Canadian Environmental Assessment Agency
Agence canadienne d'évaluation environnementale

Comprehensive Study Report
407 East Transportation Corridor

CANADIAN ENVIRONMENTAL ASSESSMENT AGENCY

April 2011

Canada

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Executive Summary

Project Summary

The proponent, the Ontario Ministry of Transportation (MTO), proposes to construct and operate the 407 East Transportation Corridor (referred to in this report as the Project). The Project would be an extension of the existing 407 transportation corridor from its eastern terminus at Brock Road in Pickering to Highway 35/115 in Clarington, including north-south links to Highway 401 in West Durham (Whitby) and East Durham (Clarington). The Project includes a highway component and a dedicated corridor for transit.

Environmental Assessment Requirements

An environmental assessment (EA) is required under the *Canadian Environmental Assessment Act* (the Act) before Transport Canada and Fisheries and Oceans may make the following decisions which would enable the Project to be carried out:

- Transport Canada may allow MTO to use a small amount of federal property in the vicinity of Brock Road and Highway 7; and
- Fisheries and Oceans Canada may issue authorizations under section 35(2) of the *Fisheries Act* for harmful alteration, disruption or destruction of fish habitat associated with watercourse crossings.

A comprehensive study type environmental assessment is required under the Act because the project as proposed by MTO falls within a category of project described in the *Comprehensive Study List Regulations* - the proposed construction of an all-season public highway that will be more than 50 km in length located on a new right-of-way.

In accordance with the requirements of the Act, the Canadian Environmental Assessment Agency (the Agency) has completed a comprehensive study of the Project and prepared and submitted this comprehensive study report (CSR) to the Minister of the Environment.

The Agency will now invite the public and Aboriginal groups to provide comments on the conclusions and recommendations and any other aspect of the CSR. The Minister of the Environment will then consider the CSR and any comments received on the report and determine whether any additional information is required or if any of the concerns cited in the comments need to be further addressed. Once satisfied that the information necessary to meet the requirements of the Act has been provided, the Minister will issue an EA decision statement that sets out:

- the Minister's opinion as to whether, taking into account the implementation of any mitigation measures that the Minister considers appropriate, the project is, or is not, likely to cause significant adverse environmental effects, and;
- any mitigation measures or follow-up program that the Minister considers appropriate.

Comprehensive Study Report

The CSR presents the public, Aboriginal groups and the Minister of the Environment with the Agency's analysis, conclusions and recommendations on the fundamental consideration set out in the Act - whether the Project is likely to cause significant adverse environmental effects. It does so by describing the Project, its potential environmental effects, measures proposed to prevent or mitigate those effects and the significance of any residual environmental effects after taking into account the proposed mitigation.

Relationship with the Provincial Environmental Assessment

The MTO initiated a provincial EA in January 2005 and completed those requirements in June 2010. During the majority of that period, federal authorities worked to integrate the requirements for a screening type assessment under the Act with the provincial process. The Supreme Court of Canada direction on the interpretation of the Act in January 2010 resulted in a need to conduct a comprehensive study which was commenced in March, 2010.

The preparation of the CSR benefited significantly from the integrated approach that was taken and the substantial work completed during the initial federal-provincial cooperative EA. As required, additional information was gathered and analysis conducted to fulfill the comprehensive study requirements of the Act.

Public Participation

During the comprehensive study process, the Agency provided the public with two opportunities to comment and participate: An opportunity to comment on the Project and the conduct of the comprehensive study was provided between July 19 and August 20, 2010 and an opportunity to comment on the draft CSR prepared by the MTO was provided between December 2 and December 22, 2010.

Notices of these opportunities were posted on the Canadian Environmental Assessment Registry (CEAR) Internet website and individuals and groups who had indicated an interest in the Project at earlier phases were notified directly.

Nine submissions were received from environmental non-governmental organizations, municipalities and members of the public in response to the invitation for comment on the draft CSR prepared by the MTO. A range of views were expressed, including concerns about the impacts of the Project on air quality, vegetation, wetlands, groundwater and wildlife crossings as well as questions on whether building the eastern mainline and the East Link were justified. Comments from the Durham Region municipalities were generally supportive of the project, but expressed concerns about the Project's phased implementation. Comments received were summarized and are included in Appendix B.

The Agency supported public participation in the comprehensive study through its Participant Funding Program (PFP). A total of $25,000 was allocated to Transport Action Ontario, the Board of Management of the Toronto Zoo, Friends of Farewell and the Huron-Wendat Nation to support their respective participation in the comprehensive study.

A third and final public participation opportunity is the comment period on this CSR.

Public participation opportunities were provided by the MTO at every stage during the provincial EA. The Ontario Ministry of Environment also provided opportunities for the public to comment on the Project and its environmental effects pursuant to its EA requirements.

Aboriginal Consultation

Prior to the commencement of the comprehensive study, the MTO had identified Aboriginal groups whose primary interest in the Project was the potential for encountering sites of archaeological and cultural importance. The Agency maintained correspondence with these groups to ensure they were informed and were provided with an opportunity to provide input to the comprehensive study at every stage. The Agency also provided participant funding to the Huron-Wendat Nation and met with the Métis Nation of Ontario. No new issues were raised by Aboriginal groups pertaining to the impacts of the Project during the comprehensive study process.

Environmental Setting

The Project is situated east of Toronto within the Region of Durham. The environmental setting in the north and east portions of the study area includes the Oak Ridges Moraine and the headwaters of creeks that flow into Lake Ontario. Some of the study area has been designated as Greenbelt. The southern third of the study area includes the urbanized areas of Pickering, Ajax, Whitby, Oshawa and Clarington. Lands in the central and northerly portion are primarily agricultural with clusters of rural communities. It is within the context of this environmental setting that the CSR presents a systematic analysis of the Project's effects on the environment.

Environmental Effects

The MTO was provided with Comprehensive Study Guidelines that set out the information required to complete the comprehensive study and prepare the draft CSR. These Guidelines identified the following 14 environmental components to be considered in the comprehensive study on the basis that each had the potential to be adversely affected by the works and undertakings associated with the Project:

- Air quality and climate (including the consideration of climate change);
- Noise and Vibration (including the consideration of noise sensitive areas);
- Surface and subsurface geology and soils (including the consideration of valley slopes, landforms and erosion);
- Groundwater (including the consideration of groundwater quality and quantity, and the location and condition of drinking water wells);
- Surface water (including the consideration of surface water quality and quantity);
- Vegetation and vegetation communities;
- Wetlands;
- Fish and fish habitat (including the consideration of sediments characteristics);
- Wildlife and wildlife habitat (including the consideration of wildlife movement corridors, specialized/sensitive habitats and their use by migratory birds);
- Species at Risk (i.e., Federal (COSEWIC) and Provincial Species at Risk);
- Socio-economic Environment (including the consideration of agriculture, community and neighbourhood characteristics, adjacent and nearby land uses);

- Cultural Environment;
- Current use of lands and resources by Aboriginal People; and
- Contaminated Sites and Waste Management.

For each of these components, the comprehensive study examined the baseline conditions, the potential effects of the Project, opportunities to avoid or mitigate those effects and the significance of any remaining effects after taking into account the implementation of the mitigation measures.

The following criteria were taken into account when considering the significance of the residual environmental effects after taking mitigation into account.

Magnitude.....The size or degree of the effects compared against baseline conditions or reference levels, and other applicable measurement parameters (i.e., standards, guidelines, objectives).

Extent.....The geographic area over or throughout which the effects are likely to be measurable.

Duration.....The time period over which the effects are likely to last.

Frequency.....The rate of recurrence of the effects (or conditions causing the effect).

Permanence.....The degree to which the effects can or will be reversed (typically measured by the time it will take to restore the environmental attribute or feature).

Ecological Context The importance of the environmental attribute or feature to ecosystem health and function.

Based on the application of these criteria, the predicted degree of impact of each residual environmental effect was characterized as being either low, medium or high.

The environmental effects which were determined to have the greatest degree of residual effect and elicited the most concerns during the comprehensive study process were:

- Effects on air quality and climate (including consideration of climate change);
- Potential project interactions with groundwater and surface water (including consideration of quality and quantity);
- Loss of vegetation, wetlands and impacts to wildlife habitat (including consideration of wildlife movement corridors);

With regard to air quality and climate, dispersion modelling was used to quantify the Project's predicted contaminant contribution. These results were added to background concentrations and the combined effects were compared to applicable air quality reference levels. The analysis revealed that during operation, the Project will result in a small measurable reduction in air quality. Taking into account the project's contribution in combination with background levels, most air quality contaminants are predicted to remain below applicable reference levels, with the exception of total suspended particulate (TSP), a nuisance contaminant. Exceedences of the levels for TSP are infrequent and of short duration. With regard to greenhouse gas emissions (GHG), the project's contribution is predicted to be 1.75% of total GHG emissions from the road transportation network in Ontario. As a result, the Project is not likely to cause significant adverse effects on air quality or climate change.

Construction related activities such as site preparation, excavation for bridge piers and major cuts and fills have the potential to alter the natural groundwater flow regime. Examples include decreased groundwater levels near deep cuts and alterations of groundwater flow due to fill placement in valleys. In addition, construction dewatering could result in temporary decreases in water levels affecting nearby creeks, fish and fish habitat and a reduction in water levels in nearby private wells. The Project will result in some localized impacts to groundwater at certain major deep cuts and fills. Mitigation measures to address these effects include restricting temporary dewatering to periods that avoid cold water fish spawning and only discharging groundwater into creeks after temperature and sedimentation control. To safeguard private wells, MTO will conduct site specific monitoring before dewatering and commits to providing a temporary or permanent water supply to compensate affected owners. Where groundwater seepage is anticipated, permeable fill material will be used to maintain groundwater flow conditions. Taking into account the implementation of these mitigation measures, the Project is not likely to cause significant adverse effects on groundwater.

There are 79 watercourse crossings along the transportation corridor. During the operation phase, adverse effects on surface water may include changes to water quality, flow and quantity. The mitigation approach proposed by MTO is a stormwater management system consisting of storm sewers in the median of the road, stormwater management ponds, and enhanced grass swales. Approximately 65 stormwater management ponds will be situated along the corridor to treat runoff prior to discharge into creeks. To further protect surface water, as part of its provincial EA approval, the Province of Ontario is requiring the MTO to develop and implement a Stormwater Management Plan for those sections of the project that do not drain into a stormwater management pond and to monitor the effectiveness of the stormwater management system, including the impacts of thermal discharges. Taking into account the implementation of these mitigation measures, the Project is not likely to cause significant adverse effects on surface water.

The project footprint will result in the removal of approximately 300 ha of vegetation as well as 28.9 ha of interior forest habitat and a loss of 62.2 ha of wetland areas. Losses of vegetation during site clearing and associated wetland and habitat removal were the primary direct effects of concern expressed by the public. The direct removal of vegetation would be offset through restoring/enhancement/creating forest and wetland communities at a ratio of 1:1 (minimum). The provincial EA conditions of approval require MTO to develop the Vegetation Restoration Plan with federal and provincial technical advice. Taking into account the implementation of these mitigation measures, the Project is not likely to cause significant adverse effects on vegetation and wetlands.

In addition to the measures to address impacts to wildlife associated with vegetation and habitat losses, direct effects of the Project on wildlife are addressed through mitigation measures that include crossing structures and wildlife fencing along the corridor. Taking into account the implementation of these measures, the Project is not likely to cause significant adverse effects on wildlife.

Follow-up

The purpose of a follow-up program under the Act is to verify the accuracy of the environmental assessment and determine the effectiveness of mitigation measures. In accordance with the requirements of the Act, a follow-up program is required for the Project. The program will focus on those environmental components where there is a relatively larger degree of uncertainty about the predicted

effects. MTO will provide annual follow-up reports on vegetation (including wetlands), surface water, groundwater, wildlife, fish and fish habitat.

Agency's Conclusion on the Significance of Residual Adverse Environmental Effects

In reaching a conclusion on whether the Project is likely to cause significant adverse environmental effects, the Agency has taken into account:

- the information, analysis and conclusions in this comprehensive study report;
- the views expressed by the public, government agencies, municipalities and Aboriginal groups;
- the information, analysis and conclusions set out in the provincial environmental assessment of the Project;
- the MTO's obligations as described in the provincial EA Conditions of Approval;
- the requirements for authorizations under section 35(2) of the *Fisheries Act* for watercourse crossings with the potential to effect fish and fish habitat; and
- the requirements for the follow-up program to be implemented by MTO.

The Agency's consideration of mitigation is based on its knowledge that the mitigation measures addressing direct harmful effects on fish and fish habitat will be ensured by Fisheries and Oceans Canada as conditions of approval under the federal *Fisheries Act* and being satisfied that all other mitigation measures identified for the Project will be implemented by the MTO as they have been included as conditions of the provincial EA approval.

Therefore, taking into account the implementation of the mitigation measures, identified for the Project, the Agency concludes that the Project is not likely to cause significant adverse environmental effects.

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Acronyms

Acronym	Definition
407 EAC	407 East Advisory Committee
AAQC	Ambient Air Quality Criteria
ANSI	Area of Natural and Scientific Interest
BHR	Built Heritage Resource
BMP	Best Management Practice
CAG	Community Advisory Group
CCME	Canadian Council for Ministers of the Environment
CEA	Canadian Environmental Assessment
CEAR	Canadian Environmental Assessment Registry
CHER	Cultural Heritage Evaluation Report
CHL	Cultural Heritage Landscape
CLOCA	Central Lake Ontario Conservation Authority
CNR	Canadian National Rail
CO	Carbon Monoxide
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CPR	Canadian Pacific Rail
CSR	Comprehensive Study Report
CTA	Canadian Transportation Agency
CVP	Community Value Plan
CWS	Canada Wide Standard
dBA	Decibels (Acoustic)

Canada

DFO	Department of Fisheries and Oceans Canada
EA	Environmental Assessment
EAA	Environmental Assessment Act
EC	Environment Canada
EDL	East Durham Link
EMP	Environmental Management Plan
ERD	Environmental Reference for Highway Design
ESA	Endangered Species Act
ESC	Erosion and Sediment Control
ESR	Environmental Screening Report
FA	Federal Authority
FEAC	Federal Environmental Assessment Co-ordinator
FGCA	Forest Gene Conservation Association
FHWA	Federal Highway Administration
FOI	Freedom of Information
GHG	Greenhouse Gases
GRCA	Ganaraska Region Conservation Authority
HADD	Harmful Alteration, Disruption or Destruction
HC	Health Canada
IEA	Individual Environmental Assessment
LID	Low Impact Development
LSA	Local Study Area
MCL	Ministry of Culture
MNO	Métis Nation of Ontario
MNR	Ministry of Natural Resources
MTAG	Municipal Technical Advisory Group
MTO	Ontario Ministry of Transportation
NAAQO	National Ambient Air Quality Objective
NEB	National Energy Board
NHS	National Heritage Status
NNL	No Net Loss
NO_x	Oxides of Nitrogen
NRCan	Natural Resources Canada
NSA	Noise Sensitive Area
NWPA	Navigable Waters Protection Act
OG	Original Ground
OGS	Oil and Grit Separator
OHSA	Ontario Health and Safety Act
OPSS	Ontario Provincial Standards Specifications
ORM	Oak Ridges Moraine
PICs	Public Information Centres
PM	Particulate Matter
PM_{10}	Inhalable Particulate Matter
$PM_{2.5}$	Respirable Particulate Matter

PSW	Provincially Significant Wetland
PTTW	Permit to Take Water
QEW	Queen Elizabeth Way
RA	Responsible Authority
RAG	Regulatory Advisory Group
RMF	Risk Management Framework
ROW	Right-of-Way
RSA	Regional Study Area
SARA	Species at Risk Act
SRP	Spills Response Plan
SSA	Site Study Area
SSWH	Specialized or Sensitive Wildlife Habitat
SWAMP	Stormwater Assessment and Monitoring Performance
SWHTG	Significant Wildlife Habitat Technical Guide
SWM	Stormwater Management
TC	Transport Canada
TDM	Travel Demand Management
ToR	Terms of Reference
TPR	Technically Preferred Route
TRCA	Toronto and Region Conservation Authority
TRR	Technically Recommended Route
TSM	Transportation Systems Management
TSP	Total Suspended Particulate Matter
TSS	Total Suspended Solids
VECs	Valued Ecosystem Components
VOCs	Volatile Organic Compounds
WDL	West Durham Link

1 General Information

1.1 Project Overview

1.1.1 Project

The Ontario Ministry of Transportation (MTO) is proposing the construction and operation of the 407 East Transportation Corridor project, an extension of the existing 407 transportation corridor from its current terminus at Brock Road in Pickering to Highway 35/115 in Clarington, including two north-south links connecting Highway 401 to the proposed extension of 407, one in West Durham (Whitby) and the other in East Durham (Clarington). The transportation corridor includes a highway component and a transitway component.

The approximate length of the Project is 70km, comprised of the following three sections:

- East-West Mainline – 49.9 km
- West Durham Link – 10.3 km
- East Durham Link – 10.5 km

1.1.2 Proponent

The MTO is the proponent for the 407 East Transportation Corridor project. The MTO contact is:

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1.1.3 Provincial Environmental Assessment Process

The MTO has been planning Highway 407 from the late 1940s and early 1950s. Since that time a transportation corridor north of Toronto has been incorporated into the planning of all major transportation and land use decisions within the Greater Toronto Area. Construction of Highway 407, which originates in Burlington and terminates in Pickering, was completed in 2001.

In January 2005, MTO initiated a provincial Individual EA for the Project. The provincial EA process for the Project was a two-step application to Ontario's Minister of the Environment administered by the Ontario Ministry of the Environment (MOE). The first step required the MTO to prepare and submit a Terms of Reference (ToR) for MOE review and approval. On January 17, 2005, the Ontario Minister of Environment approved the ToR. MTO then proceeded to prepare the provincial EA and provided the government reviewers, public and Aboriginal groups opportunities to review and comment.

On June 3, 2010, the Ontario Minister of the Environment, with the approval of Cabinet, approved the provincial EA and gave its approval for MTO to proceed with the undertaking subject to the commitments and identified mitigation measures within the EA and conditions specified by the Provincial Minister.

1.2 Purpose of this Comprehensive Study Report

The purpose of the comprehensive study report (CSR) is to provide a summary of information and analysis considered by the Canadian Environmental Assessment Agency (Agency) in reaching its conclusion on whether the Project is likely to cause significant adverse environmental effects. The Minister of the Environment will consider this report and comments received from the public and Aboriginal groups in issuing the environmental assessment decision statement.

1.3 Environmental Assessment Requirements, Roles and Responsibilities

1.3.1 Federal Environmental Assessment Requirements

- Under the *Canadian Environmental Assessment Act* (the Act), an environmental assessment is required before a federal authority can proceed with a project as the proponent; or enable a proposed project to proceed by: providing financial assistance; transferring federal land or any interest in federal land; or issuing an authorization identified in the Act's *Law List Regulations*.

In January 2008, MTO submitted a document entitled "407 East Environmental Assessment – Project Description for CEAA" to the Agency and a number of federal authorities (FAs). Based on the information set out in that document, it was determined that a screening type environmental assessment was required in relation to the Project because Transport Canada expected to have a decision to make for MTO's use of a small portion of federal land in the vicinity of Brock Road and Highway 7 and Fisheries and Oceans Canada expected to be asked to consider issuing authorizations pursuant to section 35(2) of the *Fisheries Act* for 27 individual watercourse crossings.

In July 2009, MTO submitted a Draft Environmental Screening Report. After revisions based on comments from federal authorities, the report was made available to the public in January 2010 and a notice of its availability for review was posted on the Canadian Environmental Assessment Registry (CEAR) Internet website.

On January 21, 2010, the Supreme Court of Canada issued its decision in *MiningWatch Canada v. Minister of Fisheries and Oceans et al*., in which it concluded that the scope of a project for the purposes of an environmental assessment under the Act is, at a minimum, the project as proposed by the proponent. The Supreme Court also concluded that whenever any component of a project, as described by the proponent is described in the *Comprehensive Study List Regulations*, a comprehensive study is required.

In light of this decision, Fisheries and Oceans Canada and Transport Canada expanded the scope of the project to include the entire project as proposed by MTO and determined that the 407 East Transportation Corridor project was subject to a comprehensive study under the Act as it falls into a category of projects described in the *Comprehensive Study List Regulations* - "the proposed construction of an all-season public highway that will be more than 50 km in length located on a new right-of-way." *(Part IX, section 29(b)*. A

notice of this determination was posted on the Canadian Environmental Assessment Registry (CEAR) Internet website on March 26, 2010 and a Comprehensive Study Guideline document was posted on the CEAR Internet website for public comment outlining the requirements of a comprehensive study type EA and public consultation opportunities.

1.3.2 Roles and Responsibilities

1.3.2.1 Minister of the Environment

The Act requires that the Minister of the Environment consider this CSR and any public comments received on the CSR and issue an EA decision statement that includes:

- the Minister's opinion as to whether, taking into account the implementation of any mitigation measures that the Minister considers appropriate, the project is, or is not, likely to cause significant adverse environmental effects, and;
- any mitigation measures or follow-up program that the Minister considers appropriate.

1.3.2.2 Canadian Environmental Assessment Agency

Pursuant to amendments to the Act that came into force in July 2010, the Agency is responsible for conducting the comprehensive study for the Project until the CSR is submitted to the Minister of the Environment. The Agency is also the Federal EA Coordinator (FEAC), ensuring that federal authorities fulfill their obligations under the Act in a timely manner and coordinating the federal EA process with the EA requirements of the Province to the extent possible.

1.3.2.3 Federal Authorities

- Transport Canada (TC) is involved in the EA because it may allow the MTO to use a small part of federal lands in the vicinity of Brock Road and Highway 7.
- Fisheries and Oceans Canada (DFO) is involved in the EA because it may have a regulatory decision to consider issuing authorizations pursuant to section 35(2) of the *Fisheries Act* for the harmful alternation, disruption, destruction of fish habitat for proposed watercourse crossings. DFO supported the comprehensive study by providing expertise regarding impacts to fish and fish habitat.
- After the Minister of the Environment has issued an environmental assessment decision statement provided there are no likely significant adverse environmental effects, Fisheries and Oceans and Transport Canada will be responsible for ensuring the implementation of mitigation and follow-up that has been identified through the comprehensive study process.
- Environment Canada (EC) supported the comprehensive study process by providing expertise regarding management and protection of water, air and soil quality, and renewable resources, including migratory birds and other non-domestic flora and fauna. Specifically, EC provided expert knowledge with respect to the requirements of the *Canadian Environmental Protection Act*, *Migratory Birds Convention Act*, *Species at Risk Act* and water quality provisions under sub-section 36(3) of the Fisheries Act.
- Health Canada (HC) supported the comprehensive study process by providing expertise regarding air quality and noise.

- Natural Resources Canada (NRCan) supported the comprehensive study process by providing expertise regarding hydrogeology.

1.3.2.4 Other Federal Authorities

The Canadian Transportation Agency (CTA) and the National Energy Board (NEB) were provided the project description. Pursuant to the *Canada Transportation Act*, an agreement in principle between Canadian Pacific Rail (CPR) and MTO was reached in May 2009 with respect to two rail crossings. An agreement in principle was also reached with Canadian National Rail (CNR) for the Project to cross the existing CNR line south of Highway 401 in the vicinity of the West Durham Link. Similarly, an agreement between the pipeline companies (oil and gas) and MTO was reached in September 2009 to address four pipeline crossings. Based on these agreements, approvals were not required under the *Canadian Transportation Act* nor the *National Energy Board Act* and therefore the CTA and the NEB determined that they were not RAs, and do not have a role in the EA.

1.3.3 Federal-Provincial Coordination

The Government of Canada and the Province of Ontario signed the *Canada-Ontario Agreement for Environmental Assessment Co-operation* with the objectives of achieving greater efficiency, fostering cooperation, and setting out roles and responsibilities in implementing a cooperative environmental assessment. Early federal participation in the provincial EA occurred within this framework. When it was determined that a comprehensive study would be required, the existing body of information on environmental effects was used to the extent possible in preparing the CSR. The public was consulted and included those individuals and organizations who had engaged in the provincial EA process.

Permits, Approvals, Authorizations and Policy Reviews

During the EA process, Transport Canada determined that permits under the *Navigable Waters Protection Act* (NWPA) were not required. Other federal regulatory decisions have been described in section 1.3.2.3. The Project was also reviewed against applicable provisions in the Policy for the Management of Fish and Fish Habitat; the Federal Policy on Wetland Conservation; the Federal Water Policy; and the Canadian Biodiversity Strategy.

A number of permits, approvals and agreements from Ontario government ministries and agencies are required to allow the Project to proceed. The key provincial permits, approvals and agreements that will be required are:

- Permits to Take Water (*Ontario Water Resources Act*);
- Certificates of Approval (*Drainage Act / Public Transportation and Highway Improvement Act*);
- Permits for the disturbance to endangered species and their habitat (*Endangered Species Act*); and
- various approvals under the *Ontario Environmental Protection Act, Lakes and Rivers Improvement Act, Fish and Wildlife Conservation Act, and the Ontario Heritage Act*.

MTO will need to reach final agreement with GO Transit, the Ontario Realty Corporation and Hydro One for various permanent and temporary easements. In addition, the Project was reviewed against the

applicable requirement of various provincial plans and policies, including: the Ontario Provincial Policy Statement (2005); Places to Grow Act (2005); Growth Plan for the Greater Golden Horseshoe (2006); The Oak Ridges Moraine Conservation Act and Plan (2001); The Greenbelt Act and Plan (2005); and Metrolinx Regional Transportation Plan (2008).

MTO anticipates that a number of municipal agreements may be required from the Region of Durham and various local municipalities, including tree removal permits; noise by-law exemptions; road occupancy permits; road closure by-laws, temporary construction access permits; and municipal sign by-laws.

1.4 Scope of the Project and Scope of the Assessment

1.4.1 Scope of the Project

The scope of the Project was determined to be the project as described in MTO's project description entitled "407 East Environmental Assessment – Project Description for CEAA" submitted to federal authorities in January 2008. As such, the scope of the project includes the construction and operation of the proposed 407 East Transportation Corridor project in its entirety. The Project's components and activities are further described in Section 3.

Decommissioning and abandonment of the Project are not proposed at this time and therefore, not included in the scope of the project.

1.4.2 Factors Considered in the Comprehensive Study

Pursuant to section 16 (1) and (2) of the Act, every comprehensive study shall include consideration of the following factors:

- the purpose of the project;
- alternative means of carrying out the project that are technically and economically feasible and the environmental effects of any such alternative means;
- the environmental effects of the project, including the environmental effects of malfunctions or accidents that may occur in connection with the project and any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out;
- the capacity of renewable resources that are likely to be significantly affected by the project to meet the needs of the present and those of the future;
- the significance of the effects;
- comments from the public that are received in accordance with the *Canadian Environmental Assessment Act* and the regulations;
- measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project; and
- the need for and the requirements of any follow-up program in respect of the project.

In addition to taking these required factors into account, in accordance with paragraph 16(1)(e) of the Act, the Agency determined that the assessment would also consider the need for the project and alternatives to the project as described by the MTO.

1.4.3 Scope of the Factors

Consistent with established environmental assessment practices, the comprehensive study examined those components of the environment that were anticipated to be at risk as a result of the proposed works and activities associated with the Project. The identified environmental factors were described in the Comprehensive Study Guidelines document that was subject to a public comment period. These Valued Ecosystem Components (VECs), which are set out Table 1-1, represent specific features or attributes of the environment that are considered to be important for regulatory reasons, or because of their social, cultural, economic or ecological value. The Agency is satisfied that the identified VECs are appropriate for the purposes of satisfying the comprehensive study requirements of the Act.

Table 1-1 Valued Ecosystem Components

VEC	Rationale	Effects Considerations / Indicators
Air Quality and Climate		
Air Quality Sensitive Receptors (Human / Ecological Receptors)	▪ Compliance will need to be assessed in terms of Provincial and Federal Ambient Air Quality Criteria for Highway Design. ▪ Compliance with the requirements of the Environmental Reference for Highway Design will need to be assessed. ▪ Changes in air quality have the potential to affect human health, socio-economic conditions (e.g., interference with activities and increased annoyance) and sensitive wildlife ecosystems.	▪ Potential for changes in air quality
Noise and Vibration		
Noise Sensitive Areas (NSAs) (Human / Ecological Receptors)	▪ Compliance with requirements of the Environmental Guide for Noise will be assessed. ▪ Changes in noise levels have the potential to affect socio-economic conditions (e.g., interference with activities and increased disruption to people's use and enjoyment of property) and sensitive wildlife ecosystems.	▪ Potential for changes in sound levels during construction ▪ Type and timing of construction activities ▪ Absolute sound exposure levels (Leq (24 h) values, in dBA) at Noise Sensitive Areas ▪ Change in sound exposure levels (L_{eq} (24 h) values, in dBA) at Noise Sensitive Areas
Surface and Subsurface Geology and Soils		
Valley Slopes and Landforms	• Changes to valley slopes and landforms may affect the landscape composition and consequently community character. Changes to valley slopes and landforms may result in an increased risk of erosion and sedimentation.	• Potential for effects to valley slopes and landforms • Erosion and sedimentation risk
Groundwater		
Regional Groundwater Aquifers	▪ Regional groundwater aquifers have social, economic and ecological value. Large, regional aquifers provide a source of potable water sufficient for municipal / industrial uses. They also provide baseflow to larger rivers and streams.	▪ Changes to groundwater quality, water table depth and discharge
Groundwater Wells	▪ Groundwater wells have social, economic and ecological value. They are	▪ Changes to drinking water quality and water level within wells

Table 1-1 Valued Ecosystem Components		
VEC	**Rationale**	**Effects Considerations / Indicators**
	the primary potable water supply in rural areas. There are a more than 1500 wells located near the proposed 407 East Transportation Corridor	
Groundwater Table in Surficial Soils	▪ The groundwater table in surficial soils may provide a source of potable water to rural residences. They can provide baseflow to small creeks and streams.	▪ Changes in the local water table at cuts and groundwater flow directions at major fills.
Surface Water		
Surface Water Bodies / Watercourses	▪ Surface water bodies and watercourses provide habitat for fish and other aquatic species and may support recreational activities.	▪ Reduction in surface water quality and flow conditions ▪ Changes in groundwater discharge
Vegetation and Vegetation Communities		
Forested Areas	▪ Forested areas play important ecosystem functions and contribute to biodiversity.	▪ Presence and effects on forested areas
Forested Areas with Interior Habitat	▪ Forested areas with interior habitat play important ecosystem functions and contribute to biodiversity. Some woodlots may provide important wildlife habitat (e.g., breeding and/or migratory birds and Species at Risk) that need to be considered under the *Migratory Birds Convention Act* and *Species at Risk Act.*	▪ Presence and effects on forested areas with interior habitat
Wetlands		
Wetlands	▪ Wetland communities are particularly sensitive to disturbance and are difficult to recreate. Wetlands contribute to biodiversity. Some wetlands may provide important wildlife habitat (e.g., breeding and/or migratory birds and Species at Risk) that need to be considered under the *Migratory Birds Convention Act* and *Species at Risk Act.*	▪ Presence and effects on wetlands
Fish and Fish Habitat		
High Sensitivity Fish Habitat *(e.g., coldwater fish habitat)*	▪ The protection of fish and fish habitat is a requirement of the *Fisheries Act*. High sensitivity fish habitat offers the greatest potential for harmful alteration, disruption or destruction of habitat. High sensitivity fish habitat contributes to biodiversity and may provide critical habitat that need to be considered under the *Species at Risk Act.*	▪ Presence and effects on: o Salmonid/Char spawning and rearing habitat o Redside Dace o Specialized spawning and rearing for other species
Low to Medium Sensitivity Fish Habitat	▪ The protection of fish and fish habitat is a requirement of the *Fisheries Act*. Low or moderate sensitivity fish habitat offers some potential for significant harmful alteration, disruption or destruction of habitat. Regardless, low and medium sensitivity fish habitat contribute to biodiversity.	▪ Presence and effects on: o spawning and rearing habitat for warm water fish species
Wildlife and Wildlife Habitat (including migratory birds)		
Specialized and	▪ Specialized and sensitive wildlife habitat	▪ Presence and effects on:

Table 1-1 Valued Ecosystem Components		
VEC	**Rationale**	**Effects Considerations / Indicators**
Sensitive Wildlife Habitat	provide unique habitat functions difficult to reproduce. Such habitats contribute to biodiversity. Some areas may provide important wildlife habitat (e.g., breeding and/or migratory birds and Species at Risk) that need to be considered under the *Migratory Birds Convention Act* and *Species at Risk Act.*	o Breeding bird species richness and diversity o Habitat diversity o Species of Conservation Concern o Significant habitat types o Presence of specialized wildlife habitat o Amphibian breeding habitat o Level of anthropogenic disturbance o Habitat block size o Habitat continuity
Mammals, Amphibians and Breeding/Migratory Birds	▪ Mammal, amphibians and breeding/migratory birds are vulnerable to effects of construction and operation of transportation infrastructure.	▪ Presence and effects on mammals, amphibians, breeding/migratory birds
Species at Risk		
Federal (COSEWIC) Species at Risk	▪ Species at Risk are indicators of specialized conditions in study areas. They contribute to biodiversity and need to be considered under the Federal *Species at Risk Act.*	▪ Presence and effects on habitats for: o Golden-winged Warbler o Bobolink o Redside Dace o Butternut o Blanding's Turtle o Re-introduced Atlantic Salmon
Socio-Economic Environment		
Use and Enjoyment of Private Property	▪ Nuisance effects from proximity to the corridor have the potential to affect use and enjoyment of private property.	▪ Projected levels of noise and dust.
Community Character	▪ The project could result in physical separation of smaller communities within a municipality from the other communities and community facilities. Changes in landscape composition, increased noise and dust could disturb the rural/agricultural atmosphere that is valued by local residents.	▪ Encroachment on the community, division of the community or creation of a barrier from other communities ▪ Changes to noise and dust levels
Agricultural Activity	▪ Across Durham Region, agricultural activity is an important component of the local and regional economy. Agriculture also influences a community's character and cohesion, ultimately affecting a community's well-being. Agricultural soils are a natural resource and critical to agricultural operations.	▪ Presence of agricultural operations and effects on: o Landscape composition o Presence of Class 1, 2 and 3 Agricultural Soils
Cultural Environment		
Archaeological Sites	▪ Archaeological sites with human burials are protected under the *Ontario Heritage Act.* ▪ Archaeological sites with human burials will require assessment and compliance with the provisions under the *Ontario Cemeteries Act*.	▪ Presence of and effects on: o Archaeological sites (with and without human burials)
Euro-Canadian Built Heritage and	▪ Euro-Canadian Built Heritage and Cultural Landscapes have social value,	▪ Presence of and effects on: o Built Heritage Resource (BHR)

Table 1-1 Valued Ecosystem Components		
VEC	**Rationale**	**Effects Considerations / Indicators**
Cultural Landscapes	by contributing to our understanding of Euro-Canadian history from the late 18th- to the early-20th century, for research public education purposes, and for their spiritual or cultural meaning to Canadians.	containing architecture and/or above-ground structural remains and artifacts o Cultural Heritage Landscapes (CHL) defined by farm complexes, roadscapes, waterscapes, railscapes, historic settlements, cemeteries, and historic/commemorative sites
Current Use of Land and Resources by Aboriginal People		
None Identified		
Waste / Property Contamination		
Soil Quality	▪ There is potential for encountering contaminated soil during construction activities and as such the contaminated soil will require remediation in accordance with environmental regulations. ▪ Cleaning up contaminated soil is important to the individual property owner and for the environment.	▪ Activities undertaken at each individual property (e.g. construction activities; waste storage and disposal; vehicle fuelling, maintenance, and storage operations) ▪ Number of properties with potential for contamination

1.5 Temporal Boundaries

The temporal boundaries encompassed the entire lifespan of the Project. Environmental effects were considered during the Construction Phase and the Operations and Maintenance Phase. No specific timeframes have been assigned to these two phases. However, it is anticipated that the earliest the Operations and Maintenance Phase could begin is 2013. Although the Operations and Maintenance Phase of any highway is ongoing, for the purposes of this EA the year 2031 was selected as the "planning horizon", based on the availability of population projections from the Province and Durham Region.

1.6 Spatial Boundary

In general, the spatial boundary for the comprehensive study reflects the geographic range over which the Project's environmental effects may occur. In this case, the spatial boundary was generally defined as the Analysis Area adopted for the provincial EA for the Project (see Figure 1-1). The Analysis Area was the area within and surrounding Durham Region (i.e., Highway 35/115 to the east, Lake Ontario to the south, Brock Road to the west, and approximately to the CPR railway line to the north). This analysis area or Regional Study Area (RSA) was adopted as the spatial boundary for the comprehensive study.

Of particular importance to Fisheries and Oceans Canada were the study areas for investigating effects on fish and fish habitat. In this case, the study area was established in accordance with MTO's Environmental Guide for Fish and Fish Habitat (2006) whereby a Zone of Detailed Assessment was defined to include the Project Right-of-Way (ROW) and the area of the watercourse 20 m upstream and 50 m downstream of the ROW. Where feasible, consideration was also given to a larger portion of the watercourse, namely 30 m upstream and 150 m downstream.

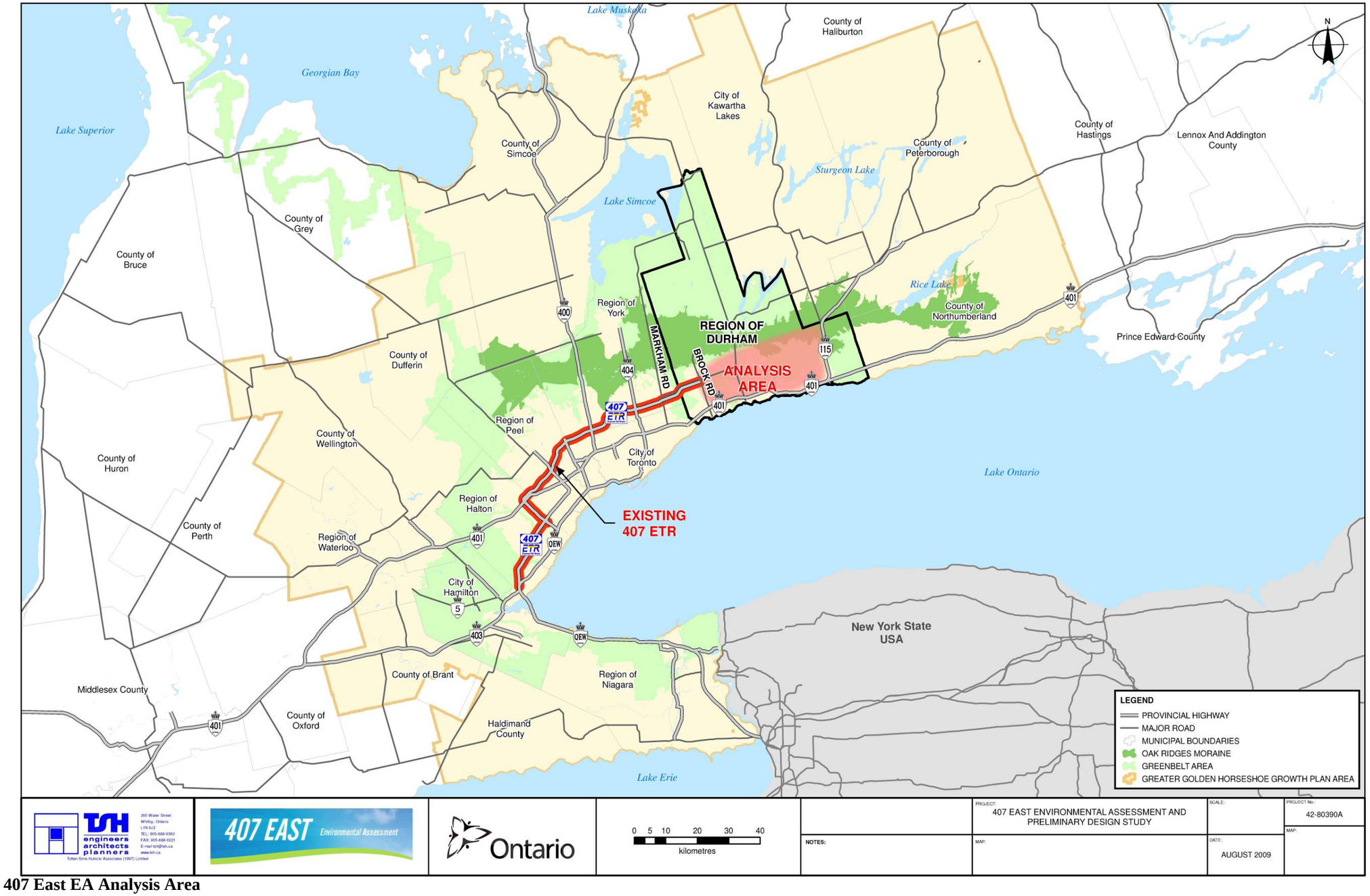

Figure 1-1 407 East EA Analysis Area

2 Consultation and Public Participation

2.1 Public Participation during the Comprehensive Study

The Act requires that the public be provided with three formal public participation opportunities:

- an opportunity to comment on the project and the conduct of the comprehensive study;
- an opportunity to participate in the comprehensive study; and
- an opportunity to comment on the comprehensive study report.

The first of these opportunities was provided between July 19 and August 20, 2010 and focused on the project description and the Comprehensive Study Guideline document.

The second consultation opportunity occurred from December 2 to December 22 and was focused on the draft CSR prepared by MTO.

Notices of these opportunities were posted on the CEAR Internet website and individuals and groups who had indicated an interest in the Project at earlier phases were notified directly.

The Agency finally invites the public and Aboriginal groups to provide comments on the conclusions and recommendations and any other aspect of this CSR. A summary of the comments received will be provided to the Minister of the Environment to inform the EA decision.

The Agency supported public participation in the EA through its Participant Funding Program (PFP). A total of $25,000 was allocated to Transport Action Ontario, the Board of Management of the Toronto Zoo, Friends of the Farewell and the Huron-Wendat Nation to support their respective participation in the comprehensive study.

The Agency has considered comments received throughout the comprehensive study process in this CSR and has summarized the input received during the first two comment opportunities into the Comment/ Response tables included in Appendix B and posted on the CEAR Internet website.

2.2 MTO's Public Consultation Process

The MTO undertook extensive public consultation throughout the provincial EA process. A summary is presented below.

- five rounds of Public Information Centres (PICs) at key project milestones;
- sixteen meetings of a Community Advisory Group (CAG);
- thirteen meetings of a Regulatory Advisory Group (RAG) and Municipal Technical Advisory Group (MTAG);
- two community workshops and three Community Value Plan workshops;
- numerous newsletters and fact sheets on various topics, including the Federal EA process;
- a Project Office where members of the public could view project material at their leisure;
- a project website (www.407eastea.com);
- a dedicated phone line;

- numerous individual meetings with any individual who requested a meeting with MTO; and
- responses to all letters, emails and phone calls received by MTO.

2.3 Aboriginal Consultation during the Comprehensive Study

The Crown has a duty to consult, and where appropriate accommodate, when it has knowledge that its proposed conduct might adversely impact an established or potential Aboriginal or treaty right. Consulting is an important part of good governance, sound policy development and decision-making.

The Agency used the same criteria as the MTO in determining the Aboriginal groups most likely to have interests in the area. These criteria were reserve proximity, traditional land use or asserted rights. The identified Aboriginal groups are listed in section 2.4.

The Huron-Wendat Nation applied to the Agency's Participant Funding Program and was awarded participant funding to support its participation in the EA.

In consideration of the results of the extensive consultative process to understand and address Aboriginal interests and concerns during the provincial EA, the Agency conducted its consultation largely via provision of written documentation with an invitation to meet where desired. Documentation was provided on the following occasions:

- March 26, 2010 - Notice of Commencement of the EA
- May 25, 2010 - Notice of availability of participant funding
- July 19, 2010 - Comments sought on the project and the conduct of the EA
- August 25, 2010 - Notice announcing the PFP recipients
- December 2, 2010 - Comments sought on the draft CSR

Representatives of the Agency and the MTO met with the Métis Nation of Ontario on October 29th, 2010. The meeting was beneficial to help inform and understand MNO interests with respect to the Project.

The consultative process identified that the primary interest of the Aboriginal groups is in relation to archaeological findings. The Agency notes that MTO continues to work closely with the Aboriginal groups to share information and consult with them in accordance with the MTO Protocol for the treatment of any archaeological evidence that may be uncovered during site assessment and construction.

2.4 MTO's Aboriginal Consultation

The MTO undertook an extensive consultative process to understanding Aboriginal interests. A summary is presented below.

Aboriginal groups that were contacted and invited to participate in consultations included those who identified as having an interest in the project by reason of reserve proximity, traditional land use or asserted rights:

- Curve Lake First Nation
- Mississaugas of Scugog Island
- Chippewas of Beausoleil Island
- Hiawatha First Nation

- Chippewas of Mnjikaning (Rama)
- Chippewas of Georgina Island
- Kawartha Nishnawbe First Nation
- Alderville First Nation

The Huron-Wendat Nation also has an interest in the project study area by virtue of historic occupation and related cultural heritage issues.

MTO's consultation process included the following activities:

- A notice was sent to the identified Aboriginal groups notifying them of the study commencement along with an offer to meet with them.
- The project mailing list for Aboriginal groups included the above noted communities as well as the applicable regulatory agencies, including Indian and Northern Affairs Canada and the Ministry of Aboriginal Affairs. The Huron-Wendat Nation was added to the project mailing list part way through the study process as they were not initially identified as having an interest in the project.
- Aboriginal groups were contacted at each key point in the study to advise them of the study progress and upcoming events.
- MTO arranged two Workshop and Information Sharing Sessions with the Williams Treaty Group, one in September 2008 and a second one in April 2009. A representative from the federal government also attended the session.
- A similar information sharing Workshop was undertaken with the Huron-Wendat Nation community on February 26, 2010.
- MTO kept Aboriginal groups up to date with regard to the archaeological field work and findings.

MTO has indicated that during subsequent design phases and construction, ongoing engagement with Aboriginal groups will be carried out in accordance with the 407 East First Nations Protocol. In recognition of the specific interest expressed in archaeological findings, MTO has committed to notifying Aboriginal groups of the opportunity to be involved in archaeological assessments related to Aboriginal finds.

3 Project Description

3.1 Purpose, Need and Rationale for the Project

According to MTO, the purpose of the Project is to address long standing transportation deficiencies and needs in Durham Region by providing additional east-west and north-south transportation capacity within the Analysis Area for a long-term planning horizon. The existing transportation network within the Analysis Area is composed of a number of provincial highways and regional arterial roads supported by GO Transit and Regional Transit services. This network is currently constrained in its ability to move people and goods effectively and efficiently. These deficiencies have been identified in previous studies and reports, leading to recommendations for a series of planned transportation improvements. Even with the planned transportation improvements, this situation will be exacerbated unless additional east-west and north-south system capacity is provided as the communities within Durham Region continue to grow.

3.2 Project Overview

MTO's project as proposed is a transportation corridor comprised of the following elements (see Figure 3-1):

- A 50 kilometre (km) extension of Highway 407 from Brock Road to Highway 35/115 known as the east-west mainline extension;
- Two north-south freeway links connecting the proposed mainline extension to Highway 401, one in Whitby (West Durham Link) and one in Clarington (East Durham Link), each approximately 10 km in length;
- Support facilities, including two highway maintenance facilities, two commercial vehicle inspection facilities and three truck lay-bys;
- Structures, including railway crossings, watercourse crossings, wildlife crossings, retaining walls and noise walls;
- Drainage and stormwater management facilities;
- Illumination requirements; and
- Protection of a dedicated transitway corridor along the east-west mainline and East and West Durham Links, including lands for two transitway maintenance facilities and 17 transitway stations / commuter parking lots.

Figure 3-1 The 407 East Transportation Corridor

3.3 Physical Works and Activities

The following physical works and activities are likely to be undertaken during the Construction Phase:

- **Site Preparation,** including activities associated with surveying and geotechnical investigations; Right-of-Way (ROW) and support facility site clearing and grubbing; modifications, relocations and removal of existing structures and obstructions; and preliminary grading and installation of stormwater management features and erosion controls;
- **Roadbed Construction,** including activities associated with the construction of the roadbed including access roads and structures. This may involve earthmoving, rock drilling, and blasting activities within the ROW and specific cut and fill areas, and water takings;
- **In-stream Works**, including the construction, installation or modification of structures aimed at stabilizing streambanks or shorelines, deflecting and/or reducing stream flows for the purposes of construction. This may also include the installation of structures aimed at trapping sediments, deflecting and/or reducing stream flows, increasing the complexity of stream banks, channels, for cover, feeding or spawning habitat for fish or other aquatic organisms; excavation, relocation/realignment and restoration of stream channels and/or stream banks aimed at creating a geomorphologically stable stream reach;
- **Surfacing and Finishing,** including paving, line painting and installation of signs, guiderails, illumination structures, utilities, wildlife crossings and fencing;
- **Ancillary Structures and Supporting Facility Construction,** including the development and decommissioning of temporary site access roads, borrow areas and storage areas; and the construction of permanent supporting facilities, such as maintenance facilities, vehicle inspection facilities, truck lay-bys, and transitway stations; and
- **Materials and Equipment Handling and Movement,** including the operation of heavy equipment; the import / export of materials (including any contaminated soils and waste materials) from the construction site; temporary storage of materials within the ROW and worker vehicular traffic both on and off-site.

The following physical works and activities are likely to be undertaken during the Operations and Maintenance Phase:

- **Winter Safety Operations**, including snow removal activities such as ploughing, melting and hauling of snow within the ROW; and ice control through physical means or by the application of sand, road salts and other de-icing agents.
- **Preventative Maintenance,** including activities such as the repair of paved roadway surfaces; grading and gravelling of shoulders; culvert clearing; cleaning and/or re-establishment of drainage ditches and storm water ponds, surface treatments, repainting and general maintenance of structures and supporting facilities.
- **Maintenance of Vegetation and Wildlife Crossings,** including manual or mechanical clearing of vegetation along the ROW to maintain sight lines; clearing of wildlife crossing structures; revegetation and plantings as appropriate.

4 Project Alternatives

4.1 Alternatives to the Project

For the purposes of paragraph 16(1)(e) of the Act, alternatives to the project are functionally different ways to meet the project's need and purpose.

An examination of alternatives to the project has been included in the comprehensive study.

4.1.1 Summary of MTO's Analysis

Ten alternatives to the Project were considered and assessed by MTO during the provincial EA:

- "Do Nothing";
- Travel Demand Management;
- Transportation Systems Management;
- Improved Air Transport Service;
- Improved and/or New Passenger Rail Service;
- Improved and/or New Goods Movement by Rail;
- Improved and/or New Marine Service;
- Improved and/or New Roadways/Transitways;
- Improved and/or New Transit Services; and
- Combinations of the above.

According to MTO, investigation of these ten alternatives revealed that, individually, none were capable of fully meeting the need for the project or achieving the project's purpose. MTO created the following combinations of alternatives to the Project in order to adequately address the transportation deficiencies and needs:

- Combination 1 – Enhanced Transit / Travel Demand Management / Transportation System Management;
- Combination 2 – Modified Transit/ Travel Demand Management / Transportation System Management plus Expansion of Existing Roadway; and
- Combination 3 – Combination 1 plus New Corridors

MTO evaluated the three Combination Alternatives, plus the "Do Nothing" alternative, based on its knowledge of existing transportation and environmental conditions in the Analysis Area. Secondary source data, government policies and public input from the consultation program were combined with professional expertise to undertake a comparative analysis of the three combination alternatives.

The MTO's recommended Combination Alternative 3 consists of transit and Travel Demand Management enhancements (Combination 1) plus a new transportation corridor. For the purposes of the assessment, the new corridor was assumed to include a new freeway connecting the existing terminus of Highway 407 at Brock Road in Pickering to Highway 35/115 in Clarington and two north-south freeway links connecting to Highway 401, one in the general vicinity of the Ajax/Whitby boundary (West Durham Link) and the second in the general vicinity of the Oshawa/Clarington boundary (East Durham Link). The new corridor

also includes a transitway corridor paralleling the freeway from Brock Road to Highway 35/115 and north-south transitways parallel to each of the links.

The MTO determined that Combination 3 was the only alternative that adequately addressed:

- the identified transportation problems and opportunities;
- land use policies and plans; and
- economic growth and sustainability goals.

The alternatives assessment and the recommended option were presented to the Regulatory Agency Group (RAG), Community Advisory Group (CAG), the Municipal Technical Advisory Group (MTAG) and the public for comment through a number of consultation activities during the preparation of the EA. They were also subject to government agency and public comment during the review of the provincial EA.

4.1.2 Government and Public Comments

MTO received numerous comments regarding its alternatives assessment during the preparation of the EA. However, the majority of these comments focused on issues outside of the consideration of alternatives to the Project, including improvements to the proposed standards for mitigation, the complexity of the EA process, the project timing being too long and the choice of route locations (i.e., alternative means).

As a result of its review of the provincial EA, the MOE concluded that MTO had considered a reasonable range of alternatives to the undertaking using criteria that considered the *Ontario Environmental Assessment Act* (EAA's) broad definition of the environment.

4.2 Alternative Means of Carrying Out the Project

In accordance with paragraph 16(2)(b) of the Act, the comprehensive study process must include consideration of alternative means of carrying out the project. Alternative means are technically and economically feasible ways the project can be implemented. In this case, the MTO analyzed alternative route segments within the Project to determine the technically recommended route (Figure 4.1).

4.2.1 Summary of MTO's Analysis

The MTO considered and assessed numerous route alternatives throughout the Analysis Area in a systematic manner. This was accomplished through the identification and screening of a long list of route alternatives, and detailed evaluation of the environmental effects, social, cultural and technical factors of a short-list of route alternatives to arrive at a Technically Recommended Route (TRR). The factors included:

- Minimize the route within Provincial Policy/ Plan Areas (e.g. Oak Ridges Moraine and Greenbelt);
- Minimize direct loss of Areas of Natural Scientific Interest and Environmental Sensitive Area;
- Minimize direct loss of Provincially Significant Wetlands;
- Minimize direct effects on agriculture and natural resources;
- Minimize the number of stream crossings;
- Minimize effects on existing and planned development;

- Maximize transportation network efficiency.

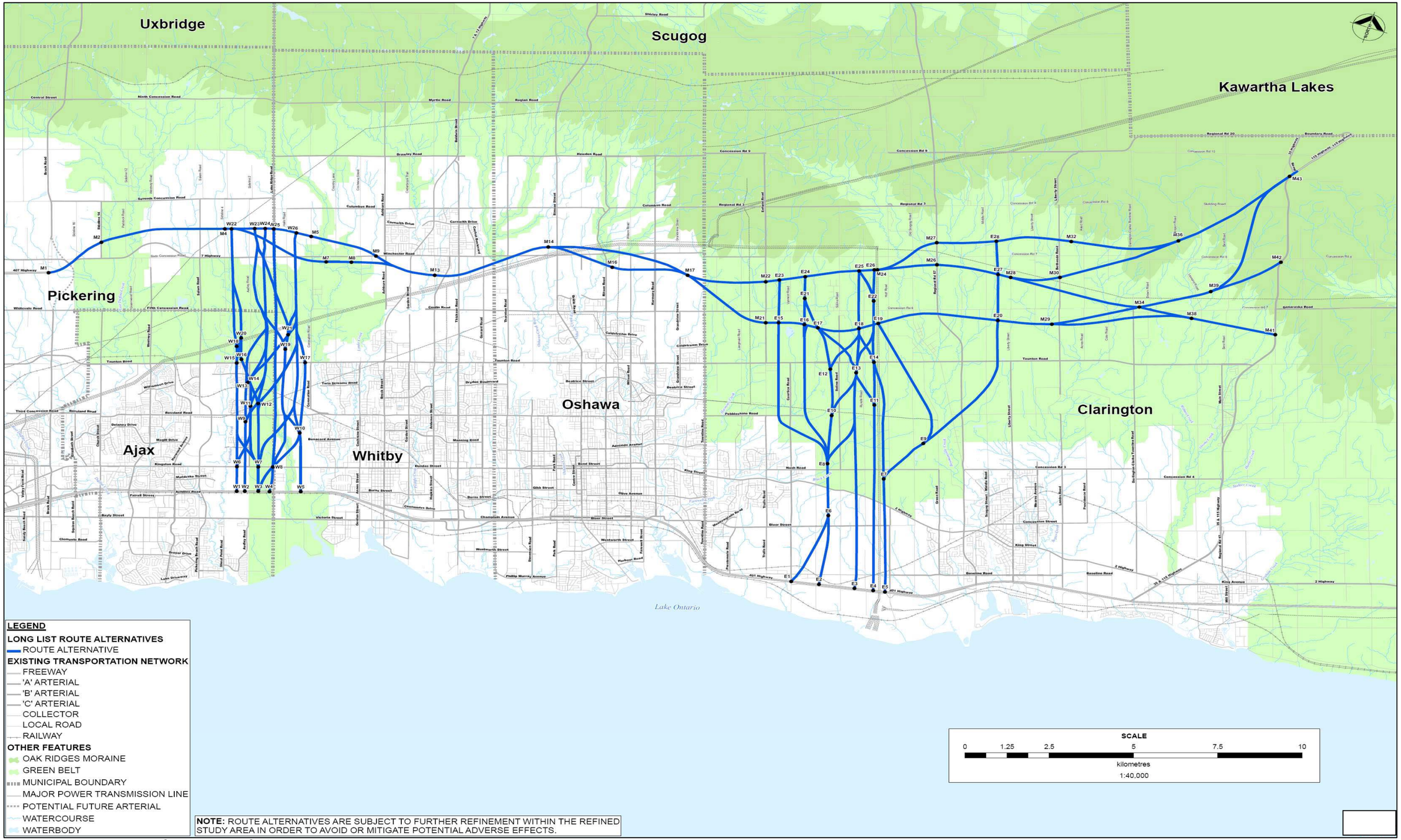

Figure 4-1 Evaluation of Long List of Alternatives

In some cases, a large number of alternatives were examined to ensure specific environmental constraints were considered in detail. In undertaking its analysis, MTO considered federal policies including the Policy for the Management of Fish and Fish Habitat (1986); Federal Policy on Wetland Conservation (1991); The Federal Water Policy (1987); and the Canadian Biodiversity Strategy (1994). The following summarizes the consideration of alternative means for carrying out the Project.

West Mainline (WM): Based on the screening of the long list of alternatives along the west portion of the mainline, only one feasible route alternative was recommended between Brock Road and Audley Road because the others were generally within existing developed areas. Elsewhere in the western portion of the mainline, two route alternatives were evaluated in detail - a north route and a south route. The north route was most preferred from the natural, social, land use/economic and technical factors, and equally preferred as the south route for the cultural factor. The preferred route minimizes effects on sensitive watercourses, forested valley habitat, environmentally sensitive areas and other natural heritage features; affects fewer residential and business properties; requires fewer and less significant local road realignments and allows for an interchange at Highway 7, a key east-west arterial road.

Central Mainline (CM): Based on the screening of the long list of alternatives along the central portion of the mainline, only one feasible route alternative was recommended between Ashburn Road and Simcoe Street because the others were generally within existing and planned development areas. Elsewhere in the central portion of the mainline, two route alternatives were evaluated in detail - a south route and a north route. The north route was most preferred from the social, land use/economic and technical factors, and equally preferred as the south route for the cultural factor. The north route was less preferred to the south for the natural environment factor. Overall, the north route alternative affects fewer residential, business and recreational properties, will likely result in lower noise and air quality effects and does not require a major realignment of Winchester Road.

East Mainline (EM): Twelve route alternatives were evaluated in detail along the eastern portion of the mainline. The recommended route was identified as having a lower potential for adverse effects on vegetation (including environmentally significant features), fish and fish habitat, wetlands and hydrological features. In addition, this route displaces fewer residential properties, affects fewer specialty crop operations and does not affect any known archaeological sites.

West Durham Link (WL): Based on the screening of a long-list of alternatives, nine route alternatives were evaluated in detail for the West Durham Link. The recommended route was either preferred or equally preferred to others for the natural, social, land use/economic, and technical factors. This route avoids fragmentation of large habitat areas and retains small good quality terrestrial features. It avoids effect to watercourse confluence zones, forested riparian areas and affects fewer residential, business and agricultural properties than the other routes.

East Durham Link (EL): Twenty-six route alternatives were initially generated for the East Durham Link, largely to ensure that effects on the Harmony-Farewell Iroquois Beach Wetland Complex and other constraints were examined in detail and avoided to the extent possible. As a result of the selection of the preferred route alternative for the mainline, a short list of 13 feasible route alternatives were evaluated in detail for the East Durham Link. The recommended route was either preferred or equally preferred to others for the natural, cultural and technical factors. It was evaluated to have the least potential effect on the natural environment, wetlands, core wildlife habitat areas, groundwater and vegetation (including

environmentally significant areas). It minimizes effects on residential and business properties and does not affect any known archaeological sites.

Following the comparative evaluation step, the resulting recommended routes were combined to identify the Technically Recommended Route (TRR) in June 2007. The TRR was then presented to agencies, Aboriginal groups and the public for review and comment. Refinements were made to the TRR based on comments received and ongoing preliminary design work. MTO confirmed the Technically Preferred Route (TPR) in June 2008 on the basis that it had the least potential for adverse environmental effects, taking into consideration the conceptual design features and technically and economically feasible mitigation.

Based on its review of the provincial EA, the MOE concluded that MTO had assessed a reasonable range of alternative methods to the Project, including alternative transportation corridor alignments and design elements that considered the EAA's broad definition of the environment. The approval granted by the Ontario Minister of Environment on June 3, 2010 concluded that no other beneficial alternative method of implementing the undertaking was identified.

4.2.2 Government and Public Comments

MTO received numerous comments regarding its alternative means assessment during the preparation of the EA. In addition, during the review of the provincial EA, the MOE received comments from federal authorities, provincial ministries and the public regarding the assessment of alternative means. Comments from the public were largely focused on the rationale for the location of the East Durham Link (EDL), its connections to Highway 401, proximity to the Solina Bog and effects on the Harmony-Farewell Iroquois Beach Wetland Complex. Concerns were also expressed that the EDL was selected so that "the entire area south of the 407 could be developed into residential housing" and that the rural nature of the area should be considered / weighted differently from the West Durham Link.

During the comment period on the draft CSR, Transport Action Ontario, a recipient of participant funding from the Agency submitted a report of its analysis of travel demand to the Agency for consideration. In evaluating MTO's travel demand modelling, Transport Action Ontario concurred there was some justification for a freeway type corridor in the western portion of the study area. However, Transport Action Ontario's analysis concluded there was insufficient travel demand to justify building the eastern mainline and East Durham Link because, in its opinion, other viable alternatives such as an expansion of regional roads could meet travel demand. Transport Action Ontario requested that the federal Minister of the Environment only "approve that portion of the project under the Phase 1 Build, thereby avoiding the significant environmental issues and costs associated with building the balance of the freeway, which is largely in the greenbelt."

The Agency responded to this request, explaining that the comprehensive study process does not lead to an approval of the highway or highway segments but rather a determination of whether the Project, in its entirety, will likely cause significant adverse environment effects. Whether the Proponent proceeds or does not proceed with the undertaking, or proceeds with it in a phased manner, is for the Government of Ontario (MTO) to determine. The Agency provided a copy of Transport Action Ontario's analysis to the MTO.

The Agency is satisfied that a reasonable range of alternative routes were considered, that the analytical process was transparent and traceable, and that it fulfills the requirement for consideration of alternative means under the Act.

5 Description of the Environment

The comprehensive study assessed the environmental effects of the Project on fourteen Valued Ecosystem Components:

- Air quality and climate (including the consideration of climate change);
- Noise and Vibration (including the consideration of noise sensitive areas);
- Surface and subsurface geology and soils (including the consideration of valley slopes, landforms and erosion);
- Groundwater (including the consideration of groundwater quality and quantity, and the location and condition of drinking water wells);
- Surface water (including the consideration of surface water quality and quantity);
- Vegetation and vegetation communities;
- Wetlands;
- Fish and fish habitat (including the consideration of sediments characteristics);
- Wildlife and wildlife habitat (including the consideration of wildlife movement corridors, specialized/sensitive habitats and their use by migratory birds);
- Species at Risk (i.e., Federal (COSEWIC) and Provincial Species at Risk);
- Socio-economic Environment (including the consideration of agriculture, community and neighbourhood characteristics, adjacent and nearby land uses);
- Cultural Environment;
- Current use of lands and resources by Aboriginal People; and
- Contaminated Sites and Waste Management.

The following is a summary of the baseline conditions for each VEC derived from the provincial EA and supporting technical documents.

5.1 Air Quality and Climate

The following contaminants were considered by MTO in assessing the potential effects of the Project on air quality because they are the main contaminants emitted from vehicle tailpipes and roadway surfaces, and depending on concentrations and human exposure, they may be associated with potential health effects:

- Carbon Monoxide (CO)
- Oxides of Nitrogen (NO_X),
- Particulate Matter (PM) including inhalable particulate matter, or PM_{10}; and respirable particulate matter, or $PM_{2.5}$.
- Volatile Organic Compounds (VOCs) including Formaldehyde, Acetaldehyde, 1,3-Butadiene, Benzene and Acrolein.

In addition, Total Suspended Particulate Matter (TSP), which gives an indication of dust levels (i.e., a nuisance contaminant), was also considered a contaminant of concern.

In examining potential effects associated with these contaminants, consideration was given to provincial and federal ambient air quality criteria, including the Ontario Ministry of the Environment's Ambient Air

Quality Criteria (AAQCs), Environment Canada's National Ambient Air Quality Objectives (NAAQOs) and the Canadian Council of Ministers of the Environment's (CCME) Canada Wide Standard (CWS) for PM2.5.

Baseline conditions were established using five year (1999-2003) historical records obtained from three MOE operated ambient air quality-monitoring stations between Pickering and Clarington. Emphasis was placed on ambient air quality data from the closest ambient air monitoring station to the Project or from the nearest alternative stations. The data indicates that levels of CO and NO_2 are well below their respective ambient air quality guidelines. The PM_{10} and $PM_{2.5}$ air quality levels are common to many cities in Southern Ontario, where there are infrequent measured levels in excess of guideline levels.

MTO also identified sensitive receptors, including residences, churches, daycare facilities, schools, hospitals and senior housing facilities throughout the study area. Special consideration was given to these receptors because of the increased potential for adverse health effects. A total of 1,861 sensitive receptors were identified within approximately 600 m of the Project.

5.1.1 Climate

The Project is situated in a climatic transition zone between Southwestern and Eastern Ontario. MTO collected data, including climate normals (e.g., wind direction, speed, temperatures, humidity, snowfall and snow depth and rainfall) from the Lester B. Pearson International Airport and the Peterborough Airport for use in the air quality assessment.

MTO also collected data regarding severe weather conditions, including freezing rain, snowfall, heavy rainfall, fog and tornadoes, for considering the effects of the environment on the Project,. In general, severe weather conditions are relatively infrequent. Heavy rainfall was of particular interest to the assessment of the environmental effects of the Project as it is an important stormwater treatment consideration. Heavy rainfall events (greater than 25 mm) are infrequent in the study area, occurring 4 to 5 days/year on average. Very heavy rainfall rates, greater than 50 mm/hr, occur only 1 to 2 times per year. Periods of dry weather or drought have been relatively uncommon in Ontario (about every 10-15 years) (Ontario Ministry of Natural Resources, 2010)

5.2 Noise and Vibration

Ambient noise level measurements were taken by MTO at various locations throughout the study area. Within the study area, ambient noise levels ranged from 46 dBA and 69 dBA which can be characterized as "moderate" to "loud". In an effort to manage noise levels from construction projects, the City of Pickering, Town of Ajax, Town of Whitby, City of Oshawa, and the Municipality of Clarington have enacted noise by-laws which stipulate the times of day when the operation of construction equipment is prohibited.

Noise Sensitive Areas (NSAs) were defined in accordance with the MTO *Environmental Guide for Noise* (MTO 2006). There are an estimated 1,841 Noise Sensitive Areas (NSAs) within 500 m of the Project.

5.3 Surface and Subsurface Geology and Soils

Surface and subsurface geological and soil conditions were considered important ecosystem components as major cuts and fills have the potential to affect groundwater aquifers and water supplies from domestic wells. Groundwater and surface water also interact to influence wetlands and their habitats. MTO characterized the study area from north to south, in terms of three east-west trending physiographic regions: the Oak Ridges Moraine, the South Slope, and the Iroquois Plain. (Chapman and Putnam, 1984).

The Oak Ridges Moraine is one of the most distinctive physiographic regions in southern Ontario and forms the drainage divide between water flowing south into Lake Ontario and water flowing north into the Trent-Severn Waterway system. The South Slope physiographic region begins on the south side of the Oak Ridges Moraine and slopes downward towards Lake Ontario. It is a gently rolling till plain, characterized by numerous drumlins oriented upslope. The gently sloping lowland extending from the till plain of the South Slope down to Lake Ontario is the Iroquois Plain physiographic region.

The bedrock in the study area is comprised of flat-lying Paleozoic limestones and shales; minor outcrops occur in stream valleys near the shore of Lake Ontario. The topography is predominantly influenced by thick layers of glacial sediments, which were deposited between about 135,000 and 12,000 years ago (Eyles, 2002). The MTO examined the distribution, thickness and composition of the Scarborough Formation, the Sunnybrook Drift, the Thorncliffe Formation, the Newmarket Till, the Oak Ridges Moraine and the Halton Till.

Because considerable erosion and re-deposition of glacial sediments occurred following deglaciation, streams cut gullies through till and glaciolacustrine plains, and wind erosion stripped fine sediment from exposed hills and deposited it in sand dunes or hollows. Organic material accumulated in isolated basins and kettles, particularly where groundwater upwelled. Revegetation of plains and hillsides reduced sediment delivery to watercourses, thereby causing rivers to incise and abandon old floodplains.

5.4 Groundwater

The baseline characterization of groundwater included the identification of key hydrostratigraphic units that comprise the shallow groundwater system and their classification as either aquifers or aquitards as well as groundwater flow, recharge and discharge. MTO also investigated the presence of groundwater wells and the state of groundwater quality in the study area.

MTO studies indicate that the shallow groundwater system within the Regional Study Area (RSA) is influenced by four key units: the Newmarket Aquitard, Oak Ridges Moraine Aquifer, Halton Till Aquitard, and Iroquois Plain Shallow Aquifer. Groundwater flow within the RSA is south-southeast from the Oak Ridges Moraine towards Lake Ontario, except where major river valleys exist. Locally, groundwater flow paths bend into river valleys and isolated topographic depressions.

Recharge areas are important because they replenish groundwater. Where exposed, the Oak Ridges Moraine exhibits the greatest rate of groundwater recharge in the RSA as nearly all precipitation infiltrates into the crest area due to the permeability of these surficial deposits. Testing confirmed downward groundwater flow and a deep water table. Minor groundwater recharge also occurs in areas of the South Slope that are underlain by Oak Ridges Moraine sediments and where the Halton Till is thin. In the areas

of thicker Halton Till and/or Newmarket Till, runoff exceeds recharge due to the low permeability of these deposits.

Nearly 90% of the groundwater recharge that occurs between Lake Ontario and the crest of the Oak Ridges Moraine discharges into stream networks. Some wetlands exist where surface water becomes trapped due to topography and underlying low permeability sediments. However, many wetlands within the RSA are associated with areas of groundwater discharge. Of particular interest is the high water table and localized groundwater upwelling within the Iroquois sands that provide ideal conditions for wetlands to form.

A residential water well survey was undertaken by MTO in 2008. A total of 1,328 residential groundwater wells were documented: including 327 (25%) shallow dug wells; 191 (14%) deep drilled wells; and 810 (61%) wells having unknown construction details.

Well water quality samples were collected at 87 residences to obtain a representative lateral and vertical distribution of the baseline water quality across the study area. Five wells were selected to gather information from upgradient and downgradient of the Project, shallow and deep aquifer units, and low sensitivity and high sensitivity aquifer units. Concentrations of one or more of the following parameters were found to exceed Ontario Drinking Water Standards (ODWS) for one or more of these wells: sodium, iron, manganese, nitrate, hardness, *E. coli*, total coliform, and Heterotrophic Plate Count (HPC). High concentrations of iron, manganese and hardness are found naturally in local aquifers, but exceedances of the other parameters indicate effects of land use activities such as road salt and fertilizer applications and/or improperly functioning septic beds.

5.5 Surface Water

There are thirteen major watercourses and associated watersheds within the RSA. From west to east, these are: Duffins Creek, Carruthers Creek, Lynde Creek, Pringle Creek, Corbett Creek, Oshawa Creek, Goodman Creek, Farewell Creek, Harmony Creek, Black Creek, Bowmanville Creek, Soper Creek and Wilmot Creek. Most of these watercourses originate in the Oak Ridges Moraine to the north of the Project and flow into Lake Ontario to the south. Smaller watercourses within the RSA that flow directly into Lake Ontario include Robinson Creek, Tooley Creek, Darlington Creek and West Side Creek. MTO documented the existing environmental conditions at all watercourse crossings in terms of their locations, drainage areas, flow conditions based on a 2-year storm event and a regional storm event. Water quality data was provided when available from Conservation Authorities. MTO confirmed that none of the watercourses are used as a supply of drinking water. Although none of the watercourses were considered to be navigable at the point of crossing and are unlikely to be used for boating, they may be used by some local residents for fishing, nature viewing and unorganized play.

5.6 Vegetation and Vegetation Communities

MTO conducted extensive research and field investigations to describe the vegetation and vegetation communities potentially affected by the Project. The vegetation and vegetation communities were characterized in each of the watersheds traversed by the Project. Within each watershed, MTO identified native and non-native plant species, regionally rare and locally rare plant species and areas designated as being of natural and scientific interest or environmentally sensitive. Over 275 plant species were identified within the study area but no provincially rare vegetation communities were identified within the corridor.

5.7 Wetlands

MTO conducted extensive research and field investigations to describe the wetlands potentially affected in each watershed traversed by the Project. Within the RSA, based on the application of the Ontario Wetland Evaluation System , 21 wetlands were identified as being provincially significant and 8 as being locally significant. In addition, the Project crosses a number of unevaluated wetlands which are primarily coniferous or deciduous swamps, meadow marshes, thicket swamps or mixed swamps.

5.8 Fish and Fish Habitat

MTO conducted extensive research and field investigations to describe fish and fish habitat potentially affected for each watersheds and watercourse traversed by the Project. Fish and habitat conditions associated with each watercourse crossing were described in terms of the fish communities present, primary functions of the watercourse, its physical characteristics and flow status, groundwater influences, specialized fish habitat functions and overall sensitivity. Eighteen crossings were considered to be of low sensitivity, five of moderate sensitivity and 23 of high sensitivity, with the remainder displaying no direct fish use.

5.9 Wildlife and Wildlife Habitat

A number of area-sensitive bird species and provincially rare breeding species were observed in habitats within the transportation corridor. Forest area-sensitive breeding species abundantly recorded include: Hairy Woodpecker, Black-and-White Warbler, Black-throated Green Warbler, Ovenbird and Veery. There are over 66 breeding bird species recorded in the various vegetation units throughout the transportation corridor. Six amphibian frog species were recorded within the transportation corridor: American Toad, Green Frog, Gray Treefrog, Spring Peeper, Wood Frog, Northern Leopard Frog. Most areas of breeding amphibian habitat in the transportation corridor contain small numbers of amphibians. Furthermore, one salamander species, the Red-backed Salamander, was located within the transportation corridor. The transportation corridor crosses a number of valleys, contiguous habitat blocks and tributaries, which vary in the type and level of function they provide for wildlife use and movement.

5.10 Species at Risk

Species at Risk identified by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as either Endangered or Threatened potentially occur within the corridor were investigated in detail as part of the environmental assessment. These species are:

- The Golden-winged Warbler (*Vermivora chrysoptera Linnaeus*, Paruline à ailes dorées) has been identified as “Threatened” by COSEWIC and is listed on Schedule 1 of the Federal *Species at Risk Act* (SARA).
- The Bobolink (Dolichonyx oryzivorus) has been identified as “Threatened” by COSEWIC and is listed under the provincial *Endangered Species Act* (ESA) and currently being considered for listing on Schedule 1 of SARA.
- The Blanding’s Turtle (*Emydoidea blandingii*) has been identified as “Threatened” by COSEWIC and is listed on Schedule 1 of SARA.

- The Butternut tree (*Juglans cinerea*) is identified as "Threatened" by COSEWIC and is listed on Schedule 1 of SARA.
- The Redside Dace (*Clinostomus elongatus*) has been identified as "Endangered" by COSEWIC.
- The Atlantic Salmon (*Salmo salar*) has been identified as "Extirpated" by COSEWIC.

The status of species in Ontario are also assessed by the Committee on the Status of Species at Risk in Ontario (COSSARO). In addition, there is one known provincially rare terrestrial wildlife species (Carolina Wren) known to occupy habitat adjacent to the transportation corridor.

5.11 Socio-economic Environment

The Regional Study Area is contained largely within the Region of Durham, laying immediately to the east of the City of Toronto within the Greater Toronto Area. The Project will serve all of southern Ontario including numerous communities and hamlets within Durham Region. Communities such as Almond Village, Brooklin, Kinsale, the Macedonian Village, Solina, Leskard, the village of Tyrone and Hampton, and the Hamlet of Columbus are all located in proximity to the transportation corridor. Further, there are several proposed future growth areas, employment lands and planned communities located near the transportation corridor.

The vast majority of the land required for the Project is privately held. There are over 500 properties impacted by the right of way of the transportation corridor, including a number of non-farm commercial activities. Eight businesses within the ROW may also be potentially affected. The right of way contains a significant amount of agricultural land, particularly in the eastern portion of the study area (i.e., Clarington). The transportation corridor traverses a range of soil types, however there is a higher percentage of Class 1-3 type soils, which are more fertile than Class 4-7 type soils.

5.12 Cultural Environment

There are a number of known archaeological sites and large areas with the potential for archaeological finds within the transportation corridor. To date, 23% of the transportation corridor footprint has been subject to a Stage 2 Archaeology Assessment and this work has identified 36 Pre-contact aboriginal sites and 43 Early European sites.

Individual built heritage resources 40 years of age and older such as residences, barns, schools or churches were identified within the transportation corridor. Several roadscapes, farm complexes, cemeteries and agricultural lands 40 years of age and older were also identified as cultural heritage landscapes. None of these resources are recognized by the Federal Government as having National Heritage Status (NHS).

5.13 Current use of Lands and Resources by Aboriginal People

Although there are no Aboriginal groups directly in the Regional Study Area (RSA), members of Aboriginal groups and persons of Métis heritage may reside within the RSA. The closest Aboriginal group, the Mississaugas of Scugog Island, is located approximately 21 km north of the Project. Nine First Nations were identified by MTO as having a historical relationship with the lands along the north shore of Lake Ontario from Toronto East to the Bay of Quinte and north to Lake Simcoe and Rice Lake. The

historical association with these lands resulted from occupation, traditional land use and related activities prior to European settlement.

Based on the research and field studies undertaken by the MTO as part of the provincial EA, there does not appear to be any current use of lands or resources by the identified Aboriginal groups along the Project or within the RSA. No commercial fishing, traditional activities (i.e., relating to food, camping, travel, social or cultural purposes), nor Aboriginal groups with a dependence on country foods or harvesting on or near the Project were identified.

5.14 Contaminated Sites and Waste Management

The Project traverses over 500 properties which are being assessed for potential site contamination. Of these properties, 385 have been assessed to date and 24 have been identified as requiring additional investigations to determine the potential waste and property site contamination.

6 Environmental Effects Assessment

The following sections provide a summary of the environmental effects assessment undertaken for this comprehensive study, including the identification of the environmental effects, mitigation measures and residual adverse effects of the Project. These summaries have been derived from the complete body of documentation on the potential effects of the Project including the provincial EA document, technical reference documents, and the draft federal environmental screening report. Key government and public comments resulting from the provincial EA and the conduct of the comprehensive study are also noted.

6.1 Air Quality and Climate

6.1.1 Approach

The approach applied by the MTO to assess air quality effects of the Project included:

- Establishing background concentrations of the contaminants of interest in the absence of the proposed project;
- Quantifying the contaminant emissions from the vehicular traffic associated with the Project;
- Using a dispersion model to predict contaminant concentrations due to the operation of the highway component of the transportation corridor at key receptor points;
- Determining combined effect on air quality; and
- Comparing the results to the applicable air quality criteria to determine the nature and extent of impacts.

The MTO considered Provincial and Federal guidelines in the form of ambient air quality criteria, including MOE's Ambient Air Quality Criteria (AAQCs); Environment Canada's (EC) National Ambient Air Quality Objectives (NAAQOs) and the Canadian Council of Ministers of the Environment (CCME) Canada Wide Standard (CWS) for $PM_{2.5}$. With the exception of Total Suspended Particulate Matter (TSP), which gives an indication of fugitive dust levels (a nuisance contaminant), all other contaminants considered are related to potential human health effects and/or effects on sensitive vegetation communities[1] and wildlife. Where there were reference levels for multiple averaging periods for a given contaminant, attainment was assessed using the threshold corresponding to the shortest averaging period (i.e., 1-hour, 8-hour, or 24-hour). With respect to effects on human health, average 24-hour pollutant concentrations were considered most appropriate. It is noted that reference levels for the protection of

[1] *Plants are potentially affected by high levels of TSP from dust fallout.*

sensitive vegetation communities and wildlife are not available for air quality. The levels used for the protection of human health were used as indicators.

6.1.2 Effects Analysis and Mitigation

The MTO's air quality analysis indicates that during the Construction Phase, Project-related emissions are expected to be of low magnitude and short term in duration. However, there may be infrequent occasions when exceedances of an applicable air quality threshold occur. The largest effects on air quality are due to releases of TSP. To minimize air quality effects during the Construction Phase, the relevant provisions contained in Environment Canada's "Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities (March, 2005)" will be written into the contract documentation between MTO and the construction contractor(s). In addition, the contractor(s) may be required to implement street cleaning methods, take measures to encourage adherence to speed limits and discourage extended periods of idling.

During the Operations Phase, the Project will contribute to reduced local and regional air quality. For the most part, maximum predicted concentrations are lower than background pollutant concentrations and most are well below applicable reference criteria as summarized below.

Table 6-1 Maximum Predicted Concentrations – Entire Transportation Corridor

Contaminant	Averaging Period	Maximum Predicted Concentration ($\mu g/m^3$)	Reference level ($\mu g/m^3$)	% of the Reference level	Attainment
CO	1-hour	3,033	36,200	8%	Yes
NO_2	1-hour	149	400	37%	Yes
$PM_{2.5}$	24-hour	20.1	30	67%	Yes
PM_{10}	24-hour	46.1	50	92%	Yes
TSP	24-hour	170	120	142%	No
1,3-Butadiene	24-hour	0.39	-	-	-
Benzene	24-hour	4.00	-	-	-
Formaldehyde	24-hour	4.61	65	7%	Yes
Acetaldehyde	24-hour	3.89	500	0.8%	Yes
Acrolein*	24-hour	0.185	0.4*	46%	Yes

*(revised acrolein reference level)

With respect to acrolein, the MTO's air quality technical information was completed using the Year 2005 acrolein reference level as the basis of the provincial EA Report and the draft CSR analysis. Therefore, MTO indicated in its original analysis that all contaminants, with the exception of acrolein and TSP, were below their applicable reference level standards.

Environment Canada advised the Agency that amendments to the provincial Ambient Air Quality Criteria (AAQC) for acrolein came into effect on February 1, 2010 revised the standard from 0.08 µg/m³ to 0.4 µg/m³ . Therefore, the Project's predicted acrolein contribution of 0.185 µg/m³ is 46% of the reference level This means that attainment is achieved.

For a worst case section of the highway (i.e., a 10 lane section with the highest traffic volumes), MTO predicted the percentage increase in 24 hour pollutant concentrations over background levels for the following contaminants of concern at both 25 m and 500 m from the edge of the highway ROW. The results are as follows:

- Carbon Monoxide - +68% (25 m) to +21% (500 m)
- Nitrogen Dioxide - +113% (25m) to 38% (500m)
- PM_{10} - +58% (25m) to +13% (500m)
- $PM_{2.5}$ - +13% (25m) to + 3.5% (500m)
- Benzene - +11% (25m) to 0% (500 m)
- Formadehyde - +5.5% (25m) to +1% (500m)
- Acetaldehyde - +1.3% (25m) to + 0.3% (500m)
- Acrolein – +1.8% (25m) to +0.4% (500m)
- 1,3-Butadiene - +7.5% (25m) to +2.5% (500m)

The MTO's analysis during the provincial EA indicated that taking these increases into account, the concentrations of all of these contaminants would be below their applicable reference levels.

The MTO's air quality modelling indicated that with respect to the nuisance contaminant TSP (primarily fugitive dust), the maximum predicted concentration of 170 µg/m³ will exceed the reference criterion of 120 ug/m^3 with concentrations diminishing with distance from the highway. The exceedance of this criterion is due to a combination of re-entrained road dust, primarily from existing arterial roads within the study area and elevated ambient background concentrations. However, TSP levels are not predicted to exceed the criterion for most sensitive receptors (i.e., residences, churches, daycare facilities, schools, hospitals and senior housing facilities) along the right-of-way. For example, only 6% of air quality sensitive receptors are anticipated to experience the worst-case. On a worst-case basis, 24% would experience concentrations in excess of 90% of 120 µg/m³. As mentioned, the elevated TSP levels are primarily related to nuisance effects from short-term construction activities resulting in reduced visibility, re-entrainment of dust and not related to health effects.

To examine the effects on human health, the MTO's air quality analysis focused on examining potential changes in $PM_{2.5}$ levels in a representative worst-case receptor for the west Whitby area, a densely populated area along the transportation corridor. The analysis concluded there is no apparent difference between $PM_{2.5}$ levels for the transportation corridor (combined with ambient conditions) and the ambient measurements. For the majority of the year, $PM_{2.5}$ levels were predicted to be substantially lower than the maximum predicted 24-hour levels. The combined effects analysis predicted annual median concentration of $PM_{2.5}$ at a representative worst-case sensitive receptor is approximately 5 µg/m^3, which is well below the reference criterion.

To minimize air quality effects during the Construction Phase, MTO has committed to incorporating a number of provisions from Environment Canada's Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities (March 2005) into contract documentation between MTO and the construction contractor(s) to be applied where practicable. In addition, the contractor(s) may be required to implement street cleaning methods, particularly on main roads adjacent to and intersecting the interchanges and the on and off-ramps to the highway. Other mitigation measures are to encourage adherence to speed

limits as well as to discourage extended periods of idling by construction vehicles. MTO will provide oversight of its contractors' compliance to contract Terms and Conditions.

Effects on air quality during the Operations and Maintenance Phase will be mitigated by implementing the following measures, where feasible:

- Reducing surface loadings by paving the shoulders of the transportation corridor;
- Ensuring there is vegetation along the corridor which limits soil erosion and helps to remove particulate matter and other contaminants from the air;
- Reducing sand and salt loadings to the transportation corridor through improved plowing or use of a pavement surface texture that minimizes ice adhesion;
- Washing the sand used for de-icing prior to its application to remove fine particulates that will become re-suspended;
- Providing high occupancy vehicle lanes and a transitway corridor will promote ride sharing and transit use and therefore reduce the reliance on single occupant vehicles. In addition, a number of provincial and federal initiatives (e.g., fuel regulations, vehicle and engine emission regulations, and amendments to provincial air pollution regulations) will help to further mitigate the transportation corridor's contribution to air pollution.

Changes in air quality will also have effects on ecological receptors. These are considered in the discussion on vegetation and vegetation communities, wetlands, wildlife and wildlife habitat, and species at risk.

The approval granted by the Ontario Minister of Environment on June 3, 2010, the Province has imposed air quality Conditions of Approval that require MTO to prepare and implement:

- a Complaint Protocol on how it will deal with and respond to inquiries and complaints received during construction and operation of the Project;
- a Construction Noise, Vibration and Air Quality Impact Mitigation Plan that would include provisions for local air quality monitoring during construction and identify mitigation measures to be implemented to address air quality impacts; and
- a Construction Management and Mitigation Plan.

6.1.3 Residual Effects

The MTO identified that during the Construction Phase, there may be infrequent occasions when applicable air quality reference levels are exceeded. The largest effects on air quality will be as a result of TSP (i.e., fugitive dust). The Project is also expected to result in increased emissions of contaminants of concern during the Operations and Maintenance Phase of the project, resulting in reduced air quality.

6.1.4 Government and Public Comments

Public comments received during the review of the provincial EA document focused on the likelihood of reduced local and regional air quality and associated potential effects on human health, agricultural lands and crops. Concern was expressed over the process used for developing the air quality criteria, the list of chemicals evaluated and the approach taken by MTO to establish baseline conditions and complete its air quality modelling. In response to comments on air quality effects, MTO prepared information to

supplement the air quality assessment and responded to the public comments. The MOE concluded that the additional information addresses the concerns raised.

During the conduct of the EA, Health Canada noted that any increase in exposure to air contaminants may result in an incremental risk to human health and that the comprehensive study should indicate air quality standard reference levels for contaminants of concerns especially for PM10 and PM 2.5 and carcinogenic substances. HC suggested that ozone be considered in the air quality assessment to prevent an underestimation of potential risk to human health. In addition, as exceedances of $PM_{2.5}$ and Ozone are suspected, HC suggested they be added to the cumulative effect analysis and that appropriate mitigation measures may be required to reduce potential risk to human health. MTO indicated that it had considered $PM_{2.5}$ with respect to its human health implications as part of the cumulative effects assessment. With respect to ozone, MTO predicted the effects of the precursors of ozone (NOx and VOCs) and thus have indirectly considered the effect of the Project on ozone levels rather than through modelling.

The Agency notes that MTO acknowledged there is a residual adverse effect on air quality and an incremental effect on human health associated with an increase in the concentration of some pollutants – whether below or above the ambient air quality criteria/standards. MTO has committed to minimize the air pollution impacts of the Project on ambient air quality criteria/standards to the extent possible.

Further comments relating to air quality and climate were submitted to the Agency during the public comment period on the draft CSR. Ecojustice on behalf of the non-profit group SHIFT commented that, in its opinion, the draft CSR did not provide an adequate assessment of greenhouse gases associated with the project and proposed mitigation measures. In consideration of this comment, the Agency, with advice from Environment Canada, notes that the air quality modelling included a regional air pollution study to quantify vehicular emissions of contaminants that contribute to regional smog and global warming. Using the model, the annual estimated project-related GHG emissions were quantified and compared to the transportation sector in Ontario. This revealed that the Project's contribution was approximately 1.75% of the total road transportation network in Ontario. Table 6-7 includes the summary discussion on GHG emissions and policy and regulatory initiatives currently being implemented by federal and provincial agencies to improve air quality and reduce emissions of GHGs.

A summary of these additional comments and the Agency's responses are set out in Appendix B.

6.2 Noise and Vibration

6.2.1 Approach

For the Construction Phase, MTO assessed the effects of noise associated with broad types of activities including general construction, bridge and embankment construction, bridge pile driving and rock drilling. For the Operations and Maintenance Phase, noise modelling was undertaken using a two-step process. Firstly, a screening level modelling was conducted to identify the range of potential impacts over the entire study area and secondly, the identification of areas where further investigation of impacts and mitigation through detailed modelling was warranted. The future no-build sound levels associated with the existing roadway network and background ambient levels were estimated using the road noise prediction model. Major links of the existing roadway network were modelled to generate a grid of sound exposure levels. The same approach was used to predict future build sound exposures, with the proposed transportation

corridor in place, and with resulting future build volumes on the surrounding roadway network. Full build-out conditions for the new highway were assumed for the analysis, and a future design year of 2031 was used, 18 years after the anticipated end-of-construction date in creating a grid of projected sound exposure levels. The two grids were combined to create a grid of changes in sound exposure levels. This data was used to create "noise change contours" (isopleths of changes in noise level), highlighting Noise Sensitive Areas (NSAs) which receive changes in 0 to 5 dB, > 5 to 10 dB, > 10 to 15 dB, and > 15 dB bands.

For those noise sensitive areas that would experience future build sound levels in excess of 65 dBA, technically feasible mitigation measures were investigated in more detail. In conducting this assessment, consideration was given to the Environmental Guide For Noise (MTO 2006) and Environmental Reference for Highway Design (MTO 2002). Under the *Environmental Guide for Noise* mitigation is warranted when increases in sound level over the no-build ambient condition are 5 dB and greater. As such, mitigation measures were considered as an integral part of the effects assessment.

6.2.2 Effects Analysis and Mitigation

MTO analyzed potential worst-case construction noise levels based on generic data (equipment types and activities) to identify potential effects on (NSAs) during construction. The various construction activities were considered at the nearest NSA to each activity and for each section of the Project.

The construction noise analysis indicated that bridge pile driving and rock drilling tend to be the noisiest activities. Depending upon the location of the nearest NSA, noise levels could range from 63 dBA (rock drilling) to 87 dBA (bridge pile driving). The nearest NSAs to the Project are located between Audley Road and Ashburn Road in the City of Pickering and the Town of Whitby. Here, construction activities could occur as close as 30 m from the NSA. Worst case construction noise levels at the nearest NSA are anticipated to be between 75 dBA (bridge construction) and 87 dBA (bridge pile driving). At this location, sound levels would be considered to be "loud" to "very loud".

MTO developed a "Code of Practice" to minimize potential noise and vibration effects during construction, the provisions of which will be written into the contract documentation between MTO and the construction contractor(s). Although blasting is not anticipated, if required blasts will be designed to meet the requirements of the MOE and Ontario Provincial Standard Specification for the Use of Explosives.

During the Operations Phase, the vast majority of receptors will experience a change in noise from 0 to 5 dBA, which can be characterized as from an "imperceptible change" to a "clearly noticeable change". Approximately 23% of receptors will experience increases of > 5 dBA and 3% will experience changes in their sound environment of > 10 dBA. Approximately 10% of all receptors are anticipated to experience reduced noise levels due to changes in traffic patterns along local and regional roads due to the presence of the Project.

Overall, the sound environment changes from one where the majority of receptors are in a rural environment (sound levels < 50 dBA) to one with urban or suburban characteristics (sound levels between 50 and 60 dBA). Using 60 dBA as a threshold, and taking into consideration sound level magnitude and change from existing conditions, MTO's analysis indicates that a small fraction of NSAs (~4%) will experience a noticeable change in sound levels (>5 dB change) and sound levels greater than 60 dBA. Overall, 56 or 3% of the 1,827 NSA receptors along the transportation corridor are predicted to have a

change in noise greater than 10 dBA. These predictions were based on the full build scenario and a future design year of 2031, so it can be expected that changes in noise levels due to the Project would increase gradually over time as use of the roadway and transitway increases.

Three noise barriers were determined to be economically and technically feasible, and are to be installed to mitigate noise impacts during the operations phase in Brooklin, Hampton and along Highway 401, east of the West Durham Link. Enhanced landscaping measures will be used in other areas that will be subject to substantial changes in noise levels. MTO has committed to complying with applicable noise control by-laws. If work outside of designated hours is anticipated, MTO and or its agents, will seek required approvals from the affected jurisdiction. If approvals cannot be obtained, maintenance will proceed in accordance with the municipal by-law.

Changes in noise levels will also have effects on ecological receptors. These are considered in the discussion for wildlife and wildlife habitat.

Pursuant to the provincial EA approval granted by the Ontario Minister of Environment on June 3, 2010, MTO will be required to prepare and implement:

- *Noise Mitigation Plans* for specified properties at which substantial noise effects were identified by MTO;
- a *Complaint Protocol* on how it will deal with and respond to inquiries and complaints received during the construction and operation of the Project;
- a *Construction Noise, Vibration and Air Quality Impact Mitigation Plan* that would identify the mitigation measures for all major construction activities including those due to possible blasting and pile-driving;
- a Construction Management and Mitigation Plan.

6.2.3 Residual Effects

Overall, increased noise levels along the Project are anticipated during the Construction, Operations and Maintenance Phases. MTO has determined that 15 sensitive noise receptors are expected to experience high levels of noise for which there are no technically or economically feasible mitigation measures.

6.2.4 Government and Public Comments

During the review of the provincial EA, comments about noise were made by MOE and the public. The MOE comments focused on MTO's cost thresholds for determining whether mitigation is economically feasible; the potential use of noise-reducing asphalts near selected receptors; and the use of vegetative buffers as noise mitigation. The public comments received expressed concern over noise at a specific location, the effects of noise on wildlife, the scope of the detailed noise assessment and the approach to mitigation.

The MOE concluded that the noise modelling undertaken to identify the range of potential effects over the entire study area was satisfactory and that the noise impact assessment satisfactorily identified areas where further investigation of effects and mitigation through detailed modelling was warranted. Nevertheless, MOE requested that MTO undertake a more detailed investigatation of the feasibility of mitigation at 56 specified NSA receptors that were initially predicted to have a change in noise greater than 10 dBA. MTO

undertook a detailed review of those receptors, taking into account the effect of screening by bridge embankments, the viewable portions of the roadways, and wooded areas. In recognition there are areas along the transportation corridor which have been designated for future development under the Growing Durham Plan, MTO's more detailed assessment used a future build ambient noise level of 50 dBA (suburban / semi-rural) rather than the 45 dBA (rural) used in the original analysis.

Following the more detailed assessment, MTO reported that it is in the process of acquiring properties that are physically affected by the corridor. At that time, 17 of the 56 NSA receptors had been fully purchased, one of the receptors was noted to have been incorrectly identified as noise sensitive and 15 were undergoing partial purchase. For these 15 receptors, MTO updated its future build sound level predictions to include the effects of screening from terrain and blocked views of the new highway. MTO also updated the resulting mitigation costs and its analysis of the feasibility of further mitigation.

While originally 6 receptors were identified as having changes greater than 15 dB, the more detailed assessment shows that none of the NSAs would experience a change in noise greater than 15 dB. In addition, the number of NSAs experiencing changes from 10 to 15 dB decreased from 50 to 15. The remaining receptors either show changes of less than 10 dB, or have been purchased/removed. MTO's review of mitigation costs indicated that further mitigation in the form of noise barriers was not technically and/or economically feasible. However, MTO identified further opportunities for woodland plantings and landscape treatment as visual screens at several of the 15 locations.

HC provided comments regarding noise focusing on the magnitude of noise effects at selected receptors and the potential effects on human health; the need for technically and economically feasible mitigation to be applied in order to reduce the potential health impacts; and the need for a complaint resolution strategy. HC advised MTO and the RAs that the Ontario noise criterion may not be sufficient to address the annoyance from blasting if there are more than 3 blasts per day.

MTO responded to all government and public comments. Specifically, MTO indicated that the noise assessment was undertaken in accordance with the provincial noise process, that mitigation measures have been proposed where they were technically and economically feasible and that visual screenings in combination with berms will be investigated during subsequent design phases. MTO confirmed that a complaint resolution strategy will be developed during subsequent design phases for implementation during construction. MTO also confirmed that no blasting is anticipated.

6.3 Surface and Subsurface Geology and Soils

The following sections summarize the effects, mitigation and compensation measures, and residual effects of the Project on surface and subsurface geology and soils. Emphasis has been placed on examining erosion and sedimentation and the overall risk to VECs such as surface waterbodies / watercourses, wetlands, specialized and sensitive wildlife habitats, high sensitivity fish habitat, and a variety of sensitive vegetation communities.

6.3.1 Approach

A detailed assessment of the erosion and sediment control risk within the ROW of the Project was completed through air photo interpretation and field work. This assessment provided the MTO with a basis for classifying and mapping areas according to their susceptibility to erosion, potential for delivering

sediment to surface water features and potential ecological consequence of sedimentation. Ultimately, specific areas along the Project will be delineated and assigned qualitative ratings – *low, medium or high* – according to their overall erosion and sediment control risk. These additional, future steps to determining the overall erosion and sediment control risk will be required on a site-by-site basis during subsequent design phases. Any erosion and sediment control plan would be designed in accordance with the preliminary erosion and sediment control (ESC) protection measures described below and in the MTO Environmental Guide for Erosion and Sediment Control (2007).

6.3.2 Effects Analysis and Mitigation

The MTO identified that the Project will result in changes in valley slopes and landforms due to site preparation, grading and earthmoving activities associated with roadbed and ancillary facility construction along the entire length of the Project. Cuts and fills will also be required, along the transportation corridor, but especially at watercourse crossings, to facilitate the installation of bridge footings and other crossing related structures. As such, the Project will result in direct changes in valley slopes at the crossings of approximately 79 natural watercourses and to landforms, such as moraines, drumlins and hummocky deposits. Overall, these changes in valley slopes and landforms will likely increase the exposure of soil to erosion.

MTO determined the susceptibility of areas along the corridor to erosion to assess the potential for surface runoff to deliver sediment to watercourses, wetlands or ponds and the potential ecological consequence of sedimentation of those surface water features. The erosion and sediment risk analysis concluded that the majority (63%) of the Project presents a "Low Risk" to produce erosion and sedimentation. This is because of the large areas with till soils at surface and with agricultural fields and drainage swales dominating the ecological environment. Areas of "Moderate Risk" are the second most common (24%), which reflects steeper slopes and more erosion-prone soils, as well as the 30 to 300 m downslope flow path to ecologically sensitive areas. Finally, "High Risk" areas are the least common (13%), which reflects the presence of tight surficial soils within the RSA and the careful route selection of the transportation corridor to avoid ecologically significant areas wherever possible.

During the Operations Phase, the implementation of design features such as stormwater management (SWM) facilities, stabilization and re-vegetation of bridge approach slopes and other mitigation measures identified by MTO will result in negligible surface erosion and instream sedimentation. Specific outfall control measures will be implemented for all SWM facilities to prevent erosion of the receiving streams, with specific attention to outfalls to the deeper valleys and at many of the high sensitivity watercourses in the eastern portion of the study area.

MTO must develop erosion and sediment control mitigation measures during subsequent design phases. These will follow the most current standard industry practices available, including the Greater Golden Horseshoe Area Conservation Authorities' Erosion and Sediment Inspection Guide (2008), Ontario Guidelines on Erosion and Sediment Control for Urban Construction Sites, Ontario Provincial Standards Specifications (OPSS), and/or established MTO procedures. MTO will adhere to the requirements of all permits, acts, guidelines (i.e., *Canadian Environmental Protection Act; Ontario Water Resources Act, federal Fisheries Act*, etc).

6.3.3 Residual Effects

The MTO anticipates that localized Project induced changes to valley slopes and landforms during the Construction Phase will likely increase the exposure of soil to erosion, notably at the locations of major cuts and fills.

6.3.4 Government and Public Comments

There were no specific comments regarding surface and subsurface geology and soils provided by provincial government reviewers or the public. Comments regarding erosion were generally focused on its effects on surface water and wetlands.

6.4 Groundwater

The following sections summarize the effects, mitigation and compensation measures, and residual effects of the Project on groundwater. The VECs identified for this analysis were regional groundwater aquifers, groundwater wells, groundwater in surficial soils, wetlands and specialized and sensitive wildlife habitat.

6.4.1 Approach

MTO conducted research and hydrogeological field investigations to assess effects on groundwater within 500 m of the ROW where protective dense till soils are present at surface, and within 1,000 m of the ROW where sandy soils are present at surface (potentially representing sensitive unconfined aquifers). Investigations were undertaken across the length of the transportation corridor as well as at specific sites of interest.

MTO installed a total of 37 groundwater monitoring well nests and 9 groundwater monitors as part of the hydrogeology component. Excavation below the water table related to deep cuts was the focus of the groundwater assessment as that activity was considered to have the greatest potential to permanently lower the water table elevation near the cut.

The assessment considered a variety of Provincial and Federal guidelines, including: Ontario Drinking Water Standards (O. Reg. 169/03), Provincial Water Quality Objectives - Ministry of Environment and Energy 1994 (Updated July 1998); Guidelines for Canadian Drinking Water (May 2008); and the MTO Groundwater Environmental Reference Highway Design.

6.4.2 Effects Analysis and Mitigation

The MTO determined that changes to the groundwater hydraulic regime can occur any time an excavation is conducted below the groundwater table. Depending on the location and nature of the excavation, effects can be experienced at a regional and/or a local level. Excavations for bridge piers and footings, placement of buried infrastructure, and deep cuts can change the groundwater flow dynamics in an area. Deep cuts can expose large areas of confined aquifer units which can de-pressurize the aquifer unit and alter the local groundwater flow patterns. Deep cuts may only require temporary dewatering to create a dry work area before the water table reaches a new equilibrium, but in some cases, where confined regional aquifer units

or a perched water table in the surficial soils has been breached by excavations, permanent groundwater control may be required. Excavations below the water table may require dewatering that can temporarily disrupt the local hydraulic regime within surficial soils.

Activities associated with the construction of bridges or culverts can temporarily reduce groundwater levels and groundwater discharge from surficial soils to receptors and impede groundwater flow and discharge.

Placement of high fill can cause changes to the groundwater hydraulic regime in surficial soils by blocking groundwater flow paths and by reducing the hydraulic properties of the underlying surficial soils due to compaction. Fill placement typically has only a minor adverse effect on groundwater flow in surficial soils and is generally considered to be more of a problem for slope stability than for the groundwater, however covering groundwater springs or seeps below the fill footprint can affect groundwater discharge and species that rely on springs.

Construction of the transportation corridor can also reduce recharge from placement of an impervious surface; impede groundwater flow and discharge; and change local groundwater flow from buried infrastructure such as pipes.

Transferring fuels and other hazardous materials during construction can result in spills that may reach the groundwater table and contaminate drinking water supplies. If management protocols are followed, however, the potential risk from spills is low.

Such changes to the groundwater hydraulic regime can cause a reduction in water levels in private wells, can reduce groundwater discharge to receptor water bodies or wetlands, and can reduce groundwater quality by mobilizing or transporting contaminated groundwater to new areas.

The MTO has identified that there is a likelihood that the transportation corridor will lower the local groundwater table at 29 major cuts. It is also likely that major fills will alter local groundwater flow in surficial soils at 41 locations. In examining effects on private wells, it was predicted that throughout the entire Project, only one (1) private well will most certainly be affected as a result of lowering of the water table and an addition 14 private wells are potentially affected by the Project. Other private wells will either be decommissioned or are located too far away from the transportation corridor to be measureably affected. MTO is in the process of undertaking additional work at the locations of deep cuts and high fills to confirm the depth of the water table, effects on private wells, and to support future detailed identification of mitigation measures at the design phase. While these adverse effects are most likely to occur during the Construction Phase, some measureable effects may persist throughout the Operations and Maintenance Phase of the Project. The ecological implications of these residual adverse effects on surface water, sensitive vegetation communities and wetlands are examined further in their respective sections. As noted in section 6.16, drought conditions could potentially exacerbate these effects.

During the Operations and Maintenance Phase, reduction in groundwater quality due to stormwater runoff, salt spray, and vehicle emissions is also possible. This adverse effect would be largely minimized by following appropriate salt application/management practices, installing stormwater management systems, and polishing collected runoff prior to discharge to receiving streams.

Improperly decommissioned wells can create a direct pathway for surficial contaminants to reach deep, confined aquifers and contaminate drinking water supplies derived from groundwater wells. Property acquisition in accordance with Ministry (MTO) policies and directives will be required, resulting in approximately 166 domestic water wells requiring decommissioning in accordance with *Ontario Reg. 903.*

The MTO Groundwater Environmental Reference Highway Design, Section 3.3 – Technical Requirements for Environmental Impact Study and Environmental Protection/ Mitigation, provides a comprehensive list of measures to mitigate effects on groundwater and private wells. Additional mitigation and design alternatives will also be considered on a site-specific basis. Where long term effects to groundwater cannot be avoided at major fills or deep cuts, site specific engineering / foundation design measures will be undertaken as appropriate. Overall, at locations where substantial groundwater seepage is anticipated, valley fills would be designed with a permeable sub-base to maintain current groundwater flow conditions.

MTO will monitor nearby private wells prior to, during and following construction for both groundwater quality and quantity. Should monitoring and/or well inspections detect a measurable effect on private wells, contingency mitigation measures and compensation will be provided in accordance with MTO policies and directives. These measures could include well repairs or deepening, well replacements. Unavoidable changes to groundwater quality and/or quantity affecting private wells would be compensated through the provision of a temporary or permanent water supply as determined on a case-by-case basis.

6.4.3 Residual Effects

The MTO anticipates that during the Construction Phase, the Project will result in the lowering of groundwater table in surficial soils at locations where foundation excavations require dewatering. During both the Construction Phase and the Operations and Maintenance Phase, the Project will result in the lowering of the groundwater table at major cuts, and the alteration of groundwater flows and levels in surficial soils at locations of major fills and foundation structures. In addition, a reduction in groundwater quality due to stormwater runoff, salt spray, and vehicle emissions is possible during the Operations and Maintenance Phase. This latter adverse effect would be largely minimized during operation of the transportation corridor by following appropriate salt application and management practices, installing stormwater management systems, and polishing collected runoff prior to discharge to receiving streams. Because shallow groundwater resources may be used as sources of drinking water, further consideration is given to the effects on human health in the context of cumulative effects assessment.

6.4.4 Government and Public Comments

During the review of the provincial EA, the MOE and members of the public provided comments. MOE requested that MTO consult it prior to detailed design to confirm Permit to Take Water requirements, including the development of a monitoring and mitigation program for discharge water quality and quantity. The MOE also recommended monitoring of private wells before dewatering and that Environmental Management Plans (EMP) include but not be limited to plans for encountering highly productive zones, dewatering interferences with surface water and groundwater users, and groundwater and surface water monitoring plans. The MOE indicated that permits will not be issued unless the MOE was satisfied with the EMP. MTO responded to these comments and the responses were considered acceptable to the MOE.

Comments from members of the public focused on lowering of the water table and effects on water supply from wells, protection of aquifers / reservoirs from contamination, and mitigation for such effects. Other comments related to the effects of the East Durham Link (EDL) on groundwater recharge or infiltration. A more general comment related to how groundwater effects were predicted and if these predictions are accurate.

NRCan and EC provided comments regarding groundwater. NRCan requested additional information from MTO regarding sampling and laboratory method, Quality Assurance/Quality control, the use of permeable sub-base material and groundwater equalization drains. NRCan requested that MTO clarify a number of issues to assist in its review. MTO provided NRCan with the requested information and clarifications where available.

Following its review of the results of the hydrogeological studies presented in the provincial EA document, NRCan requested that MTO provide a discussion of how groundwater flow regime and groundwater quality were considered in selection of alternative methods, including a rationale for placement of the EDL through the Harmony-Farewell Iroquois Beach Wetland Complex and the Maple Grove Wetland Complex.

NRCan inquired if MTO has plans to compensate for unexpected adverse effects to wetlands due to a reduction of groundwater recharge. MTO indicated that adverse effects are not expected due to the design of the EDL and keeping the route dominantly in the till dominated landscape. In the few places where the EDL lies in the more permeable shallow sands, recharge of runoff from the pavement is not restricted by the soils so no measureable reduction is expected.

NRCan inquired MTO whether conducting additional studies could minimize uncertainty as to whether some deep cuts would be above or below the water table. MTO confirmed that additional geotechnical borehole drilling has been conducted at 31 deep cuts and high fills and that geotechnical studies are ongoing and will be completed to support future detailed design phases. The results of these studies will be taken into account in the site-specific foundation designs to mitigate effects on groundwater.

6.5 Surface Water

The following sections summarize the effects, mitigation and compensation measures, and residual effects of the Project on surface water. The VECs identified for this analysis were surface waterbodies / watercourses and high sensitivity fish habitat.

6.5.1 Approach

MTO's assessment of effects on surface water relied on demonstrating the effectiveness of the design of the Project and in particular, the watercourse crossings. To date, a preliminary design has been established based on hydro-technical analyses for each crossing and geomorphological assessments at selected crossings. Detailed hydrologic modelling, further site specific geomorphological studies and detailed design of Stormwater Management (SWM) facilities, including storm sewer design will be undertaken during subsequent design stages to confirm the size and configuration of the proposed stormwater management ponds, channel reconfigurations, etc.

6.5.2 Effects Analysis and Mitigation

The Project requires 79 watercourse crossings and a number of stream realignments. None of the watercourse crossings have been identified as navigable by Transport Canada.

Construction Phase effects on surface waters include changes in water quantity, water flows and water quality. Decreases in water quantity may result from water takings at major cuts or groundwater alteration at major fills that result in a decrease in groundwater levels and related groundwater discharges to a watercourse. As noted in section 6.16, drought conditions could potentially exacerbate these effects.

Prior to construction, MTO will undertake detailed hydrogeological and geotechnical work at major cuts and fills in support of the detailed design of the transportation corridor. If discrete groundwater discharge points are identified, opportunities to direct groundwater flow to a watercourse will be evaluated and where feasible appropriate design measures will be implemented. MTO must obtain Permits to Take Water (PTTW) for major dewatering activities and will monitor stream flows upstream and downstream of crossings in accordance with the PTTW. In deeper valleys where evidence of groundwater discharge is present and where it is functionally important to fish communities, fill will include a permeable sub-base to maintain existing groundwater movement to the streams. Other opportunities to direct groundwater flow to a watercourse will be evaluated and implemented where feasible.

Adverse effects on surface water quality during the construction phase are generally associated with increased sediment loading from erosion and in-water works. MTO conducted a detailed erosion and sediment risk analysis that concluded that 63% of the Project has a “Low Risk” for erosion and sedimentation, 24% had a “Moderate Risk” and only 13% of the corridor traversed “High Risk” areas, which reflects the presence of tight surficial soils within the RSA and route selection to avoid ecologically significant areas wherever possible. Without effective mitigation, increased sediment loading from erosion and in-water works would cause increased turbidity in 79 natural watercourses for the Project as a whole.

Operations and Maintenance Phase effects on surface water in natural watercourses include changes in water quantity, water flow velocities and water quality. MTO considered potential effects in water quantity resulting from:

- increased surface runoff volumes due to installation of less permeable ground cover(s);
- changes in surface topography or the surface drainage system which expands the land area drained by surface flows; and
- increases in groundwater levels and related groundwater discharges to a watercourse.

Conversely, MTO examined decreased water quantity in natural watercourses resulting from:

- changes in surface topography or the surface drainage system which reduces the land area drained by surface flows; and
- decreases in groundwater levels and related groundwater discharges to a watercourse.

MTO also considered effects on surface water quality during the Operations and Maintenance Phase resulting from changes in soil erosion rates and input of contaminants from vehicles use of the transportation facility and maintenance procedures such as road de-icing / salting, pesticide spraying and resultant stormwater runoff. Thermal effects to surface waters at outlet structures were also considered.

In general, the MTO determined that the transportation corridor will result in increased runoff due to a less permeable surface as compared to existing conditions. However, the increased impermeable area is typically small relative to the overall watershed within which it is contained. With the proposed stormwater management measures, adverse effects to surface waters will be minimized. The overall incremental increase or change in runoff quality due to the Project is expected to be minimal, taking into consideration the implementation of the proposed design and mitigation measures. At a minimum, runoff will be treated in areas where treatment does not exist within current land use. MTO's proposed stormwater management (SWM) strategy for the Project provides for surface water quality, quantity and erosion treatment using best management practices.

The SWM strategy takes into consideration the ultimate conditions for the Project as well as groundwater levels in the study area. The proposed stormwater management system consists of three components: specifically storm sewers in the median where median barrier is proposed, stormwater management ponds and enhanced grass swales. Approximately 65 stormwater management ponds are proposed throughout the Project. Design criteria for SWM facilities were based on MOE and MTO requirements and discussions with the MOE, MNR, Toronto and Region Conservation Authority (TRCA), Central Lake Ontario Conservation Authority (CLOCA), and Ganaraska Region Conservation Authority (GRCA).

MTO's SWM strategy ensures that existing drainage patterns are maintained as much as possible. Runoff from areas external to the ROW will be intercepted and conveyed directly to a watercourse. Selection of proposed stormwater management practices was based on the 407 drainage area contributing flows to local watercourses. For contributing areas of 5.0 ha or greater, Enhanced Protection Level treatment is proposed with quantity and erosion treatment which would provide for 80% long-term removal of suspended solids from water discharging to natural watercourses[2]. For the study area, the primary stormwater management practice for providing treatment for areas of 5.0 ha or greater consists of stormwater management wet ponds. However, for some sections of the East Mainline and the East Durham Link, the groundwater is too high for a stormwater management wet pond. In order to avoid groundwater effects under these circumstances, shallow stormwater management practices such as constructed wetlands were considered with site-specific design features that protect surface water quality and quantities, particularly in wetlands. For contributing areas less than 5.0 ha, enhanced grass lined swales will be utilized in order to provide some measure of quality treatment. Grassed swales can be effective for pollutant removal if designed properly. As the water quality benefits associated with grassed swales depend on the contact area between the water and the swale and the swale slope, swales will be well vegetated with a relatively flat gradient

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2. Basic Protection provides for 60% suspended solids removal and Normal Protection provides for 70% suspended solids removal.

and a flat bottom to minimize flow velocity, maximize contact between the runoff and the vegetation, and maximize sediment retention.

Quantity control will be provided by MTO where the proposed corridor is shown to have an adverse effect on the downstream peak flows within the receiving watercourse, using either stormwater management dry ponds or enhanced grass-lined swales as storage basins.

Wet pond sizing was determined at a basic preliminary design level to identify the ultimate footprint requirements for each pond. Detailed hydrologic modelling and detailed design of SWM facilities will be undertaken during subsequent design stages to confirm the size and configuration of the proposed ponds. Wet ponds would provide Enhanced Protection Level treatment as per the 2003 MOE document "*Stormwater Management Planning and Design Manual*".

The required volume to provide surface water quantity treatment for the upstream drainage area was based on an analysis of the correlation between quantity control volumes required and 100-year storm precipitation. The final stormwater management wet pond volume requirements were based on:

- Permanent Pool sized for Enhanced Protection Level;
- Extended Detention of 40 m^3/ha;
- Erosion storm detention of 25 mm runoff over the catchment area; and
- 70% of the product of the 100-year storm precipitation and the upstream catchment area.

Given the importance of SWM ponds to the mitigation of adverse effects on surface water quality, MTO in partnership with several government agencies undertook a Stormwater Assessment and Monitoring Performance (SWAMP) Program to confirm the effectiveness of SWM ponds for highway projects. In addition to the efforts conducted under SWAMP, numerous other studies of performance have been conducted both inside and outside of Ontario. The results of these studies point to an optimistic view of SWM pond performance for the purpose of surface water quality protection.

A preliminary evaluation of the proposed outlets was undertaken to confirm the feasibility of the pond locations. Outlet types and locations were analyzed for each of the facilities with the general layout design based on three outlet types: at-grade outlet swales, pipe outlets with headwalls, and valleyland pipe outlets with headwalls. Energy dissipaters may be required at the end of the discharge pipe in order to prevent erosion at the watercourse. Overall, all stormwater management facility outlet locations are located on the straight sections of the watercourse to decrease the occurrence of the channel migrating away from the outlet. In addition, the outlets of the stormwater management facilities should discharge to major watercourses wherever possible, and avoid smaller watercourses and tributaries that are primarily groundwater fed. This will prevent erosion and subsequent negative impacts on the smaller watercourses from the facilities discharged flows, as the groundwater fed watercourses may not be stable enough to handle intense peaks from facility outlets.

Thermal impacts to receiving watercourses will be addressed for each stormwater management facility discharging to a sensitive watercourse. MTO's fish and fish habitat assessment identified those watercourses for which thermal effects of outlet structures are to be addressed. Since the current stormwater management design is conceptual, the thermal impacts of all outlet structures will require further investigation during subsequent design stages. Measures to be investigated will include:

- For at-grade swales, lining the swales with shade-producing vegetation;
- Deepening permanent pools to greater than 3 m with minor storm event flows discharged using a bottom-draw system; and
- Emerging innovative techniques.

In accordance with the provincial EA Conditions of Approval MTO will identify best management practices for the treatment of stormwater, including the use of innovative technologies on a pilot basis. These may include measures proposed by other jurisdictions such those included in the Town of Ajax's stormwater management design criteria.

Effects on water flow velocities during the Operations and Maintenance Phase may be associated with alterations in the watercourse cross-section, specific channel characteristics and stormwater detention / discharge characteristics. Water flow velocities will be maintained by maintaining watercourse cross-sections and channel characteristics to the greatest extent possible through th design of crossing structures and channel realignments.

As noted above, an evaluation was undertaken for each watercourse crossing to determine the appropriate type of structure (i.e., bridge versus culvert), size and design. In addition, geomorphological studies were undertaken at selected watercourse crossings to assist with the crossing structure and channel designs.

In accordance with the MTO Highway Drainage Design Standards, crossings were selected and designed for the 50 year storm for bridges and culvert spans less than or equal to 6 m, and the 100 year storm for bridges and culverts greater than 6 m. For structures less than 100 m in length, deck drains typically will not be required. For structures greater than 100 m in length, deck drains may be required. Where deck drains are required, runoff will be discharged to splash pads and treated with Low Impact Development measures prior to being discharged to the watercourse. Erosion and Sediment Control measures to be developed during subsequent design phases will follow the most current standard industry practices available, and specifically the Greater Golden Horseshoe Area Conservation Authorities' Erosion and Sediment Inspection Guide (2008). During the detailed design phase, the following mitigation measures will also be considered by MTO to further minimize the effects of major fills and cuts on surface water quantity:

- the selected use of a permeable sub-base material at locations of major fills;
- installation of permanent groundwater control (e.g., a gravity drain system);
- shallow groundwater control if excavations at major cuts intercept a saturated aquifer; and/or
- installation of drainage systems to convey side wall seepage towards the watercourse.

In addition to the watercourse crossing designs and the management of surface quality through the SWM system, MTO will ensure that there is vegetation along the corridor which limits soil erosion and helps prevent sediment and other contaminants in runoff from entering watercourses.

According to MTO, pesticides are only used for essential maintenance purposes, and when needed are targeted to a particular species and applied in accordance with the *Pesticides Act*. MTO employs a number of vegetation control options, with mechanical control being the most common method.

MTO will implement a Salt Management Plan developed in accordance with Environment Canada's Code of Practice for the Environmental Management of Road Salts (Environment Canada, 2004). MTO has committed to undertake road salt management consistent with the best practices in North America. MTO also indicated that it partners with stakeholders on the latest technology, tools and methods to keep roads safe for winter driving and to minimize salt usage. MTO will continue to investigate de-icing alternatives to control and reduce salt usage while ensuring highway safety.

The approval granted by the Ontario Minister of Environment on June 3, 2010 imposed several Conditions of Approval that are relevant to effects on surface water. These Conditions of Approval require MTO to prepare and implement a Stormwater Management Plan, including:

- plans and descriptions for the sections of the Project that will not be drained to a stormwater management wet pond;
- descriptions of receiving watercourses, including their characteristics, flow rates, assimilative capacities and whether species protected under the Endangered Species Act, 2007 are known to be present;
- a jurisdictional scan of best management practices for treating stormwater in catchment areas not sufficiently large to support a wet pond;
- identification of best management practices for the treatment of stormwater, and innovative technologies for potential use on a pilot basis;
- a plan outlining how the identified best management practices will be implemented;
- identification of water quality targets for treating stormwater; and
- identification of any changes to the design of the Project that may be required to accommodate the implementation of the identified best management practices.

The Conditions of Approval also require MTO to prepare and implement a Surface Water Monitoring and Mitigation Plan, including:

- the methodology and schedule for the collection of surface water quality data, including monitoring parameters, locations and frequencies, including monitoring of thermal discharges from selected SWM facilities. At a minimum, data would be collected between the year prior to construction and the year following construction.
- additional measures that would be implemented should the surface water monitoring program identify any areas where water quality targets are not being met; and
- an Ice Prevention and De-icing Management Plan including the best management practices to be employed by MTO, identification of road salt vulnerable areas and the additional mitigation measures needed in these areas.

DFO and EC are to be provided both plans for review and comment.

6.5.3 Residual Effects

During the Construction Phase, increased sediment loading from erosion and in-water works will likely result in increased turbidity in 79 natural watercourses. Although adverse effects will be minimized through the implementation of the recommended erosion and sediment controls, these measures are not always completely effective. As such, increased turbidity is considered a residual adverse effect.

During the Operations and Maintenance Phase, treated effluent will be discharged from stormwater management facilities into 79 natural watercourses. Although adverse effects will be minimized through the implementation of mitigation measures, the addition of residual contaminants and warmer water following treatment is considered a residual adverse effect.

6.5.4 Government and Public Comments

Provincial government and public comments regarding surface water focused on stormwater management and salt management. The Provincial reviewers recommended that MTO assess how stormwater water quality and quantity/flow control can be accomplished for all sub-catchments, including those areas under 5 ha in drainage and that MOE's 'Enhanced Water Quality Protection' level should be applied to all areas unless the MTO can justify a lower level. The MOE requested that increased surface runoff to receiving watercourses be quantified to determine whether water quantity control structures are required. It was felt that a balanced water budget should be developed for each sub-catchment with the objective of matching pre- and post-development hydrologic regimes. MTO indicated the SWM ponds have been sized, at a planning level of detail to deal with quantity and erosion control requirements, with due consideration to upstream and downstream flood levels. The stormwater plan will be defined in more detail during subsequent design phases.

The MOE indicated that site-specific information is needed on the SWM facilities planned for each of the support facilities and that site level wastewater treatment should be required for these areas before discharge to the stormwater management system. MTO indicated that the support facilities will be subject to future Class EA studies or the Transit Projects Regulation as appropriate, prior to implementation. Through the future studies, the specific stormwater management requirements for each site as well as wastewater treatment requirements will be identified and mitigation measures developed as appropriate.

The MOE also indicated that discharging untreated first flush of stormwater into an infiltration basin as a method of alleviating thermal impacts of SWM ponds to receiving waters is unacceptable. MTO indicated that a number of measures to alleviate thermal impacts will be investigated during subsequent design phases, including deepening permanent pools for ponds, lining swales with shade-producing vegetation and emerging innovative techniques. Appropriate measures will be selected, in consultation with the applicable regulatory agencies, and implemented.

The MOE requested that MTO consider using oil and grit separator units specially made for deck drains and the use of OG units in combination with enhanced grass swales and or dry pond/wetlands within specific sections of the highway catchments and the possibility of pond lining alone and/or in combination with usage of hybrid wet pond and infiltration/exfiltration techniques to provide for quality, quantity control and water balance. MTO responded to each comment received, indicating that the stormwater management facilities have been designed in accordance with MOE's requirements and that management plans will continue to be developed in more detail during subsequent design phases. The use of oil-grit separators will typically be considered for the support facility locations (i.e. maintenance facilities, transitway station site, etc.).

The MOE requested more information on how stormwater management facilities are to be maintained. MTO indicated that maintenance requirements for the stormwater management facilities will be determined during subsequent design and implementation phases.

Finally, the MOE requested up to date information regarding MTO's Salt Management Plan and how negative environmental impacts have been and are expected to be reduced as a result of its implementation. MTO indicated that the 2005 Salt Management Plan is the current plan, and that as new guidelines are implemented, they will be applied to the Project. MTO confirmed that best practices in salt management consistent with Environment Canada's "Code of Practice for the Environmental Management of Road Salts" are being implemented.

Public comments focused on the design and effectiveness of MTO's stormwater management measures in addressing water quantity effects during severe weather, and water quality effects in general. Concerns were expressed that alkaline leachate from cement structures will enter coldwater streams and affect fish, and that SWM ponds should not be used for fish / wildlife mitigation. MTO responded to each public comment received. In particular, MTO noted that the pH of the soils in the study area is alkaline, so they do not promote chemical weathering of the concrete structures, and that SWM ponds are not intended to be used for mitigation of impacts to fish or wildlife habitat, but will include measures within and surrounding the facilities to prevent fish and wildlife from entering the ponds.

EC also provided the MOE, the Agency and the RAs with comments regarding effects on surface water which included both points of clarity and technical review comments. The key technical comment related to the design and effectiveness of MTO's stormwater management measures in addressing TSS loading and dissolved contaminants such as nutrients and de-icing chemicals. EC suggested that the design of stormwater management for the Project should include consideration of the potential increase in extreme precipitation intensity and frequency over the lifetime of the project, particularly in regard to the design of minor crossing structures and stormwater treatment facilities adjacent to sensitive terrestrial and wetland ecosystems. EC noted that in certain locations where only dry ponds and enhanced swales are feasible, less effective mitigation and higher residual effects would generally result. As such, EC requested that any scientific research done to substantiate be cited. In regard to deck drains, EC recommended that drains discharging directly to watercourses be avoided to the maximum extent possible, taking into consideration highway safety. EC sought clarification as to whether the proposed 'splash 'pads' will provide any level of water quality treatment of the stormwater runoff from bridges prior to discharge into watercourses. EC noted that facilities that are designed to facilitate a second level of defense against the releases of spills from the bridge into sensitive aquatic ecosystems would be desirable. EC also recommended that MTO acknowledge a residual adverse effect on water quality due to stormwater runoff and thermal effects.

MTO provided the Agency, the RAs and EC with additional information and addressed each of the technical review comments. In particular, MTO confirmed that the sizing of stormwater management ponds for quantity treatment has been undertaken in accordance with MOE requirements and standard practices, which account for upstream drainage areas and are based on 100-year storm events. MTO also noted that detailed hydrologic modelling and detailed design of SWM facilities, including storm sewer design will be undertaken during subsequent design stages to confirm the size and configuration of the proposed stormwater management ponds.

6.6 Vegetation and Vegetation Communities

The following sections summarize the effects, mitigation and compensation measures, and residual effects of the Project on vegetation and vegetation communities. The VECs identified for this analysis were high

quality woodlots that support interior forest habitat and vegetation communities that are sensitive to groundwater alteration.

6.6.1 Approach

Vegetation and vegetation communities were given consideration during each stage of the EA process - route planning/evaluation, preliminary design and effects assessment. During the route planning/evaluation stage of the provincial EA, terrestrial features, and particularly significant and sensitive features, were comprehensively identified and integrated during the development and evaluation of alternatives to select the Technically Recommended Route. The terrestrial ecosystem-related information during the generation of alternatives was to ensure that alternatives avoided or minimized impacts to terrestrial features, and particularly sensitive and high quality features, to the extent possible.

The MTO indicated that once the Technically Recommended Route was selected, the key objective of the terrestrial ecosystem work during Preliminary Design was to augment the existing information base to a level of detail that would support a detailed effects assessment and identification of appropriate mitigation measures. The data collection incorporated terrestrial ecosystem parameters outlined in the Environmental Reference for Highway Design (ERD), (MTO, 2006) as well as any additional site specific parameters of interest. The area of investigation for terrestrial surveys encompassed the ROW (SSA) and adjacent lands for 120 m unless a sensitive receptor beyond that distance was likely to be adversely affected. The study area for analyzing landscape connectivity and wildlife linkage extended beyond the LSA to enable a regional assessment of habitat nodes and key linkages within southern Durham Region.

The MTO assessed the specific effects of the Project in accordance with its Environmental Reference for Highway Design (ERD) which requires consideration of the full range of direct/footprint impacts, as well as potential indirect impacts. A key part of the work was to identify terrestrial functions that may be affected by site access, staging, transportation corridor construction, any decommissioning work, and highway maintenance. Following this, the nature of anticipated terrestrial effects such as fragmentation, area removal, hydrological effects and loss or change of key functions was determined.

6.6.2 Effects Analysis and Mitigation

Vegetation clearing and associated habitat removal is the primary direct effect related to the Construction Phase. MTO these effects in association with interchanges, vertical/horizontal alignment, grading, drainage design, temporary road access, bridges, culverts and channel realignments, traffic and noise barriers, utility relocation and general construction activities.

The direct removal of vegetation often creates new edges that expose the retained vegetation to increased light, noise, wind, sun and salt spray. While the creation of the edge is a direct construction effect, the edge effects on the retained vegetation are indirect effects that will occur following construction and are discussed in the following section. In addition to these effects, the Project may also result in:

- Vegetation clearing/damage beyond the working area;
- Release of construction-generated sediment to adjacent natural areas;
- Releases of fugitive dust that may reach natural areas; and
- Spills of contaminants, fuels and other materials that may reach natural areas.

The operation and maintenance of the Project will also result in indirect effects to adjacent vegetation communities that are retained. These effects include:

- Spills of contaminants, fuels and other materials that may reach natural areas;
- Damage from excessive or improper application of herbicides and pesticides for ROW maintenance requirements;
- Damage to adjacent vegetation from activities such as salting and sanding, structure/culvert repairs, ditch cleanout. Salt runoff and salt spray into wetland areas may cause loss of vegetation vigour and in extreme cases, vegetation dieback, and spread of salt tolerant flora;
- Increased light, wind and sun exposure within the newly created edges of adjacent forest communities. These effects often lead to vegetation dieback, changes in the ground flora composition, windthrow, and/or spread of invasive species;
- Changes in groundwater and/or surface runoff flows that can affect dependant vegetation/wetland areas located either upgradient or downgradient of the ROW; Specifically:
- Blocking of existing surface/subsurface drainage patterns can result in upstream and downstream vegetation dieback/condition changes (see sensitive vegetation communities identified above); An increase in downstream runoff can result in erosion effects on receiving vegetation;
- Potential for temporary or permanent changes in vegetation community composition may occur as a result of temporary or permanent changes in groundwater levels. The extent and magnitude is related to soil type, depth of groundwater, topography and variable depth of the cut itself;
- Groundwater drawdown has the potential to shift vegetation species composition as a result of a change in moisture regime.

The provincial EA identified numerous mitigation measures that will serve to avoid and/or reduce the severity of adverse effects, including relevant Ontario Provincial Standards Specifications (OPSS) and adherence to permits, Acts and guidelines, including *Migratory Birds Convention Act* and Regulations. MTO has committed to offsetting the removal of vegetation through restoration, enhancement, and creation of forest communities at a ratio of a minimum of 1:1. In selecting locations for replacement habitat, priority will be given to sites adjacent to or in close proximity to the habitats disturbed by the Project and sites with similar and/or suitable ecological characteristics to those disturbed will be preferred so as to maintain their ecological functions to the greatest extent. Strategic planting can be undertaken in existing forested areas to mitigate for cumulative losses of interior forest habitat. MTO will first examine surplus properties acquired along the right-of-way and/or Conservation Authority lands that have been identified for habitat enhancement in existing plans.

The anticipated loss and/or changes in quality/function of vegetation and vegetation communities from salt application during operation of the Project will be mitigated by the implementation of MTO's salt management policy related to salt application, storage and stockpiling of salt-laden snow, as well as any new salt management initiatives in place at the time of operation. Overall, MTO has concluded that adverse effects to vegetation and vegetation communities and their associated habitat features resulting from construction have been minimized to the extent possible during route planning/evaluation, preliminary design and effects assessment stages of the EA. Effects from the operation and maintenance of the corridor can also largely be mitigated, however, some of these effects may be unavoidable and can only be partially mitigated (e.g., loss of vegetation vigour and spread of salt-tolerant flora due to salt-spray).

The approval granted by the Ontario Minister of Environment on June 3, 2010 includes several Conditions of Approval that are relevant to effects on vegetation and vegetation communities. These Conditions of Approval require MTO to evaluate options and identify a preferred response in the event that a new major biological feature is identified upon which the Project would have an adverse effect. MTO will also be required to prepare and implement a Vegetation Restoration Plan to offset effects on existing natural heritage features. The plan would be provided to EC, and other federal and provincial regulatory agencies for review and comment.

6.6.3 Residual Effects

The MTO anticipates that the Project will require the removal of approximately 300 ha of vegetation and vegetation communities, including approximately 30 ha of interior forest habitat. The removal of vegetation would be offset to some extent through restoring/enhancing/creating forest communities at a ratio of a minimum of 1:1.

An overall reduction in the quality/function of the retained portion of vegetation communities along/adjacent to valley crossings is considered to be a residual adverse effect during both the Construction Phase and the Operations and Maintenance Phase. This conclusion is supported by the expectation that it may be difficult to find suitable lands to undertake the proposed compensation; there will likely be difficulties encountered in replacing certain lost vegetation communities with off-site communities having a similar ecological quality / function; and there will be a loss of some existing interior forest habitat for the long term.

6.6.4 Government and Public Comments

Provincial government and public comments regarding vegetation and vegetation communities included both points of clarity and technical review comments. Comments from the MNR and Conservation Authorities focused on mitigation and monitoring, particularly in respect to Species at Risk (see section 6.10). MTO responded to these comments and will continue to work with the MNR and Conservation Authorities throughout the project to ensure that all issues have been resolved. Other provincial government comments related to alternatives to the use of herbicides for invasive species management and vegetation salvage opportunities. MTO indicated that manual or mechanical methods for invasive species control are largely ineffective and confirmed that vegetation salvage and relocation will be undertaken on MTO owned lands, in consultation with Conservation Authorities and MNR.

Public comments focused on general ecological concerns, the availability of appropriate mitigation measures, and the adequacy of the terrestrial field studies completed as part of the provincial EA. MTO indicated that the natural environment has been closely evaluated and considered throughout each stage of the EA process. The provincial EA work details the significance and sensitivities of natural areas as well as mitigation, compensation and enhancement measures to minimize impacts to these features. MTO confirmed that Environmental Management Plans (EMPs) will be prepared following federal EA approval of the Project.

With respect to comments regarding the adequacy of the work undertaken, MTO described the extensive amount of data collection that was completed to support the assessment of route alternatives and the field investigations that were conducted in order to identify, assess, evaluate and select the Technically

Recommended Route and develop that preliminary design. MTO confirmed that further work will be undertaken during subsequent detail design phases or where permission was not previously granted.

EC provided comments regarding effects on vegetation and vegetation communities which included both points of clarity and technical review comments. The key technical comments related to the mitigation and compensation measures proposed by MTO. EC expressed its support for MTO's commitment towards the restoration, enhancement and creation of forest communities to replace losses of these habitats, but cautioned that it will likely be difficult to replace certain lost vegetation communities with offsite communities having a similar ecological function. Therefore, EC requested that a compensation ratio larger than 1:1 be adopted. Moreover, EC requested that compensation for expected habitat loss proceed, to the maximum extent possible, in advance of the proposed vegetation clearing and project footprint impacts. EC also recommended that MTO consider a number of specific mitigation measures regarding vegetation clearing, stockpile and re-use any topsoil/organic material.

MTO responded to each comment indicating that its commitment to compensation is for a ratio of a minimum of 1:1. The Agency has included a follow-up program requirement on vegetation restoration and the MTO has provided a letter to the Agency, included as an Appendix to the CSR, affirming their commitment. MTO will continue to explore material and implementation techniques for erosion and sediment control measures that would minimize as much as possible, the affect on vegetation and wildlife. MTO also indicated that topsoil would be stockpiled and re-used to the extent possible and that the feasibility of limiting pile heights would be reviewed during subsequent design phases, taking into consideration property constraints, design requirements and construction issues.

In addition, further public comments relating to the potential impacts to vegetation were submitted to the Agency during the public comment period on the draft CSR. The Friends of the Farewell, provided comments recommending a higher "replacement ratio of 1:1.5 with monitoring for at least 5 years post construction to ensure a higher survival rate and to make public the Vegetation Restoration Plan."

Environment Canada advised the Agency that it is supportive of MTO's mitigation measure to replace and restore vegetation. The Agency understands that federal and provincial regulatory agencies will review the Vegetation Restoration Plan and MTO has agreed to make the Plan publicly available. The follow-up program recommended in this CSR incorporates a 5 year post construction monitoring and a minimum replacement ratio of 1:1, as recommended by expect authorities.

6.7 Wetlands

The following sections summarize the effects, mitigation and compensation measures, and residual effects of the Project on wetlands, and the VEC identified for this analysis.

6.7.1 Approach

Wetlands were given consideration by MTO during each stage of the EA process - route planning/evaluation, preliminary design and effects assessment - and with reference to the key objectives set out in the Federal Policy on Wetland Conservation. MTO conducted extensive reviews of secondary source information and field investigations within the ROW and on adjacent lands. Specific concerns and potential issues raised by the MNR, Conservation Authorities, EC and DFO staff and other interested reviewers were considered and incorporated into the field surveys where feasible. The specific effects of

the Project on wetlands were assessed in accordance with the Environmental Reference for Highway Design (ERD).

6.7.2 Effects Analysis and Mitigation

MTO determined that vegetation clearing and associated habitat removal in wetland areas is the primary direct effect related to construction. This includes the loss of wetland areas and associated habitat to accommodate interchanges, vertical/horizontal alignment, grading, drainage design, temporary road access, bridges, culverts and channel realignments, traffic and noise barriers, utility relocation and general construction activities.

The direct removal of wetlands often has a secondary effect of creating new edges that expose the retained vegetation to increased light, noise, wind, sun and salt spray. While the creation of the edge is a direct construction effect, the edge effects that influence the retained vegetation are considered indirect effects that will occur following construction. In addition to these effects, the construction of the corridor may result in the following adverse effects:

- Wetland clearing/damage beyond the working area.
- Dewatering of wetlands adjacent to the removals and conversion to upland vegetation.
- Release of construction-generated sediment to adjacent wetland areas.
- Spills of contaminants, fuels and other materials that may reach natural areas.

Approximately 60 ha of wetland habitat would be removed to accommodate the Project. Smaller wetland areas included as part of larger vegetation units may also be removed.

In addition, the operation and maintenance of the Project may also result in indirect effects to the adjacent wetland features that are retained. The potential secondary effects are similar to those described in section 6.6, Vegetation and Vegetation Communities. Two wetland areas where there is the greatest potential for a reduction in quality / function of the wetland is the Lynde Creek Coastal Wetland Complex and the swamp communities that are part of the provincially significant Harmony-Farewell Iroquois Beach Wetland Complex. Vegetation communities along the ROW include: Willow Mineral Thicket and Fresh-Moist Poplar Deciduous Forest, Swamp Maple Mineral Deciduous Swamp and White Birch-Poplar Mineral Deciduous Swamp.

The provincial EA identifies numerous mitigation measures that will serve to avoid and/or reduce the severity of adverse effects, including following relevant Ontario Provincial Standards Specifications (OPSS) and adherence to permits, Acts and guidelines, including *Migratory Birds Convention Act* and Regulations. The measures have been developed giving consideration to the objectives of the Federal Policy on Wetland Conservation. Of note is MTO's commitment for the restoration, enhancement and creation of wetlands to offset the removal of vegetation resulting from construction activities. In selecting specific locations for replacement habitat, priority will be given to sites adjacent to and/or within the same drainage basins/watersheds as the habitats disturbed by the Project. Sites with similar and/or suitable ecological characteristics to those disturbed will be preferred so as to maintain their ecological functions to the greatest extent. MTO will first examine surplus properties acquired along the right-of-way and/or Conservation Authority lands that have been identified for habitat enhancement in existing plans.

Finally, MTO has committed to consider the following measures to further minimize the effects of major fills and cuts on the retained portions of wetlands:

- the selected use of a permeable sub-base material at locations of major fills;
- installation of permanent groundwater control (e.g., a gravity drain system); and/or
- installation of shallow groundwater control if excavations at major cuts intercept a saturated aquifer.

Pursuant to the approval granted by the Ontario Minister of Environment on June 3, 2010, MTO will be required to evaluate options and identify a preferred response in the event that a new major biological feature is identified upon which the Project would have an adverse effect. MTO will also be required to prepare and implement a Vegetation Restoration Plan to offset effects on existing natural heritage features. The plan would be provided to MNR, the applicable Conservation Authorities, Environment Canada and the 407 Environmental Advisory Committee for review and comment.

6.7.3 Residual Effects

The MTO has determined that, taking into consideration the mitigation measures identified above, the removal of 62.2 ha of wetland vegetation due to the construction of the Project is considered a residual adverse effect. This effect will be offset to some extent by MTO's initiatives aimed at the restoration, enhancement, and creation of wetland communities.

During both the Construction and Operations and Maintenance Phases, a reduction in the quality/function of the retained portion of wetlands along the transportation corridor is anticipated.

6.7.4 Government and Public Comments

Provincial government, Conservation Authority and public comments regarding wetlands focused largely on the effect of the EDL on the Harmony-Farewell Iroquois Beach Wetland Complex, which is a Provincially Significant Wetland (PSW). In recognition of this, MTO undertook a detailed analysis of numerous alignments through this wetland in order to minimize effects (see section 4.2, Alternative Means of Carrying Out the Project). In addition, MTO conducted a workshop, held in February 2008, to identify further mitigation measures to minimize wetland losses and disruption, particularly with respect to the preservation of groundwater flow and the provision of wildlife passage. As a result, MTO modified the preliminary design of the EDL to include a 300 m long bridge structure over the wetland with a vertical clearance of 3 m. The MNR and the Conservation Authority have both indicated their acceptance of the proposed mitigation measures.

Other public comments related to the proximity of the corridor to the Solina Bog, suggesting that the highway design (ditching) could improve the conditions of the bog. MTO indicated that the Solina Bog was recognized to be one of the premier botanical sites in Durham Region and that any refinements made to the route in this area would directly impact the bog and/or its catchment area.

EC provided comments regarding effects on wetlands which included both points of clarity and technical review comments. EC requested clarity regarding the construction and maintenance access that would be provided, notably to valley lands at bridge crossings. MTO indicated that for the East Mainline and EDL,

the ultimate design retains the open median, allowing for permanent access from the median, where feasible. For the West Mainline, Central Mainline and WDL, the construction access and interim maintenance access will be provided via the median centreline until ultimate build-out, where feasible.

EC expressed support for the restoration, enhancement and creation of (vegetation and) wetland communities that will be undertaken to replace wetland loss, but cautioned that it will likely be difficult to replace certain lost wetlands, notably the more significant wetlands, with wetlands having a similar ecological function. Therefore, EC sought that a compensation ratio larger than 1:1 be adopted. MTO responded indicating that its commitment to compensation is for a ratio of a minimum of 1:1.

6.8 Fish and Fish Habitat

The following sections summarize the effects, mitigation and compensation measures, and residual effects of the Project on fish and fish habitat. The VECs identified for this analysis were High Sensitive Fish Habitat and Other Fish Habitat (i.e., Moderate and Low Sensitivity Fish Habitat).

6.8.1 Approach

The *Fisheries Act* provides for the protection of fish and fish habitat. No one may carry out any work in or near Canadian waters that prevents fish passage, results in fish mortality or results in the harmful alteration, disruption or destruction (HADD) of fish habitat without authorization from Fisheries and Oceans Canada. In recognition that an authorization for the HADD of fish habitat will likely be required for this Project, MTO endeavoured to undertake all of its fisheries work in a manner that would satisfy the requirements of the *Fisheries Act*.

During the route planning/evaluation (Alternative Means of Carrying Out the Project) stage, the overall objective of the fish and fish habitat planning work undertaken by MTO was to ensure that fish and fish habitat, and particularly sensitive features, were comprehensively identified and considered in the evaluation of alternatives to select the Technically Recommended Route. MTO indicated that its objective during the generation of alternatives was to avoid or minimized potential impacts to aquatic features, and particularly sensitive and high quality features, to the extent possible while still meeting the technical planning/design objectives and requirements. The evaluation process assumed that design of the crossings can usually address most effects to fish and fish habitat (e.g., large openings/spans, bridges). Once the Technically Recommended Route was selected, the key objective of the fish and fish habitat work during Preliminary Design (including developing and evaluating design refinements and alternatives) was to augment the existing information base to a level of detail so that an effects assessment could be completed.

The selection and sizing of each watercourse crossing structure took into account hydrotechnical, fluvial geomorphologic, hydrogeologic, fish habitat and terrestrial habitat criteria, in combination with the structure and highway design requirements. Each watercourse crossing design recommendation was documented in individual Watercourse Crossing Reports that were reviewed by DFO, MNR and Conservation Authorities to gain their agreement in principle. As the design process progressed, the need for relocation/realignment of sections of channels was identified. In these cases, the realigned watercourse reaches were designed using natural channel design principles to ensure that they properly convey flow and sediment (i.e., ensuring stream gradient, flow velocity/discharge are such that natural geomorphic processes are maintained).

6.8.2 Effects Analysis and Mitigation

The general effects on fish and fish habitat associated with construction are often subsidiary effects of land based activities such as vegetation clearing, grading, and excavation. These activities can produce stressors such as the addition or removal of instream organic structure, reduced bank stability and sediment deposition from erosion of exposed soils when adequate mitigation is not sufficiently employed.

In-water construction activities can pose potential impacts to fish and fish habitat through activities such as placement of material or structures in water, excavation/dredging, and water extraction. Aside from direct displacement of fish and fish habitat, these activities can also affect fish habitat through debris deposition, bank or bed alteration, removal of aquatic macrophtyte, substrate and instream cover, alteration to fish passage and sedimentation of the water column when conducted in the absence of appropriate mitigation. Similarly, the direct alteration of a channel during realignment projects can cause changes in geometry, result in losses of morphology and in-stream habitat and produce fish passage issues where gradient changes or channel widening occur.

Effects to fish and fish habitat can result from temporary dewatering of groundwater. Construction of bridge abutments and footings often require work to temporarily be completed under dry conditions. The temporary dewatering can, in some situations, reduce baseflow contributions to groundwater fed systems which can potentially affect localized water temperatures and/or fish passage in smaller systems. Effects on base flow contributions can by extension affect flow/water levels as well as water temperature, which is of particular concern in watercourses that support salmonids and/or Redside Dace.

Obstruction of fish passage can occur as a result of poor construction techniques, particularly where encroachment into the channel to install the structure or realignment of channel sections is required. Potential seasonal or permanent barriers can also develop over time as a result of poorly installed structures, or possibly as a result of erosion and sedimentation triggered through destabilization of the channels following vegetation removal.

Table 6-2 provides a summary of the number of watercourse crossings affected by the construction of the Project in terms of their sensitivity and their preliminary risk ratings. The majority of the crossings are of watercourses with no direct fish use or of Low or Moderate sensitivity. In most of these cases, crossing structures have been designed to avoid direct impacts, and/or the crossings require channel realignments resulting in increases or reductions in channel lengths to varying degrees. High sensitivity watercourses are crossed once, all by major bridge structures. These structures have been designed to avoid direct impacts, but shading of habitat, indirect effects on channel stability and form related to vegetation loss are likely. Detailed assessments of effects were prepared for each of the watercourse crossings which led to a determination by DFO, MTO and applicable Conservation Authorities that 27 crossings will likely result in a HADD and will require a *Fisheries Act* Authorization. These 27 crossings include all Medium and High risk rated crossings and several lower risk rated crossings where it was determined that the scale of the effect warranted an Authorization (e.g., major channel realignments, new channel requirements, etc.).

Table 6-2 Summary of Effects on Fish and Fish Habitat

VEC Sensitivity	Total # Watercourse Crossings	No/Low Risk	Low-Medium Risk	Medium Risk	Medium-High Risk	High Risk

None/No Direct Fish Use	37	37	0	0	0	0
Low	15	7	8	0	0	0
Moderate	4	1	0	2	1	0
High	24	11	0	7	6	0

Effect to fish and fish habitat during the Operations and Maintenance Phase are generally associated with the new watercourse crossings and associated works, stormwater inputs from the operation of the facility, and periodic maintenance and replacement activities. The effects include those associated with the permanent removal or reduction of riparian vegetation under structures which can result in reduced input of organic material and nutrients (allocthanous input), increased solar inputs that influence water temperatures (which are usually offset by shading from the structures) and localized destabilization of banks. Depending on the severity of the latter effects, changes in channel form and morphology (e.g., widening, loss/reduction of pools) may occur. In most cases, the Project will not result in direct encroachment and the bridge spans are designed to maintain channel function, however there may remain secondary effects on channel form and stability as a result of the loss or future die-back of vegetation.

Other effects during the Operations and Maintenance Phase include localized disruption in groundwater flow near abutments, obstruction of fish passage and localized effects to water quality from storm runoff and road spray. The effects to water quality from storm runoff are addressed through implementation of stormwater management (SWM) measures. However, the outlet from these facilities can also produce potential effects to receiving watercourses. Specifically, improperly designed or sited outfalls can create erosion impacts, particularly on valley slopes, as discharge flows are conveyed toward the receiving watercourse, or at the point of discharge in the watercourse. Thermal issues can also develop as a result of release of ambient temperature water to coldwater streams.

MTO's provincial EA identified measures to be implemented to avoid direct effects on fish and fish habitat including Erosion and Sediment Control (ESC) measures to be developed during subsequent design phases.

The following general construction mitigation measures will be implemented where relevant based on the specific works and character of the watercourse or drainage feature, in order to minimize adverse effects to fish and fish habitat during and following construction activities. Although not intended to be exhaustive, they summarize standard mitigation requirements to be employed during construction.

- All in-water and near-water activities will be conducted within the applicable in-water construction timing windows, as identified by the MNR, to protect the resident fishery life functions. The construction timing periods will be applied to all fish-bearing watercourses, as well as watercourses that drain directly to fish bearing watercourses, based on the thermal classification of the fish community present, as outlined below:

Table 6-3 Construction Timing Windows Based on Fish Presence

Fishery	Construction Timing Window[3]	
	Start Date	End Date
Coldwater resident[4] fish community	June 1	September 15
Coldwater and warm water resident fish community	July 1	September 15
Warm water resident fish community	July 1	March 31
Warm water resident fish community with migratory salmonids (Rainbow Trout and Chinook and Coho Salmon)	July 1	September 15
Warm water resident fish community with migratory Rainbow Trout	June 15	March 31
Warm water fishery with Northern Pike Spawning	July 1	March 15

- All hoses drawing water from streams supporting fish use during temporary flow management procedures will be screened to prevent potential entrainment of fish.
- Any fish stranded within the temporary in-water work zones (including measures above with respect to abandonment of old channel sections) will be removed and relocated using appropriate techniques by qualified fisheries specialist. Re-location sites for fish stranded within the temporary work zones for culverts where continuous flow is not present during the construction period will be identified. Generally, such a site will always be on a permanent reach of the watercourse, or where there is no continuous flow in the vicinity, may be on a permanent reach of the receiving parent watercourse. A qualified fisheries specialist will identify fish relocation sites, in consultation with MNR (if required).

3. *Construction Timing Windows refer to the period where construction is permitted in each watercourse associated with the thermal sensitivity of the fishery present.*
4. *Brook Trout, Brown Trout, Atlantic Salmon.*

Although all of these measures are relevant to most watercourses, particularly diligent and rigorous application and monitoring is warranted at higher risk crossings. These high risk crossings, and their specific sensitivities as relevant, will be specifically identified in the Contract documents, so that the Contractor is aware of the potential issues and can take particular care during all construction activities undertaken in their vicinity. Generally, these crossings are those that:

- support high sensitivity fish and fish habitat;
- are located in well defined valley settings with potentially erodible steep slopes and/or soils;
- support abundant groundwater discharge; and/or
- affect channels that are vegetation controlled or otherwise susceptible to erosion following removal of vegetation.

Specific mitigation and design principles related to groundwater and surface water inter-relationships with fish and fish habitat listed below were used during the impact assessment of the Project and will continue to be employed during subsequent design phases.

- No sub-watershed diversion of surface flow will occur. Local 'diversions' to new outfall points will only be considered on minor seasonal drainage features that do not support direct fish use.
- The functional importance of groundwater to fish and fish habitat was and will continue to be emphasized throughout the design and construction process. Specific and rigorous attention will be paid to temporary dewatering during construction at stream crossings that support coldwater fish communities and/or Redside Dace.
- Where channel relocations are required in habitat supported by groundwater discharge, the design will maintain this functional relationship in the new channel section. Preliminary conclusions that groundwater will persist in the channel realignments on the three coldwater watercourses (Lynde Creek, Oshawa Creek West and Black Creek) based on similar groundwater elevations and materials across the floodplains will be verified during subsequent design phases, and again during construction of the new channels. Specific consideration of groundwater discharge in relation to specific habitat elements (e.g., spawning habitat, refuge pools) will be integrated in this analysis and design.
- If discrete groundwater discharge points are identified during further detailed hydrogeological or geotechnical work or field work, opportunities to direct the groundwater flow to a watercourse will be evaluated, and wherever feasible, designed and implemented.
- Furthermore, if discrete groundwater discharge points are identified during subsequent field work, or during construction, all reasonable opportunities to convey groundwater to the stream, and specifically to key habitat elements such as spawning riffles and refuge pools, will be designed and implemented. These designs should consider channel geomorphology to ensure that the discharge of groundwater avoids erosion of the existing channel.
- Fill placed in the deeper valleys where evidence of groundwater discharge is present and particularly where it is functionally important to the fish communities should be designed using a permeable sub-base to maintain existing groundwater movement toward the streams.
- Specific outfall control measures will be implemented for all SWM facilities to prevent erosion of the receiving streams, with specific attention to outfalls to the deeper valleys at Brougham Creek and Tributary B and many of the high sensitivity watercourses in the eastern portion of the study area.

Specific thermal controls will also be implemented at the SWM ponds that will outlet to all High sensitivity cold/cool water receiving streams.

Temporary Flow Management and Dewatering

- Temporary flow management plans will be developed to isolate the construction zones for watercourse crossing works and to maintain clean flow downstream. These plans will be developed based on MTO's standards and in accordance with PTTW conditions and any other supporting measures as may be identified by the project hydrogeologists. Where appropriate, withdrawal points from the channel will be properly sited and designed to prevent intake of silt or bed materials, and the discharge points sited and designed to prevent erosion and any sediment release.
- Only clean materials free of fine particulate matter will be placed in the water for temporary construction measures (e.g., coffer dams will be constructed of 'pea gravel' bags, geotextile fabric or other clean material) or permanent works (e.g., substrate material).
- During all temporary dewatering required for works, appropriate energy dissipation and settling/filtration measures will be used for discharge of dewatering water to ensure no erosion or sediment release occurs in the watercourses/drainage features. The dewatering plan will include properly sized, designed and sited temporary filtration facilities. Discharge points for release of dewatering discharge will be sited and designed to prevent erosion and ensure only clean flow is released to the watercourses. If sheet piling is used to contain dewatering areas, it will be removed following construction to prevent obstruction of groundwater movement to the streams.
- The Contractor will be informed regarding which watercourses are particularly Sensitive (e.g., presence of SAR, Brook Trout and other salmonid habitat/High Sensitivity crossings). All mitigation measures for these crossings and adjacent works will be stringently implemented with comprehensive environmental inspection.
- Any opportunities identified during construction to divert any exposed groundwater discharge directly to the stream channels should be implemented, with input from the fish biologist, environmental inspector and/or hydrogeologist, and consultation with agency staff if appropriate.

Protection during Removal of Existing Bridges and Culverts

- In several situations, removal of existing structures will be required to construct the new crossings or realigned secondary roads. Appropriate containment systems will be designed and implemented during removal of the existing structures to prevent entry of debris into the watercourses. This system(s) will address large materials and fine particulates, and will be regularly monitored to remove and appropriately dispose of accumulated material.
- Materials that fall in the water will be carefully retrieved using appropriate techniques to minimize disturbance.
- Following removal of the structure, the site and open sections of watercourse will be restored and naturalised, with specific attention to integration of fish habitat opportunities wherever feasible.

Rehabilitation Following Construction

- All of the areas disturbed during construction will be restored, stabilized and re-vegetated as soon as the works are completed to prevent migration of fine material to the watercourses during runoff events, as well as minimizing the opportunity for colonization of the area by non-native, invasive species.
- Only native plants, compatible with site conditions will be used. Detailed landscaping plans will be prepared during subsequent design phases.
- Specific attention will be directed at naturalized re-construction, stabilization, inspection and re-vegetation (where light is present) of all disturbed channel and bank transition zones, valley slopes and floodplains, to ensure there is no potential for erosion and to re-naturalize these areas.
- Temporary/biodegradable erosion control fabric or other passive means of providing temporary erosion control will be installed on the re-constructed bank zones, as well as on the disturbed embankment areas draining to the watercourses as required, to provide temporary protection until vegetative cover is fully re-established. All disturbed areas will be reseeded with appropriate native seed mixtures wherever feasible. Other means of encouraging rapid re-vegetation of appropriate species such as seedbank salvage or transplant should also be employed where appropriate.
- Specifically on the outer banks of the inlet and outlet pools, the bank protection design should emphasize use of vegetation and naturalized approaches to provide bank integrity, rather than hardened approaches such as rock.
- The unique aspects of this project in relation to the large structures required to accommodate the ultimate design scenario may require further specific restoration considerations, as outlined in the site-specific mitigation measures. Specifically, the vegetation loss and die-back under the ultimate design structures is anticipated to have potential implications for maintenance of channel form, morphology and associated habitat elements under the structures. The degree and type of potential adjustment and habitat related effects will vary with the specific fluvial geomorphologic and habitat conditions associated with the affected watercourse reach. Therefore, to address this uncertainty and inform the refinement of the design of watercourse crossings that require relocation, particularly where the watercourses are sensitive to erosion and/or support sensitive species or habitats, the following measures are recommended:
- The site-specific susceptibility to erosion and lateral migration of the affected channel sections should be assessed further during subsequent design phases to determine the need for, and type/design of measures that can best achieve the ultimate objective of providing long-term channel stability, with minimum instream hardening/fixing and intrusion into the stream channels.
- This assessment should be integrated with a detailed understanding of the specific fish habitat elements that may be affected.

Site Inspection and Monitoring

- An environmental inspector experienced in working around watercourses will be responsible for inspecting the erosion and sediment control measures and identifying deficiencies. The inspector will also assess all of the other general mitigation measures to ensure they are implemented as intended. The inspector will ensure all environmental mitigation and design measures are properly installed/constructed and maintained, and appropriate contingency and response plans are in place and implemented if required.

- For any works requiring channel realignment, appropriate specialists (fluvial geo-morphologists, hydrologists, fisheries biologists) will be used. They will also be responsible for obtaining specialist advice (e.g., hydrology/hydraulics, fisheries) as required during the construction of the new channel transition zones.
- For all crossings that involve authorization under the *Fisheries Act*, a Fisheries Contracts Specialist will conduct the inspection and documentation, in accordance with the MTO's *Environmental Guide for Fish and Fish Habitat*.

6.8.3 Residual Effects

MTO has concluded that no residual adverse effects on fish and fish habitat are likely because compensation will be used by MTO to achieve a No Net Loss (NNL) of fish and fish habitat affected by the Project. MTO also recognizes that compensation will only be considered by DFO after it has been proven that it is impossible or impractical to avoid HADD of fish habitat through relocation, redesign, or mitigation. As such, effects on fish and fish habitat are not considered further in the cumulative effects assessment. Finally, based on conclusions of the surface water and groundwater assessments, it is concluded that there are no likely effects on fish and fish habitat that would have implications to human health attributable to the Project.

6.8.4 Government and Public Comments

DFO agrees with the assessment of no residual effects because authorizations under the *Fisheries Act* ensure that mitigation measures and where appropriate, compensation, will be implemented to reduce or eliminate adverse effects. Monitoring and compliance also form part of the authorization and failure to conform and/or comply with these conditions may result in enforcement action by DFO.

Provincial government and public comments regarding the effects of the Project on groundwater, surface water and wetlands expressed concern over fish and fish habitat. Few reviewers offered specific comments regarding fish and fish habitat, largely because DFO, MNR and Conservation Authorities were very closely involved in virtually all aspects of routing, project design and assessment. DFO indicated that MTO should include a commitment to use sod matting, where possible, especially on sensitive streams. This was recommended to further reduce the potential for erosion and provide immediate habitat for species such as the Redside Dace. MTO agreed to this additional commitment.

6.9 Wildlife and Wildlife Habitat

The following sections summarize the effects, mitigation and compensation measures, and residual effects of the Project on wildlife and wildlife habitat, including migratory birds. The VEC identified for this analysis was specialized and sensitive wildlife habitats.

6.9.1 Approach

Wildlife and wildlife habitat (including Migratory Birds) were given consideration during each stage of the EA process - route planning/evaluation, preliminary design and effects assessment. The MTO's approach

to the assessment and the methods applied were similar to those described in Vegetation and Vegetation Communities, including reviews of secondary source information and field investigations within the ROW and adjacent lands. Wildlife specific studies included winter resident and spring migrant bird studies and wildlife passage analysis.

Wildlife species status was evaluated using a variety of sources including TRCA L-rankings; Durham Region (Henshaw 1993); the Natural Heritage Information Centre website for Provincial significance; and the Committee on the Status of Endangered Wildlife in Canada website for Federal (National) significance. Species of Conservation Concern include Federally G-ranked species (G1-G3), Provincially S-ranked species (S1-S3) and/or species designated by COSEWIC or the Committee on the Status of Species at Risk in Ontario (COSSARO) or species considered of conservation concern in Toronto or Durham Region. Area-sensitive birds were identified based on the MNR Significant Wildlife Habitat Technical Guide (SWHTG).

During the alternatives stage of the provincial EA, a landscape connectivity and wildlife linkage analysis was undertaken followed by a more detailed wildlife movement and linkage analysis as part of the Preliminary Design process. As a separate exercise, the Ontario Road Ecology Group developed an independent GIS-based model to indicate potential herpetofauna mortality hotspots along the Project. The model output was shared with MTO and served to support and corroborate MTO's analysis and ecopassage system recommendations.

6.9.2 Effects Analysis and Mitigation

Construction of the Project can have a number of direct effects on wildlife. Direct construction effects are generally associated with habitat loss or modification including interference with noteworthy species and habitats including Species at Risk; wildlife injury or mortality; and effects on animal movement. Loss of wildlife habitat may result in loss of species, fragmentation of habitat and of wildlife populations, reduction of wildlife habitat quality, and loss of active nests of migratory birds, through the removal of vegetation or features used for shelter, feeding and/or breeding; and/or physical destruction and/or severing of habitat areas. Overall, the construction of the alignment will result in the direct removal of terrestrial forest and wetland areas that provide wildlife habitat. The implications of the habitat removal were assessed, primarily in the context of potential adverse effects to elements of specialized or sensitive wildlife habitat known or likely to be present.

Road construction typically involves the clearing of existing vegetation, the removal of overburden (grubbing) and the blasting of bedrock (where encountered). All activities require the operation of heavy machinery. These activities are likely to result in some wildlife injury or mortality within the construction zone. Wildlife species vary in their vulnerability to construction-related mortality.

Species that are sensitive to disturbance and are capable of departing areas of increased human activity (i.e., most mammals and birds) are less likely to be affected by construction. Species that avoid humans through mechanisms other than flight (e.g., crypsis) and/or move too slowly to flee disturbance (such as small mammals and some herpetofauna) are at increased risk from construction activity.

Timing also determines the vulnerability of wildlife to construction-related mortality. The greatest potential for adverse effects is during the spring and summer, when migratory birds are present in the study

areas, when most species (particularly mammals and birds) are rearing young in nests, burrows or dens, and when all species are most active, thus increasing their potential to enter into the construction zone.

Wildlife vulnerability to construction is reduced during the fall and winter because migratory birds have left the study area, young-of-the-year have dispersed from nests, burrows and dens, and remaining overwintering species (e.g., deer) are generally less active and thus less likely to move into the construction zone.

Terrestrial wildlife species will vary in their response to crossing the construction zone. Most tolerant species will continue to cross, but will likely adapt their movements to non-construction periods. Less mobile species may be deterred at some locations, and may seek other routes. Adjustments and changes can be anticipated during the construction period.

The effects of the Project on wildlife during the Operations and Maintenance Phase are habitat loss, changes in habitat quality/function and restrictions to wildlife movement and increased wildlife mortality resulting from:

- the creation of edge habitat that can affect off-site breeding, feeding, shelter quality, and/or movement opportunities for sensitive species;
- introduction of invasive species (disturbance/increased light/creation of movement passage along transportation facility);
- introduction of light and noise pollution to a habitat area;
- severing of woodlands (including woodlots) may result in residual sizes that are too small to support 'area- sensitive' wildlife species;
- fragmenting wildlife populations that may cause further endangerment of an already sensitive and rare species; and
- vehicular traffic collisions.

Noise implications for wildlife have been gaining increasing interest in the research community, although definitive studies are still limited and conclusions about the nature and extent of effects are variable. MTO has indicated there is limited information on the response of many wildlife groups to noise. While birds have been more heavily studied, the nature and extent of noise effects is still not clear. Some species appear to be negatively affected by the presence of roads, others appear to be neutral, and a number of species directly benefit from the creation of roadside habitat (FHWA 2004). Noise effects and sensitivity to noise appear to vary considerably among bird species. Similarly, some wildlife species will be more sensitive to fugitive dust, light, surface water and groundwater effects than others.

The provincial EA identifies numerous mitigation measures that will serve to avoid and/or reduce the severity of adverse effects, including relevant Ontario Provincial Standards Specifications (OPSS) and adherence to permits, Acts and guidelines, including *Migratory Birds Convention Act 1994* and Regulations. The primary mitigation measures aimed at minimizing effects on wildlife habitat, including migratory birds are those identified by MTO regarding vegetation and vegetation communities, and wetlands. In addition MTO has identified additional mitigation measures regarding wildlife mortality and movement by increasing transportation corridor permeability for wildlife through the provision of wildlife structures and funnel fencing. Final design details for these crossings will be prepared during subsequent design phases, with agency review and input. This will be included as part of the restoration and landscape plan. During subsequent design phases, MTO will explore material and implementation techniques for

erosion and sediment control measures that would minimize as much as possible, the affect on vegetation and wildlife (i.e., biodegradable, implemented to reduce accidental wildlife entrapment, etc.).

6.9.3 Residual Effects

MTO determined that during the Construction Phase and Operations and Maintenance Phases, the Project will result in restrictions to wildlife movement and potential increased wildlife mortality. During the Operations and Maintenance Phase, wildlife mortality and the restrictions to existing wildlife movements due to the transportation corridor would be minimized by the 80 structures and wildlife fencing that will accommodate wildlife passage associated with water crossings, including six terrestrial wildlife passages not associated with watercourse crossings.

Similarly, during the Construction Phase and Operations and Maintenance Phases, the Project will result in the disruption to wildlife within the retained portion of vegetation communities and wetlands along/adjacent to valley crossings, including wildlife species sensitive to habitat size/diversity, fugitive dust, noise, light, surface water and groundwater effects.

6.9.4 Government and Public Comments

Provincial government, Conservation Authority and public comments regarding wildlife were made largely in the context of effects to vegetation and vegetation communities and wetlands, and the effect of the East Durham Link (EDL) in particular. MTO indicated that the EDL has been sited to avoid higher quality natural areas such as diverse forest and wetland habitats. As a result, some areas that provide lower quality habitat for birds and other wildlife will be affected. Agricultural lands, including orchards, are not typically surveyed as a primary source for bird surveys as they primarily host common species that inhabit a range of habitat types though it is recognized that orchards can harbour numerous breeding bird species, as well as some migrants.

EC provided comments regarding wildlife and wildlife habitat, focusing on mitigation to address the potential for incidental take of migratory birds. To this end, MTO accepted EC's recommendation that construction activities with the potential to destroy migratory birds, including vegetation clearing, filling and demolition/removal of structures used by cavity nesters, should not take place in migratory bird habitat during the breeding season, generally defined (for different habitat types) as May 1 – July 31 for this region. In addition, MTO confirmed that any required avian nest surveys will be conducted by a qualified avian biologist immediately (i.e., within 2 days) prior to commencement of the works. A mitigation plan would then be developed to address any potential impacts on migratory birds or their active nests, in consultation with EC.

Additional comments relating to wildlife crossings were submitted by Ecokare consultants, on behalf of the Board of Management of the Toronto Zoo/Ontario Road Ecology Group, a participant funding recipient. These additional comments were summarized and responses were provided indicating how comments have been considered. This is included in Appendix B to this CSR.

6.10 Species at Risk

The following sections summarize the effects, mitigation and compensation measures, and residual effects of the Project on Species at Risk. The VEC identified for this analysis was Species at Risk identified by COSEWIC and/or COSSARO and/or protected under the federal *Species at Risk Act* (SARA) and/or Ontario's *Endangered Species Act* (ESA).

6.10.1 Approach

Species at Risk were given consideration by MTO during each stage of the EA process - route planning/evaluation, preliminary design and effects assessment. In addition, the following Species at Risk specific measures were undertaken:

- Completing a Health Assessment of all Butternuts within approximately 120 m of the Project.
- Specific attention was paid to temporary dewatering during construction at stream crossings that support coldwater fish communities, particularly the Redside Dace. Specific consideration of groundwater discharge in relation to important Redside Dace habitats, including spawning habitat and refuge pools, was integrated into the analysis of potential effects and the identification of mitigation measures.
- The crossings of streams that support direct use by re-introduced Atlantic Salmon were designed to maintain stream processes, which in turn should maintain habitat and support fish movement. This design process involved an integrated, multi-disciplinary review of crossing design alternatives, and iterative development of culvert alignment and bridge span arrangements in relation to channel characteristics. Where there is no direct fish use, crossings were still designed to maintain stream processes to avoid erosion and sediment transport to fish bearing watercourses.

6.10.2 Effects Analysis and Mitigation

The Butternut, protected under SARA and Ontario's ESA, will be impacted by the Project. According to MTO, the construction of the Project will result in the removal of 83 Butternut trees, including 3 seedlings, 34 of which are considered retainable. A permit under the ESA will be required for the removal of the retainable trees (no permit under SARA is required), and will include specific requirements that will assist in the development of a Recovery Strategy for Butternut across Ontario. Given that a Recovery Strategy and Butternut related policies to support the implementation of Ontario's *Endangered Species Act* have not been finalized, MTO has developed a preliminary mitigation strategy in consultation with the MNR and Forest Gene Conservation Association (FGCA). In general, the strategy involves transplanting retainable trees of suitable sizes, collection of reproductive material (e.g., nuts and/or cuttings), planting of nursery stock at appropriate ratios, monitoring of transplants and/or grafts and taking contingency measures. It is anticipated that implementation of the mitigation strategy will achieve an overall net benefit to the species. The mitigation strategy evolved during subsequent design phases of the Project and will be enforced under the *Endangered Species Act* permit.

The operations and maintenance of the Project will disrupt Redside Dace habitat at 8 watercourse crossings due to shading from large scale structures and associated loss of vegetated refuge habitat used. There is also some potential for indirect effects on channel stability and form related to vegetation loss that may affect this species. The functional importance of groundwater to Redside Dace and its habitat was

emphasized by MTO throughout the EA process through the consideration of groundwater discharge in relation to specific Redside Dace habitats such as spawning areas and refuge pools. General mitigation measures and species specific measures aimed at protecting fish are identified previously in section 6.8, Fish and Fish Habitat. Other mitigation measures to protect Redside Dace and its habitat include:

- All in-water and near-water activities will be conducted within the applicable construction timing windows, as identified by the MNR, to protect the life functions of the Redside Dace. The construction timing periods will be applied to Redside Dace bearing watercourses, as well as watercourses that drain directly to fish bearing watercourses, based on the thermal classification of the fish community present, as outlined in Table 6-4 below.

Table 6-4 Construction Timing Windows for Redside Dace Fishery

Fishery	Construction Timing Window[5]	
	Start Date	End Date
Redside Dace	July 1	September 15

- In situations where Redside Dace are present, a specific assessment program will be developed and implemented, in consultation with recognized experts and appropriate agency staff and in accordance with the *Endangered Species Act* process. Opportunities for collaboration on post-construction monitoring activities will also be explored and implemented as feasible.
- The site-specific susceptibility to erosion and lateral migration of the affected channel sections should be assessed further during subsequent design phases to determine the need for, and type/design of measures that can best achieve the ultimate objective of providing long-term channel stability, with minimum instream hardening/fixing and intrusion into the stream channels. This assessment should be integrated with a detailed understanding of the specific fish habitat elements that may be affected.
- No sub-watershed diversion of surface flow will occur. Local 'diversions' to new outfall points will only be considered on minor seasonal drainage features that do not support direct fish use.
- The functional importance of groundwater to fish and fish habitat will continue to be emphasized throughout the design and construction process. Specific and rigorous attention will be paid to temporary dewatering during construction and mitigation of thermal effects at stream crossings that support Redside Dace.

5. *Construction Timing Windows refer to the period where construction is permitted in each watercourse associated with the thermal sensitivity of the fish present.*

The Golden-winged Warbler, protected under *SARA,* was recorded approximately 150 m from the ROW. MTO concluded that based on field investigations and secondary source information, there is a low potential that the Project would result in a significant loss of Golden-winged Warbler habitat in the Regional Study Area. This is because only a small portion of this bird's suitable breeding habitat in the Regional Study Area would be affected by the Project. It is also anticipated that the Project might create some additional field edges and MTO's vegetation restoration efforts would create areas of early successional vegetation that may serve to benefit this species.

The Bobolink, protected under the provincial *Endangered Species Act* (ESA) and currently being considered for protection under SARA, may potentially be impacted by the Project. Recent supplementary field surveys undertaken by the MTO along the Project corridor have observed Bobolink in the vicinity of the Project.

The presence of the Blandings Turtle, a species protected under SARA, was suggested by a local resident during the provincial EA review process, but subsequent field studies could not confirm its presence. MTO indicated that if a Blandings Turtle is encountered during project implementation, MTO will contact MNR to determine *ESA* requirements.

While no adverse effects to the habitat of the introduced Atlantic Salmon, the Golden-Winged Warbler, Bobolink or Blandings Turtle are anticipated during operations, a minor residual effect is noted for disruption to wildlife habitat.

Should any of the listed species[6] described above, or any other species at risk subsequently protected under SARA or the ESA be encountered in, and in the immediate vicinity of the Project, the MTO must comply with all applicable requirements of the federal *Species at Risk Act,* and Ontario's *Endangered Species Act*. Except for migratory birds (where implementation of vegetation clearing timing restrictions for work impacting nesting habitat is the most appropriate mitigation), the MTO must undertake appropriate field surveys to confirm presence or absence of protected species in, and in the immediate vicinity of the Project, prior to undertaking work in these areas, if it likely that the species will be impacted.

Pursuant to the approval granted by the Ontario Minister of Environment on June 3, 2010, MTO will be required to evaluate options and identify a preferred response in the event that a new major biological feature is identified upon which the Project would have an adverse effect. If at any time, MTO encounters

[6] In regard to migratory bird species, Regulations under the *Migratory Birds Convention Act 1994* would also apply. If it is later found that migratory bird species listed under SARA are likely to be impacted during project implementation, EC must be contacted for further advice.

a species protected under Ontario's Endangered Species Act (2007), it must contact the Ontario MNR to determine if there are additional requirements or considerations in accordance with the *Endangered Species Act (2007)*. MTO indicated it will also comply with all applicable requirements of the federal *Species at Risk Act*, should listed species be encountered.

6.10.3 Residual Effects

Taking into account the recommended mitigation measures, the Project will result in the removal of 83 Butternut trees, including three seedlings (34 are considered retainable). The overall effects will be reduced/offset through implementation of mitigation measures. The removal of Butternut trees is offset by transplanting retainable trees, planting nursery stock and other measures to collect seedlings for planting. However, this is not the equivalent to leaving the Butternut trees in-place. Furthermore, the survival rate of replacement stock is unknown and requires monitoring to be effective. Regardless, 83 Butternut trees will be lost as a result of implementing the project and as a conservative measure; this was the appropriate number to characterize residual effects. The replacement ratio will be defined in consultation with the Ontario Ministry of Natural Resources as part of the *Ontario Endangered Species Act* permit requirements.

For Redside Dace, the overall effects will be reduced through the implementation of mitigation measures however, the likely residual effects still include disruption to Redside Dace habitat at 8 watercourse crossings due to shading from large scale structures and associated loss of vegetated 'deep' pool refuge habitat used by Redside Dace, as well as general uncertainty associated with potential for indirect effects on channel stability and form related to vegetation loss.

In addition, a minor residual effect as a result of disruption of habitat of Blandings Turtle, Golden-winged Warbler and Bobolink is noted. This residual adverse effect will be largely associated with the Operations and Maintenance Phase.

6.10.4 Government and Public Comments

During the review of the provincial EA, one member of the public expressed concern over biodiversity and Species at Risk in particular, expressing the view that the effects of the project are in direct conflict with Ontario's *Endangered Species Act* and that mitigation cannot compensate for the habitat destruction and fragmentation that these routes will create through the Greenbelt. The commenter noted that MTO is required to get a permit under section 17 of the *Endangered Species Act* for each species before activity can be permitted.

EC provided comments regarding Species at Risk, requesting clarification on the numbers of Butternut trees and seedlings affected versus those considered retainable. EC required that if estimates of Butternut populations in the RSA are known, it would be informative to compare Project related losses to this information. EC noted that the MNR, who is leading the development of the Recovery Strategy for Butternut has extensive experience with this species and an intimate knowledge of the project area and expressed confidence that MNR staff will provide "effective protection" of the species, as they are undertaking a field review in advance of the ESA permitting process. Also, given that a suite of proposed measures will be utilized in consultation with the MNR and Forest Gene Conservation Association, EC expected that these actions will prevent significant adverse environmental effects on Butternut. EC

recommended that the proponent continue to consult relevant MNR staff for information on appropriate mitigation and monitoring requirements; however, the RAs should also ensure that EC is advised by the Province of their efforts to protect the listed species.

Additional comments by Friends of the Farewell consultant were submitted during the public comment period of the draft CSR. Comments on Species at Risk were summarized and responses provided, which are included in Appendix B. Environment Canada advised the Agency that the status for Bobolink was recently revised and it is now protected under the provincial ESA. Also, Bobolink is currently being considered for protection under the federal Species at Risk Act (SARA).

6.11 Socio-economic Environment

The following sections identify and describe the effects, mitigation and compensation measures, and residual effects of the Project on the socio-economic environment. The specific VECs that were identified for this analysis included the use and enjoyment of lands; community, recreational and institutional services; community character and agricultural soils.

6.11.1 Approach

The MTO indicated that the assessment of effects on the socio-economic environment was initially based on functional plans for the Project and subsequently revised as a result of Preliminary Design. As a result of refinements to the Project, additional research and investigations were carried out as part of the review of the transportation corridor and associated impacts. Policy documents considered in the assessment included: Provincial Policy Statement; Oak Ridges Moraine Conservation Plan; Greenbelt Protection Plan; Growth Plan for the Greater Golden Horseshoe; Region of Durham Official Plan; Area Municipal Official Plans; and the Metrolinx Regional Transportation Plan. The effects on human health were considered by MTO in the context of its cumulative effects assessment. For the purposes of the Comprehensive Study those socio-economic effects that are linked to a change in the environment are considered.

6.11.2 Effects Analysis and Mitigation

People's use and enjoyment of property may be disrupted due to the encroachment of construction works and activities on lands used by people for residential, business, and community/recreational purposes. Encroachment effects on people are generally limited to increases in construction noise and dust. These effects were considered in previous sections of this CSR. Encroachment effects on businesses will also include increases in construction noise and dust.

In addition, the Project will result in the loss of agricultural lands and disruption to farm operations that will result in reduced agricultural activity. The transportation corridor traverses a range of soil types and will result in the removal of 2,068.3 ha of land from agricultural production. There is a higher percentage removal of Class 1-3 type soils (84.5%) than the Class 4-7 type soils. As agriculture is a dominant land use in the study area, many of the farm operations comprise large land holdings.

Changes in community character are also likely due to changes in landscape composition (i.e., changes in valley slopes and landforms), and effects of fugitive dust, noise and light associated with a large

construction project within rural/agricultural communities along the transportation corridor. Temporary disruption to recreational uses during construction will be mitigated by the relocation of trail systems where feasible and restoration/provision of signage for trail systems.

The effects on people's use and enjoyment of property and reduced agricultural activity resulting from the Project are expected to continue during the Operations and Maintenance Phase. In addition, changes in community character are likely to result from changes in the landscape composition and effects of fugitive dust, noise and light associated with a new transportation corridor within rural/agricultural communities along the transportation corridor.

The effects on landscape composition from the proposed transportation corridor can be described in terms of the likely alterations to the landscape character and scenic integrity, as well as the landscape experience of the area. The primary adverse effect on the landscape character will be a disruption to the pastoral quality and landscape connectivity caused by the actual physical obstruction of the transportation corridor as well as the removal of natural and cultural resources required to construct the Project.

The presence of the transportation corridor will alter existing viewsheds within the area, will require changes to the existing topography including cuts through steep slopes and raising of elevations through valley areas either by filling or by erecting bridge structures to span a creek system or environmentally sensitive area. In particular these raised elevations and structures may create some obstructions in some long north-south viewsheds.

The operation and maintenance of the Project will also affect surrounding residents and land users depending on their proximity to the proposed corridor due to fugitive dust, increased light and changed views. In terms of a user of the transportation corridor (e.g.., the travelling public), views from it and the perception and experience of the landscape (e.g.., vegetation, topography, natural features) will be one of the most distinguishing features.

Mitigation measures to minimize the effects on people's use and enjoyment of property due to effects of fugitive dust, noise and light have been addressed previously. Landscape composition effects on community character will be mitigated by extensive vegetative screening and buffering which is consistent with the character and surrounding land uses of the area. Measures developed through the Community Values Plan (CVP) process will mitigate adverse effects to views and viewsheds and include measures which will enhance the landscape composition of the area at select locations. CVP measures proposed in areas may improve on the existing landscape composition by providing greater screening and buffering from existing land uses.

Effects to the Greenbelt areas will be mitigated by the implementation of a Greenbelt strategy. The proposed 407 East Greenbelt Strategy has been developed to recognize the importance of the Greenbelt and its features and functions and to mitigate the potential effects associated with the Project.

6.11.3 Residual Effects

Taking into consideration the implementation of the identified mitigation measures, the residual adverse effects of the Project on socio-economic conditions resulting from effects on the environment are:

- Changes in community character due to changes in landscape composition and effects of fugitive dust, noise and light;
- Reduced agricultural activity due to changes in landscape composition (i.e., loss and/or severance of 2,068.3 ha of agricultural land); and
- Disruption to the use and enjoyment of property due to encroachment and/or proximity of the transportation corridor (i.e., increased nuisances), changed community character and landscape compositions.

6.11.4 Government and Public Comments

Provincial government comments regarding the socio-economic effects considered in the provincial EA focused on effects on agriculture and agricultural properties, land use compatibility, long term impacts of salt spray and compensation to property owners due to land acquisition. Comments on the Community Value Plan focused on the availability of detailed landscaping plans and the effectiveness of landscaped screens at attenuating noise.

Public comments regarding socio-economic effects received during the review of the provincial EA were largely focused on effects to specific properties, the importance of agriculture in Durham Region and the effect of the Project on agricultural land and food production. Other comments focused on the consistency of the Project with the Provincial Policy Statement, the Greenbelt Protection Plan, the Growth Plan for the Greater Golden Horseshoe and various municipal Official Plans. In general, public comments considered the Project as being inconsistent with various objectives or provisions of these policy and planning documents. Several municipalities, including the City of Pickering, the City of Oshawa and that Town of Whitby provided comments on the effects of the Project on municipally owned property, infrastructure, sidewalks, bike lanes and various timing and financial issues. MTO responded to each comment during the provincial EA review process and continues to work with the MOE, municipal officials and property owners to resolve outstanding concerns.

6.12 Cultural Environment

6.12.1 Approach

The following sections identify and describe the effects, mitigation and compensation measures, and residual effects of the Project on physical and cultural heritage (i.e., the cultural environment). The specific VECs identified for this analysis included archaeological sites, Euro-Canadian built heritage resources and cultural landscapes.

In Ontario, the conservation of archaeological resources is carried out by licensed archaeologists through a four-stage assessment and mitigation process administered by the Ministry of Culture (MCL) under the provisions of the Ontario Heritage Act and described in the MCL document, *Standards and Guidelines for Consultant Archaeologists* (MCL 2006). The field investigations carried out for purposes of this EA constituted a Stage 2 archaeological assessment of a sample of properties throughout the transportation corridor for which both permission to enter and suitable archaeological field conditions were available. The properties assessed provided a comprehensive inventory of actual archaeological resources, both pre-contact Aboriginal and historic Euro-Canadian, rather than the estimate of archaeological potential and

documentation of previously registered archaeological sites provided by Stage 1 assessment. In addition to documenting and registering archaeological resources, Stage 2 archaeological assessment also yielded recommendations pertaining to the need for Stage 3 archaeological assessment.

Since many archaeological resources in Ontario are of Aboriginal origin, engagement with First Nations in the course of archaeological investigation of Aboriginal sites is consistent with best practices. MTO is actively engaging with First Nations on issues of interest during the course of archaeological investigations and will continue to carry out this engagement in the future.

The assessment of effects on built heritage considered the disruption and/or displacement of cultural heritage landscapes and the disruption and/or displacement of built heritage resources. This was undertaken primarily through field survey that allowed the Project to be assessed in accordance with the *Ontario Heritage Act* 2005, Ministry of Culture (MCL) Guidelines, MTO's Environmental Reference for Highway Design (ERD – MTO 2006) and its Guide for Built Heritage and Cultural Heritage Landscapes (February 2007).

6.12.2 Effects Analysis and Mitigation

Construction-related activities associated with the Project may threaten archaeological sites. Stage 2 and Stage 3 archaeological assessment will determine which sites warrant Stage 4 mitigation, either avoidance and protection or salvage excavation. The effects on sites which can be avoided and protected from any land disturbance are considered to be neutral. Stage 4 salvage excavation will have an adverse effect on any site for which this mitigation option is chosen. Table 6-5 provides a summary of the archaeological assessment findings and recommendations submitted to MCL as of December 2008.

Table 6-5 Summary of Archaeological Findings Submitted to MCL (as of December 2008)

Corridor Section	Total
Assessed Area of Land (total ha)	291
Assessed Area of Land (%)	13
Remaining Area of Land (total ha)	1886
Remaining Area of Land (%)	87
Aboriginal Sites Documented	11*
Euro-Canadian Sites Documented	21*
Total No. of Sites Recommended for Stage 3	11*

*Note: * Subject To Further Work*

The primary potential adverse effect to built heritage resources during the Construction Phase is the displacement of built heritage resources (BHRs) and cultural heritage landscape (CHLs) resources. Displacement occurs when a BHR/CHL is within the footprint of the transportation corridor and needs to be removed (through demolition, or removal and relocation to a new site). Displacement impacts are permanent and irreversible. The construction of the Project will result in the displacement of 25 built heritage resources, including farmsteads, residences, barns, bridges, a former school, cemeteries, a rail/hydro line and miscellaneous buildings. The vast majority of the resources displaced are farmsteads

and residences. No cemeteries are directly affected. In addition, the Project will require the displacement of 42 cultural heritage landscapes and 20 roadscapes.

Following construction, no adverse effects on archaeological sites are anticipated. Operations and maintenance of the Project will result in disruption to 9 built heritage resources, including farmsteads, residences, barns, bridges, a former school, cemeteries, a rail/hydro line and miscellaneous buildings. In addition, the Project will disrupt 40 cultural heritage landscapes and 40 roadscapes.

Once a complete inventory of archaeological resources within the Project has been completed through Stage 2 archaeological assessment, and further evaluation has been completed for those sites recommended for Stage 3 assessment, a mitigation and compensation plan will be developed for those sites recommended for Stage 4 mitigation. For Aboriginal archaeological sites, engagement with First Nations will occur in advance of Stage 3 assessment. All mitigation measures for archaeological resources will comply with MCL's draft standards and guidelines. All archaeological work will be completed prior to construction and while avoidance is the preferred strategy, Stage 4 salvage excavation may be the only viable option.

Further investigation, including the completion of Cultural Heritage Evaluation Reports, will be required to determine the heritage value of these properties before specific recommendations for mitigation can be provided. Specifically, resources that lie within the transportation corridor that are found to be significant would be considered for relocation, or for documentation and removal. Adverse effects on properties due to proximity will be mitigated by design features and landscape elements to screen the transportation corridor (refer to landscape composition impact assessment report).

6.12.3 Residual Effects

The MTO determined that although the Project will result in the displacement of a minimum of 11 archaeological sites and 87 cultural heritage resources (based on studies conducted to date), the conservation, preservation and protection requirements of the *Ontario Heritage Act,* the completion of Cultural Heritage Evaluation Reports and implementation of a displacement strategy will ensure that effects are appropriately managed. Therefore, there is no residual adverse effect on the cultural environment. Similarly, the Project will result in disruption to 89 cultural heritage resources during the Operations and Maintenance Phase. Because adverse effects on properties due to proximity will be mitigated by design features and landscape elements to screen the transportation corridor, there is no residual adverse effect on the cultural environment.

6.12.4 Government and Public Comments

Provincial government comments included both points of clarity and technical review comments. The key technical comment related to whether undiscovered archaeological sites can be avoided or protected post EA-approval and under what circumstances would avoidance of such sites be considered. MTO indicated that all archaeological work will be completed prior to construction and that while avoidance is the preferred mitigation strategy Stage 4 salvage excavation may be the only viable option.

During the review of the provincial EA, a member of the public requested that the MCL and the Ontario Heritage Trust be consulted regarding impacts to heritage features. MTO responded that the EA has included an extensive consultation program which has included the MCL. MTO staff met with MCL staff

early in the process to discuss heritage and archaeological matters and later accompanied MCL staff on a tour of the corridor making site visits at several directly impacted heritage properties. MCL staff have reviewed the heritage impact assessment reports pertaining to the identification and evaluation of built heritage resources and cultural heritage landscapes. MCL staff has also been receiving and reviewing 'interim' archaeological assessment reports as these are being completed for sections of the 407 corridor.

During the public review period of the draft CSR, MTO notified the Agency that as a result of supplementary consultation and field investigations, it had become evident that the Brock Road/Sideline 16 alignment as presented in the provincial EA, had the potential to affect a Huron-Wendat Nation - Miindaamin archaeological site. This site was deemed to be a protected village located in the Seaton Lands, within the City of Pickering.

MTO noted that as a result of this new information, review of the alignment options, and ongoing consultation with the Huron-Wendat Nation, the preferred option is to realign Brock Rd. to avoid the Miindaamin Village site. This option is supported by stakeholders including the Region of Durham. As such, MTO, the Region of Durham and Ontario's Environmental Assessment Branch (EAAB) of the Ministry of Environment agreed that a minor amendment to the provincial EA will be undertaken to avoid the First Nation site.

No additional permits, authorization or licences will likely be required as a result of this modification. Finally, MTO indicated that it will compile a list of stakeholders and carry out a targeted consultation program ensuring that external agencies and adjacent property owners are informed of the proposed amendment to the provincial EA, providing them with an opportunity to comment.

6.13 Current Use of Lands and Resources by Aboriginal People

6.13.1 Approach

The following sections identify and describe the effects, mitigation and compensation measures, and residual effects of the Project on the current use of land and resources by Aboriginal People. Taking into account the current tenure of the land (largely private property) and the distance of Aboriginal groups to the RSA, the approach considers the effects on vegetation and vegetation communities, fish and fish habitat, wildlife and wildlife habitat (including migratory birds) and Species at Risk.

6.13.2 Effects Analysis and Mitigation

Based on the research and field studies undertaken as part of the provincial EA and the Agency's review during the CSR, there does not appear to be any current use land for traditional activities (i.e., relating to country foods, harvesting) on or near the Project.

The vast majority of the lands required for the Project is privately held.

6.13.3 Residual Effects

No adverse effects on the current use of lands and resources for traditional purposes by Aboriginal persons are anticipated.

6.13.4 Government and Public Comments

To better involve Aboriginal groups during the provincial EA, MTO arranged Workshop and Information Sharing Sessions with a number of Aboriginal groups, specifically the Williams Treaty First Nations and the Huron-Wendat Nation. During the Workshops/information sharing sessions, a number of questions were raised by the aboriginal groups in attendance, though the majority of the questions were regarding the general Study progress and implementation of the transportation corridor (tolling, privatization, etc.). A number of key points were also raised with regard to the archaeological assessment. Another major item of interest was the involvement of representatives of Aboriginal groups in the actual archaeological fieldwork, once the Stage 3 archaeological assessment work is initiated. MTO responded by committing to keeping aboriginal groups up to date with regard to the archaeological fieldwork and findings. MTO also committed to contact them prior to the initiation of Stage 3 work relate to Aboriginal finds and to determine a strategy for Aboriginal community representatives to be involved in that work. MTO also committed to future discussions regarding opportunities and approaches for involvement in archaeological fieldwork, strategies to recognize sites of significance to First Nations heritage and opportunities to display artefacts found through Stage 3 and Stage 4 Archaeological Assessments. Lastly, MTO committed to ongoing engagement with aboriginal groups to be carried out in accordance with the 407 Aboriginal groups Protocol.

On October 29, 2010, the Agency and the MTO met with a representative of the Métis Nation of Ontario in Toronto. MNO did not raise any concerns about the current use of lands affecting traditional activities in relation to the project's location. The Agency and the MTO commit to keeping the identified Aboriginal groups, including the MNO, informed of the project at all stages of the EA.

6.14 Contaminated Sites and Waste Management

6.14.1 Approach

The following sections identify and describe the effects, mitigation and compensation measures, and residual effects of the Project from contaminated sites and waste management. The VEC identified for this analysis was soil quality.

The description of effects of contaminated sites and waste management as a result of the construction and operation of the Project addressed the effect of properties with the potential for contamination on the footprint of the transportation corridor; disruption and/or displacement of operating or closed waste management facilities; regional contamination issues associated with other land uses on the footprint of the transportation corridor; and effects of support/ancillary facilities such as transitway stations, maintenance facilities, and stormwater management ponds on the footprint of the transportation corridor.

MTO indicated it completed 54 Freedom of Information requests with the MOE for the properties affected by the Project and a total of 14 searches resulted in property records. These records were reviewed by MTO to assess the potential for property contamination. MTO also completed additional site specific investigations or screenings to supplement secondary source data collected. The principal objective of the site specific investigations or screenings was to identify sources of waste or contamination that may have an effect on the preliminary design or subsequent phases of design for the transportation corridor. Finally,

the results of a residential water well survey undertaken as part of the groundwater assessment were reviewed. As noted previously, a total of 1,328 wells were documented during completion of the water well survey (see section 5.4).

6.14.2 Effects Analysis and Mitigation

The Project traverses over 500 properties, which continue to be assessed by MTO for potential site contamination.

Three waste management site properties and and estimate of twenty-one private/public properties were identified as having the potential for site contamination traversed by the footprint of the transportation corridor.

In addition to property specific contamination based primarily on land use activities there are also a number of more regional potential contamination issues that could impact the proposed transportation corridor during construction. The other land uses in the transportation corridor that may have potential contamination were identified. Concerns over oil/gas pipelines related to the potential for leaks and spills. Issues regarding hydro transmission towers relate to historical spraying of vegetation with pesticides and corrosion of the galvanized steel towers. Issues related to rail corridors include brake dust, cargo spills, oils and lubricants, and diesel fuels. Soil contamination may exist within the land on or adjacent to railway tracks in addition to railway ties being impregnated with creosote compounds. Since the transportation corridor crosses a number of high-use roadways, road salt contamination in proximity to roadways represents a potential for contamination. Finally, a large proportion of the transportation corridor will cross agricultural lands. The pesticides, herbicides and fertilizers used on these agricultural lands can accumulate in the environment and remain for long periods of time. These contaminants can be transported through surface water runoff, wind and dust generation, and groundwater and therefore represents a potential for contamination.

Finally, the construction of the transportation corridor and support/ancillary facilities (transitway stations, highway and transitway maintenance facilities, and stormwater management ponds) situated throughout the corridor will generate solid non-hazardous wastes and hazardous substances that will require management.

The operation and maintenance of the transportation corridor support/ancillary facilities (transitway stations, highway and transitway maintenance facilities, and stormwater management ponds) situated throughout the corridor will generate solid non-hazardous wastes and hazardous substances that will require management. In addition, operations and maintenance activities could affect the environment as a result of fuel, oil and road salt spills/leaks, and stormwater runoff. These effects are assessed in greater detail in section 6.17 Accidents and Malfunctions.

Typical mitigation applied to contaminated properties and waste management sites involves site remediation (removal of the waste materials and contamination). A mitigation work plan will be designed and implemented to address all property contamination issues within the footprint of the transportation corridor. The plan will include all properties affected by the transportation corridor, including those screened to date and those still to be screened.

Specifically, for all High potential properties, the mitigation work plan will be designed and implemented in accordance with all applicable provincial regulations. MTO must obtain approvals under the Ontario *Environmental Protection Act* and carry out any necessary conditions of approval including site remediation and leachate monitoring. For all Moderate potential properties, standard mitigation measures as per section 3.6 of the Environmental Reference for Highway Design (2006) will be implemented. This will require that MTO complete Phase I, Phase II Environmental Site Assessments and site remediation where necessary at all properties where contaminated soils has been identified prior to construction. Any contaminated soils uncovered during construction would also be remediated.

The design, construction, operation and maintenance of the transportation corridor support/ancillary facilities will be carried out using best management practices (BMPs) and sound engineering measures to minimize any potential contaminant losses to the environment. In the event of any such spills/leaks, rapid and appropriate response will be undertaken to control and remediate any spills/leaks.

MTO will require the construction contractor(s) and facility operators to implement a waste collection and disposal system in addition to implementing good site practices, including specific measures for the handling of solid non-hazardous waste and for the management of hazardous substances.

6.14.3 Residual Effects

Taking into account the implementation of mitigation/compensation measures (i.e., remediation and waste management practices), there will be no adverse effects for surficial soils or human health and a positive residual effect on the environment as all waste and contamination will be removed prior to construction, and waste generated managed effectively.

6.14.4 Government and Public Comments

Provincial government comments included both points of clarity and technical review comments. Technical comments were focused on the rationale for considering the effects of the transitway stations and maintenance facilities at this time when these facilities would be subject to further study. MTO indicated that these facilities fall within the scope of the EA approvals being sought by MTO.

The public provided comments regarding contaminated sites and waste management expressing a concern regarding a specific property that was not identified in MTO's waste report, and asking what MTO's plans were for addressing the potential contamination. MTO responded that all of the properties along the transportation corridor will be assessed for potential site contamination and that information regarding privately owned properties is kept confidential until the site is fully assessed. All properties that are contaminated and are required by MTO will be remediated in accordance with Ontario Regulations and MTO's Environmental Reference for Highway Design with all waste/contamination removed.

6.15 Consideration of Effects on the Capacity of Renewable Resources

6.15.1 Approach

Consistent with the requirements of subsection 16(2) of the Act, the Agency considered the capacity of renewable resources that are likely to be significantly affected by the Project to meet the needs of the present and those of the future. While the Agency and RAs recognize that such an assessment is only required for those renewable resources that are likely to be significantly affected, a more conservative approach was taken, in that renewable resources that might be affected, significantly or otherwise, were considered. To this end, the following renewable resources that could be affected by the Project were identified: groundwater; surface water; vegetation and vegetation communities; wetlands; wildlife and wildlife habitat, including migratory birds; and fish and fish habitat.

6.15.2 Effects Analysis and Mitigation

For the capacity of a renewable resource to be adversely affected, MTO determined that the residual adverse effects on these resources would need to be sufficiently large in magnitude, long term in duration and widespread across the RSA in order to threaten the abundance of the resource. MTO concluded that none of the residual adverse effects appear to have these characteristics.

With respect to groundwater resources, the Project is not anticipated to result in residual adverse effect on a groundwater aquifer or groundwater wells. Similarly, surface water resources will be maintained in terms of quantity (i.e., adequate flows in watercourses shall be maintained) and quality. Watercourses along the transportation corridor are not currently used for drinking water purposes and will likely remain attractive to local residents for recreational purposes.

Only short term losses of vegetation and vegetation communities, including wetlands are anticipated. No residual adverse effect is anticipated over the long term provided that restoration, enhancement and creation of vegetation and wetland communities is undertaken at a ratio of a minimum of 1:1. An overall reduction in interior forest habitat in the short term is anticipated. A reduction in the quality of the retained portion of vegetation and wetland habitats adjacent to major valley crossings and large forest blocks is not likely to threaten the capacity of the resource over the long term nor across a broad geographic area such as the RSA.

With respect to fish and fish habitat, channel realignment will either increase or decrease the length of the channel, and in some instances result in a net enhancement of existing habitat features. Channel realignments are very localized and are not likely to threaten fish stocks within the watercourse, nor across a broad geographic area such as the RSA.

In most cases, large structure spans have been designed to avoid direct impacts to fish and fish habitat, but shading and associated loss of vegetated ‘deep’ pool habitat, as well as general uncertainty associated with potential indirect effects on channel stability and form related to vegetation loss will result in residual adverse effects on fish and fish habitat. However, these effects are very localized and are not likely to threaten fish stocks within the watercourse, nor across a broad geographic area such as the RSA.

Increased wildlife mortality and reduced wildlife movements of some species as a result of the Project are likely limited to wildlife located in close proximity to the transportation corridor (i.e., within the LSA). Taking into account the mitigation measures aimed at maintaining existing wildlife movement across the transportation corridor, particularly along valleys and watercourses, it is not expected that the Project would result in a measureable effect on wildlife populations in the RSA.

Effects on Species at Risk are very localized and are not likely to be apparent across a broad geographic area such as the RSA. Removal of 30 Butternut trees will be offset through a Butternut mitigation strategy.

6.15.3 Residual Effects

Taking into account the likely magnitude, duration and geographic extent of the adverse effects, no residual adverse effects on the capacity of renewable resources are anticipated. The Project is not likely to threaten the ongoing availability of any renewable resource.

6.15.4 Government and Public Comments

No government of public comments were related specifically to the capacity of renewable resources.

6.16 Effects of the Environment on the Project

6.16.1 Approach

Under the *Canadian Environmental Assessment Act*, an environmental assessment must consider the potential effects the environment may have on the Project as part of the evaluation of effects. MTO determined that effects of the environment on transportation undertakings are largely related to severe weather and earthquakes.

6.16.2 Effects Analysis and Mitigation

Thunderstorms and hail storms are frequent occurrences and less damaging than other forms of severe weather such as tornados. Thunderstorms are more common during the warmer months of the year (May to September). Damaging hail can sometimes accompany severe thunderstorms. Lightning is a common characteristic of thunderstorms and can cause serious damage to structures and interrupt power supply. Thunderstorms can damage land-based structures and systems directly through high winds, heavy rain and lightning. The types of structures and systems that are most vulnerable to such an event include the high level structures at freeway to freeway interchanges, electrical systems (specifically the illumination, traffic signals and associated power supplies), and overhead signs.

Ice storms are known to occur in southern Ontario, and may occur in the Project area. An ice storm could temporarily affect access to the transportation corridor and associated structures and disrupt maintenance activities. It could cause physical damage to some land-based structures, but not the highway/transitway itself. The types of structures and systems that are most vulnerable to such an event include overhead signs and electrical systems.

Tornados are sometimes associated with severe thunderstorms. The distribution of tornadoes, particularly in southern Ontario, appears to be random and extremely localized. A tornado would be unlikely to affect the structural integrity of the highway/transitway, bridges and culverts, but could be devastating to other systems. The types of structures and systems that are most vulnerable to such an event include overhead signs and electrical systems.

Hurricanes are large, intense storms which produce high intensity winds, tides and rainfall. If a hurricane similar in size and characteristics to Hurricane Hazel (i.e., the Regional Storm event for the Project study area) were to pass over the transportation corridor the potential effects would include flooding however, effects on the structural integrity of the highway/transitway, bridges and culverts would be minimal as a result of the design standards used for the design of this infrastructure (see also section 6.5 Surface Water). Nevertheless, the types of structures and systems that are most vulnerable to such an event include the watercourse crossings, overhead signs and electrical systems.

Over the past 30 years, on average, only 2 to 3 magnitude 2.5 or larger earthquakes have been recorded in the southern Great Lakes region. Earthquakes under a magnitude of 5 typically do not result in damage. Therefore, the structural integrity of the highway/transitway, bridges and culverts would not likely be affected as a result of the standards used for the design of this infrastructure.

Global climate models indicate an increase in global average temperatures with an increase in precipitation amounts. It is expected that the severity and frequency of extreme weather events will also increase as a result of global warming. An increase in average wind speeds may be expected as a result of an extreme weather event, however, the structural integrity of the highway/transitway, bridges and culverts would not likely be affected as a result of the standards used for the design of this infrastructure. Nevertheless, the types of systems and structures that are most vulnerable to such an event include the electrical systems and overhead signs.

Fog is more prevalent in late spring and early summer. Fog typically affects a limited area and only for a short period of time. Dense fog may reduce visibility and can interfere with the operation of vehicles on the highway.

Periods of dry weather and low water levels or drought have been relatively uncommon in Ontario (about every 10-15 years). Below normal precipitation for an extended period of time (i.e., 3 months or more), potentially combined with high rates of evaporation, can lower lake levels, streamflows and/or baseflows and reduce soil moisture and/or groundwater storage (Ontario Ministry of Natural Resources, 2010), Drought conditions may serve to exacerbate the effects of transportation corridor on groundwater, increase the potential for effects on groundwater wells and increase the potential for erosion along the corridor. The greatest potential for such an effect is in the vicinity of deep cuts requiring dewatering, where a lowering of the groundwater table in surficial soils is anticipated and at major fills where alteration of groundwater flows are anticipated. Drought may also have indirect implications for streamflows, wetlands and sensitive terrestrial and aquatic life at these locations.

The following table identifies the key design measures and/or additional mitigation measures considered by MTO that address effects on the environment on the Project.

Table 6-6 Key Design/Mitigation Measures

Event	Design/Mitigation Measures
Heavy Rain/Flooding	Design standards for major watercourse crossing structures based on the Regional Storm event (Hurricane Hazel) to prevent potential flooding effects.
Hail	Mitigation measures include restrictions to operations in accordance with standard MTO practices.
Heavy Snow	Bridges designed in accordance with Canadian Highway Bridge Design Code which specifies applicable snow loadings for structures. Mitigation measures include snow removal operations in accordance with standard MTO practices.
Ice Storms/Freezing Rain	Bridges designed in accordance with Canadian Highway Bridge Design Code which specifies applicable snow loadings for structures. Mitigation measures include de-icing and snow removal operations in accordance with standard MTO practices.
High Winds/Tornado	Bridges designed in accordance with Canadian Highway Bridge Design Code which specifies design standards for applicable wind loadings.
Lightning	Mitigation measures include back-up systems for critical electrical systems.
Earthquake	Bridges designed in accordance with Canadian Highway Bridge Design Code which specifies design standards for applicable earthquake conditions.
Fog	Mitigation measures include installation of reflective markers on the roadway surface.
Drought	Where long term effects to groundwater cannot be avoided at major fills or deep cuts, long-term engineering/foundation design measures will be undertaken as appropriate. The implementation of the 407 East Transportation Corridor design features (i.e., effective stormwater management (SWM) facilities, stabilization and re-vegetation of bridge approach slopes, etc.) and other relevant mitigation measures identified by MTO will result in negligible surface erosion and instream sedimentation. Specific outfall control measures will be implemented for all SWM facilities to prevent erosion of the receiving streams, with specific attention to outfalls to the deeper valleys and at many of the high sensitivity watercourses in the eastern portion of the study area.

6.16.3 Residual Effects

Taking into consideration the likelihood of extreme weather and mitigation measure identified above, no residual adverse effects of the environment on the Project are anticipated.

6.16.4 Government and Public Comments

EC provided comments on the effects of the environment on the Project. EC noted that major watercourse crossing structures will be designed to convey the flood flow from the Hurricane Hazel regional storm flows. EC requested clarity as to which structures are considered to be major crossings. Also, EC

requested clarity as to what design criteria was used for smaller watercourse crossings, and whether the design would be sufficiently robust to accommodate increases in flood magnitude due to climate change effects. MTO provided a description of major structures and indicated that all of the watercourse crossings were designed to effectively convey the Regional Event without overtopping of the highway and without increasing floodlines on adjacent properties. Failure of any watercourse crossing within the project due to inadequate hydraulic capacity was considered by MTO to be very unlikely for storms occurring within this part of the province. Since the structures are designed for the Regional Storm event, effects of climate change on return period flows were adequately considered.

EC requested that MTO provide the design standards used for emergency overflow structures for stormwater management facilities, notably those adjacent to sensitive aquatic ecosystems (including wetlands). MTO indicated that all SWM ponds will be designed to accommodate the 100 year flood event. A freeboard of 300 to 500 mm will be provided from the 100 year water level to the crest evaluation of the emergency spillway. Spillway designs undertaken in subsequent design phases will ensure the greater of the 100 year event or the regional storm can be accommodated without failure of the pond.

6.17 Effects of Accidents and Malfunctions

6.17.1 Approach

The consideration of accidents and malfunctions is required for a comprehensive study.

6.17.2 Effects Analysis and Mitigation

Spills of petroleum products such as gasoline, oils or lubricants can occur during construction or during machinery refuelling, or as the result of a hydraulic line rupturing. These spills are usually highly localized and can easily be cleaned up by on-site teams using normally available equipment. In the unlikely event of a major spill, there could be contamination of the soil, groundwater and surface water. This in turn could have adverse effects on groundwater quality, on fish and fish habitat, and on wetland habitats, and wildlife could then ingest or absorb contaminants. Depending on the nature of the spill, it can also have an impact on residential, commercial, agricultural and other land uses. Emergency plans are recognized as effective ways of limiting the severity of environmental effects.

To this end, MTO will develop and implement preventative measures and contingency planning in accordance with the CSA publication “Emergency Planning for Industry (CAN/CSA-Z731-99). A Spills Response Plan (SRP) will also be developed which will address the requirements of the Ontario *Environmental Protection Act*. MTO and its agents value the safety of their employees and the public, and will implement a Health and Safety plan during the construction and operation phases of the Project.

There is a risk of failure of works designed to combat erosion and sedimentation following precipitation. This could cause the discharge of large volumes of sediment-laden effluents into streams, and could have potentially harmful effects on fish and fish habitat and disrupt the quality/functions of wetlands, particularly those sensitive to sedimentation (e.g., shallow water emergent marshes and swamps). Erosion and sedimentation control measures will be implemented in accordance with the environmental specifications. These measures will be subject to oversight by an environmental inspector during construction, especially prior to and after a heavy precipitation event in the study area or during snowmelt

when there is visible surface runoff. The inspector would also provide oversight of the condition of environmental mitigation measures when there is increased potential for damage (e.g., after periods of high winds, prolonged periods of drought, etc.). It is expected that inspection efforts would be focused on the most sensitive ecosystems, such as areas characterized as having high risk to erosion and sedimentation, high sensitivity watercourses, and wetlands. The duties and responsibilities of the environmental inspector will include ensuring that corrective measures are identified and implemented as needed.

A bridge or culvert could be overtopped and/or washed out and pavement could be eroded after heavy rainfall or storms of much greater intensity than those allowed for in the design of these structures, or if a culvert is blocked by ice or debris. Current design standards are based on the 50 year storm for bridges and culvert spans less than or equal to 6 m, and the 100 year storm for bridges and culvert spans greater than 6 m. The typical environmental effects of a bridge or culvert washout include loss of riparian habitat, increased erosion and the rapid input of sediment to a watercourse. These effects are likely to result in disruption to downstream fish and fish habitat, particularly those sensitive to sedimentation (e.g., spawning habitat) and disruption to the quality/functions of wetlands, particularly those sensitive to sedimentation (e.g., shallow water emergent marshes and swamps). There is also potential for adverse effects to public safety. Mitigation measures will include prohibiting access by road traffic to such structures during events of this scope, inspection and periodic maintenance of structures (e.g., removal of debris blocking culverts). As noted above, corrective measures will be identified and implemented as needed following each inspection.

A stormwater management facility could malfunction due to extreme flooding conditions and/or clogging by debris, ice, etc. Current design standards for stormwater management facilities include emergency spillways for all stormwater management ponds. The emergency spillways will function only under situations where the pond would otherwise overtop and wash out. All SWM ponds will be designed to accommodate the 100 year event. A freeboard of 300 to 500 mm will be provided from the 100 year water level to the crest evaluation of the emergency spillway. Spillway designs undertaken in subsequent design phases will ensure the greater of the 100 year event of the Regional Storm can be accommodated without failure of the pond. Furthermore, the standard MOE outlet structure to be used for pond outlets is not typically susceptible to blockage due to debris or ice. Mitigation measures will include periodic inspection and maintenance of stormwater management facilities. MTO will take corrective measures as needed.

Fires can lead to loss of habitat, sensory problems and mortality for wildlife, and destruction and disturbance of archaeological and heritage resources. Management of fuels and other hazardous materials as well as procedures for storage, handling and transport will reduce the likelihood and the extent of accidental fires related to the Project. In the unlikely event of a fire, local emergency response and firefighting capabilities will help reduce the severity and extent of damage.

6.17.3 Residual Effects

Taking into consideration the implementation of the identified mitigation measures, no residual adverse effects of accidents and malfunctions are anticipated. However, should a significant accident or malfunction occur, there is a risk of reduced soil, surface and groundwater quality and associated disruption to vegetation and vegetation communities, wetlands, wildlife and wildlife habitat. The overall risk has been minimized through design and mitigation measures, including emergency response plans, and

therefore, environmental effects of significant accidents and malfunctions are considered to have a very low probability of occurrence.

6.17.4 Government and Public Comments

EC provided comments of the effects of accidents and malfunctions related to the Project. EC indicated that inspection of the condition of mitigation measures should be provided prior to the expected occurrences of heavy precipitation to ensure all of the required facilities are in place and properly maintained. EC recommended that MTO include a discussion of the environmental consequences of a bridge or culvert washout to downstream ecosystems. EC also recommended that the potential for malfunction of stormwater treatment facilities, due to the occurrence of extreme flooding conditions and/or clogging by debris, ice, etc. be noted in the assessment. MTO clarified the duties and responsibilities of the Environmental Inspector during construction including its expectations on the focus of these inspections and provided a discussion of the environmental effects of washouts and malfunctions of stormwater treatment facilities.

6.18 Summary of Residual Adverse Effects

Based on the results of the effects assessment for each environmental component, Table 6-7 summarizes the residual effects of the Project.

Table 6-7 Residual Adverse Effects of the 407 East Transportation Corridor

Environmental Component	Residual Effects of the 407 East Transportation Corridor	Construction Phase	Operations and Maintenance Phase
Air Quality and Climate	Infrequent occasions where exceedance of applicable threshold occurs. The largest effect on air quality are due to releases of TSP (i.e., fugitive dust primarily)	√	
	Increased emissions of contaminants of concern resulting in reduced air quality. The largest effects on local and regional air quality are due to releases of acrolein and TSP (i.e., fugitive dust primarily)		√
Noise and Vibration	Increased noise levels along the transportation corridor	√	√
Surface and Subsurface Geology and Soils	Changes in valley slopes and landform	√	
	Increased soil exposure to erosion	√	
Groundwater	Lowering of groundwater table in surficial soils at locations with foundation excavations requiring dewatering	√	
	Lowering of groundwater table in surficial soils at locations of deep cuts requiring dewatering	√	√
	Alteration of groundwater flow and levels in surficial	√	√

Environmental Component	Residual Effects of the 407 East Transportation Corridor	Construction Phase	Operations and Maintenance Phase
	soils at locations of major fills and foundations		
	Reduction in groundwater quality in surficial soils		√
Surface Water	Increased turbidity in 79 natural watercourses	√	
	Treated effluent discharged from stormwater management facilities into 79 natural watercourses		√
Vegetation and Vegetation Communities	Loss of 350.1 ha of existing vegetation and vegetation communities	√	
	Loss of 28.9 ha of interior forest habitat	√	
	Reduction in the quality/function of the retained portion of vegetation communities along/adjacent to the transportation corridor, including vegetation and vegetation communities sensitive to groundwater alteration and exposure to fugitive dust, light, wind and sun exposure	√	√
Wetlands	Loss of 62.2 ha of wetland area.	√	
	Reduction in the quality/function of the retained portion of wetlands along the transportation corridor, including wetlands sensitive to turbidity, stormwater contaminants, groundwater and surface drainage alteration	√	√
Fish and Fish Habitat	No residual adverse effects on fish and fish habitat are anticipated because compensation will be used by MTO to achieve a No Net Loss (NNL) of fish and fish habitat. As such, effects on fish and fish habitat (other than those for Species at Risk) are not considered further in the cumulative effects assessment.		
Wildlife and Wildlife Habitat, including Migratory Birds	Restrictions to wildlife movement and increased wildlife mortality	√	√
	Disruption to wildlife within the retained portion of vegetation communities and wetlands along the transportation corridor, including wildlife species sensitive to habitat size/diversity fugitive dust, noise, light, surface water and groundwater effects	√	√
Species at Risk	Removal of 83 Butternut tees, including 3 seedlings (34 are considered retainable)	√	
	Disruption to Redside Dace habitat at eight (8) watercourse crossings		√
	Disruption to Blandings Turtle and Golden-winged Warbler habitat, Bobolink	√	√
Socio-economic Environment	Changes in community character due changes in landscape composition and effects of fugitive dust, noise and light	√	√

Environmental Component	Residual Effects of the 407 East Transportation Corridor	Construction Phase	Operations and Maintenance Phase
	Reduced agricultural activity due to changes in landscape composition (i.e., loss and/or severance of 2068.3 ha of agricultural land)	√	√
	Disruption to the use and enjoyment of property due encroachment/proximity of transportation corridor (i.e., increased nuisances), changed community character and landscape composition	√	√
Cultural Environment	No residual adverse effects are anticipated		
Current Use of Lands and Resources by Aboriginal People	No residual adverse effects are anticipated		
Contaminated Sites and Waste Management	Positive residual effect on the environment as all waste and contamination will be removed prior to construction, and waste generated managed effectively		
Capacity of Renewable Resources	No residual adverse effects are anticipated		
Effects of the Environment on the Project	No residual adverse effects are anticipated however, noting increased risk of reduced soil, surface and groundwater quality and associated disruption to vegetation and vegetation communities, wetlands, wildlife and wildlife habitat following a major weather/climatic event.		
Effects of Accidents and Malfunctions	No residual adverse effects are anticipated however, noting increased risk of reduced soil, surface and groundwater quality and associated disruption to vegetation and vegetation communities, wetlands, wildlife and wildlife habitat following a major event.		

6.19 Cumulative Effects Assessment

6.19.1 Approach

Cumulative environmental effects are defined as effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out. MTO's assessment was undertaken in accordance with the Canadian Environmental Assessment Agency's Operational Policy Statement (Agency 2007) and Cumulative Effects Assessment Practitioners Guide (Agency 1999).

The cumulative effects assessment for the Project was focused on those residual adverse effects caused by the Project combined with the effects caused by other projects and activities on or near the transportation

corridor and/or within the watersheds traversed by the transportation corridor (where relevant). This involved the consideration of the effectiveness of the mitigation measures proposed for the Project as well as the consideration of how cumulative effects are being or can be managed through other means, such as through ongoing and future environmental initiatives of governments, conservation authorities, other project proponents and other stakeholders.

The cumulative effects assessment did not consider the effects of accidents and malfunctions because they are considered to be hypothetical and significant adverse effects following a major accident or malfunction event have a very low probability of occurrence. Similarly, the effects of the environment on the Project were not considered to be cumulative in nature, because they were considered to be hypothetical and significant adverse effects following a major weather/climatic event have a very low probability of occurrence.

MTO identified, described and considered the cumulative effects of a number of relevant projects and activities:

Past and existing projects and activities included in the assessment were:

- existing urban land uses
- existing rural/agricultural land uses
- existing Provincial transportation network
- existing regional transportation network
- St. Marys Cement operations
- Darlington site and nuclear generating station (NGS) operations
- Darlington provincial park

Certain and planned projects and activities included in the assessment were:

- planned land use in the vicinity of the Project
- planned regional transportation network improvements

Potential and reasonably foreseeable projects and activities included in the assessment were:

- growth and development in Durham Region
- Metrolinx Regional Transportation Plan
- Highway 401 improvements and Holt Road Interchange
- GO Transit service extension to Clarington project
- Pickering airport
- new nuclear at Darlington project
- upgrade of 500kV transmission system
- Darlington NGS refurbishment and expansions to support continued operations
- Darlington NGS decommissioning
- Durham Region energy from waste facility
- Clarington Energy Business Park development
- Oshawa ethanol plant

Figure 6-1 provides a map of these other projects and activities:

6.19.2 Likely Cumulative Effects and Mitigation

Table 6-8 provides a summary of the likely cumulative effects and mitigation measures of the Project in combination with other projects and activities.

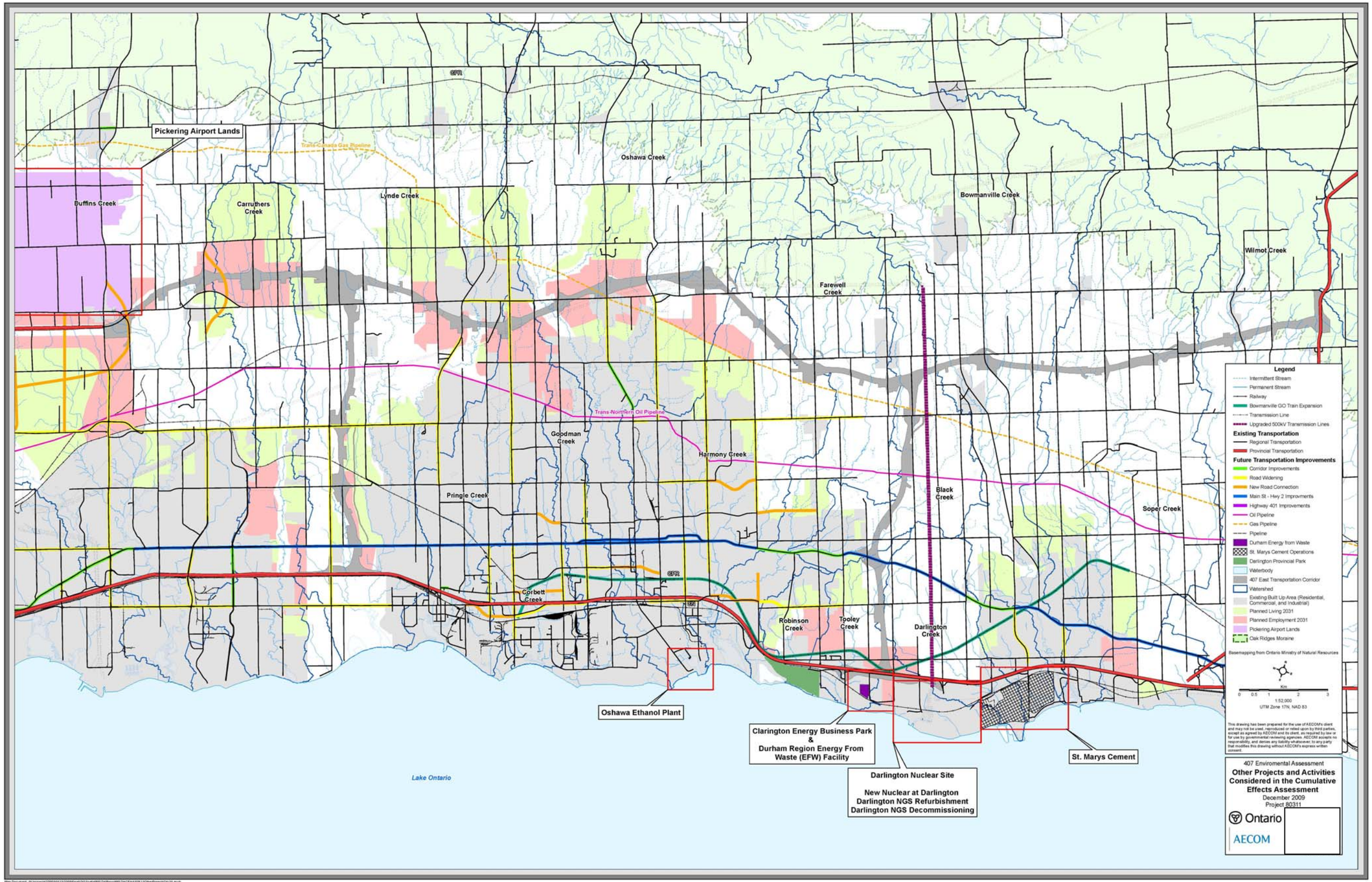

Figure 6-1 Other Projects and Activities Considered in the Cumulative Effects Assessment

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Table 6-8 Summary of Cumulative Effects and Mitigation

Table 6-8 Summary of Cumulative Effects and Mitigation					
Environmental Component	**Residual Effects of the Project**	**Project Phase**	**Cumulative Effects and Human Health / Ecological Implications**	**Mitigation / Compensation Initiatives**	**Residual Cumulative Effect**
Air Quality and Climate	Infrequent occasions where exceedance of applicable threshold occurs. The largest effect on air quality is due to releases of TSP (i.e., fugitive dust)	Construction	• Exceedances of the TSP criterion may occur more frequently or such exceedances may last longer. This cumulative effect will most likely occur under circumstances where Project construction activities are being undertaken simultaneously with those of other projects and activities being undertaken in close proximity.	• Effective mitigation of adverse cumulative effects can be achieved by: o Timing and coordination of multiple construction projects	• Increased dust levels
	Increased emissions of contaminants of concern resulting in reduced air quality. The largest effects on local and regional air quality are due to releases of acrolein and TSP (i.e., fugitive dust primarily)	Operations and Maintenance	• For the purpose of the cumulative effects assessment, Project emissions were compared with emissions from the transportation sector, and the background in Durham Region and Ontario for key contaminants. The following analysis indicates that the Project is not likely to cause an exceedance of an applicable reference criterion and is a negligible contributor to the contaminant inventory in the Regional Study Area and Ontario. • Project emissions (at full build-out) are expected to be much lower than background pollutant concentrations and most are well below applicable reference criteria. CO (8% of AAQC), NO2 (37% of AAQC), PM2.5 (67% of AAQC), PM10 (92% of AAQC), Formaldehyde (7%) and Acetalehyde (0.8% of AAQC), Acrolein (46% of AACQ) • Examining key pollutant emissions from the transportation sector in the context of emissions from all sectors for the Region of Durham, Project emissions (at full-build out) represent approximately 2.9% (NO), 0.17% (VOCs), 0.77% (PM10), and 0.22% (PM2.5) respectively of those from all sectors in the Region of Durham. Project contributions (at full build-out) to the provincial emissions levels are considered to be negligible. • The Project will generate 850,067 tonnes/year of GHG emissions, approximately 1.75%, of the total GHG emissions from the road transportation network in Ontario or 0.42% of total GHG emissions from all sectors in Ontario. • Cumulative TSP levels are likely to be measurable at a local level (i.e., in proximity of the highway) but not across the RSA or Ontario. • Precursors to ozone are generated well away from the transportation corridor, and overall emissions of ozone precursors (NOx and VOCs) per vehicle-kilometre travelled have and are expected to continue to decline in the foreseeable future. • Screening level health analysis indicates that the incremental health effects associated with exposure to pollutants in air attributable to emissions from the 407 are negligible today and would continue to be negligible into the foreseeable future.	• Effective mitigation of adverse cumulative effects can be achieved by: o Reduction of the transportation sector's contribution to emission through various MTO policies and actions. o Stricter federal vehicle emission and fuel consumption standards along with fuel quality standards o Implementation of amendments to O. Reg. 419/05 (Air Pollution – Local Air Quality) to establish new or updated Upper Risk Thresholds (URTs) for 1,3-butadiene, acetaldehyde, acrolein and benzene. o The many measures under way to manage contaminants of concern will likely result in continuing reductions in background levels of parameters of concern. As a result, it is reasonable to predict that cumulative effects will not exceed the relevant reference criteria. The Air Quality Impact Assessment Report (MTO Technical Reference document #9) describes relevant federal and provincial regulations.	• Reduced regional air quality (i.e., increased emission of contaminants of concern)
Noise and Vibration	Increased noise levels along the transportation corridor	Construction	• Exceedances of noise criteria may occur more frequently or such exceedances may last longer. This cumulative effect will most likely occur under circumstances where Project construction activities are being undertaken	• Noise levels would be reduced through the implementation of a construction code of practice, noise barriers, and the use of vegetative buffering	• Increased noise levels along the

Table 6-8 Summary of Cumulative Effects and Mitigation

Environmental Component	Residual Effects of the Project	Project Phase	Cumulative Effects and Human Health / Ecological Implications	Mitigation / Compensation Initiatives	Residual Cumulative Effect
			simultaneously with those of other projects and activities being undertaken in close proximity.	and screening to lessen the noise effects.	transportation corridor
	Increased noise levels along the transportation corridor	Operations and Maintenance	• Noise level for the future no-build scenario is likely to change from one where the majority of receptors are in a rural environment (sound levels < 50 dBA) to one with more urban or suburban characteristics, namely sound levels between 50 dBA and 60 dBA. • Project is not anticipated to substantially change the maximum and minimum sound levels experienced by existing NSAs. However, average sound levels will increase • Under future build scenario, 11 NSAs (~1%) will have future build sound levels greater than 65 dBA due to the project. 358 NSAs (~20%) have clearly noticeable increases in noise levels (> 5 dB change), 56 NSAs (~3%) will have a substantial increase (>10 dB change). More detailed assessment indicates that fewer NSAs will experience substantial increased noise levels. • Increased noise is likely to be experienced at 130 NSAs due to an operating airport in north Pickering should they be permitted to remain in the area upon the definition of an Airport Operating Area.	• Effective mitigation of adverse cumulative effects can be achieved by ensuring that future building design requirements for new construction are met by developers. The requirements for new residential construction are set out in MOE Publication LU-131 based on outdoor sound levels. • The GTAA has committed to working with all levels of government to implement an airport protection area based on the NEF 25 contour. This Airport Operating Area (AOA) would define land uses that are compatible and incompatible with airport operations to provide direction regarding future land use planning in the area. The AOA would take the noise effects of the highway operation into account at that time.	• Increased noise levels along the transportation corridor
Surface and Subsurface Geology and Soils	Changes in valley slopes and landform	Construction	• All large scale land developments or transportation infrastructure projects that will require site preparation, grading and earthmoving activities may encroach upon or traverse valley slopes and landforms, noticeably and permanently altering landscape composition. • Noticeable cumulative effects are not anticipated on the Oak Ridges Moraine (an important regional landform) as the Project traverses only a few kilometres of this feature at its eastern-most location, and there have been severe restrictions placed on large land development on the moraine. • Overall, the cumulative effects on valley slopes and landforms are the result of short term disturbances and are not likely to impair the ecological function of VECs over the long term.	• Implementing mitigation measures as part of the planning and approval processes for the various land developments and transportation infrastructure projects, including: o establishment of buffers along valleys and key landforms, o routing and engineering design of transportation infrastructure to avoid and/or minimize effects on valley lands, o valley slope restoration to appropriate grades following construction.	• Changes in valley slopes and landform
	Increased soil exposure to erosion	Construction	• The greatest potential for cumulative effects due to erosion is in the watersheds traversed by the western portion of the Project and the West Link, namely: Duffins Creek Watershed; Carruthers Creek Watershed; Lynde Creek Watershed; Pringle Creek Watershed; and Oshawa Creek Watershed. Within each of these watersheds, there are “Moderate” or “High Risk” areas located along the Project. • Cumulative effects will occur only under circumstances where 407 and other project construction activities are being undertaken simultaneously in close proximity to each other. These areas would include proposed developments identified in Secondary plans along the West Link, planned regional transportation network improvements, including the proposed arterial road (Type A and B) extensions that have planned connections (via new interchanges) to the Project and planned improvements to Highway 401.	• Timing and coordination of multiple construction projects; and • Ensuring other projects and activities implement comprehensive erosion and sediment control measures to comply with relevant Ontario Provincial Standards Specification (OPSS)	• Increased soil exposure to erosion

Table 6-8 Summary of Cumulative Effects and Mitigation

Environmental Component	Residual Effects of the Project	Project Phase	Cumulative Effects and Human Health / Ecological Implications	Mitigation / Compensation Initiatives	Residual Cumulative Effect
Groundwater	Lowering of groundwater table in surficial soils at locations with foundation excavations requiring dewatering	Construction	• Cumulative effects will occur under circumstances where construction activities are being undertaken in close proximity to each or several deep cuts and foundations are present in close proximity to each other (e.g., major interchanges). The level of the groundwater table will tend to adjust itself shortly after dewatering as foundation excavations cease, however the duration of the cumulative effect may be extended where multiple projects are being undertaken together. While possible, the circumstances that would cause measureable cumulative effects on groundwater are considered to be of low probability, infrequent, short term in duration and highly localized. Multiple projects that require major dewatering and occur in close proximity to each other are highly unlikely. There are no certain or reasonably foreseeable projects or activities located along the transportation corridor that might require dewatering of the magnitude required for the Project and therefore cause measureable cumulative effects. It is also not likely that deep cuts and major foundation excavations required for the Project would occur in the same location.	• Timing and coordination of multiple construction projects; • Consideration of the potential for multiple projects in PTTW terms and conditions • meeting all relevant provincial guidelines and standards regarding groundwater management and Permits to Take Water. • Preparation of Master Environmental Servicing Plans and potentially Neighbourhood Plans for new developments.	• Lowering of groundwater table in surficial soils at locations of foundation excavations requiring dewatering
	Lowering of groundwater table in surficial soils at locations of deep cuts	Construction and Operations and Maintenance	• Cumulative effects will occur under circumstances where construction activities are being undertaken in close proximity to each other or several deep cuts and foundations are present in close proximity to each other (e.g., major interchanges). The level of the groundwater table will tend to adjust itself shortly after dewatering as major cuts cease, but localized depression of groundwater levels are likely to persist. While possible, the circumstances that would cause measureable cumulative effects on groundwater are considered to be of low probability, infrequent, short term in duration and highly localized. There are no certain or reasonably foreseeable projects or activities located along the transportation corridor that might require major cuts of the magnitude required for the 407 and therefore cause measureable cumulative effects. It is also not likely that deep cuts and major foundation excavations required for the Project would occur in the same location.	• Timing and coordination of multiple construction projects; • Ensuring that all future development, including new transportation infrastructure, meets the broader planning objectives of the Provincial Policy Statement (2005) and those of local municipalities and Conservation Authorities as set out in their various watershed management plans and the objectives of the Greenbelt Plan. • meeting all relevant provincial guidelines and standards regarding groundwater management and Permits to Take Water. • Preparation of Master Environmental Servicing Plans and potentially Neighbourhood Plans for new developments.	• Lowering of groundwater table in surficial soils at locations of deep cuts requiring dewatering
	Alteration of groundwater flow and levels in surficial soils at locations of major fills and foundation structures	Construction and Operations and Maintenance	• Cumulative effects will occur under circumstances where construction activities are being undertaken in close proximity to each other. While possible, the circumstances that would cause measureable cumulative effects on groundwater are considered to be of low probability, infrequent, short term in duration and highly localized. There are no certain or reasonably foreseeable projects or activities located along the transportation corridor that might require major fills or foundation structures of the magnitude required for the Project and therefore cause measureable cumulative effects. Altered groundwater flow patterns will tend to adjust themselves shortly after the placement of major fills or foundation structures minimizing duration of measureable cumulative effects. Effects on groundwater levels in surficial soils at locations of major fills and foundation structures are likely to persist for some time over the planning horizon.	• Same as above	• Alteration of groundwater flow and levels in surficial soils at location of major fills and foundation structures
	Reduction in	Operations and	• Measureable cumulative effects will likely be limited to locations along the	• Same as above.	• Reduction in

Table 6-8 Summary of Cumulative Effects and Mitigation

Environmental Component	Residual Effects of the Project	Project Phase	Cumulative Effects and Human Health / Ecological Implications	Mitigation / Compensation Initiatives	Residual Cumulative Effect
	groundwater quality in surficial soils	Maintenance	transportation corridor where there is already an existing road crossing or a new crossing is proposed (i.e., a new interchange). • Existing and future built up areas represent ongoing non-point sources of contaminants to groundwaters. Future growth and development will add approximately 37% to the existing built up areas. New built up areas adjacent to the Project are primarily located in the western portions of the transportation corridor and the West Durham Link. Little or no such planned growth is slated for development prior to 2031 in east Oshawa and the Municipality of Clarington. • Agricultural land uses also represent ongoing non-point sources of contaminants to groundwaters. The most common contaminants from agricultural practices include: nutrients and pesticides. Miscellaneous other compounds such as fuels, solvents, paints, heavy metals and waste products may also contribute to impaired groundwater quality due to agricultural practices. • Refer to Effects on Surface water for human health implications.	• With respect to road salt, the Government of Canada has no plans for banning the use of road salts or proposing any measures that would compromise or reduce road safety. As such, effective mitigation of adverse cumulative effects can be achieved by the implementation of: o the MTO Road Salt Management Plan, and o the Canadian Environmental Protection Agency Code of Practice for the Environmental Management of Road Salts; o other best management practices (BMP) developed by the Transportation Association of Canada (TAC) o Durham Region and its lower tier municipalities have prepared and continue to implement road salt management plans that allow each municipality to comply with the Federal code of practice. o Durham Region is in the process of defining appropriate measures to implement, manage and/or eliminate the associated risks to the underlying groundwater from existing and potential sources of contamination through its Wellhead Protection Management Program.	groundwater quality in surficial soils
Surface Water	Increased turbidity in 79 natural watercourses	Construction	• Cumulative effects will occur only under circumstances where construction activities are being undertaken simultaneously in close proximity to each other. While possible, these circumstances are considered to be of low probability, infrequent, short term in duration and highly localized. Measureable effects are likely to be limited to areas immediately downstream of each crossing.	• Timing and coordination of multiple construction projects; • Ensuring other projects and activities implement comprehensive erosion and sediment control measures to comply with relevant Ontario Provincial Standards Specification (OPSS)	• Increased turbidity
	Treated effluent discharged from stormwater management facilities into 79 natural watercourses	Operations and Maintenance	• Existing and future transportation facilities will result in stormwater discharges to natural watercourses, representing continuous and long-term source of contaminants such as debris, suspended solids, road salt, oil and grease, polycyclic aromatic hydrocarbons (PAHs) and metals. Discharges are also likely to be warmer than the receiving watercourse, therefore having a thermal effect. • The Project in combination with the other projects and activities will result in an additional 273 crossings and/or increased activity at existing crossings. This represents an increase of approximately 26%, with the watercourses within the Tooley Creek and Harmony Creek watersheds likely to experience the greatest	• Ensuring that all future development, including new transportation infrastructure, meets the broader planning objectives of the Provincial Policy Statement (2005) and those of local municipalities and Conservation Authorities as set out in their various watershed management plans and the objectives of the Greenbelt Plan. • preparation of Master Environmental Servicing Plans and potentially Neighbourhood Plans for	• Decreased surface water quality due to effluent discharges

Table 6-8 Summary of Cumulative Effects and Mitigation					
Environmental Component	**Residual Effects of the Project**	**Project Phase**	**Cumulative Effects and Human Health / Ecological Implications**	**Mitigation / Compensation Initiatives**	**Residual Cumulative Effect**
			effects. • The Project will result in a relatively small number of additional crossings, representing an increase of approximately 7% over existing watercourse crossings and 28% of the additional future crossings. • Measureable cumulative effects will likely be limited to locations along the transportation corridor where there is already an existing crossing or a new crossing is proposed and are likely to be limited to areas immediately downstream of each crossing,. • Most of water crossings associated with the Project will be associated with a SWM facility and stormwaters will receive a high level of treatment prior to discharge. In the worst case, these new crossings will represent additional direct sources of contaminants to the watercourses within each watershed. • The overall risk to human health associated with the lead, chromium, cadmium and petroleum hydrocarbons likely to be found in runoff was considered to be low. Sulphate does not have any human health implications related to it. • Concentrations of sodium and chloride that may exceed ODWS and released from SWM ponds into local water courses offer no risk to human health as the receiving water bodies are not used for drinking water • Under certain groundwater conditions the highly toxic and volatile hydrogen cyanide (HCN) can be produced when sodium ferrocyanide reacts with iron in groundwater. Based on groundwater modelling, the concentration of Hydrogen Cyanide (HCN) in groundwater will be less than the ODWS outside of the right of way. Based on this, it was concluded that sodium ferrocyanide in road salt does not present a health risk. • Given that contaminants likely to be found in runoff (e.g., nickel, zinc, copper, lead, chromium, cadmium and ptetroleum hydrocarbons and nutrients) are not likely to be discharged to surface waters at levels that would be toxic to aquatic life, cumulative effects on populations of fish and other aquatic organisms are not considered likely.	new developments. • meeting all relevant provincial guidelines and standards regarding stormwater management. • the application of best management practices regarding fertilizers, manures, pesticides, and controlling erosion and runoff through various practices as advocated by Agriculture and Agri-food Canada (AAFC) and the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA). • See Groundwater measures	
Vegetation and Vegetation Communities	Loss of 350.1 ha of existing vegetation and vegetation communities.	Construction	• The cumulative removal of forested areas is approximately 476 ha, representing a decrease of 2.8% of all existing forested areas. The Project , represents approximately 24% of all potential removals or 0.67% of existing forested areas.	• MTO plans to restore, enhance and create vegetation communities at a ratio of a minimum of 1:1 in order to ensure that the potential for a cumulative effects resulting from the 407 East Transportation Corridor over the longer term is as low as possible. Effective mitigation of adverse cumulative effects on vegetation and vegetation communities can be achieved by: • ensuring that all future development, including new transportation infrastructure, meets the broader planning objectives of the Provincial Policy Statement (2005) and those of local municipalities and Conservation Authorities as set out in their various watershed management plans and the objectives of the Greenbelt Plan.	• Some loss of vegetation and vegetation communities

Table 6-8 Summary of Cumulative Effects and Mitigation

Environmental Component	Residual Effects of the Project	Project Phase	Cumulative Effects and Human Health / Ecological Implications	Mitigation / Compensation Initiatives	Residual Cumulative Effect
	Loss of 28.9 ha of interior forest habitat	Construction	• The cumulative removal of interior forested areas is approximately 280 ha, representing a decrease of 4.5% of all existing forested areas with some interior forest habitat. • The Project, represents approximately 10% of all potential removals or 0.57% of existing interior forest habitat available in the RSA.	• Same as above • As part of the proposed 1:1 vegetation replacement strategy, strategic planting can be undertaken in existing forested areas to mitigate for cumulative losses of interior forest habitat.	• Reduced area of interior forest habitat
	Reduction in the quality/ function of the retained portion of vegetation communities along/adjacent to the transportation corridor, including vegetation and vegetation communities sensitive to groundwater or surface drainage alteration and exposure to fugitive dust, light, wind and sun exposure.	Construction and Operations and Maintenance	• The encroachment of new development on existing forested areas will likely result in the further reduction in the quality /function of the retained portions of forested areas and/or other vegetation and vegetation communities, including those sensitive to groundwater alteration and exposure to fugitive dust. There are 26 various vegetation communities that were considered to be sensitive to groundwater alteration. Of these 26, only 14 vegetation communities have the potential to be affected by multiple projects. At these locations, cumulative effects on the quality/function of these communities will likely occur over time as new developments are approved and constructed. Nevertheless, cumulative effects are likely to persist for some time over the planning horizon.	• Same as above	• Reduced quality/function of retained vegetation and habitat
Wetlands	Loss of 62.2 ha of wetland area.	Construction	• The maximum potential cumulative removal of wetlands is approximately 309 ha, representing a decrease of 5.4% of all existing wetlands with the greatest potential losses occurring in the Duffins Creek and Lynde Creek watersheds as a result of future growth and development and potential development of the Pickering airport in the northern portions of these watersheds. • The Project, represents approximately 20% of all potential removals or 1.1% of existing wetland areas. • It is not considered likely that all of these wetland areas would need to be completely removed, and to the extent possible, new projects and activities would likely be planned to avoid the removal of most wetland areas, particularly Provincially Significant Wetlands.	• MTO plans to restore, enhance and create wetland communities in order to ensure that the potential for a cumulative effect resulting from the 407 East Transportation Corridor over the longer term is minimized to the extent possible. Other project proponents may also contribute to the management of cumulative effects, by planning new development in a manner that minimizes losses and disruption; creating and enhancing existing wetlands on their properties. • The ongoing protection of wetland areas depends upon the commitment of municipal governments to zone wetlands as natural areas where no development can occur. • The effective mitigation of adverse cumulative effects on wetlands can be achieved by ensuring that all future development, including new transportation infrastructure, meets the broader planning objectives of the Provincial Policy Statement (2005) and those of local municipalities and Conservation Authorities as set out in their various watershed management plans and the objectives of the Greenbelt Plan.	• Increased loss of wetland areas

Table 6-8 Summary of Cumulative Effects and Mitigation					
Environmental Component	**Residual Effects of the Project**	**Project Phase**	**Cumulative Effects and Human Health / Ecological Implications**	**Mitigation / Compensation Initiatives**	**Residual Cumulative Effect**
				• The federally led Great Lakes Wetland Conservation Action Plan (GLWCAP) also provides for long term Mitigation/ Compensation Measures for the adverse cumulative effects on wetlands through the co-operative action of a number of stakeholders.	
	Reduction in the quality/ function of the retained portion of wetlands along the transportation corridor, including wetlands sensitive to turbidity, stormwater contaminants, groundwater or surface drainage alteration.	Construction and Operations and Maintenance	• The encroachment of new development on existing wetland areas will likely result in the further reduction in the quality/function of the retained portions of wetlands, including those sensitive to turbidity and groundwater alteration. These reductions in quality/function may be noticeable within individual wetlands affected by multiple projects (i.e., Harmony-Farewell Iroquois Beach Wetland Complex and Lynde Creek Coastal Wetland Complex) • Cumulative effects attributable to the Project are likely to be noticeable in those portions of these two wetland complexes that are closest to the highway, and where turbidity and groundwater alteration are likely to be measureable. At these locations, cumulative effects on the quality/function of these habitats would occur over time as new developments are approved and constructed. Nevertheless, they are likely to persist for some time over the planning horizon. • All other evaluated wetlands in the RSA are located well away from the Project where measureable effects from the transportation corridor are not anticipated, and any reductions in their quality/function would be attributable to the other projects and activities only.	• Same as above.	• Reduced quality/function of retained portions of wetlands
Wildlife and Wildlife Habitat, including Migratory Birds	Restrictions to wildlife movement and increased wildlife mortality	Construction and Operations and Maintenance	• Approximately 400 km of new roads, road widenings or transit improvements will be undertaken in the RSA over the next 25 years to ensure adequate capacity. • Given the size of the Project, the west to east orientation of the mainline (i.e., crossing north-south wildlife migration routes along creek valleys), and the anticipated large volumes of traffic it is likely to accommodate, the Project is likely to be the greatest new impediment to wildlife movement and source of wildlife mortality in the RSA.	• Effective mitigation for adverse effects on wildlife and wildlife habitat, including migratory birds is through avoidance of features of concern (with appropriate buffer zones) and ensuring that new development and infrastructure projects fulfill the requirements of the *Planning Act*, Ontario's *Environmental Assessment Act* (e.g., the Municipal Class EA, or an individual Environmental Assessments) and/or the Canadian *Environmental Assessment Act*. These planning processes provide the best opportunity for developing siting and routing alternatives that minimize the potential for adverse effects. • MTO project design includes the provision of wildlife crossing structures and funnel fencing.	• Restrictions to wildlife movement and increased wildlife mortality
	Disruption to wildlife within the retained portion of vegetation communities and wetlands along the transportation corridor, including wildlife	Construction and Operations and Maintenance	• Increased urbanization will also disrupt wildlife within the retained portions of vegetation communities and wetlands along the transportation corridor. • Noticeable cumulative disruption effects attributable to the Project are likely limited to the immediate area surrounding the transportation corridor ROW, where new land developments have been approved and constructed. It is these areas that will tend to disrupt wildlife the most, particularly species sensitive to fugitive dust, noise, light, surface water and groundwater effects.	• Same as above	• Disruption to wildlife within the retained portions of vegetation communities

Table 6-8 Summary of Cumulative Effects and Mitigation

Environmental Component	Residual Effects of the Project	Project Phase	Cumulative Effects and Human Health / Ecological Implications	Mitigation / Compensation Initiatives	Residual Cumulative Effect
	species sensitive to habitat size/diversity, fugitive dust, noise, light, surface water and groundwater effects.		• Given the magnitude of these potential cumulative losses in the context of available habitat, and the magnitude of dust, noise, surface water and ground water effects resulting from the Project, it is considered unlikely that measureable declines in the populations of most wildlife species or their use of retained habitat will occur at a regional scale.		and wetlands
Species at Risk	Removal of 83 Butternut trees, including 3 seedlings (34 are considered retainable)	Construction	• It is highly likely that other projects and activities, particularly new watercourse crossings that may encroach into riparian habitat, will require that Butternuts be removed. However, it is not possible to quantify the number of individual trees that exist in the RSA nor cumulative removals. • Given a conservative estimate of the population in Ontario (largely located in southern Ontario off the Canadian Shield) is 13,000 trees, the total removal of 83 individual Butternut trees as a result of the Project represents approximately 0.6% of the remaining population. Given that less than half of these are considered retainable, the magnitude of these losses is considered very small. • Under Ontario's *Endangered Species Act*, the overall goal of the recovery strategy is to achieve a net beneficial effect on the species. Over the long term, the potential for cumulative adverse effects is anticipated to diminish. Ongoing monitoring will help ensure effectiveness of the strategy.	• Effective mitigation measures regarding the loss of Butternut as a result of the 407 East Transportation Corridor are currently being developed by MTO in consultation with the Ministry of Natural Resources (MNR) and the Forest Gene Conservation Association (FGCA). The draft mitigation strategy recommended by MTO, will continue to evolve but is available for application by other project proponents. • Mitigation for potential effects resulting from other projects and activities will likely be in place as part of a recovery strategy for Butternut, and Butternut related policies that are being developed to support the implementation of the *Endangered Species Act*.	• Removal of individual Butternut Trees
	Disruption to Redside Dace habitat at eight (8) watercourse crossings.	Operations	• It is highly likely that other projects and activities, particularly new watercourse crossings of cold water reaches will affect Redside Dace habitat. However, it is not possible to quantify the numbers or specific locations where Redside Dace habitat is found with certainty. There is a high potential for cumulative effects within those watersheds affected by the transportation corridor known to contain Redside Dace at the eight (8) 407 East Transportation Corridor crossings (i.e., Duffins Creek, Carruthers Creek and Lynde Creek watersheds). • The Project in combination with other projects and activities will require an additional 122 watercourse crossings within cold water reaches of natural watercourses in the Duffins Creek, Carruthers Creek and Lynde Creek watersheds or an increase of 29.34% over the total number of existing crossings. • Under Ontario's *Endangered Species Act*, the overall goal of the recovery strategy is to achieve a net beneficial effect on the species. Over the long term, the potential for cumulative adverse effects is anticipated to diminish over time. Ongoing monitoring help ensure effectiveness of the strategy.	• See Wildlife and Wildlife Habitat. • General mitigation measures aimed at protecting fish and fish habitat, applicable to MTO are likely to be implemented by other project proponents at locations where Red-side Dace habitat is confirmed. • In situations where Redside Dace are present, a specific assessment program will need to be developed and implemented, in consultation with the recognized experts and appropriate agency staff and in accordance with the *Endangered Species Act* (ESA) process. • In addition, local Conservation Authorities have set a number of objectives regarding Species at Risk that are aimed at protection and restoration of habitats. The Greenbelt Plan is committed to protection, maintenance and enhancement of natural heritage, hydrologic and landform features and functions, including protection of habitat for flora and fauna and particularly species at risk.	• Increase disruption to Redside Dace habitat
	Disruption to habitat of Blanding Turtle, Golden-winged Warbler and Bobolink		• It is highly likely that other projects and activities may encroach into habitat occupied by the Blandings Turtle, Golden-winged Warbler and Bobolink. However, it is not possible to quantify the number of individuals affected nor the cumulative removal of their habitat. Cumulative effects may be experienced in	• See Wildlife and Wildlife habitat • In addition, local Conservation Authorities have set a number of objectives regarding Species at Risk that are aimed at protection and restoration	• Increased disruption to habitat of Blandings

Table 6-8 Summary of Cumulative Effects and Mitigation

Environmental Component	Residual Effects of the Project	Project Phase	Cumulative Effects and Human Health / Ecological Implications	Mitigation / Compensation Initiatives	Residual Cumulative Effect
			proportion to the overall loss of forested areas, interior forest habitat and wetlands.	of habitats. The Greenbelt Plan is committed to protection, maintenance and enhancement of natural heritage, hydrologic and landform features and functions, including protection of habitat for flora and fauna and particularly species at risk.	Turtle, Golden-winged Warbler and Bobolink
Socio-economic Environment	Changes in community character due changes in landscape composition and effects of fugitive dust, noise and light.	Construction and Operations and Maintenance	• The character of every community in the RSA to some extent, but primarily from their combined effects on landscape composition due to the disruption to the pastoral quality and landscape connectivity caused by changes in topography, the loss of agricultural land; the actual physical obstruction of the transportation corridor along with new urban/suburban developments; as well as the removal of natural and cultural resources associated with each new development. • With the exception of the hamlet of Kinsale, there are no other projects or activities that would directly affect the character of small hamlets as they are all located within the Greenbelt, well removed from any existing or proposed urban/suburban development. Kinsale, located at the intersection of Kinsale Road and Highway 7 in the City of Pickering is likely to be surrounded and transformed by the new residential, commercial and industrial development, effectively transforming this rural hamlet into an area with an urban/suburban character. • The character of the south Clarington area is likely to change during both the construction phase as well as the operations and maintenance phase. Here, it is anticipated that that the "look and feel" of this rural area will change to a planned mix of light industrial and commercial uses. Land uses over time are likely to gradually change from non-industrial uses to more industrial uses. These cumulative effects are considered to be compatible with the existing community character during the Construction Phase of the Project, and a strengthening of an existing and growing industrial presence along the waterfront and the Highway 401 corridor during the Operations and Maintenance Phase. • Overall, with the exception of lands within the Greenbelt, land uses across the RSA are likely to gradually change to more intense residential, commercial and industrial uses.	• Effective mitigation of adverse cumulative effects on the socio-economic environment can be achieved by ensuring that all future development, including new transportation infrastructure, meets the broader planning objectives of the Provincial Policy Statement (2005), those of regional and local municipalities as set out in their Official Plans, and the objectives of the Greenbelt Plan.	• Changes in community character
	Reduced agricultural activity due to changes in landscape composition (i.e., loss and/or severance of 2068.3 ha of agricultural land)	Construction and Operations and Maintenance	• Reduced agricultural activity will likely occur across the RSA as a result of the change in landscape composition (i.e., the loss and/or severance of agricultural land). The cumulative amount of Class 1, 2 or 3 agricultural land that may be removed from agricultural production is 9,823 ha. • The Project represents a loss of 19% of all potential agricultural removals or 3.3% of available Class 1, 2 or 3 agricultural soils. • The Project and general growth and development in the RSA will continue the pattern of loss of farmers and the division of farm properties that can also be seen on a larger scale across Durham Region and Ontario.	• Same as above	• Reduced Agricultural Activity
	Disruption to the use and enjoyment of property due to encroachment/proximit	Construction and Operations and Maintenance	• The Project has some potential to affect up to 1827 properties (i.e., the number of receptor locations within 500 m of the transportation corridor) due to disruption of their use and enjoyment of property resulting from increased fugitive dust, noise and light along the ROW and a general change in landscape composition.	• Same as above	• Disruption to the use and enjoyment

Table 6-8 Summary of Cumulative Effects and Mitigation					
Environmental Component	**Residual Effects of the Project**	**Project Phase**	**Cumulative Effects and Human Health / Ecological Implications**	**Mitigation / Compensation Initiatives**	**Residual Cumulative Effect**
	y of transportation corridor (i.e., increased nuisances), changed community character and landscape composition.		Assuming that each property represents one household and 2.6 persons per household, it can be very conservatively estimated that a total of 5,138 persons may experience some disruption to their use and enjoyment of property. • Increased disruption to the use and enjoyment of property is particularly likely in the area closest to the East Durham Link at Highway 401 in south Clarington. Here, there is a high potential for existing and future projects and activities to cause similar effects as the Project (i.e., noise, dust, light, landscape composition) that are likely to disrupt people's use and enjoyment of property in a relatively small geographic area during both their construction phases as well as the operations and maintenance phases. No cumulative adverse effect on population or population growth is anticipated. Residents living and/or working in this area of the Municipality of Clarington may notice the change locally. • Cumulative effects on people's use and enjoyment of property of an operating Pickering Airport and the transportation corridor are also likely should airport development proceed. A cumulative effect may be experienced at 130 existing NSAs should they be permitted to remain in the area upon the definition of an Airport Operating Area. The AOA would be a noise impact area (based on a Noise Exposure Forecast (NEF) 25 contour) that would extend well off the Pickering Airport lands and over the 407 East Transportation Corridor almost to the Pickering-Whitby border.		of private property

6.19.3 Residual Cumulative Effects

Based on the results of the cumulative effects analysis, Table 6-9 summarizes the residual cumulative effects of the Project in combination with other projects and activities.

Table 6-9 Summary of Residual Adverse Cumulative Effects

Environmental Component	Residual Adverse Cumulative Effect	Project Phase	VEC Affected
Air Quality and Climate	Increased dust levels	Construction	• Air Quality Sensitive Receptors (Human/Ecological Receptors)
	Reduced regional air quality (i.e., increased emission of contaminants of concern)	Operations and Maintenance	• Air Quality Sensitive Receptors (Human/Ecological Receptors)
Noise and Vibration	Increased noise levels along the transportation corridor	Construction	• Noise Sensitive Areas (Human/Ecological Receptors)
	Increased noise levels along the transportation corridor	Operations and Maintenance	• Noise Sensitive Areas (Human/Ecological Receptors)
Surface and Subsurface Geology and Soils	Changes in valley slopes and landform	Construction	• Surface Waterbodies/watercourses
	Increased soil exposure to erosion	Construction	• Surface Waterbodies/watercourses
Groundwater	Lowering of groundwater table in surficial soils at location of foundation excavations requiring dewatering	Construction	• Groundwater in Surficial Soils • Surface Waterbodies/watercourses • Wetlands • Specialized and Sensitive Wildlife Habitat
	Lowering of groundwater table in surficial soils at locations of deep cuts requiring dewatering	Construction, Operations and Maintenance	• Groundwater in Surficial Soils • Surface Waterbodies/watercourses • Wetlands • Specialized and Sensitive Wildlife Habitat
	Alteration of groundwater flow and levels in surficial soils at locations of major fills and foundation	Construction, Operations and Maintenance	• Groundwater in Surficial Soils • Surface Waterbodies/watercourses

Environmental Component	Residual Adverse Cumulative Effect	Project Phase	VEC Affected
	structures		• Wetlands • Specialized and Sensitive Wildlife Habitat
	Reduction in groundwater quality in surficial soils	Operations and Maintenance	• Groundwater in Surficial Soils • Surface Waterbodies/watercourses • Wetlands • Specialized and Sensitive Wildlife Habitat
Surface Water	Increased turbidity	Construction	• Surface Waterbodies/watercourses • High Sensitivity • Fish Habitat
	Decreased surface water quality due to effluent discharges	Operations and Maintenance	• Surface Waterbodies/watercourses • High Sensitivity • Fish Habitat
Vegetation and Vegetation Communities	Increased loss of vegetation and vegetation communities	Construction	• Forested Areas • Specialized and Sensitive Wildlife Habitat
	Reduced area of interior forest habitat	Construction	• Forested Areas with Interior Habitat • Specialized and Sensitive Wildlife Habitat
	Reduced quality/function of retained vegetation and habitat	Construction, Operations and Maintenance	• Forested Areas • Forested Areas with Interior Habitat • Specialized and Sensitive Wildlife Habitat
Wetlands	Increased loss of wetland areas	Construction	• Wetlands
	Reduced quality/function of retailed portions of wetlands	Construction, Operations and Maintenance	• Wetlands • Specialized and Sensitive Wildlife Habitat
Wildlife and Wildlife Habitat, including Migratory Birds	Restrictions to wildlife movement and increased wildlife mortality	Construction, Operations and Maintenance	• Mammals and Amphibians
	Disruption to wildlife within the retained portions of vegetation communities and wetlands	Construction, Operations and Maintenance	• Mammals, Amphibians, Breeding/Migratory Birds • Federal (COSEWIC) Species at Risk
Species at Risk	Removal of individual Butternut Trees	Construction	• Federal (COSEWIC) Species at Risk

Environmental Component	Residual Adverse Cumulative Effect	Project Phase	VEC Affected
	Increase disruption to Redside Dace habitat	Construction	• Federal (COSEWIC) Species at Risk
	Increased disruption to Blanding Turtle, Golden-winged Warbler and Bobolink habitat	Construction, Operations and Maintenance	• Mammals, Amphibians, Breeding/Migratory Birds • Federal (COSEWIC) Species at Risk
Socio-economic Environment	Changes in community character	Construction, Operations and Maintenance	• Community character
	Reduced Agricultural Activity	Construction, Operations and Maintenance	• Agricultural Operations • Class 1,2 and 3 Agricultural Soils
	Disruption to the use and enjoyment of private property	Construction, Operations and Maintenance	• Use and enjoyment of private property

6.19.4 Government and Public Comments

Comments from government agencies and the public were provided regarding cumulative effects during the review of the provincial EA and during the CSR.

A member of the public requested that a cumulative effects assessment be undertaken and that the Seaton lands and the Pickering Airport be considered in the EA. MTO responded that the Seaton Lands and the Pickering Airport and the potential interactions between those projects and the Project were considered throughout the 407 study during the problems and opportunities phase and the alternatives to the undertaking phase. Potential development of the Seaton lands was accounted for in the demand forecast modelling, based on population and employment figures from Growth Plan for the Greater Golden Horseshoe. As the Pickering Airport has not been approved, it was not explicitly used in the modelling for the Project. The cumulative effects of the Seaton Lands, Pickering Airport and other projects in Durham Region have been considered in this CSR.

EC requested clarification as to why individual watersheds not affected by the Project were included (i.e., Corbett, Darlington, Goodman, Pringle and Robinson Creeks) in the cumulative effects analysis for the consideration of surface water effects. In EC's opinion, the inclusion of these watersheds biased quantitative cumulative effects analysis. However, in regard to the consideration of forested areas, interior forest habitat and wetlands, EC agreed that the loss of these natural features would be better placed in a regional/watershed context and that MTO's cumulative effects analysis should not be limited to only to those watersheds directly affected by the Project. EC requested that surface water analysis be amended appropriately. EC also requested that MTO report on the total number of Butternut trees to be removed in the context of the cumulative effects assessment. MTO revised the cumulative effects analyses.

HC suggested to the Agency and RAs that $PM_{2.5}$ and Ozone be considered in the cumulative effect analysis and appropriate mitigation measures be applied in order to reduce potential risk to human health. MTO's cumulative effects assessment has considered these two contaminants.

The Agency is satisfied that the cumulative effects assessment and that it fulfills the requirements under the Act.

7 Significance Assessment

7.1 Approach

As noted in section 6, the environmental assessment concluded that taking into account the relevant mitigation measures, no residual adverse effects are anticipated on the following environmental components. Therefore, these are not described further in the significance framework analysis:

- cultural environment (see section 6.12);
- the current use of lands and resources by Aboriginal people (see section 6.13);
- contaminated sites and waste management (see section 6.14);
- the capacity of renewable resources (see section 6.15);
- effects of the environment on the Project (see section 6.16);
- accidents and malfunctions (see section 6.17).

The following criteria were defined in relation to assessing the significance of the residual adverse effects from the 407 East Transportation Corridor:

Magnitude.....The size or degree of the effects compared against baseline conditions or reference levels, and other applicable measurement parameters (i.e., standards, guidelines, objectives).

Extent.....The geographic area over or throughout which the effects are likely to be measurable.

Duration.....The time period over which the effects are likely to last.

Frequency.....The rate of recurrence of the effects (or conditions causing the effect).

Permanence.....The degree to which the effects can or will be reversed (typically measured by the time it will take to restore the environmental attribute or feature).

Ecological Context The importance of the environmental attribute or feature to ecosystem health and function.

Table 7-1 provides the framework that was used to assess the degree of residual adverse effects. This framework includes the assessment criteria and definitions for three degrees of residual effects - low, medium and high. The determination of the degree of residual effects framed to generally reflect federal and provincial regulatory and industry standards and guidelines to the extent possible. In cases where these points of reference were not available, the assessments were made based on best professional judgement concerning the type and nature of the environmental effects.

Table 7-1 Assessment of Residual Effects

Table 7-1 Assessment			
Assessment Criteria	**Degree of Residual Effect**		
	Low	**Medium**	**High**
Magnitude of Effect	Project-specific and/or cumulative effects may be noticeable and/or measureable, but are not likely to exceed a reference criterion or guideline value.	Project-specific and/or cumulative effects are likely to be noticeable and measureable, representing a small change relative to existing condition. Adverse effects may exceed a reference criterion or guideline value on occasion and/or at an individual location.	Project-specific and/or cumulative effects are likely to be noticeable and measureable, representing large measureable changes relative to existing conditions. Adverse effects caused by the Project are likely to result in a reference criterion or guideline being exceeded on an ongoing basis across the RSA.
Extent of Effect	Project-specific and/or cumulative effects are likely to be measureable within an area immediately surrounding the Project ROW, generally within 500 m. Adverse effects may be experienced within a few hamlets/built up areas traversed by the transportation corridor.	Project-specific and/or cumulative effects are likely to be noticeable and/or measureable within the RSA or within most of the hamlets/built up areas traversed by the transportation corridor.	Project specific and/or cumulative effects are likely to be noticeable or measureable within the RSA. Adverse effects will be experienced by all hamlets/built up areas traversed by the transportation corridor and/or having adverse implications for VECs beyond the RSA.
Duration/Timing (of effect)	Project-specific and/or cumulative effects result from short-term events, are considered to be short-term disturbances or losses limited to within the planning horizon (i.e., up to 2031).	Project-specific and/or cumulative effects are ongoing effects related to the Construction and/or Operations and Maintenance phases of the Project.	Project-specific and/or cumulative effects are ongoing effects that are likely to persist beyond the Construction and/or Operations and Maintenance phases of the Project and there are the effects are not readily reversible despite the implementation of mitigation and/or compensation measures (see Permanence criterion

Table 7-1 Assessment			
Assessment Criteria	**Degree of Residual Effect**		
	Low	**Medium**	**High**
			below).
Frequency (or probability)	Conditions or phenomena causing a Project-specific effect occur infrequently or are effectively one-time events during the project phase in which they occur. A few other projects or activities causing cumulative effects are likely to occur along with the 407 East Transportation Corridor. They will occur periodically over the planning horizon (i.e., up to 2031).	Conditions or phenomena causing a Project-specific effect occur at regular but infrequent intervals during the project phase in which they occur. Several projects or activities causing cumulative effects are likely to occur along with the 407 East Transportation Corridor. They will occur periodically over the planning horizon.	Conditions or phenomena causing a Project-specific effect occur at regular and frequent intervals, or are ongoing conditions during the project phase in which they occur. The majority of projects or activities causing cumulative effects are likely to occur along with the 407 East Transportation Corridor. They are likely to occur frequently or repeatedly over the planning horizon.
Permanence (of effect)	Measureable or noticeable project-specific and/or cumulative effects are not likely to persist over the planning horizon (i.e., up to 2031). Project-specific mitigation and/or compensation measures and potentially those of other projects and activities will ensure that long term cumulative effects attributable to the Project are not measureable.	Measureable or noticeable project-specific and/or cumulative effects are likely to persists for some time over the planning horizon. Adverse regional trends and cumulative effects attributable to the Project are potentially reversible.	Project-specific and/or cumulative effects are not readily reversible despite the implementation of mitigation and/or compensation measures. Adverse regional trends and cumulative effects attributable to the Project are likely to persist.
Ecological Importance (of a resource or VEC)	Not Applicable	The resource/VEC is common and abundant. The resource/VEC will continue to fulfill its ecological functions.	The resource/VEC is common across the Regional Study Area. Abundance and quality is required for the

Table 7-1 Assessment			
Assessment Criteria	**Degree of Residual Effect**		
	Low	**Medium**	**High**
			resource/VEC to continue to fulfill its ecological functions.

Based on the application of this framework, an effect could be categorized as negligible, minor, moderate or significant, according to the following definitions:

- **Negligible Adverse Residual Effects** are those environmental effects which, after taking into consideration mitigation measures, have a "low" degree of residual effect for the majority of the assessment criteria; or a "low" or "medium" degree of residual effect for the majority of the criteria with "low" permanence.
- **Minor Adverse Residual Effects** are those environmental effects which, after taking into consideration mitigation measures, have a "low" or "medium" degree of residual effect for the majority of the criteria.
- **Moderate Adverse Residual Effects** are those environmental effects which, after taking into consideration mitigation measures, have a "medium" degree of residual effect for the majority of the criteria or have a "low" or "medium" degree of residual effects for the majority of the criteria with "high" permanence.
- **Significant Adverse Residual Effects** are those environmental effects which, after taking into consideration mitigation measures, have "high" magnitude, "high" extent and "high" duration residual effects.

Table 7-2 provides the assessment of the project-specific and cumulative residual adverse environmental effects of the Project, including the Agency's conclusions on the significance of those effects.

Table 7-2 Significance of Residual Adverse Effects

Table 7.2 Significance of Residual Adverse Effects **Evaluation and Conclusions on the Significance of Residual Adverse Effects**										
Residual Adverse Effects	**Project Phase**	**VEC Affected**	**Predicted Degree of Impact**						**Overall Degree of Residual Effect**	**Agency Determination on Significance of Residual Adverse Environmental Effects**
			Magnitude	*Extent*	*Duration*	*Frequency*	*Permanence*	*Ecological Importance (of resource or VEC)*		
Increased Dust Levels *(Project-specific and Cumulative Effects)*	Construction	Air Quality Sensitive Receptors (Human/Ecological Receptors)	**Medium** Increased dust levels during construction of the 407 East Transportation Corridor and cumulative effects may exceed a reference criterion or guideline value on occasion or at an individual receptor location	**Low** Increased dust levels due to the Project and in combination with other projects and activities are likely to be measureable within 500 m of the 407 East Transportation Corridor	**Low** Adverse effects are likely to be short term (e.g., major earthworks during windy periods) in duration at any one receptor location along the ROW	**Low** Project-specific effects will occur periodically, but infrequently during the construction phase. Cumulative effects may occur as a result of a few other projects/activities that are likely to occur along the 407 East Transportation Corridor	**Low** Project-specific and cumulative effects are not likely to persist once the activities causing the effects have ceased	**High** Good air quality is required for the VEC to continue to function	**Negligible Effect**	The Project is not likely to cause significant adverse effects on air quality and climate
Reduced Local and Regional Air Quality *(Project-specific and Cumulative Effects of increased emission of contaminants of concern)*	Construction, Operations and Maintenance	Air Quality Sensitive Receptors (Human/Ecological Receptors)	**Medium** Small measureable changes to local and regional air quality relative to baseline conditions and may exceed a reference criterion or guideline value on occasion or at an individual receptor location. Adverse effects of the Project are not likely to result in the exceedance of a reference criterion or guideline value on an ongoing basis across the RSA.	**Medium** Adverse effects are likely to be noticeable or measureable within the RSA and in most hamlets/built up areas traversed by the transportation corridor	**Medium** Adverse effects are ongoing effects related to both the Construction and/or the Operations and Maintenance Phases of the 407 East Transportation Corridor. Adverse regional trends can be are reversible (see Permanence criterion)	**High** Conditions or phenomena causing Project-specific effects to occur are ongoing conditions. **Medium** Most projects and activities causing the cumulative effects are likely to occur along with the 407 East Transportation Corridor. Exceedances of reference criteria or guideline values are likely to occur periodically during the Operations and Maintenance Phase	**Medium** Reduced local and regional air quality is likely to persist over the planning horizon, but conditions contributing to regional trends and cumulative effects are likely to improve with the implementation of various Federal and Provincial government transportation and air quality initiatives	**High** Good air quality is required for the VEC to continue to function	**Moderate Adverse Effect**	The Project is not likely to cause significant adverse effects on air quality and climate
Increased Noise Levels Along the Transportation Corridor *(Project-specific and Cumulative Effects)*	Construction	Noise Sensitive Areas (Human/Ecological Receptors)	**Medium** Noise levels during construction may exceed a reference criterion or guideline value on occasion or at an individual receptor location	**Low** Adverse effects are likely to be measureable within 500 m of the 407 East Transportation Corridor.	**Low** Adverse effects are likely to be short term in duration at any one receptor location along the ROW (e.g., near a single construction site, pile driving location, etc.)	**Low** Project-specific effects will occur periodically, but infrequently during the construction phase Cumulative effects will occur periodically during the construction phase as a result of a few other projects/activities that	**Low** Adverse effects are not likely to persist once the activities causing the effects have ceased	**N/A**	**Negligible Effect**	Noise and vibration associated with the Project are not likely to cause significant adverse environmental effects

Table 7.2 Significance of Residual Adverse Effects

Evaluation and Conclusions on the Significance of Residual Adverse Effects

Residual Adverse Effects	Project Phase	VEC Affected	Predicted Degree of Impact						Overall Degree of Residual Effect	Agency Determination on Significance of Residual Adverse Environmental Effects
			Magnitude	*Extent*	*Duration*	*Frequency*	*Permanence*	*Ecological Importance (of resource or VEC)*		
						are likely to occur along the 407 East Transportation Corridor				
Increased Noise Levels Along the Transportation Corridor *(Project-specific and Cumulative Effects)*	Operations and Maintenance	Noise Sensitive Areas (Human/Ecological Receptors)	**Medium** Ambient noise levels will increase over baseline conditions and may exceed a reference criterion on occasion or at an individual receptor location	**Medium** Adverse effects are likely to be measureable and noticeable within the RSA and in most hamlets/built up areas traversed by the 407 East Transportation Corridor	**Medium** Adverse effects are ongoing effects related to the Operations and Maintenance Phase of the 407 East Transportation Corridor	**High** Conditions or phenomena causing Project-specific effects to occur are ongoing conditions **Medium** Most projects and activities causing the cumulative effects are likely to occur along with the 407 East Transportation Corridor. Exceedances of reference criteria or guideline values are likely to occur periodically during the Operations and Maintenance Phase	**High** Adverse effects are not readily reversible despite the implementation of mitigation / compensation. Adverse regional trends and cumulative effects attributable to the Project are likely to persist	**N/A**	**Moderate Adverse Effect**	Noise and vibration associated with the Project are not likely to cause significant adverse environmental effects
Changes in Valley Slopes and Landform *(Project-specific and Cumulative Effects)*	Construction	Surface Waterbodies/Watercourses	**Low** Adverse effects on valley slopes and landforms are likely to be observable along watercourses	**Medium** Adverse effects on valley slopes and landform are likely to be observable within the RSA	**Low** Adverse effects on valley slopes and landform result from short term events and are considered to be short term disturbances	**Low** Project-specific effects will occur periodically, but infrequently during the construction phase. **Medium** Several project and activities causing the cumulative effects are likely to affect the same valleys or landforms along the Project	**High** Cumulative effects on valley slopes and landforms are permanent	**Medium** Natural watercourses are common and abundant. Changes in valley slopes and landforms are not likely to impair the ecological functions of the VEC	**Moderate Adverse Effect**	The Project is not likely to cause significant adverse effects on surface water
Increased Soil Exposure to Erosion *(Project-specific and Cumulative Effects)*	Construction	Surface Waterbodies/Watercourses	**Low** Adverse effects are likely be measurable and/or noticeable, but are not likely to exceed a reference criterion or guideline value	**Low** Adverse effects are likely measurable and/or noticeable within an area immediately surrounding the Project and other projects/activities	**Low** Adverse effects are considered to be short term disturbances	**Low** Adverse effects may occur periodically during the construction phase and/or as a result of a few other projects/activities that are likely to occur along the Project	**Low** Adverse effects are not likely to be measurable or noticeable in the long-term planning horizon	**Medium** Natural watercourses are common and abundant. The resource / VEC will continue to fulfill its ecological functions	**Negligible Effect**	The Project is not likely to cause significant adverse effects on surface water

Table 7.2 Significance of Residual Adverse Effects

Evaluation and Conclusions on the Significance of Residual Adverse Effects

Residual Adverse Effects	Project Phase	VEC Affected	Predicted Degree of Impact						Overall Degree of Residual Effect	Agency Determination on Significance of Residual Adverse Environmental Effects
			Magnitude	*Extent*	*Duration*	*Frequency*	*Permanence*	*Ecological Importance (of resource or VEC)*		
Lowering of Groundwater Table in Surficial Soils at Locations of Foundation Excavations Requiring Dewatering *(Project-specific and Cumulative Effects)*	Construction	Groundwater in Surficial Soils Surface Waterbodies/Watercourses Wetlands Specialized and Sensitive Wildlife Habitat	**Low** Adverse effects are likely to be measurable and/or noticeable	**Low** Adverse effects are likely measurable and/or noticeable within an area immediately surrounding dewatering locations along the Project and/or other projects/activities involving groundwater extraction	**Low** Adverse effects are considered to be short term disturbances	**Low** Adverse effects are effectively one-time events but may occur periodically during the construction phase and/or as a result of a few other projects/activities that are likely to occur along the Project	**Low** Adverse effects are not likely to be measurable or noticeable in the long-term planning horizon	**Medium** Groundwater and natural watercourses are common and abundant. The resource / VEC will continue to fulfill its ecological functions	**Negligible Effect**	The Project is not likely to cause significant adverse effects on surface water, groundwater, wetlands and wildlife habitat
Lowering of Groundwater Table in Surficial Soils at Locations of Deep Cuts Requiring Dewatering *(Project-specific and Cumulative Effects)*	Construction, Operations and Maintenance	Groundwater in Surficial Soils Surface Waterbodies/Watercourses Wetlands Specialized and Sensitive Wildlife Habitat	**Low** Adverse effects are likely to be measurable and/or noticeable	**Low** Adverse effects are likely measurable and/or noticeable within an area immediately surrounding major cuts along the Project and/or other projects/activities involving groundwater extraction	**Medium** Adverse effects are ongoing effects related to the Construction and/or Operations and Maintenance phases of the 407 East Transportation Corridor and/or other projects/activities involving groundwater extraction	**High** Conditions or phenomena causing Project-specific effects to occur are ongoing conditions. **Low** Cumulative effects may occur periodically during the construction phase as a result of a few other projects/activities that are likely to occur along the 407 East Transportation Corridor	**Medium** Measureable or noticeable project-specific and/or cumulative effects are likely to persist for some time over the planning horizon. Adverse regional trends and cumulative effects attributable to the Project are potentially reversible.	**Medium** Groundwater and natural watercourses are common and abundant. The resource/VEC will continue to fulfill its ecological functions	**Minor Adverse Effect**	The Project is not likely to cause significant adverse effects on surface water, groundwater, wetlands, wildlife habitat
Alteration of Groundwater Flow and Levels in Surficial Soils at Locations of Major Fills and Foundation Structures *(Project-specific and Cumulative Effects)*	Construction, Operations and Maintenance	Groundwater in Surficial Soils Surface Waterbodies/Watercourses Wetlands Specialized and Sensitive Wildlife Habitat	**Low** Adverse effects are likely to be measurable and/or noticeable	**Low** Adverse effects are likely measurable and/or noticeable within an area immediately surrounding major fills/foundation structures along the Project and other projects/activities with major fill operations and substantial belowground structures	**Low** Adverse effects are considered to be short term disturbances	**High** Conditions or phenomena causing Project-specific effects to occur are ongoing conditions. **Low** Cumulative effects may occur periodically during the construction phase as a result of a few other projects/activities that are likely to occur along the Project	**Medium** Measureable or noticeable project-specific and/or cumulative effects are likely to persist for some time over the planning horizon	**Medium** Groundwater and natural watercourses are common and abundant. The resource/VEC will continue to fulfill its ecological functions	**Minor Adverse Effect**	The Project is not likely to cause significant adverse effects on surface water, groundwater, wetlands and wildlife habitat

Table 7.2 Significance of Residual Adverse Effects

Evaluation and Conclusions on the Significance of Residual Adverse Effects

Residual Adverse Effects	Project Phase	VEC Affected	Predicted Degree of Impact						Overall Degree of Residual Effect	Agency Determination on Significance of Residual Adverse Environmental Effects
			Magnitude	*Extent*	*Duration*	*Frequency*	*Permanence*	*Ecological Importance (of resource or VEC)*		
Reduction in Groundwater Quality in Surficial Soils *(Project-specific and Cumulative Effects)*	Operations and Maintenance	Groundwater in Surficial Soils Surface Waterbodies/Watercourses Wetlands Specialized and Sensitive Wildlife Habitat	**Medium** Adverse effects may be measurable and/or noticeable and may exceed a reference criterion or guideline value in certain settings (e.g., areas of fine sands and silts)	**Low** Adverse effects may be measurable and/or noticeable within an area immediately surrounding the Project and/or other projects/activities	**Medium** Adverse effects are measureable and ongoing effects related to the Operations and Maintenance Phase of the Project and/or other transportation infrastructure projects	**High** Conditions or phenomena causing Project-specific effects to occur are ongoing conditions **Low** Cumulative effects may occur periodically during the operation/maintenance phase as a result of a few other projects/activities that are likely to occur along the Project	**High** Cumulative effects are not readily reversible	**Medium** Groundwater and natural watercourses are common and abundant. The resource/VEC will continue to fulfill its ecological functions	**Moderate Adverse Effect**	The Project is not likely to cause significant adverse effects on surface water, groundwater, wetlands and wildlife habitat
Increased Turbidity *(Project-specific and Cumulative Effects)*	Construction	Surface Waterbodies/Watercourses High Sensitivity Fish Habitat	**Medium** Adverse effects may be measurable and/or noticeable and may exceed a reference criterion or guideline value in areas immediately downstream of a watercourse crossing	**Low** Adverse effects are likely measurable and/or noticeable within an area immediately surrounding the Project and other projects/activities	**Low** Adverse effects are considered to be short term disturbances	**Low** Adverse effects may occur periodically during the construction phase and/or as a result of a few other projects/activities that are likely to occur along the Project	**Low** Adverse effects are not likely to be measurable or noticeable over the planning horizon	**Medium** Natural watercourses are common and abundant. The resource / VEC will continue to fulfill its ecological functions	**Minor Adverse Effect**	The Project is not likely to cause significant adverse effects on fish and fish habitat
Decreased Surface Water Quality Due to Effluent Discharges *(Project-specific and Cumulative Effects)*	Operations and Maintenance	Surface Waterbodies/Watercourses High Sensitivity Fish Habitat	**Medium** Changes in surface water quality represent small measureable changes relative to baseline conditions and may exceed a reference criterion or guideline value on occasion or at an individual location (i.e., a location where treated effluent is discharged to the same watercourse from another project/activity)	**Low** Adverse effects are likely to be measureable within an area immediately downstream of a project or activity. New watercourse crossings are sufficiently widespread across the RSA such that substantial overlaps in effects are not likely	**Medium** Adverse effects are measureable and ongoing effects related to the Operations and Maintenance Phase of the 407 East Transportation Corridor and/or other transportation infrastructure projects	**High** Conditions or phenomena causing Project-specific effects to occur are ongoing conditions **Medium** Several project and activities causing the cumulative effects are likely to affect the same watercourse as Project	**Medium** Measurable effects are likely to persist for some time over the planning horizon, but regional trends are reversible	**Medium** Natural watercourses are common and abundant. The resource/VEC will continue to fulfill its ecological functions	**Moderate Adverse Effect**	The Project is not likely to cause significant adverse effects on fish and fish habitat
Increased Loss of Vegetation	Construction	Forested Areas Specialized and	**Medium** Adverse effects	**Medium** Adverse effects are	**Low** Adverse effects are the	**Low** Project-specific adverse	**Medium** Measurable effects	**High** Forested areas are not	**Minor Adverse Effect**	The Project is not

Table 7.2 Significance of Residual Adverse Effects

Evaluation and Conclusions on the Significance of Residual Adverse Effects

Residual Adverse Effects	Project Phase	VEC Affected	Predicted Degree of Impact						Overall Degree of Residual Effect	Agency Determination on Significance of Residual Adverse Environmental Effects
			Magnitude	*Extent*	*Duration*	*Frequency*	*Permanence*	*Ecological Importance (of resource or VEC)*		
and Vegetation Communities *(Project-specific and Cumulative Effects)*		Sensitive Wildlife Habitat	represent a small change relative to existing conditions	measureable within the RSA	result of short term losses limited to within the planning horizon	effects are effectively one-time events **Medium** Cumulative effects are the results of several projects or activities likely to occur along with the Project. These are likely to occur periodically over the planning horizon (i.e., cumulative losses of vegetation communities will not occur all at once)	are likely to persist for some time over the planning horizon, but regional trends are reversible given MTO's plans to restore, enhance and create vegetation and vegetative communities and other regional initiative.	common across the RSA. Abundance and quality is required for the resource/VEC to continue to fulfill its ecological functions		likely to cause significant adverse effects on vegetation and vegetation communities
Reduced Area of Interior Forest Habitat *(Project-specific and Cumulative Effects)*	Construction	Forested Areas with Interior Habitat Specialized and Sensitive Wildlife Habitat	**Medium** Adverse effects represent a small change relative to existing conditions. Reduced area of interior forest habitat may exceed a reference criterion or guideline value at an individual location (i.e., an individual woodlot and/or a woodlot affected by multiple projects)	**Medium** Adverse effects are measureable within the RSA.	**Low** Adverse effects are the result of short term losses limited to within the planning horizon	**Low** Project-specific adverse effects are effectively one-time events **Medium** Cumulative effects are the results of several projects or activities likely to occur along with the Project These are likely to occur periodically over the planning horizon (i.e., cumulative losses of vegetation communities will not occur all at once)	**High** Cumulative effects on interior forest habitat are not readily reversible despite MTO's plans to restore, enhance and create vegetation and vegetation communities Interior forest habitat of similar function to that lost is very difficult to replace	**High** Interior forest habitat not common across the RSA. Abundance and quality is required for the resource/VEC to continue to fulfill its ecological functions	**Moderate Adverse Effect**	The Project is not likely to cause significant adverse effects on vegetation and vegetation communities
Reduced Quality/ Function of Retained Vegetation and Habitat *(Project-specific and Cumulative Effects)*	Construction, Operations and Maintenance	Forested Areas Forested Areas with Interior Habitat Specialized and Sensitive Wildlife Habitat	**Medium** Reduced quality of vegetation and habitat may be noticeable at an individual location (i.e., an individual vegetation community and/or a vegetation community affected by multiple projects)	**Low** Adverse effects are likely to be noticeable in close proximity to Project and/or other projects and activities	**Medium** Adverse effects are ongoing effects related to the Construction, Operations and Maintenance Phases of the 407 East Transportation Corridor and/or those of other projects and activities	**High** Conditions or phenomena causing Project-specific effects to occur are ongoing conditions. **Medium** Several project and activities causing the cumulative effects are likely to affect the same watercourse as the 407 East Transportation	**Medium** Adverse effects are likely to persist for some time over the planning horizon, but regional trends are reversible.	**High** Forested areas are not common across the RSA. Abundance and quality is required for the resource/VEC to continue to fulfill its ecological functions	**Moderate Adverse Effect**	The Project is not likely to cause significant adverse effects on vegetation and vegetation communities

Table 7.2 Significance of Residual Adverse Effects

Evaluation and Conclusions on the Significance of Residual Adverse Effects

Residual Adverse Effects	Project Phase	VEC Affected	Predicted Degree of Impact						Overall Degree of Residual Effect	Agency Determination on Significance of Residual Adverse Environmental Effects
			Magnitude	*Extent*	*Duration*	*Frequency*	*Permanence*	*Ecological Importance (of resource or VEC)*		
						Corridor				
Increased Loss of Wetland Areas *(Project-specific and Cumulative Effects)*	Construction	Wetlands	**Medium** Adverse effects represent a small change relative to existing conditions	**Medium** Adverse effects are measureable within the RSA.	**Low** Adverse effects are the result of short term losses limited to within the planning horizon	**Low** Project-specific adverse effects are effectively one-time events **Medium** Cumulative effects are the results of several projects or activities likely to occur along with the Project. These are likely to occur periodically over the planning horizon (i.e., cumulative losses of wetlands will not occur all at once)	**Medium** Measurable effects are likely to persist for some time over the planning horizon, but regional trends are reversible given MTO's plans to restore, enhance and create wetlands and other regional initiatives	**High** Wetland areas are not common across the RSA. Abundance and quality is required for the resource/VEC to continue to fulfill its ecological functions	**Minor Adverse Effect**	The Project is not likely to cause significant adverse effects on wetlands
Reduced Quality/ Function of Retained Portions of Wetlands	Construction, Operations and Maintenance	Wetlands Specialized and Sensitive Wildlife Habitat	**Medium** Reduced quality of wetlands and habitat may be noticeable at an individual location (i.e., an individual wetland and/or a wetland affected by multiple projects)	**Low** Adverse effects are likely to be noticeable in close proximity to the Project and/or other projects and activities	**Medium** Adverse effects are ongoing effects related to the Construction, Operations and Maintenance Phases of the Project and/or those of other projects and activities	**High** Conditions or phenomena causing Project-specific effects to occur are ongoing conditions. **Medium** Several project and activities causing the cumulative effects are likely to affect the same wetlands as the Project	**Medium** Adverse effects are likely to persist for some time over the planning horizon, but regional trends are reversible	**High** Wetland areas are not common across the RSA. Abundance and quality is required for the resource/VEC to continue to fulfill its ecological functions	**Moderate Adverse Effect**	The Project is not likely to cause significant adverse effects on wetlands
Restrictions to Wildlife Movement and Increased Wildlife Mortality *(Project-specific and Cumulative Effects)*	Construction Operations and Maintenance	Mammals and Amphibians	**Medium** Adverse effects are likely to be noticeable and/or measureable at an individual location	**Low** Adverse effects are likely to be measureable in close proximity to the Project and/or other projects and activities	**Medium** Adverse effects are ongoing effects related to the Construction, Operations and Maintenance Phases of the Project and/or those of other projects and activities	**High** Conditions or phenomena causing Project-specific effects to occur are ongoing conditions. **Low** A few projects or activities causing the cumulative effect are likely to occur along the Project. These are likely to occur periodically over the planning horizon	**Medium** Measureable or noticeable effects are likely to persist for some time over the planning horizon. Adverse regional trends are potentially reversible as wildlife become habituated to the presence of the transportation corridor	**Moderate** VEC species are common and abundant. The resource/VEC will continue to fulfill its ecological functions	**Moderate Adverse Effect**	The Project is not likely to cause significant adverse effects on wildlife

Table 7.2 Significance of Residual Adverse Effects

Evaluation and Conclusions on the Significance of Residual Adverse Effects

Residual Adverse Effects	Project Phase	VEC Affected	Predicted Degree of Impact						Overall Degree of Residual Effect	Agency Determination on Significance of Residual Adverse Environmental Effects
			Magnitude	*Extent*	*Duration*	*Frequency*	*Permanence*	*Ecological Importance (of resource or VEC)*		
Disruption to Wildlife Within the Retained Portions of Vegetation Communities and Wetlands *(Project-specific and Cumulative Effects)*	Construction Operations and Maintenance	Mammals, Amphibians, Breeding/Migratory Birds Federal (COSEWIC) Species at Risk	**Medium** Disruption may be noticeable and/or measureable. Adverse effects may exceed a reference criterion or guideline value at an individual location (i.e., an individual vegetation community or wetland affected by multiple projects)	**Low** Adverse effects are likely to be measureable in close proximity to the Project and/or other projects and activities	**Medium** Adverse effects are ongoing effects related to the Construction, Operations and Maintenance Phases of the Project and/or those of other projects and activities	**High** Conditions or phenomena causing Project-specific effects to occur are ongoing conditions. **Medium** Several project or activities are likely to occur along with the Project. These are likely to occur periodically over the planning horizon	**High** Cumulative effects are not readily reversible despite the implementation of mitigation/compensation	**Moderate** VEC species are common and abundant. The resource/VEC will continue to fulfill its ecological functions	**Moderate Adverse Effect**	The Project is not likely to cause significant adverse effects on Species at Risk
Removal of Individual Butternut Trees *(Project-specific and Cumulative Effects)*	Construction	Federal (COSEWIC) Species at Risk (i.e., Butternut Trees)	**Medium** Adverse effects represent small changes relative to existing conditions	**Medium** Adverse effects are measureable within the RSA.	**Low** Adverse effects are the result of short term losses over the planning horizon	**Low** Adverse effects may occur periodically during the construction phase and/or as a result of a few other projects/activities that are likely to occur along the Project	**Low** Measureable or noticeable effects on the overall Butternut tree population are not likely to persist over the planning horizon (i.e., up to 2031). MTO's mitigation and/or compensation measures, mitigation measures of other projects and activities and the implementation of a recovery strategy for this species will ensure that long term adverse effects do not persist	**High** Butternut trees are not common in the RSA	**Minor Adverse Effect**	The Project is not likely to cause significant adverse effects on Species at Risk
Increased disruption to Redside Dace Habitat *(Project-specific and Cumulative Effects)*	Construction	Federal (COSEWIC) Species at Risk (i.e., Redside Dace Habitat)	**Medium** Adverse effects represent small changes relative to existing conditions	**Low** Adverse effects are likely to be measureable in close proximity to the transportation corridor and/or other projects and activities	**Low** Adverse effects are the result of short term disturbances over the planning horizon	**Low** Adverse effects are effectively one-time events **Medium** Cumulative effects are the results of several projects or activities likely to occur along with the Project. These	**Low** Given *Fisheries Act* requirements for mitigation and compensation, measurable project specific and cumulative effects attributable to the Project are not likely	**High** Redside Dace habitat is not common in the RSA	**Minor Adverse Effect**	The Project is not likely to cause significant adverse effects on Species at Risk

Table 7.2 Significance of Residual Adverse Effects

Evaluation and Conclusions on the Significance of Residual Adverse Effects

Residual Adverse Effects	Project Phase	VEC Affected	Predicted Degree of Impact						Overall Degree of Residual Effect	Agency Determination on Significance of Residual Adverse Environmental Effects
			Magnitude	*Extent*	*Duration*	*Frequency*	*Permanence*	*Ecological Importance (of resource or VEC)*		
						are likely to occur periodically over the planning horizon (i.e., cumulative losses of vegetation communities will not occur all at once)	to persist over the planning horizon			
Increased disruption to habitat of Blandings Turtle, Golden-winged Warbler and Bobolink *(Project-specific and Cumulative Effects)*	Construction, Operations and Maintenance	Mammals, Amphibians, Breeding/Migratory Birds Federal (COSEWIC) Species at Risk	**Low** Adverse effects are likely to be measurable and/or noticeable within the known habitats of these two species along the Project	**Low** Adverse effects are likely to be measureable in close proximity to the transportation corridor and/or other projects and activities	**Medium** Adverse effects are ongoing effects related to the Construction, Operations and Maintenance Phases of the Project and/or those of other projects and activities	**High** Conditions or phenomena causing Project-specific effects to occur are ongoing conditions. **Low** A few projects or activities causing the cumulative effect are likely to occur along the Project. These are likely to occur periodically over the planning horizon	**Low** Given the *Endangered Species Act* requirements for mitigation, measurable project-specific and cumulative effects attributable to the Project are not likely to persist over the planning horizon	**High** Species at Risk habitats are not common in the RSA	**Minor Adverse Effect**	The Project is not likely to cause significant adverse effects on Species at Risk
Changes in Community Character *(Project-specific and Cumulative Effects)*	Construction, Operations and Maintenance	Community Character	**Medium to High** Adverse effects due to changes in landscape composition are likely to represent a large change relative to baseline conditions in a Regional Study Area context. Cumulative effects due to fugitive dust, noise and light may be noticeable and/or measureable at an individual location	**Medium** Adverse effects are likely to be noticeable or measurable in most hamlets/built up areas traversed by the Project	**Medium** Adverse effects are ongoing effects related to both the Construction and Operations and Maintenance Phases of the Project and/or those of other projects and activities	**High** Conditions or phenomena causing Project-specific effects to occur are ongoing conditions. **Medium** Several projects or activities are likely to occur along with the Project. These are likely to occur periodically over the planning horizon (i.e., community character is not likely to change all at once)	**High** Adverse effects are not readily reversible despite the implementation of mitigation/compensation, including MTO's Community Value Plan	**N/A**	**Moderate Adverse Effect**	The Project is not likely to cause significant adverse effects on socio-economic conditions that may be affected by changes the project may cause in the environment
Reduced Agricultural Activity *(Project-specific and*	Construction, Operations and Maintenanc	Agricultural Operations Class 1,2 and 3 Agricultural Soil	**Medium** Adverse effects represent small measureable changes relative to existing	**Medium** Adverse effects are measureable within the RSA	**Low** Adverse effects are the result of short term losses over the planning horizon	**Low** Adverse effects are the result of a one-time event	**High** Adverse effects are not readily reversible despite the implementation of	**N/A**	**Moderate Adverse Effect**	The Project is not likely to cause significant adverse effects

Table 7.2 Significance of Residual Adverse Effects

Evaluation and Conclusions on the Significance of Residual Adverse Effects

Residual Adverse Effects	Project Phase	VEC Affected	Predicted Degree of Impact						Overall Degree of Residual Effect	Agency Determination on Significance of Residual Adverse Environmental Effects
			Magnitude	*Extent*	*Duration*	*Frequency*	*Permanence*	*Ecological Importance (of resource or VEC)*		
Cumulative Effects)	e	s	conditions			**Medium** Cumulative effects are the results of several projects or activities likely to occur along with the Project. These are likely to occur periodically over the planning horizon	mitigation/compensation.			on socio-economic conditions that may be affected by changes the project may cause in the environment
Disruption to the Use and Enjoyment of Private Property *(Project-specific and Cumulative Effects)*	Construction Operations and Maintenance	Use and Enjoyment of Private Property	**Medium** Adverse effects represent small measureable changes relative to baseline conditions and may exceed a reference criterion or guideline value on occasion or at an individual location (i.e., at a specific residential location)	**Low** Adverse effects are likely to be noticeable or measurable within areas immediately surrounding the Project and within a few hamlets/built up areas traversed by the transportation corridor	**Medium** Adverse effects are ongoing effects related to both the Construction and Operations and Maintenance Phases of the Project and those of other projects and activities	**High** Conditions or phenomena causing Project-specific effects to occur are ongoing conditions **Medium** Cumulative effects are the results of several projects or activities likely to occur along with the Project. These are likely to occur periodically over the planning horizon	**Medium** Adverse effects are likely to persist for some time over the planning horizon for existing residents	**N/A**	**Minor Adverse Effect**	The Project is not likely to cause significant adverse effects on socio-economic conditions that may be affected by changes the project may cause in the environment

7.2 Government and Public Comments

The Agency and federal authorities evaluated MTO's residual effects assessment framework and concluded whether the Project is likely to cause significant adverse environmental effects. Additional public comments relating to the cumulative effects were submitted to the Agency during the public comment period on the draft CSR. These additional comments were summarized and responses were provided indicating how comments have been considered. This is included in Appendix B to this CSR.

8 Follow-up under the Canadian Environmental Assessment Act

8.1 Meaning of "Follow-up" under the Act

As defined in the Act, a "follow-up program" means a program for:

- verifying the accuracy of the environmental assessment of a project; and
- determine the effectiveness of any mitigation measures taken to mitigate the adverse environmental effects of the project.

8.2 Compliance with Provincial Conditions of Approval

MTO must submit an annual report outlining compliance with provincial conditions of approval to the Ontario Ministry of the Environment's Regional Director for the public record on or before May 31st of each year, with the first report being due in May 2011. This report will include progress and results on the development and implementation of detailed monitoring and mitigation plans in relation to surface water; major biological features; vegetation restoration; construction noise, vibration and air quality impacts. The monitoring and annual reporting pursuant to provincial Conditions of Approval are expected to support adjusting mitigation measures as construction proceeds, which is known as adaptive management.

8.3 Scope of Follow-up Program

The Agency consulted with federal authorities when defining the considerations that would determine which environmental factors warranted inclusion in the follow-up program. These considerations included:

- the relative degree of residual adverse effects (moderate, minor or negligible). Refer to Table 7 2;
- the extent to which public and Aboriginal group concerns were raised during the federal and provincial EAs (including comments raised by the participant funding recipients);
- areas of federal interest;
- whether provincial Conditions of Approvals required monitoring and follow-up requirements;
- whether provincial and/or federal regulatory instruments exist to help ensure the effectiveness of mitigation measures; and
- the extent to which mitigation measures are innovative in their approach versus being common and well-understood, or where the effectiveness of mitigation is difficult to predict with a high degree of certainty.

Given these considerations, the Agency has determined that the environmental factors identified in Table 8.1 will be included in the follow-up program:

Table 8-1 Follow-up Program

Environmental Factor	Follow-up Reports to be Provided by MTO: Elements	Timing
Vegetation Communities and Wetlands	Extent, location and types of vegetation, vegetation community and wetland loss and/or impairment to their ecological	Initial submission prior to construction to characterize loss and impairment of vegetation

Environmental Factor	Follow-up Reports to be Provided by MTO: Elements	Timing
	function (ha); Extent, location, types and their ecological function restored/replaced (ha) and overall effectiveness of restoration effort to date and plans for the upcoming year based on biannual draft survey reports.	communities and wetlands. Annual submission post construction for a maximum five year growing period after completion of the restoration initiative. Biannual draft reports for upland habitat restoration based on spring and fall surveys of vegetation survival; these preliminary reports will inform supplementary spring and fall planting (if required).
Wildlife, Habitat, and Migratory birds	Compliance with timing restrictions on vegetation clearing, and construction activities potentially impacting wildlife habitat to avoid the most sensitive breeding/nesting periods for wildlife, including migratory birds. Verification that encounters with protected or endangered species, and any effects on such species, were addressed in an appropriate manner in consultation with regulatory agencies.	Annual submission during construction.
Fish and Fish Habitat	Compliance with and effectiveness of implemented mitigation and compensation.	Annual submission during construction and for two years post construction of authorized works unless otherwise specified in the *Fisheries Act* authorizations.
Groundwater	Localized impacts from dewatering after mitigation for water-crossings requiring authorization. Status of design and mitigation measures implemented and their effectiveness. Potential lowering of groundwater table and altering of groundwater flow in surficial soils at locations such as: foundation excavation, deep cuts, major fills.	Annual submission during construction and for two years post construction of authorized works unless otherwise specified in the *Fisheries Act* authorizations. Annual submission during construction and for two years post construction.
Surface Water	Effectiveness of thermal mitigation in regard	Annual submission for three to five

Environmental Factor	Follow-up Reports to be Provided by MTO: Elements	Timing
	to discharges into sensitive cold water aquatic habitats from stormwater facilities.	years post construction.

8.4 Roles and Responsibilities for Follow-up

Ontario Ministry of Transportation:

The MTO has committed in a letter dated March 8, 2011 to providing the reports. Refer to Appendix C.

Transport Canada and Fisheries and Oceans Canada:

TC and DFO are responsible for the implementation of the follow-up program based on the reports that the MTO has committed to provide. DFO will be responsible for posting a Notice of Availability on the CEAR Internet website on an annual basis once the reports become available.

Environment Canada:

EC will be responsible for providing assistance, pertinent to areas of its mandate described below, as required by the responsible authorities. This assistance would normally consist of providing input to the objectives and design of monitoring studies, receiving the results of such studies, reviewing the results, and providing recommendations to the responsible authorities on any further actions required.

EC provided advice to the responsible authorities on the potential effects of the Project's construction, maintenance and operation related to water quality, air quality and toxics management, migratory birds, and, species at risk and adequacy of proposed mitigation and monitoring. In its advice, EC recommended that follow-up be undertaken to verify the effectiveness of thermal mitigation in regard to discharges into sensitive cold water aquatic habitats from stormwater treatment facilities, and to verify the effectiveness of mitigation to address physical loss and impaired ecological function of terrestrial and wetland vegetation and associated wildlife habitats (i.e., minimum of 1:1 ratio for replacement of area lost).

Natural Resources Canada:

NRCan provided advice to the responsible authorities regarding groundwater issues and will continue to provide assistance on these issues, as required by the responsible authorities. This assistance would normally consist of providing input to the objectives and design of monitoring studies, receiving the results of such studies, reviewing the results, and providing recommendations to the responsible authorities on any further actions required. Specifically, NRCan will provide a technical review of the Environmental Management Plans (EMPs) and related groundwater monitoring programs, as well as review compliance and follow-up studies and reports as they relate to hydrogeology and to groundwater issues associated with deep cuts and large fill areas. Following the technical review of these reports, NRCan will provide the responsible authorities with its expert advice and recommendations on the groundwater follow-up program

study program and results, the associated impacts of the Project, the effectiveness of related existing mitigation measures and the need for any additional actions.

Canadian Environmental Assessment Agency:

The Agency has a coordination role to ensure responsible authorities fulfill Registry requirements.

9 Agency's Conclusion on the Significance of Residual Adverse Environmental Effects

In reaching a conclusion on whether the Project is likely to cause significant adverse environmental effects, the Agency has taken into account:

- the information, analysis and conclusions in this Comprehensive Study Report;
- the views expressed by the public, government agencies, municipalities and Aboriginal groups;
- the information, analysis and conclusions set out in the provincial environmental assessment of the Project;
- the MTO's obligations as described in the provincial EA Conditions of Approval;
- the requirements for authorizations under section 35(2) of the *Fisheries Act* for watercourse crossings with the potential to effect fish and fish habitat; and
- the requirements for the follow-up program to be implemented by MTO.

The Agency's consideration of mitigation is based on its knowledge that the mitigation measures addressing fish and fish habitat will be ensured by Fisheries and Oceans Canada as conditions of approval under the federal *Fisheries Act* and being satisfied that all other mitigation measures identified for the Project will be implemented by the MTO as they have been included as conditions of the provincial EA approval.

Therefore, taking into account the implementation of the mitigation measures identified in this CSR for the Project, the Agency concludes that the Project is not likely to cause significant adverse environmental effects.

10 References

Canadian Standards Association., 2003.
Emergency Planning for Industry CAN/CSA Z731-03

Central Lake Ontario Conservation, Department of Fisheries and Oceans and Ontario Ministry of Natural Resources., July 2007.
Central Lake Ontario Fisheries Management Plan.

Chapman, L.J., Putnam, D.F., 1984:
The physiography of southern Ontario. Ontario Geological Survey, Special Volume 2, 270 p. (third edition).

Department of Fisheries and Oceans., 1986.
Policy for the Management of Fish Habitat., Communications Directorate. Ottawa, ON.

Environment Canada., 1987.
The Federal Water Policy.

Environment Canada., 1994.
Canadian Biodiversity Strategy.

Environment Canada., 2004.
Code of Practice for Environmental Management of Road Salts.
http://www.ec.gc.ca/nopp/roadsalt/en/index.cfm

Environment Canada., March 2005.
Best Practices for the Reduction of Air Emissions From Construction and Demolition Activities.

Eyles, N., 2002.
Ontario Rocks: Three Billion Years of Environmental Change. Fitzhenry & Whiteside Limited.

Government of Canada., 1991.
The Federal Policy on Wetland Conservation. Authority of the Minister of the Environment, Environment Canada, Ottawa, ON.

Government of Ontario., 2005.
Provincial Policy Statement. Toronto, ON. Queen's Printer for Ontario.

Government of Ontario., 2005.
Places to Grow – Proposed Growth Plan for the Greater Golden Horseshoe. Toronto, ON: Queen's Printer for Ontario.

Government of Ontario., 2005.
The Greenbelt Plan. Toronto, ON. Queen's Printer for Ontario.

Government of Ontario., 2006.
Places to Grow – Growth Plan for the Greater Golden Horseshoe., Ministry of Public Infrastructure Renewal.Toronto, ON. Queen's Printer for Ontario.

Health Canada., May 2008.
Guidelines for Canadian Drinking Water Quality.

Henshaw, B., 1993.
A Seasonal Checklist to the Birds of Durham Region, Ontario. The Pickering Naturalists.

Ministry of Environment and Energy., 1994 (updated July 1998).
Provincial Water Quality Objectives.

Ontario Ministry of Culture., 2006.
Standards and Guidelines for Consultants Archaeologists, Final Draft. August 2006.

Ontario Ministry of Environment (MOE)., 1977b.
Model Municipal Noise Control By-law, Publication NPC-119 – Noise from Blasting.

Ontario Ministry of Environment and Ministry of Natural Resources., 2003.
Stormwater Management Practices Planning and Design Guidelines.

Ontario Ministry of Natural Resources, 2010.
Low Water and Drought. Available at http://www.mnr.gov.on.ca/en/Business/Water/2ColumnSubPage/STEL02_165451.html. Last accessed August 25, 2010.

Ontario Ministry of Transportation (MTO)., 2002.
Environmental Reference for Highway Design.

Ontario Ministry of Transportation (MTO)., 2003.
Ontario Provincial Standard Specification OPSS 120: *General Specification for the Use of Explosives.*

Ontario Ministry of Transportation., 2006.
Environmental Guide for Fish and Fish Habitat.

Ontario Ministry of Transportation (MTO)., 2006. Amended June 2008.
Environmental Guide for Noise.

Ontario Ministry of Transportation., 2006.
Environmental Reference for Highway Design (ERD).

Ontario Ministry of Transportation., 2007.
Environmental Guide for Erosion and Sediment Control.

Ontario Ministry of Transportation., February 2007.

Guide for Built Heritage and Cultural Heritage Landscapes

The Oak Ridges Moraine Conservation Plan.,2001.
S.O. 2001, CHAPTER 31.

Toronto and Region Conservation Authority (TRCA)., 2008.
Erosion and Sediment Inspection Guide. Prepared for Greater Golden Horseshoe Area Conservation Authorities:
http://www.sustainabletechnologies.ca/Portals/_Rainbow/Documents/Final_ESC_Inspectionguide_published_lowres_v2.pdf

Town of Ajax, 2010.
Town of Ajax Design Criteria – Section C – Stormwater Management, Revised January, 2010.
Available at: http://www.townofajax.com/AssetFactory.aspx?did=8492. Last accessed August 26, 2010.

10.1 Technical Reference Documents (MTO)

Available at: http://www.407eastea.com. Last accessed December, 2010

407 East Individual Environmental Assessment (IEA) and Preliminary Design Study – Environmental Assessment Report, Volume 1 – Main Report and Volume II – Appendices (August 2009).

407 East Individual Environmental Assessment (IEA) and Preliminary Design Study – Environmental Assessment Report Errata Sheet (August 2009)

407 East Transportation Corridor Environmental Screening Report (draft MTO report, December, 2009)

407 East Environmental Assessment Review (Ontario Ministry of Environment Report, December, 2009)

Alternatives to the Undertaking (Transportation Alternatives) Report (MTO Reference Document #2)

Alternative Methods Report (MTO Reference Document #3)

Route Refinements and Preliminary Design Alternatives Comparative Assessment and Evaluation Report (MTO Reference Document #4)

Natural Environment (Fisheries) Impact Assessment Report (MTO Reference Document #5)

Natural Environment (Terrestrial) Impact Assessment Report (MTO Reference Document #6)

Natural Environment (Hydrogeology) Impact Assessment Report (MTO Reference Document #7)

Noise Impact Assessment Report (MTO Reference Document #8)

Air Quality Impact Assessment Report (MTO Reference Document #9)

Landscape Composition Impact Assessment Report (MTO Reference Document #10)

Socio-Economic Impact Assessment Report (MTO Reference Document #11)

Agricultural Impact Assessment Report (MTO Reference Document #12)

Waste Management and Contamination Impact Assessment Report (MTO Reference Document #13)

Archaeology Impact Assessment Report (MTO Reference Document #14)

Built Heritage Impact Assessment Report (MTO Reference Document #15)

Consultation Summary Report (MTO Reference Document #16)

Natural Environment Field Investigation Report (MTO Reference Document #17).

Human Health Implications Report (MTO Reference Document #18)

TRCA, CLOCA and GRCA Stormwater Management Strategy Reports (MTO Reference Document #19)

11 Appendix A

Summary of Key Mitigation Measures from the provincial EA report

Exhibit 8.216: Summary of Key Mitigation/Compensation Measures and Net Effects From the Ontario Ministry of Environment Review of the 407 East EA, November 2009		
Potential Effects	**Mitigation / Compensation Measures**	**Net Effects**
MEASURES FOR ENTIRE TRANSPORTATION CORRIDOR/RECOMMENDED DESIGN		
HYDROGEOLOGY		
Temporary decrease in groundwater levels due to dewatering (i.e. for setting of bridge foundations) during construction.	• Minimize dewatering through foundation design. • Carry out dewatering period so cold water fish spawning seasons are avoided. • Discharge groundwater into receptor creek following temperature and clarity controls to maintain baseflow.	The temporary decrease in groundwater levels due to dewatering would be minimized through foundation design.
Temporary changes to groundwater quantity and quality affecting private wells	• Provide a temporary or permanent water supply for owners whose wells are affected	The temporary changes to groundwater quantity and quality affecting private wells would be compensated through the provision of a temporary or permanent water supply.
Reduction in groundwater quality from spills during construction.	• Follow MTO's Environmental Reference for Contract Preparation (Section 8: Management of Waste and Excess Materials) document.	The reduction in groundwater quality from spills during construction would be minimized by following MTO's Environmental Reference for Contract Preparation document.
Changes to groundwater flow from fill placement in valleys.	• Design valley fill with a permeable sub-base to maintain current groundwater flow conditions where groundwater seepage is anticipated. • Remove organic soils in valley to prevent blocking of pores in drainage blanket.	The change to groundwater flow from fill placement in valley would be minimized through valley fill design and organic soils removal.
Decrease in groundwater levels near deep cuts.	• Carry out dewatering period so cold water fish spawning seasons are avoided. • Discharge groundwater into receptor creek following temperature and clarity controls to maintain baseflow. • Convey groundwater seepage from cut slopes during operation of the recommended design to provide additional cold water baseflow to local watercourses as a compensation measure, where applicable.	Decreases in groundwater levels near deep cuts have been minimized by avoiding deep cuts in high permeability sediments.
Reduction in groundwater quality due to stormwater runoff during operation of the transportation corridor.	• Follow MTO Road Salt Management Plan, Environmental Guide for Patrol Yard Design, and Highway Transportation Association of Canada's Synthesis of Best Practices – Road Salt Management. • Where feasible, collect stormwater in Stormwater Management Systems. • Consider various drainage alignment alternatives, liners and runoff separation where permeable sediments area present at surface and are being used for potable water supply. • Use vegetation polishing, in and around stormwater management ponds to aid in contaminant removal prior to discharge.	The reduction in groundwater quality due to stormwater runoff would be minimized during operation of the transportation corridor by following appropriate salt application/management practices, installing stormwater management systems, and polishing collecting runoff prior to discharge to receiving streams.
TERRESTRIAL		
Effects on vegetation due to the release of sediments and spills during construction.	• Install erosion and sediment control measures prior to construction and maintain them within their effective limits throughout construction and until the restoration of disturbed vegetation, rock revetments or similar are successfully completed. Erosion and sediment control structures will be designed, installed, maintained, and removed according to *Ontario Guidelines on Erosion and Sediment Control for Urban Construction Sites (1987),* OPSS Guidelines, and/or established MTO procedures. • Temporarily stabilize exposed soil areas as soon as possible (or covered with tarps, erosion control blankets, etc.) to control sediment transport and erosion. In addition, natural vegetation cover will be retained wherever possible (and root grubbing minimized where possible) to provide natural erosion control.	Effects on vegetation due to the release of sediments and spills during construction would be minimized.

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Potential Effects	Mitigation / Compensation Measures	Net Effects
	• Enclose earth stockpiles with appropriate sediment and erosion control fencing. • Filter runoff from material stockpiles or site de-watering through an appropriate device (temporary settling facility, filter bag, etc.) before release. • Regularly inspect sediment control structures including after storms and repair as required. The structures will be cleaned out when accumulated sediment reaches half the design height. • Re-stabilize and re-vegetate exposed surfaces as soon as possible, using native vegetation seed mixes and plantings or other appropriate cover. • Ensure that the design completed in subsequent design phases captures drainage from any unstabilized surface and adequately filters it prior to discharge to natural areas, including receiving drainage features. • Design erosion and sediment control measures and then install on site prior to any grading. • Use dust suppression methods (water, calcium chloride or other as appropriate) in dust sensitive areas as required to control off-site migration of particulates. A dust suppressant license will be required from MOE for use of registered dust suppressants other than water. • Follow relevant Ontario Provincial Standards Specifications (OPSS) – OPSS 577 (Erosion and Sediment Control Measures), OPSS 503 (Site Preparation), OPSS 206 (Grading), OPSS 506 (Dust Control). • Do not permit refuelling within 30 m of any woodland, wetland or watercourse, or the top of bank areas. • Adhere to permits, Acts and guidelines: Canadian Environmental Protection Act; Ontario Water Resources Act, Federal Fisheries Act, Fuels and hazardous materials will be stored and handled in compliance with Ontario Regulation 347 of the EPA, the Gasoline Handling Act, Ministry of Consumer and Commercial Relations, and any license to operate a temporary explosives magazine (if blasting is required).	
Removal of vegetation (including habitat loss) from construction of the recommended design.	• MTO will continue to work with the Conservation Authorities and MNR to identify priority areas for habitat replacement and develop/finalize an approach to offset the impacts to vegetation communities/habitat features that adequately reflect the ecological functions that will be lost.	The direct removal of vegetation will be offset through restoration and enhancement. MTO will continue to work with the Conservation Authorities and MNR to identify priority areas for habitat replacement and develop an approach to offset the impacts to vegetation communities/habitat features that adequately reflect the ecological functions that will be lost.
Removal of regionally rare species.	• Develop a salvage plan as part of subsequent design phases, with agency input, prior to construction for implementation. • Retain a biologist, where regionally rare plants are the target species, to first locate and flag the relevant material. • Identify invasive plant species zones within the working areas. Such material should not be used in the salvage/restoration work, but should be properly disposed of in consultation with agency staff. This would include regionally rare species that are intermixed with invasive species to transplant without transplanting the invasive species	A salvage plan would be developed and implemented for addressing the direct removal of regionally rare species so as to minimize their loss.
Removal of and damage to Butternut trees.	A permit under the Ontario *Endangered Species Act* will be required for the removal of retainable Butternut trees. Measures will be implemented to mitigate effects of Butternut removal, recognizing its status under the *Endangered Species Act* (ESA), and develop appropriate approaches in consultation with the Ministry of Natural Resources (MNR) and the Forest Gene Conservation Association (FGCA). Since a Recovery Strategy for Butternut, and Butternut related policies to support the implementation of the ESA (2007) have not yet been finalized, the following draft mitigation strategy is recommended. It is expected that the Butternut mitigation strategy will continue to evolve through subsequent design phases, once MNR has had an opportunity to complete their field review and the ESA permitting process is underway. In the meantime, several approaches are recommended for consideration to mitigate for the removal of Butternut trees depending on the results of the	Removal of Butternut trees would be offset through a Butternut mitigation strategy developed in consultation with MNR and FGCA during subsequent design phases and subject to ESA permit requirements.

**Exhibit 8.216: Summary of Key Mitigation/Compensation Measures and Net Effects
From the Ontario Ministry of Environment Review of the 407 East EA, November 2009**

Potential Effects	Mitigation / Compensation Measures	Net Effects
	health assessment, the size of the tree and its location. • Transplant retainable trees of a suitable size. This work should be carried out under the supervision of an experienced forester or arborist. • If a 'retainable' Butternut is within the grading limits, reproductive material (i.e., nuts and/or cuttings) could be collected for propagation instead of transplanting, because transplant success generally decreases as tree size increases. Following current methodology, cuttings must be dormant and delivered promptly to nursery for grafting. The replacement ratio for removed trees will be confirmed in consultation with the MNR. The propagation methods should be confirmed with MNR to determine appropriate timelines for collection and resources required (e.g., nursery location, skilled staff). • Plant Butternut nursery stock in ratios to be determined through additional consultation with MNR and the ESA permitting process. Suitable nursery stock sources will be selected in consultation with the MNR/FGCA. • Monitoring of the success of the transplants and/or grafts should be completed for a period of time (e.g., 5 years) to ensure survival of the trees. The timeline will be specified in the ESA permit issued by MNR. Where transplants and/or grafts are not successful, a suitable response/action will be identified (e.g., replacement plantings). Again, a replacement plan for failing stock will be part of the ESA permit requirements. • Additional actions may be required to achieve overall benefit to the species. These could include removing competing species around Butternut trees that are retained in situ, and/or providing the cut logs to the MNR to sell with the proceeds going to the Butternut Recovery Fund. • If Butternut planting sites are required, MTO lands which are surplus to transportation needs within the 407 Transportation Corridor or lands managed/owned by MNR, Durham Region, TRCA and CLOCA should be reviewed for suitability to receive Butternut plantings (i.e., canopy, soils etc). The sites should be carefully selected to ensure the success of the plantings. If the Butternut trees are planted as a requirement of a permit under the *Endangered Species Act*, these Butternut trees will then be protected by the Act from future removal. • The FGCA/MNR will be provided with the data collected on retainable trees as per the FGCA's *Butternut Health Assessment in Ontario* (2008) methods. The FGCA/MNR will also be provided with the opportunity to access these trees prior to removal, in order to collect additional genetic material from these trees for recovery efforts.	
Removal of vegetation due to clearing/damage beyond the construction working areas.	• Limit clearing within the right-of-way (ROW) in areas not required for highway construction, such as the transitway ROW. • Protect vegetated areas bordering working areas with temporary tree protection and sediment fencing as determined in the final grading plan. Equipment, storage of materials, and other construction activities will not be permitted in these working areas. • Construction activities with the potential to destroy migratory birds, including vegetation clearing, filling and demolition/removal of structures used by cavity nesters, should not take place in migratory bird habitat during the breeding season, generally defined (for different habitat types) as May 1 – July 31 for this region. • If works must be conducted within breeding bird habitat during the identified breeding season for migratory birds, a nest survey will be conducted by a qualified avian biologist immediately (i.e., within 2 days) prior to commencement of the works to identify and locate active nests of species covered by the Migratory Birds Convention Act, 1994. A mitigation plan (which may include establishing appropriate buffers around active nests) should then be developed to address any potential impacts on migratory birds or their active nests, and should be reviewed by Environment Canada prior to implementation. • If active nests are found where construction or maintenance work is to take place, please contact EC for	The removal of vegetation due to clearing/damage beyond the construction working areas would be minimized.

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From the Ontario Ministry of Environment Review of the 407 East EA, November 2009**

Potential Effects	Mitigation / Compensation Measures	Net Effects
	further guidance. • Conduct a nest survey by a qualified avian biologist prior to commencement of works to identify and locate active nests of species covered by the MBCA, if works must be conducted during the breeding bird season, This will include the development of a mitigation plan to address any potential impacts on migratory birds and their active nests. • Restrict tree grubbing to the required working areas. Where possible, tree stumps will be cut flush to the ground and grubbing avoided minimizing soil disturbance, particularly in erosion prone areas. • Fell trees into ROW to avoid damaging other standing vegetation and away from any watercourse where it is safe to do so. • Check the cleared area edges after clearing has taken place and repair or remove any trees damaged. An arborist is to inspect damage to trees. • Dispose of cut and grubbed material through chipping. Where possible, cut material may be piled and re-used for wildlife habitat. Wood chip material may also be used in the edge plantings (at the identified edge management and landscape areas along the ROW). • Use forest topsoil that can be re-spread within 6 months of initial storage wherever practical and feasible at forest edge planting sites, stormwater management facility margins, and within the footprint of the interchanges. • Follow relevant Ontario Provincial Standards Specifications (OPSS) – OPSS 201 (Clearing and Grubbing), OPSS 503 (Site Preparation), OPSS 565 (Tree Protection), OPSS 182 (Environmental Protection for Construction in Waterbodies and on Waterbody Banks). • Adhere to permits, Acts and guidelines: Permit to Burn (if required), Migratory Birds Convention Act and Regulations.	
Transportation of non-native and invasive species into sensitive vegetation communities due to seed disturbance/dispersal along cleared areas and construction equipment.	• Indicate the extent of the target invasive species on the contract drawings and in the field by a biologist. • Treat the site, prior to construction, with an herbicide application to reduce the size of the population (3 applications, 3 weeks apart). • Thoroughly clean all equipment working in the identified invasive species locations prior to moving away from the site. • Do not remove soil from the locations unless it is placed in an area that will be actively managed (e.g., mowed park) or buried below an impervious surface (e.g., road).	The transportation of non-native and invasive species into sensitive vegetation communities due to seed disturbance/dispersal along cleared areas and construction equipment would be minimized.
Reduction in the quality of the retained portion of vegetation and habitat adjacent to major valley crossings and large forest blocks.	• Tree protection fencing and erosion control fencing should meet the most current and applicable OPSS and/or MTO standards available at the time of construction (and also for watercourse protection prior to and throughout construction). • Implement and maintain measures prior to and throughout construction. • Limit zone of construction impacts (i.e., vegetation removal, soil compaction) to the extent possible (e.g., keep staging areas outside of the forested valley, keep construction and maintenance access roads under or close to the centreline of proposed bridge structures). • Construction and maintenance access should be provided under the bridge centreline wherever feasible. However if not possible, access is generally preferred along the north side of the structures (for structures located along the mainline). This is because the north side will be shaded by the structures and vegetation growth will be less vigorous and plantings less successful than on the south side. Additionally, some site specific recommendations regarding preferred valley access (east side vs. west side) are provided to avoid sensitive valley slopes, vegetation communities and/or species. • The widths of access roads should at a maximum be 5 m and ideally 3 m within forests and wetlands.	The reduction in the quality of the retained portion of vegetation and habitat adjacent to major valley crossings and large forest blocks will be minimized through the development and implementation of a post-construction valley restoration plan.

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Potential Effects	Mitigation / Compensation Measures	Net Effects
	• Retain and stockpile some of the woody debris removed from the unit – to be placed in the valley, particularly under the bridge, for habitat cover and to restore organic matter to soil. • Where practical, leave cut stumps in situ to reduce erosion and retain organic matter. • In order to maintain moisture regimes under bridges and maximize tree and other vegetation retention , runoff should be directed to these areas, with appropriate consideration of erosion protection at outfalls • Model restoration plans after natural reference habitat, based on site-specific conditions, with the overall objective of restoring/maintaining key ecological features and functions. Possible native shrub species suitable for cover, funnelling, and food sources are: Highbush Cranberry, Nannyberry, Red-osier Dogwood, Staghorn Sumac, Grey Dogwood, Northern Prickly-Ash, and shrub willows. • Use appropriate local genetic stock and species as an ecological restorations priority. • Use a variety of seeding and planting methods, multiple species and relatively high planting densities for woody species to build natural redundancy into the restoration plans. • Balance construction site restoration objectives by minimizing the fill footprint associated with bridge embankments (i.e. recognize that softening fill embankment slopes to accommodate plantings may actually increase fill footprint in the valley and may be at odds with the objective to minimize the overall fill footprint). • Prepare planting and restoration plan as a component of the final bridge design and final sediment/erosion control plan (developed during subsequent design phases). • Replant temporary construction access roads with native trees and shrubs (may also require measures to address compacted soil). • Use soil restoration (possibly reducing soil compaction and increasing organic matter) to facilitate the success of vegetation plantings (considering that described in Arthur and Associates and SNC-Lavalin Engineers and Constructors Inc. 2006).	
Creation of new edge resulting from vegetation removal (increased sun, wind and change in humidity and shade).	• Create an edge management strategy that incorporates the following principles: • Temporary vegetation protection fencing will be installed at the edge of the clearing limits where the edge of a forest community is removed. This fencing will delineate the clearing limits and prevent further intrusion into the adjacent forested habitat. • Tree removal will be restricted to the working area. Wherever possible, vegetation will be retained in areas not requiring grading or other works. Grading requirements will be reviewed during subsequent design phases to facilitate that objective. • Trees along the newly created edge will be flush cut (not grubbed) to stimulate suckering regeneration. • Wood chip material will be applied in the edge plantings (at the identified edge management areas) that will be developed during subsequent design phases. This material will help retain soil moisture and prevent weed spread. • Hazard tree management will be undertaken along the new edge as required. • Buffer plantings will be installed to help increase shade, reduce wind in retained vegetation, particularly wetland vegetation and other sensitive natural areas and from the effects of the adjacent highway (e.g., salt spray and contaminants). Spruce trees should be planted to seal the edges of new cuts on the north side only. • Pre-stressing of forest edges will be implemented in selected areas as soon as possible. Pre-stressing involves advanced thinning of the future forest edge, prior to construction, to promote dense young shrub and tree growth in the understory. This dense growth will help buffer the retained vegetation from the effects of the adjacent highway. Incorporate pit and mound topography (to hold water) in areas where grade is to be reconstructed and planted.	The creation of new edge resulting from vegetation removal (increased sun, wind and change in humidity and shade) will be minimized through the development and implementation of an edge management strategy.

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Potential Effects	Mitigation / Compensation Measures	Net Effects
Reduction in existing wildlife movements.	• Provide structures suitable for target species as well as structures capable of facilitating movement by a broad range of wildlife species/sizes (multi-species use); • Provide a mixed size array of structures that may assist in reducing predation risk while also providing diverse opportunities for wildlife passage; • Locate and space structures to take advantage of existing linkage features present in the landscape while also considering target wildlife species ability to travel along the ROW and find suitable structures for passage; • Wherever possible ensure that entrance and exits to the structures are reasonably level (no major grade changes) to provide an unimpeded view through the structure (and habitat beyond); • Ensure that wildlife structures are located where existing natural linkages are anticipated to be retained and protected over the long term, and not at locations where future urban build-out is likely or planned; • Provide suitable cover elements adjacent to the passage structure (either retained or planted vegetation) that can facilitate wildlife use of the structures (cover/shelter on route to structure) while not blocking the structure entrance or blocking movement along funnel walls; • Ensure natural substrates (native soil materials) are used inside the structures so they are more conducive to wildlife use. In addition, provide under-bridge cover elements for larger structures to facilitate wildlife passage through what might otherwise be a relatively open environment with limited or no vegetation cover (for example, boulder material, logs/stumps and other woody debris that can provide a continuous cover/shelter zone under the bridge structure for a variety of wildlife species). • Provide funnel fencing that can guide wildlife to the structures while also restricting the ability of wildlife to access the ROW; • Provide escape structures at suitable locations/intervals to enable wildlife trapped within the ROW to have an opportunity to safely exit to nearby cover and habitat; and • Final design details for the crossings will be prepared during subsequent design phases, with agency review and input. This will be included as part of the restoration and landscape plan. **<u>Wildlife Passage Design Elements</u>** • A minimum target Openness Ratio (OR) of 0.05 is to be achieved for crossings that will provide movement opportunities for smaller wildlife species that are adapted to nocturnal and/or tunnel like conditions in their life history (typically a variety of small to mid-size mammals and common amphibians). • A minimum target OR of 0.1 is to be achieved for crossings that will provide movement opportunities for a range of common reptiles and amphibians, especially in areas with damp conditions that may be associated with hydro corridors, local linear drainage features, and other locations where suitable habitat conditions exist and will persist on either side of the Transportation Corridor over the long term. • A minimum target OR of 0.25 is to be achieved for crossings that will provide movement opportunities for turtles and SAR herpetiles species such as Blanding's Turtle and where such habitat conditions will persist on either side of the transportation corridor over the long term. • A minimum clearance height of 3 m for crossings that will provide movement opportunities for larger mammals such as deer. A corresponding minimum target OR of 0.6 is also recommended. • Provide stable natural substrates with surface layer consisting of fine material for wildlife footing and minimum 200-300 mm in depth within or under the structure. • Consider headwalls/wingwalls or open median to shorten culvert length. • Wherever possible utilize root wads, tree trunks, and other woody debris obtained from the clearing zone to re-cycle this material for the underbridge elements. After vegetation is cleared, stock pile and retain some of the woody debris to be used for this purpose.	The reduction in existing wildlife movements due to the transportation corridor would be minimized by the 85 structures that will accommodate wildlife passage including 6 terrestrial wildlife passages not associated with watercourse crossings.

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Potential Effects	Mitigation / Compensation Measures	Net Effects
	• Where practical, leave cut stumps in situ to reduce erosion, retain organic matter and provide under bridge cover elements for wildlife. • Ensure that cover materials are suitably sized and secured to withstand periodic flood events. • Ensure that any riprap stabilization areas contain a mix of interbedded fine materials to provide as smooth a travel area as possible. **<u>Fencing for smaller wildlife species</u>** • Fencing for smaller wildlife species should be at least 0.6 to 0.9 m high and able to act as a barrier to small mammals, amphibians, turtles and snakes. This can be achieved by installing an additional impermeable layer to the bottom of the standard fencing, or ungulate fencing, in sections where the target wildlife species are to be funnelled. Possible materials could consist of very fine wire mesh fencing or aluminum flashing. Other suitable materials available at the time of construction should also be considered. • Length of fencing away from passageway will be determined on a site-specific basis, but generally extend about 25 metres beyond the edge of the natural habitat area surrounding the passage. • This supplementary fencing should be installed in a trench to reduce digging by smaller terrestrial species. **<u>Fencing for larger wildlife species</u>** • Fence height should be 2.4 m with the mesh attached to the outside (habitat side) of the fence posts to resist pressure loading on the fencing from ungulates pushing on it and testing it for weakness. • The higher fencing should typically extend beyond the prime habitat zone, and, where ungulate movement zones are relatively clear or known, fencing is typically installed extending from 400 m to 1600 m on either side of the wildlife structure. • Fencing should be installed either flush with the ground, or buried to reduce wildlife entry by digging.	
Changes in vegetation community composition including vegetation dieback due to short term or long term changes in groundwater levels.	• See the proposed mitigation/compensation measures associated with the Hydrogeology sub-section of this table.	The changes in vegetation community composition including vegetation dieback due to short term or long term changes in groundwater levels would be minimized.
<u>Wildlife Species at Risk</u>	• Avoid the potential Blanding's Turtle habitat through appropriate design and mitigation developed during subsequent design phases. The transportation corridor does not remove or encroach upon the large pond that is in the vicinity of the area where the Blanding's Turtle was recorded (Wilmot Creek valley); however, the transitway corridor and relocated Hydro Tower corridor cross the north portion of this pond. • Build the proposed wildlife structure at this location to facilitate the passage for all animals (refer to above for further details) • Golden-winged Warbler habitat was recorded approximately 150 m from the ROW and only a small portion of the suitable habitat is affected and therefore no mitigation is required.	There would be no removal of potential Blanding's Turtle habitat due to the transportation corridor footprint and avoidance through design and mitigation for the future transitway and hydro corridor would be developed during subsequent design phases. There is a low potential to affect Golden-winged Warbler habitat.
Removal of vegetation from salt application during operation of the recommended design.	• Implement MTO's salt management policy related to salt application, storage and stockpiling of salt-laden snow, as well as any new salt management initiatives in place at the time of operation.	The loss of vegetation from salt application during operation of the recommended design would be minimized.
AQUATIC		
Temporary changes to groundwater and surface water during construction affecting watercourses.	• No sub-watershed diversion of surface flow will occur. Local 'diversions' to new outfall points will only be considered on minor seasonal drainage features that do not support direct fish use. • Continue to emphasize the functional importance of groundwater to fish and fish habitat throughout the design	The temporary changes to groundwater and surface water during construction affecting watercourses would be minimized.

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From the Ontario Ministry of Environment Review of the 407 East EA, November 2009**

Potential Effects	Mitigation / Compensation Measures	Net Effects
	and construction process. Specific and rigorous attention will be paid to temporary dewatering during construction at stream crossings that support coldwater fish communities and/or Redside Dace. • Attempt to maintain this functional connection in the new channel section during design where channel relocations are required in habitat supported by groundwater discharge. Preliminary conclusions that groundwater will persist in the channel realignments on the three coldwater watercourses (Lynde Creek, Oshawa Creek West and Black Creek) based on similar groundwater elevations and materials across the floodplains will be verified during subsequent design phases, and again during construction of the new channels. Specific consideration of groundwater discharge in relation to specific habitat elements (e.g., spawning habitat, refuge pools) will be integrated in this analysis and design. • If discrete groundwater discharge points are identified during further detailed hydrogeological or geotechnical work or field work, opportunities to direct the groundwater flow to a watercourse will be evaluated, and wherever feasible, designed and implemented. • Furthermore, if discrete groundwater discharge points are encountered in the vicinity of a watercourse during construction, all reasonable opportunities to convey the groundwater to the stream channel will be designed and implemented. • Fill placed in the deeper valleys where evidence of groundwater discharge is present and particularly where it is functionally important to the fish communities should be designed using a permeable sub-base to maintain existing groundwater movement toward the streams. If discrete groundwater discharge points are identified during subsequent fieldwork, or during construction, specific measures to convey groundwater to the stream, and specifically to key habitat elements such as spawning riffles and refuge pools, should be designed (e.g., "French drains", tile drains). These designs should consider channel geomorphology to ensure that the discharge of groundwater avoids erosion of the existing channel. • Specific outfall control measures will be implemented for all SWM facilities to prevent erosion of the receiving streams, with specific attention to outfalls to the deeper valleys at Brougham Creek and Tributary B and many of the high sensitivity watercourses in the eastern portion of the study area including main crossings of Farwell Creek (Site 59), Bowmanville Creek (Site 61), Soper Creek (Sites 72 & 75) and Wilmot Creek (Sites 78 & 79). SWM ponds have been designed to address concerns regarding thermal regime. Additional detail of the SWM treatments proposed within each watershed and along specific reaches is provided under separate cover in a series of technical stormwater Management reports.	
Indirect loss of aquatic habitat due to construction practices.	• The construction access and work areas will be confined to the extent required for the construction activities, and these areas then delimited in the field using appropriately installed protective fencing. • Removal of riparian vegetation, particularly woody vegetation, will be kept to the minimum necessary for the project works. The woody vegetation that will likely require removal should be replaced with appropriate native species. This will be implemented through a comprehensive landscape design contract. • Any temporarily stockpiled material, construction or related materials will be properly contained (e.g., within silt fencing) in areas separated a minimum of 30 m from any waterbody. • All construction materials and debris will be removed and appropriately disposed of following construction. • Retain as much of the natural vegetation as reasonably possible to help ensure bank stability, control erosion, and expedite the re-colonization of vegetative cover. • All vegetation clearing required for access will be conducted using proper clearing techniques and appropriate construction timing windows as may be defined by other legislation (e.g., *Migratory Birds Convention Act*). • All debris and potential contaminants (e.g., concrete and structural materials, paint and solvents) generated from construction of the structure will be properly sited and contained to prevent debris from entering the watercourse, and all debris will be properly disposed of off-site.	The indirect loss of aquatic habitat due to construction practices would be minimized.

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Potential Effects	Mitigation / Compensation Measures	Net Effects
	• All activity will be controlled so as to prevent entry of any petroleum products, debris or other potential contaminants/deleterious substances, in addition to sediment as outlined above, to any waterbody. No storage, maintenance or refuelling of equipment will be conducted near any waterbody). A Spills Prevention and Response Plan will be developed by the Contractor and kept on site at all times. • All in-water and near-water activities will be conducted within the applicable in-water construction timing windows, as identified by with the MNR, to protect the resident fishery life functions. The construction timing periods will be applied to all fish-bearing watercourses, as well as watercourses that drain directly to fish bearing watercourses, based on the thermal classification of the fish community present	
Indirect loss of aquatic habitat due to sedimentation and debris during construction.	• Perimeter silt fence will be installed between the work areas and all reaches of those watercourses where works are required, including ditch and drainage works that drain to watercourses that support fish habitat. • The fencing will be properly installed and regularly inspected and maintained. It will be left in place and maintained until all surfaces contributing drainage to these watercourses are fully stabilized. • All sediment and erosion control measures will be regularly inspected and monitored by a trained environmental inspector. • All exposed and newly constructed surfaces will be stabilized using appropriate means in accordance with the characteristics of the soil material. • These surfaces will be fully stabilized and re-vegetated as quickly as possible following completion of the works. • Contingency procedures, materials and notification procedures will be readily available on- for use in the event of a silt release, and for general application in regular maintenance and repair.	The indirect loss of aquatic habitat due to sedimentation and debris during construction would be minimized.
Indirect loss of aquatic habitat due to temporary dewatering during construction.	• Temporary flow management plans will be developed to isolate the construction zones for watercourse crossing works and to maintain clean flow downstream. These plans will be developed based on MTO's standards and in accordance with Permission To Take Water (PTTW) conditions and any other supporting measures as may be identified by the project hydrogeologists. Where appropriate, withdrawal points from the channel will be properly sited and designed to prevent intake of silt or bed materials, and the discharge points sited and designed to prevent erosion and any sediment release. • Only clean materials free of fine particulate matter will be placed in the water for temporary construction measures (e.g., coffer dams will be constructed of 'pea gravel' bags, geotextile fabric or other clean material) or permanent works (e.g., substrate material). • All hoses drawing water from streams supporting fish use during temporary flow management procedures will be screened to prevent potential entrainment of fish. • Any fish stranded within the temporary in-water work zones (including/see also measures above with respect to abandonment of old channel sections) will be removed and relocated using appropriate techniques by qualified fisheries specialist. Re-location sites for fish stranded within the temporary work zones for culverts where continuous flow is not present during the construction period will be identified. Generally, such a site will always be on a permanent reach of the watercourse, or where there is no continuous flow in the vicinity, may be on a permanent reach of the receiving/parent watercourse. A qualified fisheries specialist will identify fish relocation sites, in consultation with MNR (if required). • During all temporary dewatering required for works, appropriate energy dissipation and settling/filtration measures will be used for discharge of dewatering water to ensure no erosion or sediment release occurs in the watercourses/drainage features. The dewatering plan will include properly sized, designed and sited temporary filtration facilities. Discharge points for release of dewatering discharge will be sited and designed to prevent erosion and ensure only clean flow is released to the watercourses. If sheet piling is used to contain	The indirect loss of aquatic habitat due to temporary dewatering during construction would be minimized.

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Potential Effects	Mitigation / Compensation Measures	Net Effects
	dewatering areas, it will be removed following construction to prevent obstruction of groundwater movement to the streams. • The Contractor will be informed regarding which watercourses are particularly Sensitive (e.g., presence of SAR, Brook Trout and other salmonid habitat/High Sensitivity crossings). All mitigation measures for these crossings, and all crossings, and adjacent works will be stringently implemented with comprehensive environmental inspection. • Any opportunities identified during construction to divert any exposed groundwater discharge directly to the stream channels should be implemented, with input from the fish biologist, environmental inspector and/or hydrogeologist, and consultation with agency staff if appropriate.	
Indirect loss of aquatic habitat due to the removal of existing bridges and culverts during construction.	• In several situations, removal of existing structures will be required to construct the new transportation corridor crossings or realigned secondary roads offer the opportunity to remove and rehabilitate the abandoned sections of roads and associated crossings (e.g., Brougham Creek Sites 3 and 3a, Tributary A of Brougham Creek Sites 4/5/101/102, Lynde Creek Tributary A Site 51, Lynde Creek Site 100). Appropriate containment systems will be designed and implemented during removal of the existing structures to prevent entry of debris into the watercourses. This system(s) will address large materials and fine particulates, and will be regularly monitored to remove and appropriately dispose of accumulated material. • Materials that fall in the water will be carefully retrieved using appropriate mitigation measures to minimize disturbance. • Following removal of the structure, the site and open sections of watercourse will be restored and naturalised, with specific attention to integration of fish habitat opportunities wherever feasible.	The indirect loss of aquatic habitat due to the removal of existing bridges and culverts during construction would be minimized.
Direct loss of aquatic habitat due to channel realignments.	• Where channel relocations cannot be avoided, the realigned watercourse reaches will be designed using natural channel design principles, by qualified technical experts • The new channel sections will be designed to re-instate and wherever feasible enhance the habitat features and functions that occur along the existing channel section and their inter-relationships. Features include morphological elements, particularly pool, riffle complexes, substrates, particularly mixed and coarse materials, and in stream and overhanging cover. Functions include consideration of groundwater influx, particularly in the coldwater watercourses, and may warrant consideration of the relationship between groundwater influx and specific habitat elements (e.g., seasonal refuge pools, spawning riffles), and fluvial geomorphic considerations (e.g., bank stability, maintenance of morphologic features). • Naturalized design measures should be used throughout, recognizing that selected physical and hydraulic treatments/measures may be required where vegetation cannot be used under shaded portions of the structures, particularly to maintain certain features such as deep pools or ‘control’ potential lateral widening. • Wherever feasible, the length of the new channel section should match the length of the existing channel section, thereby maintaining channel slope and opportunities to re-instate existing habitat features. Where this is not possible, changes in channel slope will be accommodated in the design of the replacement channel section and its transitions. • The substrate mix will be designed to replicate the existing substrate material size composition and general shape. In many cases, the surficial materials in the new channel location may be similar to the existing channel materials, however this should be confirmed, and appropriate replacement materials used that replicate or where appropriate enhance the existing materials. Opportunities to salvage existing materials should be considered. Where materials are imported, locally sourced, washed, pit-run material should be used to ensure a similar shaped material. • The bankfull and low flow channel sections will be designed to match the existing channel sections (assuming	The direct loss of aquatic habitat due to channel realignments would be offset.

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Potential Effects	Mitigation / Compensation Measures	Net Effects
	similar slope conditions), or otherwise designed to maintain of enhance existing fluvial geomorphic processes that support fish habitat elements. • Maintenance or enhancement of fish movement under all relevant conditions (e.g., low flow and higher flows) will be integrated in the design and construction of the new channel section and transitions. Avoidance of potential barriers to movement will consider channel slope and velocity and potential for barriers to develop in the future in relation to channel stability (e.g., either too high/potential for degradation or too low/potential for aggredation). • The fine details of the channel installation should be done under the direction of a fluvial geomorphologist. 'Field fitting' of the detailed installation of the channel sections and specific habitat components is a critical component of their installation, to ensure the stream channel and habitat maintain or enhance existing conditions and transition smoothly with the up and downstream reaches. • Specialty Contractors with demonstrated experience in undertaking channel relocations of this scale should be used to construct channel realignment. • Wherever feasible, channel realignment works, including flow transfer, should occur early during construction to ensure that the realigned channel is functioning as designed. • Flow transfer from the abandoned to the new channel section will be conducted during the appropriate in stream work window. The new channel section will be surveyed prior to flow transfer, with careful attention to the transitions to ensure they have been constructed as designed and to ensure that the design matches the field conditions as intended. The flow transfer process will be carefully planned and organized to ensure the flow transfer is completed as quickly and efficiently as possible. The flow transfer will not be completed during rain or runoff events, and weather forecasts will be monitored to schedule the transfer outside of forecasted storms. Prior to abandoning the existing channel transition zones and the culvert, fish will be removed from the channel section to be abandoned by qualified fisheries biologists using standard procedures.	
Direct loss of aquatic habitat due to culvert crossings.	• Appropriate design measures to ensure substrate and channel stability/maintenance of a low flow channel though the structure will be developed during subsequent design phases. This analysis and design process will integrate specific fluvial geomorphologic and hydrologic input. • In cases where box culverts are being used, they will be designed and installed by embedding the bottom of the culvert below the existing stream invert, backfilling with substrate and creating a low flow channel. Although box culverts may still be used in some cases where evidence of groundwater discharge is present, they were not used when a functional relationship with the habitat and fish community was identified. • The tie-in zones between the culvert inlet and outlet zones and the existing up and downstream channel will be designed to transition smoothly, and will be constructed carefully and monitored to confirm the final transition zones are continuous. • Particular care will be taken to ensure the substrates transition smoothly from the structures to the channel sections up and downstream, to ensure no barriers to fish movement are created or erosion is triggered. • If scour/rock protection is required for the areas around the culvert inlets or outlets, it should be designed and installed so as to minimize alteration of the channel profile (e.g., inset to match existing grade) and/or designed to provide fish habitat opportunities (e.g., culvert outlet pools), and maintain fish passage at all times. Use of rock protection/'hardening' of the channel banks should be avoided. • The incorporation of a low flow channel with an overbank area will also facilitate dry land passage for wildlife.	The direct loss of aquatic habitat due to culvert crossings would be offset.
Direct loss of aquatic habitat due to bridge crossings.	• Loss of vegetation in the long term may result in impacts to channel stability, habitat form and morphology, and associated potential for erosion and downstream sediment transport, or changes to the low flow channel	The direct loss of aquatic habitat due to bridge crossings would be offset.

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Potential Effects	Mitigation / Compensation Measures	Net Effects
	and fish movement opportunities. • Therefore, appropriate design measures to ensure substrate and channel stability and maintenance of a 'stable' bankfull channel and associated fluvial geomorphologic processes though the structure will be developed during subsequent design phases. This analysis and design will integrate specific fluvial geomorphologic and hydrologic input, with specific consideration of fish habitat elements. In many cases, this process will involve collection and analysis of additional information to support the detailing of the design. • There will be no direct discharge of deck drainage outlets (deck drains) into the watercourses, and as much of the deck drainage as possible should be conveyed off the bridge deck and away from watercourses for application of the recommended SWM measures. Release of any drainage that cannot be fully conveyed away from the watercourse should be restricted to the ends of the structure onto the floodplain areas, and the need for specific treatment measures (e.g., splash pads, vegetation filtering) should be assessed during subsequent design phases. • If scour/rock protection is required for the areas around the bridge abutments or piers, it should be designed and installed so as to transition smoothly with the valley and avoid any encroachment into the channel. Hardening/armouring of the channel banks should also be avoided, unless otherwise required for channel stability, and designed in consultation with a fluvial geomorphologist. In the event that rock protection is required in the water, it should be designed to provide fish habitat opportunities (e.g. cover).	
AIR QUALITY		
Temporary changes to air quality during construction (i.e. emissions, dust).	• The contractor is responsible to investigate and address all complaints related to dust or emissions associated with construction activities which may involve further mitigation opportunities. • Use reformulated fuels, emulsified fuels, catalyst and filtration technologies, cleaner engine repowers, and new alternative-fuelled trucks to reduce emissions from off-site construction equipment. • Undertake regular cleaning of construction sites and access roads to remove construction caused debris and dust. • Undertake dust suppression on unpaved haul roads and other traffic areas susceptible to dust. However, chemical dust suppressants should not be used in areas where these may harm plants, wetlands, fish and other aquatic organisms • Cover fine grained materials when transporting them • Promptly clean paved streets/roads where tracking of soil, mud or dust has occurred • Prevent trucks and other vehicles from tracking soil, mud or dust onto paved streets or roads • Cover soil, sand and aggregate stockpiles as necessary to prevent potential fugitive dust • Comply with posted speed limits and, as appropriate, further reduce speed when travelling on unpaved surfaces to reduce dust creation	With the implementation of air quality control measures as part of the construction Code of Practice, no net negative effects are anticipated from construction.
Changes to air quality during operation of the recommended design (i.e. dust).	• Reduce surface loadings by paving the shoulders of the transportation corridor. • Ensure that there is vegetation along the corridor which limits soil erosion and removes particulate matter and other contaminants from the air. • Reduce sand and salt loadings to the transportation corridor through improved plowing or utilization of a pavement surface texture that minimizes ice adhesion. • Wash the sand that is used for de-icing, prior to its application, to remove fine particulates that will become re-suspended without reducing the effectiveness of the coarse particles which prevents skidding. • Provision of high occupancy vehicle lanes and a transitway corridor will promote ride sharing and transit use and therefore reduce the reliance on single occupant vehicles. In addition, a number of provincial and federal initiatives will help to further reduce transportation's contribution to air pollution.	The proposed project will have no net effect on all the contaminants modelled, with the exception of acrolein and TSP. All other contaminants are expected to produce concentrations well below their respective thresholds. Predicted levels of acrolein exceed the threshold; however, the Recommended Design contributes an insignificant amount compared to the ambient background. As such, it is considered to have no net effect. Similarly, predicted levels of TSP exceed the threshold due to a combination of re-entrained road dust, primarily from existing arterial roads

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Potential Effects	Mitigation / Compensation Measures	Net Effects
		within the study area and elevated ambient background concentrations.
NOISE		
Temporary increase in noise levels during construction.	• Build the three recommended noise barriers as close to the start of construction as possible so that acoustical screening is provided for construction activities. • Construction should be limited to the time periods allowed by the locally applicable by-laws. • If construction is required outside of the hours allowed in the applicable by-laws, MTO or its Agents on behalf of the Contractor will seek any required exemptions and permits directly from the affected jurisdiction, in advance for any work to be performed outside of the allowable time periods listed above. If an exemption cannot be obtained, then construction will proceed in accordance with the By-law requirements. • There should be explicit indication that Contractors are expected to comply with all applicable requirements of the contract and local noise by-laws. Enforcement of noise control by-laws is the responsibility of the Municipality for all work done by Contractors. • All equipment should be properly maintained to limit noise emissions. As such, all construction equipment should be operated with effective muffling devices that are in good working order. • The Contract documents should contain a provision that any initial noise complaint will trigger verification that the general noise control measures agreed to are in effect. • In the presence of complaints, sound emission standards for the various types of construction equipment used on the project should be checked to ensure that they meet the specified limits contained in MOE Publication NPC-115 – "Construction Equipment". • In the presence of persistent complaints and subject to the results of a field investigation, alternative noise control measures may be required, where reasonably available. In selecting appropriate noise control and mitigation measures, consideration should be given to the technical, administrative and economic feasibility of the various alternatives. • All blasts (if required) should be designed to meet any applicable overpressure and vibration limits established by the MOE in Publication NPC-119 and by the MTO in OPSS 120.	Any temporary increase in sound levels during construction will be managed through the use of a construction Code of Practice that will be written into contract documentation.
Increase in noise levels during operation of the Recommended Design.	• Construct the three recommended noise barriers as part of the recommended design: o Constructed to shield residences in the southern portion of the village of Brooklin. The barrier will be comprised of a 4 m high noise wall located on the bridge structure over the watercourse, combined with a 5 m high noise wall located at the edge of the transportation corridor o Constructed to shield residences in the hamlet of Hampton. The barrier will be comprised of a 4 m high noise wall located on the bridge structure over the watercourse, combined with a 5 m high noise wall located at the edge of the transportation corridor o Constructed to replace the existing barrier along the north side of Highway 401 in the area undergoing realignment. The barrier will be comprised of a 5 m high noise wall. • Enhanced landscaping measures will be used in areas with a sound level change of greater than 10dB, where feasible. Such measures may include buffer plantings, contour grading, vegetative slope stabilization and enhanced edge management at wooded areas.	The increase in noise levels during operation of the recommended design in these 3 areas would be reduced through noise barriers. The use of vegetative buffering and screening may help to lessen the noise effects for areas with a sound level change of greater than 10dB
SOCIO-ECONOMIC		
Temporary disruption to properties during construction (i.e. access, septic system, well, landscaping).	• Relocate property access if required, where feasible. • Relocate affected septic systems and wells if required, where feasible. • Reinstate landscaping if required, where feasible.	No net effect.

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Potential Effects	Mitigation / Compensation Measures	Net Effects
Temporary disruption to businesses and institutions during construction.	• Relocate property access if required, where feasible. • Relocate affected septic systems and wells if required, where feasible. • Reinstate landscaping if required, where feasible. • Restore or provide signage for businesses and institutions. •	No net effect.
Temporary disruption to recreational uses during construction.	• Relocate trail systems where feasible. • Restore or provide signage for trail systems.	The temporary disruption to recreational uses during construction would be minimized.
Loss of property.	• Property acquisition at fair market value in accordance with Ministry policy and directives.	All property owners would be compensated for loss of property at fair market value in accordance with Ministry policy and directives.
LANDSCAPE COMPOSITION		
Alteration of existing landscape character.	• Landscape composition mitigation will include significant vegetative screening and buffering which is consistent with the character and surrounding land uses of the area.	Alterations to the viewsheds and impacts to properties in close proximity to the corridor will be mitigated.
Alteration of existing views and viewscapes.	• Landscape composition mitigation will include significant vegetative screening and buffering. Measures developed through the CVP process will mitigate impacts to views and viewsheds and include measures which will enhance the landscape composition of the area at select locations. CVP measures proposed in areas may improve on the existing landscape composition by providing greater screening and buffering from existing land uses.	Alterations to the viewsheds and impacts to properties in close proximity to the corridor will be mitigated and in some areas may result in a positive net effect.
AGRICULTURE		
Temporary disruption to farm equipment traffic/route access during construction	• Maintain farm traffic corridors to allow continued farm equipment movement during construction.	The temporary disruption to farm equipment traffic/route access during construction would be minimized by maintaining farm traffic corridors
Loss of field access	• Provide alternate/new field access in order to maintain entrance to property/operation.	No net effect.
Disruption to surface and subsurface drainage	• Replace/reroute any surface or tile drains.	No net effect.
Disruption of fencing	• Replace fencing where the recommended design abuts the affected property.	No net effect.
Loss of property affecting agricultural operations.	• Property acquisition at fair market value in accordance with Ministry policy and directives.	All property owners would be compensated for loss of property at fair market value in accordance with Ministry policy and directives.
WASTE MANAGEMENT AND CONTAMINATION		
Generation of excess materials during construction.	• Undertake proper management of generated excess materials including appropriate storage and disposal.	Generated excess materials from construction would be properly managed including appropriate storage and disposal.
Uncovering contaminated soils at the Brock Road Landfill, Darlington NGD Landfill or Waste Transfer Station during construction.	• Obtain Section 27 and Section 46 approvals, as required, under the Environmental Protection Act (EPA) and carry out any necessary conditions of approval including site remediation and leachate monitoring.	Any soil contamination uncovered at the Brock Road Landfill, Darlington NGD Lanfill or the Waste Transfer Station during construction, would be remediated and monitored in accordance with obtaining Section 27 and Section 46 approvals, as required, under the EPA.

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Potential Effects	**Mitigation / Compensation Measures**	**Net Effects**
Uncovering contaminated soils on any property during construction.	• Complete and implement environmental work plans, including Phase I ESAs, Phase II ESAs and site remediation if necessary, at all properties where contaminated soils are uncovered.	All contaminated soils uncovered during construction of the recommended design would be remediated.
Contamination of the environment during construction and operation of the recommended design.	• Carry out BMPs during the operation of the recommended design to minimize any potential contaminant releases to the environment and undertake a rapid and appropriate response to control and remediate any spills/leaks in the unforeseen event they occur.	Any environmental contamination during the operation of the recommended design would be remediated resulting in a positive net effect.
ARCHAEOLOGY		
Uncovering unknown archaeological resources or human remains during construction.	• Cease alteration of the construction work site immediately and engage a licensed archaeologist to carry out archaeological field work in compliance with sec. 48 (1) of the Ontario Heritage Act. • Notify the police or coroner and the Registrar of Cemeteries, Ministry of Government Services immediately upon discovering human remains.	Any unknown archaeological resources or human remains found will be mitigated in compliance with Section 48 of the Ontario Heritage Act. No net effects.
BUILT HERITAGE		
Displacement of a Built Heritage Resource (BHR) or Cultural Heritage Resource (CHR) during construction	• Complete a Cultural Heritage Evaluation Report (CHER) for all directly displaced Built Heritage Resources and Cultural Heritage Resources to determine their heritage value and specific mitigation measures. • Carry out the specific mitigation measures recommended in CHER.	All BHRs and CHRs within the transportation corridor would be assessed through CHERs with recommendations for mitigation being considered prior to any displacement during construction.
Disruption of a Built Heritage Resource (BHR) or Cultural Heritage Resource (CHR) during construction and operation of the recommended design	• Carry out the mitigation/compensation measures associated with the Air Quality, Noise, and Landscape Composition disciplines • Construct berms and/or plant landscape screening, where feasible and appropriate	The disruption of BHRs and CHRs during construction and operation of the recommended design would be minimized.

12 Appendix B

Responses to Comments Received on the Draft Comprehensive Study Report

On December 2, 2010, the Canadian Environmental Assessment Agency (Agency) posted a notice on the Registry Internet website inviting comments on the draft Comprehensive Study Report (CSR) prepared by the Ontario Ministry of Transportation (MTO). The draft CSR can be accessed at www.ceaa.gc.ca under reference number 08-03-39781. During the comment period, the Agency received 9 submissions. These included: 3 reports from the Participant Funding recipients (Transport Action Ontario, Friends of the Farewell, Board of Management of the Toronto Zoo (Ontario Road Ecology Group)), 1 letter from Ecojustice on behalf of the non-profit group SHIFT, 3 letters from municipalities (City of Oshawa, Town of Whitby and Municipality of Clarington) and two letters from individuals. The following Comment/Response table, prepared by the Agency with input from federal authorities and the MTO, is a summary of all comments received by December 22, 2010 during the comment period.

Vegetation and Wetlands			
Submitted By	**Summary of Comments**	**Ontario Ministry of Transportation Response**	**Canadian Environmental Assessment Agency Response**
Friends of the Farewell Consultant - (R.J. Burnside Consulting Limited)	1. Can the report be revised to detail vegetation loss by ecosite type (forest, wetland, thickets, grasslands etc)? 2. We recommend a replacement ratio of 1:1.5 with monitoring for at least 5 years post construction to ensure a higher survival rate. 3. The Vegetation Restoration Plan should be made available for public review and comment 4. It is unclear how the Federal Policy (Wetland Conservation) of "no net loss of wetland functions" will be achieved. This should be detailed in the CSR.	1. The draft CSR quantifies the loss of forested areas and wetlands and identifies mitigation measures to address the indirect effects of these losses. The losses have been documented using the Ecological Land Classification (ELC) System (i.e. by ELC rather than by ecosite) as per MNR's requirements. 2. The provincial environmental assessment (EA) documentation includes MTO's commitment to further develop vegetation restoration/enhancement plans in consultation with the Ontario Ministry of Natural Resources and the Conservation Authorities to offset vegetation removals, including an initial approach for permanent forest and wetland vegetation removals/habitat loss at a minimum 1:1 ratio. 3. The final vegetation restoration plans will be made available to the public. 4. Through the development of a follow-up plan as part of the comprehensive study, MTO will be required to verify the accuracy of its predictions and the effectiveness of mitigation measures proposed. The success of implementing restoration will be a key consideration in determining what adaptive management measures may need to be undertaken. Through the route generation, assessment and evaluation process, wetlands were avoided to the extent possible and where avoidance was not feasible, encroachment was minimized to the extent possible as defined in the provincial environmental assessment documentation. Less than 1% of the Project footprint impacts wetlands. Moreover, as indicated in the cumulative effects assessment, the wetland losses within the corridor represent approximately 1.1% of existing wetlands in the Regional Study Area. MTO has and will continue to abide with the spirit and intent of the Federal Policy of "no net loss of wetland functions" which applies primarily to federal Crown lands, but encourages provinces to protect their wetlands as well. As such, emphasis in	1. The Agency is satisfied with MTO's analysis of vegetation loss and its proposal for a minimum 1:1 replacement ratio as documented in section 6 of the CSR. Provincial and federal regulatory agencies including MNR, Conservation Authorities and Environment Canada (EC) will be involved in the review of the Vegetation Restoration Plan. 2. The Agency agrees with the suggested 5 year post construction monitoring. This has been incorporated into the requirements of the follow-up program for the Project. 3. The Agency agrees that the Vegetation Restoration Plan should be publicly available. MTO has indicated that the Vegetation Restoration Plan will be made available to the public and containing a level of detail closer to what the commenter is seeking. 4. The Agency is satisfied the route assessment and evaluation process during the "Alternatives To/Alternative Means" was undertaken in a sufficiently rigorous manner to avoid, where possible, and minimize impacts to environmental features such as wetlands. Section 6.7 of the CSR sets out the requirements in respect to wetlands. The MTO has committed to specific mitigation measures to address wetlands, including compensation for loss of wetland areas at a minimum ratio of 1:1. Subsequent design phases are appropriate phases to address details about how the goal will be achieved. The follow-up program described in the CSR includes vegetation, vegetation communities and wetlands.

Vegetation and Wetlands			
Submitted By	**Summary of Comments**	**Ontario Ministry of Transportation Response**	**Canadian Environmental Assessment Agency Response**
		MTO's restoration plans will be placed on the no net loss of function of the Cedar Swamp located on the federal airport lands. Specific requirements will be defined through subsequent design phases in consultation with appropriate regulatory agencies, including Environment Canada and Transport Canada.	

Biodiversity			
Submitted By	**Summary of Comments**	**Ontario Ministry of Transportation (MTO) Response**	**Canadian Environmental Assessment Agency (the Agency) Response**
Friends of the Farewell	1. Biodiversity was not considered by the EA, only Species at Risk. A biodiversity approach was not taken to planning the East Link.	1. Biodiversity was considered in the analysis throughout the environmental assessment by ensuring that all vegetation communities and wildlife potentially affected were identified and effects on these species were assessed. Cumulative effects were examined in accordance with the Operation Policy Statement Addressing Cumulative Effects under the Canadian Environmental Assessment Act (November 2007). The draft CSR documents the cumulative effects analysis.	1. The Agency is satisfied that the comprehensive study assessed effects on specific species of concern and habitat of the Project including the cumulative effects, all of which supports biodiversity.

Residual Adverse Effects			
Submitted By	**Summary of Comments**	**Ontario Ministry of Transportation (MTO) Response**	**Canadian Environmental Assessment Agency (the Agency) Response**
Friends of the Farewell Consultant	1. Any Valued Ecosystem Component (VEC) with more than two effects identified as 'high' should be considered to have a Significant Adverse Effect. 2. Draft CSR Table 7-6 should be revised to state that there will be minor adverse effects to the Golden-winged Warbler habitat (it currently states no adverse effects). 3. Draft CSR Table 8-2 should be revised to reflect: The duration of impacts to loss of vegetation and vegetation communities as medium significance given the statement in section 7.6 of the draft CSR that "it may be difficult to find suitable lands to undertake the proposed compensation". The duration of impacts to Interior Forest Habitat as high significance	1.-3. The assessment of net effects and determination of significance was undertaken in accordance with the methodology outlined in the draft CSR. The criteria and thresholds for determining significance reflect current practice in federal environmental assessments, whereby a significant environmental effect would require a high magnitude, extent and duration to be considered significant. The assessment was undertaken by the environmental specialists, based on the detailed inventory of environmental conditions within the study area and the assessment of environmental impacts for the Recommended Design, taking into consideration mitigation opportunities and their professional judgement/expertise. As such, no changes to the net effects assessment and determination of significance are warranted. Requirements with respect to Species at Risk will be defined through the permitting process with the Ontario MNR in accordance with Ontario's Endangered Species Act (2007). The permitting process has been initiated. The significance assessment framework applied includes two interrelated criteria (duration/timing and permanence). • Given the definitions of the significance ratings outlined in the draft CSR section 8, and taking into consideration that "High" rating applied to the "Permanence" criterion for Interior	1. – 3. The Agency is satisfied the methodology applied to analysing the residual adverse environmental effects supports its conclusions on the significance of those effects. 2. See below, "species at risk" regarding Golden-winged Warbler. 3. Environment Canada advised the Agency that it is possible to replace interior forest habitat that will be lost (i.e., in the long term), if appropriate species are planted, at appropriate densities, in strategic areas, which will be protected in perpetuity (e.g., conservation authority lands). Environment Canada commits to working with MTO and other agency stakeholders to ensure the mitigation planting provides the greatest benefit in the long term. The Agency is satisfied this constitutes a viable and responsible path forward to address interior forest habitat.

Residual Adverse Effects			
Submitted By	**Summary of Comments**	**Ontario Ministry of Transportation (MTO) Response**	**Canadian Environmental Assessment Agency (the Agency) Response**
	as it will not be possible to replace the interior forest habitat that will be lost. Impacts to Interior Forest habitat beyond construction given the statement "there will be a loss of some existing interior forest habitat for the long term". Permanent loss of wetland habitat as high duration and high permanence. "Other regional initiatives" should not be used as compensation for the effects on wetlands.	Forest Habitat no changes to the net effects assessment and determination of significance are warranted. This acknowledges the difficulties in the replacement of interior forest habitat. • Given the definitions of significance ratings and taking into consideration MTO's plans for wetland restoration, enhancement and creation, a rating of 'Low" for duration and a rating of 'Medium' for permanence is considered appropriate and no changes to the net effects assessment and determination of significance are warranted. The "Medium' rating reflects the anticipated effectiveness of MTO's wetland restoration efforts in relation to the permanence of effects on interior forest habitat which were rated "High" (see above). • Other regional initiatives are identified as mitigation for cumulative effects on wetlands over the long term and do not represent compensation by MTO. The consideration of regional initiatives is consistent with best practice in cumulative effects assessment.	

Spills & Accidents			
Submitted By	**Summary of Comments**	**Ontario Ministry of Transportation (MTO) Response**	**Canadian Environmental Assessment Agency (the Agency) Response**
Friends of the Farewell	1. Spills and accidents in the middle of nowhere (specifically on the East Durham Link), with no emergency access have not been appropriately described or mitigated within the EA.	1. The effects and mitigation measures for spills are described in Section 7.17 of the draft CSR and will conform to the most recent Canadian Standards Association and Ontario's Environmental Protection Act requirements. Consideration to emergency access was given in the development of the Recommended Design, which includes several dedicated emergency access points along the East Mainline and the East Link where a greater distance between interchanges exists. MTO has a defined emergency response protocol for spills and accidents. Furthermore, standard specifications will be included in the construction contract documentation to address spills and accidents.	1. The Agency is satisfied with the assessment of accidents and malfunctions.

Species at Risk			
Submitted By	**Summary of Comments**	**Ontario Ministry of Transportation (MTO) Response**	**Canadian Environmental Assessment Agency (the Agency) Response**
Friends of the Farewell Consultant	1. The draft CSR notes that "a small portion" of habitat suitable for the Gold Winged Warbler will be affected; the Final CSR should quantify this amount, e.g. is it 1% of suitable habitat.	1. – 7. Based on field investigations and secondary source information, there is a low potential that the Project would result in a significant loss of Golden-winged Warbler habitat in the context of available habitat in the Regional Study Area. This is because where this bird species was recorded was approximately 150 m from the ROW and only a small portion of this bird's	1. – 7. The Agency is satisfied that the provincial EA, Conditions of Approval and MNR permits required by the MTO under the Ontario Endangered Species Act (2007) will adequately address this issue. Environment Canada advised the Agency that the status for Bobolink was recently revised and it is now protected under the provincial ESA. Also, Bobolink is currently being considered by EC's Canadian Wildlife

Species at Risk			
Submitted By	**Summary of Comments**	**Ontario Ministry of Transportation (MTO) Response**	**Canadian Environmental Assessment Agency (the Agency) Response**
	2. Greater clarity should be provided surrounding the Blandings Turtle. The report notes that habitat for this species was not confirmed but Table 7-6 suggests there will be a negative impact to the Blandings Turtle habitat. 3. Will an environmental inspector be on site during construction in case Species At Risk are encountered? Or will construction crews be provided with SAR training? 4. A specific protocol for SAR should be developed for this project and included as a follow up requirement in the EA. 5. A greater discussion of the Whip-poor-will, Bobolink and Snapping Turtle should be provided in the draft CSR, including how any potential impacts will be addressed (evidence of these species in the study area has been provided by our client). 6. No management plan for Snapping Turtle or its habitat was provided in the draft CSR. 7. An actual target ratio/minimum ratio should be identified for the restoration of Butternut trees.	suitable breeding habitat across the Regional Study Area would be affected by the 407 East Transportation Corridor (i.e., their preferred breeding habitat is areas of early successional vegetation, found primarily on field edges, hydro or utility right-of-ways). The amount of habitat affected both directly and indirectly is considered negligible. It is also anticipated that the Project would create some additional field edges and MTO' vegetation restoration efforts would create areas of early succesional vegetation that may serve to benefit this species. At any rate, MTO must comply with all applicable requirements of Ontario's Endangered Species Act and the federal Species at Risk Act, should listed species be encountered. The Recommended Design, as proposed, is not expected to impact the habitat of the Blandings turtle, however, consistent with the precautionary principle, the draft CSR has assumed that Blanding Turtle habitat exists, despite the fact that is was not confirmed to date. To this end, if a Blandings Turtle is encountered in subsequent design or construction phases, MNR and Environment Canada will be contacted immediately. MTO must comply with all applicable requirements of Ontario's Endangered Species Act and the federal Species at Risk Act. The provincial environmental assessment documentation contains a number of commitments with respect to the noted Species at Risk, specifically Commitments 18, 25 and 30 (Section 9, pages 9-5, 9-7 and 9-8). One permit will be obtained for each Species at Risk and will be subject to approval by MNR. MTO must also comply with all applicable requirements of the federal Species at Risk Act, should listed species be encountered. Requirements with respect to items such as environmental inspection and monitoring will be defined through the permitting process which has already been initiated. As species are uplisted (such as the Bobolink which was uplisted in November 2010), they will be dealt with through the permitting process (see page 69 of the Draft CSR which states that "If at any time, MTO encounters a species protected under Ontario's Endangered Species Act (2007) ESA, it must contact the Ontario MNR to determine if there are additional requirements or considerations in accordance with the Endangered Species Act (2007). In addition, MTO must comply with all applicable requirements of the federal Species at Risk Act, should listed species be encountered. Information regarding the Bobolink has been submitted to the Agency to assist in the preparation of the CSR, including the fact that during the EA, there were occurrences of Bobolink noted within the transportation corridor study area, generally in	Services for protection under the federal Species at Risk Act (SARA). EC recommended the CSR be revised to reflect additional information on the Bobolink and potential for interacting with other species at risk not identified in the provincial EA. This recommendation was implemented. As described in Section 6, Species at Risk of the CSR, should any Species at Risk, subsequently protected under SARA or ESA, be encountered in the immediate vicinity of the Project, the MTO must comply with all applicable requirements of the federal Species at Risk Act, and Ontario's Endangered Species Act. For migratory birds (where implementation of vegetation clearing timing restrictions for work impacting nesting habitat is the most appropriate mitigation), the MTO must undertake appropriate field surveys to confirm presence or absence of protected species in, and in the immediate vicinity of the Project, prior to undertaking work in these areas, if it likely that the species will be impacted.

Species at Risk			
Submitted By	**Summary of Comments**	**Ontario Ministry of Transportation (MTO) Response**	**Canadian Environmental Assessment Agency (the Agency) Response**
		permanent hayfields or uplands areas, but to date there has been no specific confirmation of breeding, although there are indications of this activity. Restoration requirements will be defined through the permitting process with the Ontario MNR in accordance with Ontario's Endangered Species Act (2007). The permitting process has been initiated. In addition, MTO must comply with all applicable requirements of the federal Species at Risk Act, should listed species be encountered.	

Wildlife			
Submitted By	**Summary of Comments**	**Ontario Ministry of Transportation (MTO) Response**	**Canadian Environmental Assessment Agency (the Agency) Response**
Consultant - Board of Management of the Toronto Zoo - Ontario Road Ecology Group (Ecokare)	1. Remove the north south link in the east from all plans to reduce impacts to wildlife and to areas of Greenbelt, PSWs, SSWH and ESA. 2. Require more designated crossing structures for wildlife for both semi aquatic and terrestrial species. 3. Work with municipalities to mitigate impacts to wildlife mortality (when crossing roads) created by municipal roads that intersect with the 407. 4. Consider a variety of designs to accommodate greater openness ratios for target species. 5. Require ongoing monitoring and maintenance of the effectiveness and condition of fencing. 6. Ensure fencing lengths are appropriate, especially where the 407 bisects natural features.	1. The MTO has demonstrated and described the "Need for", "Purpose of" and "Alternative to" of the project. This is documented in the provincial Individual EA Environmental Assessment Report and supporting technical reference documents. 2. The Recommended Design includes the provisions of over 80 structures throughout the 407 East transportation corridor which can accommodate wildlife passage. In addition, six dedicated terrestrial crossings not associated with watercourse crossings have been incorporated into the design. The number, location and design criteria for the crossing structures were determined in consultation with the appropriate regulatory agencies, including MNR, DFO and the local conservation authorities, recognizing key natural environment features such as watercourse crossings and existing wildlife corridors/linkages. 3. Comment noted. MTO will forward this comment to the Region of Durham and the local municipalities for their consideration as this issue is beyond the scope of the provincial environmental assessment for the 407 East transportation corridor. 4. Minimum openness ratios for target species were established in consultation with MNR and the local conservation authorities. Many of the proposed structures exceed the minimum openness ratios. 5., 6. Agreed. The entire 407 transportation corridor will be fenced. Different fence types will be considered based on wildlife considerations. In addition, specialized wildlife fencing will be provided at wildlife crossings. The lengths of the specialized wildlife fencing will be determined through subsequent design phases. Monitoring and maintenance of the effectiveness and condition of fencing will be undertaken in	1. The comprehensive study includes an assessment of the effects of the entire project as proposed by the proponent (MTO). The Minister of the Environment's decision is to determine whether there are likely to be significant adverse environmental effects from the project. The Agency is satisfied that the analytical process was transparent and traceable and considers MTO's effort sufficient for the requirements of the need for and alternatives to analysis in a comprehensive study. Additional details are included in section 4 of the CSR. 2. The Agency is satisfied that with the implementation of crossing structures and dedicated wildlife structures designed to minimize the impact to wildlife movement. 3. & 4. The Agency notes that the MTO will continue to work closely with Ecokare to consider further recommendations to designing wildlife crossings such as developing appropriate measures to mitigation wildlife mortality and appropriate crossing openness ratios. 5 & 6. The Agency is satisfied that appropriate fencing will be adequately addressed through the provincial EA Condition of Approval requiring an annual compliance monitoring report submitted by the MTO to the Ontario Ministry of Environment.

Wildlife			
Submitted By	**Summary of Comments**	**Ontario Ministry of Transportation (MTO) Response**	**Canadian Environmental Assessment Agency (the Agency) Response**
		accordance with MTO standards.	
Friends of the Farewell	1. I am concerned that the wildlife fencing and the culverts, wildlife crossings, specifically on the East Link are insufficient. 2. There is no monitoring planned for reptiles. 3. Sensitivity of birds to noise was not included in the EA. 4. MTO's own information notes that no reptile or bird survey was completed (November 2006 CAG displays).	1. The entire 407 transportation corridor will be fenced. In addition, specialized wildlife fencing will be provided at wildlife crossings. The Recommended Design includes the provisions of over 80 structures throughout the 407 East transportation corridor which can accommodate wildlife passage. In addition, six dedicated terrestrial crossings not associated with watercourse crossings have been incorporated into the design. The number, location and design criteria for the crossing structures were determined in consultation with the appropriate regulatory agencies, including MNR, DFO and the local conservation authorities, recognizing key natural environment features such as watercourse crossings and existing wildlife corridors/linkages. 2. A general monitoring plan will be developed through subsequent design phases that will address the monitoring requirements for all wildlife including reptiles. 3. Noise impacts on wildlife were considered at a high level in the Terrestrial Impact Assessment Report and are noted as an indirect effect under each of the criteria assessed for wildlife and vegetation and acknowledged in Section 7.9.2 of the draft CSR. Studies regarding the implications of noise are still limited and conclusions about the nature and extent of effects are variable with noise effects and sensitivity to noise varying considerably. This area continues to be an active focus of research globally which will hopefully provide guidance concerning new mitigation approaches. 4. Field surveys for reptiles and bird were conducted post 2006 as documented in the Natural Environment Field Investigations Report. Additional field work is being conducted as part of the implementation phase to support the permitting process.	1. See above response relating to Ecokare's comment. The Agency is satisfied that this issue will be adequately addressed as a result of the provincial EA Condition of Approval requiring an annual compliance monitoring report submitted by the MTO to the Ontario Ministry of Environment. 2. If reptile species listed in the Ontario ESA are subsequently identified as being adversely effected, monitoring requirements will be described in the Ontario ESA permit. 3. The Agency is satisfied with the level of analysis done for the assessment of noise impacts on wildlife in the CSR as required in the Comprehensive Study Guidelines document. 4. Agency is satisfied with the level of assessment of effects on wildlife and notes that MTO will conduct additional field surveys as required to address this concern.
Ecojustice	1. How will the prohibition against nest destruction be enforced (required under the Migratory Birds Protection Act)? There are no details about the steps to be taken during birding seasons.	1. The prohibition against nest destruction as required under the Migratory Birds Regulations under the Migratory Birds Convention Act (1994) is required by law. Construction contract documentation will include standard Ministry specifications with respect to migratory birds.	1. In Section 6.9 of the CSR, Environment Canada provided advice and comments on mitigation to address the potential for incidental take of migratory birds. This included EC's recommendation that construction activities with the potential to destroy migratory birds, including vegetation clearing, filling and demolition/removal of structures used by cavity nesters, should not take place in migratory bird habitat during the breeding season, generally defined (for different habitat types) as May 1 – July 31 for this region. In addition, MTO confirmed that any required avian nest surveys will be conducted by a qualified avian biologist within 2 days of the commencement of the works. A mitigation plan would then be developed to address any potential impacts on migratory birds or their active nests, in consultation with EC." In addition, the follow up program in the CSR requires MTO to provide annual verification that construction timing avoids sensitive

Wildlife			
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			breeding/nesting periods for wildlife, including migratory birds. In the event that an infraction under the MBPA is reported to EC, EC will undertake appropriate measures to investigate.

Non-automobile Forms of Transportation			
Submitted By	**Summary of Comments**	**Ontario Ministry of Transportation (MTO) Response**	**Canadian Environmental Assessment Agency (the Agency) Response**
City of Oshawa	1. Sidewalks and bike lanes are integral and must be constructed as standard features on all crossings in Oshawa during the initial construction phase and fully funded by the 407 project.	1. - 2. The comprehensive study only assesses the project as proposed by the proponent. The project includes accommodation for non-automobile forms of transportations, including pedestrians and cyclists. Effects of the transportation corridor have been assessed in accordance with the Canadian Environmental Assessment Act's definition of environmental effect. MTO has indicated that the proposed approach for the treatment of sidewalks and bike lanes at structure locations took into consideration the Growth Plan, Growing Durham, existing Official Plans, existing cycling plans, current infrastructure and existing MTO policies, practices, procedures and guidelines. Sidewalks are proposed on the major crossing road structures to be situated within future planned development areas. Bike lanes are proposed at all major crossing road structures situated along the proposed cycling routes identified in the Durham Region Cycling Plan. At the remaining crossing road structures, the shoulder area will accommodate pedestrian and cyclist movements. Sidewalk and bike lane requirements at crossing road structures will be confirmed, in consultation with the Region and local municipalities, during subsequent design phases. This will include a review of proposed locations as well as proposed sidewalk and bike lane widths. The additional structure width for sidewalks and bike lanes will be the subject of cost sharing discussions with the City and the Region during the detailed design and implementation phases of the project.	1. - 2. Municipalities discussed these items during the conduct of the provincial EA with the MTO. The MTO and municipalities have a forum to continue discussions in the 407 East Advisory Committee (407 EAC) as stipulated in the provincial EA Conditions of Approval. Financial considerations such as cost sharing of municipal sidewalks and bike lanes are outside the scope of the comprehensive study. These issues are best discussed between the municipalities and the province.
Town of Whitby	2. The effects of the Highway as a barrier within and between communities, especially for non-automobile transportation should be included in the list of socio-economic adverse effects.		

Growth of Urban Development			
Submitted By	**Summary of Comments**	**Ontario Ministry of Transportation (MTO) Response**	**Canadian Environmental Assessment Agency (the Agency) Response**
Friends of the	1. The East Link will lead to	1. Growth in Clarington and Durham Region as a whole is	1. The comprehensive study included an analysis of cumulative effects

Growth of Urban Development			
Submitted By	**Summary of Comments**	**Ontario Ministry of Transportation (MTO) Response**	**Canadian Environmental Assessment Agency (the Agency) Response**
Farewell	expansion of the urban boundary and urban sprawl.	expected regardless of the presence of the 407 East Transportation Corridor. Urban boundaries and areas identified for growth are addressed through Provincial policies, including the Greenbelt Plan and the Growth Plan for the Greater Golden Horseshoe, and municipal Official Plans and will not be the direct result of the presence of the 407 East Transportation Corridor Land use in Durham Region is under the jurisdiction of the Region of Durham and its constituent municipalities who are required to act in conformity with the Provincial plans noted above. Based on the urban boundaries identified in these provincial plans, no development will be permitted along a significant portion of the 407 East through the Clarington area.	and took into consideration planned and reasonably foreseeable future projects. This included accounting for the urban growth as predicted in the Official Land Use Plan of Durham Region. The Agency is satisfied that the cumulative effects assessment takes into account the planned urban growth.

Phased Implementation of Project			
Submitted By	**Summary of Comments**	**Ontario Ministry of Transportation (MTO) Response**	**Canadian Environmental Assessment Agency (the Agency) Response**
City of Oshawa	The assessment of impacts on the socio-economic environment should include: Financial impacts associated with phasing on the Region and municipalities. The ability of the local transportation network to accommodate the traffic and transit service associated with phasing. The ability of local municipalities to deal with safety issues associated with traffic volumes generated by the proposed phasing. The impact of the proposed phasing plan on rural settlement areas and quality of life. The impact of the proposed phasing on economic growth and the development of employment areas. The effects of unbalanced growth in the Region associated with the proposed phasing (creating a western bias). The impact of the proposed phasing on the ability of local	Additional analysis and consultation is being undertaken during the implementation phase of the project to address phasing of the proposed undertaking. As such, phasing of the project will not be included as part of the CSR. The CSR only assesses the project as proposed by the proponent. A broad approach was taken to the identification of potential impacts to the natural, socio-economic and cultural environments as detailed in the provincial environmental assessment documentation and summarized in the federal documentation, in accordance with the requirements set out in the Comprehensive Study Guidelines Document for the 407 East project. As per the provincial EA commitments, MTO has committed to further consultation and monitoring to ensure potential project phasing issues are addressed through subsequent design phases. A number of meetings have been held with the Region of Durham and the local municipalities to-date to discuss project phasing issues. In addition, three meetings have been held with the 407 East Advisory Committee (407 EAC) to-date. As the project phasing requirements are detailed through subsequent design phases, potential impacts and mitigation measures will be identified in consultation with the Region of Durham, the local municipalities and the appropriate regulatory agencies. MTO has undertaken a traffic study to analysis traffic impacts for the phasing of the project and potential termination location for the first phase of works. The report has been provided to Region of Durham and local municipalities The report identifies potential improvements to the network to address traffic related	The comprehensive study has assessed the significance of adverse environmental effects on the Project as proposed by the Proponent. The MTO's Project as described in its Project Description is for the 407 East Transportation Corridors in its entirety. Given the length of the 2031 planning horizon, the timing and phasing of implementation is determined by Ontario. The MTO and municipalities have a forum to continue discussions about project phasing in the 407 East Advisory Committee (407 EAC) as stipulated in the provincial EA Conditions of Approval.

Phased Implementation of Project			
Submitted By	**Summary of Comments**	**Ontario Ministry of Transportation (MTO) Response**	**Canadian Environmental Assessment Agency (the Agency) Response**
	municipalities to accommodate the jobs, population and economic growth prescribed by the Growth Plan to achieve prosperous, balanced, healthy and sustainable communities. The impacts of the proposed phasing on the ability to use 407 as a bypass of the Toronto area to alleviate congestion and reduce costs for goods movement. The impacts of the proposed phasing on the loss of key business links between and easy access to major economic drivers (e.g. UOIT and Darlington Nuclear New Build). MTO must adhere to the FLOW Agreement (2007) which included specific reference to the 407 to Highway 35/115 by 2013. The decision by Infrastructure Ontario to extend the 407 only to Simcoe Street is strongly opposed by the City. The Federal EA should clearly identify what interchanges are being built. The City intends to engage the MTO and CEAA in a productive exercise of review and comments on the Final CSR to ensure impacts from the proposed phasing are addressed in an appropriate manner. The Federal EA must address the impacts of phasing on factor categories such as air quality and vibration. The analysis performed under the Provincial EA did not assess impacts or mitigation measures and do not reflect the phased approach and the results which will occur because of this approach.	issues. The Ministry will continue to consult with the stakeholders and discuss recommended improvements. The MTO is working with the Region of Durham, Oshawa and other municipalities to understand and assess the impact to the local traffic network of the proposed termination of 407 East Extension. MTO is building a plan with municipalities to minimize disruption to local roads, as well as residents and businesses. The MTO continues to meet with the region and local municipalities to review the project and discuss key project features The ministry remains committed to completing 407 East to Simcoe Street and extending to Highway 35/115.	

Phased Implementation of Project			
Submitted By	**Summary of Comments**	**Ontario Ministry of Transportation (MTO) Response**	**Canadian Environmental Assessment Agency (the Agency) Response**
Town of Whitby	Given the phased approach, the EA should consider the difference in impacts associated with the deferral of future phases, including impacts to: Noise Socio-economic environment Traffic infiltration Peoples use and enjoyment of property Community character It is not clear that the undertaking will in fact meet its purpose (Section 3.3 of the Draft CSR) given that no schedule or commitment for future construction of the remaining phases on the undertaking (beyond Phase 1) has been given. Traffic impacts should be monitored post construction of Phase 1 and until the entire undertaking is complete.	See response relating to project phasing - Oshawa.	See response relating to project phasing - Oshawa.
Municipality of Clarington	Other initiatives will be adversely affected by not completing the full build out of the 407 corridor (e.g. GO service to Bowmanville, Darlington New Nuclear Build). Given the phased approach, the EA should be revised to include a broader discussion of the socio-economic environment not just impacts related to “the use and enjoyment of lands; community, recreational and institutional services; community character and agricultural soils. No mitigation measures are proposed to deal with the impacts associated with the interim termination of the 407 at Simcoe Street. Temporal boundaries, discussed in section 4.4.2 of the CSGD, are intended to “encompass the entire lifespan of the project on each	See response relating to project phasing - Oshawa.	See response relating to project phasing - Oshawa.

Phased Implementation of Project			
Submitted By	**Summary of Comments**	**Ontario Ministry of Transportation (MTO) Response**	**Canadian Environmental Assessment Agency (the Agency) Response**
	factor beginning with the construction phase". The Draft CSR does not meet the intent of this section of the Guidelines. The Follow Up and Monitoring program will have to propose and implement mitigation measures to deal with the impacts of the interim termination of the 407 at Simcoe Street.		
Columbus Community Coalition	1. The proposed Simcoe Street terminus means the EA fails to take into account the additional noise, vibration, air quality, groundwater, drinking water, well water impacts and the adverse effects to the use and enjoyment of our properties. 2. The EA fails to consider the social and cultural impacts associated with increased traffic volumes on Simcoe Street (due to the 407 ending at Simcoe St.) 3. We have been told Simcoe Street is where the usage and revenues taper off. This is unacceptable from a safety point as it appears revenues are being considered above safety. 4. The Hamlet of Columbus is not identified in the Socio-Economic Environment (draft CSR Section 6.11) as an area in close proximity to the corridor.	See response relating to project phasing – Oshawa for comments 1-3.	See response relating to project phasing – Oshawa for comments 1-3. 4. Agreed. Section 5.11 of the CSR includes the Hamlet of Columbus.

Climate Change Greenhouse Gases			
Submitted By	**Summary of Comments**	**Ontario Ministry of Transportation (MTO) Response**	**Canadian Environmental Assessment Agency (the Agency) Response**
Ecojustice	1. The draft CSR only includes one mention and paragraph (draft CSR Section 7.16.2) related to Climate Change and does not provide an assessment of the	1. – 3. Table 7-7 of the draft Comprehensive Study and MTO's August 2009 Air Quality Impact Assessment report for the 407 East transportation corridor includes a quantitative prediction of the annual greenhouse gas (GHG) emissions expected from traffic on the planned highway, which amount to less than 2% of	1. – 3. The assessment of air quality and climate is summarized in Section 6.1 of the CSR (local air quality effects and regional analysis). The Agency is satisfied that the Project will not likely cause significant adverse environmental effects on air quality and climate. CSR Table 6-8 includes GHG emission estimates and policy and

Climate Change Greenhouse Gases			
Submitted By	**Summary of Comments**	**Ontario Ministry of Transportation (MTO) Response**	**Canadian Environmental Assessment Agency (the Agency) Response**
	GHG increases associated with the project. 2. No mitigation for GHG's are included in the Summary of Cumulative Effects and Mitigation (draft CSR Table 7-7). 3. The Guidelines require the EA to include "evaluation of regional impacts through pollutant burden analyses with an emphasis on NO_2, SO_2, O_3 … the burden analysis would also include greenhouse gases ….". This appears to be missing. 4. The Glossary of Terms does not include GHGs.	Ontario's transportation GHG emissions and approximately 0.4% of total GHG emissions from all sectors in Ontario MTO advises that the Province of Ontario is actively working on reducing provincial emissions of GHGs. Partly due to this effort, the Province's 2010 emissions are expected to be lower than those in 1990. MTO also advises that the Province of Ontario takes a broad and comprehensive approach to address GHG emissions. This approach allows for continued development and growth in the province while maintaining a low per capita or per GDP emission level. Some of these initiatives are outlined in the cumulative effects assessment.	regulatory initiatives being implemented by federal and provincial agencies to reduce emissions of GHG's. Additional details on mitigation measures can be located in the technical Reference Document #9 Air Quality Impact Assessment available on MTO's 407 East Transportation Corridor web site: http://www.407eastea.com. 4. GHG added to the Acronyms section in the CSR.

Hydrogeology Groundwater Stormwater Management			
Submitted By	**Summary of Comments**	**Ontario Ministry of Transportation (MTO) Response**	**Canadian Environmental Assessment Agency (the Agency) Response**
Friends of the Farewell Consultant	1. Lined storm water ponds will contribute to greater reductions in groundwater recharge over the area of the pond. 2. It is anticipated that the Environmental Management Plan will provide details of the monitoring program to be implemented to track impacts due to the proposed works. 3. Monitoring of the impact of the project on the hydrogeological environment is critical and a clear cut approach for this monitoring should be provided. 4. Will a PTTW be sought for locations where the taking is less than 50,000 L/day? What monitoring mechanism will be used and who is the regulatory authority for these locations (less	1. – 3. Lined stormwater management ponds are only being considered for a few select locations where the groundwater table is high and/or there are groundwater sensitivities. No significant change in recharge for the area is expected as a result of the implementation of lined ponds in a few locations. The provincial EA conditions of approval provided for the identification of changes to the design of the project that may be required to accommodate the implementation of Best Management Practices for the treatment of stormwater. The detailed design of stormwater management ponds is subject to further approval from the Ontario Ministry of Environment. Federal authorities will also consider this matter as part of the follow-up program of the comprehensive study process. 4. No. A PTTW is only required for locations where the proposed water taking is greater than 50,000 L/day. There are no regulatory/permitting requirements for water takings of less than 50,000 L/day.	1. – 3. The Agency, with advice from Natural Resources Canada, is satisfied that inclusion of lined stormwater management ponds at select locations will result in minimal effects to groundwater recharge. The follow-up program as described in Section 8 of the final CSR includes a role for Natural Resources Canada to provide expert advice to responsible authorities on matters relating to impacts to hydrogeology. The follow up program includes reporting by MTO on localized impacts from dewatering after mitigation for water-crossings requiring authorization; status of design and mitigation measures implemented and their effectiveness; and effectiveness of thermal mitigation in regard to discharges into sensitive cold water aquatic habitats from stormwater facilities. 4. A Permit To Take Water is a permit issued by the Ontario Ministry of Environment.

Hydrogeology Groundwater Stormwater Management			
Submitted By	**Summary of Comments**	**Ontario Ministry of Transportation (MTO) Response**	**Canadian Environmental Assessment Agency (the Agency) Response**
	than 50,000 L/day)?		
Friends of the Farewell	1. How can the claim there will be no impact (from the East Link) on groundwater and wetlands within and outside the 407 ROW when empirical evidence has not been generated for all the development in the area? 2. The use of road salt was not considered in the EA.	1. Potential impacts to groundwater and wetlands resulting from the implementation of the East Durham Link and associated mitigation measures have been identified and documented in the environmental assessment documentation for both the provincial and the federal EAs. Furthermore, cumulative effects were examined in accordance with the Operation Policy Statement Addressing Cumulative Effects under the Canadian Environmental Assessment Act (November 2007). On the basis of the cumulative effects assessment, no significant residual adverse effects are expected for the groundwater and wetland environmental components (see Table 8-2 of the Draft CSR). 2. The use of road salt was considered in the EA as documented in Table 7.7 and on page 39 of the Draft CSR. Further information is provided in the provincial environmental assessment documentation, including the Natural Environmental (Hydrogeology) Impact Assessment Report. The Draft CSR indicates that MTO is committed to the implementation of best salt management practices and will implement a Salt Management Plan in accordance with Environment Canada's Code of Practice for the Environmental Management of Road Salts (Environment Canada, 2004).	1. The final CSR has identified likely effects and proposed mitigation measures for the entire corridor. The Agency, with advice from Natural Resources Canada, is satisfied that with the implementation of mitigation measures and the additional monitoring/follow-up, the Project will not likely cause significant adverse environmental effects to groundwater. 2. The use of road salt is a consideration of highway safety. The Agency is satisfied that the use of road salt was considered in the assessment of groundwater in the CSR. The Agency is satisfied that the MTO will implement the Salt Management Plan as part of their operational practices consistent with the Transportation Association of Canada's Syntheses of Best Practices for Road Salt Management, http://www.tac-atc.ca/english/resourcecentre/roadsalt.cfm

Approval			
Submitted By	**Summary of Comments**	**Ontario Ministry of Transportation (MTO) Response**	**Canadian Environmental Assessment Agency (the Agency) Response**
Transport Action Ontario	1. We recommend that CEAA only approve the corridor to the Phase 1 Build Levels (mainline to Simcoe Street and the West Durham Link). 2. Lands required beyond the Phase 1 Build Levels should remain in current ownership so that viable agricultural business can occur.	The MTO has demonstrated and described the "Need for", "Purpose of" and "Alternative to" of the project. This is documented in the provincial Individual EA Environmental Assessment Report and supporting technical reference documents. The identification of the preferred alternatives was not based solely on traffic demand. Other factors beyond traffic demand were considered as part of the need and justification and assessment of transportation alternatives. These factors included network connectivity, economic and natural environment, emergency management and land use planning.	As required, under the Canadian Environmental Assessment Act, the comprehensive study includes an assessment of the effects of the entire project as proposed by the Proponent. Whether the Proponent proceeds with the undertaking or proceeds with it in a phased manner, and the timing of the phases will be determined by the Province of Ontario (MTO).
Friends of the Farewell	1. CEAA should request that MTO amend the EA (as noted is possible in Chapter 12 of the Provincial EA) in the area of the East Durham Link to move or	1. The MTO has demonstrated and described the "Need for", "Purpose of" and "Alternative to" of the project. This is documented in the provincial Individual EA Environmental Assessment Report and supporting technical reference documents.	1. See response above regarding the determination of significance and the federal Minister of the Environment's EA decision. 2. The Agency is satisfied that a reasonable range of alternative locations were considered, that the analytical process was transparent and traceable, and that it fulfills the requirement for a comprehensive

Approval			
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	exclude the EDL. 2. Two other areas were identified during the EA and are better suited for the location of the East Durham Link. 3. The concerns of a 2003 Peer Review on the Terms of Reference for the Highway 407 East Completion, by IBI Group were not considered in the EA Report.	2. The identification of the preferred alternatives was not based solely on traffic demand. Other factors beyond traffic demand were considered as part of the need and justification and assessment of transportation alternatives. These factors included network connectivity, economic and natural environment, emergency management and land use planning. 3. Section 4.2 of the Draft CSR summarizes the alternative means analysis conducted by MTO. On the basis of the net effects and comparative evaluation results, Route EL8 was selected as the recommended route (June 2007) for the East Link. The technically recommended route, including Route EL8 was presented to agencies, First Nations and the public for review and comment and confirmed in June 2008. This route has the least impact on the natural environment features in this area, including wetlands, groundwater, vegetation, wildlife, ESAs and landscape connectivity features, impacts no known archaeological sites and results in moderate effects to the social and land use/economic environments. 3. The 407 East EA was conducted in accordance with the requirements set out in the 407 East EA Terms of Reference (ToR) dated November 2004, and approved by the Ministry of the Environment on January 17, 2005. The Terms of Reference were subject to widespread consultation and review and approval of the Ministry of Environment.	study. Final CSR Section 4.2 provides a summary of the assessment of alternative means of carrying out the Project. 3. The Agency notes that the comment is related to the provincial EA Terms of Reference which was approved by the Ontario Minister of the Environment in 2005.

13 Appendix C

Ministry of Transportation

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Ontario

March 8, 2011

Jim Chan
Project Manager
Canadian Environmental Assessment Agency
Ontario Region
55 St. Clair Avenue East, Suite 907, Toronto, ON M4T 1M2
Government of Canada

Dear Mr. Chan

Re: 407 East Transportation Corridor Comprehensive Study Report – Follow Up under the Canadian Environmental Assessment Act

This letter is provided to confirm the Ministry of Transportation Ontario (MTO) will undertake the follow up program under the Canadian Environmental Assessment (CEA) Act as specified in Section 8 of the Comprehensive Study Report prepared for the 407 East Transportation Corridor.

Sincerely,

Dan Remollino, P.Eng.
Head, Planning and Engineering

cc Lou Politano (MTO)
Peter Chackeris (MTO)
Bill Jones (MTO)
Darlene Proudfoot (MTO)