the City of Barrie Engineering Department (see contact information below).

The Honourable Glen R. Murray
Minister of the Environment and Climate Change
77 Wellesley Street West
11th Floor, Ferguson Block
Toronto, ON M7A 2T5

Mr. Ralph Scheunemann, P. Eng.
City of Barrie, Engineering Department
P.O. Box 400
70 Collier Street, 6th Floor
Barrie, ON L4M 4T5

Following the successful completion of the Class EA process, and providing no Part II Orders have been received, it would be the City’s intention to proceed to detail design for the Highway Crossing subject to available budgets.
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- Cost Estimate for Harvie Road / Big Bay Point Road Crossing Under Highway 400 (Alternatives 3a, 3b and 3c)
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- PIC #2 Comments and Emails
Summary of PIC #2 Comments and Responses
Meeting Minutes

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- Preferred Design Alternative Profile
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- Ultimate Typical Section: MTO Standard Geometrics
- Interim Typical Section: City of Barrie Standard Geometrics
- Ultimate Typical Section: City of Barrie Standard Geometrics
- Interim Typical Section: Reduced Geometrics
- Ultimate Typical Section: Reduced Geometrics

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1. INTRODUCTION AND BACKGROUND

1.1 Introduction

The Corporation of the City of Barrie is undertaking this Study that is consistent with the Municipal Class Environmental Assessment (Class EA) process to identify and assess the required transportation improvements to Harvie Road and Big Bay Point Road in the area of Highway 400.

MH completed the Phase 1 & 2 Environmental Study Report in January 2012 (please refer to the Phase 1 & 2 Environmental Study Report for further information). The report is available on the City of Barrie web page (www.barrie.ca\eastudies) under Big Bay Point Road/Harvie Road/Highway 400 Transportation Improvements Class EA Phase 1 & 2.

In July 2013, MH was retained to complete Phase 3 & 4 of the Class EA process with respect to the Harvie Road and Big Bay Point Road crossing. This Phase 3 and 4 Environmental Study Report was built on the Phase 1 and 2 Environmental Study Report and reviews the study background, existing and future conditions within the study area, existing and future projected conditions within the study area, existing and future traffic data and the alternatives solutions. In addition, the ESR reviews and presents the results from Public Information Centre (PIC) #2, the final preferred design and recommendations for construction. The report is available on the City of Barrie web page (www.barrie.ca\eastudies) under Harvie Road/Big Bay Point Road/Highway 400 Transportation Improvements (Bryne Drive to Bayview Drive) Phase 3 & 4 Municipal Class EA.

1.2 Project Scope

The overall objective of this report is to document the planning process for the proposed transportation improvements in the study area. The objectives of this project are as follows:

- Identify the problem or opportunity;
- Identify alternative planning solutions to the problem or opportunity;
- Perform an inventory of the physical, social / cultural, natural, and economic environment;
- Identify impacts of the alternative solutions on the environment and provide mitigating measures;
- Evaluate alternative solutions and identify recommended solutions;
- Consult the reviewing agencies and the public regarding the problem or opportunity and alternative solutions;
- Identify design alternatives;
- Obtain public input and comments;
- Prepare preliminary project costs and property requirements and identify appropriate mitigating measures;
- Liaise with other jurisdictions affected by this undertaking; and

1.3 The Municipal Class Environmental Assessment (Class EA)

The Environmental Assessment Act of Ontario (EAA) provides for the protection, conservation, and wise management in Ontario of the environment. The EAA applies to municipalities and to activities including municipal road projects. Activities with common characteristics and common
potential effects may be assessed as part of a “class”, and are therefore approved subject to compliance with the approved Class Environmental Assessment (EA) process.

This process provides a rational planning approach to consider the environmental and technical advantages and disadvantages of alternatives and their trade-offs to arrive at a preferred alternative for addressing the problem (or opportunity). The Municipal Class EA is an approved planning document that describes the process that must be followed by Municipalities to meet the requirements of the Ontario EA Act.

The Class EA process places emphasis on both project assessment and on public and agency involvement and consultation, and encourages stakeholder participation throughout the process to resolve all project related issues and concerns. If concerns are raised that cannot be resolved through discussion with the City of Barrie, a “Part II Order” request may be submitted to the Minister of the Environment.

Municipal infrastructure projects are classified in the Class EA in terms of one of the following schedules:

Schedule ‘A’ Projects that are limited in scale have minimal adverse environmental effects and include the majority of municipal road maintenance, operation, and emergency activities. These projects are pre-approved and therefore, a municipality can proceed without further approval under the EA Act.

Schedule ‘A+’ Projects that have the potential for local environmental impacts and generally includes the rehabilitation of existing facilities. These projects are pre-approved but require notifying the affected public.

Schedule ‘B’ Projects that have the potential for some adverse environmental effects. These projects are approved subject to a screening process, which includes directly contacting affected public and relevant review agencies.

Schedule ‘C’ Projects that have the potential for significant environmental effects that must proceed under the planning and documentation procedures outlined in the Municipal Class EA document.

This project is being completed as a Schedule “C” project. The preparation of an Environmental Study Report (ESR) is required for Schedule ‘C’ projects. This ESR is filed for a minimum 30 day public review period.

The Municipal Class EA process is shown in Figure 1-1 and includes the following basic phases for a Class “C” project. Figure 1-1 is from the Municipal Class Environmental Assessment manual written by the Municipal Engineers Association in June 2000, as amended in 2007 & 2011.

MH completed the Phase 1 & 2 Environmental Study Report in January 2012. Please refer to the Phase 1 & 2 Environmental Study Report for further information on the City of Barrie web page (www.barrie.ca/capeastudies). This report summarizes the Phase 1 & 2 Class EA report and documents the Phase 3 and 4 Class EA process.
Figure 1-1 - Municipal Class Environmental Assessment Design and Planning Process
1.4 Study Area

The study area includes the Essa Road interchange, the proposed Harvie / Big Bay / 400 Crossing interchange, and the Mapleview Drive interchange (refer to Figure 1-2).

1.5 Project Background

The MTO has completed a Planning and Preliminary Design Study and recommended transportation improvements to address traffic operation, capacity, and safety needs associated with the Highway 400 corridor through Barrie. The 2004 Highway 400 TESR and 2005 Preliminary Design Report (PDR) called for eight lanes but protection for ten lanes at Harvie Road and Big Bay Point Road.

The City of Barrie undertook the Highway 400 Crossing Roads Class Environmental Assessment consistent with the Municipal Class Environmental Assessment (Class EA) process
to identify and assess required improvements to the eleven road corridors within the City that cross Highway 400. The study consisting of Phases 1 and 2 of the EA process was completed in June 2005. As per Motion 05-G-343, a crossing between Harvie Road and Big Bay Point Road consisting of 6 through lanes and 1 turning lane for a total of 7 lanes was identified in the EA as a recommended improvement.

Phase 1 and 2 of the Bryne Drive MP, which was completed in December 2005, identified the potential for an interchange in the study area and noted that the proposed interchange will affect the proposed alignment of Bryne Drive. The update to the Bryne Drive MP (to assess alternative Bryne Drive alignments) is currently on hold. The preferred alternative, approved by Council by Motion 06-G-005 in December 2005, is a five lane roadway.

In 2006, the Harvie Road/Big Bay Point Road Feasibility Interchange Study was conducted by TSH (now Aecom) with input from the City of Barrie and The Ministry of Transportation (MTO) to review the feasibility of providing a new interchange on Highway 400 at the Harvie Road/Big Bay Point Road crossing. This report was never finalized but the draft report suggested that a new interchange on Highway 400 was feasible and examined several different interchange configurations.

A Class EA has been completed for Harvie Road between Bryne Drive and Essa Road and the preferred design alternative, approved by Council by Motion 02-G-534, is a four lane roadway.

A Class EA has been completed for Whiskey Creek in October 2009. The preferred alternative calls for regional storm conveyance under Highway 400, Bryne Drive and Harvie Road and was approved by Council by Motion 09-G-418.

MH was retained to reassess Phase 2 of the Class EA process with respect to the Harvie Road and Big Bay Point Road crossing. MH completed the Phase 1 & 2 Environmental Study Report in January 2012. Both the macro and micro modelling was done as part of this study. The City of Barrie in consultation with Morrison Hershfield retained the firm of Delcan to use the 2031 traffic demands from the City’s macro model (in Emme 3) and the Aimsun software to develop the scenarios for the year 2031, which included future transportation improvements identified in the City of Barrie 1999 Transportation Master Plan.

In December 2013, The City of Barrie approved the Multi-Modal Active Transportation Master Plan (MMATMP) which serves as the City’s roadmap in developing a well-balanced transportation network to serve its future needs and development. A new highway crossing at Harvie Road / Big Bay Point Road was recommended as a high priority for implementation. In addition, the TMP recommends a new Highway 400 interchange at Big Bay Point Road. The needs/justification and property requirements for a potential interchange will be established/refined through a future Class EA study. The micro modeling completed as part of Phase 1 and 2 report by Delcan was updated by WSP as part of the MMATMP. The MMATMP recommendations differed from previous recommendations as follows:

- 3 lanes on Harvie Road between Essa Road and Veterans Drive
- 5 lanes on Harvie Road between Veterans Drive and Bryne Drive
- Buffered bike lanes on Harvie Road/Big Bay Point Road between Essa Road and Bayview Drive
- Partial Interchange (no north bound on ramps)
Highway 400 improvements are presently under study by MTO under the Highway 400 TESR addendum. The MTO Highway 400 TESR Update is scheduled to be completed in 2015 and will provide guidance on the proposed alignment shift of Highway 400 associated to the 10 lane widening and any provide guidance on any additional transportation improvements at the adjacent Essa and Mapleview Interchanges.

1.6 Problem or Opportunity

The City of Barrie has developed into its present form through population growth and annexation. The City has grown from the City Centre and north shore of Kempenfelt Bay southerly, around the west side of the bay encompassing Allandale, Painswick and more recently, the area between Essa Road and Mapleview Drive along Highway 400.

The impetus for this study is to meet the existing and future travel demand in the growing residential, industrial and commercial areas in the south end of Barrie between Mapleview Drive and Essa Road. The City recognizes that to meet the transportation needs associated with existing and future growth, improvements to the transportation infrastructure are necessary.

1.7 Issues

Traffic

The City of Barrie currently has two major highway 400 interchanges in the south end of Barrie namely Mapleview Drive and Essa Road. Both Mapleview Drive and Essa Road are currently experiencing delays during the peak hours, particularly in the area of Highway 400 ramp terminals. As developments expand and traffic volumes increase delays on Mapleview Drive and Essa Road will continue to increase and eventually may affect the mainline operation of Highway 400.

Additional traffic analysis may be required in the future as the future Highway 400 can still be influenced by planning for Highway 400 improvements being studied presently by MTO under the Highway 400 TESR addendum. The number of lanes on Highway 400 will influence the operation/weaving, need/justification associated with the interchange. Therefore, the assessment for the interchange cannot be finalized in this study. The City will undertake an updated needs and justification study once MTO has determined the preliminary preferred design alternative associated with Highway 400.

The MTO Highway 400 TESR Update is scheduled to be completed in 2015 and will provide guidance on the proposed alignment shift of Highway 400 associated to the proposed 10 lane widening.

Upon completion of the Highway 400 TESR Update, the traffic report will need to be updated to undertake additional weaving and safety analysis to finalize the alignment of the future interchange ramps and the associated property protection.

Weaving

The alignments of the on-ramps of a potential new interchange at Harvie & Big Bay Point Road may constitute weaving conflict for the existing MTO Service Centre north of the proposed interchange. This conflict will be of prime concern in the study with respect to safe operations of
proposed highway interchange alternative. Lastly, the potential conflicts to and from the Mapleview Drive interchange should also be examined.

**Property Impact**

Since the interchange assessment will not be finalized until after completion of the Highway 400 TESR Update, it is important that the portions of properties impacted by the proposed interchange are protected from future development. The City may seek to acquire the lands impacted by the future interchange as part of development approval on the affect properties.

**Whiskey Creek**

The realignment of Whiskey Creek under Highway 400 will be required to implement the Harvie Road / Big Bay Point crossing. The existing 1.2m x 0.9m concrete box culvert will be replaced with a closed system approximately 500m in length to convey Whiskey Creek under Highway 400 and Big Bay Point Road and out letting to the existing creek west of Fairview Road.

On the west side of Highway 400 there is an existing on-line pond on Whiskey Creek, also known as Pond A, which provides quantity and Level 2 quality control, for storm events up to, and including, the 100-year.

Any loss of storage between Pond A and Highway 400 resulting from the construction of the proposed Highway 400 interchange or the proposed Harvie Road crossing will have to consider the downstream effects resulting from loss of storage and a dam-break of Pond A.

**Rail Crossing**

There is an existing rail crossing (spur) that crosses Big Bay Point Road at approximately 450m west of Bayview Drive (to the old Molson’s Brewery property) which is privately owned.

The existing rail crossing is signed and very infrequently used. The need for a gate at the crossing will be evaluated in accordance with Transport Canada guidelines. A bridge truss structure crossing the entire width of the proposed road maybe required for the installation and support of warning signals for the at-grade rail crossing.

**Utility**

Design Alternatives may impact existing utilities, both surface and underground infrastructure, as the cut profile may extend into the existing utility corridor and impact the required depth of cover for the utilities.

**Noise**

As Highway 400 traffic is the most substantial noise generator in the study area. On Harvie Road / Big Bay Point Road (R1I and R2I), the sound exposures increase is predicted to be greater than 5dBA. Thus, noise migration measures need to be considered as part of detailed design.
Bryne Drive Alignment

Phase 1 and 2 of the Bryne Drive MP, which was completed in December 2005, identified the potential for an interchange in the study area and noted that the proposed interchange will affect the proposed alignment of Bryne Drive. The update to the Phase 1 & 2 Bryne Drive MP to assess alternative Bryne Drive alignments is currently on hold pending the outcome of the Harvie Big Bay 400 Phase 3 & 4 Class EA. The preferred alternative, approved by Council by Motion 06-G-005 in December 2005, is a five lane roadway.

The Bryne Drive alignment will impact the Harvie Road and Bryne Drive intersection design and have to be reviewed during the detail design.

1.8 Problem Statement

The Problem Statement, which sets the framework for this Class EA, is as follows:

“That existing traffic and infrastructure deficiencies be corrected in an environmentally friendly manner that also meets future transportation needs.”

The City of Barrie is undertaking this project in response to the problems and complaints associated with the congested transportation system in the south end of Barrie. Proposed transportation improvements will result in an opportunity to correct existing infrastructure deficiencies, provide better connectivity and accessibility, and allow for future growth.

1.9 Study Organization

1.9.1 The Project Team

Morrison Hershfield Limited (MH) was retained by the City of Barrie to undertake the Class EA for the transportation improvements at Harvie Road/Big Bay Point Road and Highway 400. The Project Team is outlined in Table 1-1.

Table 1-1 - Project Team

<table>
<thead>
<tr>
<th>Proponent:</th>
<th>City of Barrie</th>
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</thead>
<tbody>
<tr>
<td>Ralph Scheunemann</td>
<td>Project Manager</td>
</tr>
<tr>
<td>Stew Patterson / Sherry Diemert</td>
<td>Manager IP</td>
</tr>
<tr>
<td>Steve Rose</td>
<td>Traffic</td>
</tr>
<tr>
<td>Geoff Mitchinson</td>
<td>Operations (Rail)</td>
</tr>
<tr>
<td>Mike Nugent</td>
<td>Engineering (Rail)</td>
</tr>
<tr>
<td>Kate Ash</td>
<td>Policy and Standard Technologist (Rail)</td>
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<tr>
<th>Ministry:</th>
<th>Ministry of Transportation</th>
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<tbody>
<tr>
<td>Jason White</td>
<td>Manager, Engineering</td>
</tr>
<tr>
<td>Bob Stephenson</td>
<td>Head, Planning &amp; Design</td>
</tr>
<tr>
<td>Olga Garces</td>
<td>Area Manager, Highway Engineer</td>
</tr>
<tr>
<td>Linda Fischer</td>
<td>Head, Environ. Planning</td>
</tr>
<tr>
<td>Janice Munro</td>
<td>Area Manager, Traffic Office</td>
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</tbody>
</table>
1.9.2 The Key Project Milestones

The Phase 1 & 2 study was initiated in October 2009. The key project milestones to date are as follows:

**Phase 1 and 2:**

- **Notice of Study Commencement:** November 5 & 6, 2010
- **Final Meeting with MTO:** October 20, 2010
- **PIC Notice Mailed:** October 29, 2010
- **Advertised:** November 11, 12 & 13, 2010
- **Public Information Centre #1:** November 17, 2010
Phase 3 and 4:

<table>
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<td>Kick-off meeting</td>
<td>July 10, 2013</td>
</tr>
<tr>
<td>Public Information Centre #2</td>
<td>April 23, 2015</td>
</tr>
<tr>
<td>Final Meeting with MTO</td>
<td>June 8, 2015</td>
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</tbody>
</table>

1.9.3 Notice of Study Commencement

During this study, a Notice of Study Commencement was advertised in the Barrie Examiner on November 5 & 6, 2010. A copy of the Notice of Study Commencement is included in the Phase 1 & 2 Class EA Report. This notice described the purpose of the study, the need for improvements and the proposed alternative solutions.

1.9.4 Agencies

Technical agencies, including federal, provincial and municipal agencies and utilities with a potential interest in the study or whose mandate may be affected, were contacted early in the study to ascertain whether or not they want to participate in the study. The agencies were asked to provide comments and concerns regarding the study. Agency comments, responses and meeting minutes are provided in Appendix D.
2. SUMMARY OF PHASE 1 & 2 REPORT
The following sections summarize the key points of the Phase 1 & 2 Environmental Study Report.

2.1 Alternative Solutions

The following alternative solutions were developed during Phase 2 of the Class EA:

2.1.1 Alternative Solution 1 – Do Nothing Alternative
Continue to operate the transportation facility in its current form. Please refer to Appendix F Exhibit 1 in Phase 1 & 2 Report of the Class EA.

2.1.2 Alternative Solution 2 – Build a Highway 400 Crossing Connecting Harvie Road and Big Bay Point Road
This alternative involves connecting Harvie Road and Big Bay Point Road across Highway 400. Please refer to Appendix F Exhibit 2 in Phase 1 & 2 Report of the Class EA.

2.1.3 Alternative Solution 3 – Implement a New Highway 400 Interchange at Harvie Road and Big Bay Point Road
This alternative includes the implementation of a New Highway 400 Interchange at Harvie Road and Big Bay Point Road. Please refer to Appendix F Exhibit 3 in Phase 1 & 2 Report of the Class EA.

2.1.4 Alternative Solution 4 – Limit Future Growth and Development
Implement policies that would place additional constraints on where growth may occur and/or how much development may occur.

2.1.5 Alternative Solution 5 – Transportation Demand Management
The Transportation Demand Management (TDM) includes Diversion of traffic to other roadways. TDM also entails the encouragement of the use of other modes of transportation such as transit usage, bicycles, and carpooling.

2.1.6 Alternative Solution 6 – Update Other Roadways
This alternative involves updating other roadways including possible widening and additional provisions for alternative modes of transportation, such as public transit and bicycles for travelers using the corridors. Other road improvements were considered in the TMP.

2.2 Pre-Screening of Alternatives

The following alternative solutions were considered as potential alternatives in the planning process but were not carried forward as stand-alone alternatives, as they did not solve the problem statement:
Alternative Solution 4 (Limit Future Growth and Development)
Alternative Solution 5 (Transportation Demand Management (TDM))
Alternative Solution 6 (Update Other Roadways)

The alternative solutions above were not carried forward due to the following reasons:

- Alternative 4 – Existing transportation problems will not be resolved.
- Alternative 5 - Non-structural improvement solutions such as more car-pooling, greater transit use and staggering of working times were considered to be beneficial, however, these measures would have only a minor impact on future traffic volumes and would not address any of the existing or future transportation / infrastructure deficiencies.
- Alternative 6 – Property and geometric limitations for transportation improvements would not resolve existing transportation issues at Mapleview Drive. There is inadequate capacity crossing Highway 400 in the south end of Barrie.

2.3 Public Information Centre #1

The first Public Information Centre (PIC) was held on **Wednesday November 17, 2010**, from 4:00 p.m. to 7:00 p.m. at Barrie City Hall, in the Sir Robert Barrie Room, located on the 2nd Floor, City Hall, 70 Collier Street to receive comments regarding the proposed alternative solutions (including the potential for a new highway crossing or an interchange). These comments were used to develop a Preferred Solution.

Approximately 54 people attended the PIC. The attendees had the opportunity to speak with representatives from the City and the Consultant and provide comments in the form of a comment sheet. The comments received either in the form of the comment sheet provided or in subsequent correspondences either by emails, facsimiles, or letters, are compiled in the Phase 1 & 2 Report of the Class EA.

In general, over 70% of the respondents agreed that the “Do Nothing” option is not feasible and of that over 70% of the public agreed that an interchange is necessary to alleviate congestion and improve the traffic in the area. However, approximately 40% of the respondent has expressed concern regarding the potential increase of traffic in the residential area as a result of an interchange. Other general concerns included the increase in noise and air pollution and impacts to adjacent woodlots and the natural environment.

A copy of the PIC display boards can be found in Appendix F of the Phase 1 & 2 Report of the Class EA.

2.4 Analysis and Evaluation of Alternative Solutions

Following the PIC and in consideration of all concerns and comments raised by the reviewing agencies and public, the alternative solutions were evaluated and assessed by the Project Team, related reviewing agencies including MTO, and relevant stakeholders while taking into considerations the feedbacks from the public in order to identify a preferred solution.

The detailed evaluation and assessment of the Alternative Solutions by the Project Team can be found in the Phase 1 & 2 Report of the Class EA.
2.5 Selection of the Preferred Planning Solution

Both Alternative Solutions 2 and 3 will improve traffic, provide better connectivity and accessibility, and allow for future growth within Barrie, the associate costs and environmental impacts for an interchange will be more substantial when compared to Alternative Solution 2, the crossing option, hence the overall evaluation yields that Alternative Solution 2 is the preliminary preferred planning solution. For further information, refer to slide 3 of PIC #2 in Appendix D.

2.6 Proceeding to Phase 3 and 4 of the Class EA

MTO’s November 24th 2010 comments (see Phase 1 & 2 Report of the Class EA) indicated that the traffic analysis and evaluation using macro-simulation in this study was acceptable at a strategic level, the results, including the weaving analysis, needed to be further confirmed and evaluated at a micro level as part of the Phase 3 & 4 Class EA to confirm operational performance.

Given this required additional review, the micro modeling completed as part of Phase 1 and 2 report by Delcan was updated by WSP (formally Genivar) as part of the MMATMP and again by Morrison Hershfield as part of the Phase 3 & 4 Class EA.

WSP completed a comprehensive calibration of the Delcan Aimsun Model, enhanced the model development and validated to the adjusted 2011 base year traffic counts. In addition, the future preferred road networks recommended in the City of Barrie Multimodal Active Transportation Master Plan (TMP) was fine-tuned and analyzed with the Aimsun micro-simulation software for the south section of the City of Barrie, including the annexed area, to identify the potential operational deficiencies on the future networks. The Aimsun micro-simulation models were developed from the calibrated and validated base year model.

The Harvie Road / Big Bay Point Road / Highway 400 Phase 3 & 4 Class EA study identified three Alternative Design concepts for the proposed Harvie Road/ Big Bay Point Road / Highway 400 crossing to address the preferred solution from Phase 1 & 2 of the Class EA.

In addition, a conceptual Partial Parclo A interchange was also developed in the Phase 3 & 4 Class EA to identify preliminary property requirements to protect for a potential future interchange, which will be subject to a future Class EA. Morrison Hershfield completed the Harvie Road / Big Bay Point Road and Highway 400 Interchange – Future Traffic Operations report as part of the Phase 3 and 4 EA. This study examined three design alternatives for the potential interchange at Harvie Road/ Big Bay Point Road at Highway 400, and reviewed the Traffic Operations that addresses existing and future deficiencies and the effect of each design alternative on the operations of Highway 400 mainline lanes, interchange ramps and speed change lanes as well as other intersections within the study area.

The key findings of the Harvie Road / Big Bay Point Road and Highway 400 Interchange – Future Traffic Operations report (under separate cover) are discussed in Section 3.6.

MTO has not endorsed the conclusions of the traffic report associated with the future Highway interchange at this time.
3. PROJECT ENVIRONMENT

This section provides a description of the physical, social, cultural and economic environment within the Harvie Road / Big Bay Point Road / Highway 400 Crossing study area. A combination of field investigation, review of existing engineering drawings and impacts, traffic studies, natural environment studies, and archaeological study established this inventory.

3.1 Emergency Services

Emergency Police and Ambulance vehicles currently access the study area mainly from either, the existing Essa Road / Highway 400 interchange, or the Mapleview Drive / Highway 400 interchange. Fire Station 4 is located on Ardagh Road, west of Ferndale Drive and Fire Station 3 is located on Big Bay Point Road east of Huronia Road.

3.2 Transit Service

Presently, there is a single bus route on Bryne Drive between Caplan Avenue and Commerce Park Drive (south intersection). The future plan is to extend this service to Essa Road. There are also transit routes on Bayview Drive between Big Bay Point Road and Little Avenue.

3.3 Safety

There is a history of mostly traffic congestion complaints for the area adjacent to Mapleview Drive. Winter safety complaints, in terms of slippery conditions, can be addressed with greater priority given to sanding, salting and ploughing. The City of Barrie has an Advanced Road Weather Information Tower in South Barrie on Yonge Street south of Ashford Drive that assesses and predicts road weather conditions so that maintenance needs can be more accurately determined.

3.4 Property Access

Access configuration will depend on proposed plans for property development. The Molson Brewery Plant that was located on the east side of Highway 400 and on the south side of Big Bay Point Road and has been demolished. Depending on the plans for the development of the site.

The Phases 3 and 4 of the Class EA has considered the need for medians, which may affect some of the turning movements at the existing access points on Big Bay Point Road and Harvie Road in the study area. For the interim condition a Two Way Left Turn Lane can be considered as part of detail design. For the ultimate condition medians with access restrictions may be required.

3.5 Land Use

Most of the land in the study area surrounding the proposed Harvie / Big Bay Point/ Highway 400 crossing is not developed. The old Molson plant building has been demolished.

The area is primarily designated as Highway 400 Industrial, Service Industrial, General Industrial or General Commercial with Whiskey Creek located within an environmental protection area.
3.6 Transportation

Traffic analysis was undertaken during Phase 1 and 2 to determine the traffic impacts of the alternative solutions (Highway 400 crossing, Highway 400 interchange).

As previously discussed in Section 2.6, MTO requested additional traffic analysis for a larger study area and additional weaving analysis to confirm the need and justification of a Harvie/Big Bay Point Road interchange at Highway 400.

MH examined three design alternatives for the highway crossing and potential interchange at Harvie Road/Big Bay Point Road at Highway 400, and reviewed the Traffic Operations that addresses existing and future deficiencies and the effect of each design alternative on the operations of Highway 400 mainline lanes, interchange ramps and speed change lanes as well as other intersections within the study area.

The key findings of the Harvie Road / Big Bay Point Road and Highway 400 Interchange – Future Traffic Operations report are discussed in the following sections. For further information, refer to the standalone traffic report entitled Harvie Road / Big Bay Point Road and Highway 400 Interchange – Future Traffic Operations.

3.6.1 Existing Road Network

Harvie Road and Big Bay Point Road are under the jurisdiction of the City of Barrie. Highway 400 is under the jurisdiction of the Ministry of Transportation Ontario.

Highway 400

Highway 400 is a north-south 6-lane provincial highway under the jurisdiction of the Ministry of Transportation, Ontario. It has a posted speed of 100 km/h and includes a diamond interchange at Mapleview Drive and a Parclo A-4/A-2 interchange at Essa Road. Given potential growth in traffic in the area MTO has completed a Class EA to widen Highway 400 to eight lanes but protection for ten lanes at Harvie and Big Bay Point Road. MTO is currently updating this study and considering improvements to the existing Highway interchanges and 10 lanes including HOV lanes on Highway 400.

MTO also plans on implementing improvements to the median on Highway 400 at Harvie and Big Bay in 2017.

Mapleview Drive

Mapleview Drive is an east-west arterial road under the jurisdiction of the City of Barrie. It has a posted speed limit of 60 km/h and has a 6-lane urban cross section. There are currently 8 signalized intersections located between Veterans Drive in the west and Bayview Drive in the east, including the signalized intersection at the two diamond interchange ramp terminals with Highway 400.

The City of Barrie MMATMP recommended HOV lanes on Mapleview Drive
Harvie Road

Harvie Road is an east-west arterial road under the jurisdiction of the City of Barrie. It includes a 2-lane rural cross section and has a posted speed of 50 km/h. Harvie Road currently terminates just west of Highway 400 but is closed to vehicular traffic east of the entrance to the Harvie Water Reservoir.

Four lanes have been approved by Council as part of the Harvie Road Class EA from Bryne Drive to Essa Road but the MMATMP recommends 3 lanes with buffered bike lanes from Essa to Veterans and 5 lanes with buffered bike lanes from Veterans Drive to Bryne Drive. The next step to resolve and finalize the number of lanes is to revisit the Phase 3 & 4 Class EA subject to available budgets.

Big Bay Point Road

Big Bay Point Road is an east-west arterial road under the jurisdiction of the City of Barrie. It has a 2-lane rural cross section and has a posted speed limit of 50 km/h. As Big Bay Point Road approaches Highway 400 from the east, it curves northward and continues as Fairview Road parallel to Highway 400 east of the Service Centre.

The City of Barrie’s Highway 400 crossing EA calls for widening Harvie Road and Big Bay Point Road to 7 lanes from Bryne Drive to Bayview Drive. The MMATMP also recommends that Harvie/Big Bay Point Road east of Bryne Drive be widened to 7 lanes but with buffered bike lanes. The Phase 3 & 4 EA study on Big Bay Point Road is currently underway from Bayview Drive to Huronia Road.

Essa Road

Essa Road is an arterial road under the jurisdiction of the City of Barrie that runs generally from south-south-west to north-north-east. It consists of a 4-lane cross-section and has a posted speed limit of 50 km/h. Signalized intersections are provided at the two ramp terminal intersection of the interchange with Highway 400.

The Phases 3 and 4 of the Essa Road Class EA Study is complete. The City of Barrie Highway 400 crossing EA recommends the widening Essa Road by one lane in each direction in the vicinity of Highway 400. A new W-S ramp was built in the southwest quadrant of the Essa Road Interchange. The MMATMP recommends buffered bike lanes by 2051.

Bryne Drive

Bryne Drive is a north-south major collector under the jurisdiction of the City of Barrie. It currently has 5-lanes from south of Mapleview Drive to north of Caplan Drive and doesn't exist from north of Caplan Drive and south of Essa Road.

The Bryne Drive Class EA approved by Council in 2006, recommends five lanes between Caplan Drive and Essa Road.

An update to Phase 1 & 2 of the Bryne Drive Class EA to assess alternative alignments in consideration of the future interchange at Harvie Road / Big Bay Point Road / Hwy 400 is currently on hold. Pending the completion of this study the Bryne Drive Phase 1 & 2 Class EA is planned to be completed starting this fall subject to available budgets.
The MMATMP recommended 5 lanes plus bike lanes on Bryne Drive within the 2031 time horizon.

**Fairview Road**

Fairview Road is a 2-lane north-south arterial road under the jurisdiction of the City of Barrie. It has a posted speed limit of 50 km/h and extends from the west limit of Big Bay Point Road to Essa Road.

The City of Barrie’s MMATMP recommends post 2031 that 5 lanes with regular bike lanes may be required along Fairview Road from Little Avenue to Big Bay Point Road. Within the 2031 time horizon only 2 lanes with regular bike lanes is recommended.

**Bayview Drive**

Bayview Drive is a north-south major collector under the jurisdiction of the City of Barrie. It has a posted speed limit of 50 km/h and includes a 5-lane cross section from Big Bay Point Road to Mapleview Drive.

The City of Barrie’s MMATMP recommends post 2031 that 5 lanes with regular bike lanes may be required along Bayview Drive from Little Avenue to Big Bay Point Road. Within the 2031 time horizon only 3 lanes with regular bike lanes is recommended. The Phase 3 & 4 EA study on Bayview Drive is currently underway from Little Avenue to Big Bay Point Road.

**Service Centre**

A Service Centre is located on the east side of Highway 400 just north of Big Bay Point Road. The existing Service Centre has direct access and egress to and from Highway 400 northbound. The Service Centre can also be accessed by pedestrians from a parking lot just off of Fairview Road.

Any transportation improvements identified in the study area will require that the existing Highway 400 Barrie Service Centre, located on the east side of Highway 400 just north of Big Bay Point Road, remain open.

The existing lane configurations within the study area are shown in **Figures 3-1**.
Figure 3-1 - Existing Lane Configurations
3.6.2 Existing Traffic Operations

Existing intersection operations were analyzed in order to identify any operational deficiencies in the existing road network.

The existing signalized intersections within the Study Area were determined to be currently operating at overall LOS of D or better during the weekday AM and PM peak hours.

The results of the operational analyses for the signalized intersections and detailed analysis sheets can be found in the Harvie Road / Big Bay Point Road and Highway 400 Interchange – Future Traffic Operations report on the City of Barrie’s website.

3.6.3 Future Road Network

Transportation improvements recommended in the MMATMP within the 2031 and potentially post 2031 time horizons are shown in the MMATMP on Figure 10-2.

The draft addendum to the Highway 400 TESR is suggesting that 10 lanes may be needed within the 2031 time horizon on Highway 400 between Mapleview Drive and Essa Road.

3.6.3.1 City Road Improvements

The MMATP recommends the following transportation improvements to City-owned roads by 2031 (see Figure 10-2 in the MMATMP for potential additional lane widening by 2051 and Figure 7-20 for the proposed 2051 Cycling, Pathway and Trail Network):

- Little Avenue widening to five lanes from Fairview Road to Marshall Street with buffered bike lanes.
- Essa Road widening to seven lanes from Bryne Drive to east of Fairview Road with signed bike routes
- Fairview Road widening to five lanes north of Little Avenue with buffered bike lanes.
- Fairview Road south of Little Avenue widened to include regular bike lanes.
- Bryne Drive five lanes from 680m south of Essa Road to 530m north of Caplan Drive with regular bike lanes. The Bryne Drive profile was revised to accommodate the Harvie Road EA profile and the existing SWM Pond outlet structures. The revised Bryne Drive Profile is shown in Appendix F.
- Harvie Road / Big Bay Point Road widening and new Highway 400 crossing are expected to be:
  - three lanes from Essa Road to Veterans Drive with buffered bike lanes
  - five lanes from Veterans Drive to future Bryne Drive with buffered bike lanes
  - seven lanes from future Bryne Drive to Huronia Road including across Highway 400 with buffered bike lanes
A new Highway 400 interchange at Harvie Road / Big Bay Point Road was recommended in the City MMATMP as a partial four-ramp Parclo A4 interchange without the two northbound on-ramps at Big Bay Point Road.

3.6.3.2 Highway 400 Mainline and Interchanges Improvements

Planned improvements/expansions on Highway 400 in this area were identified in the Highway 400 Planning and Design Study Report which is currently being updated. The timing for Highway 400 widening is uncertain and is not identified in the TESR.

- The mainline Highway 400 will be widened from the current six lanes to 8 lanes (protection for 10 lanes) from the Essa Interchange to the Mapleview Interchange with an alignment shift to the west.

- Median improvements are scheduled for construction in 2017.

- The Essa Road Interchange geometric configurations include:
  - additional lane on the N-E/W off-ramp
  - realigned E-S on-ramp loop
  - realigned W-N on-ramp loop
  - a new W-S on-ramp in the southwest quadrant
  - additional lane on the S-E/W off-ramp

3.6.4 Future Traffic Operations

3.6.4.1 Future Traffic Operations without Improvements - Do Nothing Scenario

The Do Nothing option (2031 with no Hwy 400 widening) would not address the future congestion and facilitate any future growth in the area, and most signalized intersections in the Study Area are expected to operate at LOS E or F during the PM peak hour and the existing network cannot accommodate the planned growth.

Details of the Future Do Nothing scenario can be found in the Harvie Road / Big Bay Point Road and Highway 400 Interchange – Future Traffic Operations report.

3.6.4.2 Future Traffic Operations with Improvements

The future (2031) intersection operations were analyzed with the network improvements (mentioned in Sections 3.6.3) in order to identify any operational deficiencies and explore the potential merit of changes in proposed lane configuration and/or signal timing to address such deficiencies.

The future signalized intersections within the Study Area are expected to operate at overall LOS of D or better during the AM and PM peak hour which is considered acceptable.

The results of the operational analyses for the signalized intersections can be found in the Harvie Road / Big Bay Point Road and Highway 400 Interchange – Future Traffic Operations report.
3.6.5  Weaving Analysis

As mentioned in Section 3.6.3.2, the timing for Highway 400 widening is uncertain as it is not identified in the existing TESR/PDR and is currently being reviewed by MTO under the TESR Update.

MH conducted a weaving analysis for two sections along Highway 400 under two scenarios:

1. Harvie Road / Big Bay Point Road and Highway 400 Interchange with existing Highway 400 lane geometry; and

2. Harvie Road / Big Bay Point Road and Highway 400 Interchange with widened Highway 400.

The two weaving sections are:

- Highway 400 northbound and southbound between the potential New Harvie Road / Big Bay Point Road interchange and Mapleview Drive interchange; and

- Highway 400 southbound between the proposed Essa Road W-S interchange ramp and the potential new Harvie Road / Big Bay Point Road interchange.

For further details regarding the weaving analysis, refer to the Harvie Road / Big Bay Point Road and Highway 400 Interchange – Future Traffic Operations report.

3.6.5.1  Harvie Road / Big Bay Point Road and Highway 400 Interchange with Existing Highway 400 Lane Geometry (6 lanes)

In this scenario, it was assumed that the Highway 400 widening will not be implemented by the 2031 horizon year when the interchange will be fully functional and the mainline Highway 400 will remain six lanes from the Mapleview Interchange to the Essa Interchange.

Weaving Analysis from Essa Road Interchange to Proposed Harvie Road / Big Bay Point Road / Hwy 400 Interchange (south bound)

The length of the southbound weaving section is 685m. The weaving distance was measured according to the MTO Geometric Design Manual methodology. The Level of Service in the weaving segment between the potential interchange at Harvie Road / Big Bay Point Road and the interchange at Essa Road is not satisfactory and there would be weaving issues based on the existing Highway 400 configurations and geometry and the projected weaving volumes.

Weaving Analysis between Mapleview Drive Interchange and Proposed Harvie Road / Big Bay Point Road / Hwy 400 Interchange (both north and south bound)

The lengths of the northbound and southbound weaving sections are 513m and 606m, respectively. The weaving distance was measured according to the MTO Geometric Design Manual methodology. The weaving segment between the potential interchange at Harvie Road / Big Bay Point Road and the existing interchange at Mapleview Drive is expected to reach failing levels of service. There would be weaving issues with the existing Highway 400 configurations and geometry and the forecast weaving volumes.
3.6.5.2 Harvie Road / Big Bay Point Road and Highway 400 Interchange with widened Highway 400 (8 lanes)

In this scenario, it is assumed that the Highway 400 widening and interchange improvements will be implemented by the 2031 horizon year and the mainline Highway 400 will be widened from the current 6 lanes to 8 through lanes plus the following auxiliary lanes (an auxiliary lane is an extra lane between highway interchanges but is not a highway through lane):

- south bound between the proposed W-S Essa interchange ramp and the proposed Harvie Road / Big Bay Point Road / Hwy 400 Interchange
- south bound between the proposed Harvie Road / Big Bay Point Road / Hwy 400 Interchange and the existing Mapleview Interchange
- north bound between the existing Mapleview Interchange and the proposed Harvie Road / Big Bay Point Road / Hwy 400 Interchange

Weaving Analysis from Essa Road Interchange to Proposed Harvie Road / Big Bay Point Road / Hwy 400 Interchange (south bound)

The Level of Service in the weaving segment between the existing interchange at Essa and the potential interchange at Harvie Road / Big Bay Point Road would be LOS C, which is satisfactory. There would be no weaving issues based on the recommended configurations and geometry and the forecast weaving volumes within the 2031 time horizon.

Weaving Analysis between Mapleview Drive Interchange and Proposed Harvie Road / Big Bay Point Road / Hwy 400 Interchange (both north and south bound)

The Level of Service in the weaving segment between the potential interchange at Harvie Road / Big Bay Point Road and the existing interchange at Mapleview Drive would be LOS C in both the north and south bound direction, which is satisfactory and there would be no weaving issues based on the recommended configurations and geometry and the forecast weaving volumes within the 2031 time horizon.

3.6.6 Simulated Travel Speed Analysis

MH conducted a lane by lane simulated travel speed analysis along Highway 400 for the construction of Harvie Road / Big Bay Point Road and Highway 400 Interchange. In this scenario, it is assumed that the Highway 400 will be widened from the current 6 lanes to 8 through lanes plus 2 auxiliary lanes south of Harvie Road / Big Bay Road and 1 auxiliary lane north of Harvie Road / Big Bay Road (see Section 3.6.5.2). The following sections were studied:

- Highway 400 northbound and southbound between the proposed Harvie Road / Big Bay Point Road / Hwy 400 interchange and Mapleview interchange; and
- Highway 400 southbound between the proposed Essa Road W-S interchange ramp and the potential new Harvie Road / Big Bay Point Road interchange.

The key findings of the simulated travel speed analysis are summarized in the following sections. For further details regarding the simulated travel speed analysis, refer to the Harvie Road / Big Bay Point Road and Highway 400 Interchange – Future Traffic Operations report.
3.6.6.1 Simulated Travel Speed Analysis to and from Mapleview Road Interchange

The simulated travel speeds in the weaving segment between the potential interchange at Harvie Road / Big Bay Point Road and the existing interchange at Mapleview Drive would be satisfactory. There would be no significant speed reduction issues based on the recommended configurations and geometry and the forecast weaving volumes within the 2031 time horizon.

3.6.6.2 Simulated Travel Speed Analysis from Essa Road Interchange

The simulated travel speeds in the weaving segment between the proposed W-S Essa interchange ramp and the proposed Harvie Road / Big Bay Point Road / Hwy 400 Interchange would be satisfactory. There would be no significant speed reduction issues based on the recommended configurations and geometry and the forecast weaving volumes.

3.6.7 Future Additional Traffic Analysis

Additional traffic analysis will be required in the future as the proposed Harvie Road / Big Bay Point Road / Hwy 400 interchange can still be influenced by planning for Highway 400 improvements being studied presently by MTO under the Highway 400 TESR addendum. Therefore, the need for the interchange cannot be finalized in this study. Upon completion of the Highway 400 TESR Update the following will need to be further assessed:

- need and justification for the Harvie Road / Big Bay Point Road / Hwy 400 interchange.
- additional weaving and safety analysis to finalize the design of the future interchange ramps.

The MTO Highway 400 TESR Update is scheduled to be completed in 2015 and will provide guidance on the proposed alignment shift of Highway 400 associated to the 10 lane widening and any provide guidance on any additional transportation improvements at the adjacent Essa and Mapleview Interchanges.

Since the interchange design will not be finalized until after completion of the Highway 400 TESR Update, it is important that the property adjacent to the future interchange is protected from any further development. The City may negotiate the protection of land as part of its development review and approval. Refer to Appendix B for the anticipated property impacts of the potential interchange construction. In order to determine the required property protection area, conservative ramp geometries were assumed using MTO’s Geometric Design Guidelines to ensure adequate property would be available if in the future, an interchange is warranted. Land requirements will be reviewed during the design phase of this project.

3.7 Natural Environment

3.7.1 Whiskey Creek

The Whiskey Creek Master Drainage Plan Update was completed in October 2009. The findings of the report are summarized below.

Whiskey Creek flows through the study area in an easterly direction across Harvie Road, Highway 400 and Fairview Avenue then discharges to Kempenfelt Bay at Minet's Point. The headwater of Whiskey Creek is located just west of Highway 400. The creek flows from west to
east for approximately 5250m prior to out-letting into Kempenfelt Bay adjacent to Minet’s Point Park.

Within the Harvie Road study corridor, the stream is approximately 0.8m wide and the riparian area is covered by grasses with sumac and some poplar growth. Watercress was also seen along the stream. Downstream of Highway 400, where the stream crosses Fairview Road, it passes through a heavily wooded area and is wider (up to 3.0m). Whiskey Creek is considered to have a riffle/run/pool configuration with substrates dominated by gravel and sand. Some fish cover is provided by woody debris, undercut banks and overhanging terrestrial vegetation. Seasonal migratory barriers were noted at the Fairview Road culvert due to debris jams.

The areas examined fall within Reaches 5 and 6 of Whiskey Creek, as designated by Azimuth Environmental Consulting Inc. (R.G. Robinson and Associates (Barrie) Ltd., 2002) as part of the Whiskey Creek Master Drainage Plan. Watercress was observed upstream of Harvie Road, indicating groundwater inputs to the watercourse. Whiskey Creek, between Highway 400 and Harvie Road, was described by Azimuth as having an incised creek channel with substrates dominated by cobble, gravel, sand and woody debris. Between Highway 400 and Fairview Road, the creek was not considered to sustain a resident fish population. Azimuth Environmental Consulting Inc. identified an accumulation of sand and debris at the outlet of the culverts that discharge to Whiskey Creek from the Highway 400 east embankment. Approximately 50 m downstream of Fairview Road, surface flow was noted to withdraw into the sandy substrate, which was considered to be a groundwater recharge zone (R.G. Robinson and Associates, 2002).

As mentioned in the Whiskey Creek Master Drainage Plan Update, storm sewers are to be designed to convey up to the 5-year storm event without surcharging.

Roadways may convey the major system runoff provided the product of depth of flow at the gutter times the velocity of flow is less than 0.65 m²/s. Furthermore, during the 1:100 year storm event the maximum depth of flooding permitted above the crown of the road is 0.15m. Road crossings of the Creek should have culverts capable of conveying the following peak flows without over-topping the roadway:

- Local Roads 1:10 to 1:25 year storms
- Collectors Roads 1:25 to 1:50 year storms
- Arterial Roads 1:100 year to Regional storms

The Municipality shall control drainage on all hazard lands and shall exercise this by deed, easement or other means.

The report identified an underpass option would present a secondary problem with respect to the conveyance of overland storm runoff. Harvie Road will have to be constructed with a down gradient on the west side of the highway and rise up on the east side to connect to Fairview Road. This would have the undesirable effect of conveying overland storm runoff under the highway along the new Harvie Road arterial and potentially trapping it under the Highway.

As indicated in the MTO Highway 400 Harvey Road / Big Bay Point Road Interchange Feasibility Study, Whiskey Creek currently crosses Highway 400 through a 1.2 x 0.9 concrete culvert from a south-west to north-east direction.
3.7.2 Vegetation Communities

A detailed environmental impact assessment was undertaken for the project to document existing aquatic, terrestrial and land use resources throughout the environmental study area and to assess potential impacts on these resources in relation to the project works. The key findings of the environmental assessment study are summarized in the following sections.

For more information, refer to the standalone Natural Heritage Environmental Impact Assessment Study Report.

The study area contains six vegetation communities: Cultural Meadow (CUM), Cultural Thicket (CUT), Cultural Woodlot (CUW) Coniferous Forest (FOC), Deciduous Forest (FOD) and Meadow Marsh (MAM). The forested areas are mature forests with many trees having a diameter of greater than 30cm. The vegetation communities are shown in Figure 3-2.

3.7.3 Wildlife

Wildlife was observed within the study area during field investigations and Potential Species at Risk and Species of Conservation were identified. Table 3-1 provides a summary of all the potential Species at Risk habitat in the study area.

<table>
<thead>
<tr>
<th>Species</th>
<th>Common Name</th>
<th>Designations</th>
<th>Protection*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Common Name</td>
<td>Scientific Name</td>
<td>COSEWIC (SARA)</td>
</tr>
<tr>
<td>Birds</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barn Swallow</td>
<td>Hirundo rustica</td>
<td>THR</td>
<td>THR</td>
</tr>
<tr>
<td>Peregrine Falcon</td>
<td>Falco peregrinus</td>
<td>SC</td>
<td>THR</td>
</tr>
<tr>
<td>Red-headed Woodpecker</td>
<td>Melanerpes</td>
<td>THR</td>
<td>SC</td>
</tr>
<tr>
<td></td>
<td>erythrocephalus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bobolink</td>
<td>Dolichonyx</td>
<td>THR</td>
<td>THR</td>
</tr>
<tr>
<td></td>
<td>oryzivorus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whip-poor-will</td>
<td>Caprimulgus</td>
<td>THR</td>
<td>THR</td>
</tr>
<tr>
<td></td>
<td>vociferus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Common Nighthawk</td>
<td>Chordeiles</td>
<td>THR</td>
<td>SC</td>
</tr>
<tr>
<td></td>
<td>minor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chimney Swift</td>
<td>Chaetura pelagica</td>
<td>THR</td>
<td>THR</td>
</tr>
</tbody>
</table>
Species Designations Protection* Suitable Habitat in Environmental Study Area

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>COSEWIC (SARA)</th>
<th>Provincial (SARO)</th>
<th>Federal Legislation</th>
<th>Provincial Legislation</th>
<th>Suitable Habitat in Environmental Study Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada Warbler</td>
<td><em>Wilsonia canadensis</em></td>
<td>THR</td>
<td>SC</td>
<td>SARA</td>
<td>-</td>
<td>Yes</td>
</tr>
<tr>
<td>Eastern Meadowlark</td>
<td><em>Sturnella magna</em></td>
<td>THR</td>
<td>THR</td>
<td>MBCA</td>
<td>ESA</td>
<td>No</td>
</tr>
</tbody>
</table>

### Birds

<table>
<thead>
<tr>
<th>Species</th>
<th>Designations</th>
<th>Protection*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eastern Wood-Pewee</td>
<td>Contopus virens</td>
<td>SC</td>
</tr>
<tr>
<td>Wood Thrush</td>
<td></td>
<td>THR</td>
</tr>
</tbody>
</table>

### Herpetofauna

<table>
<thead>
<tr>
<th>Species</th>
<th>Designations</th>
<th>Protection*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snapping Turtle</td>
<td>Chelydra serpentina</td>
<td>SC</td>
</tr>
<tr>
<td>Milksnake</td>
<td>Lampropeltis triangulum</td>
<td>SC</td>
</tr>
</tbody>
</table>

### Mammals

<table>
<thead>
<tr>
<th>Species</th>
<th>Designations</th>
<th>Protection*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Little Brown Myotis</td>
<td>Myotis lucifugus</td>
<td>END</td>
</tr>
<tr>
<td>Northern Myotis</td>
<td>Myotis septentrionalis</td>
<td>END</td>
</tr>
<tr>
<td>Eastern Small-footed Myotis</td>
<td>Myotis leibii</td>
<td>END</td>
</tr>
</tbody>
</table>

### 3.7.4 Fish and Fish Habitat

There is one watercourse within the study limits, Whiskey Creek, which flows permanently in a general easterly direction and outlets into Lake Simcoe at Minet’s Point. The watercourse is conveyed under Highway 400 by a 1.2m by 0.9m open footing concrete culvert on a south-west to north-east skew. This watercourse at this location is near to the headwaters of the Whiskey Creek.

During the site investigations, downstream of Highway 400, the channel had good morphology with a mix of riffles, runs, flats, and pools. The riffle areas had a mean depth of 0.06m and mean width of 1.2m. The mean depth of the runs was 0.09m with a mean width of 1.0m. The flats had a mean depth of 0.13m and a mean width 1.5m. Pooled areas had a mean depth of 0.4m and a mean width of 1.0m. Substrates within this reach were mainly gravel, sand and silt with cobbles present close to the culvert. The banks were stable within this reach with no erosion evident. Instream cover was provided mainly by instream and overhanging woody debris and vascular plants. Submergent aquatic vegetation consisted of mainly Richardson’s Pondweed (Potamogeton richardsonii). Shore cover was moderate as the reach flows through a wooded...
area. Some drainage flows from the south and into the creek at the culvert area. Fish sampling was not conducted due to the extremely shallow water depths and no fish observed.

The morphology of the reach upstream of Highway 400 to the culvert under Harvie Road was a mix of runs and flats. The widths ranged from 0.5m to 1.0m and depth ranged from 0.10 to 0.25m. Pooled areas were identified directly upstream of the culvert at Harvie Road and located at a debris blockage upstream of the right-of-way (ROW) fence. Substrates in this reach were mainly silt and sand with some gravel and cobble present at the culverts. Some minor erosion of the banks was evident in this reach with moderate erosion also present on the outside bends of meanders at the midway point in the reach. Minimal shore cover was present as the riparian areas were mainly meadow communities with sparse riparian trees, mainly in the vicinity of the ROW fence. Fisheries sampling was not conducted at this reach. In addition, MH did not observe any fish during the field investigations.

Consultation with the Lake Simcoe Region Conservation Authority (LSRCA) identified the following fish species as being present in Whiskey Creek based on sampling conducted further downstream of the Highway 400 study area: Brook Trout (Salvelinus fontinalis), Slimy Sculpin (Cottus cognatus), Mottled Sculpin (Cottus bairdii), Northern Redbelly Dace (Phoxinus eos), Blacknose Dace (Rhinichthys atrarius), Longnose Dace (Rhinichthys cataractae), Creek Chub (Semotilus atromaculatus), and Smallmouth Bass (Micropterus dolomieu).

LSRCA classified this waterway as coolwater thermal regime within the study area but with sensitive coldwater species downstream. As such, a timing window for in-water work applies with no in-water work allowed from October 1st to June 1st. Table 3-2 summarizes the existing fish and fish habitat within the study area.

**Table 3-2 - Summary of Existing Fish and Fish Habitat**

<table>
<thead>
<tr>
<th>Waterbody</th>
<th>Whiskey Creek</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow: Permanent, Intermittent or Ephemeral</td>
<td>Permanent</td>
</tr>
<tr>
<td>Thermal Regime: warm/cool/cold</td>
<td>MNR: warmwater; LSRCA: coolwater with sensitive coldwater species downstream</td>
</tr>
<tr>
<td>Sensitivity: High, Moderate, Low</td>
<td>High (LSRCA)</td>
</tr>
<tr>
<td>Substrate Type</td>
<td>Gravel, sand, silt, cobble</td>
</tr>
<tr>
<td>Vegetation: Riparian &amp; In-stream</td>
<td>Watercress, Pondweed</td>
</tr>
<tr>
<td>Fish Observed: Species</td>
<td>MH: No sampling</td>
</tr>
<tr>
<td></td>
<td>MNR: Brook Trout downstream of study area</td>
</tr>
<tr>
<td></td>
<td>LSRCA: Brook Trout, Slimy Sculpin, Mottled Sculpin, Northern Redbelly Dace, Blacknose Dace, Longnose Dace, Creek Chub and Smallmouth Bass (downstream of Highway 400 study area)</td>
</tr>
<tr>
<td>Directly Support a Fishery: Y/N</td>
<td>Yes</td>
</tr>
<tr>
<td>Timing Window Restriction</td>
<td>October 1&lt;sup&gt;st&lt;/sup&gt; to June 1&lt;sup&gt;st&lt;/sup&gt;</td>
</tr>
</tbody>
</table>
3.7.5 Environmentally Significant Areas

3.7.5.1 Wetlands

There are no significant wetlands within the study area.

There are several unverified wetlands within or adjacent to the study area. Two unverified wetlands are located within the Whiskey Creek watercourse system on the west and east side of Fairview Road. The third unverified wetland is situated to the south-east of the proposed Bryne Drive. There is another wetland located north of Harvie Road, west of Highway 400 along Whiskey Creek.

3.7.5.2 Designated Natural Areas

Designated natural areas include areas identified for protection. There are no Designated Natural Areas within the study area. The study area does fall within the Lake Simcoe Protection Plan area.

3.7.5.3 Lake Simcoe Protection Plan

Lake Simcoe Protection Plan (2009) is a plan for watershed protection to restore the health of Lake Simcoe. Primary objectives include restoring the health of the cold water fisheries and other aquatic life within Lake Simcoe watershed; improving and maintain water quality; reducing the amount of phosphorus going into the lake; protecting and rehabilitating important natural areas such as shorelines; and addressing impacts of invasive species, climate change and recreational activities.
Figure 3-2 – Vegetation Communities (Ecological Land Classification)
Figure 3-3 – Watercourses and Aquatic Habitats
3.8 Archaeology and Cultural Heritage

A Stage 2 Archaeological Assessment was conducted for this project in order to identify the archaeological potential for the location for any Native and Euro-Canadian archaeological sites that may be impacted by proposed highway and road improvements of this study.

The road plans impact three areas east of Highway 400 and one area west of the highway (Refer to Figure 3-4). The three areas east of the highway include an area determined by a previous Stage 1 to have no archaeological potential because it was the site of a former brewery. The other two eastern areas are east and west of Fairview Road encompassing 1.3 and 1.9 hectares of land north of the Big Bay Point Road right-of-way. The western study area encompassed five hectares of land north of Harvie Road and Highway 400.

Based on these findings, portions of the study lands required for Harvie Road/Big Bay Point Road/Highway 400 was determined to have archaeological potential for significant archaeological remains. A total of 52 percent of the 11.15 hectare of the lands required for changes to the Harvie Road and Big Bay Point Road alignments and Highway 400 ramps was subject to Stage 2 assessment through test pit survey 5 metre intervals. The remaining area was not subject to physical testing due to disturbances (39%), low and wet conditions (5%) and steep slopes (4%).

Two archaeological sites were identified during the test pit assessment of the lands required for the project. Site 1 consists of the recovery of 11 artifacts from six shovel test pits across 135 meter long area. Nine of the artifacts are ceramic body sherds that indicate a Late Woodland occupation. Two of the artifacts are chunky fragments of Onondaga chert shatter. This chert debitage is not diagnostic of a specific time period or culture but the chunky pieces are consistent with the Late Woodland affiliation. These finds were catalogued under registered site designation BcGw-93.

Site 2 consists of a single small bifacial tool fragment. The colour and potlids indicate the tool has been burnt. The knapping qualities of Onondaga chert do not benefit from heat treatment so it is likely this tool was disposed in a hearth. The test pit was 135 metres from the concentration of artifacts of Site 1 so it is considered a separate archaeological site. Since this site could be an isolated find or part of BcGw-93, it has not been registered at this time.

Based on the above information, the following recommendations can be made:

1. Stage 3 site specific assessment through the excavation of one-metre square test excavation units should be conducted at Site 1, BcGw-93.
2. Stage 3 site specific assessment through the excavation of one-metre square test excavation units should be conducted at Site 2.
3. The remaining areas required for the proposed redesign of Highway 400/ Harvie Road and Big Bay Point Road outside of the two areas defined by Site 1 and Site 2 has been completely assessed through test pit survey. The Stage 2 did not identify any additional archaeological sites requiring further assessment or mitigation of impacts, therefore, no further Stage 2 archaeological assessment of the property is required.

Refer to the Stage 2 Archaeological Assessment Report in Appendix A for further details regarding the archaeological findings.
Figure 3-4 – Location of the Highway 400 Harvie Road Big Bay Point Road study area, 31D05 Barrie (Natural Resources Canada 2010)
3.9  Noise

Valcoustics Canada Limited completed a preliminary traffic noise assessment as part of the Highway 400 Crossing Roads Study in May 2005.

Sound exposures were calculated using STAMSON V5.02-ORNAMENT, the computerized road traffic noise prediction model of the Ministry of Environment (MOE).

Using the road traffic data (supplied by Dillon Consulting), 24-hour (Leq 24-hour) sound exposures was calculated at each receptor location. To assess the noise impact, the existing sound exposures were compared to the future with the proposed road improvements. This was a conservative approach since the future “Do Nothing” scenario is typically compared with the future “With Improvements” scenario. Since the traffic volumes are typically increasing, the existing sound exposure would be somewhat less than for the future “Do Nothing” scenario and the predicted noise impact greater.

On Harvie Road / Big Bay Point Road (R1I and R2I), the sound exposures increase is predicted to be greater than 5dBA. Thus, noise migration measures need to be considered as part of detailed design.

In addition to the comment provided with respect to noise from Valcoustics Canada Limited, a Noise Impact Review (August, 2008) was undertaken by I.E Coulter Associates Limited for Bryne Drive Master Plan for the City of Barrie. The report concluded that due to the significant background noise generated by traffic on Highway 400, none of the identified Bryne Drive Alignment Alternatives will result in an increase in noise levels.

3.10  Soil Conditions

The quaternary geology in the general area of the site results from the actions of the Simcoe lobe of the Laurentide Ice Sheet which covered the area in the Late Wisconsinan glaciation. The predominant soil formations in the area are the glaciofluvial ice-contact deposits, which consist of gravel and sand; minor till; including esker, kame, end moraine, ice-marginal delta and subaqueous deposits.

A geotechnical investigation on Big Bay Point Road was carried out by Trow (exp) in February 2008 for the Big Bay Point Road Transmission Watermain at Highway 400. The purpose of the investigation was to determine the subsurface soil and groundwater conditions by way of three sampled boreholes.

The partial report that was provided was completed by Dominion Soil Investigation Inc. in November of 1980. This investigation included two deep boreholes, one on each side of the highway (Boreholes 8 and 9). The borehole logs encountered brown sand with traces of silt and gravel, loose to very dense and dry to damp. These boreholes extended to elevations of 277.7 and 277.2 metres, respectively. Both boreholes were dry upon completion. Piezometers installed in the boreholes confirmed that the boreholes remained dry during the three weeks following the drilling.

The three additional reports provided by the City of Barrie detailed the findings for investigations located in the general vicinity of the site. Table 3-3 details the relevant findings in each report.
Table 3-3 - Borehole Information

<table>
<thead>
<tr>
<th>Report Title and Origin</th>
<th>Borehole ID</th>
<th>Distance from Site (m)</th>
<th>Relevant Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geotechnical Investigation Allandale Sewer and Water Project, Barrie, Ontario Peto MacCallum Ltd., 1985</td>
<td>Peto MacCallum Borehole 14 &amp; Surface Elevation 276.63</td>
<td>650</td>
<td>Sand: Compact brown silty fine sand, some gravel, wet Becoming fine to medium sand, some silt, moist at 1.5 metres depth Upon completion of auguring, borehole open, no free water</td>
</tr>
<tr>
<td>Geotechnical Investigation Bayview Drive Reconstruction and Churchill Drive Extension, Barrie, Ontario Peto MacCallum Ltd., 1999</td>
<td>Peto MacCallum Borehole No. 4 &amp; Surface Elevation 278.85</td>
<td>650</td>
<td>Sand: Compact to very dense brown/grey fine to medium sand, trace silt to silty, trace to some gravel, moist Upon completion of auguring borehole open to 4.50 m (dry)</td>
</tr>
<tr>
<td>A Soil Investigation For A Proposed Industrial Subdivision at Lots 8, 9 &amp; 10, Concessions 11 &amp; 12, City of Barrie Soil-Eng Limited, 1982</td>
<td>Soil-Eng Borehole 17 &amp; Surface Elevation 279.8</td>
<td>660</td>
<td>Brown compact to very dense Fine Sand traces of silt and gravel Dry on completion</td>
</tr>
</tbody>
</table>

The location of the Harvie Road / Big Bay Point Road crossing may be adjusted during detail design. Since foundation boreholes are required to be located within the outline of the final foundation location a full foundations investigation study was not completed as part of this Phase 3 & 4 study. The foundations for the overpass structure over Highway 400 can be assessed in a general way as follows. If spread foundations are possible, they would be founded at levels approximately at the existing ground elevations on either side of Highway 400. They would then need to be lowered or backfilled to at least provide frost protection cover at approximately 1.8 metres of cover.

3.11 Site Geology and Subsurface Conditions

The stratigraphy at the site, as revealed in the boreholes, is generally comprised of granular fill overlying native deposits of sand and silt.

Topsoil and Asphalt

A 0.15 metre thick layer of topsoil was encountered at the surface of Borehole BH14. The top 300 mm of Borehole BH16 was comprised of asphalt.

Sand and Gravel Fill

Boreholes BH14 and BH16 both encountered a deposit of sand and gravel fill underneath the overlying surficial materials. The sand and gravel fill extended to approximately 0.8 to 2.3 metres below existing grade. The fill material within the boreholes was found to be damp.
Sandy Silt Till

Native sandy silt till, with trace gravel layer was encountered as the surficial deposit in Borehole BH13, and in BH14 directly below the sand and gravel fill material. The material extended to 3.0 to 3.5 metres depth. The compactness condition of the native sandy silt varied from loose to very dense, but was typically compact. Moisture contents ranged from 6 to 24 percent.

Sand

A native sand layer was encountered in Boreholes BH13, BH14, and BH16. The sand, with trace amounts of gravel, and trace to with silt, extended from 2.3 to 3.5 metres below grade to the termination of the boreholes at depth ranging from 12.7 to 20.4 metres below grade. The compactness condition of the native sand varied from loose to very dense, but was typically dense to very dense. Moisture contents ranged from 3 to 19 percent. Although no boulders were encountered in the sand deposit in the boreholes, sand deposits can contain boulders and there may be boulders located along the proposed tunnel path.

3.12 Groundwater Conditions

Groundwater observations are included as footnotes on the enclosed Borehole Logs (Refer to Appendix C in the Phase 1 & 2 Environmental Study Report). All of the boreholes were open and dry upon completion of drilling. The moisture contents of the recovered samples indicate the groundwater table in this area is located below the bottom of the boreholes. It must be noted that seasonal variations in the water table should be expected, with higher levels occurring during wetter periods of the year (such as spring thaw and late fall), and lower levels during drier periods.

3.13 Drainage

Current requirements for freeboard at hydraulic structures are specified in the Highway Drainage Design Standards (Ontario Ministry of Transportation, January 2008). Based upon these standards, the storm event (i.e. Design Storm), for which 1.0 m freeboard is required, is determined based upon the classification of the roadway (i.e. freeway, arterial, collector, local), the type of cross-section (i.e. urban or rural), and the span of the opening. These criteria are summarized in Table 3-4.

Table 3-4 - Design Standards for Hydraulic Structures

<table>
<thead>
<tr>
<th>Functional Road Classification</th>
<th>Return Period of Design Event (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total Span &lt; 6 m</td>
</tr>
<tr>
<td>Freeway, Urban Arterial</td>
<td>50</td>
</tr>
<tr>
<td>Rural Arterial, Collector</td>
<td>25</td>
</tr>
<tr>
<td>Local Road</td>
<td>10</td>
</tr>
</tbody>
</table>

In addition, the River & Stream Systems Flooding Hazard Limit Technical Guidelines and Appendix 6 (MNR 2002) specifies that depths of overtopping less than 1.2 m (max.) and velocities less than 4.5 m/s would be adequate to allow the passage of emergency vehicles, and depth of overtopping less than 0.6 m (max.) and velocities less than 3.0 m/s would be adequate to allow for the passage of private vehicles.
Overtopping of the crossings during a Regional Storm event is not considered to pose a threat to life for velocities less than 1.7 m/s, depths less than 0.8 m, and a product of depth and velocity less than 0.4 m²/s. These criteria have been applied for the Regulatory (Regional Storm) Event in order to verify that vehicular access and egress would be provided during the Regulatory Storm event.

As shown in Table 3-5, the following is the Freeboard design standard for culverts that cross under roadways:

<table>
<thead>
<tr>
<th>Road Type</th>
<th>Freeboard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freeways, arterials, collectors</td>
<td>≥ 1.0 m</td>
</tr>
<tr>
<td>Highway Ramps</td>
<td>≥ 1.0 m</td>
</tr>
<tr>
<td>Local Roads including Private Entrances</td>
<td>≥ 0.3 m</td>
</tr>
</tbody>
</table>

Whiskey Creek crosses 400 which is classified as a freeway, therefore the required freeboard for the culvert is more than 1m for the 50/100 year design storm. As identified in Table 3-4, the required storm event is dependent on the structure span which must be confirmed through a drainage study undertaken during detailed design.

3.14 Utilities and Services

The following utilities can be found within the vicinity of the proposed transportation improvements:

- A 400mm watermain, a 500mm watermain, a 600mm sanitary sewer, and a 750mm CPP watermain;
- A water booster pumping station located immediately north of Big Bay Point Road approximately 400m east of Highway 400;
- A 300mm watermain located approximately 80m west of the pumping station, running west to east and associated fire hydrants;
- A 300mm watermain along the east side of Fairview Road and associated fire hydrants;
- A Bell Canada underground line contained within a 0.3m steel pipe located just south of Harvie Road;
- Bell Fiber Optic underground lines located along the west limit of the Highway 400 right-of-way, running in a north-south direction, and located on both north side and south side of Big Bay Point Road running west to east. Utility may need relocation depending on the location of the future bridge piers to be determined during the detail design;
- A gas underground line located approximately 28 north of the centerline of Harvie Road and 200mm gas line running west to east just east of Highway 400;
- Hydro line and poles are located along the south side of Harvie Road and Big Bay Point Road crossing Highway 400. Also, on the east side of Fairview Road; and
- Culverts under Harvie Road, Highway 400 and Fairview Road.

The proposed Harvie Road crossing alignment was shifted to the north to minimum impact to the existing utilities within the existing Harvie Road and Big Bay Point Road ROW.

The plan drawings of the Design Alternatives in Appendix B show the location of utilities along Harvie Road / Big Bay Point Crossing.
3.15 Railway

There is an existing railway siding that crosses Big Bay Point Road approximately 450m west of Bayview Drive (to the old Molson’s Brewery property). This existing railway siding is covered by an agreement dated the 8th Day of January 1993.

The existing rail crossing is signed and not currently used. Removal of the existing rail crossing will be considered as part of this Phase 3 & 4 study.

3.16 Economic Environment

3.16.1 Impact on Business

Business Owners along Highway 400 between Mapleview Drive and Essa Road have advised that the existing traffic congestion is negatively impacting their business. Any improvement in traffic capacity would have a positive impact on business.

Without a highway crossing development opportunity would eventually be limited in the south end of Barrie.

3.16.2 Budget Considerations

The Corporation of the City of Barrie has a 5-Year Capital Plan with 10-Year Outlook which is approved annually by Council. The design phase of this project will start upon successful completion of this Phase 3 & 4 Class EA and subject to Council approval of the budget. The City of Barrie 2014 Development Cost Background Studies identifies that approximately 65% of the funding for the proposed transportation improvements will be through development cost charges.

3.16.3 Related Projects

In addition to the recommendation within this Phase 3 & 4 Class EA the following transportation improvements are recommended in the MMATMP within the 2031 time horizon (see Figure 3-5):

- Big Bay Point Road – Bayview Drive to Huronia Road (7 lanes)
- Harvie Road - Veterans Drive to Bryne Drive (5 lanes)
- Harvie Road – Essa Road to Veterans Drive (3 lanes)
- Bryne Drive – from North of Caplan to south of Essa (5 lanes)
- Bayview Drive – Big Bay Point Road to Little Ave (3 lanes)
Figure 3-5 – Transportation Improvements Recommended in the MMATMP within the 2031 Time Horizon
4. DESIGN ALTERNATIVES AND EVALUATION

Integral to this planning process is the development of design alternatives to implement the Preferred Planning Solution identified in the Phase 1 and 2 Report. The development and evaluation of the design alternatives for this study is detailed in the following sections.

4.1 Design Alternative Requirements

In developing the design alternatives for Harvie Road / Big Bay Point Road as a multi-modal corridor, the following components were required:

- Six general purpose lanes for vehicular traffic
- Provision of left turn lanes and/or continuous centre median, where appropriate
- Accommodation for Active Transportation via dedicated on-road bike lanes or off-road multi-use paths
- Sidewalks

In addition, the following aspects were considered:

- Minimizing impacts to adjacent properties
- Minimizing impacts to the municipal pump station on Big Bay Point Road
- Minimizing impacts to the natural environment (i.e. Whiskey Creek, woodlots, trees, etc.)
- Maximizing traffic operations and safety
- Minimizing construction costs

4.2 Development and Pre-Screening of Design Alternatives

Based on the considerations listed previously, a number of alternative design concepts were developed based on the Phase 2 Preferred Planning Solution that attempted to address the problem statement. A preliminary screening of these alternatives was also done at this time to eliminate alternatives that would cause significant impacts. All design alternatives were assessed using 80km/h as the design speed.

The pre-screening assessment resulted in 2 alignment alternatives, 5 profile alternatives and 3 typical section alternatives being considered for further analysis.

4.2.1 Alignment Alternatives

The following alignment alternatives were proposed for the Harvie Road / Big Bay Point Road crossing:

- Highway 400 Crossing with 500m Horizontal Radius; and
- Highway 400 Crossing with 280m Horizontal Radius.

During this process it was subsequently determined that the 500m Horizontal Radius Alignment option was to be dropped from further consideration as it would conflict with the existing municipal pump station and would place the radius on the crossing structure which was considered undesirable. The 280m Horizontal Radius alignment option was thus carried through for all Design Alternatives. The 280m Horizontal alignment require super elevation.
4.2.2 Profile Alternatives

The following profile alternatives were proposed for the Harvie Road / Big Bay Point Road crossing:

- Highway Crossing over Highway 400 and over the railway crossing (red profile on Figure 4-1);
- Highway Crossing over Highway 400 and at-grade with the railway crossing (black dashed profile on Figure 4-1);
- Highway Crossing over Highway 400 and removing the railway crossing (blue profile on Figure 4-1);
- Highway Crossing under Highway 400 and at-grade with the railway crossing (red profile on Figure 4-2); and
- Highway Crossing under Highway 400, raising Highway 400 and at-grade with the railway crossing (blue profile on Figure 4-2).

The Highway Crossing over Highway 400 and at-grade with the railway crossing profile option was dropped from further evaluation due to requiring a reduction in design speed to implement the necessary vertical curves.

4.2.3 Typical Sections

The Harvie Road / Big Bay Point Road crossing would be designed for the ultimate 7 lanes but constructed for 5 lanes in the interim. The following typical sections were proposed for the Harvie Road / Big Bay Point Road crossing:

- MTO Standard Geometrics
  - MTO Typical Sections within CAH Limits with Buffered Bike Lanes (Refer to Figure 4-3)
- City of Barrie Standard Geometrics
  - City of Barrie Typical Sections outside of CAH Limit between Bayview Drive and Bryne Drive with Buffered Bike Banes (Refer to Figure 4-4)
- City of Barrie Reduced Geometrics
  - City of Barrie Reduced Geometrics West of Bryne Drive with Buffered Bike Lanes (Refer to Figure 4-5)

Note: 1) cross sections are looking east and the right side of the cross section is the south side of the ROW and the north side the left.
2) A Controlled-Access Highway (CAH) is a type of road which has been designed for high-speed vehicular traffic, with all traffic flow and ingress/egress regulated (in this case by MTO).
Figure 4-3 – Typical Section: MTO Standard Geometrics

Figure 4-4 – Typical Section: City of Barrie Standard Geometrics

Figure 4-5 – Typical Section: Reduced Geometrics
The design alternatives were further assessed to be compatible with a Partial Parclo A interchange concept to determine what additional property is required for a potential future interchange, but will need to be updated once the Highway 400 TESR Update is completed by MTO.

4.3 Description of Design Alternatives

Following the completion of the pre-screening process, the alternatives which were carried forward from each category were combined as appropriate to form an intermediate list of alternatives for detailed analysis. The Design Alternatives are described in the following sections and the plan drawings can be found in Appendix B.

4.3.1 Design Alternative 1: Do Nothing

Design Alternative 1 is a continuation of existing conditions and would involve no change to the existing roadway.

The physical environment, in terms of existing infrastructure and pavement structure will continue to deteriorate with time. Maintenance costs are expected to increase as the deterioration continues.

As the population of the City of Barrie grows, the volume of traffic in south Barrie will continue to increase. The number of complaints, disruption to enjoyment of ride and potential impact on property values will increase as the infrastructure continues to deteriorate and traffic congestion increases.

Existing property accesses will be maintained and would not require any reconstruction or relocations. Although as traffic congestion increases, accessing the properties will become more difficult.

The natural environment will not be affected through this alternative.

4.3.2 Design Alternative 2a: Harvie Road / Big Bay Point Road Crossing Over Highway 400 & Over Railway Crossing & Standard Geometrics

Design Alternative 2a proposes the construction of a highway crossing linking Harvie Road to Big Bay Point Road going over the existing Highway 400 and a grade separated crossing over the existing railway crossing on Big Bay Point Road.

The standard roadway typical section is proposed to be implemented outside the Controlled Access Highway (CAH) limits. Within the CAH limits, the MTO typical sections will be utilized.

This Design Alternative will require the placement of high fills to a maximum of approximately 12m to implement the proposed road profile. The high fills will result in significant grading impacts that may affect adjacent properties, existing utilities and the natural environment. Retaining walls could be considered during detail design to minimize these impacts.

East of Fairview Road the proposed railway grade separation will require the relocation of the existing access points to the municipal water booster pump station, adjacent private property further east and result in steep driveway grades.
This Design Alternative assumes the realignment of the Highway 400 southbound lanes during construction to install the crossing structure. No impacts to the Highway 400 northbound lanes are anticipated.

The construction staging is anticipated to occur in the following sequence:

- Construction Stage 1: The Highway 400 southbound lanes will be permanently shifted to the west and both abutments will be constructed; and
- Construction Stage 2: The centre pier will be constructed.

A grade separation structure would be required to maintain the existing railway crossing further adding to the costs.

The realignment of Whiskey Creek under Highway 400 will be required to implement this Design Alternative. The existing 1.2mX0.9m concrete box culvert will be replaced with a closed system approximately 400m in length to convey Whiskey Creek under Highway 400 and Big Bay Point Road and outletting to the existing creek west of Fairview Road.

This Design Alternative will impact existing utilities by adding some fill on top of portions of the existing utility corridor and affect surface infrastructure such as overhead hydro and fire hydrants.

As Highway 400 traffic is the most substantial noise generator in the study area, increased noise from the proposed crossing over Highway 400 will be minor in comparison but greater than the design alternatives proposing a crossing under Highway 400.

### 4.3.3 Design Alternative 2b: Harvie Road / Big Bay Point Road Crossing Over Highway 400, Remove Railway Crossing & Reduced Geometrics

Design Alternative 2b is similar to 2a with the exception that the railway crossing will be removed. This allows an optimized road profile that reduces fill required and limits impacts to adjacent properties.

This design alternative includes a reduced roadway typical cross section outside of the CAH limits which further reduces property and grading impacts in comparison to Design Alternative 2a due to the smaller footprint of the proposed transportation improvements. Within the CAH limits, the MTO typical sections will be utilized.

Due to the removal of the railway crossing, the vertical profile was lowered in the vicinity of the railway crossing (but is still about 2 meters above existing grade) compared to Design Alternative 2a. This design alternative will still require the placement of high fills to a maximum of approximately 12m to implement the proposed road profile. The high fills will result in significant grading impacts that may affect adjacent properties, existing utilities and the natural environment. Retaining walls could be considered during detail design to minimize these impacts.

Compared to Design Alternative 2a, the proposed raised road profile in the vicinity of the pump station entrance has been reduced to about a meter above existing grade. This will allow the existing entrance location to be maintained with some regrading of the driveway profile to match the new profile. The raised road profile will also impact existing private property entrances.
4.3.4 Design Alternative 3a: Harvie Road / Big Bay Point Road Crossing Under Highway 400, At Grade Railway Crossing & Standard Geometrics

Design Alternative 3a is the construction of a highway crossing linking Harvie Road to Big Bay Point Road going under the existing Highway 400 and matching the existing profile just west of the existing railway for an at-grade crossing.

The standard roadway typical section is proposed to be implemented outside the Controlled Access Highway (CAH) limits. Within the CAH limits, the MTO typical sections will be utilized.

This Design Alternative will require earth cuts to a maximum of approximately 6m to implement the proposed road profile. The cuts may cause grading impacts to adjacent properties to implement the necessary back slopes and may require the construction of retaining walls to mitigate these impacts.

The proposed profile will follow the existing profile in the vicinity of the municipal pump station entrance. This will allow the existing entrance location to be maintained with some minor regrading of the driveway profile to accommodate the widening of Big Bay Point Road. The lowered profile will also impact existing private property entrances.

This Design Alternative will require the realignment of the Highway 400 northbound and southbound lanes to install the crossing structures on Highway 400.

The construction staging is anticipated to occur in the following sequence:

- Construction Stage 1: The southbound crossing structure will be constructed to the west of the existing southbound lanes. The Highway 400 southbound lanes will be permanently shifted to the west and both abutments will be constructed; and

- Construction Stage 2: Northbound lanes will be shifted to the existing southbound structure and the new northbound structure will be constructed and the northbound lanes will be shifted back to the northbound structure.

The at-grade rail crossing will be maintained as part of this design alternative and the widening at Big Bay Point Road will be designed to accommodate the existing railway grades.

The realignment of Whiskey Creek under Highway 400 will be required to implement this Design Alternative. The existing 1.2m x 0.9m concrete box culvert will be replaced with a closed system approximately 500m in length to convey Whiskey Creek under Highway 400 and Big Bay Point Road and out letting to the existing creek east of Fairview Road. A low point would be created on the road profile on the east side of Highway 400 and overland flow could discharge directly to a proposed channel that would discharge to Whiskey Creek.

This Design Alternative may impact existing utilities, both surface and underground infrastructure, as the cut profile may extend into the existing utility corridor and impact the required depth of cover for the utilities.

As Highway 400 traffic is the most substantial noise generator in the study area, increased noise from the proposed crossing under Highway 400 will be minor in comparison.
4.3.5 Design Alternative 3b: Harvie Road / Big Bay Point Road Crossing Under Highway 400, At Grade Railway Crossing & Reduced Geometrics

Design Alternative 3b is similar to Design Alternative 3a with exception of the implementation of a reduced roadway typical cross section outside of the CAH limits which further reduces property and grading impacts in comparison to Design Alternative 3a due to the smaller footprint of the proposed transportation improvements.

4.3.6 Design Alternative 3c: Harvie Road / Big Bay Point Road Crossing Under Highway 400, Raising Highway 400, At Grade Railway Crossing & Reduced Geometrics

Design Alternative 3c is similar to Design Alternative 3b with the exception that Highway 400 will be raised at the crossing location to obtain the necessary clearance between the proposed crossing profile and the existing 1.2mX0.9m concrete box culvert conveying Whiskey Creek. This allows for an optimized profile to reduce the cut required and eliminates the low-point within the crossing location that is present in Design Alternative 3a and 3b.

The reduced roadway typical section outside of the CAH limits would reduce the property and grading impacts in comparison to Design Alternative 3a due to the smaller footprint of the proposed transportation improvements.

This Design Alternative will require earth cuts to a maximum of approximately 4m to implement the proposed profile (compared to 6m required for Design Alternative 3a and 3b). The cuts will cause less grading impacts to adjacent properties to implement the necessary back slopes which could be further mitigated by the construction of retaining walls.

The realignment of Whiskey Creek under Highway 400 will be required to implement this Design Alternative. The realigned Whiskey Creek would be located under the proposed Harvie Road alignment and discharge to the existing culvert outlet under Highway 400. The elimination of the profile low-point will also have the benefit that overland flow will be directed east and can outlet directly to the existing Whiskey Creek channel.

This Design Alternative should not impact underground infrastructure but may impact surface infrastructure.

4.4 Evaluation Criteria

The design alternatives developed to correct the deficiencies are to be screened with respect to their impact on the technical, physical, social/cultural, natural, and economic environments. The assessment process compares various alternatives to the undertaking in a comprehensive manner by ensuring that the conclusions and recommendations are reached in a clear and logical fashion, and that all environmental issues sensitive to each undertaking are given thorough consideration. This assessment has been based on the work undertaken to-date.

The preliminary assessment and evaluation of design alternatives table used the Design Alternatives above and weighs each against the following Evaluation Criteria:

Technical
- Design Speed;
• Traffic Operations (Includes Road Geometrics and Active Transportation);

**Physical**
• Emergency Services;
• Railway;
• Property Access;
• Transit; and
• Water Booster Pump Station.

**Social / Cultural**
• Archaeological;
• Residential;
• Noise; and
• Development.

**Natural**
• Fisheries / Aquatic Habitats;
• Natural Hazards; and
• Terrestrial Habitats.

**Economic**
• Capital Costs (Harvie Road and Big Bay Road);
• Capital Staging Costs (Highway 400);
• Life Cycle Costs
• Maintenance Costs;
• Economic Stimulus due to Development of open lands; and
• Land Costs.

The capital costs for Harvie Road-Big Bay Road and Highway 400 are estimated for each design alternative and are the summary of information shown at the PIC #2. Details of the cost estimates are provided in Appendix C.

### 4.5 Evaluation and Assessment of the Design Alternative

The design alternatives were evaluated qualitatively based on the set of evaluation criteria. The design alternatives were assessed under each criterion individually and the overall effectiveness of the alternative was determined. **Table 4-1** illustrates the complete evaluation of the Design Alternatives. The evaluation table was updated since PIC #2 and the life cycle cost was added to the table as an evaluation criteria and the preferred design alternative was added to the evaluation table.

The Do Nothing option does not address the existing and future traffic congestion or facilitate any growth, although there would be no natural environmental impacts. The social impact related to congestion, including time loss and commuter frustration would increase as delays grow. Therefore, the Do Nothing option was deemed ineffective but included for comparison purposes.
### Table 4-1 - Evaluation & Assessment of Alternative Designs for Harvie / Big Bay Point Crossing

#### Harvie Big Bay Point Road Highway 400 Transportation Improvements

Municipal Class Environmental Assessment Phase 3 and 4 – Evaluation Table

The purpose of this assessment of the alternatives is to present the benefits and the impacts associated with the alternatives being considered. The evaluation is used to determine which alternative is preferred and the evaluation is a relative comparison between alternatives. Each potential impact was given a rank from (red solid circle) to (solid green circle). The ranking displayed graphically with positive effects in green and negative effects in red. Therefore, the alternative with the larger value indicates a greater degree of positive potential effects. A neutral effect was given a hollow black circle.

**Neutral Rank:** No significant change between alternatives | **Positive Rank:** Fully shaded circle indicates greatest positive effect

**Negative Rank:** Fully shaded circle indicates greatest negative effect

#### Evaluation Criteria

<table>
<thead>
<tr>
<th>Description of Evaluation Criteria</th>
<th>How the Criteria is Being Assessed</th>
<th>Alternatives and Ranking</th>
<th>Preferred Design Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Technical</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Design Speed</strong></td>
<td>Impact on roadway design speed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Existing Design Speed will be evaluated on Harvie Road and Big Bay Point Rail.</td>
<td>Increased Design Speed to 60km/h</td>
<td>Design Speed reduction between Byrne Drive and Beverley Drive, all facets east of Byrne Drive</td>
</tr>
<tr>
<td></td>
<td>• Increased Design Speed to 60km/h</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Traffic Operation (including Road Geometries &amp; Netra Transportation)</strong></td>
<td>Ability to maintain and/or maximize opportunities for improved Traffic Operations including Road Geometries (i.e., Lane Width), and Active Transportation (e.g., Sidewalks, On-Street Bike Lanes).</td>
<td>The NMAATP recommended cross-sections are implemented following the City of Toronto standard element widths.</td>
<td>The NMAATP recommended cross-sections are implemented using reduced element widths.</td>
</tr>
<tr>
<td></td>
<td>• Existing road geometries will be maintained and does not implement the recommendations from the City’s Multi-Modal Action Transportation Master Plan (NMAATP).</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Physical</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Emergency Services</strong></td>
<td>Ability to maintain and/or maximize opportunities for improved access for emergency vehicles.</td>
<td>• No improvements to existing emergency services.</td>
<td>Improved distribution of emergency services through the connection of Harvie Road to Big Bay Point Road.</td>
</tr>
<tr>
<td></td>
<td>• Improved distribution of emergency services through the connection of Harvie Road to Big Bay Point Road.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Railway</strong></td>
<td>Ability to minimize impacts on the existing at-grade railway spur crossing Big Bay Point Road.</td>
<td>The existing railway spur crossing Big Bay Point Road will be maintained.</td>
<td>The existing railway spur crossing Big Bay Point Road will be renewed and improved.</td>
</tr>
<tr>
<td></td>
<td>• The existing railway spur crossing Big Bay Point Road will be maintained through the implementation of a new at-grade railway spur crossing Big Bay Point Road crossing over the railway.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• The existing railway spur crossing will be renewed.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Morrison Hershfield Limited

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Table 4-1 - Evaluation & Assessment of Alternative Designs for Harvie / Big Bay Point Crossing (Cont’d)

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>Description of Evaluation Criteria</th>
<th>Alternative 2a Harvie / Big Bay Point Crossing Over Hay 400 &amp; Over Railway Crossing &amp; Standard Geometrics</th>
<th>Alternative 2b Harvie / Big Bay Point Crossing Under Hay 400, Reduced Railway Crossing &amp; Standard Geometrics</th>
<th>Alternative 3a Harvie / Big Bay Point Crossing Under Hay 400 &amp; At Grade Railway Crossing &amp; Standard Geometrics</th>
<th>Alternative 3b Harvie / Big Bay Point Crossing Under Hay 400 &amp; At Grade Railway Crossing &amp; Reduced Geometrics</th>
<th>Alternative 5a Harvie / Big Bay Point Crossing Over Hay 400 Remove Railway Crossing, Reduced Geometrics west of Bryne (Alternative 2a) plus Buffered Bike Lanes &amp; Papoose Implementation</th>
<th>Preferred Design Alternative</th>
<th>Preferred Design Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property Access</td>
<td>Ability to maintain and/or maximize opportunities for improved access into adjacent residential and commercial properties.</td>
<td>- No improvements to existing entrances.</td>
<td>- East of Hay 400, close in road profile impacts existing entrance grades.</td>
<td>- East of Hay 400, road profile closely follows the existing grade and maintains existing entrances.</td>
<td>- East of Hay 400, road profile closely follows the existing grade and maintains existing entrances.</td>
<td>- East of Hay 400, road profile closely follows the existing grade and maintains existing entrances.</td>
<td>- East of Hay 400, close in road profile impacts existing entrance grades.</td>
<td>- East of Hay 400, close in road profile impacts existing entrance grades.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>East of Hay 400, significant rise in road profile to accommodate railway grade separation.</td>
<td>The future access points on west side of Hay 400 being relocated to Bryne Drive.</td>
<td>The future access points on west side of Hay 400 being relocated to Bryne Drive.</td>
<td>The future access points on west side of Hay 400 being relocated to Bryne Drive.</td>
<td>The future access points on west side of Hay 400 being relocated to Bryne Drive.</td>
<td>- East of Hay 400, close in road profile impacts existing entrance grades.</td>
<td>- East of Hay 400, close in road profile impacts existing entrance grades.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>East of Fairview Road the proposed railway grade separation will require relocation of the existing access points on the municipal water treatment plant from private property further east and result in steep driveway grades.</td>
<td>The future access points on west side of Hay 400 being relocated to Bryne Drive.</td>
<td>The future access points on west side of Hay 400 being relocated to Bryne Drive.</td>
<td>The future access points on west side of Hay 400 being relocated to Bryne Drive.</td>
<td>The future access points on west side of Hay 400 being relocated to Bryne Drive.</td>
<td>- East of Hay 400, close in road profile impacts existing entrance grades.</td>
<td>- East of Hay 400, close in road profile impacts existing entrance grades.</td>
</tr>
<tr>
<td>Trunk</td>
<td>Ability to improve from existing and/or integrate transit services into the overall transportation system.</td>
<td>No improvements to existing emergency services.</td>
<td>Improved integration of transit services through the connection of Harvie Road to Big Bay Point Road.</td>
<td>Improved integration of transit services through the connection of Hay 400 to Big Bay Point Road.</td>
<td>Improved integration of transit services through the connection of Harvie Road to Big Bay Point Road.</td>
<td>Improved integration of transit services through the connection of Hay 400 to Big Bay Point Road.</td>
<td>Improved integration of transit services through the connection of Harvie Road to Big Bay Point Road.</td>
<td>Improved integration of transit services through the connection of Harvie Road to Big Bay Point Road.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Significant rise in road profile to accommodate railway grade separation will impact existing entrance and grading.</td>
<td>Rise in road profile adjacent to the pump station will impact existing entrance and grading.</td>
<td>Road profile adjacent to the pump station closely follows the existing grade and will minimally impact the pump station.</td>
<td>Road profile adjacent to the pump station closely follows the existing grade and will minimally impact the pump station.</td>
<td>Road profile adjacent to the pump station closely follows the existing grade and will minimally impact the pump station.</td>
<td>Improved integration of transit services through the connection of Harvie Road to Big Bay Point Road.</td>
<td>Improved integration of transit services through the connection of Harvie Road to Big Bay Point Road.</td>
</tr>
<tr>
<td>Water Booster PS</td>
<td>Ability to minimize impacts on the existing Water Booster Pump Station along Big Bay Point Road.</td>
<td>No impacts to the pump station.</td>
<td>Rise in road profile adjacent to the pump station will impact existing entrance and grading.</td>
<td>Road profile adjacent to the pump station closely follows the existing grade and will minimally impact the pump station.</td>
<td>Reduced roadway widths will limit the impacts to the property.</td>
<td>Reduced roadway widths will limit the impacts to the property.</td>
<td>Improved integration of transit services through the connection of Harvie Road to Big Bay Point Road.</td>
<td>Improved integration of transit services through the connection of Harvie Road to Big Bay Point Road.</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>Improved integration of transit services through the connection of Harvie Road to Big Bay Point Road.</td>
<td>Improved integration of transit services through the connection of Harvie Road to Big Bay Point Road.</td>
</tr>
<tr>
<td>Social/Cultural Environment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Improved integration of transit services through the connection of Harvie Road to Big Bay Point Road.</td>
<td>Improved integration of transit services through the connection of Harvie Road to Big Bay Point Road.</td>
</tr>
<tr>
<td>Archaeological</td>
<td>Potential for disruption of archaeological resources.</td>
<td>No impacts on archaeological resources.</td>
<td>Potential impact on minor or potentially more significant archaeological resources.</td>
<td>Potential impact on minor or potentially more significant archaeological resources.</td>
<td>Potential impact on minor or potentially more significant archaeological resources.</td>
<td>Potential impact on minor or potentially more significant archaeological resources.</td>
<td>Potential impact on minor or potentially more significant archaeological resources.</td>
<td>Potential impact on minor or potentially more significant archaeological resources.</td>
</tr>
</tbody>
</table>
Table 4-1 - Evaluation & Assessment of Alternative Designs for Harvie / Big Bay Point Crossing (Cont’d)

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>How the Colony is Being Assessed</th>
<th>Alternative 2a Harvie / Big Bay Point Crossing Over Hwy 400 &amp; Over Railway Crossing &amp; Standard Geometries</th>
<th>Alternative 2b Harvie / Big Bay Point Crossing Over Hwy 400, Rainbow Railway Crossing &amp; Reduced Geometrics</th>
<th>Alternative 3a Harvie / Big Bay Point Crossing Under Hwy 400, All Grade Railway Crossing &amp; Standard Geometries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>Potential for impacts on adjacent residential areas.</td>
<td>Some impact to residential areas south of Harvie Road and west of Hwy 400.</td>
<td>Some impact to residential areas south of Harvie Road and west of Hwy 400.</td>
<td>Some impact to residential areas south of Harvie Road and west of Hwy 400.</td>
</tr>
<tr>
<td></td>
<td>No disruption to the corridor, however does not address negative impacts of existing congestion at south of Harvie Road and east of Hwy 400.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noise</td>
<td>Ability to minimize impacts on ambient noise levels in the Study Area.</td>
<td>Increased traffic on expressway, major traffic and Byrne Drive are not distributed. Most significant residential areas are mainly at Esso.</td>
<td>Higher noise levels as a result of higher traffic volumes for the crossing gate Hwy 400.</td>
<td>Increase of noise levels as a result of higher traffic volumes for the crossing gate Hwy 400.</td>
</tr>
<tr>
<td>Development</td>
<td>Potential for impacts on adjacent and future development.</td>
<td>No impacts on development but lack of transportation improvements will reduce potential economic benefits.</td>
<td>Allows for future development potential.</td>
<td>Allows for future development potential.</td>
</tr>
<tr>
<td>Natural Environment</td>
<td>Fishermans / Aquatic Habitats.</td>
<td>No impacts on fishermans, aquatic habitats and watercourses.</td>
<td>Requires the realignment of Whiskey Creek under Hwy 400 through approximately 300m of larger closed system.</td>
<td>Requires the realignment of Whiskey Creek under Hwy 400 through approximately 300m of larger closed system.</td>
</tr>
<tr>
<td></td>
<td>Would require removal of land inside Harvie Road to allow for major storm sewer and major outfalls.</td>
<td></td>
<td></td>
<td>Requires the realignment of Whiskey Creek under Hwy 400 through approximately 500m of larger closed system.</td>
</tr>
<tr>
<td></td>
<td>Overland flow will be directed to the south to the proposed upstream side of the Whiskey Creek culvert crossing.</td>
<td></td>
<td></td>
<td>Requires the realignment of Whiskey Creek under Hwy 400 through approximately 500m of larger closed system.</td>
</tr>
<tr>
<td></td>
<td>Replacement culvert structure will require upscaling to accommodate the increased flows and convey the 100 year Storm.</td>
<td></td>
<td></td>
<td>The existing 1.22m x 1.12m box culvert carrying Whiskey Creek under Hwy 400 can be maintained and extended.</td>
</tr>
<tr>
<td></td>
<td>Requires the realignment of Whiskey Creek under Hwy 400 through approximately 300m of larger closed system.</td>
<td></td>
<td></td>
<td>Requires the realignment of Whiskey Creek under Hwy 400 through approximately 300m of larger closed system.</td>
</tr>
<tr>
<td></td>
<td>West of Hwy 400, the overland flow will be directed east to the proposed upstream side of the Whiskey Creek culvert crossing.</td>
<td>West of Hwy 400, the overland flow will be directed east to the proposed upstream side of the Whiskey Creek culvert crossing.</td>
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</tr>
<tr>
<td></td>
<td>Replacement culvert structure will require upscaling to accommodate the increased flows and convey the 100 year Storm.</td>
<td>Replacement culvert structure will require upscaling to accommodate the increased flows and convey the 100 year Storm.</td>
<td>Replacement culvert structure will require upscaling to convey the Regional storm and to be discharged downstream of Fairview Road.</td>
<td>Replacement culvert structure will require upscaling to convey the Regional storm and to be discharged downstream of Fairview Road.</td>
</tr>
<tr>
<td></td>
<td>West of Hwy 400, the overland flow will be directed east to the upstream side of the Whiskey Creek culvert crossing.</td>
<td>West of Hwy 400, the overland flow will be directed east to the downstream side of the Whiskey Creek culvert crossing.</td>
<td>West of Hwy 400, the overland flow will be directed east to the downstream side of the Whiskey Creek culvert crossing.</td>
<td>West of Hwy 400, the overland flow will be directed east to the downstream side of the Whiskey Creek culvert crossing.</td>
</tr>
<tr>
<td></td>
<td>Overland flow will be directed east and can outlet directly in the existing Whiskey Creek culvert crossing.</td>
<td>Overland flow can outlet directly in the existing Whiskey Creek culvert crossing.</td>
<td>Overland flow can outlet directly in the existing Whiskey Creek culvert crossing.</td>
<td>Overland flow will be directed east and can outlet directly in the existing Whiskey Creek culvert crossing.</td>
</tr>
<tr>
<td></td>
<td>Replacement culvert structure will require upscaling to convey the Regional storm and to be discharged downstream of Fairview Road.</td>
<td>Replacement culvert structure will require upscaling to convey the Regional storm and to be discharged downstream of Fairview Road.</td>
<td>Replacement culvert structure will require upscaling to convey the Regional storm and to be discharged downstream of Fairview Road.</td>
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<td></td>
<td>West of Hwy 400, the overland flow will be directed east to the proposed upstream side of the Whiskey Creek culvert crossing.</td>
<td>West of Hwy 400, the overland flow will be directed east to the proposed downstream side of the Whiskey Creek culvert crossing.</td>
<td>West of Hwy 400, the overland flow will be directed east to the proposed downstream side of the Whiskey Creek culvert crossing.</td>
<td>West of Hwy 400, the overland flow will be directed east to the proposed downstream side of the Whiskey Creek culvert crossing.</td>
</tr>
<tr>
<td></td>
<td>Overland flow can outlet directly in the existing Whiskey Creek culvert crossing.</td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

Morrison Hershfield Limited
## Table 4-1 - Evaluation & Assessment of Alternative Designs for Harvie / Big Bay Point Crossing (Cont’d)

<table>
<thead>
<tr>
<th>Description of Evaluation Criteria</th>
<th>Do Nothing</th>
<th>Alternative 2a Harvie / Big Bay Point Crossing Over Hwy 400 &amp; 401/427 Railway Crossing &amp; Standard Geometrics</th>
<th>Alternative 2b Harvie / Big Bay Point Crossing Under Hwy 400, Removal Railway Crossing &amp; Reduced Geometrics</th>
<th>Alternative 3a Harvie / Big Bay Point Crossing Under Hwy 400, At Grade Railway Crossing &amp; Standard Geometrics</th>
<th>Alternative 3b Harvie / Big Bay Point Crossing Under Hwy 400, At Grade Railway Crossing &amp; Reduced Geometrics</th>
<th>Preferred Design Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Terrestrial Habits</strong></td>
<td>• No impacts on terrestrial species and habitats.</td>
<td>• Impacts to existing woodland.</td>
<td>• Reduced impacts to existing woodland.</td>
<td>• Impacts to existing woodland.</td>
<td>• Reduced impacts to existing woodland.</td>
<td>• Reduced impacts to existing woodland on due to phased implementation</td>
</tr>
<tr>
<td><strong>Economic</strong></td>
<td>• No construction costs</td>
<td>• $80 Million. Additional costs due railway grade separation crossing structure.</td>
<td>• $35 Million.</td>
<td>• $40 Million. Additional costs due railway grade separation crossing structure.</td>
<td>• $35 Million.</td>
<td>• $40 Million. Additional costs due railway grade separation crossing structure.</td>
</tr>
<tr>
<td><strong>Capital Staging Costs Highway 400</strong></td>
<td>• No construction costs</td>
<td>• Permanent realignment to accommodate the central bridge span.</td>
<td>• $10 to $17 Million.</td>
<td>• Permanent realignment to accommodate the central bridge span.</td>
<td>• $10 to $17 Million.</td>
<td>• Permanent realignment to accommodate the central bridge span.</td>
</tr>
<tr>
<td><strong>Life Cycle Costs</strong></td>
<td>• Minimal life cycle cost of dead end roads.</td>
<td>• Life cycle costs increase because of higher maintenance requirements.</td>
<td>• Life cycle costs increase because of higher maintenance requirements.</td>
<td>• Life cycle costs increase because of higher maintenance requirements.</td>
<td>• Life cycle costs increase because of higher maintenance requirements.</td>
<td>• Life cycle costs increase because of higher maintenance requirements.</td>
</tr>
<tr>
<td><strong>Maintenance Costs</strong></td>
<td>• Increasing maintenance costs as existing infrastructure deteriorates and requires repairs.</td>
<td>• Costs limited to winter maintenance (plowing, sanding).</td>
<td>• Costs limited to winter maintenance (plowing, sanding).</td>
<td>• Costs limited to winter maintenance (plowing, sanding).</td>
<td>• Costs limited to winter maintenance (plowing, sanding).</td>
<td>• Costs limited to winter maintenance (plowing, sanding).</td>
</tr>
<tr>
<td><strong>Economic Stimulus due to Development of green lands</strong></td>
<td>• No improvement or allowance for new development.</td>
<td>• Provides for new development.</td>
<td>• Provides for new development.</td>
<td>• Provides for new development.</td>
<td>• Provides for new development.</td>
<td>• Provides for new development.</td>
</tr>
</tbody>
</table>
Table 4-1 - Evaluation & Assessment of Alternative Designs for Harvie / Big Bay Point Crossing (Cont’d)

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>Description of Evaluation Criteria</th>
<th>Alternative 2a: Harvie / Big Bay Point Crossing Over Hwy 400 &amp; Over Railway Crossing &amp; Standard Geometrics</th>
<th>Alternative 2b: Harvie / Big Bay Point Crossing Over Hwy 400, Remove Railway Crossing &amp; Reduced Geometrics</th>
<th>Alternative 3a: Harvie / Big Bay Point Crossing Under Hwy 400, At Grade Railway Crossing &amp; Standard Geometrics</th>
<th>Alternative 3b: Harvie / Big Bay Point Crossing Under Hwy 400, At Grade Railway Crossing &amp; Reduced Geometrics</th>
<th>Preferred Design Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Costs</td>
<td>Costs to acquire adjacent property to implement transportation improvements.</td>
<td>• No property acquisition required.</td>
<td>• Significant property acquisition required.</td>
<td>• Reduced property acquisition required due to narrower ROW.</td>
<td>• Significant property acquisition required.</td>
<td>Harvie / Big Bay Point Crossing Over Hwy 400, Remove Railway Crossing, Reduced Geometrics west of Byrne (Alternative 2b) plus Ruffled Bike Lanes Phased implementation</td>
</tr>
</tbody>
</table>

Note 1: Costs are based on MTO Parametric Estimating Guide.
Note 2: Costs don’t include future lengthening of structure to accommodate 10 lanes.
5. CONSULTATION (PUBLIC INFORMATION CENTRE #2)

Consultation is a key feature of the environmental assessment planning process, which provides a two-way communications process between the proponent and the affected and interested parties. Consultation provides opportunities for information exchange and for those consulted to have their concerns considered during the decision-making process. The goal of consultation is to generate meaningful dialogue between the project planners and stakeholders and to allow an exchange of ideas and broadening of the information base to ultimately lead to an improved decision-making process, and thereby, an improved design solution.

The second Public Information Centre (PIC #2) was held on Thursday April 23, 2015, from 4:00pm to 7:00pm, at Holly Community Centre, 171 Mapleton Ave., Barrie, ON in the Multi-Purpose Room on the 2nd Floor.

The information displayed during the PIC included the following:
- Study Purpose
- Purpose of the Public Information Centre #2
- Summary of Additional Studies Completed Since Public Information Centre #1
- Objectives of Phase 3 & 4 of the Class EA
- Municipal Class EA Planning and Design Process
- Multimodal Active Transportation Master Plan Recommendations
- Study Area
- Alternative Design Concepts
- Evaluation of Alternative Design Concepts
- Highway 400 Crossing Estimated Costs and Timing
- Preliminary Future Interchange Property Requirements

Ninety-two (92) people signed the attendance register at the PIC.

The PIC #2 presented the alternative designs and evaluation to the public to obtain comments and suggestions received from the public and agencies. Preferred rankings were received on forty-two (42) comment sheets and the results are shown in Table 5-1.

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Number of Preferred Rankings</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7</td>
<td>17%</td>
</tr>
<tr>
<td>2a</td>
<td>12</td>
<td>29%</td>
</tr>
<tr>
<td>2b</td>
<td>16</td>
<td>38%</td>
</tr>
<tr>
<td>3a</td>
<td>4</td>
<td>9%</td>
</tr>
<tr>
<td>3b</td>
<td>2</td>
<td>5%</td>
</tr>
<tr>
<td>3c</td>
<td>1</td>
<td>2%</td>
</tr>
<tr>
<td>Total</td>
<td>42</td>
<td>100%</td>
</tr>
</tbody>
</table>

The attendees had the opportunity to speak with representatives from the City and the Consultant and provide comments in the form of a comment sheet. The comments received either in the form of the comment sheet provided or in subsequent correspondences either by emails, facsimiles, or letters, are compiled in Appendix D.
Table 5-2 shows the summary of major issues that were raised in the PIC (for detailed comments and responses please see Appendix D).

A copy of the PIC #2 display boards is included in Appendix D.

**Table 5-2 - Summary of Major Issues Raised in PIC**

<table>
<thead>
<tr>
<th>Major Issue</th>
<th>Response/Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access to Fairview Drive will be difficult from adjacent properties due to additional traffic volume.</td>
<td>Future growth in traffic volume on Fairview Road will be minimized by the new Highway crossing connecting Harvie and Big Bay. The MMATMP suggests that 5 lane Fairview Road may be required beyond 2031 (includes a turning lane in the centre of the road).</td>
</tr>
<tr>
<td>Rail road Crossing.</td>
<td>The preferred design alternative proposes to remove the existing railway spur.</td>
</tr>
<tr>
<td>Increased cut through traffic on adjacent residential streets.</td>
<td>As part of detailed design traffic calming measures will be considered on impacted residential streets.</td>
</tr>
<tr>
<td>Impact to Molson archaeological site</td>
<td>The archaeological site has been cleared.</td>
</tr>
<tr>
<td>Bryne Drive needs to be connected</td>
<td>Bryne Drive is subject to a Schedule C Class EA. Funding is being considered for inclusion in the 2016-2020 Capital Plan to connect Bryne Drive before the new Highway crossing connecting Harvie to Big Bay is opened to the public.</td>
</tr>
<tr>
<td>Bicycle paths should take the form of multi-use trails instead of on-road bike lanes in order to see higher numbers of cyclists using the infrastructure, which will in-turn bring more people by different modes of transportation to the area.</td>
<td>The proposed multiuse trail would conflict with driveways and pedestrians and be a potential safety issue over the Highway. Multiuse trails are also less compatible with commuter cyclists.</td>
</tr>
<tr>
<td>Concerned about impact of Crossing / Interchange on Harvie Road</td>
<td>The Highway 400 crossing connecting Harvie Road to Big Bay Point Road is one of the critical elements needed to resolving the traffic issues in the south end of Barrie. The Harvie Road EA between Bryne and Veteran’s is subject to a separate Class EA process but this Class EA recommends that reduced geometrics and four lanes be considered. Also, funding is being considered in the 2016-2020 Capital plan to connect Bryne Drive which will minimize cut through traffic on Harvie Road west of Bryne.</td>
</tr>
<tr>
<td>Impacts on Whiskey Creek, floodplain aquatic habitat, groundwater and stormwater management.</td>
<td>The preferred design alternative includes an alignment shift to the north which will minimize the impact to the natural environment. Additional mitigation measure will be considered as part of detail design including the potential of retaining walls which will reduce the footprint of the recommended transportation improvements.</td>
</tr>
</tbody>
</table>
5.1 Selection of the Preferred Design Alternative.

Following the PIC and in consideration of all concerns and comments raised by the reviewing agencies and public, the design alternatives were evaluated and assessed by members of the Project Team taking into considerations the comments received throughout the PIC process.

The evaluation recommended a modified and phased in version of design alternative 2b as the preferred design alternative. MTO and the LSRCA have both endorsed the preferred design alternative subject to specific details being worked out during detail design.
6. PREFERRED DESIGN ALTERNATIVE

The preferred design alternative is to construct the Harvie Road / Big Bay Point Road Crossing linking Harvie Road to Big Bay Point Road going over the existing Highway 400 and removing the existing railway spur crossing Big Bay Point Road between Fairview Road and Bayview Drive.

The preferred design alternative reduces the construction cost due to less staging works on Highway 400 in comparison to the design alternatives under Highway 400. In addition, the preferred design alternative reduces property acquisition and impact to archaeological resources in part due to the recommended phased implementation.

The following subsections provide additional details on the preferred design alternative.

6.1 Description of the Preferred Design Alternative

The road improvements necessary to accommodate the preferred design alternative are shown on the drawings (plan and profile) provided in Figure 6-1, Figure 6-2 and Appendix E. The preferred design alternative for the Harvie Road / Big Bay Point Road Crossing includes the following elements:

- Harvie Road / Big Bay Point Road Crossing Over Hwy 400
- Removal of the existing railway crossing on Big Bay Point Road between Bayview Road and Fairview Road
- Reduced Geometrics west of Bryne Drive to be considered as part of the update to the Harvie Class EA between Veteran’s Drive and Bryne Drive and standard geometrics elsewhere.
- Buffered bike lanes and sidewalks on both sides
- 5 lanes in the interim and 7 lanes ultimate between Bryne Drive and Bayview Drive
- protection of land for a potential future Highway interchange

The crossing will be designed for the ultimate 7 lane configuration compatible with a future interchange but constructed for 5 lanes in the interim. The Highway Interchange will be subject to a future separate Class EA study.

6.2 Design Criteria

Design criteria associated with the preferred design alternative was established using the following (see Table 6-1):

- Input from the City of Barrie and MTO
- recommendations in the MMATMP
- MTO’s Ontario Geometric Design Standards for Ontario Highways
- Design standards from Transportation Association of Canada (TAC) – Geometric Design Guide for Canadian Roads
- TAC guidelines.
Table 6-1 - Harvie Road / Big Bay Point Road Crossing Design Criteria

<table>
<thead>
<tr>
<th></th>
<th>Present Conditions</th>
<th>Design Standards</th>
<th>Proposed Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highway Classification</td>
<td>UAU 70</td>
<td>UAD 80</td>
<td>UAD 80</td>
</tr>
<tr>
<td>Minimum Stopping Sight Distance</td>
<td>110m</td>
<td>135m</td>
<td>135m+</td>
</tr>
<tr>
<td>Equivalent Minimum &quot;K&quot; Factor</td>
<td>C 18, S12</td>
<td>C 35, S 30</td>
<td>C 35, S 30</td>
</tr>
<tr>
<td>Grades Maximum</td>
<td>±3%</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>Minimum Radius</td>
<td>n/a</td>
<td>250m</td>
<td>250m</td>
</tr>
<tr>
<td>Pavement Width</td>
<td>3.5m+/- x 2</td>
<td>3.5m lanes</td>
<td>3.30-3.75m x 7</td>
</tr>
<tr>
<td>Superelevaton</td>
<td>n/a</td>
<td>??</td>
<td>??</td>
</tr>
<tr>
<td>Posted Speed</td>
<td>50km/h</td>
<td>60km/h</td>
<td>60km/h</td>
</tr>
</tbody>
</table>

6.3 Road Geometry

6.3.1 Horizontal Alignment

The Transportation Association of Canada (TAC) – *Geometric Design Guide for Canadian Roads* was used to assess and select the proposed curve radius values for the preliminary horizontal alignment design.

Highway 400 Crossing with 280m Horizontal Radius was recommended along the Harvie Road / Big Bay Point Road Crossing to meet an 80 km/h design speed (TAC) while minimizing the impacts to adjacent land owners.

If a larger radius is used additional grade impacts are anticipated to the booster pump station.

6.3.2 Vertical Alignment

Transportation Association of Canada (TAC) – *Geometric Design Guide for Canadian Roads* was used to assess and select the proposed vertical curve (K) values for the preliminary vertical alignment design.

**Harvie Road / Big Bay Point Road Crossing**

The vertical alignment proposed for the Harvie Road / Big Bay Point Road Crossing between Stations 9+350 and 10+650 can be reviewed on the Preferred Design Profile in Figure 6-2 and Appendix E. East and west of these limits the road profile will match the existing vertical road alignment.

The existing road profile was raised west of Highway 400 in part to allow the existing storm pond outlet emergency spillway to overtop a low point on Bryne Drive. The recommended road profile crosses approximately 7.5m over Highway 400 and is approximately 12m above existing grade just east of Highway. “K” Factor ranges from 30 to 60 and maximum slope is 5%.

**Highway 400**

The recommended Harvie Big Bay road profile was set for worst case Highway 400 span scenario which takes into account a potential Core/Collector and the existing Service Centre.
access. The assumed structure length is ±130 meters long requiring potentially a 4 span structure (thinner 2.5m girders were assumed and top of pavement to soffit was assumed to be about 1.6m minimum).

From MTO’s recent Preliminary Draft typical Hwy 400 cross section for 10 lanes at McKay (W.O. 06-20016), the bridges are planned to be 38.91m two span bridges which would be possible at Harvie/Big Bay Point including allowance for a Service Centre access. In this case, a Top of Pavement to Soffit clearance of 2.5m is proposed.
Alternative Design Concepts (Over Highway 400) - Profile

FIGURE 6-2
PREFERRED DESIGN PROFILE - HARVIE ROAD / BIG BAY POINT ROAD CROSSING OVER HWY 400 (ALTERNATIVE 2b) - PHASE 3 AND 4 EA

The City of Barrie
6.3.3 Typical Cross-Sections

Harvie Road / Big Bay Point Road Crossing

As discussed in Section 4.2.3, the Harvie Road / Big Bay Point Road crossing would be designed for the ultimate 7 lanes but constructed for 5 lanes in the interim. The following typical sections were proposed for the Harvie Road / Big Bay Point Road crossing:

- MTO Standard Geometrics (from sta 9+700 to sta 10+365)
- City of Barrie Standard Geometrics (from sta 9+600 to sta 9+700 and 10+365 to sta 10+650)
- City of Barrie Reduced Geometrics (9+400 to sta 9+600)

The MTO Standard Geometrics typical section is recommended within MTO’s CAH limits of Highway 400 and includes an interim cross-section and an ultimate cross-section (Refer to Figures 6-3 and 6-4). The typical cross-section elements are summarized below:

**Interim cross-section (35m -36.4m):**
- 3.75m travel lanes, 2 in each direction
- 3m two way left turn lane
- 2m median
- 2.0m-2.3m buffered bike lane (both sides)
- 0.50m curb (both sides)
- 2.5m-2.9m boulevard (both sides)
- 2m sidewalk (both sides)
- 0.5 clearance (both sides)

**Ultimate cross-section (42.5m - 43.9m):**
- 3.75m travel lanes, 3 in each direction
- 3m two way left turn lane
- 2m median
- 2.0m-2.3m buffered bike lane (both sides)
- 0.50m curb (both sides)
- 2.5m-2.9m boulevard (both sides)
- 2m sidewalk (both sides)
- 0.5 clearance (both sides)

The City of Barrie Standard Geometrics is recommended between Bayview Drive and Bryne Drive outside of the MTO CAH limits. The City of Barrie Standard Geometrics is comprised of an interim cross-section and an ultimate cross-section (Refer to Figures 6-5 and 6-6). The typical cross-section elements are summarized below:

**Interim cross-section (34m):**
- 3.5m travel lanes, 2 in each direction
- 3m two way left turn lane
- 1.2m median
- 2.0m buffered bike lane (both sides)
- 0.50m curb (both sides)
- 2.9m boulevard (both sides)
- 2m sidewalk (both sides)
• 0.5 clearance (both sides)

**Ultimate cross-section (41m):**
• 3.5m travel lanes, 3 in each direction
• 3m two way left turn lane
• 1.2m median
• 2.0m buffered bike lane (both sides)
• 0.50m curb (both sides)
• 2.9m boulevard (both sides)
• 2m sidewalk (both sides)
• 0.5 clearance (both sides)

The City of Barrie Reduced Geometrics is recommended west of Bryne Drive. The City of Barrie Reduced Geometrics is comprised of an interim cross-section and an ultimate cross-section (Refer to Figures 6-7 and 6-8). The typical cross-section elements are summarized below:

**Interim cross-section (28.2m):**
• 3.3m travel lanes, 2 in each direction
• 2.0m buffered bike lane (both sides)
• 0.50m curb (both sides)
• 2.5m boulevard (both sides)
• 2m sidewalk (both sides)
• 0.5 clearance (both sides)

**Ultimate cross-section (33.2m):**
• 3.3m travel lanes, 2 in each direction
• 4.2m two way left turn lane
• 2.0m buffered bike lane (both sides)
• 0.50m curb (both sides)
• 2.5m boulevard (both sides)
• 2m sidewalk (both sides)
• 0.5 clearance (both sides)

Bike lane and boulevard widths within the CAH limits will be sort out with MTO during detail design.

The medians are potentially only needed at intersections and will be further reviewed during the detail design.

**Highway 400**

At the time of the writing of this report, the preliminary Highway 400 TESR recommended that Highway 400 be widened to ten lanes at Harvie and Big Bay. MTO’s Preliminary Draft typical Highway 400 cross section for the recommended 10 lanes will shift the existing Highway 400 centerline 12.15m to the west.
Figure 6-3 – Interim Typical Section: MTO Standard Geometrics

Figure 6-4 – Ultimate Typical Section: MTO Standard Geometrics
Figure 6-5 – Interim Typical Section: City of Barrie Standard Geometrics

Figure 6-6 – Ultimate Typical Section: City of Barrie Standard Geometrics
6.3.4 Pedestrian and Cyclist Facilities

Provisions for cyclists and pedestrians have been included in the preferred design alternative through the inclusion of buffered bike lanes and sidewalks on both sides.

All proposed pedestrian and cycling facilities along the Harvie Road / Big Bay Point Road Crossing conformed to the minimum requirements in the Ontario Traffic Manual Book 18 (Cycling Facilities), Table 4-4.

OTM Book 18 Table 4-4 indicates that bike lanes shall have minimum 1.5m lane + 0.5 m buffer which matches City typical cross section but also recommends that 1.8 m lane + 1.2 m buffers are desirable.

Consequently, 2m sidewalk is recommended on both sides of the crossing with the minimum 2m buffered bike lanes.
6.3.5 Streetscape

The construction of the Harvie Road / Big Bay Point Road Crossing provides an opportunity to improve both the aesthetics and ecological conditions of the corridor. A tree protection plan and streetscape plan will be required during the detail design stage and shall conform to the City of Barrie’s Tree Protection Manual (Version 2, Revised January 2010) for street trees within the City’s Right of Way (ROW).

6.3.6 Construction Staging

The ongoing Highway 400 TESR calls for ten lanes. MTO’s Preliminary Draft typical Highway 400 cross section for 10 lanes shifts the existing centerline location 12.15 m to the west. This alignment shift will impact the construction of the Harvie Road / Big Bay Point Road Crossing. As such, the project team developed construction strategies for several possibilities.

As shown in Table 6-2, the following options were assessed from a staging and cost perspective:

**Table 6-2 – Staging Options**

<table>
<thead>
<tr>
<th>Stage 1</th>
<th>Stage 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 1 5 lane crossing over 6 lane Hwy 400</td>
<td>7 lane crossing and interchange ramps over 10 lane Hwy 400</td>
</tr>
<tr>
<td>Option 2 5 lane crossing over 10 lane Hwy 400</td>
<td>7 lane crossing and interchange ramps over 10 lane Hwy 400</td>
</tr>
<tr>
<td>Option 3 7 lane crossing over 6 lane Hwy 400</td>
<td>7 lane crossing and interchange ramps over 10 lane Hwy 400</td>
</tr>
<tr>
<td>Option 4 7 lane crossing over 10 lane Hwy 400</td>
<td>Interchange ramps</td>
</tr>
</tbody>
</table>

The EMME output from the MMATMP that shows approximately 17,000 ADT on the Harvie Road / Big Bay Point Road crossing by 2016. Given the anticipated growth in the south end of Barrie four through lanes plus a turning lane (total 5 lanes) would adequately service traffic volumes within the 2031 time horizon.

The staging for the future works is simplified if less is built initially, which allows more flexibility for future widening and lengthening of the bridge structure. The following key items were considered in the selection of the staging strategy:

i. Whether the stage 2 construction of the bridge widening could be undertaken all on north side given that the potential future E-S ramp would require widening on the north side (issue is related to the desire of maintaining the road cross fall for the ultimate seven lanes).

ii. Whether the west abutment should be constructed in a location compatible with the proposed 10 lane Highway 400 for options 1 & 3.

iii. Whether or not to eliminate the sidewalk on the side to be widened.

iv. Intersection Queue Lengths at Fairview Road and Bryne Drive and whether the queues would back onto the bridge structure.

v. Potential highway 400 realignment.
vi. Staging Costs (Further discussed in Section 6.3.9).

The first three key items will be further reviewed during the detail design. The following sections further discuss aspects of the project that will impact the construction of the Harvie Road / Big Bay Point Road Crossing.

6.3.6.1 Assessment of Staging for Options 1 & 2

Within the vicinity of the crossing structure Options 1 & 2 would permit the temporary elimination of the centre two way left turn lane (TWLTL) and bike lanes which would facilitate the stage 2 widening and lengthening of the structure while still maintaining one lane of travel in each direction.

During stage 1, Options 1 & 2 would permit full turning movements to and from the Barrie pump station, the old Molson Property and facilitate turning lanes on all approaches to the Fairview Road/Big Bay Point Road and Bryne Drive/Harvie Road intersections. During the construction of stage 2 the bike lanes and turning lanes could be temporarily eliminated to facilitate the widening of the road.

Minimum Required East Bound Left Turn Storage Length to the Fairview Road

Given the proximity of Fairview to Highway 400, the minimum required eastbound left turn (EBLT) storage length from Harvie Road / Big Bay Point Road to Fairview Road was calculated using MTO Geometric Design Standards for Ontario Highways (Table E9-1).

As discussed in Section 1.5, the micro modeling completed as part of Phase 1 and 2 report by Delcan was updated by WSP then Morrison Hershfield for a new highway crossing plus a new Highway 400 interchange at Big Bay Point Road as part of the MMATMP. Since WSP didn’t model the crossing separately, the traffic volume on the EBLT lane during the morning and afternoon peak hours were extracted from the 2031 microsimulation model with the interchange.

As shown in Table 6-3, the traffic volumes on the EBLT lane during the morning and afternoon peak hours from the 2031 microsimulation model are 109 and 95, respectively.

Future (2031) intersection operations were analyzed in Synchro Software. The level of service and the 95th queue length of the EBLT lane during the morning and afternoon peak hours were extracted from the 2031 Synchro model.

As shown in Table 6-3, the EBLT lane during the morning and afternoon peak hours is expected to operate at LOS C with the 95th queue length of 31.3m and 26.3m, respectively.

The distance from Fairview Road to Highway 400 is approximately 130m. As shown in Table 6-3, the Minimum required EBLT Storage Length from Harvie Road / Big Bay Point Road to the Fairview Road is 37.5m. Based on MTO Geometric Design Standards for Ontario Highways, a 130m taper and 50m parallel lane is required to meet an 80 km/h design speed along the Harvie Road / Big Bay Point Road crossing. Consequently, the total left turn lane length of 217.5m would extend onto the structure.
Table 6-3 - Minimum Required Left Turn Storage Length for Eastbound Direction from Harvie Road / Big Bay Point Road to the Fairview Road

<table>
<thead>
<tr>
<th>Peak Hour</th>
<th>Direction</th>
<th>Volumes (veh/h)</th>
<th>95th Queue Length from Synchro (m)</th>
<th>LOS from Synchro</th>
<th>Minimum Required Left Turn Storage Length for Eastbound Direction using MTO Geometric Design Standards for Ontario Highways (Table 4) (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM</td>
<td>EBL</td>
<td>109</td>
<td>31.3</td>
<td>C</td>
<td>37.5</td>
</tr>
<tr>
<td>PM</td>
<td>EBL</td>
<td>95</td>
<td>26.3</td>
<td>C</td>
<td>30</td>
</tr>
</tbody>
</table>

Minimum required WBLT Storage Length from Harvie Road / Big Bay Point Road to the Bryne Drive

As shown in Table 6-4, the traffic volumes on the WBLT lane during the morning and afternoon peak hours from the 2031 microsimulation model are 235 and 178, respectively.

The WBLT lane during the morning and afternoon peak hours is expected to operate at LOS A and C with the 95th queue length of 18.3m and 38.7m, respectively.

The distance from Bryne Drive to Highway 400 is approximately 350m. As shown in Table 6-4, the Minimum required EBLT Storage Length from Harvie Road / Big Bay Point Road to the Bryne Drive is 45m. Based on MTO Geometric Design Standards for Ontario Highways, a 130m taper and 50m parallel lane is required to meet an 80 km/h design speed along the Harvie Road / Big Bay Point Road crossing. Consequently, the total left turn lane length of 225m would not extend to the structure.

Table 6-4 - Minimum Required Left Turn Storage Length for Eastbound Direction from Harvie Road / Big Bay Point Road to the Fairview Road

<table>
<thead>
<tr>
<th>Peak Hour</th>
<th>Direction</th>
<th>Volumes (veh/h)</th>
<th>95th Queue Length from Synchro (m)</th>
<th>LOS from Synchro</th>
<th>Minimum Required Left Turn Storage Length for Eastbound Direction using MTO Geometric Design Standards for Ontario Highways (Table 4) (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM</td>
<td>WBL</td>
<td>235</td>
<td>18.3</td>
<td>A</td>
<td>45</td>
</tr>
<tr>
<td>PM</td>
<td>WBL</td>
<td>178</td>
<td>38.7</td>
<td>C</td>
<td>45</td>
</tr>
</tbody>
</table>

Note: if a big box retail goes in, the queue lengths could be much longer.

6.3.6.2 Highway 400 Realignment Impacts on Staging

The Project Team identified that shifting of the existing 6 lane Highway 400 slightly to the east will push the bullnose of Service Center ramp to the north and makes the Service Center ramp shorter.

The Mapleview area already has a wide median with concrete barrier. Around the Service Center Highway 400 goes into a grass median curve toward Essa and it looks like the two directions are not well matched in elevation and may require additional capital improvements by MTO to rectify. The distance between the concrete median barriers at Mapleviw Drive and the
grassed area by the service centre is about 570m. The aforementioned issue will need to be resolved by MTO before the concrete median barrier can be built by MTO in 2017.

6.3.6.3 Recommended Construction Staging Strategy

The recommended construction staging strategy is Option 1 due to the lowest net present value and benefits from not building a structure that will not be required for at least 25 years until Hwy 400 is widened. Option 1 includes the following components:

- Relocation of above and underground utilities in conflict with the proposed road widening. This will include relocation of above ground utility pole, and other above and underground utility services. Detailed design to be completed considering utility locations and to provide the minimum cover.

- Stage 1 Construction – interim 5 Lane Harvie Road-Big Bay Point Road Crossing over the existing 6 lane Highway 400 or realigned six lane Highway 400 approximately 3.4m to the east.

- Stage 2 Construction - ultimate 7 Harvie Road-Big Bay Point Road Crossing over the widened 10 lane Highway 400 and interchange ramps.

The construction staging will be further developed during the detail design stage of the project.

6.3.7 Preliminary Preferred Design Alternative Cost Estimates

As mentioned in Section 6.3.6.3, the construction is anticipated to be undertaken in two phases. Stage 1 would be the interim 5 Lane Harvie Road-Big Bay Point Road Crossing over the existing or realigned 6 lane Highway 400. Stage 2 would be the ultimate 7 Harvie Road-Big Bay Point Road Crossing over the widened 10 lane Highway 400 and interchange ramps.

The total cost of constructing the interim 5 Lane Harvie Road-Big Bay Point Road Crossing over the existing 6 lane Highway 400 is estimated to be approximately **$24 million**

The total cost of constructing the ultimate 7 Harvie Road-Big Bay Point Road Crossing and interchange over 10 lane Highway 400 is estimated to be approximately an additional **$31 million**.

Due to the shifting of Highway 400 at McKay, additional cost for highway realignment may be required and it will be confirmed at detail design

The cost estimate for the Preferred Design Alternative is based on full reconstruction of existing roads. The estimated cost includes land acquisition and the additional land costs for the ultimate condition includes lands for the interchange and the widening from 5 to 7 lanes.

The estimated cost includes new culvert under Highway 400. At this time of the study a need for changing the culvert is unknown and a full drainage study is required, therefore an approximate estimate was considered during this EA Study (Refer to costs in Whiskey Creek Master Drainage Plan).

The estimated cost includes 15% Design, 10% utility relocation, 30% Contingency, and 1.76% HST. The costs are based on Barrie road costs and 2011 MTO Parametric Estimating Guide. These figures are expressed in 2015 dollars and do not carry any escalation allowance for work undertaken in future fiscal periods.

Detail design is required to assess and provide a more accurate cost estimate. 30% contingencies were included in part due to unknowns like the cost to relocate the fiber optic
cable running down the west side of Highway 400 which may conflict with the centre bridge abutment.

Details of the cost estimates for the preferred alternative design are provided in Appendix G.

### 6.3.7.1 Construction Staging Cost

**Harvie Road / Big Bay Point Road**

As mentioned in Section 6.3.6.3, the recommended construction staging strategy is Option 1. Details of the 2015 cost for each staging option are provided in Appendix H.

Option 1 has the lowest net present value and benefits from not building a structure that will not be required for at least 25 years until Hwy 400 is widened.

Table 6-5 shows the total 2015 cost for the interim and ultimate construction phase including the staging costs. The estimated staging cost on Harvie Road / Big Bay Point Road for the ultimate phase is $2 Million.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Cost ($ millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interim</td>
<td>$24 M</td>
</tr>
<tr>
<td>Ultimate</td>
<td>$29 M + $2 M Staging Cost on Harvie Road</td>
</tr>
<tr>
<td>Total</td>
<td>$55 M</td>
</tr>
</tbody>
</table>

**Highway 400**

The cost on Highway 400 is $1 Million for the Hwy 400 median barrier and storm sewer improvements by MTO. The ultimate staging cost on Highway 400 is assumed to be coordinated with MTO widening of Highway 400. Potential cost sharing with MTO will be discussed during detail design and no cost was included for the City of Barrie in this estimate.

The costs are based on Barrie road costs and 2011 MTO Parametric Estimating Guide. These figures are expressed in 2015 dollars and do not carry any escalation allowance for work undertaken in future fiscal periods. Detail design is required to assess and provide additional detailing to provide a more accurate cost estimate based on a final detailed design.

### 6.3.8 Cost Sharing with MTO

As mentioned in Section 6.3.8, the potential cost sharing with MTO will be discussed during detail design.

### 6.3.9 Implementation

The detailed design for the Harvie Road-Big Bay Point Road Crossing is anticipated to start in the fall of 2015 subject to Council endorsement of the Preferred Design Alternative, available funding and successful completion of this Phase 3 & 4 Class EA.
7. ENVIRONMENTAL IMPACTS, MITIGATION MEASURES AND MONITORING

This section describes the anticipated or potential environmental impacts, both positive and negative, associated with the implementation of the preferred design alternative. Mitigation measures, to minimize any adverse effects of the project, and recommended monitoring activities are also identified in this chapter.

7.1 Property Impacts

Property takings will be required to implement the Highway 400 crossing and it is based on the ultimate 7 Harvie Road-Big Bay Point Road Crossing over 10 lane Highway 400 design. Outside of the existing ROW’s property is privately owned exception of the parcel south of the Highway 400 Service Centre, east of Highway 400, west of Fairview Road and north of the Big Bay Point Road ROW which is owned by MTO.

Additional property will be required for the future interchange. Since the interchange configuration will not be finalized until after completion of the Highway 400 TESR Update, it is important that a conservative approach be taken to protect for a potential future interchange, which will be subject to future Class EA. The City may seek to acquire the lands impacted by the future interchange as part of development approval on the affect properties. Refer to Appendix B for the property to be protected associated with the proposed interchange.

The final property required to implement the interchange will be dependent on the proposed ramp design which will require confirmation through an update to the Traffic Report and additional weaving and safety analysis.

Property owners and tenants may experience interruption to their property access during construction. To reduce this impact, all property owners should be notified prior to construction and in advance of work related to their access.

Short term impacts during construction are anticipated within the Study area and would include temporary lane closures. Other short term impacts, such as noise, dust and exhaust emissions are anticipated due to construction activities. Management plans (for traffic, noise, dust, etc.) will be implemented and monitored to ensure effective mitigation of these impacts during construction.

7.1.1 Satellite Dishes North of Harvie Road and west of Highway 400

There are three satellite dishes north of Harvie Road and west of Highway 400. The extent of the grading to implement the preferred alternative design will not impact the existing satellite dishes and no relocation is required.

7.2 Natural Environment

7.2.1 Terrestrial Impacts Assessment and Mitigation

Potential impacts to the terrestrial habitat in the project area include loss of/damage to vegetation, disturbance to bird’s nests and loss of habitat to other animals. With appropriate mitigation measures damage can be kept to a minimal level.

The following mitigation measures are recommended to protect terrestrial habitat include:
• Appropriate lengths of silt fencing along the perimeter of minimized, designated work areas to limit construction impacts;
• Utilization best management practices;
• Prior to construction the contractor shall inspect the construction area for nests and eggs and advise the Contract Administrator of the locations of any nests and eggs immediately;
• The contractor shall, prior to the removal of any nests, notify the Contract Administrator who shall contact the Environmental Office and the environmental consultant responsible for birds;
• Following the removal of a nest, the structure will be netted to prevent the recurrence of nesting activity;
• The contractor shall monitor the area daily for the recurrence of nesting activity upon removal of nests and notify the Contract Administrator immediately if a nest reappears;
• The contractor shall not destroy nests and eggs of protected migratory birds during migratory bird nesting season (April 1 to July 15);
• Advise workers to perform a visual survey of machinery and work area prior to commencing work, as wildlife may be found basking or hiding on or under equipment, rocks, debris piles etc.;
• If any trenches are being filled, visually inspect the trench before filling and release any wildlife that is within the trench;
• Minimized vegetation removal;
• Development and implementation of a replanting plan in keeping with the sensitive local communities, and based on native, indigenous species complementary to those communities and their ecological functions;
• Trees or shrubs to be removed during construction should be considered with respect to transplanting opportunities within the project area, as feasible regarding slope and exposure characteristics, soil types and moisture regimes, and relative timing considerations;

The impacts and implementation of mitigation measures will be reviewed during the detailed design stage.

7.2.2 Fisheries and Aquatic Habitat Impacts and Mitigation

Whiskey Creek is considered degraded within the study area but supports sensitive coldwater species in its downstream reaches. Efforts are being made by LSRCA and landowners to rehabilitate and protect coldwater habitats within Whiskey Creek. In addition, the LSRCA has identified that the design will be subject to the following parameters with respect to Whiskey Creek:

• Maintain the quality and quantity of the water within Whiskey Creek;
• Maintain the floodplain function of Whiskey Creek;
• Prevent erosion and sedimentation;
• Maintain and enhance fish habitat;
• Provide for appropriate mitigation (replacement) for natural feature loss; and
• Maintain the geomorphological processes (i.e. meanderbelt) of Whiskey Creek.

The following are potential environmental impacts to aquatic habitat that have been identified:
• Permanent changes to existing aquatic habitat related to the enclosure and/or modification of the existing channel;
• Alteration of riparian vegetation which may affect bank stability and exposed soils;
• Increased erosion potential which may lead to sediment transport; and
• Introduction of contaminants into the watercourse through increased stormwater runoff, the use of industrial equipment, and construction debris which may lead to changes in water chemistry and/or cause direct mortality of fish.

The following mitigation measures are recommended to avoid causing harm to fish and fish habitat for work in and around Whiskey Creek are described below:

• Implementation of timing constraints for in-water works to the period from October 1 to June 1 where no in-water work can occur for coldwater watercourses to protect sensitive life stages/processes of fish;
• Design and implement isolation/containment plan to delineate in-water work zones to allow work in the dry and maintain clean flow downstream/around the work zone at all times;
• Ensure that building material used in a watercourse has been handled and treated in a manner to prevent the release or leaching of substances into the water that may be deleterious to fish;
• Manage all water from dewatering operations to prevent erosion and/or release of sediment-laden or contaminated water to the waterbody;
• Screen any water intakes or outlet pipes to prevent entrainment or impingement of fish;
• Any dewatering should be filtered through a sediment bag and discharged in the roadside ditch or flat vegetated area as far from the watercourse as reasonably possible (minimum 30m);
• Retain a qualified environmental professional to ensure applicable permits for relocating fish are obtained and to capture any fish trapped within an isolated/enclosed area at the work site and safely relocate them to an appropriate location in the same waters. Fish may need to be relocated again, should flooding occur on the site;
• Limit access to waterbody and banks to protect riparian vegetation and minimize bank erosion;
• Clearing of riparian vegetation should be kept to a minimum: use existing trails, roads or cut lines wherever possible to avoid disturbance to the riparian vegetation and prevent soil compaction. When practicable, prune or top the vegetation instead of grubbing/uprooting;
• Minimize the removal of natural woody debris, rocks, sand or other materials from the banks, the shoreline or the bed of the waterbody below the ordinary high water mark. If material is removed from the waterbody, set it aside and return it to the original location once construction activities are completed;
• Immediately stabilize shoreline or banks disturbed by any activity associated with the project to prevent erosion and/or sedimentation, preferably through re-vegetation with native species suitable for the site;
• Design and implement erosion and sediment controls to contain/isolate the construction zone, manage site drainage/runoff and prevent erosion of exposed soils and migration of sediment to the waterbody, and ensure site is stabilized prior to removal following construction;
• Regular inspection and maintenance of erosion and sediment control measures during the course of construction;
• Repairs to erosion and sediment control measures and structures if damage occurs;
• Stabilize and re-vegetate all areas of disturbed/exposed soil following construction;
• Design and implement vegetation rehabilitation plan following construction to reinstate riparian vegetation to pre-construction or better condition;
• Removal of non-biodegradable erosion and sediment control materials once site is stabilized;
• A qualified environmental inspector shall monitor construction activities in and around watercourses and ensure all related mitigation measures are properly installed and maintained, and are functioning effectively;
• Stockpiles will be located at a minimum of 30m from the watercourse and isolated to ensure material will not enter any watercourse, wetland or ditchline. All stockpiles will be removed upon completion of the works and the site restored, as appropriate;
• Develop a response plan that is to be implemented immediately in the event of a sediment release or spill of a deleterious substance and keep an emergency spill kit on site;
• Ensure that machinery arrives on site in a clean condition and is maintained free of fluid leaks, invasive species and noxious weeds;
• Operate, store and maintain all equipment and associated materials in a manner that prevents the entry of any deleterious substance to the waterbody;
• All mobile equipment will have drip pans installed and refueling will take place no closer than 30m to any study area watercourses, wetted roadside channels, ditchlines, and wetlands in order to prevent water contamination due to accidental fuel spills;
• All construction debris and litter will be removed frequently; and
• Restoration of any temporary disruptions to in-stream fish habitat promptly.

Further coordination with LSRCA will be undertaken during the detailed design phase to refine the impact mitigation plan for aquatic habitats.

7.2.3 Erosion and Sediment Control

An Erosion and Sediment Control plan will be prepared during detailed design to minimize the erosion and sedimentation during the temporary construction works.

The following mitigation measures are recommended for implementation in the Erosion and Sediment Control Plan:

• Conscientious design, installation and maintenance of sediment traps, silt fencing, and check dams;
• Timely re-vegetation of exposed soils, both for temporary work areas and final grades (existing vegetation on embankments shall be maintained as long as possible and new slopes shall be stabilized as soon as possible by seeding and mulching);
• Minimized vegetation removal;
• The contractor will be required to specify construction access routes and fuelling areas to avoid watercourse and groundwater contamination and siltation;
• The contractor will be reminded of the requirement to report contaminant spills (including the discharge of sediment into waterways) as per the Environmental Protection Act and the Fisheries Act. All toxic chemicals and contaminants must be disposed of off-site in approved disposal sites under appropriate MOE regulations.
7.2.4 Permits and Approvals

Whiskey Creek has been identified as supporting a sensitive coldwater fishery in its downstream reaches but is considered degraded. All proposed project work have to follow the timing windows identified by LSRCA, as well as the mitigation measures listed in this report, in order to mitigate impacts to Whiskey Creek. Further assessment of the preferred alternative at detailed design is required, to determine if “serious harm” to fish and fish habitat will result under Section 35 of the Fisheries Act.

A permit from Lake Simcoe Region Conservation Authority will be required, under the regulation Development, Interference with Wetlands and Alterations to Shorelines and Watercourses”

Potential habitat exists within the study area for four species protected under the Endangered Species Act. Vegetation removals should be assessed for bird nesting habitat and/or bat maternity colonies prior to removal and, in the instance that a nest or maternity colony is encountered, consultations with Ministry of Natural Resources should be undertaken to determine the need for a permit or approval.

The removal or destruction of any nest of a migratory bird protected under the Migratory Birds Convention Act may require approval from Environment Canada – Canadian Wildlife Service.

As part of the detailed design phase of this project, permit from Ministry of the Environment and Climate Change (MOECC) will be required to Take Water, Certificate of Approval for Storm, Sanitary and Watermain construction.

As part of the detailed design phase of this project, permit from the Ministry of Transportation of Ontario (MTO) will be required for any works within the CAH limits.

7.3 Geotechnical

As previously discussed in Section 4.3, significant earth fill is anticipated as part of the construction of the highway crossing which will increase the roadway footprint and associated impacts. The potential to use steeper slopes should be examined during the detailed design phase to limit the impacts of grading.

Detailed geotechnical investigations are recommended for the detailed design of fill slopes of significant height.

If steeper slopes are found to be unfeasible or do not limit the grading as required, the use of retaining walls should be investigated. Detailed foundation investigations are recommended for the detailed design of any retaining structure.
8. CONCLUSIONS

This Environmental Study Report presents the results of the Environmental Assessment Study and concluded that Harvie Road / Big Bay Point Road Crossing linking Harvie Road to Big Bay Point Road shall go over the existing Highway 400 and also recommended removing the existing railway spur (modified version of Alternative 2b).

The project was found to be feasible with no major impediments or unacceptable environmental impacts. It conforms to the requirements for Schedule ‘C’ projects, in accordance with the Municipal Engineers Association, Municipal Class Environmental Assessment (October 2000, as amended in 2007 and 2011).

8.1 Next Steps

Following the completion of the PIC, and in consideration of all concerns raised through review agency and public comment, the preferred alternative design solution was identified and appropriately documented in the ESR. The ESR and accompanying recommendations will be presented to the City of Barrie General Committee of Council for endorsement. Those individuals and parties that requested to be kept informed of the Class EA process will be notified of the date that Council may approve the preferred alternative design solution so that deputations to Council can be made.

Following approval by Barrie City Council, the Final Draft ESR will be placed on the public record for a period of at least 30 calendar days and be available for review by the public or any other interested parties with a Notice of Completion being issued.

If concerns are raised during the Class EA process which cannot be resolved in discussion with the Corporation of the City of Barrie, the Ministry of the Environment may be requested to make an Order for the project to comply with Part II of the Environmental Assessment Act (referred to as a Part II Order). Requests for a Part II Order must be received by the Ministry of the Environment within 30 days of the publication of the Notice of Completion. A copy of the request must also be sent to the City of Barrie Engineering Department (see contact information below).

The Honourable Glen R. Murray  Mr. Ralph Scheunemann, P. Eng.
Minister of the Environment and Climate City of Barrie, Engineering Department
Change  P.O. Box 400
77 Wellesley Street West  70 Collier Street, 6th Floor
11th Floor, Ferguson Block  Barrie, ON L4M 4T5
Toronto, ON  M7A 2T5

Following the successful completion of the Class EA process, and providing no Part II Orders have been received, it would be the City's intention to proceed to detail design for the Highway Crossing subject to available budgets.