The First Capital Realty
2150 Lake Shore Boulevard West

Air Quality Impact Assessment Report

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HATCH					

Executive Summary

Hatch was retained by First Capital Realty (FCR) to conduct an air quality assessment for the Zoning By-law Amendment Application, Draft Plan of Subdivision Application and Official Plan Amendment resubmission at 2150-2194 Lake Shore Boulevard West and 23 Park Lawn Road ("the site"). In October 2019, FCR (Park Lawn) LP and CPPIB Park Lawn Canada Inc. ('the Owners') made an application for an Official Plan Amendment (OPA) in support of a proposed Master Plan for the redevelopment of the 27.7 acre / 11.2 hectare site located on the northeast corner of Park Lawn Road and Lake Shore Boulevard West.

This air quality assessment focuses on rail and road transportation emissions and the industrial operations located north of the proposed development. This air quality assessment reviews the compatibility of the development with the surrounding land uses, and considers the impacts of contaminants of concern. For both scenarios, traffic patterns and estimated Emission Factors (EFs) for each type of vehicles and emissions from the Lakeshore West Rail Corridor were used to determine impacts within the study area and were then compared to applicable regulatory criteria. In order to assess the impacts of surrounding air emissions on the proposed development, predicted cumulative contaminant concentrations were compared to guidelines established by government agencies such as Ontario Ambient Air Quality Criteria (AAQC). Trucks and vehicles entering and exiting the Ontario Food Terminal were also included in the traffic emission sources modeled. The emissions from the Humber Wastewater Treatment Plant were assessed qualitatively based on previous odour complaints that were received by the facility from 2016 to 2018. In 2017, the Humber Plant implemented an odour reduction plan that should resolve past odour issues near the Plant. Fewer complaints were logged in 2018 as a result of this odour reduction plan.

A quantitative analysis was completed for transportation emission sources that were modeled using AERMOD and five years of meteorological data to complete the air quality impact assessment (AQIA). In total, nine contaminants were modeled for the Existing scenario (2020) without the Project and for the Future scenario (2030) that includes the Project.

Based on the modeling results and the comparison with air quality criteria, it is possible to conclude that the sources surrounding the Project are not contributing to high air pollution levels. When cumulative concentrations including the background concentrations are assessed, two contaminants are exceeding the standards. Annual concentration results for Benzene are contributing to 145 percent of the criteria. Daily and annual concentrations for B(a)P are also exceeding the standards but the emission sources near the Project are not contributing to the cumulative concentration levels. Background concentrations for B(a)P are already 240 percent and 770 percent of the daily and annual criterions, respectively. These high concentration levels are common in urban areas and are recorded at most of the Greater Toronto Area (GTA) air quality monitoring stations. Those concentration values should not be considered as a risk that would prevent new developments. The results also show that most of the pollution levels will decrease in 2030 even with higher traffic rates as vehicles, trucks and locomotives are expected to have lower emission rates and increase their overall performance.

Table of Contents

List of Figures

List of Tables

Glossary of Terms and Acronyms

AAQC	Ambient Air Quality Criteria
ADMGO	Air Dispersion Modelling Guidelines for Ontario
AERMOD	American Meteorological Society/EPA Regulatory Model
AQIA	Air Quality Impact Assessment
B(a)P	Benzo(a)pyrene
BMPs	Best Management Practices
CAAQS	Canadian Ambient Air Quality Standard
CNR	Canadian National Railway
CO	Carbon Monoxide
COC	Contaminant of Concern
EA	Environmental Assessment
EAA	*Environmental Assessment Act*, 1990
ECCC	Environment and Climate Change Canada
EF	Emission Factor
HC	Hydrocarbon
MOE/MOEE/MOECC/ MECP	The Ministry of the Environment (MOE) was created in 1972 and merged with the Ministry of Energy to form the Ministry of Environment and Energy (MOEE) from 1993 to 1997 and again in 2002. The Ministry of the Environment (MOE) changed its name to the Ministry of the Environment and Climate Change (MOECC) on June 24, 2014. Subsequently, only June 29, 2018 the MOECC changed its name to the Ministry of the Environment, Conservation and Parks (MECP). Thus, MOE, MOEE, MOECC, and MECP are considered to be synonymous for the purposes of this Report.
MOVES	Motor Vehicle Emission Simulator
MTO	Ministry of Transportation
NAAQO	National Ambient Air Quality Objectives
NAPS	National Air Pollution Surveillance
NO_2	Nitrogen Dioxide
NO	Nitric Oxide
NO_x	Nitrogen Oxides
O_3	Ozone
OLM	Ozone Limiting Method

PAH	Polycyclic Aromatic Hydrocarbon
$PM_{2.5}$	Respirable Particulate Matter
PM_{10}	Inhalable Particulate Matter
PM	Particulate Matter
POI	Point of Impingement
RPM	Revolutions per Minute
TPAP	Transit Project Assessment Process
US EPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

1. Introduction

Hatch was retained by First Capital Realty (FCR) to conduct an air quality assessment for the Zoning By-law Amendment Application, Draft Plan of Subdivision Application, and Official Plan Amendment resubmission ('the Application) at 2150-2194 Lake Shore Boulevard West and 23 Park Lawn Road.

This air quality impact assessment (AQIA) focuses on rail and road transportation emissions and the industrial operations located north of the proposed development. This air quality assessment reviews the compatibility of the development with the surrounding land uses, and considers the impacts of regulated contaminants of concerns.

1.1 Project Description

1.1.1 The Original Master Plan Proposal (October, 2019)

In October 2019, FCR (Park Lawn) LP and CPPIB Park Lawn Canada Inc. ('the Owners') made an application for an Official Plan Amendment (OPA) in support of a proposed Master Plan for the redevelopment of the 27.7 acre / 11.2 hectare site located on the northeast corner of Park Lawn Road and Lake Shore Boulevard West, municipally known as 2150-2194 Lake Shore Boulevard West and 23 Park Lawn Road site ("the site" or "2150 Lake Shore"). The original Master Plan proposal envisioned a vibrant, mixed-use, transit-oriented redevelopment of the site. The Master Plan included a new Park Lawn GO Station, related TTC transit improvements, a fine-grained network of new streets and connections, a range of new open spaces including a new public park, and a diverse mix of residential, retail, service, entertainment and employment uses. At that time, the Master Plan contemplated a range of built form typologies including low, mid and high-rise buildings, fifteen towers ranging in height from 22 to 71 storeys.

1.1.2 The Revised Master Plan Proposal

The Master Plan for the site has further evolved, both in response to comments and suggestions from stakeholders, including City staff, and as a result of a more detailed review to support this combined Application. The fundamental vision and key elements of the Master Plan remain consistent, including:

- **An Integrated Transit Hub:** the new Park Lawn GO station is located along the northern edge of the site, with the platform spanning the Park Lawn Road right of way and a direct interface with the redeveloped site. A TTC streetcar loop is proposed to bring streetcars into the site, integrating directly with the GO station. Bus service stops are located on Park Lawn Road, also in close proximity to entrances to the GO platform, providing seamless connections between public transit modes.
- **The Relief Road:** a new relief road (Street A) is proposed along the northern edge of the site, connecting the Park Lawn Road Gardiner access ramp with the Gardiner ramp to the east. The proposed relief road works to divert vehicular traffic away from Park Lawn Road and Lake Shore Boulevard West to relieve existing congestion in the area. It also provides access to the proposed shared below-grade parking and servicing

areas within the site, significantly minimizing the impacts of vehicles on the public realm.

- **New Local Street Network:** new internal streets extend from the surrounding street network, responding to the unusual shape of this large site to create a loop road (Street B) with spokes that will draw transit vehicles, cars, pedestrians and bikes into the site, and create a multi-modal transit node at the GO station.
- **Diverse Open Space Network:** a range of new interconnected open spaces are proposed across the site, including a new public park, two large squares, a covered galleria (discussed below), and a series of groves, largos (enlarged sidewalks), lanes and mews, which together provide a rich network of places for every-day community interaction, recreation, play and relaxation.
- **The Galleria**: the galleria functions as a covered pedestrian street lined with a variety of retail, services and amenities. It is open to the elements while still offering protection from wind, rain and snow, extending opportunities for vibrant activity during all seasons. The galleria and public park are located at the centre of the site, creating a vibrant 'dual-heart' for the project.
- **Employment, Retail Services & Entertainment**: 64,392 m2 of employment / office gross floor area (GFA) is included in the Master Plan, creating a significant cluster of new office-type jobs at the GO Station and within the galleria. This is complemented by a range of retail, service, amenity and entertainment uses that together make up 36,659 m2 of GFA, providing a regionally accessible employment cluster that contributes to the creation of a complete community.
- **A Range of New Homes**: the Master Plan includes a substantive residential component, including 557,642 m2 of residential GFA, estimated as approximately 7,139 units. This includes a range of unit sizes, typologies and tenure, including a significant commitment to affordable housing and a high percentage of larger units appropriate for families (10% 3+ BD, 15% 2B+Den, 25% 2B).
- **Distinct Architecture**: the Master Plan features a range of building types that blend forms and uses, and respond to the distinct geometry of the proposed street and block pattern. Fifteen towers are proposed on the site with heights ranging from 16 to 70 storeys, with the tallest towers generally clustered near the GO Station. The towers feature generous separation distances, and are interspersed with a range of standalone mid-rise and low-rise building typologies to create a sense of place and urban fabric that appears to have evolved over time.

1.2 Study Objectives

To satisfy the study objectives, the predicted air quality effects associated with nearby sources were compiled at the site. The modeled concentration levels were assessed for existing and future conditions and compared to threshold limits.

1.3 Study Area

This AQIA was completed on a km area around the site. Air emission sources considered in this assessment consist of the worst combination of high traffic volumes on nearby roads and highways, largest increases in traffic, rail transit volumes, trucking operations from the nearby Ontario Food Terminal and the proximity to residential areas or critical receptors as defined in the MTO Guideline.

During the construction phase of the site, temporary effects on air quality can be expected in the surrounding area. Typically, emissions related to construction activities consist of fugitive dust emissions (Total Suspended Particles (TSP), inhalable particulate matter (PM_{10}) and respirable particulate matter ($PM_{2.5}$)) and mobile equipment emissions. Therefore, people working and living next to the project's construction area may experience an increase in dust concentrations and other criteria air contaminants for the duration of the construction phase. However, those emissions are limited spatially and temporally. Construction emission were thus not modelled as part of this assignment and should be dealt with directly through the deployment of ambient monitoring stations and mitigation measures during the construction phase.

2. Methodology

Local air quality impacts were assessed by estimating contaminant concentrations resulting from the worst combination of air emission sources stated in section 1.3 above. This AQIA was completed by modelling atmospheric dispersion of contaminants for two scenarios:

- Existing Case scenario (2020); and
- Future Case scenario (2030), with the Project implemented.

The methodology used for this AQIA is outlined in the *Air Quality Study Terms of Reference* from the City of Toronto (City of Toronto, s.d.) as well as MECP's Guideline D-6 "*Compatibility Between Industrial Facilities and Sensitive Land Uses*" (MECP, 1995). The assessment relied on atmospheric dispersion modelling. The guidance pertaining to the technical aspects of the modelling is provided within the Ministry of the Environment, Conservation and Parks' (MECP) Air Dispersion Modelling Guideline for Ontario (ADMGO) (MECP, 2017).

2.1 Approach

For both scenarios, traffic patterns and estimated Emission Factors (EFs) for each type of vehicle and emissions from surrounding industrial facilities were used to determine impacts at receptors within the study area and were then compared to applicable regulatory criteria. Contaminants considered in this assessment are presented in section 2.2 below. Table 2-1shows the area of influence on air quality for the different industrial land use classes according to MECP's Guideline D-6. Figure 2-1 below shows land use zoning around the project area. Class I industrial facilities located south-west of the project were not included in this assessment since they are located too far away from the project area and are thus considered to have negligible impact on it's air quality.

Table 2-1 : Area of influence of different industrial land use classes

Industrial land use class	Area of influence
Class I	70 m
Class II	300 m
Class III	1000 m

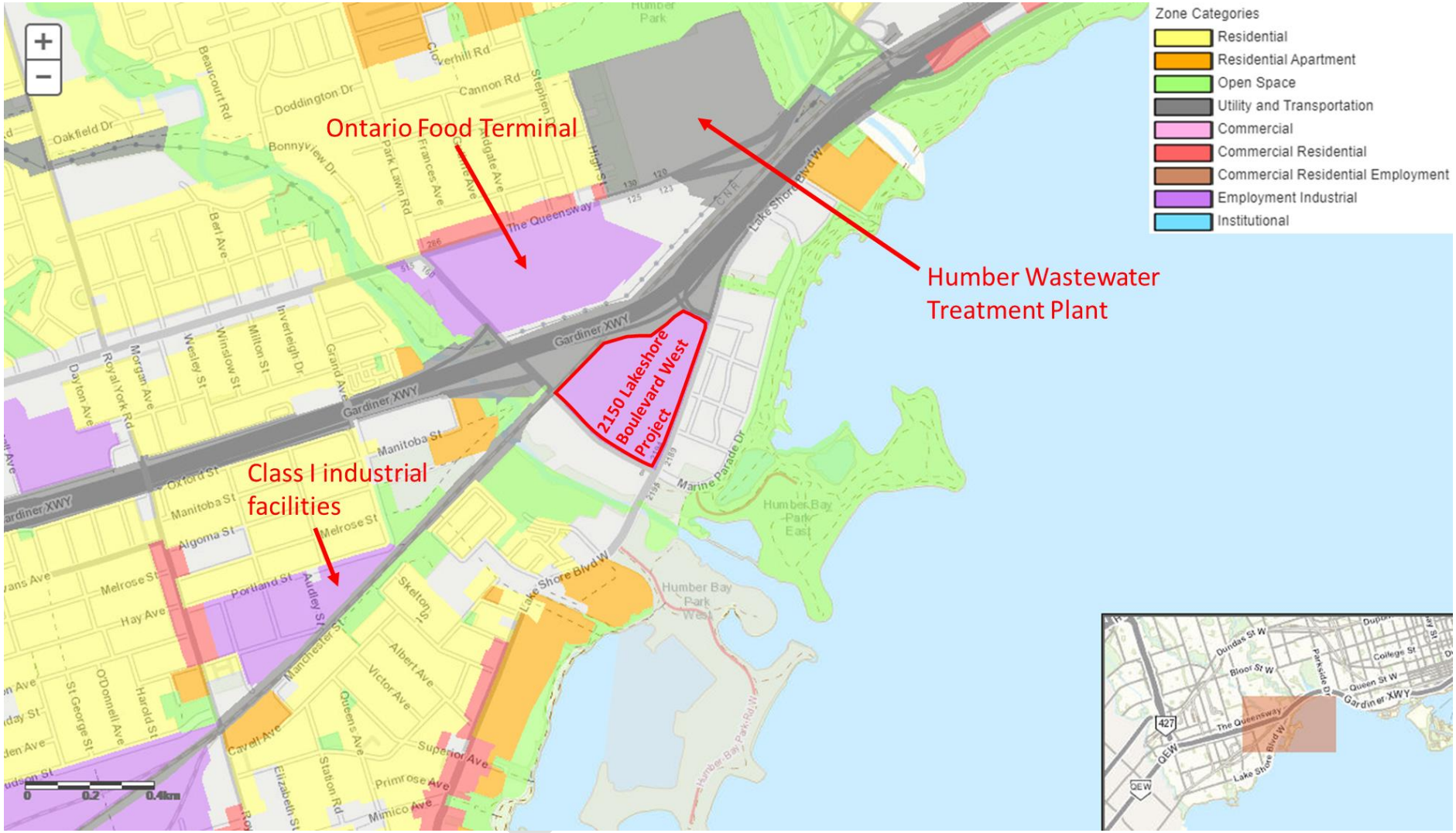

Figure 2-1 : Zoning Categories Around the Project Location

Table 2-2 presents the applicable air quality thresholds which are regulatory. The effects were predicted using engine emission rates, modelled emission rates and air dispersion modelling. Emission and dispersion models used for this assessment were respectively the United States Environmental Protection Agency's (US EPA) Motor Vehicle Emission Simulator (MOVES) and American Meteorological Society/EPA Regulatory Model (AERMOD version 19191). The MOVES software is an MECP-approved simulator used to determine vehicle EFs for vehicle traveling on roads modelled. It is noted that AERMOD is also an approved MECP air dispersion model under *Ontario Regulation 419/05 Air Pollution - Local Air Quality* (O. Reg 419/05) (MECP, 2017). It is a steady-state dispersion model used to determine short-range dispersion of the air emissions associated with the aforementioned two (2) scenarios. AERMOD is also composed of a meteorological data pre-processor (AERMET) and a terrain pre-processor (AERMAP).

The modelled concentrations of contaminants due to the change in traffic patterns as well as the emissions from nearby industrial sources were added to background concentrations. The resulting sums were then compared to the air quality threshold in order to evaluate the potential for adverse effects. A potential for an adverse effect is considered to exist when the summed concentration for a contaminant exceeds the air quality criterion at a sensitive receptor. If the background concentration of a contaminant already exceeds the criterion, then a potential for an adverse effect already exists, without the consideration of the Project.

2.2 Contaminants of Concern

Contaminants of Concern (COC) that were assessed in this AQIA included:

- Suspended particulate matter (PM);
- Nitrogen dioxide (NO_2): nitrogen oxides (NOx) correction using available ozone (O_3) calculations for conversion of nitric oxide (NO) to NO_2 (see section 2.5);
- Carbon monoxide (CO);
- Volatile Organic Compounds (VOCs):
  - Acetaldehyde;
  - Acrolein;
  - Benzene;
  - 1,3-butadiene;
  - Formaldehyde; and
- Polycyclic Aromatic Hydrocarbons (PAHs): benzo(a)pyrene.

2.3 Air Quality Thresholds

In order to assess the impacts of surrounding air emissions on the proposed development, predicted cumulative contaminant concentrations were compared to guidelines established by government agencies. Predicted cumulative pollution concentrations of COCs were compared with the Ontario Ambient Air Quality Criteria (AAQC).

The Ontario AAQC list desirable concentrations of contaminants in air, based on protection against adverse effects on health and/or the environment. AAQCs are developed by the MECP and have varying time weighted averaging periods (e.g., 30-minute, one hour, eight hour, 24 hour, and annual) appropriate for the adverse effect that they are intended to protect against (i.e., acute or chronic). The adverse effects considered may be related to health, odour, vegetation, soiling, visibility, or corrosion. AAQCs may be changed from time to time based on the state-of-the-science for a particular contaminant (MECP, 2012).

The AAQC are referred to as “air quality thresholds” in this AQIA. An exceedance of one of the air quality thresholds will cause mitigation to be considered, assuming the air quality threshold is not already exceeded by the ambient background concentration of a contaminant. Table 2-2 summarizes the air quality thresholds.

Table 2-2: Air Quality Thresholds for Contaminants of Concern

Contaminant	Averaging Time	Threshold Value (µg/m³)	Source
$PM_{2.5}$	24 hours	28	CAAQS
	24 hours	27	CAAQS (2020)
	Annual	10	CAAQS
	Annual	8.8	CAAQS (2020)
NO_2	1 hour	400	AAQC
	1 hour	119	CAAQS (2020)
	1 hour	83	CAAQS (2025)
	24 hours	200	AAQC
	Annual	60	NAAQO
	Annual	23	CAAQS (2025)
CO	1 hour	36,200	AAQC
	8 hours	15,700	AAQC
Acrolein	1 hour	4.5	AAQC
	24 hours	0.4	AAQC
Benzene	24 hours	2.3	AAQC
	Annual	0.45	AAQC
1,3-Butadiene	24 hours	10	AAQC
	Annual	2	AAQC
Acetaldehyde	30 minutes	500	AAQC
	24 hours	500	AAQC
Formaldehyde	24 hours	65	AAQC
Benzo(a)pyrene	24 hours	0.00005	AAQC
	Annual	0.00001	AAQC

The applicable averaging periods for the contaminants are based on 30-minute, one hour, eight hour, 24 hour, and annual exposures. The different averaging periods for contaminants are based on adverse effects to human health, vegetation or animals. These effects are indicated within the AAQC (MECP, 2012).

2.4 Background Air Quality

By definition, background concentrations include sources that affect air quality in the study area, and generally do not include emissions from the Project itself. Thus, the MECP and

National Air Pollution Surveillance (NAPS) ambient air monitoring stations were reviewed and selected based on their proximity to the study area and the fact that they are located in an area that has minimal to no influence from an existing rail corridor. This avoids double counting the ambient background levels of the COCs when processed with the dispersion modelling results. However, even though the background air quality stations selected were not necessarily close to an existing rail corridor, it is important to note that the background levels used include and double count some of the traffic modelled.

A total of five MECP and NAPS ambient air monitoring stations were identified as shown in Table 2-3 and Figure 2-2. However, not all contaminant concentrations are available at every station, which is the reason five stations were selected to characterize background concentrations. One MECP station was selected to represent respirable particulate matter ($PM_{2.5}$), Nitrogen Dioxide (NO_2) and Ozone (O_3). The Toronto Downtown ambient air monitoring station was chosen because it is the closest station to the study area. As Carbon Monoxide (CO) was not measured at this particular MECP station, another MECP station, the Toronto West ambient air monitoring station, was also used to evaluate the background concentration of that specific COC. Furthermore, both of the station locations are qualified as an urban area, which is representative of the Project's surroundings. Toronto Downtown and Toronto West stations were thus selected to represent the background $PM_{2.5}$, NO_2 as well as O_3 and CO concentrations, respectively.

Three NAPS stations were selected to represent background concentrations for other contaminants. The Egbert monitoring station was the only station with recent data for acetaldehyde and formaldehyde and was thus selected to represent the acetaldehyde and formaldehyde background concentrations. Toronto Gage Institute monitoring station was selected to represent B(a)P, benzene and 1,3-butadiene background concentrations due to its proximity to the study area. Toronto (Ruskin/Perth St) monitoring station was used for acrolein. A summary of data from these stations and the years of data used are provided in Table 2-3, while their locations are shown on Figure 2-2.

Table 2-3: Ambient Air Monitoring Station Information

Contaminant of Concern	Station ID	Station Location	Years of Data Used
Particulate Matter ($PM_{2.5}$)	MECP - 31103	Toronto Downtown (Bay/Wellesley St. W)	2013-2020
Nitrogen Dioxide (NO_2)	MECP - 31103	Toronto Downtown (Bay/Wellesley St. W)	2013-2020
Carbon Monoxide (CO)	MECP - 35125	Toronto West (125 Resources Road)	2013-2020
Ozone (O_3)	MECP - 31103	Toronto Downtown (Bay/Wellesley St. W)	2013-2020
Acrolein	NAPS - 60418	Toronto (Ruskin/Perth Street)	2002-2006
Benzene	NAPS - 60427	Toronto - Gage Institute (223 College Street)	2010-2014
1,3-Butadiene	NAPS - 60427	Toronto - Gage Institute (223 College Street)	2010-2014

Contaminant of Concern	Station ID	Station Location	Years of Data Used
Acetaldehyde	NAPS - 64401	Egbert (8th Line and 10th Side Road)	2006-2010
Formaldehyde	NAPS - 64401	Egbert (8th Line and 10th Side Road)	2006-2010
B(a)P	NAPS - 60427	Toronto - Gage Institute (223 College Street)	2010-2014

To establish an initial baseline of concentrations for the COCs, background data from the stations listed above were gathered and compiled for the most recent five consecutive years. Based on published air quality studies and common practice, the 90th percentile concentration for each COC was used for averaging periods of one hour, eight hours and 24 hours to determine the background concentration. For COCs with an annual averaging period, the annual mean from the ambient air monitoring stations was used. Values of interest were compiled and are presented in Table 2-4.

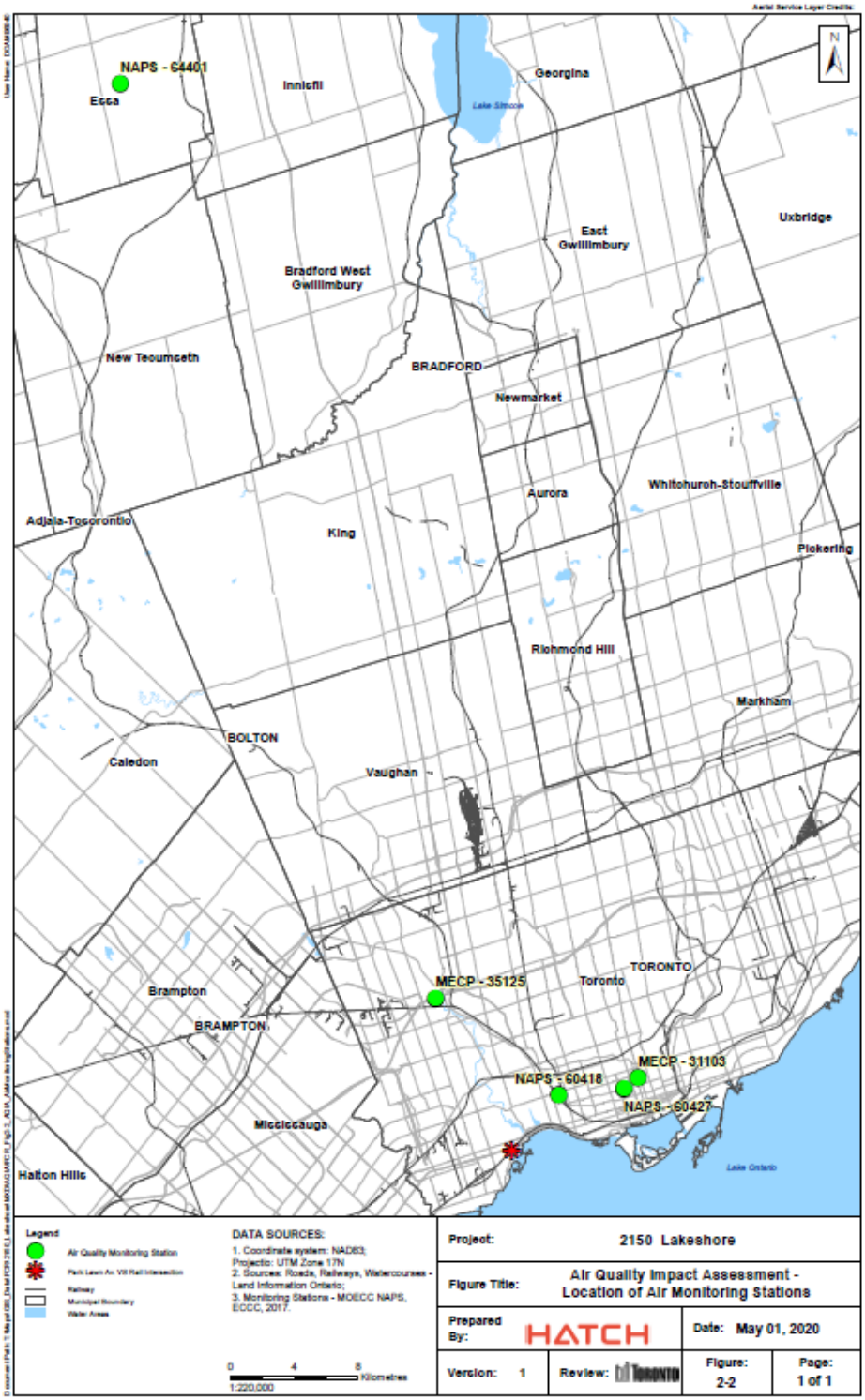

Figure 2-2: Location of Air Monitoring Stations

Table 2-4: Background Concentrations (µg/m^3)

Contaminant	Period	Unit	Criterion	Maximum	Minimum	Median	Background Value	% of criterion
$PM_{2.5}$	24 Hour	µg/m^3	27.0	39.1	0.1	6.7	14.1	52%
$PM_{2.5}$	Annual	µg/m^3	8.8	8.7	7.0	8.3	7.93	90%
NO_2	1 Hour	µg/m^3	400	122.2	1.9	21.4	46.3	12%
NO_2 (CAAQS 2025)	1 Hour	µg/m^3	83	122.2	1.9	21.4	46.3	56%
NO_2	24 Hour	µg/m^3	200	80.6	4.9	23.6	38.9	19%
NO_2	Annual	µg/m^3	60	26.3	24.4	25.1	25.2	42%
NO_2 (CAAQS 2025)	Annual	µg/m^3	23	26.3	24.4	25.1	25.2	110%
CO	1 Hour	µg/m^3	36200	1911	0	256	412	1%
CO	8 Hour	µg/m^3	15700	1412	34	264	400	3%
O_3	1 Hour	µg/m^3		176.6	0.0	49.4	81.6	
O_3	24 Hour	µg/m^3		115.1	6.0	49.0	73.6	
O_3	Annual	µg/m^3		51.5	50.2	50.4	50.5	
Acrolein	24 Hour	µg/m^3	0.4	1.2	0.0	0.072	0.24	59%
Acrolein	1 Hour	µg/m^3	4.5					
Benzene	24 Hour	µg/m^3	2.3				0.95	41%
Benzene	Annual	µg/m^3	0.45	2.03	0.19	0.61	0.64	141%
1,3 Butadiene	24 Hour	µg/m^3	10				0.10	1%
1,3 Butadiene	Annual	µg/m^3	2	0.19	0.01	0.05	0.06	3%
Acetaldehyde	24 Hour	µg/m^3	500	3.1	0.0	0.85	1.6	0.3%
Acetaldehyde	30 minutes	µg/m^3	500					
Formaldehyde	24 Hour	µg/m^3	65	8.2	0.14	2.2	4.2	6%
Benzo(a)pyrene	24 Hour	µg/m^3	0.00005				0.00012	240%
Benzo(a)pyrene	Annual	µg/m^3	0.00001				0.000077	770%

Notes:

Ozone (O_3) concentrations were used to calculate the NO to NO_2 conversion using the Ozone Limiting Method (See Section 2.5).
'-' : Insufficient data to estimate these values

2.5 Conversion of Nitrogen Oxides (NO_x) to Nitrogen Dioxide (NO_2)

When nitrogen oxides (NO_x) are emitted in diesel exhaust, their initial composition is dominated by nitric oxide (NO). Approximately 90 percent of the emissions of NO_x are in the form of NO. Once in the ambient air, NO is irreversibly oxidized by ground level ozone (O_3) to produce nitrogen dioxide (NO_2) as follows:

$$\mathbf{NO + O_3 \rightarrow NO_2 + O_2}$$

NO_2 is a COC with established air quality thresholds, so the concentration of NO_2 is important to quantify. For the purpose of this assessment, a simplified version of the Ozone Limiting Method (OLM) was used to estimate the maximum short-term NO_2 concentrations resulting from emissions of NO_x. The one hour and 24 hour NO_x concentrations predicted by AERMOD were compared to the average 90th percentile measured ambient ozone (O_3) concentration for years 2013 - 2017 from the Toronto Downtown (Bay/Wellesley St. W) ambient air monitoring station.

The OLM method assumes that if the concentration of NO (90 percent of the modelled NO_x) is less than the available 90th percentile ambient O_3, then all of the NO is converted to NO_2 as follows:

$$\mathbf{If\ 0.9NO_x(ppm) < O_3(ppm), then\ NO_2(ppm) = NO_x(ppm)}$$

If the concentration of NO (90 percent of the modelled NOx) is greater than the available 90th percentile ambient O_3, then there is not enough O_3 to convert all the NO to NO_2, so the following relationship applies:

$$\mathbf{If\ 0.9NO_x(ppm) > O_3(ppm), then\ NO_2(ppm) = 0.1NO_x(ppm) + O_3(ppm)}$$

The conservative nature of this method assumes that the peak NO_x emissions from the dispersion modelling occur simultaneously with the 90th percentile peak of O_3, to maximize the amount of NO_2 that could be present.

2.6 Credible Worst-Case Analysis

The COC concentrations from modelling air emission sources around the site were summed with background concentrations. The results were then compared to the applicable air quality thresholds in order to evaluate the potential for adverse effects on the project.

It is noted that the Project's surrounding air emissions and the background concentrations vary widely from day to day, depending on weather conditions and operational conditions. Thus, the credible worst-case analysis was undertaken for this assessment, as an appropriate analytical response to this issue. This analysis is based on the concept that a project is acceptable under all conditions if it is acceptable under a credible worst-case condition (MTO, 2012). In the credible worst-case analysis, the maximum modelled 30 minutes, one hour, eight hour, 24 hour and annual concentrations, under maximum operating conditions and worst-case meteorological conditions, are assumed to coincide with peak ambient background concentrations.

For each COC, the 90th percentile concentration from the ambient background monitoring data was used to represent the peak background condition in this calculation. The sum of the maximum modelled Project contribution and the 90th percentile background concentration was compared to the applicable air quality threshold. If the credible worst-case analysis indicate that the sensitive receptors located in the project area may be subject to air quality that does not meet the provincial/national ambient air quality criteria/standards (AAQS/CAAQS), then a more detailed analysis will be carried out for that specific community or receptor. Otherwise, no further local AQIA is needed (MTO, 2012).

2.7 Atmospheric Dispersion Modelling

Dispersion models use mathematical formulations to represent the atmospheric processes that transport and disperse air contaminants emitted by a source. This AQIA involved the AERMOD dispersion model. The AERMOD model is the US EPA's preferred steady-state dispersion model, designed to predict air contaminant concentrations at receptor locations within several kilometres of a source. It incorporates the turbulence structure associated with the atmosphere near the ground, and includes treatment of surface and elevated sources, as well as both simple and complex topography. It is noted that AERMOD has been adopted by the MECP as an approved dispersion model for regulatory purposes under O. Reg. 419/05.

The US EPA provides guidance to assess transportation sources within AERMOD, which has been adopted in this AQIA. All accepted dispersion modelling approaches for transportation emissions treat the emissions as steady-state within a given hour. Since the shortest averaging time of interest for pollutant concentration is 30 minutes, this assumption does not significantly compromise the results.

AERMOD uses the meteorological information (e.g., temperature, wind speed, relative humidity) and terrain data (e.g., surface roughness, albedo, and Bowen ratio) supplied by AERMET pre-processor in dispersion models to calculate the mixed layer height which was used in estimating the dispersion of emissions.

In the present study, five years of hourly meteorological data were used in AERMOD. Predicted worst-case concentrations for 30 minutes, one hour, eight hour, 24 hour and annual averaging times were extracted from the results for the entire five-year period. Two (2) meteorological datasets were needed to perform dispersion modelling analysis using the AERMOD model: upper air data (i.e., measurements recorded at various heights above the surface by weather balloons released twice per day); and surface data (i.e., hourly measurements recorded at surface-based weather stations located ten (10) metres above the ground). Upper air data were obtained from the Buffalo International Airport Station (ID 14733) for the years 2015 - 2019 inclusively, and surface data were obtained from the Toronto Pearson International Airport (ID 61587) for the same five-year period in pre-processed datasets directly from the MECP. Buffalo is the upper air station designated for the City of Toronto, as upper air quality does not change significantly over a geographic area. The MECP meteorological datasets were processed using the AERMET meteorological data processor for the urban surface category.

Terrain information for the area surrounding the site was obtained from the MECP Ontario Digital Elevation Model Data web site. The terrain data are based on the North American Datum 1983 (NAD83) horizontal reference datum (Tile 087). These data were run through the

AERMAP terrain pre-processor to estimate base elevations for sources and receptors and to help the model account for changes in elevation of the surrounding terrain.

The AERMOD model is able to generate values for different averaging periods (hourly, eight hour, daily and annual averages) over the five years of simulation. The hourly concentrations were estimated based on hourly emission rates expressed in grams per second (g/s) and hourly meteorological data. Figure 2-3 presents the wind rose resulting from the meteorological data pre-processing.

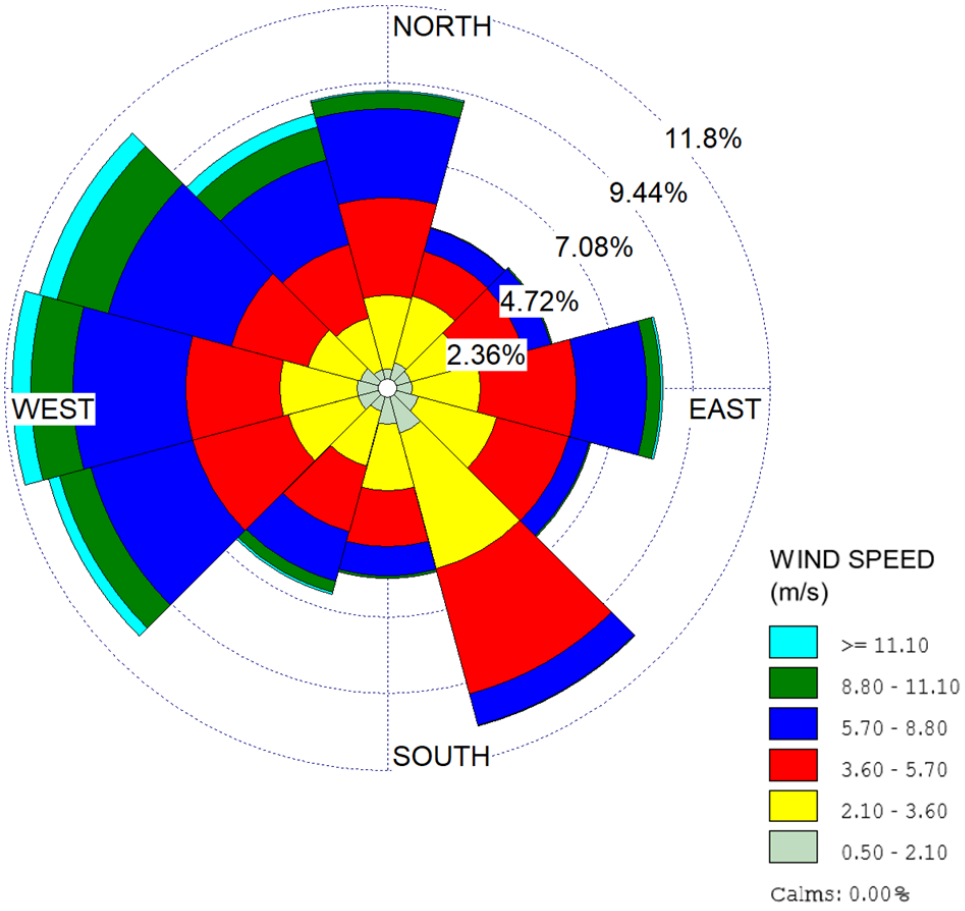

Figure 2-3: Wind Rose for Toronto Pearson International Airport (2015-2019)

2.8 Receptors

Receptors were selected based on the location of the Project and the purpose of this AQIA. As the main purpose is to determine the air quality at the site, receptors were placed inside the perimeter of the site with a 50 meter receptor spacing. This approach was used since the location of future sensitive and critical receptors is not confirmed at this stage of the Project. In total 289 receptors were included in the model for AQIA. These receptors are shown in Figure 2-4.

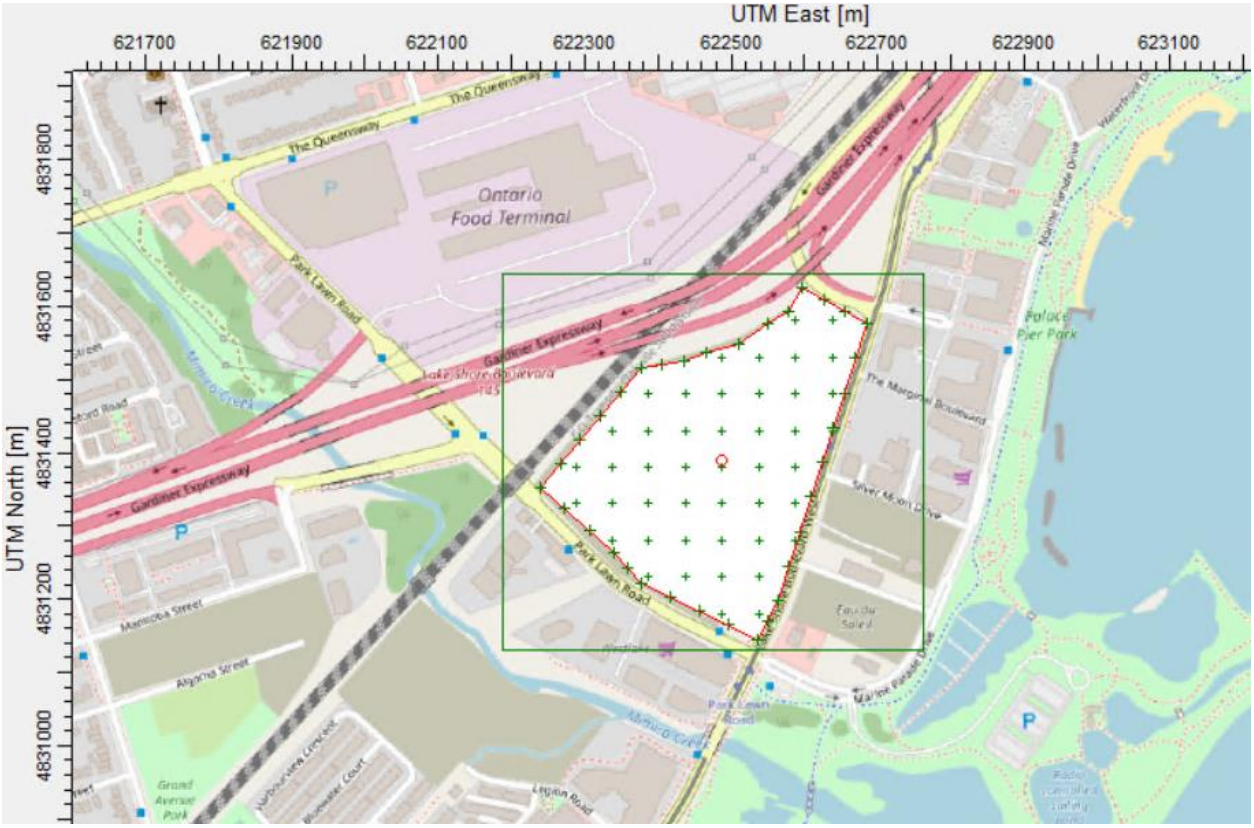

Figure 2-4: Receptors in the Air Dispersion Model

2.9 Modelling Scenarios

The modelling portion of the AQIA is developed based on the vehicle's traffic pattern changes due to the development of the site.

The following emission sources will be included in the dispersion model for each of the two (2) modelled scenario:

- Existing on-road vehicle and locomotives emissions around the project area for the base case scenario (Current conditions (2020)); and
- Future on-road vehicle and locomotives emissions around the project area after the completion of the "Project" (Future project case scenario (2030)).

The vehicles will be represented by line-volume source along the Project's most impacted road segments. The emission level for these two scenarios is based on the existing and projected number of vehicles and average EFs for typical vehicles from US EPA MOVES software. For locomotives travelling on the Lakeshore West Rail Corridor, existing and projected number of trains and average EFs for GO Transit locomotives were considered.

3. Emission Sources

The most significant sources of concern in a one kilometer radius from the site were included in the air dispersion model. According to available information, the following emission sources were included in the AQIA for this Project:

- Vehicles and heavy-vehicles emissions on the main roads in the vicinity of the Project for the two scenarios modelled:
  - Existing Case scenario (2020): Existing traffic data; and
  - Future Case scenario (2030): Projected traffic data.
- Diesel locomotives on the Lakeshore West Rail Corridor (Metrolinx, VIA and CN):
  - Existing Case scenario (2020): Existing rail traffic and schedule; and
  - Future Case scenario (2030): Projected rail traffic and new Park Lawn GO station.

Figure 3-1 shows the sources included in the model.

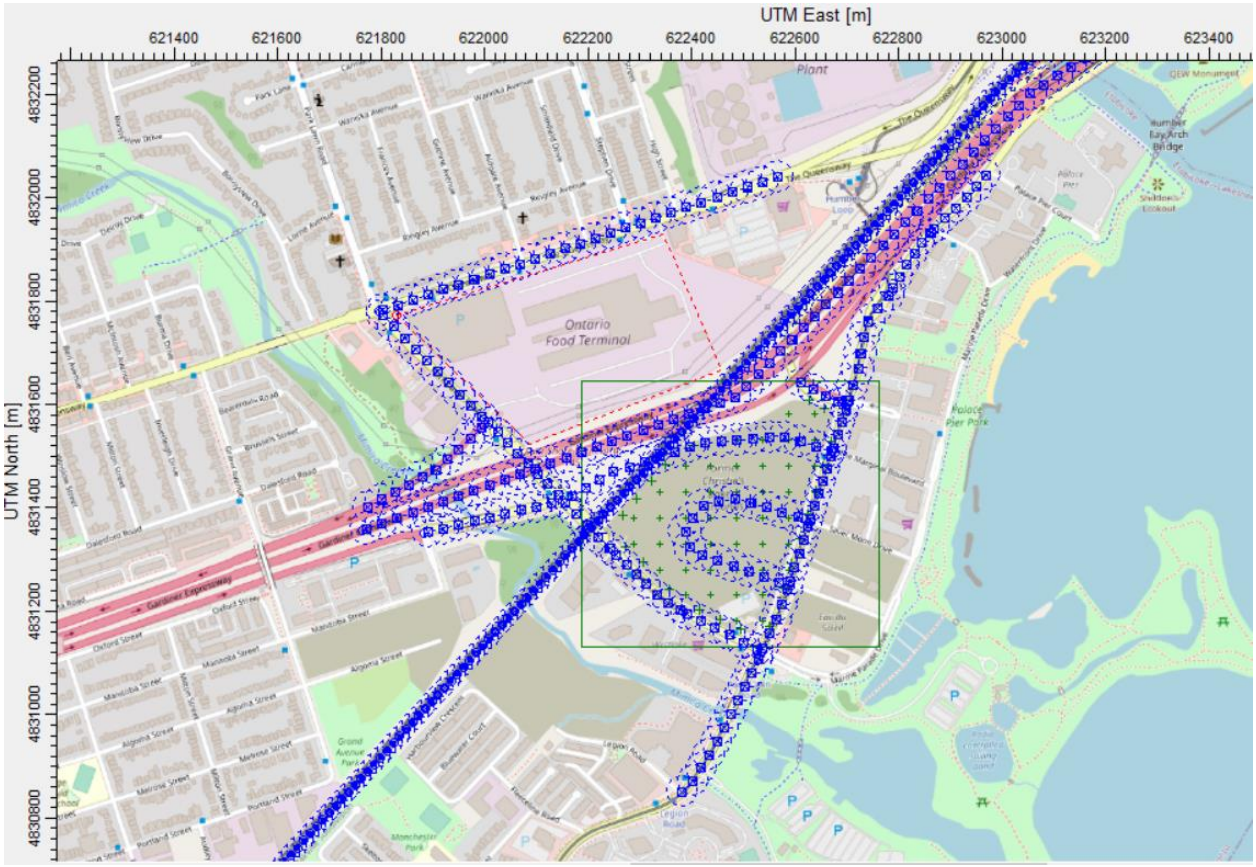

Figure 3-1: Emission Sources Included in the Air Dispersion Model

3.1 Road Transportation Sources

3.1.1 Passenger Vehicles and Heavy-Vehicles

US EPA MOVES was used to determine the EFs for passenger vehicles travelling on roads modelled. The same procedure was used to calculate the EFs from buses and heavy-vehicles travelling on roads around the Project.

The MOVES model has been used in transportation projects in Ontario and it is the MECP recommended model for these assessments. MOVES is a state of the science emission modelling system that estimates emissions for mobile sources at the national, county, and project level for criteria pollutants and air toxics. MOVES provides estimates of existing and future emission rates from motor vehicles based on a variety of factors such as local meteorology and vehicle fleet composition. For this study, MOVES was used to estimate vehicle emissions based on vehicle type, model year, and vehicle speed. Table 3-1 specifies the major inputs into MOVES.

Table 3-1: MOVES Input Parameters

Parameter	Input
Scale and Geographical Bounds	Custom County Domain
Pollutants	$PM_{2.5}$, CO, NO_x, Acetaldehyde, Formaldehyde, 1,3-Butadiene, Benzene, Acrolein, and Benzo(a)pyrene
Year	2020, 2030
Meteorology	Temperature and Relative Humidity Values were obtained from the Toronto Pearson International Airport Station (1981-2010).
Source Use Types and Fuel Combinations	Passenger Vehicles (Gasoline) Heavy vehicles (Diesel)
Road Type	Urban Unrestricted Access
Vehicle Age Distribution	MOVES defaults based on years selected

All EFs were computed for two months: January and July. The highest value was retained and used in the air dispersion model. Associated hourly meteorological data (temperature and relative humidity) for those months were collected from the Toronto Pearson International Airport Station from 1981 to 2010. January and July were used to consider two extremes as they resulted in high-end estimates of EFs for most contaminants due to reduced operating efficiency in cold/hot weather. For some contaminants, such as VOCs, the EFs are normally higher during warmer conditions due to a lower evaporative component at cold temperatures.

Emission sources included in this AQIA are essentially emissions from vehicles (passenger cars), buses and heavy vehicles on roads around the Project.

The emission rates were calculated in custom county domain scale and EFs were generated for each vehicle type. The MOVES model has the capability to provide EFs for a specific speed range. The EFs used for all roads modelled were generated at a speed of 40 km/h for streets and boulevards and 100 km/h for highways.

A summary of MOVES EFs for passenger vehicles and heavy-vehicles used for both of the modelled scenarios are presented in Table 3-2 and Table 3-3.

Table 3-2: MOVES Output Emissions Factors for Existing Case Scenario (2020)

Contaminant	40 km/h (g/VKT)		100 km/h (g/VKT)	
	Passenger Vehicle	Truck	Passenger Vehicle	Truck
$PM_{2.5}$[1]	4.50E-06	1.17E-04	6.05E-06	6.45E-05
Nitrogen Oxides (NO_x)	3.85E-05	3.70E-03	2.82E-05	1.36E-03
Carbon Monoxide (CO)	9.70E-04	1.01E-03	2.62E-04	7.17E-04
Acrolein	8.95E-09	2.59E-06	4.35E-09	1.44E-06
Benzene	4.38E-07	3.10E-06	2.17E-07	1.71E-06
1,3-Butadiene	6.77E-08	1.03E-06	3.03E-08	5.80E-07
Acetaldehyde	1.82E-07	1.44E-05	8.45E-08	7.94E-06
Formaldehyde	1.92E-07	3.37E-05	9.33E-08	1.84E-05

Contaminant	40 km/h (g/VKT)		100 km/h (g/VKT)	
	Passenger Vehicle	Truck	Passenger Vehicle	Truck
Benzo(a)pyrene	2.41E-09	2.00E-08	3.23E-09	7.85E-09

Notes: [1]Includes breakwear and tirecar.

Table 3-3: MOVES Output Emissions Factors for Future Case Scenario (2030)

Contaminant	40 km/h (g/VKT)		100 km/h (g/VKT)	
	Passenger Vehicle	Truck	Passenger Vehicle	Truck
$PM_{2.5}$[1]	8.19E-07	1.87E-05	8.05E-07	1.33E-05
Nitrogen Oxides (NO_x)	5.31E-06	1.12E-03	5.79E-06	4.85E-04
Carbon Monoxide (CO)	4.55E-04	3.30E-04	1.10E-04	2.54E-04
Acrolein	1.55E-09	7.80E-07	1.15E-09	3.92E-07
Benzene	1.03E-07	9.68E-07	7.60E-08	4.85E-07
1,3-Butadiene	6.61E-10	1.91E-07	3.02E-10	1.01E-07
Acetaldehyde	1.11E-08	4.85E-06	8.27E-09	2.41E-06
Formaldehyde	2.76E-08	1.34E-05	2.04E-08	6.59E-06
Benzo(a)pyrene	4.38E-10	2.32E-09	4.30E-10	1.24E-09

Notes: [1]Includes breakwear and tirecar.

3.1.2 Source Parameters for Dispersion Modelling

Dispersion models are used to predict how a contaminant concentration is diluted as it moves through the atmosphere. The concentration of a contaminant at a specific receptor is a function of a variety of parameters, including meteorological conditions in the vicinity of the source, contaminant emission rate(s), physical characteristics of the source and terrain in the vicinity of both the source and receptor. Atmospheric dispersion models use a combination of data inputs for these parameters in conjunction with mathematical algorithms that describe both the temporal and spatial variation of contaminants as they move away from the source (MECP, 2017). Some of these model inputs were discussed in Section 3. Selecting emission source parameters for the AERMOD model plays a very essential role in modelling. The dispersion modelling parameters for each of the emission sources used in this assessment are discussed in Table 3-4.

Table 3-4: Roads Source Parameters

Parameters	Unit	Value	Notes
Configuration	-	Adjacent	Adjacent Volume Sources
Plume Height	m	2.55	Vehicle Height x 1.7
Plume Width, one lane	m	7.8	Vehicle width + 6 m
Plume Width, two lanes	m	16	2 x (Vehicle width + 6 m)
Release Height	m	1.28	0.5 x Height of plume

3.2 Rail Transportation

The Lakeshore West rail corridor is located less than one kilometer from the Project. Current rail traffic (2020) based on the GO Train schedule for the Lakeshore West corridor includes 172 trains per day, with 84 eastbound and 88 westbound trains. These schedules include non-revenue movements on the corridor such as deadhead runs and maintenance runs. VIA Rail and CN trains are also operating locomotives on the rail corridor.

The emissions for the Current (2020) and future (2030) conditions for the GO Train prime mover and the HEP unit were estimated using the trains' supplier data. The current GO Transit prime mover and HEP units are in compliance with the US EPA Tier 2 and some engines are in compliance with the Tier 3 emission standards. As a worst-case scenario, Tier 2 EFs will be considered for the assessment. The following table present the EFs for the Tier 2 (Table 3-5).

The future conditions for GO Transit locomotives were based on the GO Rail Network Electrification TPAP Lakeshore West Corridor published in 2017. As a conservative assumption, locomotives were all considered to be diesel locomotives. Based on the Final Air Quality Impact Assessment Report for the Lakeshore West Corridor (RWDI, 2017) diesel Tier 4 locomotives are considered for future operations. Table 3-6 presents EFs for the future conditions (2030).

Table 3-5: MP40PH-3C Emission Factors from EMD 710 Tier 2 Engine (g/h)

Notch setting	$PM_{2.5}$	NOx	CO	Benzene	1,3-Butadiene	Formaldehyde	Acetaldehyde	Acrolein	B(a)P
Low IDLE	1.13E+00	7.29E+01	2.16E+01	5.54E-02	2.01E-04	3.08E-01	9.79E-02	2.29E-02	5.15E-06
IDLE	3.51E+00	2.25E+02	6.67E+01	1.71E-01	6.21E-04	9.52E-01	3.02E-01	7.08E-02	1.59E-05
DB	5.89E+00	3.78E+02	1.12E+02	2.87E-01	1.04E-03	1.60E+00	5.08E-01	1.19E-01	2.67E-05
1	2.92E+01	1.88E+03	5.56E+02	1.42E+00	5.18E-03	7.93E+00	2.52E+00	5.90E-01	1.32E-04
2	5.66E+01	3.63E+03	1.08E+03	2.76E+00	1.00E-02	1.54E+01	4.88E+00	1.14E+00	2.57E-04
3	1.24E+02	7.96E+03	2.36E+03	6.05E+00	2.20E-02	3.37E+01	1.07E+01	2.50E+00	5.62E-04
4	1.82E+02	1.17E+04	3.47E+03	8.89E+00	3.23E-02	4.95E+01	1.57E+01	3.68E+00	8.27E-04
5	2.37E+02	1.52E+04	4.50E+03	1.15E+01	4.19E-02	6.42E+01	2.04E+01	4.78E+00	1.07E-03
6	3.63E+02	2.33E+04	6.91E+03	1.77E+01	6.43E-02	9.86E+01	3.13E+01	7.33E+00	1.65E-03
7	4.61E+02	2.96E+04	8.78E+03	2.25E+01	8.17E-02	1.25E+02	3.98E+01	9.32E+00	2.09E-03
8	5.33E+02	3.43E+04	1.02E+04	2.60E+01	9.45E-02	1.45E+02	4.60E+01	1.08E+01	2.42E-03

Table 3-6: MP40PH-3C Emission Factors from EMD 710 Tier 4 Engine (g/h)

Notch setting	$PM_{2.5}$	NOx	CO	Benzene	1,3-Butadiene	Formaldehyde	Acetaldehyde	Acrolein	B(a)P
Low IDLE	2.62E-01	1.17E+01	2.16E+01	1.29E-02	4.69E-05	7.19E-02	2.28E-02	5.35E-03	1.19E-06
IDLE	8.09E-01	3.61E+01	6.67E+01	3.99E-02	1.45E-04	2.22E-01	7.06E-02	1.65E-02	3.67E-06
DB	1.36E+00	6.07E+01	1.12E+02	6.70E-02	2.43E-04	3.73E-01	1.19E-01	2.78E-02	6.16E-06
1	6.74E+00	3.01E+02	5.56E+02	3.32E-01	1.21E-03	1.85E+00	5.88E-01	1.38E-01	3.06E-05
2	1.31E+01	5.83E+02	1.08E+03	6.44E-01	2.34E-03	3.59E+00	1.14E+00	2.67E-01	5.92E-05
3	2.86E+01	1.28E+03	2.36E+03	1.41E+00	5.12E-03	7.85E+00	2.49E+00	5.84E-01	1.30E-04
4	4.20E+01	1.88E+03	3.47E+03	2.07E+00	7.53E-03	1.15E+01	3.67E+00	8.59E-01	1.91E-04
5	5.46E+01	2.44E+03	4.50E+03	2.69E+00	9.78E-03	1.50E+01	4.76E+00	1.12E+00	2.48E-04
6	8.37E+01	3.74E+03	6.91E+03	4.13E+00	1.50E-02	2.30E+01	7.30E+00	1.71E+00	3.80E-04
7	1.06E+02	4.76E+03	8.78E+03	5.25E+00	1.91E-02	2.92E+01	9.28E+00	2.17E+00	4.83E-04
8	1.23E+02	5.50E+03	1.02E+04	6.07E+00	2.21E-02	3.38E+01	1.07E+01	2.51E+00	5.58E-04

The US EPA provides guidance on modelling mobile trains and vehicles. In dispersion models, emissions from moving locomotives are represented as if coming from stationary sources (i.e., volume sources) distributed along the corridor of travel. The corridor is divided into short line segments and each segment is treated as a stationary source. The emissions from each stationary source corresponds to the amount of emissions produced by the locomotives travelling along that segment of the corridor. Table 3-7 summarizes the source parameters for mobile GO Trains on the Lakeshore West rail corridor.

Table 3-7: Mobile GO Train Source Parameters

Parameters	Unit	Value	Notes
Configuration	-	Adjacent	Adjacent Volume Sources
Plume Height	m	8.0	Locomotive Height x 2
Plume Width	m	9.2	Single Track
Release Height	m	4.0	Height of Locomotive

3.3 Industrial Sources

Two industrial facilities are located in the vicinity of the Project as shown in Figure 2-1. Potential air emission sources for these facility were estimated based on available information to integrate potential air quality impacts from these facilities on the Project.

3.3.1 Ontario Food Terminal

This facility poses a potential risk to air quality based on the non-negligible amount of trucks that are accessing the facility on a daily basis. Traffic data included in the model considers the amount of trucks that are entering and exiting the facility. Any idling on the industrial property was not included because of the lack of reliable data to estimate the idling time for each truck.

3.3.2 Humber Wastewater Treatment Plant

Wastewater treatment plants are potential air quality threats due to the emission of volatile organic compounds, total reduced sulphur and nitrogenous compounds. They also pose a threat for odor emissions. As limited information on air quality emissions is available, the contribution of the plant on the air quality was assessed qualitatively based on the plant's latest annual reports from 2016 to 2018 and from an article published in 2019 stating odour issues in the neighborhood. Even if complaints are less frequent in recent years, many residents that live near the Humber Plant say that the smell is getting worse according to a news article published in 2019 (Pelley, 2019).

Humber Treatment Plant personnel logged nine (9) odour complaints in 2016. In seven of the cases no unusual odour was detected. In three of those cases the complaint was made about previous odours and therefore an investigation into the conditions at that time was not possible. Two of the odour complaints were linked back to cleaning of primary tanks during which scum and sludge were exposed to air. Cleaning was hastened and the odours were eliminated (Toronto Water, 2019). The number of complaints was reduced in subsequent years. This is

probably due to the odour reduction plan that has been implemented at the Humber Plant. The few complaints logged in 2017 and 2018 are presented in the Table 3-8 below.

Table 3-8: List of Odour Complaints from the Humber Wastewater Treatment Plant

Date of Complaint	Description of the Complaint	Approximate Location
August 6, 2018	Noxious gas smell coming from the Humber Plant	Sobey's Plaza
August 14, 2018	Bad smell coming from the Humber Plant	150 Park Lawn Road (Starbucks)
March 27, 2017	Excrement odour coming from the Humber Plant	Not available
July 7, 2017	Recurring foul odour detected in the evenings.	Not available
August 18, 2017	Unbearable odour detected in the past few days. The odour is particularly bad during overnight hours.	Not available
August 31, 2017	Odour complaint received in the evening.	Not available

The Humber Plant also emits air contaminants that are not necessarily related to odour issues. The amount of emissions varies with the composition of the influent. As the influent composition is variable, it is difficult to determine the exact amount of contaminants that will be emitted hourly. The contaminants presented in Table 3-9 can potentially be emitted by the Humber Plant based on typical emissions values retrieved from the NPRI database of Environment Canada and the US EPA. The air emissions associated with the Humber Plant are not considered to have a significant impact on the Project based on the low EFs for contaminants of concern.

Table 3-9: Potential Air Contaminants Emitted by the Humber Wastewater Treatment Plant

NPRI SUBSTANCE	AIR-EMISSION FACTOR	UNITS	REFERENCE
Acrolein	0.18	kg/ kg in influent	EPA FIRE (FIRE 6.23)
Acrylonitrile	0.24	kg/ kg in influent	EPA FIRE (FIRE 6.23)
Ammonia	2.28	kg/ 1000 m^3 influent	EPA FIRE (FIRE 6.23)
Aniline	1.2	kg/ kg in influent	EPA FIRE (FIRE 6.23)
Benzene	1.14	kg/ kg in influent	EPA FIRE (FIRE 6.23)
1,3- Butadiene	1.7	kg/ kg in influent	EPA FIRE (FIRE 6.23)
Carbon tetrachloride	1.42	kg/ kg in influent	EPA FIRE (FIRE 6.23)
Chlorobenzene	1.04	kg/ kg in influent	EPA FIRE (FIRE 6.23)
Chloroform	1.04	kg/ kg in influent	EPA FIRE (FIRE 6.23)
2- Chlorophenol	0.03	kg/ kg in influent	EPA, Oct. 1988
Cresol	0.012	kg/ kg in influent	EPA FIRE (FIRE 6.23)
o-Cresol (2-Cresol)		kg/ kg in influent	

NPRI SUBSTANCE	AIR-EMISSION FACTOR	UNITS	REFERENCE
Cresol	0.0018	kg/ kg in influent	EPA FIRE (FIRE 6.23)
p-Cresol(4-Cresol)		kg/ kg in influent	
Dibenzofuran	0.97	kg/ kg in influent	EPA, Oct. 1988
o- Dichlorobenzene	0.41	kg/ kg in influent	EPA, Oct. 1988
(1,2- Dichlorobenzene)		kg/ kg in influent	
p- Dichlorobenzene	0.78	kg/ kg in influent	EPA FIRE (FIRE 6.23)
(1,4- Dichlorobenzne)		kg/ kg in influent	
Dichloromethane	1.04	kg/ kg in influent	EPA FIRE (FIRE 6.23)
2,4- Dichlorophenol	0.009	kg/ kg in influent	EPA, Oct. 1988
N, N- Dimethylformamide	0.08	kg/ kg in influent	EPA FIRE (FIRE 6.23)
Ethylbenzene	1.12	kg/ kg in influent	EPA FIRE (FIRE 6.23)
Hexachlorobenzene	0.52	kg/ kg in influent	EPA FIRE (FIRE 6.23)
Naphthalene	0.32	kg/ kg in influent	EPA FIRE (FIRE 6.23)
Nitrobenzene	0.04	kg/ kg in influent	EPA FIRE (FIRE 6.23)
Phenol	0.0018	kg/ kg in influent	EPA FIRE (FIRE 6.23)
Styrene	0.5	kg/ kg in influent	EPA FIRE (FIRE 6.23)
Toluene	1.16	kg/ kg in influent	EPA FIRE (FIRE 6.23)
1,2,4- Trichlorobenzene	0.74	kg/ kg in influent	EPA FIRE (FIRE 6.23)
Trichloroethylene	1.24	kg/ kg in influent	EPA FIRE (FIRE 6.23)
Vinyl chloride	1.62	kg/ kg in influent	EPA FIRE (FIRE 6.23)
Volatile organic compounds	1.07	kg/ 1000 m^3 influent	EPA FIRE (FIRE 6.23)
Xylene	1.1	kg/ kg in influent	EPA FIRE (FIRE 6.23)

3.4 Assumptions

A few assumptions were required to complete this AQIA. The approach used to determine these assumptions were more conservative. Therefore, the air quality in the vicinity of the Project is not underestimated. Here is a brief description of the assumptions made for the completion of this assessment.

Cumulative contaminant concentration with background values

The cumulative contaminant concentration was calculated by summing the 90th percentile background concentration and the modeled concentration at each receptor. It is important to note that concentrations recorded at the monitoring stations already include traffic emissions from nearby roads. The addition of road and highway emissions in the model may lead to an overestimation of air quality concentration levels at the receptors.

Cumulative contaminant concentration for Existing vs Future case scenario

The cumulative contaminant concentration was calculated by summing the 90th percentile background concentration and the modelled concentration at each receptor. It is important to

note that the future scenario year will use the known ambient background concentration data for the Existing scenario (2020). Ambient data is unknown for the Future scenario. Due to this unknown nature, future data will be assumed to be the same as current ambient trends.

4. Air Quality Results and Compliance Assessment

The air dispersion modeling results were compiled for the Project's location. These results include road transportation, rail transportation within a one kilometer radius from the Project. Fugitive dust emissions associated with activities such as vehicle movement were not included in the compliance assessment as per Guideline A-10: Procedure for Preparing an Emissions Summary and Dispersion Modelling Report.

4.1 Fine Particulate Matter $PM_{2.5}$

Values predicted for $PM_{2.5}$ are shown in Table 4-1 for the 24-hour (daily) and annual averaging periods. The 90th percentile background levels at the MECP station were 14.1 µg/m^3 for the 24-hour and 7.9 µg/m^3 for the annual averaging period. They respectively represent 52 percent and 90 percent of their objectives.

The maximum modelled concentrations including background levels for the Existing scenario are 16 µg/m^3 and 8.6 µg/m^3 for the daily and annual averaging periods, respectively. These values represent 59 percent and 98 percent of the daily and annual averaging periods, respectively. The maximum concentration modelled is located near the Lakeshore West Rail Corridor and the Gardiner Expressway.

The maximum modelled concentrations including background levels for the Future scenario are 15 µg/m^3 and 8.3 µg/m^3 for the daily and annual averaging periods, respectively. These values represent 56 percent and 94 percent of the daily and annual averaging periods, respectively. The maximum concentrations modelled are located near the Lakeshore West Rail Corridor and the Gardiner Expressway.

Based on the cumulative results for $PM_{2.5}$, it is possible to conclude that the air quality at the site is almost 100% of the air quality objectives for $PM_{2.5}$. It is common to see high levels of $PM_{2.5}$ in urban areas with high road traffic. The air quality standards for $PM_{2.5}$ are set as objectives (CAAQS) and are not part of the Ontario Air Pollution Regulation (Reg. 419/05).

Table 4-1: $PM_{2.5}$ Maximum Concentration Results at the Project Location

Location of Maximum Concentration (UTM)		Averaging Period	Scenario	Background Concentration ($\mu g/m^3$)	Criterion ($\mu g/m^3$)	Maximum Modelled Concentration ($\mu g/m^3$)	Maximum Cumulative Concentration ($\mu g/m^3$)	% of Criterion (%)
622376	4831515	24 hours	Existing	14.1	27	1.9	16	59%
622376	4831515	24 hours	Future	14.1	27	1.0	15	56%
622376	4831515	Annual	Existing	7.9	8.8	0.71	8.6	98%
622376	4831515	Annual	Future	7.9	8.8	0.41	8.3	94%

4.2 Nitrogen Dioxide

Values predicted for NO_2 are shown in Table 4-2 for the hourly, 24-hour (daily) and annual averaging periods. The 90th percentile background levels at the MECP station were 46.3 µg/m^3 for the hourly, 38.9 µg/m^3 for the 24-hour and 25.2 µg/m^3 for the annual averaging period. They respectively represent 12 percent, 19 percent and 42 percent of their criterions based on Ontario regulations.

The maximum modelled concentrations including background levels for the Existing scenario are 191 µg/m^3, 91 µg/m^3 and 45 µg/m^3 for the hourly, daily and annual averaging periods, respectively. These values represent 48 percent, 46 percent and 74 percent of the hourly, daily and annual averaging periods, respectively. The maximum concentration modelled is located near the Lakeshore West Rail Corridor and the Gardiner Expressway.

The maximum modelled concentrations including background levels for the Future scenario are 160 µg/m^3, 69 µg/m^3 and 37 µg/m^3 for the hourly, daily and annual averaging periods, respectively. These values represent 40 percent, 35 percent and 62 percent of the hourly, daily and annual averaging periods, respectively. The maximum concentrations modelled are located near the Lakeshore West Rail Corridor and the Gardiner Expressway.

Based on the cumulative results for NO_2 it is possible to conclude that the air quality at the Project's location is not more than 74 percent of the Ontario's air quality objectives for NO_2. It is common to see high levels of NO_2 in urban areas with dense road traffic. It is important to mention that maximum hourly concentrations do not represent concentration levels to which receptors would be exposed over an extended period.

It is also important to mention that based on CAAQS objectives for 2025, the annual objective of 23 µg/m^3 is already exceeded by the existing background concentrations. Consequently, it is difficult to comply with federal objectives for air quality in urban areas and this exceedance should not be considered in the compatibility assessment for the Project.

Table 4-2: NO_2 Maximum Concentration Results at the Project Location

Location of Maximum Concentration (UTM)		Averaging Period	Scenario	Background Concentration ($\mu g/m^3$)	Criterion ($\mu g/m^3$)	Maximum Modelled Concentration ($\mu g/m^3$)	Maximum Cumulative Concentration ($\mu g/m^3$)	% of Criterion (%)
622376	4831515	1 hour	Existing	46.3	400	144	191	48%
622376	4831515	1 hour	Future	46.3	400	114	160	40%
622376	4831515	24 hours	Existing	38.9	200	52	91	46%
622376	4831515	24 hours	Future	38.9	200	30	69	35%
622376	4831515	Annual	Existing	25.2	60	19	45	74%
622376	4831515	Annual	Future	25.2	60	12	37	62%

4.3 Carbon Monoxide

Values predicted for CO are shown in Table 4-3 for the hourly and eight hour averaging periods. The 90th percentile background levels at the MECP station were 412 µg/m^3 for the hourly and 400 µg/m^3 for the eight hour averaging period. They respectively represent 1 percent and 3 percent of their criterions.

The maximum modelled concentrations including background levels for the Existing scenario are 493 µg/m^3 and 437 µg/m^3 for the hourly and eight hour averaging periods, respectively. These values represent 1 percent and 3 percent for the hourly and eight hours averaging periods, respectively.

The maximum modelled concentrations including background levels for the Future scenario are 491 µg/m^3 and 438 µg/m^3 for the hourly and eight hour averaging periods, respectively. These values represent 1 percent and 3 percent for the hourly and eight hour averaging periods, respectively.

All maximum concentrations modelled are located near the Lakeshore West Rail Corridor and the Gardiner Expressway. Based on the cumulative results for CO, it is possible to conclude that the air quality at the Project's location is not a concern.

Table 4-3: CO Maximum Concentration Results at the Project Location

Location of Maximum Concentration (UTM)		Averaging Period	Scenario	Background Concentration (µg/m^3)	Criterion (µg/m^3)	Maximum Modelled Concentration (µg/m^3)	Maximum Cumulative Concentration (µg/m^3)	% of Criterion (%)
622376	4831515	1 hour	Existing	412	36,200	81	493	1%
622376	4831515	1 hour	Future	412	36,200	79	491	1%
622376	4831515	8 hours	Existing	400	15,700	37	437	3%
622376	4831515	8 hours	Future	400	15,700	38	438	3%

4.4 Volatile Organic Compounds (VOCs)

Air emissions from transportation sources such as vehicles, trucks and locomotives include the emission of VOCs. The main VOCs that were considered in this study are:

- Acetaldehyde (Table 4-4);
- Acrolein (Table 4-5);
- Benzene (Table 4-6);
- 1,3-Butadiene (Table 4-7); and
- Formaldehyde (Table 4-8).

Based on the cumulative modelling results, most of the contaminant concentrations from surrounding emission sources are negligible compared to the existing background concentrations. As seen in the result tables presented below, most cumulative concentrations are equal or similar to the background values. Results for Acetaldehyde, 1,3-Butadiene and Formaldehyde show that the cumulative concentrations are low compared to the criterions (less than 7 percent).

For other VOCs, Acrolein annual cumulative concentration results contribute to 43 percent of the criteria. Only annual concentration results for Benzene are exceeding the criteria. The exceedances are not caused by local sources around the Project, as background concentrations are already exceeding the annual criteria and very low concentrations are added by surrounding sources.

Consequently, it is concluded that the location of the Project is not incompatible with air quality as all the air quality monitoring stations in the GTA are recording high concentration levels for Benzene. High levels are mainly caused by the addition of multiple anthropogenic sources in urban areas.

Table 4-4: Acetaldehyde Maximum Concentration Results at the Project Location

Location of Maximum Concentration (UTM)		Averaging Period	Scenario	Background Concentration (µg/m³)	Criterion (µg/m³)	Maximum Modelled Concentration (µg/m³)	Maximum Cumulative Concentration (µg/m³)	% of Criterion (%)
622376	4831515	30 minutes	Existing	-	500	0.25	0.25	0.05%
622376	4831515	30 minutes	Future	-	500	0.06	0.06	0.01%
622376	4831515	24 hours	Existing	1.6	500	0.07	1.7	0.33%
622376	4831515	24 hours	Future	1.6	500	0.05	1.6	0.33%

Table 4-5: Acrolein Maximum Concentration Results at the Project Location

Location of Maximum Concentration (UTM)		Averaging Period	Scenario	Background Concentration (µg/m³)	Criterion (µg/m³)	Maximum Modelled Concentration (µg/m³)	Maximum Cumulative Concentration (µg/m³)	% of Criterion (%)
622376	4831515	1 hour	Existing	-	5	0.05	0.05	1%
622376	4831515	1 hour	Future	-	5	0.04	0.04	1%
622376	4831515	24 hours	Existing	0.24	0.4	0.02	0.26	64%
622376	4831515	24 hours	Future	0.24	0.4	0.01	0.25	63%

Table 4-6: Benzene Maximum Concentration Results at the Project Location

Location of Maximum Concentration (UTM)		Averaging Period	Scenario	Background Concentration (µg/m³)	Criterion (µg/m³)	Maximum Modelled Concentration (µg/m³)	Maximum Cumulative Concentration (µg/m³)	% of Criterion (%)
622376	4831515	24 hours	Existing	0.95	2.3	0.05	1.0	43%
622376	4831515	24 hours	Future	0.95	2.3	0.03	0.98	43%
622376	4831515	Annual	Existing	0.64	0.45	0.02	0.66	146%
622376	4831515	Annual	Future	0.64	0.45	0.01	0.65	145%

Table 4-7: 1,3-Butadiene Maximum Concentration Results at the Project Location

Location of Maximum Concentration (UTM)		Averaging Period	Scenario	Background Concentration (µg/m³)	Criterion (µg/m³)	Maximum Modelled Concentration (µg/m³)	Maximum Cumulative Concentration (µg/m³)	% of Criterion (%)
622376	4831515	24 hours	Existing	0.1	10	1.6E-04	0.1	1%
622376	4831515	24 hours	Future	0.1	10	1.0E-04	0.1	1%
622376	4831515	Annual	Existing	0.06	2	6.0E-05	0.06	3%
622376	4831515	Annual	Future	0.06	2	4.0E-05	0.06	3%

Table 4-8: Formaldehyde Maximum Concentration Results at the Project Location

Location of Maximum Concentration (UTM)		Averaging Period	Scenario	Background Concentration (µg/m³)	Criterion (µg/m³)	Maximum Modelled Concentration (µg/m³)	Maximum Cumulative Concentration (µg/m³)	% of Criterion (%)
622376	4831515	24 hours	Existing	4.2	65	0.24	4.4	7%
622376	4831515	24 hours	Future	4.2	65	0.15	4.4	7%

4.5 Polycyclic Aromatic Hydrocarbons (PAHs)

For PAHs, only Benzo(a)Pyrene (B(a)P) was modeled as it is the main PAH released by transportation sources. Concentration results modelled are all below 1E-10 µg/m^3 and are too low to be extracted from the model. Based on the cumulative modeling results, daily and annual concentration levels are exceeding the criterions. The exceedances are not caused by local sources around the Project , as the background concentrations are already exceeding the daily and annual criterions by 240 percent and 770 percent, respectively.

Consequently, it is concluded that the location of the Project is not incompatible with air quality as all the air quality monitoring stations in the (GTA are recording high concentration levels for B(a)P. High levels are mainly caused by the addition of multiple anthropogenic sources in urban areas.

5. Conclusion

The AQIA considered existing air quality background and modelled concentrations at the site to determine if the proposed land use is compatible for a residential area. The AQIA considered the existing air quality background with the addition of air emission sources for a one kilometer radius around the site. Emissions from vehicles and trucks on nearby roads and highways, as well as emissions from the Lakeshore West Rail Corridor were included in the model. The air dispersion modelling was completed for the Existing scenario (2020) and the Future Conditions scenario (2030). A qualitative AQIA for odour was also completed.

Based on the cumulative results, air quality thresholds are exceeded for annual concentration levels for Benzene and daily and annual concentration levels for B(a)P. The background concentration levels that consider the 90th percentile of the concentration values for the averaging period are already exceeding the air quality thresholds. Those exceedances are recorded at multiple air quality monitoring stations in the GTA. Therefore, the air quality conditions are not specific to the site and should not be considered as a risk for the redevelopment including residential land uses in an urban area.

Based on documentation reviewed for the Humber Wastewater Treatment Plant, an odour reduction plan was implemented in 2017 and 2018 to minimize odour nuisance in the area. Fewer complaints were logged in 2018 after the plan was put in place, but it is still possible that odour nuisance occurs during maintenance or uncommon events. The frequency of such events are estimated to be less than 1 percent of the time based on the number of complaints logged in the past three years to the Humber Plant operators.

Finally, based on cumulative air quality concentration results at the site, it is possible to conclude that there is no risk related to air quality for new developments. The air contaminants concentration levels in the Project's area are similar to what is recorded in the GTA and no industrial sources are preventing this area from having acceptable air quality conditions.

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