

Niagara Region

Niagara Escarpment Crossing Comprehensive Environmental Assessment Proposed Terms of Reference

Appendix C Air Quality Work Plan

October 2024

Prepared by:



CONNECTING MORE PEOPLE TO MORE POSSIBILITIES

Table of Contents

1	Intr	roduction	1
2	Est	tablishment of Air Quality Conditions	2
	2.1	Confirmation of the Preliminary Study Area	2
	2.2	Review of Available Existing Information Sources	3
	2.3	Baseline Conditions Air Quality Modelling and Assessment	3
3	Ass	sessment of the Alternatives	8
	3.1	Alternatives To the Project	8
	3.1.1	Preliminary Criteria and Indicators	8
	3.2	Alternative Methods of Carrying Out the Project	9
	3.2.1	Preliminary Criteria and Indicators	9
4	Imp	pact Assessment of the Proposed Project	11
	4.1	Air Quality Impact Assessment	11
	4.2	Greenhouse Gas Assessment	12
	4.3	Construction Related Impacts Assessment	12
5	Do	cumentation	13

List of Tables

Table 3-1: Preliminary Criteria and Indicators for Assessing the Alternatives To the	
Project	8
Table 3-2: Preliminary Criteria and Indicators for Assessing the Alternative Methods of Carrying Out the Project	of 9

List of Figures

Figure 2-1: Preliminary Study Area	Figure 2-1	: Preliminary Study	/ Area	2
------------------------------------	------------	---------------------	--------	---

1 Introduction

This document outlines the proposed work plan that will be carried out during the Niagara Escarpment Crossing Environmental Assessment (EA) to generate a more detailed description and understanding of the environment from an air quality perspective. Further, this document describes how that information will be used to assess the effects of the alternatives and proposed project on the environment through evaluation criteria and indicators. This work plan forms **Appendix C** to the proposed Niagara Escarpment Crossing Comprehensive EA Terms of Reference (ToR) and should be read in conjunction with it.

The ToR presently provides a preliminary description of the environment to gain a general understanding of the potential effects that should be examined in the Niagara Escarpment Crossing EA based on the range of alternatives to the project currently anticipated. This description reflects all components included within the Ontario *Environmental Assessment Act (EA Act*) definition of the environment: natural, social, built, economic, and cultural.

Several investigative studies are proposed as part of the Niagara Escarpment Crossing EA to expand on this preliminary description, including, but not limited to the following:

- Air Quality
- Agricultural
- Archaeology
- Built Heritage and Cultural Heritage Landscapes
- Contaminated Property
- Groundwater
- Land Use
- Natural Heritage
- Noise and Vibration
- Surface Water
- Visual Impact

The details associated with the air quality investigation are provided in this document while details of the other investigative studies are provided as separate work plans. In addition to the investigative studies, the proposed ToR includes three other work plans: Traffic, Operations, and Safety, Transportation Planning and Engineering, and Financial all of which are included as separate appendices.

2 Establishment of Air Quality Conditions

2.1 Confirmation of the Preliminary Study Area

The preliminary study area provided in the ToR will be utilized as a starting point for establishing existing and future environmental conditions (**Figure 2-1**). This preliminary study area will be finalized during preparation of the Niagara Escarpment Crossing EA when more detailed information has been obtained, the alternatives to the project have been confirmed, and the potential environmental effects are better understood.



Figure 2-1: Preliminary Study Area

2.2 Review of Available Existing Information Sources

Available existing sources of information will be collected and reviewed to determine existing and future environmental conditions, including any data gaps that need to be addressed through subsequent work (e.g., field investigations, modeling, etc.). Presently, the list of existing information sources that will be collected and reviewed as part of the proposed Air Quality Work Plan includes, but may not be limited to, the following:

- Background air quality from federal and/or provincial air monitoring stations nearby or representative of the final study area
- Existing air quality studies relevant to the final study area
- Identification of potential non-mobile air emitters and environmental permits for qualitative evaluation
- Identification of existing and future sensitive receptors from satellite imagery, zoning maps, etc. The identification of sensitive receptors will remain consistent between the air quality and noise and vibration investigative studies. The proposed Noise and Vibration Work Plan provides the various sensitive receptor classifications.

In addition, documentation prepared during the Niagara Escarpment Crossing EA from the other proposed work plans (e.g., Transportation Planning, Land Use, Noise and Vibration, etc.) will also be considered, as appropriate, along with the preceding existing information sources.

There are currently no field investigations proposed at this time as part of the Air Quality Work Plan.

2.3 Baseline Conditions Air Quality Modelling and Assessment

The air quality assessment will address existing (baseline), future no-build, and future build conditions. Once a preferred method has been confirmed, a future year assessment for the build condition will be carried out as part of the impact assessment of the proposed project stage of the Niagara Escarpment Crossing EA (**Section 4**).

Establishing baseline and future no-build air quality conditions will be performed using air dispersion modelling software and utilize the following guidance:

- Ministry of Transportation Environmental Reference for Highway Design (ERD, June 2013).
- Ministry of Transportation Environmental Guide for Assessing and Mitigating the Air Quality Impacts and Greenhouse Gas Emissions of Provincial Transportation Projects (AQGHG Guide, May 2020)
- Air Dispersion Modelling Guideline for Ontario (ADMGO, February 2017)

Contaminants of Interest

Contaminants of Interest (COI) relevant to this assessment are transportation related contaminants as identified in the AQGHG Guide and will include the following:

- carbon monoxide (CO)
- nitrogen dioxide (NO2)
- particulate matter less than 10 microns in diameter (PM10)
- particulate matter less than 2.5 microns in diameter (PM2.5)
- 1,3-butadiene
- acetaldehyde
- acrolein
- benzene
- benzo(a)pyrene
- formaldehyde and
- ozone (O3)

According to the AQGHG Guide, the air quality health index (AQHI) is used by the Ontario Ministry of Environment, Conservation and Parks (MECP) as a health-protection tool designed to inform the public on short-term exposure to air pollution. This index is calculated based on the combined effects of ground-level ozone (O3), PM2.5 and NO2. Volatile Organic Compounds (VOCs) are described as "transportation-related emissions" in the AQGHG Guide.

The air quality criteria for the COIs will be based on either the applicable provincial ambient air quality criteria (AAQC), the Canadian Ambient Air Quality Standards (CAAQS), or both.

Emission Rate Assessments

The baseline emission rates will be developed using the United States Environmental Protection Agency (USEPA) Motor Vehicle Emission Simulator (MOVES) model and predicted traffic volume data for the baseline year. Currently, the baseline year is tentatively assumed to be 2025; however, the baseline year may change depending upon when the Niagara Escarpment Crossing EA is initiated by Niagara Region.

The future no-build emission rates will be developed using the USEPA MOVES model and predicted traffic volumes for the future year. Currently, the future year is tentatively assumed to be 2051; however, the future year may change should the baseline year change.

Air Dispersion Models

The MECP established air dispersion modelling protocols under the ADMGO with the use of the USEPA AERMIC dispersion modelling suite. The current dispersion modelling suite in Ontario consists of the following models and versions:

- AERMAP v.18081 terrain data preprocessor
- BPIPPRM v.04274 building profile input model
- AERMET v.22112 meteorological data preprocessor
- AERMOD v.22112 steady-state plume model

The preceding versions may change due to regulatory changes in the future. As a result, air dispersion modelling may be updated during the Niagara Escarpment Crossing EA to reflect any such changes if necessary.

Meteorological Data

The regional meteorological screening data, as made available by MECP, will be used for the air dispersion modelling. The current meteorological datasets contain five years of hourly data for the years 1996 to 2000. The most recent dataset available from MECP will be used at the time of modelling during the Niagara Escarpment Crossing EA.

Averaging Periods

Air contaminants will be modelled with appropriate averaging periods based on their respective air quality criteria, either 1-hour, 8-hour, 24-hour and/or annual averages.

Digital Elevation Model

Digital elevation model (DEM) data, as made available by MECP, will be used for the air dispersion modelling. The DEM data allows AERMOD to include the effects of terrain in the modelling, such as plume terrain following and splitting.

Source Types and Input Parameters

The modelling will use line-volume sources to account for the mixing of air caused by passing traffic-related turbulence. The dimensions of these sources will be representative of the transportation facilities (e.g., roads) under assessment.

Modelling Scenarios

The baseline assessment will be composed of the following modelling scenarios:

- Baseline (e.g., 2025): This scenario will consist of the existing transportation facilities in the final study area as applicable. Traffic volumes and MOVES emission factors for 2025 will be applied to the model to predict baseline air contaminant concentrations.
- Future (e.g., 2051) No-Build: This scenario will consist of the existing transportation facilities in the final study area as applicable. Existing traffic volumes projected to 2051 and MOVES emission factors for 2051 will be applied to predict future no-build air contaminant concentrations.
- Future (e.g., 2051) Build: This scenario will consist of the alternative methods of carrying out the project (i.e., alternative alignments). Existing traffic volumes projected to 2051 and MOVES emission factors for 2051 will be applied to predict future build air contaminant concentrations.

Receptors

The assessment will consider discrete receptors at sensitive and critical locations and receptors to assess near-field concentrations as defined as follows:

- Sensitive and Critical Locations: Discrete receptors representing these locations within 500 m of the alternative methods (i.e., alternative alignments).
- Near-Field Concentrations: A fenceline grid to a distance of 500 m from the alternative methods (i.e., alternative alignments), with decreasing density of receptors as distance increases.

Documentation

The results of reviewing available existing information sources as well as the modelling and assessment will be documented in a stand-alone Air Quality Baseline Conditions Report.

3 Assessment of the Alternatives

3.1 Alternatives To the Project

Following confirmation of the preliminary list of alternatives to the project, they will be assessed and comparatively evaluated leading to a recommended alternative(s) to the project. The recommended alternative(s) will be presented to review agencies, Indigenous Communities, and the public for a defined period to receive comments, following which a preferred alternative(s) will be identified. The assessment of the alternatives to the project (through the application of evaluation criteria) will be based on available existing information sources contained in the Baseline Conditions Reports.

3.1.1 **Preliminary Criteria and Indicators**

The preliminary evaluation criteria and indicators that will be used for assessing the alternatives to the project from an air quality perspective include, but may not be limited to, those set out in **Table 3-1**. The preliminary evaluation criteria and indicators will be finalized based on comments received during the Niagara Escarpment Crossing EA and documented in the EA Report.

Table 3-1: Preliminary Criteria and Indicators for Assessing the Alternatives Tothe Project

Category	Criterion	Indicator
Natural Environment	 Effect on air quality and greenhouse gas emissions and climate change from vehicular road traffic 	 Estimated air contaminant and carbon dioxide equivalent emission rates
Social Environment	 Effect on air quality conditions on residents from vehicular road traffic 	 Approximate number of sensitive receptors affected and extent and duration of adverse effects

3.2 Alternative Methods of Carrying Out the Project

Following the identification of the preferred alternative(s) to the project, alternative methods of carrying out the project will be generated, possibly screened, assessed, and comparatively evaluated leading to a recommended method(s). The recommended method(s) will be presented to review agencies, Indigenous communities, and the public for a defined period to receive comments, following which a preferred method(s) will be identified.

The generation and possible screening of the alternative methods will be based on available existing information sources contained in the Baseline Conditions Reports. The assessment of the alternative methods of carrying out the project (through the application of evaluation criteria) will be based more on the information provided through subsequent work (e.g., field investigations, modelling, etc.) contained in the Baseline Conditions Reports, as appropriate.

3.2.1 Preliminary Criteria and Indicators

The preliminary evaluation criteria and indicators that will be used for assessing the alternative methods of carrying out the project from an air quality perspective include, but may not be limited to, those set out in **Table 3-2**. The preliminary evaluation criteria and indicators will be finalized based on comments received during the Niagara Escarpment Crossing EA and documented in the EA Report.

Category	Criterion	Indicator
Natural Environment	 Effect on air quality and greenhouse gas emissions and climate change from vehicular road traffic 	 Estimated air contaminant and carbon dioxide equivalent emission rates
Social Environment	 Effect on residents during construction (e.g., dust and construction related emissions) 	 Approximate number of sensitive receptors affected and extent and duration of adverse effects

Table 3-2: Preliminary Criteria and Indicators for Assessing the AlternativeMethods of Carrying Out the Project

Category	Criterion	Indicator
Social Environment	 Effect on air quality conditions on residents from vehicular road traffic 	 Approximate number of sensitive receptors affected and extent and duration of adverse effects

4 Impact Assessment of the Proposed Project

Once selected, the preferred method(s) of carrying out the project (i.e., proposed project) will be further developed at a preliminary design level of detail so that the potential environmental effects can be identified with more certainty, more site-specific impact management measures (i.e., avoidance, mitigation, and compensation measures) can be developed for application, net environmental effects can be identified with more certainty, appropriate monitoring requirements can be clearly defined, and specific approval/permitting requirements for constructing the proposed project can be identified.

In concert with preparing the preliminary design level of detail, it may be necessary to undertake additional work (e.g., field investigations, modelling, etc.) at the impact assessment stage of the Niagara Escarpment Crossing EA. The additional work proposed as part of the Air Quality Work Plan could include the following subject to preparation of the EA:

- An air quality impact assessment
- A greenhouse gas assessment
- A construction related impacts assessment

4.1 Air Quality Impact Assessment

The air quality impact assessment will closely follow the methodology in **Section 2.3**. With this in mind, the alignment, design, emission rates, and sensitive receptors associated with the recommended method(s) will be adjusted as appropriate to reflect the proposed project. The air quality impact assessment of the proposed project will be composed of the following modelling scenarios:

- Future (2051) No-Build: This scenario will consist of the existing transportation facilities in the final study area as applicable. Existing traffic volumes projected to 2051 and MOVES emission factors for 2051 will be applied.
- Future (2051) Build: This scenario will consist of the proposed project including all components (e.g., mainline, interchange configuration, intersecting regional and municipal roads, etc.). Traffic volumes for the proposed project and MOVES emission factors for 2051 will be applied. The quantitative modelling will be used to confirm impacts, further develop appropriate impact management measures, and assess residual effects of the proposed project.

Additional baseline and no-build modelling may be required to assess sensitive receptors not previously considered at the alternative methods of carrying out the project stage.

4.2 Greenhouse Gas Assessment

The effect of the proposed project on greenhouse gas emissions will be assessed by an estimate of the net change in greenhouse gas emissions due to it. An evaluation of the proposed project will be made with respect to Ontario's provincial greenhouse gas emissions and reduction objectives.

4.3 Construction Related Impacts Assessment

An assessment of the potential impacts of constructing the proposed project will be carried out considering potential fugitive particulate emissions, including compounds contained in the particulate, and construction equipment and vehicle tailpipe emissions. As part of the assessment, best management practices for reducing construction related emissions will be considered.

Documentation

The results of the impact assessment including any additional work will be documented in an Air Quality Impact Assessment Report.

5 Documentation

The results of implementing this work plan will be documented in two reports during the Niagara Escarpment Crossing EA:

- Air Quality Baseline Conditions Report will document the results of collecting and reviewing available existing sources of air quality information and will include the results of the existing, future no-build, and future build air quality modelling of emissions from traffic.
- Air Quality Impact Assessment Report will document the results of the impact assessment of the proposed project including any additional work such as the air quality impact assessment, greenhouse gas assessment, and construction related impacts assessment.

Upon completion, each report will be made available during the Niagara Escarpment Crossing EA to review agencies, Indigenous Communities, and the public for their information via the project website and upon request and will become either a reference or supporting document to the submitted EA Report. The EA Report will be based on and reflect the information contained in the two reports.