

Appendix F

Air Quality Assessment Report

Air Quality Assessment

Runway End Safety Area, Billy Bishop Toronto City Airport

PortsToronto

60733457

October 2025

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Air Quality Assessment

Runway End Safety Area, Billy Bishop Toronto City Airport

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1	May 2025	AECOM	Draft Air Quality Assessment
2	October 2025	AECOM	Final Air Quality Assessment

Distribution List

# Hard Copies	PDF Required	Association / Company Name
	✓	PortsToronto
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Land Acknowledgement

We acknowledge that Billy Bishop Toronto City Airport is located on the traditional territory of many nations including the Mississaugas of the Credit, the Anishinaabe, the Chippewa, the Haudenosaunee, and the Wendat peoples, and is now home to many diverse First Nations, Inuit, and Métis peoples. PortsToronto also recognizes that Toronto is covered by Treaty 13 signed with the Mississaugas of the Credit, and the Williams Treaties signed with multiple Mississaugas and Chippewa bands.

Executive Summary

AECOM Canada ULC, herein after referred to as “AECOM”, has been retained by Avia NG to complete an Environmental Assessment for the implementation of Runway End Safety Areas (RESAs) for Runway 08/26 at Billy Bishop Toronto City Airport (the Project). The Billy Bishop Toronto City Airport is owned and operated by PortsToronto (the Project proponent) and is located in the City of Toronto on the Toronto Islands.

The purpose of the Project is to comply with the Canadian Aviation Regulations Part III, Subpart 2, Division VI – Runway End Safety Area (RESA), published in January 2022, which mandate RESAs for airports serving over 325,000 commercial passengers annually. RESAs are designated open spaces at both ends of runways, designed to minimize damage if an aircraft overruns or undershoots the runway. At Billy Bishop Toronto City Airport, the RESA requirements apply only to the primary runway, Runway 08/26, which enables commercial aircraft use.

Although there are no regulatory requirements under the federal or the provincial acts that mandate the Environmental Assessment process for the Project, a Section 82 evaluation under the Impact Assessment Act is required for all Project components that fall on Transport Canada-owned land. A Section 82 evaluation is a requirement under the Impact Assessment Act for projects located on federal lands or being carried out by federal authorities. In the City of Toronto’s Official Plan (2024), policies exist that require projects where lakefilling in Lake Ontario is proposed to undertake an Environmental Assessment. As such, PortsToronto has undertaken a non-statutory Environmental Assessment process for the RESA project at Billy Bishop Toronto City Airport.

As part of the Environmental Assessment, PortsToronto has identified and evaluated alternatives for implementing RESAs at Billy Bishop Toronto City Airport. The Environmental Assessment also considers the opportunities to enhance airport operational safety. This includes minimizing regular non-airport and airport vehicular crossings on Runway 08/26, currently necessary for both airport operations and Toronto Islands access requiring co-ordination with the airport traffic control tower. This effort supports Transportation Safety Board of Canada’s objective to reduce the risk of runway incursions at airports. Additionally, the Environmental Assessment examined measures to reduce emissions and ground-based noise levels along the lakefront.

The Project Study Area encompasses all Billy Bishop Toronto City Airport lands involved in the RESA implementation, including the Marine Exclusion Zone. The Marine Exclusion zone is a buoy-marked area of the lake where vessel entry is prohibited without PortsToronto’s authorization. From Billy Bishop Toronto City Airport, the Air Quality Study Area extends 500 metres to capture air quality impacts and effects from construction activities within the surrounding area. The 500 metre buffer is

recommended through the Ontario Ministry of Transportation's Environmental Guide for Assessing and Mitigating the Air Quality Impacts and Greenhouse Gas Emissions of Provincial Transportation Projects (2020) ("Ministry of Transportation Air Quality Guideline"). Within this Air Quality Study Area, a total of 14 sensitive receptors and three critical receptors were identified.

An air quality impact assessment was conducted for the Construction phase, along with a quantitative greenhouse gas assessment for the Operational phase of the Project. For the Construction phase, the assessment evaluated emissions from on-site construction vehicles and equipment, marine vessels operating within the Marine exclusion zone, on-site material handling activities, and road dust emissions. There are slight differences in construction equipment between the RESA 1, and the RESA 2, RESA 3 alternatives; however, the overall emissions based on a worst case 24 hour averaging period are not expected to differ significantly. A comparison of the expected equipment for construction confirmed that RESA 1 would require slightly fewer construction vehicles for the onshore area, resulting in lower emissions than the construction emissions generated for RESA 2, RESA 3. Thus, the RESA 2, RESA 3 equipment data was used for dispersion modelling to model the worst-case scenario and assess the most conservative air quality impacts for all RESA alternatives. The following contaminants of concern are considered criteria air contaminants, which have the corresponding Ontario Ambient Air Quality Criteria and Federal Canadian Ambient Air Quality Standards. The greenhouse gas assessment did not include embodied carbon, because detailed information on material quantities, sourcing, and manufacturing processes is not available at this stage of the Project:

- Nitrogen dioxide (assessed over 1-hour, 24-hour, and annual averaging periods).
- Carbon monoxide (assessed over 1-hour and 8-hour averaging periods).
- Sulphur Dioxide (assessed over 10-minute, 1-hour, and annual averaging periods).
- Suspended particulate matter (assessed over 24-hour and annual averaging period).
- Particulate matter (<10 microns), (assessed over 24-hour period).
- Particulate matter (<2.5 microns), (assessed over 24-hour and annual averaging periods).

Based on data provided by Avia NG, the year 2023 was used to represent the Current Conditions and the year 2027 was used to represent Future Conditions.

For the Operational phase, there will be no changes with respect to the operation of the aircraft, number of flights or change in the aircraft type with the implementation of the Project. Thus, the operational assessment did not assess the aircraft operations and solely focused on the proposed modifications of RESA 1, 2 and 3 alternatives, which

would impact greenhouse gas emissions. The greenhouse gas emissions are comprised of carbon dioxide, methane and nitrous oxide. The greenhouse gas emissions were compared between the Current Conditions on-road vehicle and taxiway operations and the proposed improvements for Future operations for RESA 1, RESA 2 and RESA 3.

The operational assessment approach for each RESA alternative is detailed below:

- **RESA 1 (Minimum Landmass Expansion):** This alternative involves the smallest landmass expansion with a restricted airside perimeter road, which will still require queuing of on-road vehicle operations to access the restricted airside perimeter road for crossings.
- **RESA 2 (Taxiway Improvements):** RESA 2 enhancements include taxiway improvements offering potential long-term benefits, including reductions in taxiing times and associated aircraft emissions. Due to its close alignment with RESA 3 in terms of aircraft taxiway operations, its reduction in greenhouse gas emissions are the same as RESA 3. Similarly to RESA 1, RESA 2 will still require some queuing of on-road vehicle operations.
- **RESA 3 (Noise Wall and East Utility Conduit):** This alternative introduces the most substantial modifications to airfield infrastructure and on-road vehicle operations. RESA 3 enhancements include taxiway improvements offering potential long-term benefits, including reductions in taxiing times and associated aircraft emissions. RESA 3 will also provide on-road vehicle operations unrestricted access the airside perimeter road for crossings.

The results of the Construction phase of all three alternatives, RESA 1, RESA 2, and RESA 3, predict that there will be some air quality impacts within the Air Quality Study Area.

Based on the maximum concentrations for the assessed pollutants, a sensitive receptor along Queens Quay W (sensitive receptor 14) and a sensitive receptor at the marina on Stadium Road (sensitive receptor 1) are expected to experience the highest impact amongst all receptors.

One criteria air contaminant, nitrogen dioxide, shows modelled cumulative concentrations above the respective Federal air quality criteria for the 1-hour and annual averaging period at a total of three sensitive receptors (sensitive receptor 1, sensitive receptor 13, and sensitive receptor 14) and two critical receptors (CR2 and CR3). The maximum cumulative concentration results for nitrogen dioxide are presented below, at the most impacted receptors:

- For the 1-hour averaging period, the maximum modelled nitrogen dioxide concentration is 322% of the Canadian Ambient Air Quality Standards (2025) limit at sensitive receptor 14 (Multi-Unit Dwelling, Queens Quay West).

- For the annual averaging period, the maximum modelled nitrogen dioxide concentration is 152% of the Canadian Ambient Air Quality Standards (2025) limit at sensitive receptor 1 (Marina, 1 Stadium Road).

The exceedance of nitrogen dioxide for the annual averaging period is primarily due to elevated existing ambient air quality concentration, which exceeds the Federal air quality criteria prior to including the construction contributions.

For all other criteria air contaminants, cumulative concentrations remain below applicable standards, suggesting that construction emissions from the Project alone are unlikely to significantly impact overall air quality within the Air Quality Study Area.

During the Operational phase, greenhouse gas emissions are projected to decrease due to the aircraft taxiway improvements introduced under the RESA 2 and RESA 3 alternatives. Annual greenhouse gas emissions are projected to decrease from 693 tonnes (2023) to 508 tonnes (2027) under both RESA 2 and RESA 3, due to improved taxiway efficiency and reduced fuel consumption.

However, the change in on-road vehicle operations for all RESA alternatives are projected to increase the annual carbon dioxide₂ equivalent emissions from 592 tonnes in 2023 (Current Conditions) to:

- 967 tonnes in 2027 (Future Conditions) for RESA 1, primarily due to the increase in distance traveled from the rerouting of vehicles to a restricted airside perimeter road. Although runway crossings are removed, delays from the control tower remain, resulting in no change to idling times.
- 974 tonnes in 2027 (Future Conditions) for RESA 2, also due to the increase in distance traveled from the rerouting of vehicles to a restricted airside perimeter road. As with RESA 1, delays from the control tower remain, resulting in no change to idling times.
- 891 tonnes in 2027 (Future Conditions) for RESA 3, due to the increase in distance traveled from the rerouting of vehicles to an unrestricted air side perimeter road. However, unlike RESA 1 and RESA 2, this alternative eliminates the need for vehicles to stop at runway crossings, thereby avoiding idling times and partially offsetting the increased emissions associated with longer travel times.

While traffic flow is improved from an operational standpoint, the longer travel distances have a greater effect on greenhouse gas emissions. As a result, on-road vehicle emissions are higher compared to Current Conditions across all alternatives.

Table of Contents

1.	Introduction	1
1.1	Study Area	2
1.2	Runway End Safety Area at Billy Bishop Toronto City Airport	2
1.2.1	RESA 1 – Minimum Landmass	2
1.2.2	RESA 2 – Taxiway Improvements	3
1.2.3	RESA 3 – Noise Wall and East Utility Conduit	3
1.3	Air Quality Assessment Overview	3
2.	Methodology	7
2.1	Representative Receptors	8
2.2	Assessment of Contaminants	10
2.3	Relevant Air Quality Guidelines	10
2.4	Emission Inventory Assessment Methodology, Construction Phase	12
2.4.1	Construction Emission Sources	12
2.4.2	Construction Equipment and Vehicle Exhaust	12
2.4.3	Dispersion Modelling Assessment Methodology	13
2.5	Emission Inventory Assessment Methodology, Operational Phase	14
3.	Existing Ambient Air Quality	17
4.	Greenhouse Gas Emission Inventory	22
4.1	Annual Greenhouse Gas Inventory – Operational Phase	22
4.1.1	RESA 1	22
4.1.2	RESA 2	23
4.1.3	RESA 3	24
4.2	Operational Phase greenhouse gas Compared to Ontario Transportation Sector Emissions	25
5.	Dispersion Modelling	28
5.1	Modelling Inputs	28
5.1.1	Meteorology	28
5.1.2	Terrain	28
5.1.3	Identified Receptors	28
5.2	Nitrogen dioxide Assessment using Ozone Limiting Method	29
6.	Results	31
6.1	Predicted Cumulative Concentrations: Construction Phase	31
6.1.1	Cumulative Frequency Analysis	31
6.1.2	1- Hour Average nitrogen dioxide Impacts for the Construction Phase	34
6.2	Construction Air Quality Impacts	35
6.3	Summary of Potential Effects and Proposed Mitigation Measures	35

6.3.1	Summary of Potential Effects – Construction	35
6.3.2	Fugitive Dust – Proposed Mitigation Measures	36
6.3.3	Proposed Mitigation for Construction Activity	37
6.3.4	Summary of Potential Effects – Operation	38

7. Conclusion 42

8. References 44

Figures

Figure 1-1:	Study Area Map	5
Figure 1-2:	Air Quality Study Area	6
Figure 3-1:	Location of National Air Pollution Surveillance Monitoring Stations in Proximity to RESA	21
Figure 4-1:	Trends in Greenhouse Gas Ontario Transportation Sector Emissions (2000-2021), National Resources Canada	26
Figure 6-1:	Cumulative Frequency Analysis Sensitive Receptor 14 1-hour Nitrogen Dioxide	34

Tables

Table 2-1:	Identified Critical and Sensitive Receptors within Air Quality Study Area	9
Table 2-2:	Air Quality Criteria and Standards	11
Table 2-3:	Motor Vehicle Emission Simulator Source IDs	15
Table 2-4:	Motor Vehicle Emission Simulator 4.0 Input Data	16
Table 3-1:	Air Quality National Air Pollution Surveillance Monitoring Stations' Information	17
Table 3-2:	Background Ambient Air Quality Concentrations (2018-2022)	19
Table 3-3:	98 th Percentile Background Ambient Air Quality Concentration (2018-2022)	19
Table 3-4:	99 th Percentile Background Ambient Air Quality Concentration (2018-2022)	19
Table 3-5:	Comparison of Background Ambient Air Quality Data to Relevant Ambient Air Criteria/Standard	20
Table 4-1:	Greenhouse Gas 100-year Global Warming Potentials	22
Table 4-2:	Annual Greenhouse Gas Emissions from On-road Vehicles for RESA 1 – Current Conditions (2023) and Future Conditions (2027)	23
Table 4-3:	Annual Greenhouse Gas Taxiway Emissions for RESA 2 - Current Conditions (2023) and Future Conditions (2027)	24
Table 4-4:	Annual Greenhouse Gas Emissions from On-road Vehicles for RESA 2- Current Conditions (2023) and Future Conditions (2027)	24

Table 4-5:	Annual Greenhouse Gas Taxiway Emissions for RESA 3 - Current Conditions (2023) and Future Conditions (2027)	25
Table 4-6:	Annual Greenhouse Gas Emissions from On-road Vehicles for RESA 3 – Current Conditions (2023) and Future Conditions (2027)	25
Table 4-7:	Greenhouse Gas Project Contribution Regional Assessment for RESA 1	26
Table 4-8:	Greenhouse Gas Project Contribution Regional Assessment for RESA 2	27
Table 4-9:	Greenhouse gas Project Contribution Regional Assessment for RESA 3	27
Table 5-1:	Local Ambient Ozone Levels (90 th Percentile Concentrations, micrograms per cubic metre)	30
Table 6-1:	Summary of Maximum Cumulative Concentrations	32
Table 6-2:	Maximum Cumulative Concentration for Sensitive Receptor 14 (0.49 km Distance from Study Area)	33
Table 6-3:	Maximum Cumulative Concentration for Sensitive Receptor 1 (0.18 km Distance from Study Area)	33
Table 6-4:	Nitrogen Dioxide Calculation Using Ozone Limiting Method: Maximum Concentration	35
Table 6-5:	Net Effects Analysis of RESA 1, RESA 2 and RESA 3 for Air Quality – Construction	40
Table 6-6:	Net Effects Analysis of RESA 1, RESA 2 and RESA 3 for Air Quality – Operation	41

Appendices

Appendix A.	Figures
Appendix B.	Motor Vehicle Emission Simulator 4.0 Output Summary
Appendix C.	Ambient Air Monitoring Data
Appendix D.	Construction Phase Inputs & Emission Inventory
Appendix E.	Operational Phase Inputs & Emission Inventory
Appendix F.	Ozone limiting method Calculations at Sensitive and Critical Receptors
Appendix G.	Maximum Concentrations at Sensitive and Critical Receptors
Appendix H.	Isopleth Figures – Construction Phase

Acronyms and Abbreviations

RESA Runway End Safety Area

1. Introduction

AECOM Canada ULC, herein after referred to as “AECOM”, has been retained by Avia NG to complete an Environmental Assessment for the implementation of Runway End Safety Area (RESA) for Runway 08/26 at Billy Bishop Toronto City Airport (the Project). The Billy Bishop Toronto City Airport is owned and operated by PortsToronto (the Project proponent) and is located in the City of Toronto on the Toronto Islands.

The purpose of the Project is to comply with the Canadian Aviation Regulations Part III, Subpart 2, Division VI – Runway End Safety Area (RESA), published in January 2022, which mandate RESAs for airports serving over 325,000 commercial passengers annually.

RESAs are designated open spaces at both ends of runways, designed to minimize damage if an aircraft overruns or undershoots the runway. At Billy Bishop Toronto City Airport, the RESA requirements apply only to the primary runway, Runway 08/26, which enables commercial aircraft use.

Although there are no regulatory requirements under the federal or the provincial acts that mandate the Environmental Assessment process for the Project, a Section 82 evaluation under the Impact Assessment Act is required for all Project components that fall on Transport Canada-owned land. A Section 82 evaluation is a requirement under the Impact Assessment Act for projects located on federal lands or being carried out by federal authorities. In the City of Toronto’s Official Plan (2024), policies exist that require projects where lakefilling in Lake Ontario is proposed to undertake an Environmental Assessment. As such, PortsToronto has undertaken a non-statutory Environmental Assessment process for the RESA project at Billy Bishop Toronto City Airport.

As part of the Environmental Assessment, PortsToronto has identified and evaluated various alternatives for implementing a RESA at Billy Bishop Toronto City Airport. The Environmental Assessment considers the opportunities to enhance airport operational safety. This includes minimizing regular non-airport and airport vehicular crossings on Runway 08/26, currently necessary for both airport operations and Toronto Islands access requiring co-ordination with the airport traffic control tower. This effort supports Transportation Safety Board of Canada’s objective to reduce the risk of runway incursions at airports. Additionally, the Environmental Assessment examined measures to reduce emissions and ground-based noise levels along the lakefront.

This assessment builds on prior studies, including the RWDI Air Quality Assessment (AECOM, 2017), and the University of Toronto’s studies (2024).

1.1 Study Area

The Project Study Area encompasses all Billy Bishop Toronto City Airport lands involved in the RESA implementation, including the Marine Exclusion Zone. The Marine Exclusion Zone is a buoy-marked area of the lake where vessel entry is prohibited without PortsToronto's authorization. The Project Study Area is illustrated in **Figure 1-1**.

The Air Quality Assessment component includes a 500 m buffer from the Project Study Area to capture air quality impacts. This Air Quality Study Area is illustrated in **Figure 1-2**. The 500 m buffer is recommended through the Ministry of Transportation's Environmental Guide for Assessing and Mitigating the Air Quality Impacts and Greenhouse Gas Emissions of Provincial Transportation Projects (2020) ("Ministry of Transportation Air Quality Guideline"). Within this Air Quality Study Area, a total of 14 sensitive receptors and three critical receptors were identified.

1.2 Runway End Safety Area at Billy Bishop Toronto City Airport

The Project involves the implementation of RESAs at Billy Bishop Toronto City Airport, which requires expanding the landmass at both the east and west ends of Runway 08/26. To meet the requirements for RESA implementation, three alternatives were developed, each progressively building on the previous one with increased landmass expansion and additional features. The following outlines the three RESA alternatives.

1.2.1 RESA 1 – Minimum Landmass

RESA 1 proposes the minimum landmass expansion to meet RESA requirements, extending 54 m from the seawall on the west end (7,850 m²), and 52 m on the east end (6,100 m²). On the west end, the breakwater structure will be raised to 81 m above sea level, about 4.5 m above the threshold at Runway 08/26, to prevent wave overtopping and water spray. The breakwater at the east end (Inner Harbour) will be raised to 77 m above sea levels, about 1 to 1.5 m above the threshold, since there is no need to control any waves or water spray.

The proposed layout includes perimeter airfield roads around the RESA ends, providing restricted access across the runway, similar to current access conditions. The road will be managed by the control tower to avoid conflicts with aircraft landing or taking off, as this landmass configuration does not provide sufficient airspace clearance for unrestricted vehicle passage (does not meet Obstacle Limitation Surface (OLS) requirements. An OLS is an imaginary surface or series of surfaces that define the limits

to which objects may project into airspace, to protect the airspace for the safe operation of aircraft during takeoff, landing and emergency operations.

1.2.2 RESA 2 – Taxiway Improvements

This alternative builds on RESA 1 – Minimum Landmass by incorporating additional airfield improvements in conjunction with the RESA work at both runway ends. Specifically, it proposes upgrades to Taxiway B at the west end and Taxiway D at the east end to enhance operational efficiency and safety at the airport.

For Taxiway B, the relocation of the Localizer 26 antenna to the new western RESA increases the landmass expansion to the west, reaching 82 m² from the seawall (11,800 m²). The relocation of Taxiway D requires additional landmass to the northeast, bringing the total landmass on the east end to 11,300 m². This relocation enables the airport to upgrade its visual approach guidance system for aircraft landing on Runway 26, which is intended to improve aviation safety with a more precise system. All other features from RESA 1- Minimum Landmass remain the same in this alternative.

1.2.3 RESA 3 – Noise Wall and East Utility Conduit

This alternative builds on RESA 2 – Taxiway Improvements by incorporating additional elements. The key new features of RESA 3 include: 1) unrestricted airfield perimeter roads connecting the north and south sides of the airport, 2) a noise wall at the east end along with an extension of the existing noise wall at the west end, and 3) a reserved utility conduit for future hydro, water, and telecommunication services to the Toronto Islands community.

To accommodate these new components and ensure aeronautical airspace clearances over the new roads, security fences, and noise walls, a landmass expansion is required; 73 m from the seawall (29,980 m²) on the east end and 82 m from the seawall (12,600 m²) on the west end. All other features from RESA 2 are included in this alternative.

1.3 Air Quality Assessment Overview

For the Construction Phase, based on the expected activities and equipment that would be present during the construction, the Air Quality Assessment included the following contaminants of concern:

- Carbon monoxide.
- Nitrogen dioxide.
- Sulphur dioxide.
- Suspended Particulate Matter.

- Particulate matter with diameter less than 10 micron.
- Particulate matter with diameter less than 2.5 micron.

For the Operational phase, there will be no changes with respect to the operation of the aircraft, number of flights or change in the aircraft type with the implementation of the Project. Thus, the assessment did not assess the aircraft operations and solely focused on the proposed modifications of the RESA 1, 2, and 3 alternatives, which may impact greenhouse gas emissions. Greenhouse gases are represented by carbon dioxide equivalent which includes carbon dioxide, methane and nitrous oxide.

The quantitative assessment of air quality impacts during the Construction phase included the following tasks:

- Estimation of emissions of identified contaminants of concern from the identified air emission sources within the Air Quality Study Area.
- Air dispersion modelling of estimated emissions to predict the point of impingement concentrations for each contaminant of concern.
- Identify contaminants of concern that exceed their Ontario Ambient Air Quality Criteria and/or the Federal Canadian Ambient Air Quality Standards.
- Identify the point of impingement concentrations at the identified sensitive and critical receptors for each contaminant of concern.

The quantitative assessment of air quality impacts during the Operational phase included the following tasks:

- Estimation of emissions of greenhouse gas, for the current operations and the proposed modifications, specifically the taxiway improvement and air side perimeter road within the Air Quality Study Area.
- Regional impact assessment for greenhouse gas to determine the Project's impacts in relation to Provincial targets and existing contributions from the Transportation Sector.

Figure 1-1: Study Area Map

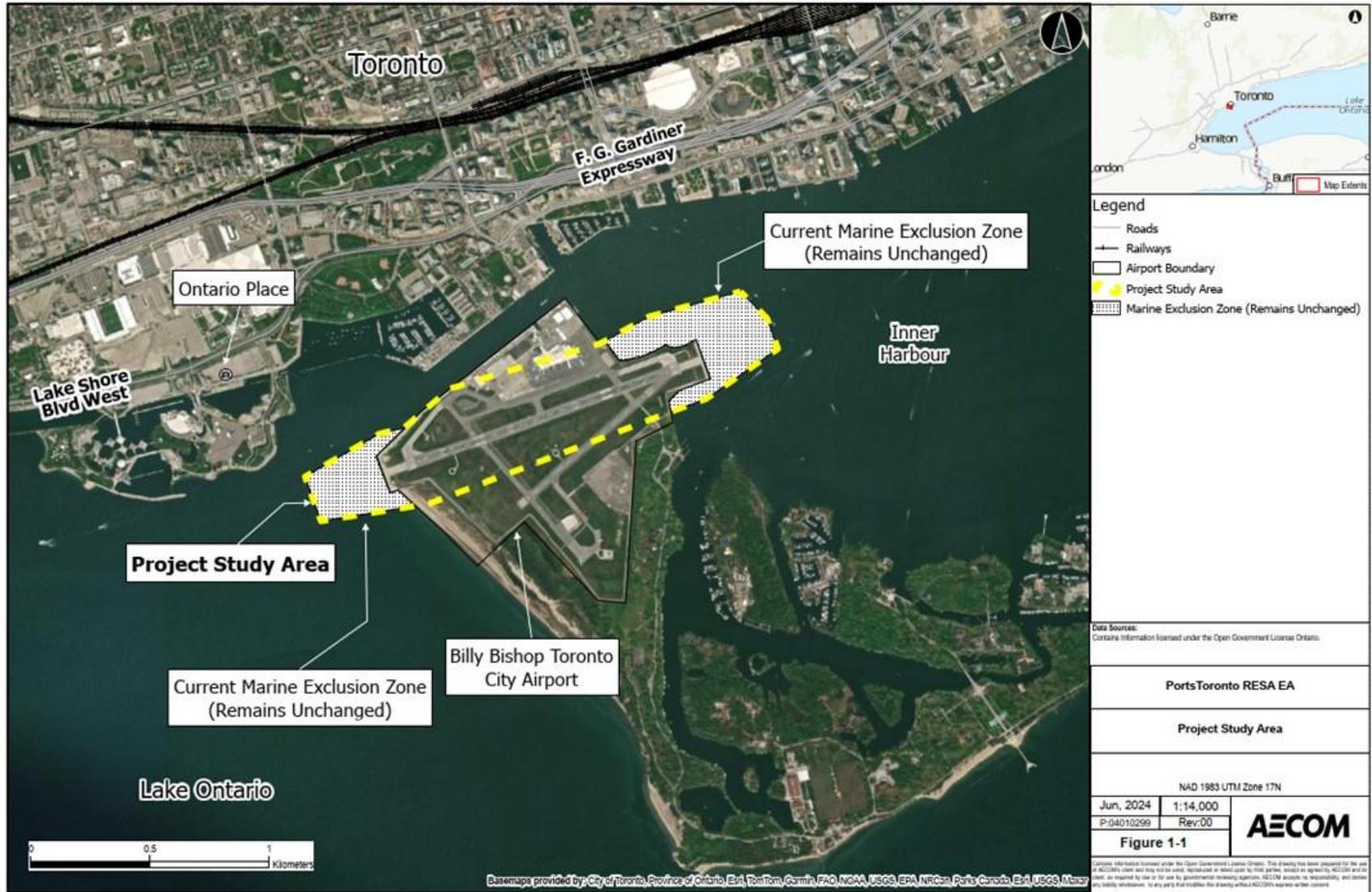
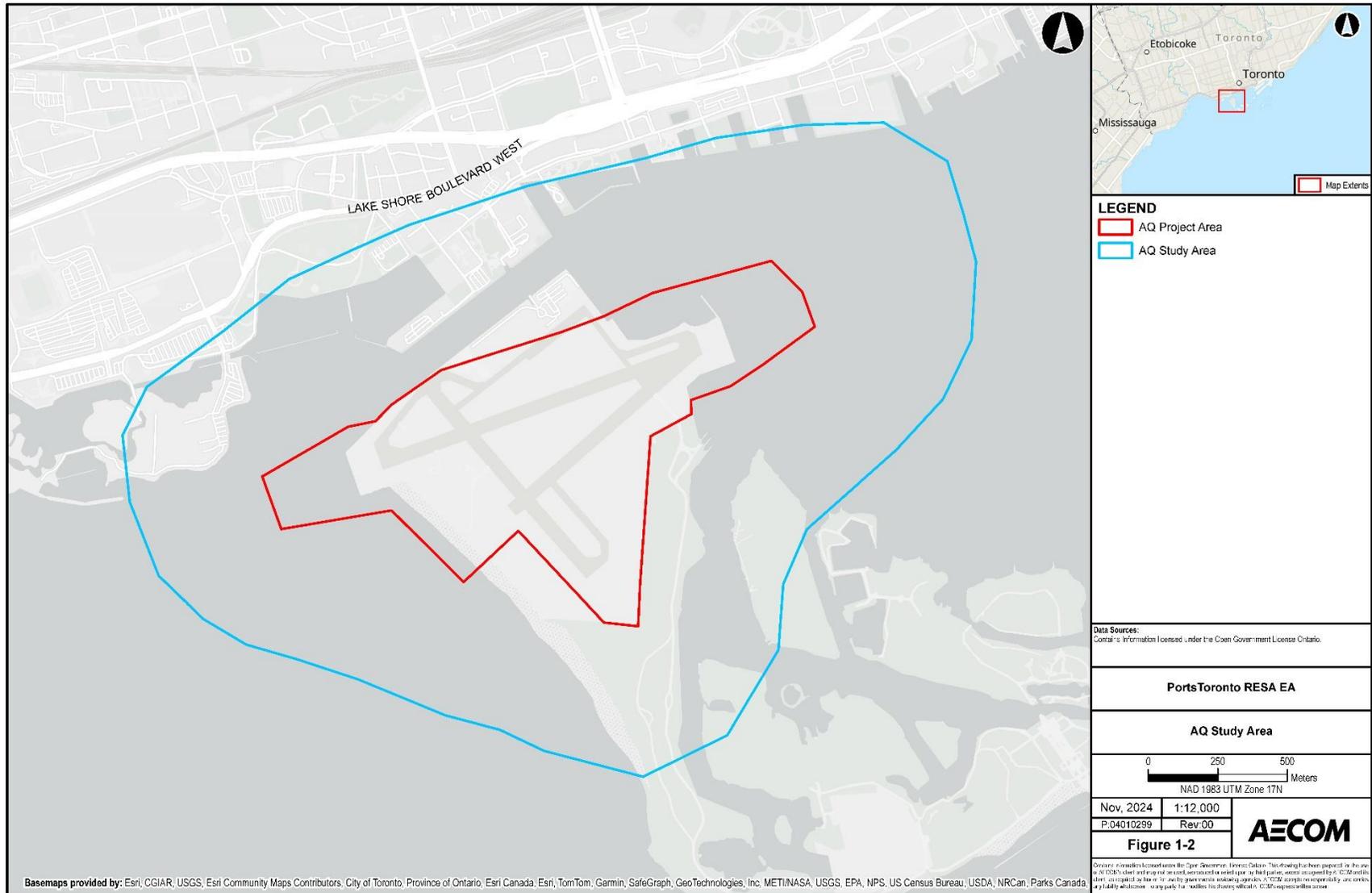


Figure 1-2: Air Quality Study Area



2. Methodology

The overall objective of the Air Quality Assessment was to determine the impacts of the Project on local air quality and generation of greenhouse gas for the Construction and Operation phases.

For the Construction phase, the impacts were assessed by preparing an emission inventory for the construction activities and equipment, and the use of an advanced air dispersion model. Through this analysis, air quality impacts were predicted at the identified sensitive and critical receptors present within the Air Quality Study Area. The modelling was based on construction equipment and activity data for RESA 2 and RESA 3, which represents the most intensive construction scenario. A comparison of the expected equipment for construction confirmed that RESA 1 would require slightly fewer construction vehicles for the onshore area, resulting in lower emissions than the construction emissions generated for RESA 2 and RESA 3. Thus, the RESA 2 and RESA 3 equipment data was used for dispersion modelling to model the worst-case scenario and assess the most conservative air quality impacts for all RESA alternatives.

For the Operational phase of the three alternatives, an emission inventory was prepared for the on-road vehicles. For RESA 2 and RESA 3 alternatives, aircraft taxiway operations within the Billy Bishop Toronto City Airport were also assessed. These were compared between Current and Future Conditions to determine the change in greenhouse gas emissions from each modification. This assessment did not account for the potential of increased vehicle demand and crossing activity through the area from improved access. It is also important to note that the on-road vehicle emission inventory was based primarily on changes in road length and idling time. While this approach captures the physical extension of the roadway and the presence or absence of vehicle delays (e.g., at controlled crossings), it does not fully reflect the operational efficiencies that may arise from improved traffic flow. As a result, the estimated emissions may be conservative and do not necessarily capture the full operational benefits of these alternatives.

The background air quality concentrations within the Air Quality Study Area were based on existing Environment and Climate Change Canada (Environment and Climate Change Canada, 2022) air monitoring station data which is collected under the National Air Pollution Surveillance network. Five years of existing data sets were analyzed from stations within the region, and the complete data set from the closest station or most representative station for each contaminant of concern was selected to represent the background air quality for the Air Quality Study Area. As this Project is located within the Billy Bishop Toronto City Airport on Toronto Island, the monitoring stations closest to the Air Quality Study Area were given preference as the one of the most representative

locations for the air quality contaminants of concern. As such, Toronto Downtown, Toronto West, and Etobicoke South monitoring stations (all located approximately 1 to 14 km from the Study Area) were used. The closest monitoring station is located at Toronto Downtown, approximately 1 km from the Study Area.

2.1 Representative Receptors

The identified critical and sensitive receptors are listed in **Table 2-1**. The location of the identified critical receptors, such as schools, daycares, or nursing homes, and sensitive receptors, are shown in **Figure A1**, in **Appendix A**. Existing sensitive and critical receptors were included as discrete receptors within the air dispersion model.

Table 2-1: Identified Critical and Sensitive Receptors within Air Quality Study Area

Receptor ID	Type	Address	Description	UTM Co-ordinates Easting (m)	UTM Co-ordinates Northing (m)
Sensitive Receptor 1	Sensitive	1 Stadium Road	Marina	628879	4832199
Sensitive Receptor 2	Sensitive	90 Stadium Road #922	Multi-unit Dwelling	628939	4832516
Sensitive Receptor 3	Sensitive	667-38 Stadium Road	Multi-unit Dwelling	629006	4832460
Sensitive Receptor 4	Sensitive	32 Stadium Road	Multi-unit Dwelling	629045	4832421
Sensitive Receptor 5	Sensitive	28 Stadium Road	Multi-unit Dwelling	629085	4832394
Sensitive Receptor 6	Sensitive	700 Queens Quay West	Single-unit Dwelling	629014	4832550
Sensitive Receptor 7	Sensitive	140 Stadium Road	Single-unit Dwelling	629056	4832490
Sensitive Receptor 8	Sensitive	6 Little Norway Crescent	Multi-unit Dwelling	629106	4832428
Sensitive Receptor 9	Sensitive	34 Little Norway Crescent	Multi-unit Dwelling	629150	4832462
Sensitive Receptor 10	Sensitive	106 Little Norway Crescent	Multi-unit Dwelling	629101	4832526
Sensitive Receptor 11	Sensitive	637 Lakeshore Blvd West	Multi-unit Dwelling	628899	4832568
Sensitive Receptor 12	Sensitive	680 Queens Quay West	Multi-unit Dwelling	629094	4832616
Sensitive Receptor 13	Sensitive	539 Queens Quay West	Multi-unit Dwelling	629470	4832655
Sensitive Receptor 14	Sensitive	401 Queens Quay West	Multi-unit Dwelling	629791	4832849
Critical Receptor 1	Critical	635 Queens Quay West	School	629290	4832674
Critical Receptor 2	Critical	650 Queens Quay West	Childcare Centre	629150	4832638
Critical Receptor 3	Critical	635 Queens Quay West	Childcare Centre	629308	4832685

2.2 Assessment of Contaminants

Based on the construction non-road equipment and construction activities within the Air Quality Study Area, the primary air contaminants are expected from fuel combustion, road dust and material handling. Thus, the Air Quality Assessment included the following criteria air contaminants from non-road and construction activity emissions:

- Nitrogen dioxide (assessed over 1-hour, 24-hour, and annual averaging periods).
- Carbon monoxide, carbon monoxide (assessed over 1-hour and 8-hour averaging periods).
- Sulphur dioxide (assessed over 10-minute, 1-hour, and annual averaging periods).
- Suspended Particulate Matter (assessed over 24-hour and annual averaging periods).
- Particulate matter (<10 microns), (assessed over 24-hour period).
- Particulate matter (<2.5 microns), (assessed over 24-hour and annual averaging periods).

Emissions of nitrogen dioxide, carbon monoxide and Sulphur dioxide are emitted from fuel combustion at the stationary and mobile equipment. Emissions of the coarse fraction of particulates (Suspended particulate matter), particulate matter (<10 microns) are emitted mostly from tire wear, brake wear, material handling and road dust fugitives, whereas the fine fraction Particulate matter (<2.5 microns) is mostly attributed to vehicle emission exhausts.

For the Operational phase, impacts of pollutants contributing to the regional greenhouse gas levels including carbon dioxide, nitrous oxide, and methane were included. The impacts of these pollutants are compared to the Ministry of the Environment, Conservation, and Parks projected transportation emissions for the Future year, in units of carbon equivalent, as shown in the Ontario's Climate Change Strategy¹.

2.3 Relevant Air Quality Guidelines

The criteria air contaminants have Ontario Ambient Air Quality Criteria and Federal Canadian Ambient Air Quality Standards. The Canadian Ambient Air Quality Standards has two time periods for the phase-in of the standards, namely in 2020 and 2025;

1. Ministry of the Environment and Climate Change "Ontario's Climate Change Strategy" accessed November 2024 <https://dr6j45jk9xcmk.cloudfront.net/documents/4914/climate-change-strategy-report.pdf>

however, only the more stringent standards for 2025 were selected for the assessment. The relevant air quality criteria and standards are presented below in **Table 2-2**.

Table 2-2: Air Quality Criteria and Standards

Criteria Air Contaminants	Averaging Period (hour)	Concentration (micrograms per cubic metre)	Source
Nitrogen Dioxide	1	400	Ambient Air Quality Criteria
	1	83.2	Canadian Ambient Air Quality Standards (2025) ¹
	24	200	Ambient Air Quality Criteria
	Annual	23.8	Canadian Ambient Air Quality Standards (2025) ¹
CO	1	36,200	Ambient Air Quality Criteria
	8	15,700	Ambient Air Quality Criteria
	1	179	Canadian Ambient Air Quality Standards (2025) ²
	1	106	Ambient Air Quality Criteria
	10 minutes	178	Ambient Air Quality Criteria
	Annual	10.6	Ambient Air Quality Criteria
	Annual	11.0	Canadian Ambient Air Quality Standards (2025)
Suspended Particulate Matter	24	120	Ambient Air Quality Criteria
	Annual	60	Ambient Air Quality Criteria
Particulate Matter (<10 microns)	24	50	Ambient Air Quality Criteria
Particulate Matter (<2.5 microns)	24	27	Canadian Ambient Air Quality Standards ³
	Annual	8.8	Canadian Ambient Air Quality Standards ³

Notes: (1) Standard value from Canadian Ambient Air Quality Standards for Nitrogen dioxide is 42 parts per billion for the 1-hour averaging period and 12 parts per billion for the Annual averaging period. Standard converted to micrograms per cubic metre using a temperature of 10 °C and pressure of 1 atm. The statistical form of the 1-hour standard is based on a 3-year average of the 98th percentile of the daily maximum 1-hour average concentrations. The annual standard is based on an average over a single calendar year of all 1-hour average concentrations.

(2) Standard value from Canadian Ambient Air Quality Standards for Sulphur dioxide is 65 parts per billion for the 1-hour averaging period and 4.0 parts per billion for the Annual averaging period. Standard converted to micrograms per cubic metre using a temperature of 10 °C and pressure of 1 atm. The Annual averaging period was higher than the Ambient Air Quality Criteria Standard for the same averaging period and is therefore excluded from the table. The statistical form of the 1-hour standard is based on a 3-year average of the 99th percentile of the daily maximum 1-hour average concentrations.

(3) The statistical form of the Particulate matter (<2.5 microns) 24-hour Canadian Ambient Air Quality Standards standard is based on a 3-year average of the 98th percentile of the daily 24-hour average concentrations. The annual Canadian Ambient Air Quality Standards standard is based on a 3-year average of the daily 24-hour average concentrations.

The Ambient Air Quality Criteria are acceptable effects-based levels in ambient air which are developed to address health and environmental impacts of air pollutants. Levels are set based on the “limiting effect” and are the lowest concentrations at which an adverse effect may be experienced. Effects considered during their development may include health impacts (such as pulmonary irritation or an increased lifetime risk of cancer), as well as odour, vegetation damage, soiling, visibility, corrosion, or other concerns. The values are assigned different averaging times appropriate to the effects they are intended to protect against—shorter averaging times for acute effects and longer ones for chronic effects. If a contaminant has an Ambient Air Quality Criteria for more than one averaging time, all averaging times must be used for assessment purposes, as each time averaging period may represent a different type of effect.

The Canadian Council of Ministers of the Environment has also developed Canada-wide standards for various contaminants, including fine Particulate matter (<2.5 microns), nitrogen dioxide, and sulphur dioxide, under the Canadian Ambient Air Quality Standards. These standards are developed collaboratively across provincial jurisdictions using a scientific, risk-based approach. The Canadian Ambient Air Quality Standards are nationally recognized, health-based standards that complement the Ambient Air Quality Criteria, offering a robust framework for evaluating air quality impacts and managing public health risks.

2.4 Emission Inventory Assessment Methodology, Construction Phase

2.4.1 Construction Emission Sources

Construction activities release fine particulates (fugitive dust) and other pollutants, including diesel exhaust, asphalt volatile contaminants, and emissions from machinery. These emissions primarily come from construction equipment, the movement of materials, and activities such as grading, rock blasting, road paving, and equipment operation. Fugitive dust is generated when construction equipment moves or transports materials and is particularly noticeable during periods of intense construction activity, often exacerbated by dry or windy conditions. Diesel-powered construction equipment and trucks emit exhaust contaminants, contributing to air pollution. Although these emissions are temporary and unlikely to have long-lasting effects, they can cause short-term health problems.

2.4.2 Construction Equipment and Vehicle Exhaust

Environment Canada adopted amendments to the Off-Road Compression-Ignition Engine Emission Regulations which align Canadian emission standards with the United

States Environmental Protection Agency Tier 4 standards for non-road engines, including the emission limits, testing methods and effective dates.

The Regulations Amending the Off-Road Compression-Ignition Engine Emission Regulations (the Amendments) impose stricter standards and new requirements starting with engines of the 2012 and later model years.

Emission inventories were prepared for each criteria air contaminant (where applicable) during the Construction phase. Sources included the following activities and equipment:

- On-site construction vehicles (non-road) and equipment, such as dump trucks, excavators, bulldozers, generators.
- Marine vessel operation within the Marine Exclusion Zone, such as barges and scows.
- On-site material handling of rock and sand materials.
- Road dust emissions on airport roadways.

As mentioned in **Section 2**, an emission inventory was developed based on construction equipment and activity data provided for RESA 2 and RESA 3. As a comparison of the expected equipment for construction confirmed that RESA 1 would require slightly fewer construction vehicles for the onshore area, resulting in lower emissions than the construction emissions generated for RESA 2 and RESA 3. Therefore, the RESA 2 and RESA 3 emission inventory with daily emission rates was selected for evaluating the worst case 24 hour averaging period during the Construction phase.

Emission inventories estimate the quantities (in mass units) of criteria air contaminants emitted over a given period and provide information about contributions from various sources. Emissions are estimated by multiplying emission factors by source activity levels. An emission factor represents the emissions from a single source for a unit of time or distance (e.g., grams of carbon monoxide per vehicle mile traveled). The source activity may be the number of vehicle-miles-traveled on a roadway segment or the amount of material transferred in a given time period, such as one day.

A copy of the emission inventory tables is included in **Appendix D**.

2.4.3 Dispersion Modelling Assessment Methodology

The calculated emission inventory for all criteria air contaminants during the Construction phase were modelled using the United States Environmental Protection Agency gaussian dispersion model, AERMOD (version 22112). The model can predict impacts from a variety of source types, including stationary sources (e.g., equipment

with stacks), line sources (e.g., truck traffic emissions along on-site roads), and stationary volume sources (e.g., pile unloading).

AERMOD predicts contaminant impacts using the Gaussian dispersion model in conjunction with hourly meteorological data. Meteorological and terrain data closest to the Air Quality Study Area were pre-processed by the Ontario Ministry of the Environment, Conservation and Parks for use in AERMOD.

Emission sources identified within the model were based on construction equipment emissions and idling emissions within the Study Area, including:

- Construction activities from equipment operating on the east and west ends of Runway 08/26, including inside the Marine Exclusion Zone.
- Truck traffic and other vehicles transporting materials to and from the east and west ends of Runway 08/26.
- Stockpiling and material handling operations in the southern area of the Billy Bishop Toronto City Airport, within the Study Area.

For each source, non-road emissions and construction operations data were input into the model. Release heights and plume widths were calculated in accordance with United States Environmental Protection Agency recommended methodologies (United States Environmental Protection Agency, 2012).

2.5 Emission Inventory Assessment Methodology, Operational Phase

An emission inventory was prepared for greenhouse gas compounds during the Operational phase for both the current operations and the future operations based on RESA 1, RESA 2, and RESA 3 alternatives. The RESA alternatives did not include any changes to aircraft flight operations from current operations, as described in **Section 2**. No changes are anticipated to the current number of vehicles using the airside perimeter road; therefore this assessment did not account for the potential of increased vehicle demand and crossing activity through the area from improved access. As such, the sources of emissions were limited to the following activities and equipment:

- On-road vehicles using the proposed airside perimeter road to access Toronto Island.
- Aircraft taxiway operations.

A greenhouse gas emission inventory was prepared for the on-road vehicle emissions for the current operations and for the proposed RESA1, RESA 2 and RESA 3

alternatives. The current operations require on-road vehicles to queue at the Billy Bishop Toronto City Airport and wait for approval prior to crossing the runway and accessing the main road on Toronto Island. In the RESA 1 and RESA 2 alternative, an air side perimeter road is proposed; however, traffic will need to queue and wait for approval to travel along the roadway due to the proximity to Runway 08/26. In the RESA 3 alternative, the air side perimeter road is located further away from Runway 08/26, which clears the aviation object limitation surface (OLS), and will allow unrestricted traffic access to the main road on Toronto Island and avoid potential idling emissions.

The emission inventory used available Project design details, and traffic data for identified sources at the Billy Bishop Toronto City Airport within the Air Quality Study Area. Emission factors were produced from the United States Environmental Protection Agency emissions modelling software Motor Vehicle Emission Simulator version 4.0. This software provides emission rates for a wide variety of source types (i.e., passenger cars, motorcycles, long-haul trucks, etc.), speed bins, road types, and emission types (i.e., running emissions, idling emissions, etc.). Emission rates were developed for greenhouse gas compounds from light duty vehicles and heavy-duty vehicles, as shown in **Table 2-3**. Motor Vehicle Emission Simulator 4.0 outputs for both the Construction and Operational phases are included in **Appendix B**.

Table 2-3: Motor Vehicle Emission Simulator Source IDs

Motor Vehicle Emission Simulator Source ID	Assessment Source Type Classification	Source Description
31	Light Duty Vehicles	Passenger Truck
32	Light Duty Vehicles	Light Commercial Truck
51	Heavy-Duty Vehicles	Refuse Truck
52	Heavy-Duty Vehicles	Single Unit Short-haul Truck
53	Heavy-Duty Vehicles	Single Unit Long-haul Truck
61	Heavy-Duty Vehicles	Combination Short-haul Truck
62	Heavy-Duty Vehicles	Combination Long-haul Truck

Source: United States Environmental Protection Agency emissions modelling software Motor Vehicle Emission Simulator.4.0

The United States Environmental Protection Agency emissions modelling software Motor Vehicle Emission Simulator 4.0 calculates emissions from mobile sources using a variety of factors: time span, geographic bounds, vehicle type, road type, and emission or process type. The time span calculates emission using default fleet composition and fuel criteria specific to a pre-selected year, month, hour, and weekday/weekend profile. Fleet composition and fuel criteria are also specific to geographic location, with default database data provided for each county in the United States.

For Canada, the closest United States County to the Air Quality Study Area is expected to provide fleet and fuel characteristics as close of a match as possible; therefore,

Niagara County in New York State was selected. Since Motor Vehicle Emission Simulator is developed in the United States, Canadian-specific county data are not available. It is typical for Canadian air quality transportation environmental assessment projects to assume a similar vehicle fleet and fuel characteristics to that of the closest United States based county. This approach has been accepted by the Ministry of the Environment, Conservation, and Parks.

Further details of the Motor Vehicle Emission Simulator 4.0 inputs are detailed below in **Table 2-4**.

Table 2-4: Motor Vehicle Emission Simulator 4.0 Input Data

Parameter	Input	Reference (if applicable)
Scale	■ County Scale	-
Representative County	■ Niagara County	-
Calculation Type	■ Emission Rates	-
Years of Evaluation	■ 2023, 2027	-
Months of Evaluation	■ January and July	-
Temperature (°C)	■ Full set of average hourly temperatures for the months of January and July	■ Environment Canada Historical Climate Data – Toronto Centre
Humidity	■ Full set of average hourly temperatures for the months of January and July	■ Environment Canada Historical Climate Data – Toronto Centre
Fuel Types	■ Default Fuel Type IDs 1, 2, 3. ■ ID 5 (Ethanol) was not considered.	■ Motor Vehicle Emission Simulator 4.0 Default Data
Vehicle Types	■ Source IDs 31, 32, 51, 52, 53, 61, 62	■ Motor Vehicle Emission Simulator 4.0 Default Data
Vehicle Age Distribution	■ Default Age Fraction Data	■ Motor Vehicle Emission Simulator 4.0 Default Data

A greenhouse gas emission inventory was prepared for the aircraft emissions along the existing taxiway for the current operations and for the proposed RESA 2 and RESA 3 alternative. In the RESA 2 and RESA 3 alternatives, a new taxiway will be constructed, which will reduce the length of the taxiway distance by approximately 74 m. RESA 1 does not include this taxiway improvement. Therefore, no emissions for RESA 1 were assessed for this modification.

The emission inventory used available Project design details, and aircraft traffic data for identified sources at the Billy Bishop Toronto City Airport within the Air Quality Study Area. The aircraft emissions were estimated using taxi times, fuel consumption provided by Avia NG (2024), and greenhouse gas emission factors from National Inventory Report (2023).

3. Existing Ambient Air Quality

The existing ambient air quality levels were based on publicly available historical data from ambient air quality monitoring stations within Ontario. Data utilized is the most recent publicly available at the time of the preparation of this assessment. The following National Air Pollution Surveillance air quality monitoring stations were selected as representative of the ambient air quality within the Study Area:

- Toronto Downtown (National Air Pollution Surveillance ID 60445).
- Etobicoke South (National Air Pollution Surveillance ID 60435).
- Toronto West (National Air Pollution Surveillance ID 60430).

These stations are located nearest to the Air Quality Study Area and monitored (in combination) all relevant criteria air contaminants for the assessment, since one station is unable to monitor all criteria air contaminants. Where multiple stations were found to monitor a common criteria air contaminant, the closest representative station was selected for the assessment.

Details of the air quality monitoring stations closest to the Air Quality Study Area for each station are provided in **Table 3-1** and their locations with respect to the Air Quality Study Area are shown on **Figure 3-1**. A copy of the air quality monitoring data is provided in **Appendix C**.

Table 3-1: Air Quality National Air Pollution Surveillance Monitoring Stations' Information

Station Information	Toronto Downtown	Etobicoke South	Toronto West
National Air Pollution Surveillance ID	60445	60435	60430
Address	55 John Street	461 Kipling Avenue	125 Resources Road
Years of Data Available	2020 - 2022 ⁽¹⁾	2018 - 2019 ⁽¹⁾	2018 - 2022
Latitude	43.645	43.610	43.709
Longitude	-79.389	-79.521	-79.544
Station Type	Urban	Urban	Urban
Criteria air contaminants Measured ²	Nitrogen dioxide, Particulate matter (<2.5 microns), Ozone	Nitrogen dioxide, Particulate matter (<2.5 microns), Ozone	Carbon monoxide, Sulphur dioxide ₂
Distance from Study Area	1 km	9 km	14 km

Notes: (1) National Air Pollution Surveillance Station 60435 was used for data in 2018 and 2019, in conjunction with Station 60445 data from 2020 to 2022, due to some gaps in consistent data.

(2) Suspended particulate matter and Particulate matter (<10 microns) measurements are not captured by the ambient air stations. Values for Suspended particulate matter and Particulate matter (<10 microns) were based on Particulate matter (<2.5 microns) measurements. Ozone data was used in ozone limiting method calculations for Nitrogen dioxide, as per Section 5.2.

Ambient monitoring data was collected for all contaminants from the most recent data available, as per the averaging period(s) listed in **Table 3-2** through **Table 3-4**, and the following methodology was used for the calculations:

- 1 hour, 8 hour, and 24 hour ambient concentrations for the criteria air contaminants were obtained from the 90th percentile of hourly measurements from the representative air monitoring stations (the average value was calculated from the available years).
- Annual ambient concentrations for the criteria air contaminants were obtained from the mean measurements from the representative air monitoring station:
 - The average value was calculated from the available years, when compared to the Ambient Air Quality Criteria.
 - The average of the most recent three years used for particulate matter (<2.5 microns), when compared to Canadian Ambient Air Quality Standards.
 - The maximum annual average value from the available years used for nitrogen dioxide and sulphur dioxide, when compared to the Canadian Ambient Air Quality Standards.

The background concentrations for each contaminant were also compared to the applicable Provincial Ambient Air Quality Criteria and Federal Canadian Ambient Air Quality Standards for the time averaging periods, as shown in **Table 3-5**.

Table 3-2: Background Ambient Air Quality Concentrations (2018-2022)

Criteria air contaminant	Station ID	Averaging Period ^[1] (hour)	90th Percentile Concentrations (micrograms per cubic metre)					5-Year Average
			2018	2019	2020	2021	2022	
Nitrogen dioxide	60445/60435	1	55.4	57.4	43.6	45.5	51.5	51.5
		24	43.8	47.6	37.4	39.5	43.6	43.0
		Annual ¹	29.2	29.2	24.4	25.1	28.5	27.3
Suspended particulate matter ²	60445/60435	24	53.6	52.2	47.2	50.3	47.5	50.3
		Annual	30.4	28.9	28.2	30.9	29.3	29.6
Particulate matter (<10 microns) ³	60445/60435	24	26.8	26.1	23.6	25.1	23.8	25.2
Particulate matter (<2.5 microns)	60445/60435	24	14.5	14.1	12.7	13.6	12.8	13.6
		Annual	8.21	7.81	7.62	8.35	7.91	7.98
Carbon monoxide	60430	1	0.41	0.42	0.37	0.42	0.43	0.41
		8	0.39	0.41	0.35	0.40	0.42	0.40
Sulphur dioxide	60430	1	2.21	1.38	1.10	1.38	1.65	1.65
		10 min	3.64	2.28	1.82	2.28	2.73	2.73
		Annual	0.88	0.75	0.53	0.65	0.80	0.72
Ozone	60445/60435	1	80.6	74.4	78.5	84.7	78.5	78.5
		24	68.4	62.7	69.0	77.1	71.1	70.3
		Annual ¹	48.1	44.6	50.0	54.2	50.1	49.4

Notes: (1) Annual values were based on average of all available data and was not based on 90th percentile concentration for all contaminants.
 (2) Suspended particulate matter was not available in National Air Pollution Surveillance Station measurements. Therefore, Suspended particulate matter concentrations were estimated assuming 2* Particulate matter (<10 microns) = Suspended particulate matter, as per Brook et. al (1997).
 (3) Particulate matter (<10 microns) was not included in National Air Pollution Surveillance Station measurements, and therefore was estimated using Particulate matter (<2.5 microns) measurements, assuming a ratio of 1 µg/m³ Particulate matter (<10 microns) per 0.54 µg/m³ of Particulate matter (<2.5 microns) as per Lall et. al (2004). ²

Table 3-3: 98th Percentile Background Ambient Air Quality Concentration (2018-2022)

Criteria Air Contaminant	Station ID	Averaging Period (hour)	98 th Percentile Concentrations (micrograms per cubic metre)					3-Year Avg (1-Hour) or 5-Year Max Annual ^[1]
			2018	2019	2020	2021	2022	
Nitrogen dioxide	60445/60435	1	104.4	115	98.1	99.6	106.4	108.5
		Annual	29.2	29.2	24.4	25.1	28.5	29.2
							3-Year Average (24-Hour) or Annual Average ^[1]	
Particulate matter (<2.5 microns)	60445/60435	24	20.5	19.8	20.0	21.3	18.6	20.6
		Annual	8.21	7.81	7.62	8.35	7.91	8.15

Notes: (1) Annual values were based on average of all available data. They were not based on 98th percentile concentration for all contaminants.

Table 3-4: 99th Percentile Background Ambient Air Quality Concentration (2018-2022)

Criteria Air Contaminant	Station ID	Averaging Period (hour)	99 th Percentile Concentrations (micrograms per cubic metre)					Average of Three Highest Years
			2018	2019	2020	2021	2022	
Sulphur dioxide	60430	1	19.3	20.6	16.5	19.8	15.7	19.9

2. Lall, R., M. Kendall, K. Ito and G.D. Thurston, 2004: Estimation of historical annual particulate matter (<2.5 microns) exposures for health effects assessment (Atmospheric Environment. 38, 2004), 5217-5226.

Table 3-5: Comparison of Background Ambient Air Quality Data to Relevant Ambient Air Criteria/Standard

Criteria Air Contaminant	Station ID	Averaging Period (hour)	Years	Average of Background Data (10 °C and 1 atm) (micrograms per cubic metre)	Percentile	Criteria/ Standard (micrograms per cubic metre)	Source	% of Criteria
Nitrogen dioxide	60445/60435	1	2018-2022	51.5	90th	400	Ambient Air Quality Criteria	13%
		1	2018-2022	108.5	98th	83.2	Canadian Ambient Air Quality Standards (2025)	130%
		24	2018-2022	43.0	90th	200	Ambient Air Quality Criteria	21%
		Annual	2018-2022	29.2	Mean	23.8	Canadian Ambient Air Quality Standards (2025)	123%
Carbon dioxide	60430	1	2018-2022	410	90th	36,200	Ambient Air Quality Criteria	1%
		8	2018-2022	396	90th	15,700	Ambient Air Quality Criteria	3%
Sulphur Dioxide	60430	1	2018-2022	19.9	99th	179	Canadian Ambient Air Quality Standards (2025)	11%
		1	2018-2022	1.65	90th	106	Ambient Air Quality Criteria	2%
		10 minutes	2018-2022	2.73	90th	178	Ambient Air Quality Criteria	2%
		Annual	2018-2022	0.72	Mean	10.6	Ambient Air Quality Criteria	7%
		Annual	2018-2022	0.88	Mean	11.0	Canadian Ambient Air Quality Standards (2025)	8%
Suspended particulate matter	60445/60435	24	2018-2022	50.3	98th	120.00	Canadian Ambient Air Quality Standards	42%
		Annual	2018-2022	29.6	Mean	60.00	Canadian Ambient Air Quality Standards	49%
Particulate matter (<10 microns)	60445/60435	24	2018-2022	25.2	90th	50	Ambient Air Quality Criteria	50%
Particulate matter (<2.5 microns)	60445/60435	24	2018-2022	20.6	98th	27	Canadian Ambient Air Quality Standards	76%
		Annual	2018-2022	8.15	Mean	8.8	Canadian Ambient Air Quality Standards	93%

- Notes: (1) Exceedances to Air Quality criteria are shown in red.
- (2) Standard value from Canadian Ambient Air Quality Standards for nitrogen dioxide is 42 parts per billion for the 1-hour averaging period and 12 parts per billion for the Annual averaging period. Standard converted to micrograms per cubic metre using a temperature of 10 °C and pressure of 1 atm. The statistical form of the 1-hour background concentration is presented as a 3-year average of the 98th percentile of the daily maximum 1-hour average concentrations. The annual background concentration is presented as an average over a single calendar year of all 1-hour average concentrations.
- (3) Standard value from Canadian Ambient Air Quality Standards for sulphur dioxide is 65 parts per billion for the 1-hour averaging period and 4.0 parts per billion for the Annual averaging period. Standard converted to micrograms per cubic metre using a temperature of 10 °C and pressure of 1 atm. The statistical form of the 1-hour background concentration is presented as a 3-year average of the 99th percentile of the daily maximum 1-hour average concentrations.
- (4) The statistical form of the particulate matter (<2.5 microns) 24-hour background concentration is presented as a 3-year average of the 98th percentile of the daily 24-hour average concentrations. The annual background concentration is presented as a 3-year average of the daily 24-hour average concentrations.

As noted in red font above in **Table 3-5**, one contaminant was found to exceed the Federal Canadian Ambient Air Quality Standards in the existing ambient air levels. The exceedances for nitrogen dioxide are based on the existing background levels within the Air Quality Study Area.

4. Greenhouse Gas Emission Inventory

As discussed in **Section 2.5**, a greenhouse gas emission inventory was prepared for the Operational phase.

Individual greenhouse gasses have differing abilities to absorb heat in the atmosphere. These varying heat absorption properties are quantified by an individual global warming potential factor for each contaminant which converts the mass of a greenhouse gas to the representative equivalent mass of carbon dioxide equivalent.

The global warming potentials are calculated based on the amount of heat trapping potential that would result from the emission of 1 kilogram of a given greenhouse gas to the emission of 1 kilogram of carbon dioxide. The global warming potentials for various greenhouse gas compounds are defined by Environment Canada in Environment and Climate Change Canada (2023) document are summarized below **Table 4-1**.

Table 4-1: Greenhouse Gas 100-year Global Warming Potentials

Greenhouse Gas	100-year Global Warming Potentials
Carbon dioxide	1
Methane	28
Nitrous oxide	265

4.1 Annual Greenhouse Gas Inventory – Operational Phase

This section outlines the operational changes and associated greenhouse gas emissions impacts for each RESA alternative. The impacts are dependant on the RESA alternative and proposed modifications, which includes changes to aircraft taxiway operations and on-road vehicle movements along the airside perimeter road.

The operational differences for the three RESA alternatives are discussed below.

4.1.1 RESA 1

The implementation of the RESA 1 alternative will focus on expanding the landmass to meet the regulatory minimum RESA length requirements and adding restricted access to a proposed airside perimeter road, requiring on-road vehicles to continue coordinating with the control tower for permission to access the roadway. This is expected to result in vehicle idling at access points, consistent with the Current Conditions.

Table 4-2 shows the predicted annual greenhouse gas emissions during Current Conditions (2023) from on-road vehicles and the predicted annual greenhouse gas emissions during the Future Conditions (2027) if RESA 1 is implemented. Full calculations are included in Appendix E. **Section 2** outlines the methodology used for the following emission inventory.

Table 4-2: Annual Greenhouse Gas Emissions from On-road Vehicles for RESA 1 – Current Conditions (2023) and Future Conditions (2027)

Greenhouse Gas	Total Annual Emissions – Current (kilogram)	Total Annual Emissions – RESA 1 (kilogram)	Change in Greenhouse Gas from Current (kilogram)
Carbon dioxide	455,733	713,547	257,815
Methane	4,544	8,541	3,996
Nitrous Oxide	33	53	20
Carbon dioxide equivalent	591,747	966,734	374,987

Notes: (1) It was assumed 75% of vehicles travel through the east side route and 25% of vehicles travel through the west side route to access the main public road for Toronto Island.

(2) Traffic volume remained the same as number of on-road vehicles will not be changing in Future Conditions.

4.1.2 RESA 2

The RESA 2 alternative introduces aircraft taxiing efficiency and safety improvements by modifying Taxiway B and Taxiway D, alongside the required RESA expansion. These enhancements are expected to optimize aircraft movement, reduce taxiing times, and enhance operational efficiency, contributing to a potential reduction in aircraft taxiway emissions over time. RESA 2 will have restricted access to the proposed airside perimeter road, requiring on-road vehicles to continue coordinating with the control tower for permission to access the roadway. This is expected to result in vehicle idling at access points, consistent with the Current Conditions. The annual aircraft greenhouse gas emissions during the taxiway operations were estimated using fuel emission factors (kilogram,/kilometer) and the estimated fuel usage. **Table 4-3** shows the predicted annual greenhouse gas emissions during the Current Conditions (2023) as well as the predicted emissions during the Future Conditions (2027) if RESA 2 is implemented. Full calculations are included in **Appendix E**.

Table 4-3: Annual Greenhouse Gas Taxiway Emissions for RESA 2 - Current Conditions (2023) and Future Conditions (2027)

Greenhouse Gas	Total Annual Emissions – Current (kilogram)	Total Annual Emissions – RESA 2 (kilogram)	Change in Greenhouse Gas from Current (kilogram)
Carbon Dioxide	687,556	503,967	-183,590
Methane	4.83	3.54	-1.29
Nitrous Oxide	19.1	14.0	-5.10
Carbon Dioxide Equivalent	692,753	507,775	-184,977

Table 4-4 shows the predicted annual greenhouse gas emissions during Current Conditions (2023) from on-road vehicles and the predicted annual greenhouse gas emissions during the Future Conditions (2027) if RESA 2 is implemented. Full calculations are included in Appendix E. **Section 2** outlines the methodology used for the following emission inventory.

Table 4-4: Annual Greenhouse Gas Emissions from On-road Vehicles for RESA 2- Current Conditions (2023) and Future Conditions (2027)

Greenhouse Gas	Total Annual Emissions – Current (kilogram)	Total Annual Emissions – RESA 2 (kilogram)	Change in greenhouse gas from Current (kilogram)
Carbon Dioxide	455,733	718,621	262,889
Methane	4,544	8,601	4,057
Nitrous Oxide	33	53	20
Carbon Dioxide Equivalent	591,747	973,600	381,853

Notes: (1) It was assumed 75% of vehicles travel through the east side route and 25% of vehicles travel through the west side route to access the main public road for Toronto Island.

(2) Traffic volume remained the same as number of on-road vehicles will not be changing in Future Conditions.

4.1.3 RESA 3

RESA 3 introduces the most substantial modifications to airfield infrastructure and on-road vehicle operations compared to the other alternatives. These enhancements include modifying taxiway B and D, and an unrestricted airside perimeter road, which avoids potential idling emissions associated with runway crossings and improves overall traffic flow.

The annual aircraft greenhouse gas emissions during the taxiway operations were estimated using fuel emission factors (kilogram/kilo litre) and the estimated fuel usage.

Table 4-5 shows the predicted annual greenhouse gas emissions during the Current

Conditions (2023) as well as the predicted emissions during the Future Conditions (2027) if RESA 3 is implemented. Full calculations are included in **Appendix E**.

Table 4-5: Annual Greenhouse Gas Taxiway Emissions for RESA 3 - Current Conditions (2023) and Future Conditions (2027)

GREENHOUSE GAS	Total Annual Emissions – Current (kilogram)	Total Annual Emissions – RESA 3 (kilogram)	Change in Greenhouse Gas from Current (kilogram)
Carbon Dioxide	687,556	503,967	-183,590
Methane	4.83	3.54	-1.29
Nitrous Oxide	19.1	14.0	-5.10
Carbon Dioxide Equivalent	692,753	507,775	-184,977

Table 4-6 shows the predicted annual greenhouse gas emissions during Current Conditions (2023) from on-road vehicles and the predicted annual greenhouse gas emissions during the Future Conditions (2027) if RESA 3 is implemented. Full calculations are included in **Appendix E**. **Section 2** outlines the methodology used for the following emission inventory.

Table 4-6: Annual Greenhouse Gas Emissions from On-road Vehicles for RESA 3 – Current Conditions (2023) and Future Conditions (2027)

Greenhouse Gas	Total Annual Emissions – Current (kilogram)	Total Annual Emissions – RESA 3 (kilogram)	Change in greenhouse gas from Current (kilogram)
Carbon Dioxide	455,733	658,312	202,579
Methane	4,544	7,856	3,312
Nitrous Oxide	33	47	14
Carbon Dioxide Equivalent	591,747	890,867	299,120

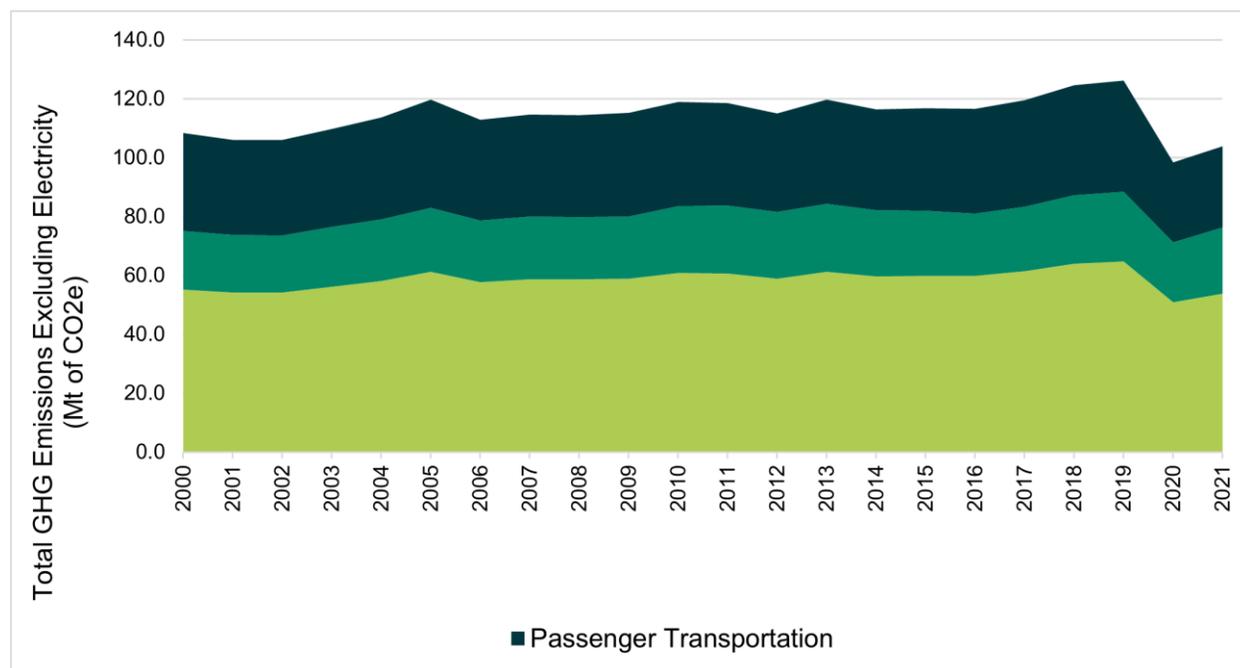
Notes: (1) It was assumed 75% of vehicles travel through the east side route and 25% of vehicles travel through the west side route to access the main public road for Toronto Island.

(2) Traffic volume remained the same as number of on-road vehicles will not be changing in Future Conditions.

4.2 Operational Phase greenhouse gas Compared to Ontario Transportation Sector Emissions

Currently, there are no greenhouse gas emission standards in Canada or the United States on a per-source basis. However, National Resources Canada reports annual greenhouse gas emissions for various industrial sectors, including the Transportation sector. **Figure 4-1** below shows historical annual trend of greenhouse gas emissions from the transportation sector from 2000 to 2021, in Mega tonnes of carbon dioxide equivalent.

Figure 4-1: Trends in Greenhouse Gas Ontario Transportation Sector Emissions (2000-2021), National Resources Canada



Source: National Resources Canada (2023)

The Project contributions of on-road greenhouse gas for RESA 1, RESA 2, and RESA 3 alternatives in the Future year (2027) were compared to the 2021 carbon dioxide equivalent contributions from the Ontario Transportation sector (Natural Resources Canada, 2023), shown in **Table 4-7**, **Table 4-8** and **Table 4-9**, respectively. The Project greenhouse gas contributions for all alternatives are negligible compared to the total Ontario Transportation 2021 carbon dioxide equivalent emissions.

Table 4-7: Greenhouse Gas Project Contribution Regional Assessment for RESA 1

Contaminant	Future On-Road Vehicle Crossing (Year 2027) (t) ¹	Ontario 2021 Reported greenhouse gas Emissions for the Transportation Sector ³ (t carbon dioxide equivalent)	% Current On-Road Vehicle Crossing Contribution	% Future On-Road Vehicle Crossing Contribution
Carbon Dioxide	714	-	-	-
Methane	8.54	-	-	-
Nitrous Oxide	0.053	-	-	-
Carbon Dioxide Equivalent²	967	45,100,000 ³	0.00131%	0.00214%

Notes: (1) Carbon dioxide equivalent was calculated for the Future Condition using global warming potential conversion for Nitrous oxide and methane (265 and 28, respectively).

(2) National Resource Canada: Table 8 “Greenhouse Gas Emissions by Transportation Mode”, Comprehensive Energy Use Database (accessed November 2024), excluding off-road, air, rail, and marine emissions.

Table 4-8: Greenhouse Gas Project Contribution Regional Assessment for RESA 2

Contaminant	Future On-Road Vehicle Crossing (Year 2027) (tonnes) ¹	Ontario 2021 Reported greenhouse gas Emissions for the Transportation Sector ³ (tonnes carbon dioxide equivalent)	% Current On-Road Vehicle Crossing Contribution	% Future On-Road Vehicle Crossing Contribution
Carbon Dioxide	719	-	-	-
Methane	8.60	-	-	-
Nitrous Oxide	0.053	-	-	-
Carbon Dioxide Equivalent²	974	45,100,000 ³	0.00131%	0.00216%

Notes: (1) Carbon dioxide equivalent was calculated for the Future Condition using global warming potential conversion for nitrous oxide and methane (265 and 28, respectively).

(2) National Resource Canada: Table 8 "Greenhouse Gas Emissions by Transportation Mode", Comprehensive Energy Use Database (accessed November 2024), excluding off-road, air, rail, and marine emissions.

Table 4-9: Greenhouse gas Project Contribution Regional Assessment for RESA 3

Contaminant	Future On-Road Vehicle Crossing (Year 2027) (tonnes) ¹	Ontario 2021 Reported greenhouse gas Emissions for the Transportation Sector ³ (tonnes carbon dioxide equivalent)	% Current On-Road Vehicle Crossing Contribution	% Future On-Road Vehicle Crossing Contribution
Carbon Dioxide	658	-	-	-
Methane	7.86	-	-	-
Nitrous Oxide	0.047	-	-	-
Carbon Dioxide Equivalent²	891	45,100,000 ³	0.00131%	0.00198%

Notes: (1) Carbon dioxide equivalent was calculated for the Future Condition using global warming potential conversion for Nitrous oxide and methane (265 and 28, respectively).

(2) National Resource Canada: Table 8 "Greenhouse Gas Emissions by Transportation Mode", Comprehensive Energy Use Database (accessed November 2024), excluding off-road, air, rail, and marine emissions.

5. Dispersion Modelling

Dispersion modelling was conducted with the United States Environmental Protection Agency modelling software AERMOD, version 21112, and AERMET 21112. The air dispersion modelling was set-up using guidance provided in the “Air Dispersion Modelling Guideline for Ontario, Guideline A-11, version 3.0” published by the Ministry of the Environment, Conservation and Parks. Release heights and plume widths were calculated in accordance with United States Environmental Protection Agency’s recommended methodologies.

5.1 Modelling Inputs

5.1.1 Meteorology

Site-specific meteorological data for a five-year period (2015-2019) was processed by Ministry of the Environment, Conservation and Parks for similar surrounding land use for AERMOD (Version 22112). The meteorological data for the surface station was collected from Toronto Station (ID 61583) and Buffalo Station (ID 14733) for the upper air station.

5.1.2 Terrain

Terrain data are publicly available from the Ministry of the Environment, Conservation and Parks via their website for the Air Quality Study Area in the form of GeoTiff files. The GeoTiff file used for the modelling input was `cdem_dem_030M.tiff`.

5.1.3 Identified Receptors

The sensitive and critical receptors identified within the Air Quality Study Area have been listed in **Table 2-1**, under **Section 2.1** of this Report.

In addition to these identified receptors, the AERMOD models were created with a nested grid of 20 m x 20 m receptor points within the Air Quality Study Area. Some grid receptors which overlapped with the influence area surrounding the line of volume sources were removed to prevent an overestimation of road impacts.

5.2 Nitrogen dioxide Assessment using Ozone Limiting Method

The concentration of nitrogen dioxide in the atmosphere is affected by the reaction of nitric oxide with ozone, which is a by-product of mobile vehicle fuel combustion. The atmospheric reaction of nitrous oxide with ozone is demonstrated as follows:



It is assumed that the rate of conversion of nitric oxide to nitrogen dioxide is controlled by the availability of ozone in the ambient atmosphere. This principle is called the “ozone limiting method”. Using the same principles, given a high enough concentration of ozone in the ambient atmosphere, all of the emitted nitric oxide emissions will convert to nitrogen dioxide and disperse in the same way as other inert combustion products from mobile vehicles. According to nitric oxide studies done by the United States Environmental Protection Agency, emissions of nitric oxides from combustion are primarily in the form of nitric oxide (United States Environmental Protection Agency, 1999). Nitric oxides is defined as sum of nitric oxides and nitrogen dioxide. Modelled concentrations of nitric oxides were therefore used along with ambient measured concentrations of background ozone levels from nearby ambient air monitoring stations to calculate the concentrations of nitrogen dioxide at a given sensitive or critical receptor.

The Québec Ministry of the Sustainable Development, Environment, and Parks published a technical guide for calculating atmospheric concentration of nitrogen dioxide using the Ozone limiting method method (Couture, 2008), described as follows:

- If the concentration (part per million) of nitric oxide is lower than that of ozone ([nitrous oxide] < [ozone] or, more precisely, [ozone] > 0.9 [nitric oxides]), then we assume that all of nitric oxide was converted to nitrogen dioxide: [nitrogen dioxide] = [nitric oxides].
- If the concentration parts per billion of nitric oxide is greater than that of ozone ([nitric oxides] > [ozone]), then the concentration of nitric oxide equal to the concentration parts per billion of ozone is converted to nitrogen dioxide: [Nitrogen dioxide] = [ozone] + 0.1* [nitric oxides].

The concentration of ambient ozone was taken as the average of the maximum 90th percentile values (2018 to 2022) for measured ozone concentrations at the National Air Pollution Surveillance Etobicoke South (National Air Pollution Surveillance ID 60435) and Toronto Downtown (National Air Pollution Surveillance ID 60445) stations as shown in **Table 5-1**.

The National Air Pollution Surveillance Toronto Downtown station (National Air Pollution Surveillance ID 60445) is located approximately 1 km north of the Study Area. The station did not have a consistent 5-year set of data. Therefore, National Air Pollution Surveillance Etobicoke South (National Air Pollution Surveillance ID 60435), located 9 km from the Study Area, was used in conjunction with Toronto Downtown data. Based on proximity and data availability, they were both chosen as the most representative stations to provide the concentrations for the ozone background level assessment.

Table 5-1: Local Ambient Ozone Levels (90th Percentile Concentrations, micrograms per cubic metre)

Contaminant	Averaging Period (hour)	2018	2019	2020	2021	2022	5-Year Average
Ozone	1	80.6	74.4	78.5	84.7	78.5	78.5
Ozones	24	68.4	62.7	69.0	77.1	71.1	70.3
Ozones	Annual	48.1	44.6	50.0	54.2	50.1	49.4

6. Results

6.1 Predicted Cumulative Concentrations: Construction Phase

The highest predicted contaminant emissions for the Construction phase were modelled in AERMOD using a receptor grid, including identified sensitive and critical receptors. The results of the dispersion modelling identified the location of the maximum concentration at the most impacted receptor within the Air Quality Study Area based on the RESA 2 and RESA 3 alternatives, as mentioned in **Section 2.4.3**.

The maximum concentrations at sensitive and critical receptors are summarized in **Table 6-1**. The results include the background concentrations for each contaminant, per averaging period to determine the cumulative concentrations. The cumulative concentrations were compared to the applicable Provincial air quality criteria and Federal standards. The predicted exceedances are noted in red in **Table 6-1**.

The maximum concentration cumulative impacts at each identified sensitive and critical receptor are included in **Appendix G**. The isopleth figures showing maximum impact for all contaminants during the Construction phase are shown in **Appendix H**.

Table 6-2 presents the maximum cumulative concentrations for sensitive receptor 14 (Multi-Unit Dwelling, 401 Queens Quay West), as nitrogen dioxide exceedances where present at this receptor. This analysis was included to provide a comprehensive assessment of all pollutants at sensitive receptor 14, offering insight into its significance within the Air Quality Study Area.

Table 6-3 presents the maximum cumulative concentrations for sensitive receptor 1 (Marina, 1 Stadium Road), as nitrogen dioxide exceedances where present at this receptor. This analysis was included to provide a comprehensive assessment of all pollutants at sensitive receptor 1, offering insight into its significance within the Air Quality Study Area.

6.1.1 Cumulative Frequency Analysis

A cumulative frequency analysis was conducted to estimate the potential for exposure during the predicted 1-hour averaging period, at the worst-case impacted sensitive receptor. The nitrogen dioxide concentration (1-hour) is predicted to exceed the Federal Canadian Ambient Air Quality Standards at the most impacted sensitive receptor, sensitive receptor 14 (Multi-Unit Dwelling, 401 Queens Quay West); however, it did not exceed the Provincial Ambient Air Quality Criteria.

Table 6-1: Summary of Maximum Cumulative Concentrations

Contaminant	Averaging Period (hour)	Percentile	Background Concentration (micrograms per cubic metre)	Maximum Modelled Concentration (micrograms per cubic metre)	Sensitive / Critical Receptor ⁽¹⁾	Cumulative Concentration (micrograms per cubic metre)	Ambient Air Quality Criteria/ Canadian Ambient Air Quality Standards (micrograms per cubic metre)	Standard Source	Max Point of impingement % of Ambient Air Quality Criteria/ Canadian Ambient Air Quality Standards	Cumulative% of Ambient Air Quality Criteria/ Canadian Ambient Air Quality Standards
Nitrogen Dioxide	1	90th	51.5	159	sensitive receptor 14	211	400	Ambient Air Quality Criteria	40%	53%
	1	98th	108.5	159	sensitive receptor 14	268	83	Canadian Ambient Air Quality Standards (2025)	192%	322%
	24	90th	43.0	75.3	sensitive receptor 13	118	200	Ambient Air Quality Criteria	38%	59%
	Annual	Mean	29.2	6.9	sensitive receptor 1	36.1	24	Canadian Ambient Air Quality Standards (2025)	29%	152%
Carbon Dioxide	1	90th	410.0	245	sensitive receptor 14	655	36200	Ambient Air Quality Criteria	1%	2%
	8	90th	396.0	68.0	sensitive receptor 13	464	15700	Ambient Air Quality Criteria	0%	3%
Sulphur Dioxide	1	99th	19.9	30.3	CR2	50.2	179	Canadian Ambient Air Quality Standards (2025)	17%	28%
	1	90th	1.7	30.3	CR2	32.0	106	Ambient Air Quality Criteria	29%	30%
	10 minutes	90th	2.7	50.0	CR2	52.8	178	Ambient Air Quality Criteria	28%	30%
	Annual	Mean	0.7	0.16	sensitive receptor 2	0.89	10.6	Ambient Air Quality Criteria	1.5%	8%
	Annual	Mean	0.9	0.16	sensitive receptor 2	1.05	11	Canadian Ambient Air Quality Standards (2025)	1.5%	9%
Suspended Particulate Matter	24	90th	50.3	45.2	sensitive receptor 13	95.5	120	Ambient Air Quality Criteria	38%	80%
	Annual	Mean	29.6	4.30	sensitive receptor 1	33.8	60	Ambient Air Quality Criteria	7%	56%
Particulate Matter (<10 microns)	24	90th	25.2	17.5	sensitive receptor 13	42.7	50	Ambient Air Quality Criteria	35%	85%
Particulate Matter (<2.5 microns)	24	98th	20.6	4.78	sensitive receptor 13	25.4	27	Canadian Ambient Air Quality Standards	18%	94%
	Annual	Mean	8.15	0.42	sensitive receptor 1	8.57	8.8	Canadian Ambient Air Quality Standards	5%	97%

- Notes: (1) The receptors shown are the locations where the maximum concentrations occurred for each pollutant, based on the modelled results.
- (2) nitrogen dioxide is represented using the Motor Vehicle Emission Simulator emissions rate for nitrous oxides, converted to nitrogen dioxide using the ozone limiting method.
- (3) Air Quality Threshold for fine particulate (Particulate matter (<2.5 microns)) is based on the 98th percentile ambient measurement (24-hour), annually averaged over three years. This standard is referenced from the appropriate year of the Canadian Ambient Air Quality Standards. The Canadian Ambient Air Quality Standards are voluntary objectives.
- (4) 1 hour, 8 hour, and 24 hour ambient concentrations for the contaminants were obtained from the 90th percentile of hourly measurements from representative Air Quality monitoring stations. Annual ambient concentrations for the contaminants were obtained from the mean measurements from the representative Air Quality monitoring stations.
- (5) The annual maximum impacts presented in **Appendix G** reflect the average of all five years of meteorological data, rather than the highest predicted impact of each of the five year's individual annual average. The locations of maximum concentration impacts are shown in isopleth figures compiled in **Appendix H**.
- (6) Exceedances to Air Quality thresholds are shown in **red**. The exceedances presented in this table are the maximum modelled Point of impingement concentrations at sensitive receptor 14 (located along Queens Quay West, 0.49 km from the Study Area) and at sensitive receptor 1 (located along Stadium Road, 0.18 km from the Study Area).

Table 6-2: Maximum Cumulative Concentration for Sensitive Receptor 14 (0.49 km Distance from Study Area)

Contaminant	Averaging Period (hour)	Percentile	Background Concentration (micrograms per cubic metre)	Maximum Modelled Concentration (micrograms per cubic metre)	Cumulative Concentration (micrograms per cubic metre)	Ambient Air Quality Criteria/ Canadian Ambient Air Quality Standards (micrograms per cubic metre)	Standard Source	Max Point of impingement % of Ambient Air Quality Criteria/ Canadian Ambient Air Quality Standards	Cumulative% of Ambient Air Quality Criteria/ Canadian Ambient Air Quality Standards
Nitrogen dioxide	1	90th	51.5	159.3	211	400	Ambient Air Quality Criteria	40%	53%
	1	98th	108.5	159.3	268	83	Canadian Ambient Air Quality Standards (2025)	192%	322%
	24	90th	43.0	55.3	98	200	Ambient Air Quality Criteria	28%	49%
	Annual	Mean	29.2	3.2	32	24	Canadian Ambient Air Quality Standards (2025)	13%	136%
Carbon monoxide	1	90th	410	245	655	36200	Ambient Air Quality Criteria	1%	2%
	8	90th	396	48	444	15700	Ambient Air Quality Criteria	0%	3%
Sulphur dioxide	1	99th	19.9	26.9	46.8	179	Canadian Ambient Air Quality Standards (2025)	15%	26%
	1	90th	1.65	26.9	28.5	106	Ambient Air Quality Criteria	25%	27%
	10 min	90th	2.73	44.4	47.1	178	Ambient Air Quality Criteria	25%	26%
	Annual	Mean	0.72	0.08	0.80	10.6	Ambient Air Quality Criteria	1%	8%
	Annual	Mean	0.88	0.08	0.97	11.0	Canadian Ambient Air Quality Standards (2025)	1%	9%
Suspended particulate matter	24	90th	50.3	31.3	81.6	120	Ambient Air Quality Criteria	26%	68%
	Annual	Mean	29.6	2.0	31.6	60	Ambient Air Quality Criteria	3%	53%
Particulate matter (<10 microns)	24	90th	25.2	12.3	37.4	50	Ambient Air Quality Criteria	25%	75%
Particulate matter (<2.5 microns)	24	98th	20.6	3.4	24.0	27	Canadian Ambient Air Quality Standards	12%	89%
	Annual	Mean	8.15	0.2	8.35	8.8	Canadian Ambient Air Quality Standards	2%	95%

Table 6-3: Maximum Cumulative Concentration for Sensitive Receptor 1 (0.18 km Distance from Study Area)

Contaminant	Averaging Period (hour)	Percentile	Background Concentration (micrograms per cubic metre)	Maximum Modelled Concentration (micrograms per cubic metre)	Cumulative Concentration (micrograms per cubic metre)	Ambient Air Quality Criteria/ Canadian Ambient Air Quality Standards (micrograms per cubic metre)	Standard Source	Max Point of impingement % of Ambient Air Quality Criteria/ Canadian Ambient Air Quality Standards	Cumulative% of Ambient Air Quality Criteria/ Canadian Ambient Air Quality Standards
Nitrogen dioxide	1	90th	51.5	145.0	197	400	Ambient Air Quality Criteria	36%	49%
	1	98th	108.5	145.0	253	83	Canadian Ambient Air Quality Standards (2025)	174%	305%
	24	90th	43.0	63.9	106.9	200	Ambient Air Quality Criteria	32%	53%
	Annual	Mean	29.2	6.87	36.1	24	Canadian Ambient Air Quality Standards (2025)	29%	152%
Carbon monoxide	1	90th	410	204	614	36200	Ambient Air Quality Criteria	1%	2%
	8	90th	396	54.4	451	15700	Ambient Air Quality Criteria	0%	3%
Sulphur dioxide	1	99th	19.9	4.8	24.7	179	Canadian Ambient Air Quality Standards (2025)	3%	14%
	1	90th	1.65	4.8	6.44	106	Ambient Air Quality Criteria	4%	6%
	10 min	90th	2.73	7.9	10.63	178	Ambient Air Quality Criteria	4%	6%
	Annual	Mean	0.72	0.08	0.80	10.6	Ambient Air Quality Criteria	1%	8%
	Annual	Mean	0.88	0.08	0.96	11.0	Canadian Ambient Air Quality Standards (2025)	1%	9%
Suspended particulate matter	24	90th	50.3	41.2	91.5	120.0	Ambient Air Quality Criteria	34%	76%
	Annual	Mean	29.6	4.3	33.9	60.0	Ambient Air Quality Criteria	7%	56%
Particulate matter (<10 microns)	24	90th	25.2	14.8	40	50.0	Ambient Air Quality Criteria	30%	80%
Particulate matter (<2.5 microns)	24	98th	20.6	4.0	24.6	27.0	Canadian Ambient Air Quality Standards	15%	91%
	Annual	Mean	8.15	0.42	8.57	8.80	Canadian Ambient Air Quality Standards	5%	97%

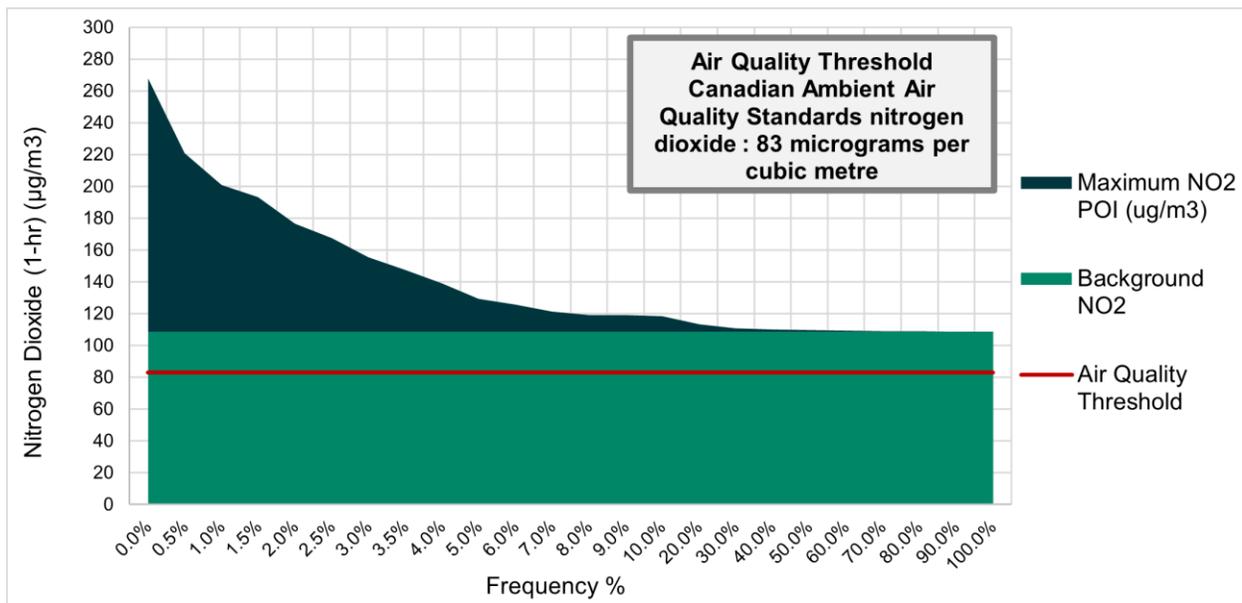
6.1.2 1- Hour Average nitrogen dioxide Impacts for the Construction Phase

Figure 6-1 shows the cumulative frequency analysis curve representing the percentage of time at which the most impacted sensitive receptor 14 is predicted to experience a concentration of nitrogen dioxide averaged over 1-hour, in relation to the Federal Canadian Ambient Air Quality Standards standard.

The figure also illustrates the separate contribution from the Project sources and from the existing (or background) air quality concentrations, highlighting the following points:

- 100% of the hours have a cumulative nitrogen dioxide concentration (1-hour) above the Canadian Ambient Air Quality Standards limit.
- The background level of nitrogen dioxide concentration (1-hour) is 108.5 micrograms per cubic metre and contributes approximately 131% of the Canadian Ambient Air Quality Standards (83 micrograms per cubic metre).
- The concentration of nitrogen dioxide from the Project alone is predicted to exceed the Canadian Ambient Air Quality Standards for less than 2% of the time, based on the cumulative frequency analysis.

Figure 6-1: Cumulative Frequency Analysis Sensitive Receptor 14 1-hour Nitrogen Dioxide



6.2 Construction Air Quality Impacts

The calculated nitrogen dioxide concentrations using the Ozone limiting method for each time averaging period are shown below in **Table 6-4**. The calculated nitrogen dioxide concentration using the Ozone limiting method for the most impacted sensitive and critical receptors are shown in **Appendix F**.

Table 6-4 Nitrogen Dioxide Calculation Using Ozone Limiting Method: Maximum Concentration

Scenario	Averaging Period (hour)	Maximum Modelled Nitrogen Oxides Concentration (parts per billion) ^[2]	Ambient ozone (parts per billion)	Ozone limiting method nitrogen dioxide (parts per billion)	Ozone limiting method nitrogen dioxide (micrograms per cubic metre)	Receptor Location at Maximum Concentration
Construction Phase	1	425	38.0	80.5	159.3	sensitive receptor 14
	24	39.8	34.0	38.0	75.3	sensitive receptor 13
	Annual	3.47	23.9	3.47	6.87	sensitive receptor 1

Notes: (1) Conversion from micrograms per cubic metre to parts per billion uses the molecular weight of nitrogen dioxide (46 g/mol), gas constant (8.314 m³ Pa mol⁻¹ K⁻¹), and standard temperature and pressure of 101.325 Pa and 10 degrees Celsius.

6.3 Summary of Potential Effects and Proposed Mitigation Measures

6.3.1 Summary of Potential Effects – Construction

Emissions from construction activity are temporary and unlikely to have long-lasting effects on the surrounding area. The results of the assessment show that one criteria air contaminant, nitrogen dioxide, exhibited modelled cumulative concentrations above the respective Federal air quality criteria for the 1-hour and annual averaging period at a total of three sensitive receptors (sensitive receptor 1, sensitive receptor 13, and sensitive receptor 14) and two critical receptors (CR2 and CR3). The maximum cumulative concentration results for nitrogen dioxide are presented below, at the two most impacted receptors:

- For the 1-hour averaging period, nitrogen dioxide is 322% of the Canadian Ambient Air Quality Standards (2025) limit at sensitive receptor 14 (Multi-Unit Dwelling, Queens Quay West).

- For the annual averaging period, nitrogen dioxide is 152% of the Canadian Ambient Air Quality Standards (2025) limit at sensitive receptor 1 (Marina, 1 Stadium Road).

The exceedance of nitrogen dioxide for the annual averaging period is primarily due to elevated existing ambient air quality concentration, which exceeds the Federal air quality criteria prior to including the construction contributions.

The 1-hour concentration of nitrogen dioxide from the Project alone is predicted to exceed the Canadian Ambient Air Quality Standards for less than 2% of the time, based on the cumulative frequency analysis. For all other criteria air contaminants, cumulative concentrations remain below applicable standards and criteria, suggesting that construction emissions from the Project alone across all alternatives are unlikely to significantly impact overall air quality within the Air Quality Study Area. **Table 6-5** outlines the potential effects, proposed mitigation measures, and net effects of RESA 1, RESA 2 and RESA 3 within the Air Quality study area, during Construction.

6.3.2 Fugitive Dust – Proposed Mitigation Measures

Implementing good practices including wetting exposed earth areas; covering dust-producing materials during transport; and limiting construction activities during high wind conditions will minimize the impacts of fugitive dust. Example mitigation measures that may be employed by the construction contractor to reduce fugitive dust issues, as part of an Air Quality Management Plan, include:

- Seeding, paving, covering, wetting, or otherwise treating disturbed soil surfaces.
- Utilizing barging for material transport to and from the construction zone, where feasible, to minimize the use of on-road haul trucks. This will reduce vehicle traffic on nearby streets, lowering fugitive dust and emissions near sensitive and critical receptors.
- Minimizing storage and unnecessary transfers of spoils and debris on-site.
- Using wind screens or fences.
- Covering all truckloads of dust-producing material.
- Removing all loose or unsecured debris or materials from empty trucks prior to leaving the site.
- Reducing traffic speeds on any unpaved surfaces.

- Vacuum sweeping or water truck spraying of all paved surfaces and roadways on which equipment and truck traffic enter and leave the construction areas.
- Using wheel washes and truck washes at site egresses.
- Modifying work schedules when weather conditions could lead to adverse impacts (e.g., very dry soil and high winds).
- Fugitive dust from construction activities can be managed through implementation of an Air Quality Management Plan, where mitigation measures are specified for the planned construction activities and implemented on an as-needed basis.

6.3.3 Proposed Mitigation for Construction Activity

Exposure to construction-related emissions will be mitigated by the following:

- Ensuring that mobile equipment is in good condition, properly and regularly maintained, and compliant with applicable Federal and Provincial Regulations for off-road diesel engines.
- Ensuring that all machinery is maintained and operated in accordance with manufacturer's specification.
- Locating stationary equipment (generators, compressors, etc.) as far away from sensitive and critical receptors as practical.
- Minimizing idling time and posting signage to this effect around the construction site.
- Implementing the use of non-chloride dust suppressants.
- Temporary seeding or mulching and compression of bare soil and storage piles to reduce erosion.
- Develop and implement an Air Quality Management Plan for the duration of the Construction phase, which includes practices to minimize combustion emissions and fine particulate release from mobile equipment, materials handling, and wind erosion. The Air quality management plan should:
 - Define the project's air quality impact zone and identify all sensitive and critical receptors within this area.
 - Assess the requirement for continuous monitoring during project construction.
 - Provide mitigation measures and identify requirements for implementation of these measures.

- Ensure that all construction equipment used complies with the latest emissions standards.
- Include explicit commitment to implementation of applicable best practices identified Environment Canada’s *Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities* (Cheminfo Services Inc., 2005) and the Ministry of the Environment, Conservation and Parks’ *Technical Bulletin Management Approaches for Industrial Fugitive Dust Sources*.
- If applicable, include a commitment to follow guidelines on hot mix asphalt outlined in the Ontario Hot Mix Producers Association’s *Environmental Practices Guide: Ontario Hot Mix Asphalt Plants, Fifth Edition* (Ontario Hot Mix Producers Association, 2015).
- Develop a Communications Protocol and a Complaints Protocol in accordance with the Project Agreement.
- Site supervisors during the Construction phase should monitor the site for wind direction and weather conditions to ensure that high-impact activities be reduced when the wind is blowing consistently towards nearby sensitive receptors.
- Site supervisor should also monitor for visible fugitive dust and take action to determine the root-cause to determine proper mitigation. Specific details to this effect should be included in the Air Quality Management Plan.

6.3.4 Summary of Potential Effects – Operation

The RESA 1 alternative does not result in emission reductions during operation. The RESA 2 and RESA 3 alternatives both include improvements that result in some emission reductions. Given the similarities between RESA 2 and RESA 3 in terms of taxiway modifications, RESA 2 is expected to achieve the same reductions in taxiway emissions.

For taxiway operations, annual greenhouse gas emissions (expressed as carbon dioxide equivalent) are projected to decrease from 693 tonnes in 2023 (Current Conditions) to 508 tonnes in 2027 (Future Conditions) for RESA 2 and RESA 3 alternatives. This improvement is primarily driven by enhanced taxiway efficiency, which reduces aircraft idling and taxiing.

On-road vehicle operations for all RESA alternatives are projected to increase the annual CO₂ equivalent emissions from 592 tonnes in 2023 (Current Conditions) to:

- 967 tonnes in 2027 (Future Conditions) for RESA 1, primarily due to the increase in distance traveled from the rerouting of vehicles to a restricted airside perimeter road. Although runway crossings are removed, delays from the control tower remain, resulting in no change to idling times.
- 974 tonnes in 2027 (Future Conditions) for RESA 2, also due to the increase in distance traveled from the rerouting of vehicles to a restricted airside perimeter road. As with RESA 1, delays from the control tower remain, resulting in no change to idling times.
- 891 tonnes in 2027 (Future Conditions) for RESA 3, due to the increase in distance traveled from the rerouting of vehicles to an unrestricted air side perimeter road. However, unlike RESA 1 and RESA 2, this alternative eliminates the need for vehicles to stop at runway crossings, thereby avoiding idling times and partially offsetting the increased emissions associated with longer travel times.

While traffic flow is improved from an operational standpoint, the longer travel distances have a greater effect on greenhouse gas emissions. As a result, on-road vehicle emissions are higher compared to Current Conditions across all alternatives.

Additionally, project contributions of on-road greenhouse gas in the Future year (2027) were assessed relative to the 2021 carbon dioxide equivalent contributions from the Ontario Transportation sector (Natural Resources Canada, 2023). The analysis was detailed in **Table 4-7**, **Table 4-8**, and **Table 4-9**, respectively, and showed that the Project greenhouse gas contributions are negligible compared to the total Ontario Transportation 2021 carbon dioxide equivalent emissions for all alternatives. **Table 6-6** outlines the potential effects, proposed mitigation measures, and net effects of RESA 1, RESA 2 and RESA 3 within the Air Quality study area, during Operation.

Table 6-5: Net Effects Analysis of RESA 1, RESA 2 and RESA 3 for Air Quality – Construction

Air Quality Condition	Potential Effect	Mitigation Measure(s)	Monitoring	Net Effects
<ul style="list-style-type: none"> ■ Changes in Air Quality during Construction (Construction Vehicle Operation and Surface Particulate Disruption). 	<ul style="list-style-type: none"> ■ Potential impacts on air quality. 	<p style="text-align: center;">RESA 1, RESA 2, RESA 3</p> <ul style="list-style-type: none"> ■ Cumulative concentrations at all sensitive and critical receptors within the air quality study area were below the applicable air quality criteria and standards for carbon monoxide, suspended particulate matter, particulate matter (<10 microns) and particulate matter (<2.5 microns). ■ Nitrogen dioxide cumulative concentrations above the respective federal Canadian Ambient Air Quality Standards were observed for the 1-hour and annual averaging period at three sensitive receptors (1, 14, and 13) and two critical receptors (2 and 3). ■ The nitrogen dioxide maximum exceedance for the annual averaging period was observed at one sensitive receptor (Marina on Stadium Road, located 0.18 km from the Billy Bishop Toronto City Airport). The exceedance is primarily due to elevated existing ambient air quality concentrations. ■ The nitrogen dioxide maximum exceedance for the 1-hour averaging period was observed at sensitive receptor 14 (residential located at 401 Queens Quay West, within 0.49 km from the Billy Bishop Toronto City Airport). A cumulative frequency analysis at this location shows that emissions from the Project alone are predicted to exceed the federal Canadian Ambient Air Quality Standards less than 2% of the time. ■ Overall, construction emissions from the Project alone are unlikely to significantly impact air quality within the air quality study area. ■ Odour and dust may cause temporary public annoyance at existing sensitive and critical receptors within the air quality study area during the construction phase. 	<p style="text-align: center;">RESA 1, RESA 2, RESA 3</p> <ul style="list-style-type: none"> ■ Develop an Air Quality Management Plan during detailed design and implement the plan, which will include practices to minimize combustion emissions and fine particulate release from mobile equipment, materials handling, and wind erosion, for the duration of the construction phase. ■ Install screening and/or barriers at practical locations within the air quality study area to decrease wind driven emissions of particulates. ■ Ensure that mobile equipment is in good condition, properly and regularly maintained, and compliant with applicable Federal and Provincial Regulations for off-road diesel engines. ■ Ensure that all machinery is maintained and operated in accordance with manufacturer's specifications. ■ Locate stationary equipment (generators, compressors, etc.) as far away from sensitive and critical receptors as practical. ■ Minimize idling time and posting signage to this effect around the construction site. ■ Implement the use of non-chloride dust suppressants. ■ Temporary seeding or mulching and compression of bare soil and storage piles to reduce erosion. ■ Develop a Communications Protocol and a Complaints Protocol in accordance with the Project agreement. ■ Site supervisors during the construction phase should monitor the site for wind direction and weather conditions to ensure that high-impact activities be reduced when the wind is blowing consistently towards nearby sensitive receptors. ■ Site supervisors should also monitor for visible fugitive dust. Refer to Appendix G Air Quality Assessment Report for the details of the proposed mitigation measures for fugitive dust. 	<p style="text-align: center;">RESA 1, RESA 2, RESA 3</p> <ul style="list-style-type: none"> ■ Low Net Negative Effect. ■ Although construction activities may result in localized odour and dust, these are short-term and unlikely to result in lasting effects on air quality. ■ The development of communication protocols and a Construction Air Quality Management Plan will support mitigation of air emission sources and help reduce public complaints related to dust or odours. ■ Construction activities are unlikely to significantly impact overall air quality, as some exceedances are attributed to elevated baseline concentrations.

Table 6-6: Net Effects Analysis of RESA 1, RESA 2 and RESA 3 for Air Quality – Operation

Air Quality Condition	Potential Effect	Mitigation Measure(s)	Monitoring	Net Effects
<p>■ Changes to Air Quality (New Airside Road and Taxiway Modifications)</p>	<p>■ Potential impacts on air quality.</p>	<p>RESA 1</p> <ul style="list-style-type: none"> ■ For on-road vehicle operations, annual greenhouse gas emissions (expressed as carbon dioxide equivalent) are projected to increase from 592 tonnes in 2023 (Current Conditions) to 967 tonnes in 2027 (Future Conditions). This increase, resulting from the longer travel distance due to the rerouting of vehicles to a new restricted airside road, accounts for only 0.00214% of Ontario’s reported greenhouse gas emissions for the Transportation Sector in 2021. Current vehicle idling times are still present in this alternative. ■ As no taxiway improvements are included in this alternative, no greenhouse gas emissions were estimated for aircraft taxiway operations. <p>RESA 2</p> <ul style="list-style-type: none"> ■ For on-road vehicle operations, annual greenhouse gas emissions are projected to increase from 592 tonnes in 2023 (Current Conditions) to 974 tonnes in 2027 (Future Conditions). This increase, resulting from the longer travel distance due to the rerouting of vehicles to a new restricted airside road, accounts for only 0.00216% of Ontario’s reported greenhouse gas emissions for the Transportation Sector in 2021. As with RESA 1, current vehicle idling times remain the same. ■ For aircraft taxiway operations, annual greenhouse gas emissions are projected to decrease from 693 tonnes in 2023 (Current Conditions) to 508 tonnes in 2027 (Future Conditions) (approximately 30% reduction). The reduction is due to improved taxiway efficiency, resulting in lower emissions. <p>RESA 3</p> <ul style="list-style-type: none"> ■ For on-road vehicle operations, annual greenhouse gas emissions are projected to increase from 592 tonnes in 2023 (Current Conditions) to 891 tonnes in 2027 (Future Conditions). This increase, resulting from the longer travel distance due to the rerouting of vehicles to a new airside road, accounts for only 0.00198% of Ontario’s reported greenhouse gas emissions for the Transportation Sector in 2021. As the new road will be unrestricted, current vehicle idling times will be eliminated which reduces emissions compared to RESA 2. ■ For aircraft taxiway operations, annual greenhouse gas emissions are projected to decrease from 693 tonnes in 2023 (Current Conditions) to 508 tonnes in 2027 (Future Conditions) (approximately 30% reduction). The reduction is due to improved taxiway efficiency, resulting in lower emissions. 	<p>RESA 1, RESA 2</p> <ul style="list-style-type: none"> ■ Implement idling reduction programs to limit vehicle emissions, particularly for trucks, tugs, and other vehicles operating at Billy Bishop Toronto City Airport and along the restricted airside perimeter road. <p>RESA 1, RESA 2, RESA 3</p> <ul style="list-style-type: none"> ■ As most of the vehicles currently access the airport through the east side of the road, optimizing vehicle routing along the airside perimeter road by restricting routine use to the east side only, where feasible, would reduce total travel distances and associated on-road vehicle emissions. 	<p>RESA 1, RESA 2, RESA 3</p> <ul style="list-style-type: none"> ■ Low Net Negative Effect. ■ Increased greenhouse gas emissions associated with the increase in distance traveled from the rerouting of vehicles to a new airside perimeter road which will be longer than the existing runway crossing. However, Project greenhouse gas contributions are around 0.002% which is negligible compared to the total Ontario Transportation 2021 carbon dioxide equivalent (45,000,000 tonnes) emissions for all alternatives. <p>RESA 2, RESA 3</p> <ul style="list-style-type: none"> ■ Low-Moderate Net Positive Effect associated with improved taxiway operation. ■ Decrease in greenhouse gas emissions (approximately 30%) due to improved taxiway operations/ shorter taxi time. <p>RESA 3</p> <ul style="list-style-type: none"> ■ Greater Positive Effect than RESA 2 because of dual operational benefits by reducing both taxiway emissions and on-road vehicle idling.

7. Conclusion

The Air Quality Assessment indicates that the Construction phase of all three alternatives, RESA 1, 2, and 3, will result in some air quality impacts within the Air Quality Study Area.

During construction, nitrogen dioxide is the only criteria air contaminant with modelled cumulative concentrations predicted to exceed the Federal Canadian Ambient Air Quality Standards for the 1-hour and annual averaging period at a total of three sensitive receptors (sensitive receptor 1, sensitive receptor 13, and sensitive receptor 14,) and two critical receptors (CR2 and CR3). The maximum cumulative concentration results for nitrogen dioxide are presented below, at the two most impacted receptors:

- For the 1-hour averaging period, nitrogen dioxide is 322% of the Canadian Ambient Air Quality Standards (2025) limit at sensitive receptor 14 (Multi-Unit Dwelling, Queens Quay West).
- For the annual averaging period, nitrogen dioxide is 152% of the Canadian Ambient Air Quality Standards (2025) limit at sensitive receptor 1 (1 Stadium Road).

The exceedance of nitrogen dioxide for the annual averaging period is primarily due to an elevated existing ambient air quality concentration, which exceeds the Federal Canadian Ambient Air Quality Standards prior to including the construction contributions.

The 1-hour concentration of nitrogen dioxide from the Project alone is predicted to exceed the Federal Canadian Ambient Air Quality Standards for less than 2% of the time, based on the cumulative frequency analysis.

All other criteria air contaminants remain below applicable standards, indicating that emissions from construction activities are not expected to significantly contribute to overall air quality impacts in the Air Quality Study Area.

During operations, the greenhouse gas taxiway emissions are projected to decrease due to the RESA 2 and RESA 3 taxiway modifications. Annual aircraft taxiway greenhouse gas emissions are estimated to decrease from 693 tonnes (2023) to 508 tonnes (2027) due to improved taxiway efficiency and reduced fuel consumption for both RESA 2 and RESA 3 alternatives.

However, for RESA 1, annual on-road vehicle carbon dioxide equivalent emissions are expected to increase from 592 tonnes to 967 tonnes due to the increase in distance traveled from the rerouting of vehicles to the restricted air side perimeter road.

Similarly, for RESA 2, annual on-road vehicle carbon dioxide equivalent emissions are also expected to increase from 592 tonnes to 974 tonnes due to the increase in distance traveled from vehicle rerouting to the restricted air side perimeter road.

For RESA 3, annual on-road vehicle carbon dioxide equivalent emissions are expected to increase from 592 tonnes to 891 tonnes due to the increase in distance traveled as well. However, this alternative results in the lowest on-road emissions among the three alternatives, as idling is eliminated, partially offsetting the increase.

This increase is primarily driven by the extended length of the new air side perimeter road, which increases the total vehicle kilometers traveled. The number of vehicles using the air side road was assumed to not change from the Current Conditions. As a result, on-road vehicle emissions are higher compared to Current Conditions.

It is important to note that while this emission estimate captures the physical expansion of the roadway and the presence or absence of vehicle delays (e.g., controlled runway crossings), it does not fully reflect the broader benefits of improved circulation and more efficient vehicle movement.

From a greenhouse gas emissions perspective, RESA 2 and RESA 3 demonstrate the same results in terms of taxiway emission reductions. However, RESA 3 provides slightly greater overall benefits by reducing both taxiway emissions and on-road idling. While all three alternatives result in increased on-road emissions due to longer travel distances, RESA 3 helps mitigate this increase through the elimination of runway crossing delays.

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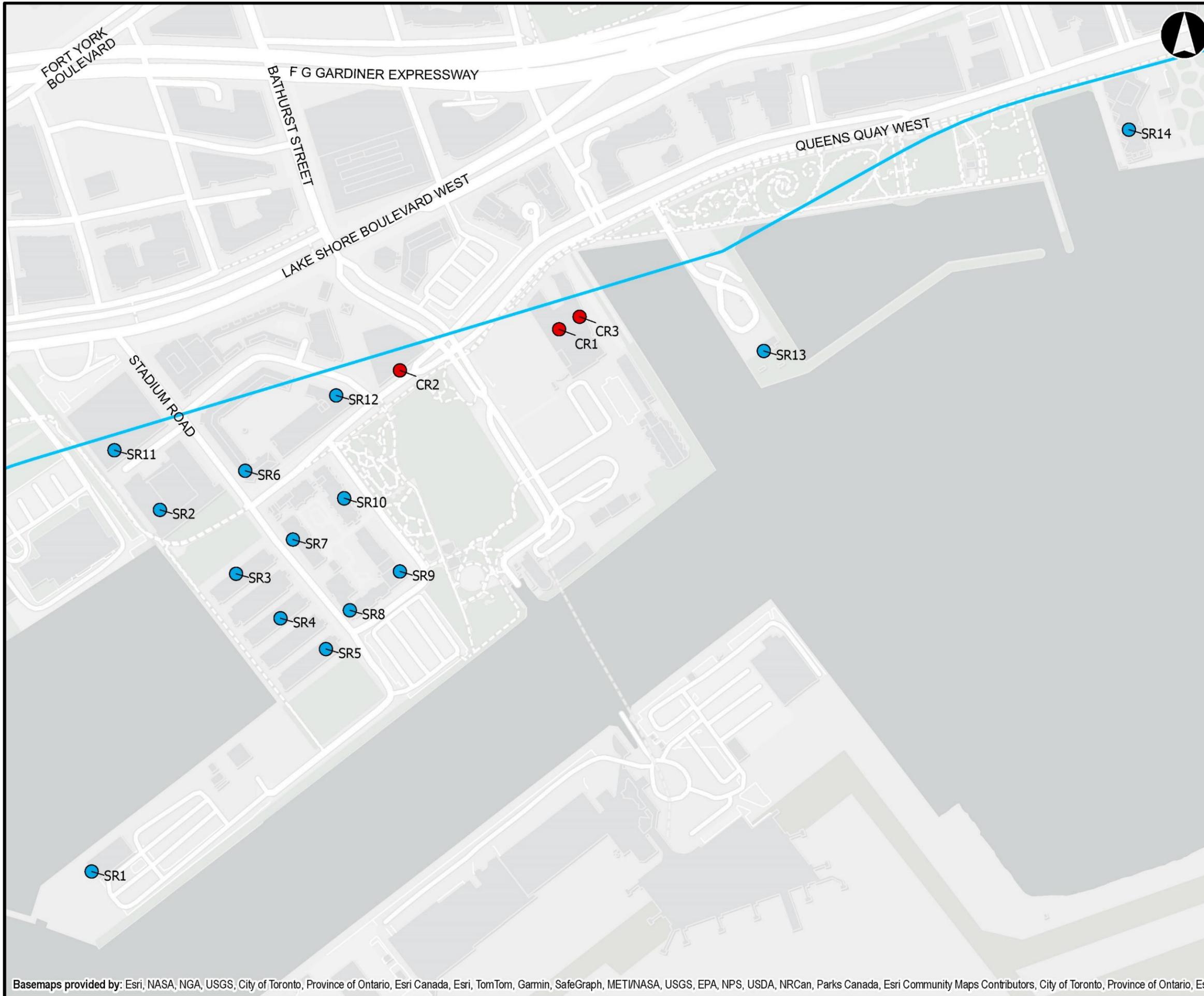
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Appendix A

Figures





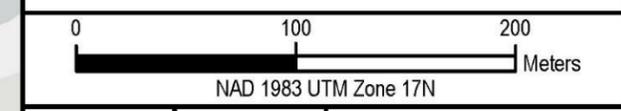
LEGEND

- Critical Receptors
- Sensitive Receptors
- AQ Study Area

Data Sources:
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PortsToronto RESA EA

Critical and Sensitive Receptors



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Figure A1



Appendix B

MOVES 4.0 Output Summary



**B1. Construction Phase –
MOVES 4.0 Output Summary**



Air Quality Impact Assessment

Appendix B

Nonroad Emission Rates: 2026

PollutantID 3 Oxides of Nitrogen (NOx)

fuelTypeID	equipDescription	g/HP-hr
23	Air Compressors	1.5854
23	Bore/Drill Rigs	2.1277
23	Cement & Mortar Mixers	2.8757
23	Concrete/Industrial Saws	2.0232
23	Cranes	0.5121
23	Crawler Tractor/Dozers	0.5896
23	Crushing/Proc. Equipment	1.0432
23	Dumpers/Tenders	3.4551
23	Excavators	0.3639
23	Gas Compressors	0.8572
23	Generator Sets	2.8597
23	Graders	0.2116
23	Hydro Power Units	1.8084
23	Off-Highway Tractors	1.3689
23	Off-highway Trucks	1.3960
23	Other Construction Equipment	1.0606
23	Pavers	0.6473
23	Paving Equipment	1.0339
23	Plate Compactors	4.0647
23	Pressure Washers	2.8368
23	Pumps	2.8667
23	Rollers	0.8779
23	Rough Terrain Forklifts	0.9652
23	Rubber Tire Loaders	0.7267
23	Scrapers	0.3492
23	Signal Boards/Light Plants	3.3201
23	Skid Steer Loaders	3.3190
23	Surfacing Equipment	1.8192
23	Tampers/Rammers	4.2012
23	Tractors/Loaders/Backhoes	2.0090
23	Trenchers	1.8158
23	Welders	3.5093

Air Quality Impact Assessment

Appendix B

Nonroad Emission Rates: 2026

PollutantID	31	Sulphur Dioxide (SO2)
fuelTypeID		g/HP-hr
23	Air Compressors	0.00159
23	Bore/Drill Rigs	0.00162
23	Cement & Mortar Mixers	0.00178
23	Concrete/Industrial Saws	0.00163
23	Cranes	0.00146
23	Crawler Tractor/Dozers	0.00145
23	Crushing/Proc. Equipment	0.00150
23	Dumpers/Tenders	0.00218
23	Excavators	0.00144
23	Gas Compressors	0.00155
23	Generator Sets	0.00178
23	Graders	0.00143
23	Hydro Power Units	0.00162
23	Off-Highway Tractors	0.00148
23	Off-highway Trucks	0.00142
23	Other Construction Equipment	0.00155
23	Pavers	0.00147
23	Paving Equipment	0.00154
23	Plate Compactors	0.00216
23	Pressure Washers	0.00178
23	Pumps	0.00179
23	Rollers	0.00152
23	Rough Terrain Forklifts	0.00154
23	Rubber Tire Loaders	0.00148
23	Scrapers	0.00145
23	Signal Boards/Light Plants	0.00196
23	Skid Steer Loaders	0.00208
23	Surfacing Equipment	0.00163
23	Tampers/Rammers	0.00216
23	Tractors/Loaders/Backhoes	0.00194
23	Trenchers	0.00159
23	Welders	0.00216

**Air Quality Impact Assessment
Appendix B**

Nonroad Emission Rates: 2026

PollutantID	100	PM10
fuelTypeID		g/HP-hr
1	Air Compressors	0.15309
1	Bore/Drill Rigs	0.22252
1	Cement & Mortar Mixers	0.15876
1	Concrete/Industrial Saws	3.79353
1	Cranes	0.07368
1	Crushing/Proc. Equipment	0.45056
1	Dumpers/Tenders	0.12703
1	Generator Sets	0.16706
1	Hydro Power Units	0.22510
1	Other Construction Equipmer	0.06796
1	Pavers	0.11674
1	Paving Equipment	0.34355
1	Plate Compactors	0.53719
1	Pressure Washers	0.18875
1	Pumps	1.13690
1	Rollers	0.11501
1	Rough Terrain Forklift	0.07049
1	Rubber Tire Loaders	0.06933
1	Signal Boards/Light Plants	0.27931
1	Skid Steer Loaders	0.08623
1	Surfacing Equipment	0.16277
1	Tampers/Rammers	9.22825
1	Tractors/Loaders/Backhoes	0.11956
1	Trenchers	0.14699
1	Welders	0.11764

Air Quality Impact Assessment

Appendix B

Nonroad Emission Rates: 2026

PollutantID	100	PM10
fuelTypeID		g/HP-hr
23	Air Compressors	0.05364
23	Bore/Drill Rigs	0.11998
23	Cement & Mortar Mixers	0.19785
23	Concrete/Industrial Saws	0.05295
23	Cranes	0.02549
23	Crawler Tractor/Dozers	0.02299
23	Crushing/Proc. Equipment	0.03257
23	Dumpers/Tenders	0.42006
23	Excavators	0.01530
23	Gas Compressors	0.01300
23	Generator Sets	0.16324
23	Graders	0.01373
23	Hydro Power Units	0.06087
23	Off-Highway Tractors	0.03803
23	Off-highway Trucks	0.01916
23	Other Construction Equipmer	0.07612
23	Pavers	0.02121
23	Paving Equipment	0.04645
23	Plate Compactors	0.22944
23	Pressure Washers	0.15190
23	Pumps	0.17921
23	Rollers	0.03450
23	Rough Terrain Forklifts	0.04245
23	Rubber Tire Loaders	0.03522
23	Scrapers	0.02406
23	Signal Boards/Light Plants	0.13948
23	Skid Steer Loaders	0.36605
23	Surfacing Equipment	0.09747
23	Tampers/Rammers	0.25726
23	Tractors/Loaders/Backhoes	0.24029
23	Trenchers	0.05135
23	Welders	0.32920

**Air Quality Impact Assessment
Appendix B**

Nonroad Emission Rates: 2026

PollutantID	110	PM2.5
fuelTypeID		g/HP-hr
1	Air Compressors	0.14085
1	Bore/Drill Rigs	0.20472
1	Cement & Mortar Mixers	0.14606
1	Concrete/Industrial Saws	3.49006
1	Cranes	0.06778
1	Crushing/Proc. Equipment	0.41451
1	Dumpers/Tenders	0.11687
1	Generator Sets	0.15370
1	Hydro Power Units	0.20709
1	Other Construction Equipment	0.06253
1	Pavers	0.10740
1	Paving Equipment	0.31607
1	Plate Compactors	0.49422
1	Pressure Washers	0.17365
1	Pumps	1.04594
1	Rollers	0.10581
1	Rough Terrain Forklift	0.06485
1	Rubber Tire Loaders	0.06378
1	Signal Boards/Light Plants	0.25697
1	Skid Steer Loaders	0.07933
1	Surfacing Equipment	0.14975
1	Tampers/Rammers	8.48999
1	Tractors/Loaders/Backhoes	0.11000
1	Trenchers	0.13523
1	Welders	0.10823

Air Quality Impact Assessment

Appendix B

Nonroad Emission Rates: 2026

PollutantID	110	PM2.5
fuelTypeID		g/HP-hr
23	Air Compressors	0.05203
23	Bore/Drill Rigs	0.11638
23	Cement & Mortar Mixers	0.19192
23	Concrete/Industrial Saws	0.05136
23	Cranes	0.02472
23	Crawler Tractor/Dozers	0.02230
23	Crushing/Proc. Equipment	0.03159
23	Dumpers/Tenders	0.40745
23	Excavators	0.01484
23	Gas Compressors	0.01261
23	Generator Sets	0.15834
23	Graders	0.01332
23	Hydro Power Units	0.05904
23	Off-Highway Tractors	0.03688
23	Off-highway Trucks	0.01859
23	Other Construction Equipment	0.07384
23	Pavers	0.02057
23	Paving Equipment	0.04505
23	Plate Compactors	0.22256
23	Pressure Washers	0.14734
23	Pumps	0.17384
23	Rollers	0.03346
23	Rough Terrain Forklifts	0.04118
23	Rubber Tire Loaders	0.03417
23	Scrapers	0.02334
23	Signal Boards/Light Plants	0.13530
23	Skid Steer Loaders	0.35507
23	Surfacing Equipment	0.09455
23	Tampers/Rammers	0.24955
23	Tractors/Loaders/Backhoes	0.23308
23	Trenchers	0.04981
23	Welders	0.31932

**B2. Operational Phase –
MOVES 4.0 Output Summary**

CAR Travel Emission Rate Calculation: GHG (2023)

PollutantID	90	Atmospheric CO2	G/VKT
RoadTypeID	AverageSpeedID	HourID	CAR
1	0	1	9956.4
1	0	2	9873.3
1	0	3	9786.9
1	0	4	9786.9
1	0	5	9786.9
1	0	6	9786.9
1	0	7	9786.9
1	0	8	9900.0
1	0	9	10122.3
1	0	10	10244.7
1	0	11	10379.7
1	0	12	10482.3
1	0	13	10516.1
1	0	14	10617.7
1	0	15	10647.5
1	0	16	10605.2
1	0	17	10640.9
1	0	18	10667.6
1	0	19	10600.4
1	0	20	10445.9
1	0	21	10387.9
1	0	22	10260.3
1	0	23	10150.7
1	0	24	10070.5

CAR Travel Emission Rate Calculation: GHG (2023)

PollutantID	90	Atmospheric CO2	G/VKT
RoadTypeID	AverageSpeedID	HourID	CAR
2	2	1	3250.5
2	2	2	3230.0
2	2	3	3208.7
2	2	4	3208.7
2	2	5	3208.7
2	2	6	3208.7
2	2	7	3208.7
2	2	8	3236.6
2	2	9	3291.4
2	2	10	3321.6
2	2	11	3354.8
2	2	12	3380.1
2	2	13	3388.4
2	2	14	3413.5
2	2	15	3420.8
2	2	16	3410.4
2	2	17	3419.2
2	2	18	3425.8
2	2	19	3409.2
2	2	20	3371.1
2	2	21	3356.8
2	2	22	3325.4
2	2	23	3298.4
2	2	24	3278.6

CAR Travel Emission Rate Calculation: GHG (2023)

PollutantID		6		Nitrous Oxide (N2O)	
RoadTypeID	AverageSpeedID	HourID	G/VKT	CAR	
1	0	1	0.56717		
1	0	2	0.56717		
1	0	3	0.56717		
1	0	4	0.56717		
1	0	5	0.56717		
1	0	6	0.56717		
1	0	7	0.56717		
1	0	8	0.56717		
1	0	9	0.56717		
1	0	10	0.56717		
1	0	11	0.56717		
1	0	12	0.56717		
1	0	13	0.56717		
1	0	14	0.56717		
1	0	15	0.56717		
1	0	16	0.56717		
1	0	17	0.56717		
1	0	18	0.56717		
1	0	19	0.56717		
1	0	20	0.56717		
1	0	21	0.56717		
1	0	22	0.56717		
1	0	23	0.56717		
1	0	24	0.56717		

CAR Travel Emission Rate Calculation: GHG (2023)

PollutantID	6	Nitrous Oxide (N2O)		G/VKT
RoadTypeID	AverageSpeedID	HourID	CAR	
2	2	1	0.16877	
2	2	2	0.16877	
2	2	3	0.16877	
2	2	4	0.16877	
2	2	5	0.16877	
2	2	6	0.16877	
2	2	7	0.16877	
2	2	8	0.16877	
2	2	9	0.16877	
2	2	10	0.16877	
2	2	11	0.16877	
2	2	12	0.16877	
2	2	13	0.16877	
2	2	14	0.16877	
2	2	15	0.16877	
2	2	16	0.16877	
2	2	17	0.16877	
2	2	18	0.16877	
2	2	19	0.16877	
2	2	20	0.16877	
2	2	21	0.16877	
2	2	22	0.16877	
2	2	23	0.16877	
2	2	24	0.16877	

CAR Travel Emission Rate Calculation: GHG (2023)

PollutantID	5	Methane (CH4)		G/VKT
RoadTypeID	AverageSpeedID	HourID	CAR	
1	0	1	0.36000	
1	0	2	0.35934	
1	0	3	0.35866	
1	0	4	0.35866	
1	0	5	0.35866	
1	0	6	0.35866	
1	0	7	0.35866	
1	0	8	0.35956	
1	0	9	0.36131	
1	0	10	0.36228	
1	0	11	0.36335	
1	0	12	0.36416	
1	0	13	0.36443	
1	0	14	0.36523	
1	0	15	0.36547	
1	0	16	0.36513	
1	0	17	0.36541	
1	0	18	0.36563	
1	0	19	0.36509	
1	0	20	0.36387	
1	0	21	0.36341	
1	0	22	0.36240	
1	0	23	0.36154	
1	0	24	0.36090	

CAR Travel Emission Rate Calculation: GHG (2023)

PollutantID	5	Methane (CH4)		G/VKT
RoadTypeID	AverageSpeedID	HourID		CAR
2	2	1		0.10961
2	2	2		0.10919
2	2	3		0.10876
2	2	4		0.10876
2	2	5		0.10876
2	2	6		0.10876
2	2	7		0.10876
2	2	8		0.10933
2	2	9		0.11044
2	2	10		0.11105
2	2	11		0.11172
2	2	12		0.11224
2	2	13		0.11241
2	2	14		0.11291
2	2	15		0.11306
2	2	16		0.11285
2	2	17		0.11303
2	2	18		0.11316
2	2	19		0.11283
2	2	20		0.11206
2	2	21		0.11177
2	2	22		0.11113
2	2	23		0.11058
2	2	24		0.11018

TRK Travel Emission Rate Calculation: GHG (2023)

PollutantID	90	Atmospheric CO2		G/VKT
RoadTypeID	AverageSpeedID	HourID		TRK
1	0	1		31322.2
1	0	2		31322.2
1	0	3		31322.2
1	0	4		31322.2
1	0	5		31322.2
1	0	6		31322.2
1	0	7		31322.2
1	0	8		31322.2
1	0	9		31322.2
1	0	10		31322.2
1	0	11		31322.2
1	0	12		31322.2
1	0	13		31322.2
1	0	14		31322.2
1	0	15		31322.2
1	0	16		31322.2
1	0	17		31322.2
1	0	18		31322.2
1	0	19		31322.2
1	0	20		31322.2
1	0	21		31322.2
1	0	22		31322.2
1	0	23		31322.2
1	0	24		31322.2

TRK Travel Emission Rate Calculation: GHG (2023)

PollutantID	90	Atmospheric CO2		G/VKT
RoadTypeID	AverageSpeedID	HourID		TRK
2	2	2	1	12103.7
2	2	2	2	12103.7
2	2	2	3	12103.7
2	2	2	4	12103.7
2	2	2	5	12103.7
2	2	2	6	12103.7
2	2	2	7	12103.7
2	2	2	8	12103.7
2	2	2	9	12103.7
2	2	2	10	12103.7
2	2	2	11	12103.7
2	2	2	12	12103.7
2	2	2	13	12103.7
2	2	2	14	12103.7
2	2	2	15	12103.7
2	2	2	16	12103.7
2	2	2	17	12103.7
2	2	2	18	12103.7
2	2	2	19	12103.7
2	2	2	20	12103.7
2	2	2	21	12103.7
2	2	2	22	12103.7
2	2	2	23	12103.7
2	2	2	24	12103.7

TRK Travel Emission Rate Calculation: GHG (2023)

PollutantID	6 Nitrous Oxide (N2O)			G/VKT
RoadTypeID	AverageSpeedID	HourID		TRK
1	0	1		3.26852
1	0	2		3.26852
1	0	3		3.26852
1	0	4		3.26852
1	0	5		3.26852
1	0	6		3.26852
1	0	7		3.26852
1	0	8		3.26852
1	0	9		3.26852
1	0	10		3.26852
1	0	11		3.26852
1	0	12		3.26852
1	0	13		3.26852
1	0	14		3.26852
1	0	15		3.26852
1	0	16		3.26852
1	0	17		3.26852
1	0	18		3.26852
1	0	19		3.26852
1	0	20		3.26852
1	0	21		3.26852
1	0	22		3.26852
1	0	23		3.26852
1	0	24		3.26852

TRK Travel Emission Rate Calculation: GHG (2023)

PollutantID	6 Nitrous Oxide (N2O)		G/VKT
RoadTypeID	AverageSpeedID	HourID	TRK
2	2	1	0.85551
2	2	2	0.85551
2	2	3	0.85551
2	2	4	0.85551
2	2	5	0.85551
2	2	6	0.85551
2	2	7	0.85551
2	2	8	0.85551
2	2	9	0.85551
2	2	10	0.85551
2	2	11	0.85551
2	2	12	0.85551
2	2	13	0.85551
2	2	14	0.85551
2	2	15	0.85551
2	2	16	0.85551
2	2	17	0.85551
2	2	18	0.85551
2	2	19	0.85551
2	2	20	0.85551
2	2	21	0.85551
2	2	22	0.85551
2	2	23	0.85551
2	2	24	0.85551

TRK Travel Emission Rate Calculation: GHG (2023)

PollutantID	5	Methane (CH4)		G/VKT
RoadTypeID	AverageSpeedID	HourID		TRK
1		0	1	364.96
1		0	2	364.96
1		0	3	364.96
1		0	4	364.96
1		0	5	364.96
1		0	6	364.96
1		0	7	364.96
1		0	8	364.96
1		0	9	364.96
1		0	10	364.96
1		0	11	364.96
1		0	12	364.96
1		0	13	364.96
1		0	14	364.96
1		0	15	364.96
1		0	16	364.96
1		0	17	364.96
1		0	18	364.96
1		0	19	364.96
1		0	20	364.96
1		0	21	364.96
1		0	22	364.96
1		0	23	364.96
1		0	24	364.96

TRK Travel Emission Rate Calculation: GHG (2023)

PollutantID	5	Methane (CH4)		G/VKT
RoadTypeID	AverageSpeedID	HourID		TRK
2		2	1	130.56
2		2	2	130.56
2		2	3	130.56
2		2	4	130.56
2		2	5	130.56
2		2	6	130.56
2		2	7	130.56
2		2	8	130.56
2		2	9	130.56
2		2	10	130.56
2		2	11	130.56
2		2	12	130.56
2		2	13	130.56
2		2	14	130.56
2		2	15	130.56
2		2	16	130.56
2		2	17	130.56
2		2	18	130.56
2		2	19	130.56
2		2	20	130.56
2		2	21	130.56
2		2	22	130.56
2		2	23	130.56
2		2	24	130.56

CAR Travel Emission Rate Calculation: GHG (2027)

PollutantID		90	Atmospheric CO2	
RoadTypeID	AverageSpeedID	HourID	G/VKT	CAR
1	0	1	9174.3	
1	0	2	9097.5	
1	0	3	9017.6	
1	0	4	9017.6	
1	0	5	9017.6	
1	0	6	9017.6	
1	0	7	9017.6	
1	0	8	9122.2	
1	0	9	9327.5	
1	0	10	9440.6	
1	0	11	9565.3	
1	0	12	9660.1	
1	0	13	9691.3	
1	0	14	9785.2	
1	0	15	9812.7	
1	0	16	9773.6	
1	0	17	9806.7	
1	0	18	9831.3	
1	0	19	9769.2	
1	0	20	9626.5	
1	0	21	9572.9	
1	0	22	9455.0	
1	0	23	9353.7	
1	0	24	9279.6	

CAR Travel Emission Rate Calculation: GHG (2027)

PollutantID		90	Atmospheric CO2	
RoadTypeID	AverageSpeedID	HourID	G/VKT	CAR
2	2	1	2977.0	
2	2	2	2958.1	
2	2	3	2938.5	
2	2	4	2938.5	
2	2	5	2938.5	
2	2	6	2938.5	
2	2	7	2938.5	
2	2	8	2964.2	
2	2	9	3014.7	
2	2	10	3042.5	
2	2	11	3073.2	
2	2	12	3096.5	
2	2	13	3104.2	
2	2	14	3127.3	
2	2	15	3134.0	
2	2	16	3124.4	
2	2	17	3132.5	
2	2	18	3138.6	
2	2	19	3123.3	
2	2	20	3088.2	
2	2	21	3075.0	
2	2	22	3046.0	
2	2	23	3021.1	
2	2	24	3002.9	

CAR Travel Emission Rate Calculation: GHG (2027)

PollutantID	6	Nitrous Oxide (N2O)		G/VKT
RoadTypeID	AverageSpeedID	HourID	CAR	
1	0	1	0.59446	
1	0	2	0.59446	
1	0	3	0.59446	
1	0	4	0.59446	
1	0	5	0.59446	
1	0	6	0.59446	
1	0	7	0.59446	
1	0	8	0.59446	
1	0	9	0.59446	
1	0	10	0.59446	
1	0	11	0.59446	
1	0	12	0.59446	
1	0	13	0.59446	
1	0	14	0.59446	
1	0	15	0.59446	
1	0	16	0.59446	
1	0	17	0.59446	
1	0	18	0.59446	
1	0	19	0.59446	
1	0	20	0.59446	
1	0	21	0.59446	
1	0	22	0.59446	
1	0	23	0.59446	
1	0	24	0.59446	

CAR Travel Emission Rate Calculation: GHG (2027)

PollutantID	6	Nitrous Oxide (N2O)		G/VKT
RoadTypeID	AverageSpeedID	HourID	CAR	
2	2	1	0.18110	
2	2	2	0.18110	
2	2	3	0.18110	
2	2	4	0.18110	
2	2	5	0.18110	
2	2	6	0.18110	
2	2	7	0.18110	
2	2	8	0.18110	
2	2	9	0.18110	
2	2	10	0.18110	
2	2	11	0.18110	
2	2	12	0.18110	
2	2	13	0.18110	
2	2	14	0.18110	
2	2	15	0.18110	
2	2	16	0.18110	
2	2	17	0.18110	
2	2	18	0.18110	
2	2	19	0.18110	
2	2	20	0.18110	
2	2	21	0.18110	
2	2	22	0.18110	
2	2	23	0.18110	
2	2	24	0.18110	

CAR Travel Emission Rate Calculation: GHG (2027)

PollutantID	5	Methane (CH4)		G/VKT
RoadTypeID	AverageSpeedID	HourID		CAR
1	0	1		0.30570
1	0	2		0.30513
1	0	3		0.30455
1	0	4		0.30455
1	0	5		0.30455
1	0	6		0.30455
1	0	7		0.30455
1	0	8		0.30532
1	0	9		0.30683
1	0	10		0.30766
1	0	11		0.30857
1	0	12		0.30927
1	0	13		0.30950
1	0	14		0.31019
1	0	15		0.31039
1	0	16		0.31010
1	0	17		0.31035
1	0	18		0.31053
1	0	19		0.31007
1	0	20		0.30902
1	0	21		0.30863
1	0	22		0.30776
1	0	23		0.30702
1	0	24		0.30647

CAR Travel Emission Rate Calculation: GHG (2027)

PollutantID	5	Methane (CH4)		G/VKT
RoadTypeID	AverageSpeedID	HourID	CAR	
2	2	1	0.08615	
2	2	2	0.08582	
2	2	3	0.08548	
2	2	4	0.08548	
2	2	5	0.08548	
2	2	6	0.08548	
2	2	7	0.08548	
2	2	8	0.08593	
2	2	9	0.08681	
2	2	10	0.08729	
2	2	11	0.08783	
2	2	12	0.08823	
2	2	13	0.08837	
2	2	14	0.08877	
2	2	15	0.08889	
2	2	16	0.08872	
2	2	17	0.08886	
2	2	18	0.08897	
2	2	19	0.08870	
2	2	20	0.08809	
2	2	21	0.08786	
2	2	22	0.08735	
2	2	23	0.08692	
2	2	24	0.08660	

TRK Travel Emission Rate Calculation: GHG (2027)

PollutantID	90	Atmospheric CO2	G/VKT
RoadTypeID	AverageSpeedID	HourID	TRK
1	0	1	30080
1	0	2	30080
1	0	3	30080
1	0	4	30080
1	0	5	30080
1	0	6	30080
1	0	7	30080
1	0	8	30080
1	0	9	30080
1	0	10	30080
1	0	11	30080
1	0	12	30080
1	0	13	30080
1	0	14	30080
1	0	15	30080
1	0	16	30080
1	0	17	30080
1	0	18	30080
1	0	19	30080
1	0	20	30080
1	0	21	30080
1	0	22	30080
1	0	23	30080
1	0	24	30080

TRK Travel Emission Rate Calculation: GHG (2027)

PollutantID	90	Atmospheric CO2	G/VKT
RoadTypeID	AverageSpeedID	HourID	TRK
2	2	1	11610
2	2	2	11610
2	2	3	11610
2	2	4	11610
2	2	5	11610
2	2	6	11610
2	2	7	11610
2	2	8	11610
2	2	9	11610
2	2	10	11610
2	2	11	11610
2	2	12	11610
2	2	13	11610
2	2	14	11610
2	2	15	11610
2	2	16	11610
2	2	17	11610
2	2	18	11610
2	2	19	11610
2	2	20	11610
2	2	21	11610
2	2	22	11610
2	2	23	11610
2	2	24	11610

TRK Travel Emission Rate Calculation: GHG (2027)

PollutantID		6 Nitrous Oxide (N2O)		G/VKT
RoadTypeID	AverageSpeedID	HourID	TRK	
1	0	1	3.2152	
1	0	2	3.2152	
1	0	3	3.2152	
1	0	4	3.2152	
1	0	5	3.2152	
1	0	6	3.2152	
1	0	7	3.2152	
1	0	8	3.2152	
1	0	9	3.2152	
1	0	10	3.2152	
1	0	11	3.2152	
1	0	12	3.2152	
1	0	13	3.2152	
1	0	14	3.2152	
1	0	15	3.2152	
1	0	16	3.2152	
1	0	17	3.2152	
1	0	18	3.2152	
1	0	19	3.2152	
1	0	20	3.2152	
1	0	21	3.2152	
1	0	22	3.2152	
1	0	23	3.2152	
1	0	24	3.2152	

TRK Travel Emission Rate Calculation: GHG (2027)

PollutantID		6		Nitrous Oxide (N2O)		G/VKT	
RoadTypeID	AverageSpeedID	HourID	TRK				
2	2	1	0.8493				
2	2	2	0.8493				
2	2	3	0.8493				
2	2	4	0.8493				
2	2	5	0.8493				
2	2	6	0.8493				
2	2	7	0.8493				
2	2	8	0.8493				
2	2	9	0.8493				
2	2	10	0.8493				
2	2	11	0.8493				
2	2	12	0.8493				
2	2	13	0.8493				
2	2	14	0.8493				
2	2	15	0.8493				
2	2	16	0.8493				
2	2	17	0.8493				
2	2	18	0.8493				
2	2	19	0.8493				
2	2	20	0.8493				
2	2	21	0.8493				
2	2	22	0.8493				
2	2	23	0.8493				
2	2	24	0.8493				

TRK Travel Emission Rate Calculation: GHG (2027)

PollutantID		5 Methane (CH4)		G/VKT
RoadTypeID	AverageSpeedID	HourID	TRK	
1	0	1	412.13	
1	0	2	412.13	
1	0	3	412.13	
1	0	4	412.13	
1	0	5	412.13	
1	0	6	412.13	
1	0	7	412.13	
1	0	8	412.13	
1	0	9	412.13	
1	0	10	412.13	
1	0	11	412.13	
1	0	12	412.13	
1	0	13	412.13	
1	0	14	412.13	
1	0	15	412.13	
1	0	16	412.13	
1	0	17	412.13	
1	0	18	412.13	
1	0	19	412.13	
1	0	20	412.13	
1	0	21	412.13	
1	0	22	412.13	
1	0	23	412.13	
1	0	24	412.13	

TRK Travel Emission Rate Calculation: GHG (2027)

PollutantID		5 Methane (CH4)		G/VKT
RoadTypeID	AverageSpeedID	HourID	TRK	
2	2	1	150.45	
2	2	2	150.45	
2	2	3	150.45	
2	2	4	150.45	
2	2	5	150.45	
2	2	6	150.45	
2	2	7	150.45	
2	2	8	150.45	
2	2	9	150.45	
2	2	10	150.45	
2	2	11	150.45	
2	2	12	150.45	
2	2	13	150.45	
2	2	14	150.45	
2	2	15	150.45	
2	2	16	150.45	
2	2	17	150.45	
2	2	18	150.45	
2	2	19	150.45	
2	2	20	150.45	
2	2	21	150.45	
2	2	22	150.45	
2	2	23	150.45	
2	2	24	150.45	

Appendix C

Ambient Air Monitoring Data



Background Ambient Air Quality Calculations

Criteria Air Contaminant	Station ID	Averaging Period (hr)	Units	90th Percentile Concentrations				
				2018	2019	2020	2021	2022
NO2	60435/60445	1	ppb	28.0	29.0	22.0	23.0	26.0
		24	ppb	22.1	24.0	18.9	20.0	22.0
		Annual	ppb	14.7	14.7	12.3	12.7	14.4
CO	60430	1	ppm	0.34	0.35	0.31	0.35	0.36
		8	ppm	0.32	0.34	0.29	0.33	0.35
SO2	60430	1	ppb	0.80	0.50	0.40	0.50	0.60
		0.16667	ppb	1.32	0.83	0.66	0.83	0.99
		Annual	ppb	0.32	0.27	0.19	0.24	0.29
TSP	60435/60445	24	µg/m3	53.6	52.2	47.2	50.3	47.5
		Annual	µg/m3	30.4	28.9	28.2	30.9	29.3
PM10	60435/60445	24	µg/m3	26.8	26.1	23.6	25.1	23.8
PM2.5	60435/60445	24	µg/m3	14.5	14.1	12.7	13.6	12.8
		Annual	µg/m3	8.2	7.8	7.6	8.3	7.9
Ozone	60445/60435	1	ppb	39.0	36.0	38.0	41.0	38.0
		24	ppb	33.1	30.3	33.4	37.3	34.4
		Annual	ppb	23.3	21.6	24.2	26.2	24.3

Parameters	
R (L.kPa/K.mol)	8.3
TEMP (K)	283.2
Pressure (Pa)	101325
Molecular Weights (g/mol)	
NO2	46
CO	28
SO2	64
O3	48
Conversion Factor	
ppb - ug/m3	24.5
ppm - ug/m3	0.02

Background Ambient Air Quality Calculations

Criteria Air Contaminant	Station ID	Averaging Period	Units	98th Percentile Concentrations					99th Percentile Concentrations				
				2018	2019	2020	2021	2022	2018	2019	2020	2021	2022
NO2	60435/60445	1	ppb	52.7	57.9	49.6	50.3	53.7	-	-	-	-	-
		24	ppb						-	-	-	-	-
		Annual	ppb	14.7	14.7	12.3	12.7	14.4	-	-	-	-	-
CO	60430	1	ppm	-	-	-	-	-	-	-	-	-	-
		8	ppm	-	-	-	-	-	-	-	-	-	-
SO2	60430	1	ppb	-	-	-	-	-	7.0	7.5	6.0	7.2	5.7
		0.16667	ppb	-	-	-	-	-					
		Annual	ppb	-	-	-	-	-	-	-	-	-	-
TSP	60435/60445	24	µg/m3	-	-	-	-	-					
		Annual	µg/m3	-	-	-	-	-					
PM10	60435/60445	24	µg/m3	-	-	-	-	-	-	-	-	-	-
PM2.5	60435/60445	24	µg/m3	20.5	19.8	20.0	21.3	18.6	-	-	-	-	-
		Annual	µg/m3	8.2	7.8	7.6	8.3	7.9	-	-	-	-	-
Ozone	60445/60435	1	ppb										
		24	ppb	-	-	-	-	-	-	-	-	-	-
		Annual	ppb	-	-	-	-	-	-	-	-	-	-

Parameters	
R (L.kPa/K.mol)	8.3
TEMP (K)	283.2
Pressure (Pa)	101325
Molecular Weights (g/mol)	
NO2	46
CO	28
SO2	64
O3	48
Conversion Factor	
ppb - ug/m3	24.5
ppm - ug/m3	0.02

Appendix D

Construction Phase Inputs & Emission Inventory



Air Quality Impact Assessment
Appendix D
Non-Road Emissions

Equipment Name	Number of Vehicles/ Equipment	Operating Hours (hr/day)	Engine Power (hp)	Tier (or Age of Engine)	Emission Rates (g/s)					
					NOX (g/s)	CO (g/s)	SO2 (g/s)	TSP=PM10 (g/s)	PM10 (g/s)	PM2.5 (g/s)
Airport Area										
Crane	1	8	282	2	0.04012	0.01046	0.00011	0.00200	0.00200	0.00194
Cable Crowd Piling Rig	1	8	443	3	0.26183	0.08238	0.00020	0.01476	0.01476	0.01432
Excavators	2	8	420	2	0.08491	0.01751	0.00034	0.00357	0.00357	0.00346
Backhoe Loader	1	8	86	2	0.04799	0.03699	0.00005	0.00574	0.00574	0.00557
Skid Steers	1	8	142	2	0.13092	0.10018	0.00008	0.01444	0.01444	0.01401
Concrete/Metal/Asphalt Saw/Coring Machine	2	8	13	2	0.01461	0.00327	0.00001	0.00038	0.00038	0.00037
Generators	2	8	72	2	0.11367	0.04063	0.00007	0.00649	0.00649	0.00629
Vibro-compactors	1	8	131	2	0.03195	0.00775	0.00006	0.00126	0.00126	0.00122
Bulldozer	1	8	603	2	0.09877	0.02080	0.00024	0.00385	0.00385	0.00374
Dump trucks 20 t - last plan	5	8	314	2	0.60882	0.03113	0.00062	0.00836	0.00836	0.00811

5 trucks 10 mins 10 trucks 10 mins	TOTAL for equipment w/o truck	0.825	0.320	0.001	0.052	0.052	0.051
	Idling emissions per side (E=W)	0.190	0.010	0.0002	0.003	0.003	0.003
	Idling emissions at Southern Tip	0.381	0.019	0.0004	0.005	0.005	0.005
trucks + equipment trucks + 2 excavators	East OR West End	1.137	0.336	0.00148	0.057	0.057	0.055
	South Tip	0.465	0.037	0.00072	0.009	0.009	0.009
	Haul Road (assume the same time to travel)	0.228	0.012	0.0002	0.003	0.003	0.003

Air Quality Impact Assessment

Appendix D

Dust Emissions

Dust Emissions Calculations

Time modelled for Construction operations:

8 hours start at 10:59 pm and finish at 6:59 am

Based on # of equipment and type, for the " Shoreline Protection, Breakwater, Sheet Piles & Dock Walls Case." provided by AVIA

Dump Trucks	PM2.5 (g/VKT)	PM10 (g/VKT)	TSP (g/VKT)
Bell	3.81	15.76	82.11
Hydrema 992G (Dump Truck)	2.88	11.89	61.95

Total Emissions West Side g/day	647.30	2675.52	13938.57
Total Emissions East Side g/day	517.84	2140.41	11150.86
	PM2.5 (g/s)	PM10 (g/s)	TSP (g/s)

Total Dump Truck Travelling Emissions - West Side g/s	0.02248	0.09290	0.48398	g/s
Total Dump Truck Travelling Emissions - East Side g/s	0.01798	0.07432	0.38718	

Excavator and Trucks

Emission factor (AP 42, US EPA)	Truck	Excavator
TSP (kg/VKT)	0.181577	0.283760
PM10 (kg/VKT)	0.065368	0.102154
PM2.5 (kg/VKT)	0.003087	0.004824

WEST or EAST Side	PM2.5 (g/s)	PM10 (g/s)	TSP (g/s)
Total Emissions Truck g/s	0.00027	0.00567	0.01576
Total Emissions Excavator g/s	0.00523	0.11084	0.30790

Unloading - Loading of Rock:	X3 (unloading rock from Barge, Loading on trucks and unloading somewhere else)					
	EF TSP (kg/m3)	Emissions (g/s)	with Watering	Emissions (g/s)	with Watering	
Loading (dragline) - TSP	0.0102	0.0883	0.022	0.265		0.066
PM10	0.0036	0.0317	0.008	0.095		0.024
PM2.5		0.00150	0.0004	0.005		0.001

Unloading - Loading of Sand:	At Pile loading on Trucks					
	EF TSP (kg/m3)	Emissions (g/s)	with Watering	Emissions (g/s)	with Watering	
Loading (dragline) - TSP	0.0054	0.3756	0.094	0.563		0.141
PM10	0.0019	0.1346	0.034	0.202		0.050
PM2.5		0.00639	0.0016	0.010		0.002

X3 (unloading from Truck on ONE side, Loading on excavator and unloading somewhere else)

**Air Quality Impact Assessment
Appendix D
Dust Emissions**

Loading/Unloading on each side (West or East)		
	Emissions (g/s)	with Watering
Loading (dragline equation) - TSP	0.828	0.207
PM10	0.297	0.074
PM2.5	0.014	0.004

Unloading - Loading of Sand from self unloading barge:	At Pile loading on Trucks				
	EF TSP (kg/m3)	Emissions (g/s)	with Watering	Emissions (g/s)	with Watering
Loading (dragline equation) - TSP	0.0054	0.4695	0.117	0.939	0.235
PM10	0.0019	0.1683	0.042	0.337	0.084
PM2.5		0.00798	0.0020	0.016	0.004

X2 (loading on conveyor and conveyor drop)

Assume unloading from self unloading barge (loading on conveyor and unload from conveyor)

Total load of barge

20000 t of sand like material

Unload for 48 hours 6 h/day = 8 days

2500 t/day

Bulldozing Operations:			
	PM2.5	PM10	TSP
Bulldozing (kg/h)	0.064	0.086	0.607
Bulldozing (g/s)	0.018	0.024	0.169
with Watering	0.0044	0.0060	0.0421

Emissions Summary - On-site Construction Emissions

WEST or EAST Side	PM2.5 (g/s)	PM10 (g/s)	TSP (g/s)
Total Emissions Dump Truck g/s - West Side	0.022476	0.092900	0.483978
Total Emissions Dump Truck g/s - East Side	0.017981	0.074320	0.387183
Total Emissions Rock handling g/s - controlled	0.001126	0.023742	0.066256
Total Emissions Sand handling g/s - controlled	0.002395	0.050475	0.140861
Total Emissions Sand - Self Unloading Barge g/s - controlled	0.003991	0.084126	0.234768
Total Emissions Bulldozing g/s - controlled	0.004424	0.005963	0.042129
Total Emissions Truck g/s - controlled	0.000067	0.001419	0.003940
Total Emissions Excavator g/s - controlled	0.001309	0.027711	0.076975

TOTAL Emissions on West OR East Volume source 100

m diameter

0.01331

0.19344

0.56493

g/s

Excavator and Trucks

Appendix E

Operational Phase Inputs & Emission Inventory



E1. On-Road Vehicle Emissions



RESA 1

CAR				MOVES Emission Rates (g/vkt - 24hr sum)			2023 Max Emission Rate (kg/year)			MOVES Emission Rates (g/vkt - 24hr sum)			2027 Max Emission Rate (kg/year)		
2023 Data	2027 Data	Current Road Length (m)	Future Road Length (m)	CO2	CH4	N2O	CO2	CH4	N2O	CO2	CH4	N2O	CO2	CH4	N2O
469	469	2601	3916	79626.06	2.66	4.05	33246.05	1.11	1.69	72936.12	2.09	4.35	52473.60	1.51	3.13

Traced based on site layout

TRK				MOVES Emission Rates (g/vkt - 24hr sum)			2023 Max Emission Rate (kg/year)			MOVES Emission Rates (g/vkt - 24hr sum)			2027 Max Emission Rate (kg/year)		
2023 Data	2027 Data	Current Road Length (m)	Future Road Length (m)	CO2	CH4	N2O	CO2	CH4	N2O	CO2	CH4	N2O	CO2	CH4	N2O
1427	1427	2601	3916	290488.6	3133.4	20.5	369032.9	3980.6	26.1	278636.64	3610.72	20.38	609940.6	7903.9	44.6

Traced based on site layout

CAR - Idling			MOVES Emission Rates (g/vkt - 24hr sum)			2023 Max Emission Rate (kg/year)			MOVES Emission Rates (g/vkt - 24hr sum)			2027 Max Emission Rate (kg/year)		
2023 Data	2027 Data	Road Length (m)	CO2	CH4	N2O	CO2	CH4	N2O	CO2	CH4	N2O	CO2	CH4	N2O
469	469	60	245504	8.69	13.61	5181.36	0.18	0.29	226233.49	7.38	14.27	4774.66	0.16	0.30

Traced based on site layout

TRK - Idling			MOVES Emission Rates (g/vkt - 24hr sum)			2023 Max Emission Rate (kg/year)			MOVES Emission Rates (g/vkt - 24hr sum)			2027 Max Emission Rate (kg/year)		
2023 Data	2027 Data	Road Length (m)	CO2	CH4	N2O	CO2	CH4	N2O	CO2	CH4	N2O	CO2	CH4	N2O
1427	1427	60	751734	8759.1	78.4	48272.57	562.46	5.04	721927.84	9891.20	77.16	46358.60	635.16	4.96

Traced based on site layout

TOTAL Annual Emissions - Operational Phase			
2023	CO2 (kg/year)	CH4 (kg/year)	N2O (kg/year)
CAR + TRK	402278.90	3981.75	27.78
CAR + TRK Idling	53453.93	562.65	5.32

TOTAL Annual Emissions - Operational Phase			
2023	CO2 (tonnes/ year)	CH4 (tonnes/ year)	N2O (tonnes/ year)
CAR + TRK	402.279	3.982	0.028
CAR + TRK Idling	53.454	0.563	0.005

SUM	455.73	4.54	0.03
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TOTAL Annual Emissions - Operational Phase			
2027	CO2 (kg/day)	CH4 (kg/day)	N2O (kg/day)
CAR + TRK	662414.23	7905.45	47.74
CAR + TRK Idling	51133.25	635.32	5.26

TOTAL Annual Emissions - Operational Phase			
2027	CO2 (tonnes/ year)	CH4 (tonnes/ year)	N2O (tonnes/ year)
CAR + TRK	662.414	7.905	0.048
CAR + TRK Idling	51.1333	0.6353	0.0053

SUM	713.55	8.54	0.05
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Current Year	
GHG	Annual Emissions (t)
CO2	456
Methane	4.54
N2O	0.033
CO2e	592

Ontario 2021 GHG emissions (t CO2 eq.)

45100000	0.00131%
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Future Year	
GHG	Annual Emissions (t)
CO2	714
Methane	8.54
N2O	0.053
CO2e	967

Ontario 2021 GHG emissions (t CO2 eq.)

45100000	0.00214%
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Carbon dioxide (CO ₂)	1
Methane (CH ₄)	28
Nitrous oxide (N ₂ O)	265

[Transportation Sector Ontario Table 8: GHG Emissions by Transportation Mode | Natural Resources Canada \(nrcan.gc.ca\)](#)

Excludes Air, Rail, Marine, Off-Road

RESA 2

CAR				MOVES Emission Rates (g/vkt - 24hr sum)			2023 Max Emission Rate (kg/year)			MOVES Emission Rates (g/vkt - 24hr sum)			2027 Max Emission Rate (kg/year)		
2023 Data	2027 Data	Current Road Length (m)	Future Road Length (m)	CO2	CH4	N2O	CO2	CH4	N2O	CO2	CH4	N2O	CO2	CH4	N2O
469	469	2601	3963	79626.06	2.66	4.05	33246.05	1.11	1.69	72936.12	2.09	4.35	52875.54	1.52	3.15

Traced based on site layout

TRK				MOVES Emission Rates (g/vkt - 24hr sum)			2023 Max Emission Rate (kg/year)			MOVES Emission Rates (g/vkt - 24hr sum)			2027 Max Emission Rate (kg/year)		
2023 Data	2027 Data	Current Road Length (m)	Future Road Length (m)	CO2	CH4	N2O	CO2	CH4	N2O	CO2	CH4	N2O	CO2	CH4	N2O
1427	1427	2601	3963	290488.6	3133.4	20.5	369032.9	3980.6	26.1	278636.64	3610.72	20.38	614612.6	7964.5	45.0

Traced based on site layout

CAR - Idling			MOVES Emission Rates (g/vkt - 24hr sum)			2023 Max Emission Rate (kg/year)			MOVES Emission Rates (g/vkt - 24hr sum)			2027 Max Emission Rate (kg/year)		
2023 Data	2027 Data	Road Length (m)	CO2	CH4	N2O	CO2	CH4	N2O	CO2	CH4	N2O	CO2	CH4	N2O
469	469	60	245504	8.69	13.61	5181.36	0.18	0.29	226233.49	7.38	14.27	4774.66	0.16	0.30

Traced based on site layout

TRK - Idling			MOVES Emission Rates (g/vkt - 24hr sum)			2023 Max Emission Rate (kg/year)			MOVES Emission Rates (g/vkt - 24hr sum)			2027 Max Emission Rate (kg/year)		
2023 Data	2027 Data	Road Length (m)	CO2	CH4	N2O	CO2	CH4	N2O	CO2	CH4	N2O	CO2	CH4	N2O
1427	1427	60	751734	8759.1	78.4	48272.57	562.46	5.04	721927.84	9891.20	77.16	46358.60	635.16	4.96

Traced based on site layout

TOTAL Annual Emissions - Operational Phase			
2023	CO2 (kg/year)	CH4 (kg/year)	N2O (kg/year)
CAR + TRK	402278.90	3981.75	27.78
CAR + TRK Idling	53453.93	562.65	5.32

TOTAL Annual Emissions - Operational Phase			
2023	CO2 (tonnes/ year)	CH4 (tonnes/ year)	N2O (tonnes/ year)
CAR + TRK	402.279	3.982	0.028
CAR + TRK Idling	53.454	0.563	0.005

SUM	455.73	4.54	0.03
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TOTAL Annual Emissions - Operational Phase			
2027	CO2 (kg/day)	CH4 (kg/day)	N2O (kg/day)
CAR + TRK	667488.14	7966.00	48.11
CAR + TRK Idling	51133.25	635.32	5.26

TOTAL Annual Emissions - Operational Phase			
2027	CO2 (tonnes/ year)	CH4 (tonnes/ year)	N2O (tonnes/ year)
CAR + TRK	667.488	7.966	0.048
CAR + TRK Idling	51.1333	0.6353	0.0053

SUM	718.62	8.60	0.05
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Current Year	
GHG	Annual Emissions (t)
CO2	456
Methane	4.54
N2O	0.033
CO2e	592

Ontario 2021 GHG emissions

(t CO2 eq.)	45100000	0.00131%
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Future Year	
GHG	Annual Emissions (t)
CO2	719
Methane	8.60
N2O	0.053
CO2e	974

Ontario 2021 GHG emissions

(t CO2 eq.)	45100000	0.00216%
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Carbon dioxide (CO ₂)	1
Methane (CH ₄)	28
Nitrous oxide (N ₂ O)	265

[Transportation Sector Ontario Table 8: GHG Emissions by Transportation Mode | Natural Resources Canada \(nrcan.gc.ca\)](#)

Excludes Air, Rail, Marine, Off-Road

RESA 3

CAR				MOVES Emission Rates (g/vkt - 24hr sum)			2023 Max Emission Rate (kg/year)			MOVES Emission Rates (g/vkt - 24hr sum)			2027 Max Emission Rate (kg/year)		
2023 Data	2027 Data	Current Road Length (m)	Future Road Length (m)	CO2	CH4	N2O	CO2	CH4	N2O	CO2	CH4	N2O	CO2	CH4	N2O
469	469	2601	3940	79626.06	2.66	4.05	33246.05	1.11	1.69	72936.12	2.09	4.35	52148.64	1.50	3.11

Traced based on site layout

TRK				MOVES Emission Rates (g/vkt - 24hr sum)			2023 Max Emission Rate (kg/year)			MOVES Emission Rates (g/vkt - 24hr sum)			2027 Max Emission Rate (kg/year)		
2023 Data	2027 Data	Current Road Length (m)	Future Road Length (m)	CO2	CH4	N2O	CO2	CH4	N2O	CO2	CH4	N2O	CO2	CH4	N2O
1427	1427	2601	3940	290488.6	3133.4	20.5	369032.9	3980.6	26.1	278636.64	3610.72	20.38	606163.29	7854.99	44.34

Traced based on site layout

CAR - Idling			MOVES Emission Rates (g/vkt - 24hr sum)			2023 Max Emission Rate (kg/year)			MOVES Emission Rates (g/vkt - 24hr sum)			2027 Max Emission Rate (kg/year)		
2023 Data	2027 Data	Road Length (m)	CO2	CH4	N2O	CO2	CH4	N2O	CO2	CH4	N2O	CO2	CH4	N2O
469	469	60	245504	8.69	13.61	5181.36	0.18	0.29	226233.49	7.38	14.27	No Idling Expected for RESA 3		

Traced based on site layout

TRK - Idling			MOVES Emission Rates (g/vkt - 24hr sum)			2023 Max Emission Rate (kg/year)			MOVES Emission Rates (g/vkt - 24hr sum)			2027 Max Emission Rate (kg/year)		
2023 Data	2027 Data	Road Length (m)	CO2	CH4	N2O	CO2	CH4	N2O	CO2	CH4	N2O	CO2	CH4	N2O
1427	1427	60	751734	8759.1	78.4	48,272.57	562.46	5.04	721927.84	9891.20	77.16	No Idling Expected for RESA 3		

Traced based on site layout

TOTAL Annual Emissions - Operational Phase			
2023	CO2 (kg/year)	CH4 (kg/year)	N2O (kg/year)
CAR + TRK	402278.90	3981.75	27.78
CAR + TRK Idling	53453.93	562.65	5.32

TOTAL Annual Emissions - Operational Phase			
2023	CO2 (tonnes/ year)	CH4 (tonnes/ year)	N2O (tonnes/ year)
CAR + TRK	402.279	3.982	0.028
CAR + TRK Idling	53.454	0.563	0.005

SUM	455.73	4.54	0.03
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TOTAL Annual Emissions - Operational Phase			
2027	CO2 (kg/day)	CH4 (kg/day)	N2O (kg/day)
CAR + TRK	658311.93	7856.49	47.45

TOTAL Annual Emissions - Operational Phase			
2027	CO2 (tonnes/ year)	CH4 (tonnes/ year)	N2O (tonnes/ year)
CAR + TRK	658.312	7.856	0.047

Current Year	
GHG	Annual Emissions (t)
CO2	456
Methane	4.54
N2O	0.033
CO2e	592

Ontario 2021 GHG emissions

(t CO2 eq.)
45100000 **0.00131%**

Future Year	
GHG	Annual Emissions (t)
CO2	658
Methane	7.86
N2O	0.047
CO2e	891

Ontario 2021 GHG emissions

(t CO2 eq.)
45100000 **0.00198%**

Carbon dioxide (CO₂)	1
Methane (CH₄)	28
Nitrous oxide (N₂O)	265

[Transportation Sector Ontario Table 8: GHG Emissions by Transportation Mode | Natural Resources Canada \(nrcan.gc.ca\)](#)

Excludes Air, Rail, Marine, Off-Road

E2. Aircraft Taxiway Emissions



**Air Quality Impact Assessment
Appendix E**

GHG Taxiway Emissions - Q400 Estimate

Average taxiing time per aircraft before	1.64	minutes
Average taxiing time per aircraft after	1.20	minutes
AVIA considered DH8 Aircraft Only		
Number of Arrivals in 2023 landing on Runway 26:	12780	Time Difference (Mins)
75% of Runway 26 Arrivals is using Taxiway B	9585	4,195.55
Number of departures from Runway 08 (100% was Taxiing)	7380	3,230.38
Fuel Use per Aircraft - Arrivals		
Fuel Use per Aircraft - Departure		
Total Fuel Use (lbs)		
Total Fuel Use (litres)		
Total time for 9580 Arrivals BEFORE:	15,712.61	minutes
Total time for 9580 Arrivals AFTER:	11,517.06	minutes
TOTAL TIME SAVED for arrivals (to check):	4,195.55	minutes
Total time for 7380 Departures BEFORE:	12,097.97	minutes
Total time for 7380 Departures AFTER:	8,867.59	minutes
TOTAL TIME SAVED for departures (to check):	3,230.38	minutes
TOTAL TIME for taxiing BEFORE	27,810.57	minutes
TOTAL TIME for taxiing AFTER	20,384.65	minutes

Taxi fuel consumptions given by AVIA (lbs/min)		
Taxi Fuel Consumption	6	One Engine Arr
Taxi Fuel Consumption	12	Two Engine Dep
Jet A	6.74	lb/gallon conversion for Jet Fuel A
		liter/US Gallon
		3.785

Converted to Gallons		BEFORE	35,526.89	US Gallon
		AFTER	26,040.57	US Gallon
Converted to litres TOTALfor Q400 aircraft only		BEFORE	134,469.29	Litres
		AFTER	98,563.57	litres
SMALL AirCraft Estimation like in Saving Calculation (2.09 & 0.4739)		BEFORE	133,189.21	Litres
		AFTER	97,625.29	litres
CHECK		Difference	35,563.92	Litres
TOTAL Litres		BEFORE	267,658.50	Litres
		AFTER	196,188.86	litres
Check			71,469.64	

In 2016 proportion of OTHER fuels and oil was 0.355% 0.003548314

Estimation of savings for other fuels and oil is

NOW - real TOTAL of savings of small, Dash 8 and Other fuels and Oils

Fuel		
	94,275.63	lbs one engine
	69,102.34	lbs one engine
	145,175.62	lbs two engines
	106,411.12	lbs two engines
	239,451.26	lbs
	175,513.46	lbs

	35,526.89	US Gallon
	26,040.57	US Gallon

	134,469.29	Litres
	98,563.57	litres
	133,189.21	Litres
	97,625.29	litres
	35,563.92	Litres
	267,658.50	Litres
	196,188.86	litres
	71,469.64	

Data Source <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=2310026701>

	949.74	litres
	696.14	
	268,608.23	litres
	196,885.00	litres

Emission factor	CO2 (kg/kl)	CH4 (kg/kl)	N2O (kg/kl)
Turbo Fuel	2559.7	0.018	0.0711

GHG	tCO2	tCH4	tN2O	tCO2e
GHG (kg) BEFORE	687556	4.83	19.1	692753
GHG (t) BEFORE	688	0.0048	0.0191	693
GHG (kg) AFTER	503967	3.54	14.0	507775
GHG (t) AFTER	504	0.0035	0.0140	508

GWP	
28	CH4
265	N2O

Appendix F

**OLM Calculations at Sensitive
and Critical Receptors**



OLM Method for NOx conversion to NO2

MW	46.0055
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Table F-1: Conversion of atmospheric NOx to NO₂ using the OLM Method: Maximum Concentration

Modelling Scenario	Averaging Period (hr)	Modelled NOx Concentration (µg/m ³)	Modelled NOx Concentration (ppb)	Background O ₃ Concentration (ppb)	OLM NO ₂ Concentration (ppb)	OLM NO ₂ Concentration (µg/m ³)	Receptor ID
Construction Phase	1	841	425	38.0	80.5	159.3	SR14
	24	78.7	39.8	34.0	38.0	75.3	SR13
	Annual	6.87	3.47	23.9	3.47	6.87	SR1

Table F-2: Conversion of atmospheric NOx to NO₂ using the OLM Method: Sensitive Receptor No. 14

Modelling Scenario	Averaging Period (hr)	Modelled NOx Concentration (µg/m ³)	Modelled NOx Concentration (ppb)	Background O ₃ Concentration (ppb)	OLM NO ₂ Concentration (ppb)	OLM NO ₂ Concentration (µg/m ³)	Receptor ID
Construction Phase	1	841.1	424.78	38.0	80.48	159.3	SR14
	24	55.3	27.9	34.0	27.9	55.3	SR14
	Annual	3.2	1.61	23.9	1.61	3.19	SR14

Table F-3: Conversion of atmospheric NOx to NO₂ using the OLM Method: Sensitive Receptor No. 13

Modelling Scenario	Averaging Period (hr)	Modelled NOx Concentration (µg/m ³)	Modelled NOx Concentration (ppb)	Background O ₃ Concentration (ppb)	OLM NO ₂ Concentration (ppb)	OLM NO ₂ Concentration (µg/m ³)	Receptor ID
Construction Phase	1	771.8	389.8	38.0	76.98	152.4	SR13
	24	78.7	39.8	34.0	38.0	75.27	SR13
	Annual	3.72	1.88	23.9	1.88	3.72	SR13

Table F-4: Conversion of atmospheric NOx to NO₂ using the OLM Method: Sensitive Receptor No. 1

Modelling Scenario	Averaging Period (hr)	Modelled NOx Concentration (µg/m ³)	Modelled NOx Concentration (ppb)	Background O ₃ Concentration (ppb)	OLM NO ₂ Concentration (ppb)	OLM NO ₂ Concentration (µg/m ³)	Receptor ID
Construction Phase	1	697.9	352.5	38.0	73.2	145.0	SR1
	24	63.9	32.29	34.0	32.3	63.9	SR1
	Annual	6.87	3.471	23.9	3.47	6.87	SR1

Table F-5: Conversion of atmospheric NOx to NO₂ using the OLM Method: Critical Receptor No. 3

Modelling Scenario	Averaging Period (hr)	Modelled NOx Concentration (µg/m ³)	Modelled NOx Concentration (ppb)	Background O ₃ Concentration (ppb)	OLM NO ₂ Concentration (ppb)	OLM NO ₂ Concentration (µg/m ³)	Receptor ID
Construction Phase	1	629.7	318.0	38.0	69.80	138.2	CR3
	24	54.8	27.7	34.0	27.7	54.8	CR3
	Annual	3.37	1.70	23.9	1.70	3.37	CR3

Table F-6: Conversion of atmospheric NOx to NO₂ using the OLM Method: Critical Receptor No. 2

Modelling Scenario	Averaging Period (hr)	Modelled NOx Concentration (µg/m ³)	Modelled NOx Concentration (ppb)	Background O ₃ Concentration (ppb)	OLM NO ₂ Concentration (ppb)	OLM NO ₂ Concentration (µg/m ³)	Receptor ID
Construction Phase	1	475.0	239.9	38.0	62.0	122.7	CR2
	24	40.7	20.5	34.0	20.5	40.7	CR2
	Annual	3.20	1.62	23.9	1.62	3.20	CR2

Appendix G

**Maximum Concentrations at
Sensitive and Critical Receptors**



Maximum Concentration Results (1-hour)						Maximum Concentration Results (24-hour)							
CO	Receptor ID	NOx	Receptor ID	SO2	Receptor ID	CO	Receptor ID	NOx	Receptor ID	SO2	Receptor ID		
204.19051	SR1	697.865	SR1	4.78401	SR1	18.15594	SR1	63.93405	SR1	0.92682	SR1		
135.42824	SR2	467.428	SR2	26.02798	SR2	14.90386	SR2	52.27742	SR2	3.20034	SR2		
162.45194	SR3	554.406	SR3	4.16474	SR3	14.95154	SR3	52.7385	SR3	0.68982	SR3		
170.91633	SR4	585.117	SR4	4.15875	SR4	12.87421	SR4	46.03133	SR4	0.67366	SR4		
169.69271	SR5	582.745	SR5	4.36897	SR5	14.8773	SR5	50.97556	SR5	0.63036	SR5		
170.69693	SR6	581.068	SR6	3.6753	SR6	12.58067	SR6	43.98465	SR6	0.60651	SR6		
167.24569	SR7	574.130	SR7	3.80317	SR7	16.95531	SR7	59.19823	SR7	0.65706	SR7		
187.99253	SR8	641.323	SR8	3.89348	SR8	16.64483	SR8	58.64801	SR8	0.62513	SR8		
188.51100	SR9	645.824	SR9	19.66106	SR9	19.84617	SR9	68.86605	SR9	1.90821	SR9		
181.25191	SR10	616.927	SR10	9.44762	SR10	14.24314	SR10	49.82379	SR10	1.162	SR10		
151.87307	SR11	519.842	SR11	23.40249	SR11	14.00892	SR11	47.8035	SR11	2.2534	SR11		
146.09488	SR12	498.576	SR12	17.247	SR12	15.94546	SR12	54.79393	SR12	1.20715	SR12		
226.69184	SR13	771.850	SR13	3.59108	SR13	22.70399	SR13	78.74863	SR13	0.21869	SR13		
244.81090	SR14	841.084	SR14	26.85726	SR14	16.05767	SR14	55.2528	SR14	1.92225	SR14		
180.70154	CR1	614.763	CR1	3.83422	CR1	15.39963	CR1	52.99338	CR1	0.41802	CR1		
139.65257	CR2	474.993	CR2	30.30184	CR2	11.79773	CR2	40.68372	CR2	3.29625	CR2		
184.10683	CR3	629.683	CR3	3.53251	CR3	15.96061	CR3	54.80241	CR3	0.40281	CR3		
MAX SR	244.81	SR14	841.08	SR14	26.86	SR14	MAX SR	22.70	SR13	78.75	SR13	3.20	SR2
MAX CR	184.11	CR3	629.68	CR3	30.30	CR2	MAX CR	15.96	CR3	54.80	CR3	3.30	CR2
MAX Conc.	244.81	SR14	841.08	SR14	30.30	CR2	MAX Conc.	22.70	SR13	78.75	SR13	3.30	CR2

Maximum Concentration Results (24-hour)						Maximum Concentration Results (Annual)				
TSP	Receptor ID	PM10	Receptor ID	PM2.5	Receptor ID	NOx	Receptor ID	SO2	Receptor ID	
41.17532	SR1	14.79572	SR1	4.03025	SR1	6.87209	SR1	0.07544	SR1	
31.33012	SR2	11.77085	SR2	3.21897	SR2	3.66368	SR2	0.16284	SR2	
31.9704	SR3	11.91082	SR3	3.25676	SR3	4.14722	SR3	0.05718	SR3	
28.74121	SR4	10.48275	SR4	2.8654	SR4	4.49743	SR4	0.0621	SR4	
29.11502	SR5	11.25572	SR5	3.09606	SR5	4.85194	SR5	0.06686	SR5	
26.31891	SR6	9.90136	SR6	2.70687	SR6	3.56036	SR6	0.0384	SR6	
35.03223	SR7	13.28611	SR7	3.63231	SR7	4.03032	SR7	0.04326	SR7	
35.43704	SR8	13.24116	SR8	3.6188	SR8	4.61868	SR8	0.04894	SR8	
40.2415	SR9	15.41563	SR9	4.21375	SR9	4.42861	SR9	0.1185	SR9	
29.59074	SR10	11.18053	SR10	3.05917	SR10	3.81275	SR10	0.07695	SR10	
26.77327	SR11	10.58954	SR11	2.89326	SR11	3.25363	SR11	0.13298	SR11	
31.22584	SR12	12.14984	SR12	3.32779	SR12	3.0111	SR12	0.09379	SR12	
45.22903	SR13	17.51395	SR13	4.78404	SR13	3.71636	SR13	0.03236	SR13	
31.32795	SR14	12.25999	SR14	3.34978	SR14	3.18758	SR14	0.08131	SR14	
30.2964	CR1	11.80225	CR1	3.22417	CR1	3.34871	CR1	0.02983	CR1	
24.10868	CR2	9.03772	CR2	2.47524	CR2	3.19989	CR2	0.14028	CR2	
31.18885	CR3	12.18966	CR3	3.33066	CR3	3.37397	CR3	0.03008	CR3	
45.23	SR13	17.51	SR13	4.78	SR13	MAX SR	6.87	SR1	0.16	SR2
31.19	CR3	12.19	CR3	3.33	CR3	MAX CR	3.37	CR3	0.14	CR2
45.23	SR13	17.51	SR13	4.78	SR13	MAX Conc.	6.87	SR1	0.16	SR2

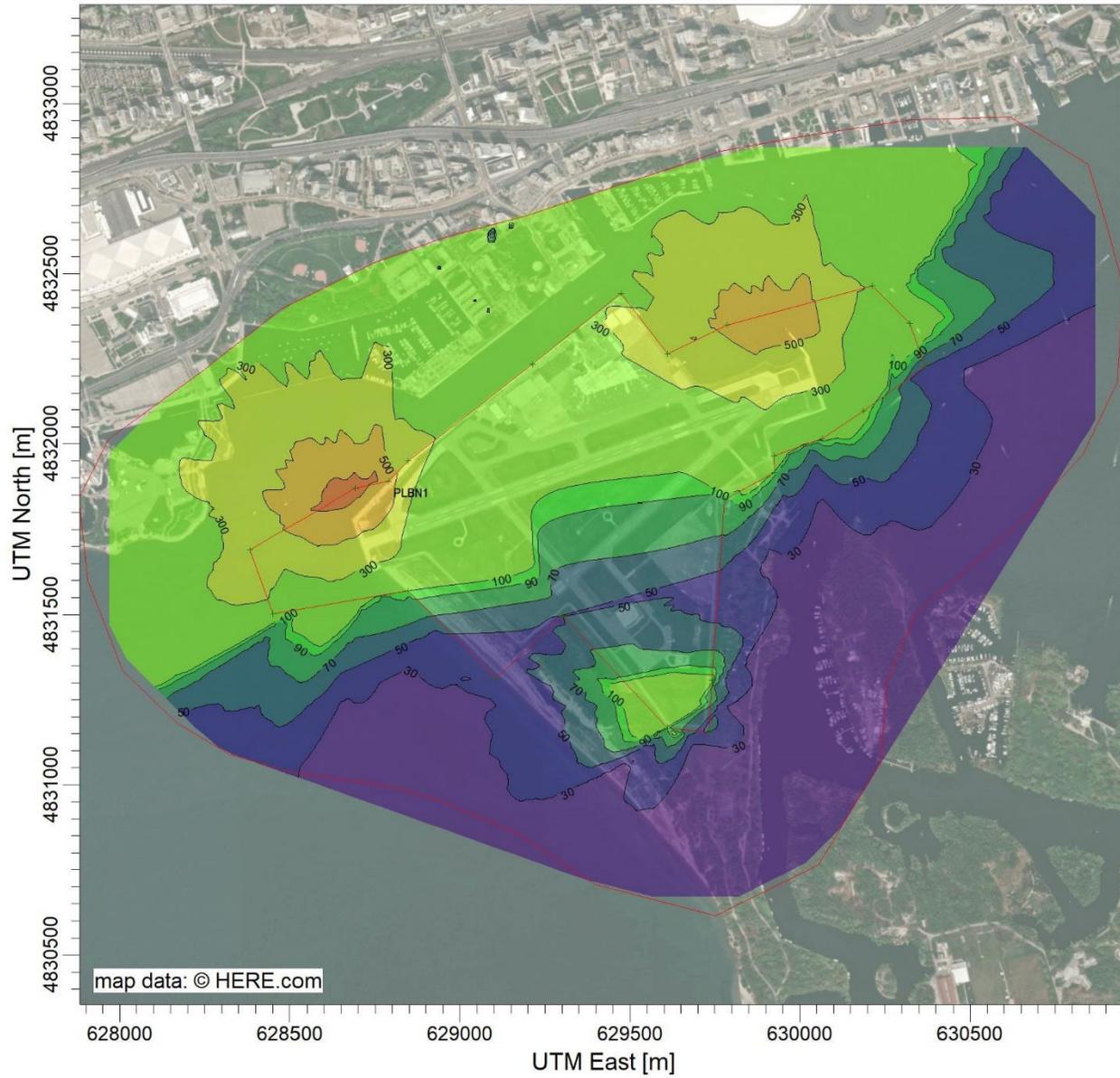
Maximum Concentration Results (Annual)				Maximum Concentration Results (8-hour)		
TSP	Receptor ID	PM2.5	Receptor ID	CO	Receptor ID	
4.29518	SR1	0.41787	SR1	54.3842	SR1	
2.36176	SR2	0.22297	SR2	44.41011	SR2	
2.65903	SR3	0.25202	SR3	44.52622	SR3	
2.87854	SR4	0.27323	SR4	38.27251	SR4	
3.10187	SR5	0.29481	SR5	44.55807	SR5	
2.29717	SR6	0.21649	SR6	37.54606	SR6	
2.58897	SR7	0.24488	SR7	50.54693	SR7	
2.95646	SR8	0.28058	SR8	49.58392	SR8	
2.83643	SR9	0.26883	SR9	59.3165	SR9	
2.44029	SR10	0.23101	SR10	40.19085	SR10	
2.11376	SR11	0.19631	SR11	41.98943	SR11	
1.93424	SR12	0.18213	SR12	45.85676	SR12	
2.39577	SR13	0.22535	SR13	68.00779	SR13	
2.0267	SR14	0.19274	SR14	48.04681	SR14	
2.17035	CR1	0.20352	CR1	37.29997	CR1	
2.05608	CR2	0.19362	CR2	34.07347	CR2	
2.18084	CR3	0.2049	CR3	38.11722	CR3	
MAX SR	4.30	SR1	0.42	SR1	68.01	SR13
MAX CR	2.18	CR3	0.20	CR3	38.12	CR3
MAX Conc.	4.30	SR1	0.42	SR1	68.01	SR13

Appendix H

Isopleth Figures –
Construction Phase



Carbon Monoxide (CO) - 1HR



ug/m³

791

700 **5725**

500 **Concentration**

300 **791 ug/m³**

100

90

70

50

30

11

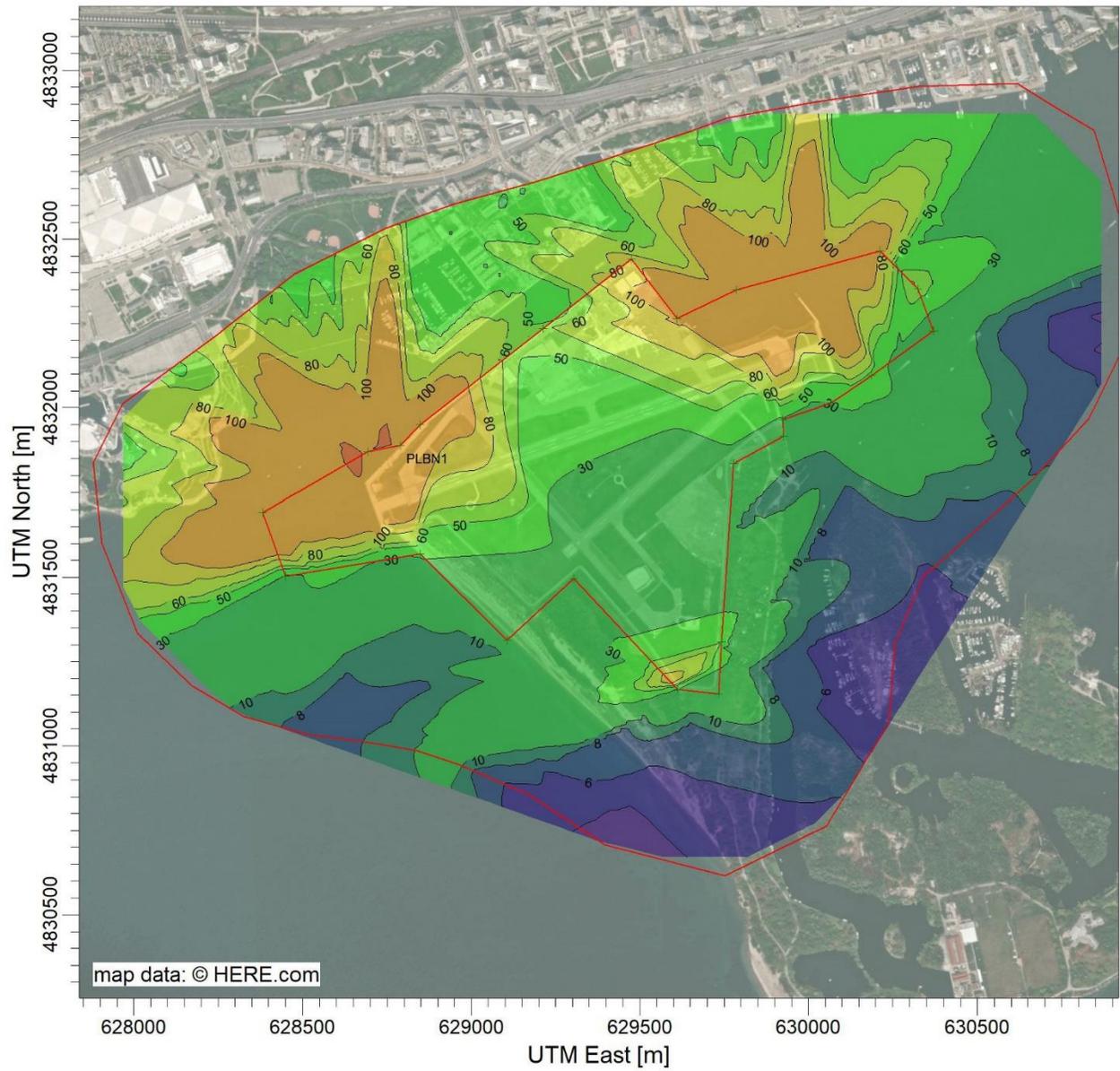
PLOT FILE OF HIGH 1ST HIGH 1-HR VALUES FOR SOURCE GROUP: ALL

Max: 791 [ug/m³] at (628649.18, 4831851.21)

SCALE: 1:20,000

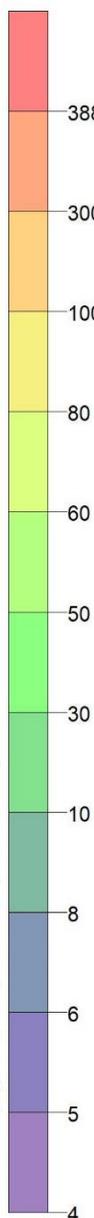
0 0.5 km

Carbon Monoxide (CO) - 8HR



PLOT FILE OF HIGH 1ST HIGH 8-HR VALUES FOR SOURCE GROUP: ALL

Max: 388 [ug/m³] at (628649.18, 4831851.21)



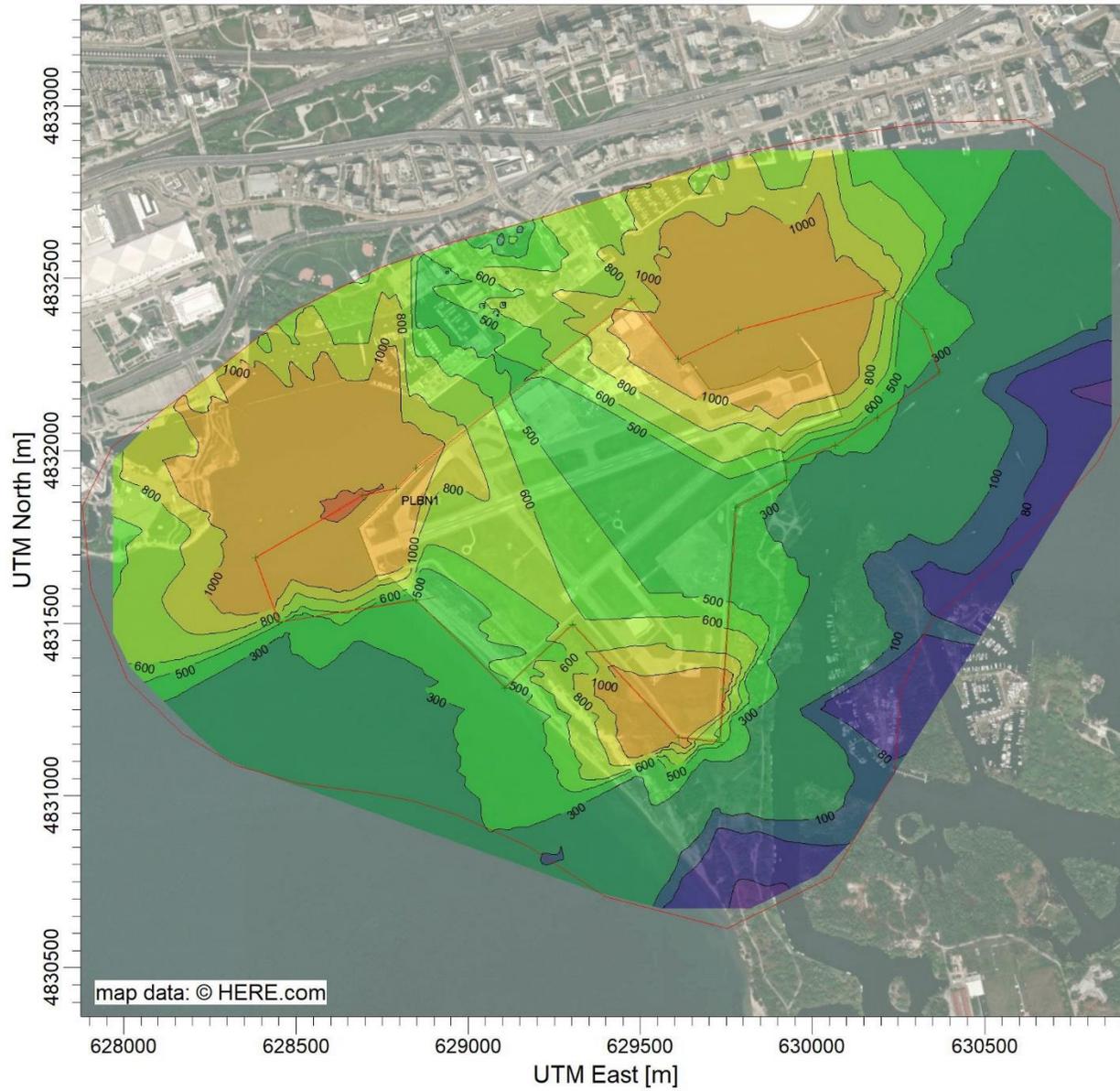
7

5725

Concentration

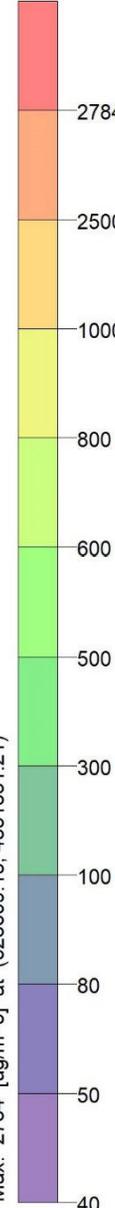
388 ug/m³

Nitrogen Oxides (NOX) - 1HR



ug/m³

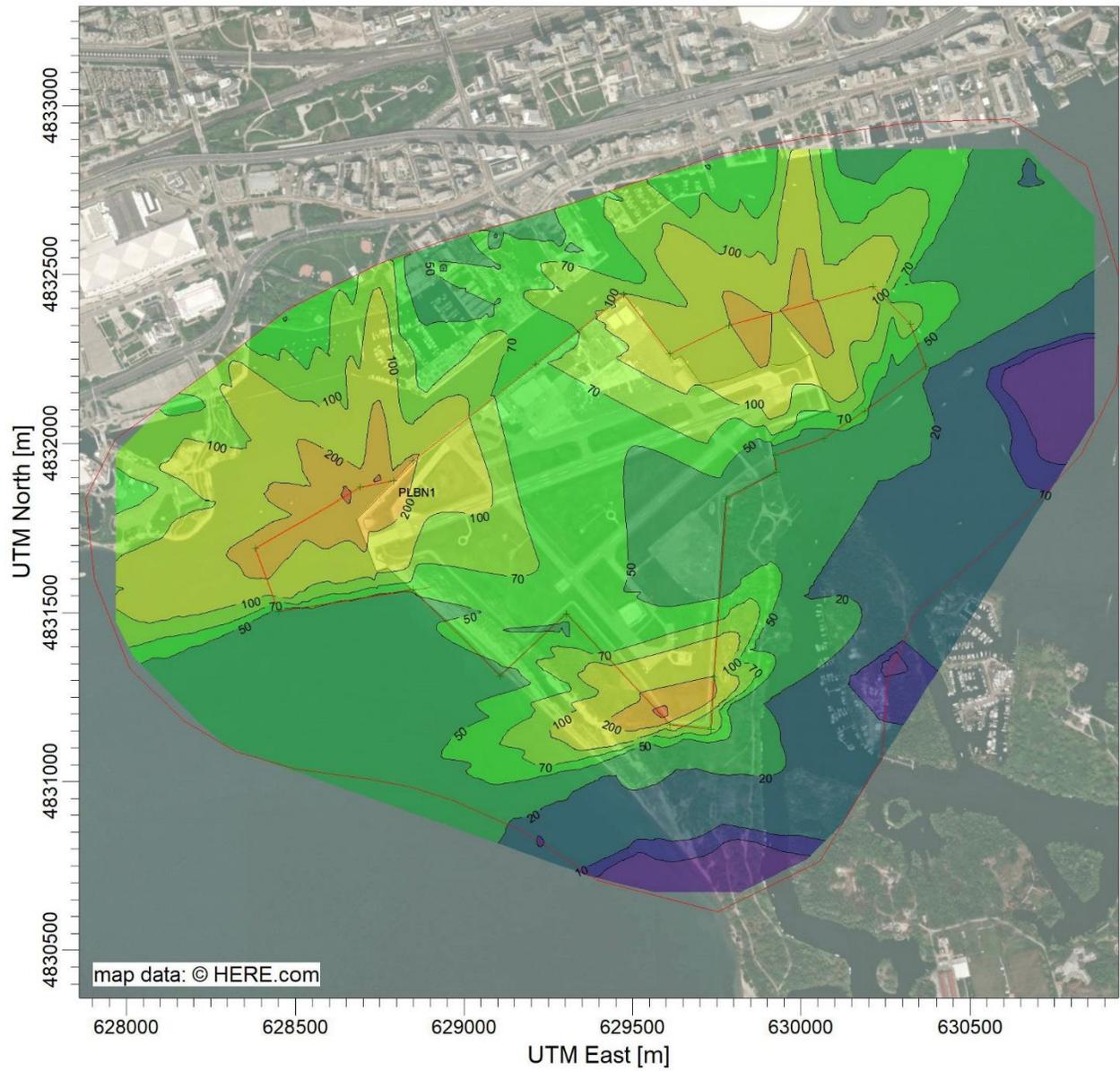
PLOT FILE OF HIGH 1ST HIGH 1-HR VALUES FOR SOURCE GROUP: ALL
 Max: 2784 [ug/m³] at (628609.18, 4831831.21)



7
5725
Concentration
2784 ug/m³

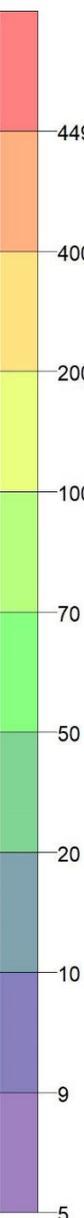
SCALE: 1:20,000
 0 0.5 km

Nitrogen Oxides (NOX) - 24HR

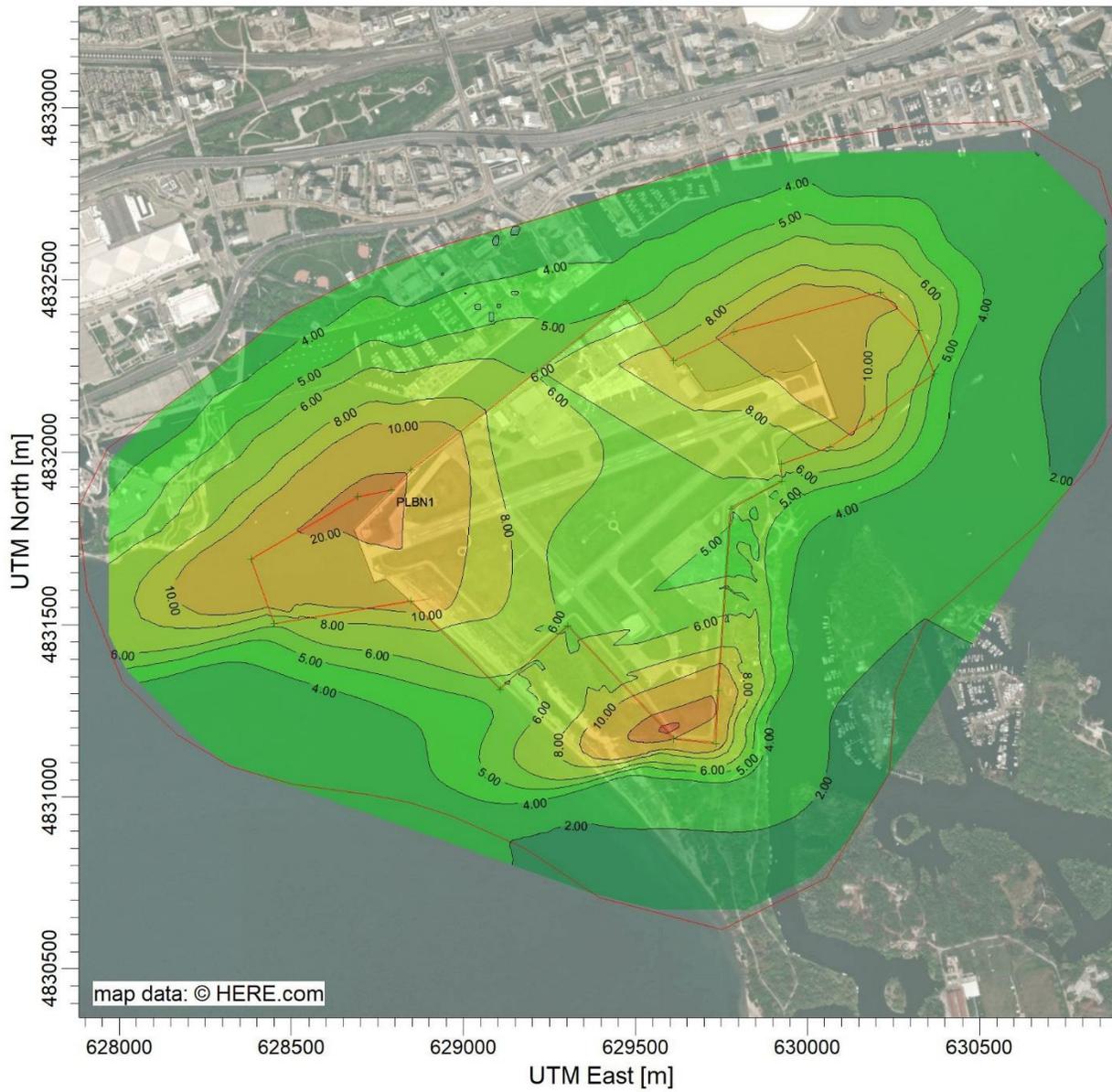


PLOT FILE OF HIGH 1ST HIGH 24-HR VALUES FOR SOURCE GROUP: ALL

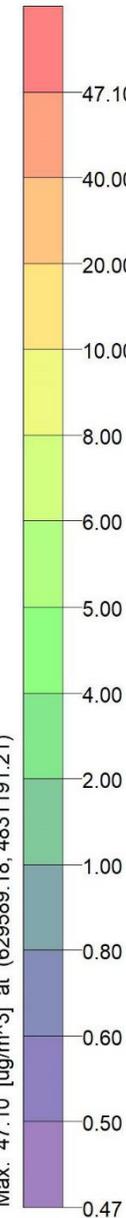
Max: 449 [ug/m³] at (628649.18, 4831851.21)



Nitrogen Oxides (NOX) - Annual

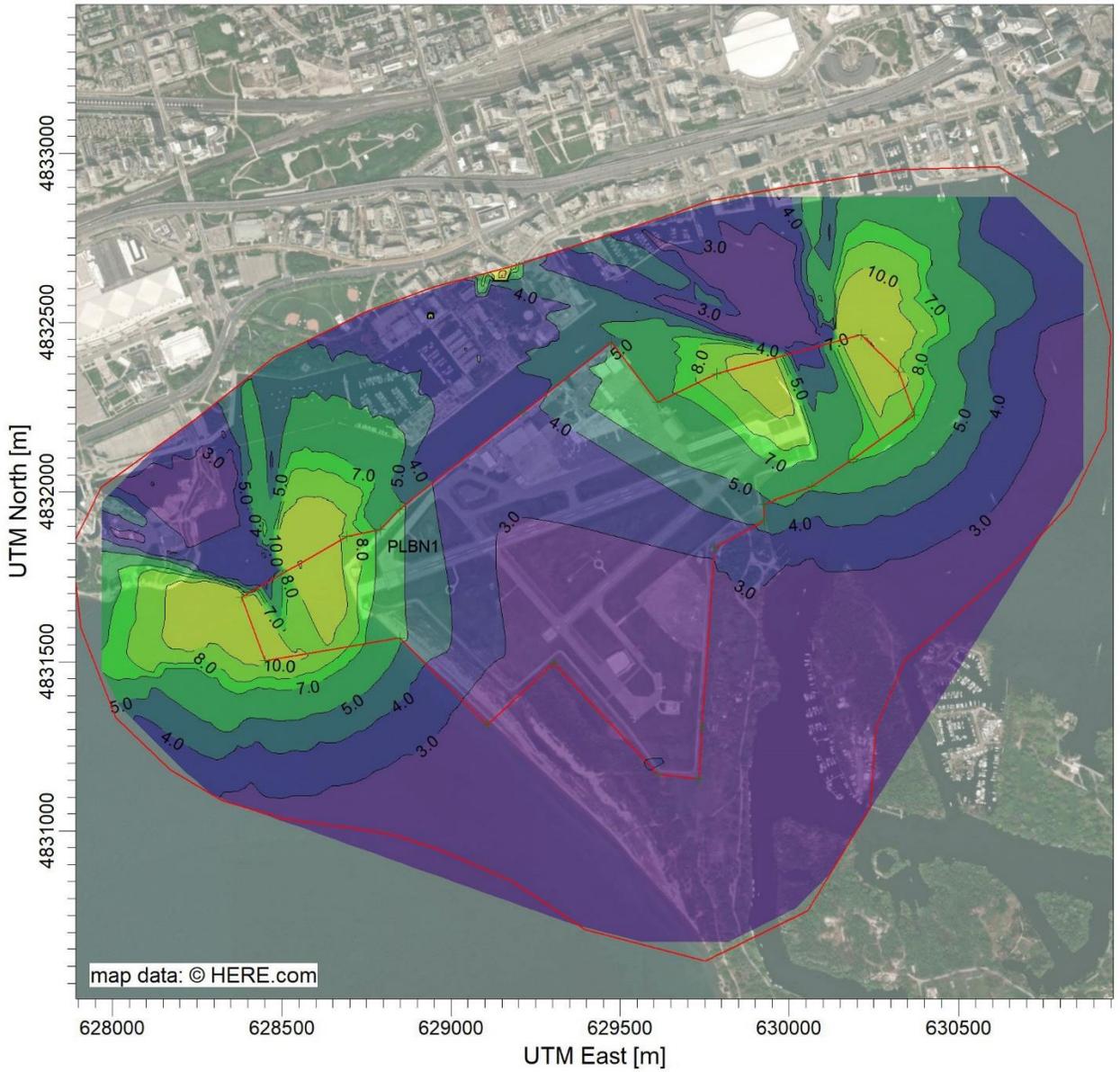


PLOT FILE OF ANNUAL VALUES AVERAGED ACROSS 5 YEARS FOR SOURCE GROUP: ALL
 Max: 47.10 [ug/m^3] at (629589.18, 4831191.21)

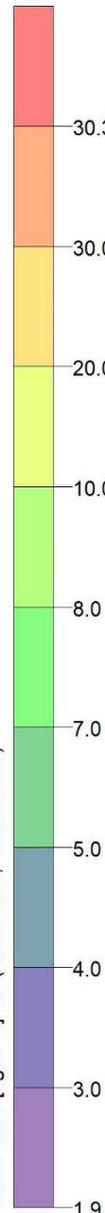


7
5725
Concentration
47.10 ug/m^3

Sulphur Dioxide (SO2) - 1HR

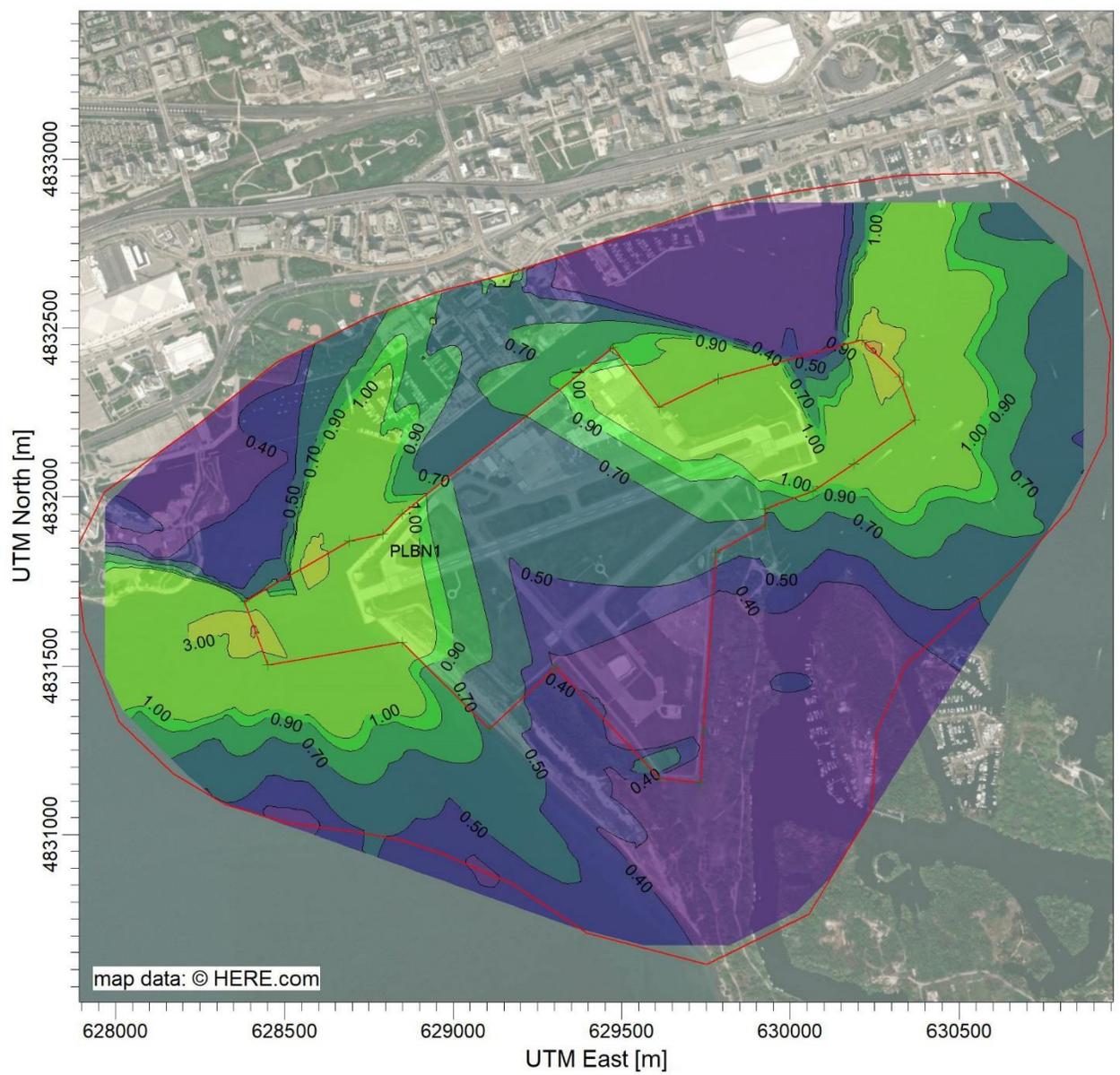


PLOT FILE OF HIGH 1ST HIGH 1-HR VALUES FOR SOURCE GROUP: ALL
 Max: 30.3 [$\mu\text{g}/\text{m}^3$] at (629150.00, 4832638.00)

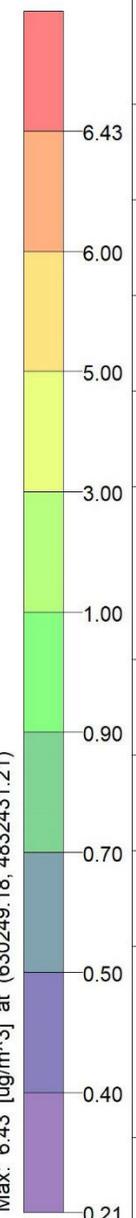


7
5725
Concentration
30.3 $\mu\text{g}/\text{m}^3$
SCALE: 1:20,000
0 0.5 km

Sulphur Dioxide (SO2) - 24HR



PLOT FILE OF HIGH 1ST HIGH 24-HR VALUES FOR SOURCE GROUP: ALL
 Max: 6.43 [ug/m³] at (630249.18, 4832431.21)



7

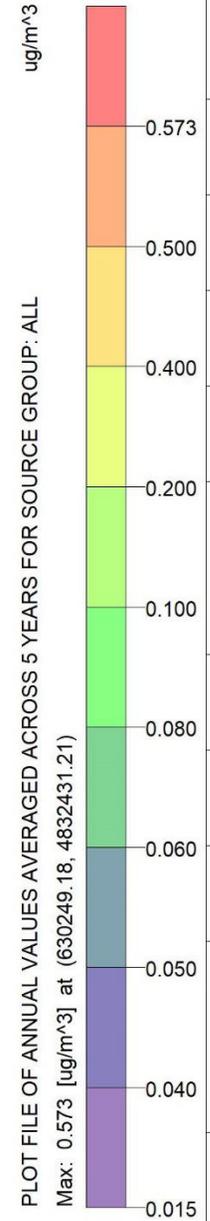
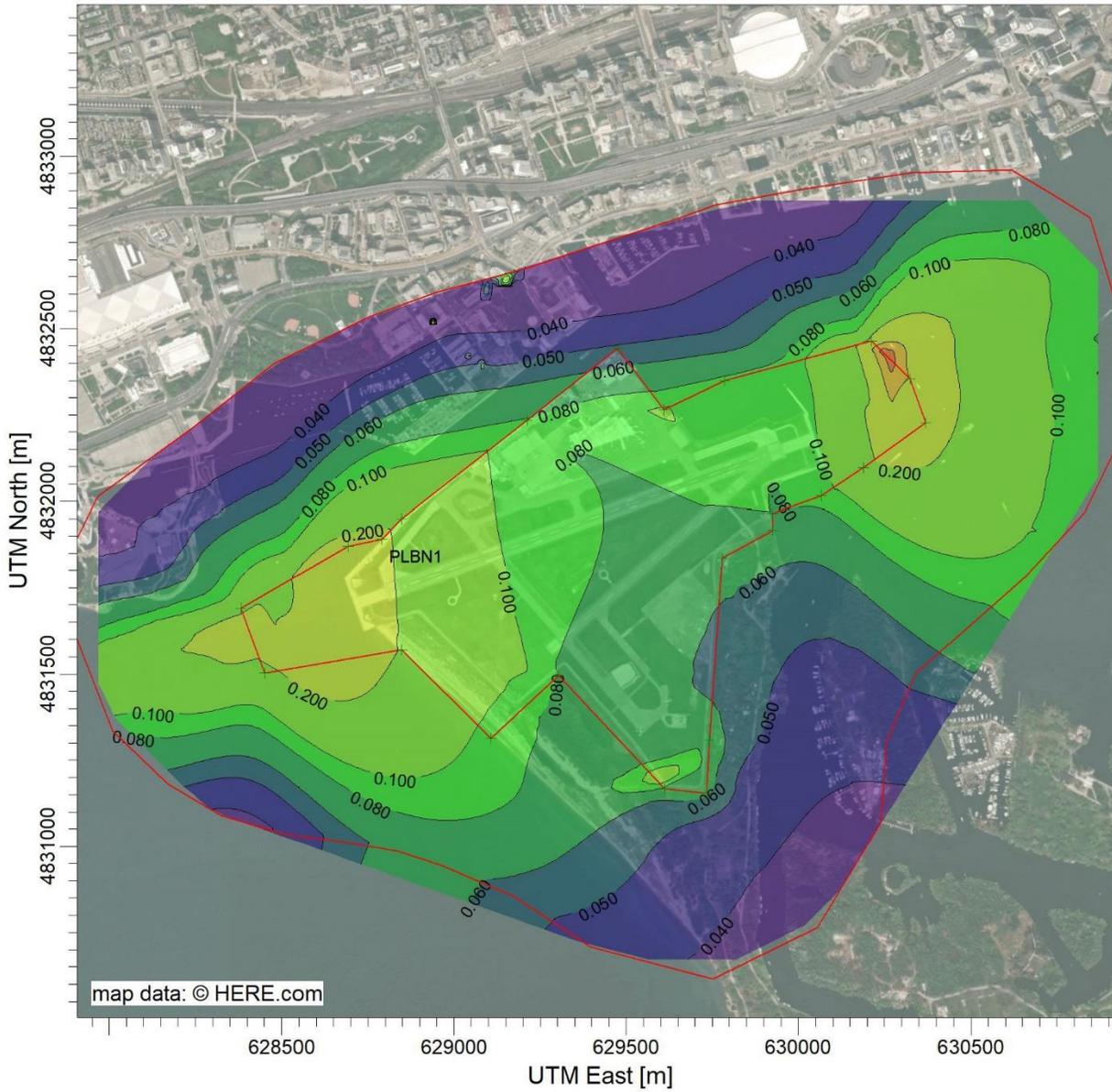
5725

Concentration

6.43 ug/m³



Sulphur Dioxide (SO2) - Annual



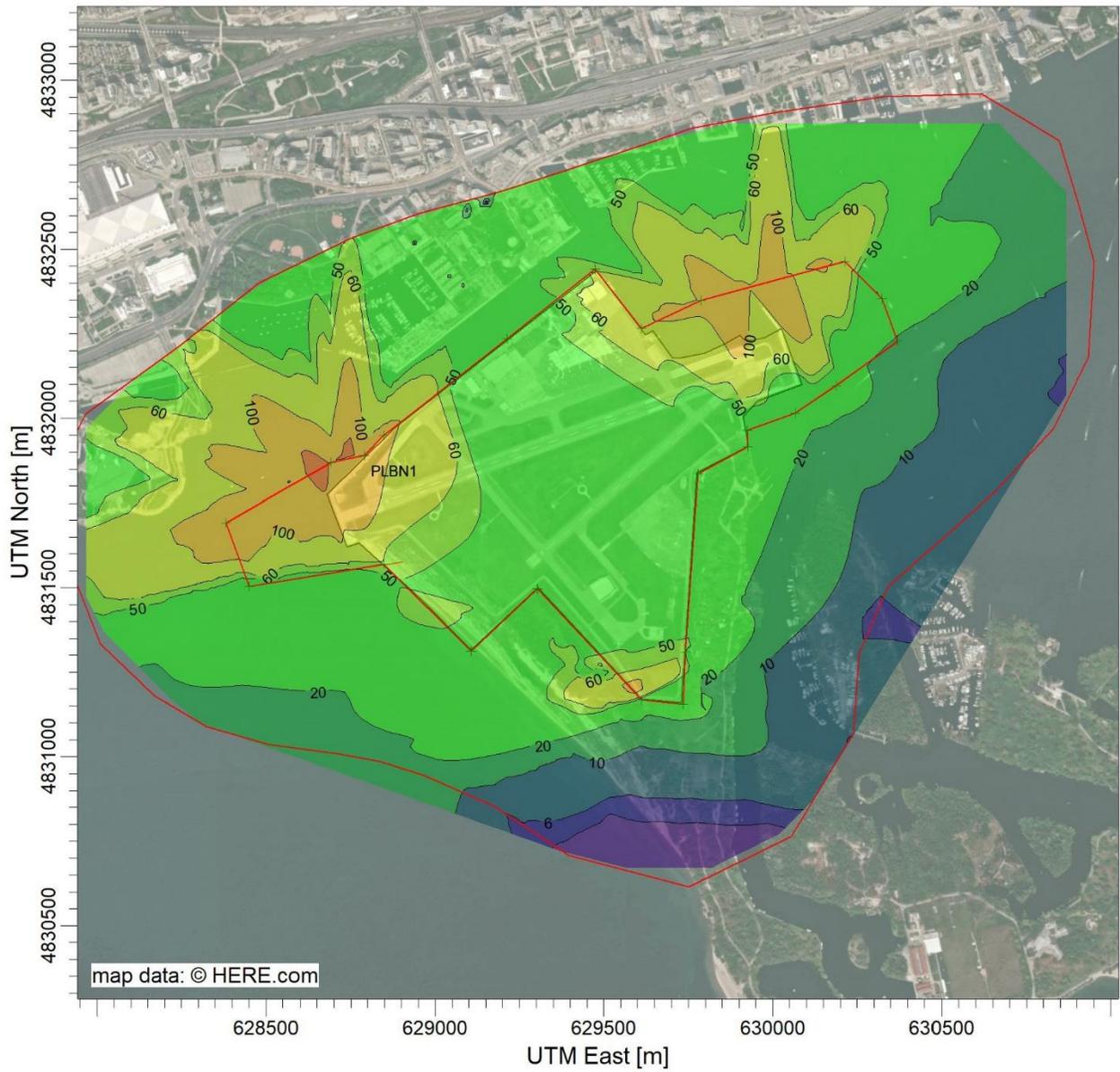
PLOT FILE OF ANNUAL VALUES AVERAGED ACROSS 5 YEARS FOR SOURCE GROUP: ALL

Max: 0.573 [ug/m^3] at (630249.18, 4832431.21)



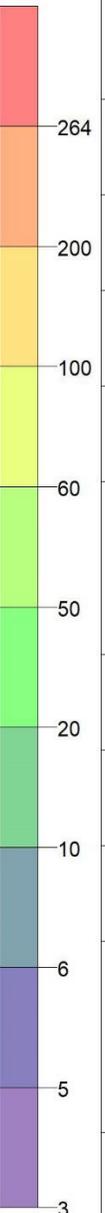
7
5725
Concentration
0.573 ug/m^3

Suspended Particulate Matter (SPM) - 24HR



PLOT FILE OF HIGH 1ST HIGH 24-HR VALUES FOR SOURCE GROUP: ALL

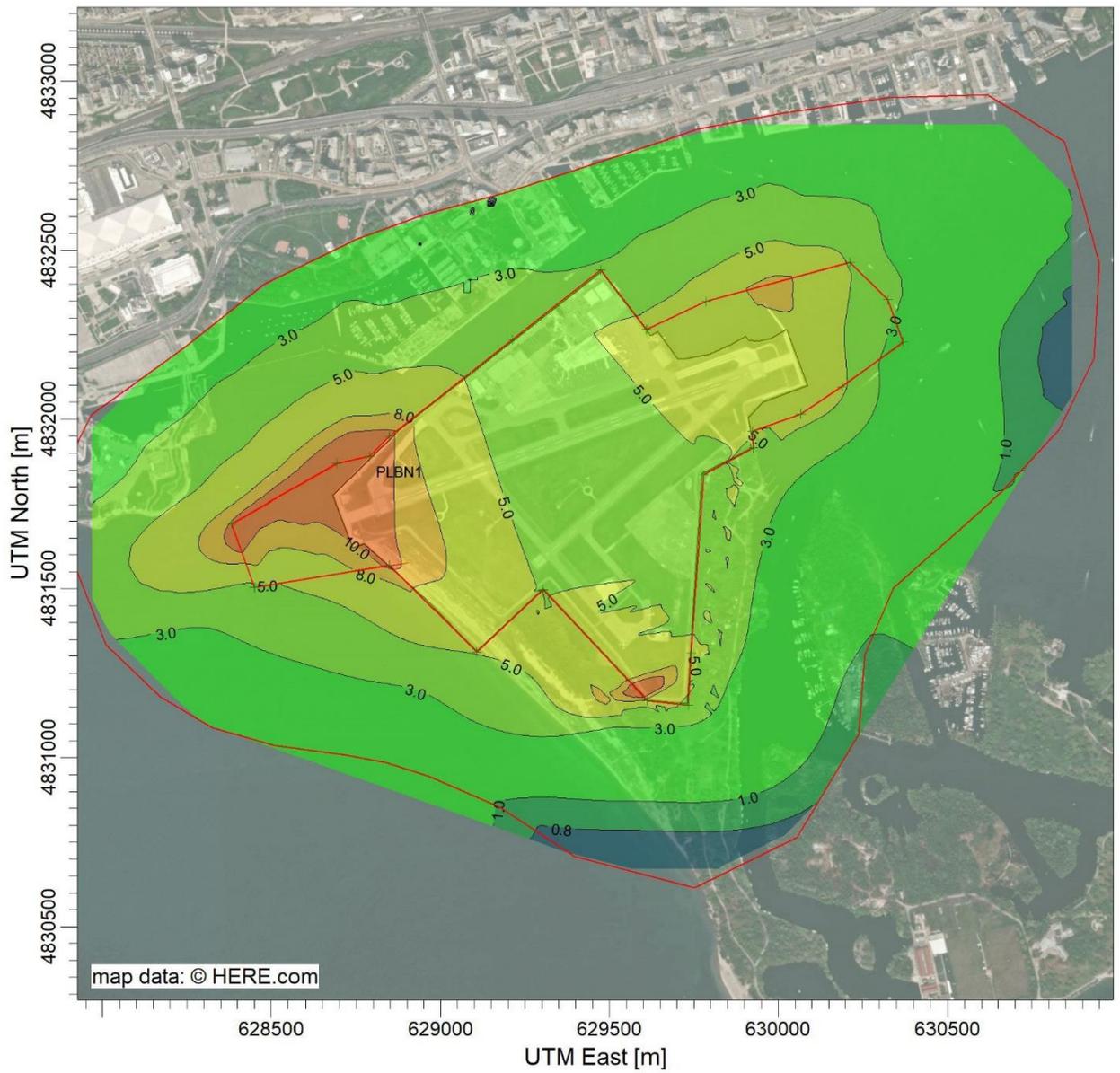
Max: 264 [ug/m³] at (628649.18, 4831851.21)



7
5725
Concentration
264 ug/m³

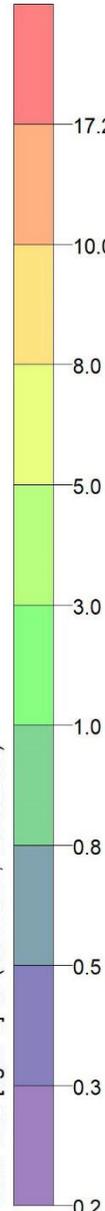
SCALE: 1:20,000
0 0.5 km

Suspended Particulate Matter (SPM) - Annual



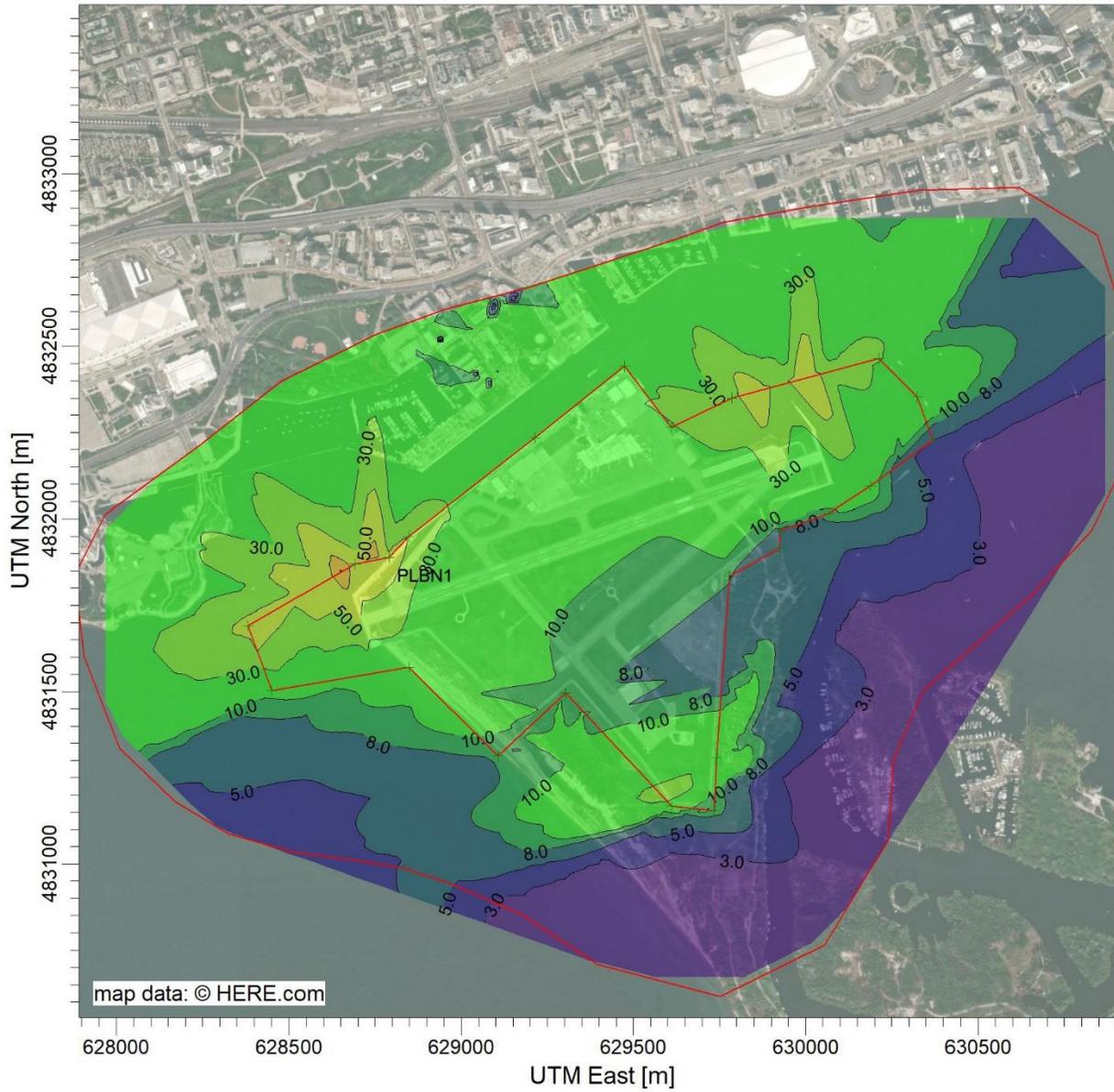
PLOT FILE OF ANNUAL VALUES AVERAGED ACROSS 5 YEARS FOR SOURCE GROUP: ALL

Max: 17.2 [$\mu\text{g}/\text{m}^3$] at (628789.40, 4831889.53)



7
5725
Concentration
17.2 $\mu\text{g}/\text{m}^3$

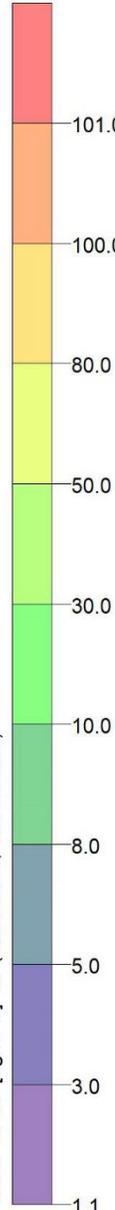
Particulate matter (PM10) - 24HR



ug/m³

PLOT FILE OF HIGH 1ST HIGH 24-HR VALUES FOR SOURCE GROUP: ALL

Max: 101.0 [ug/m³] at (628649.18, 4831851.21)



7

5725

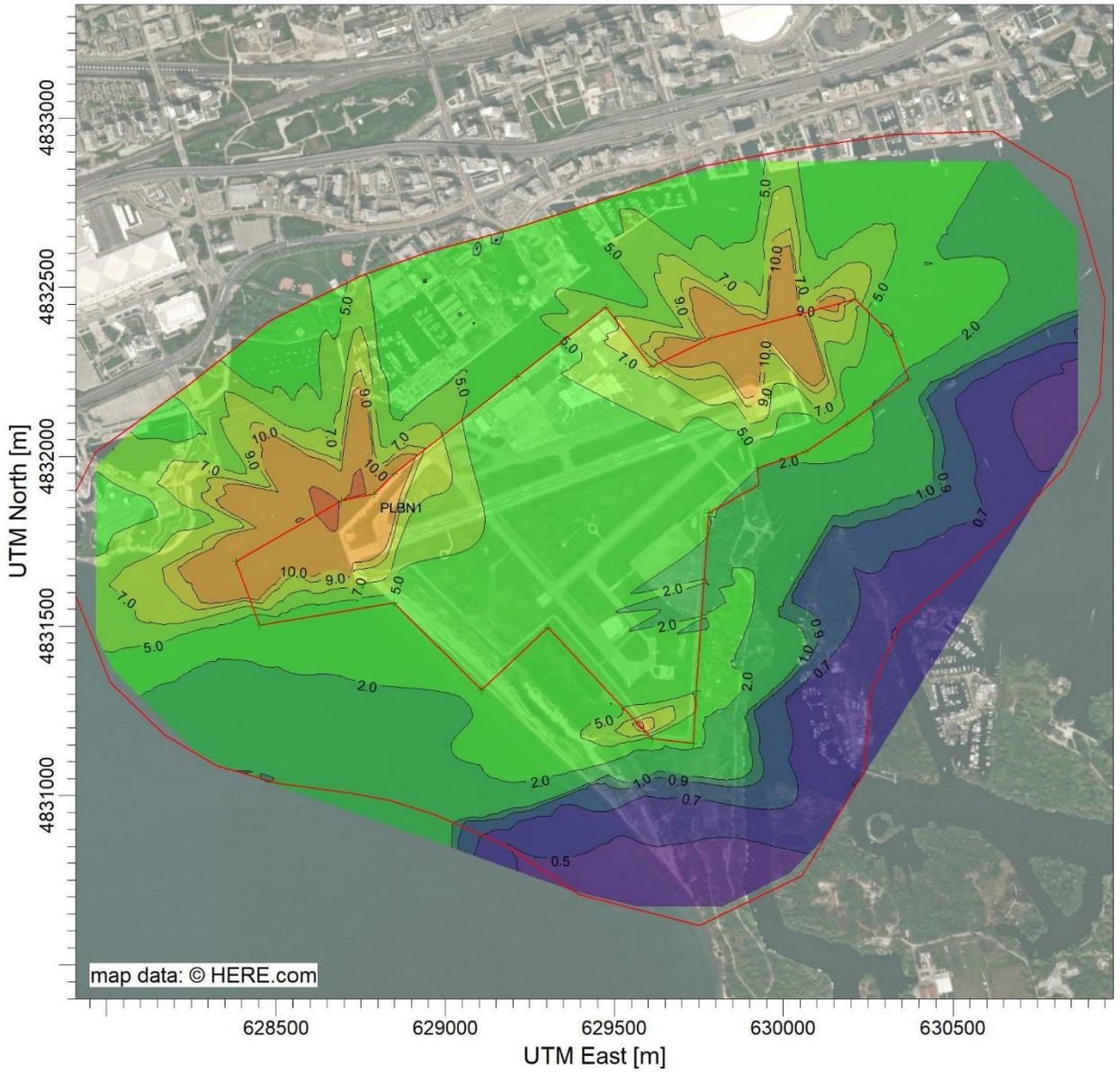
Concentration

101.0 ug/m³

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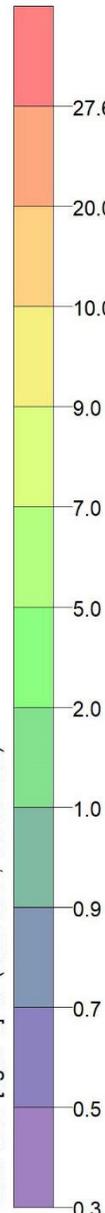


Particulate matter (PM2.5) - 24HR



PLOT FILE OF HIGH 1ST HIGH 24-HR VALUES FOR SOURCE GROUP: ALL

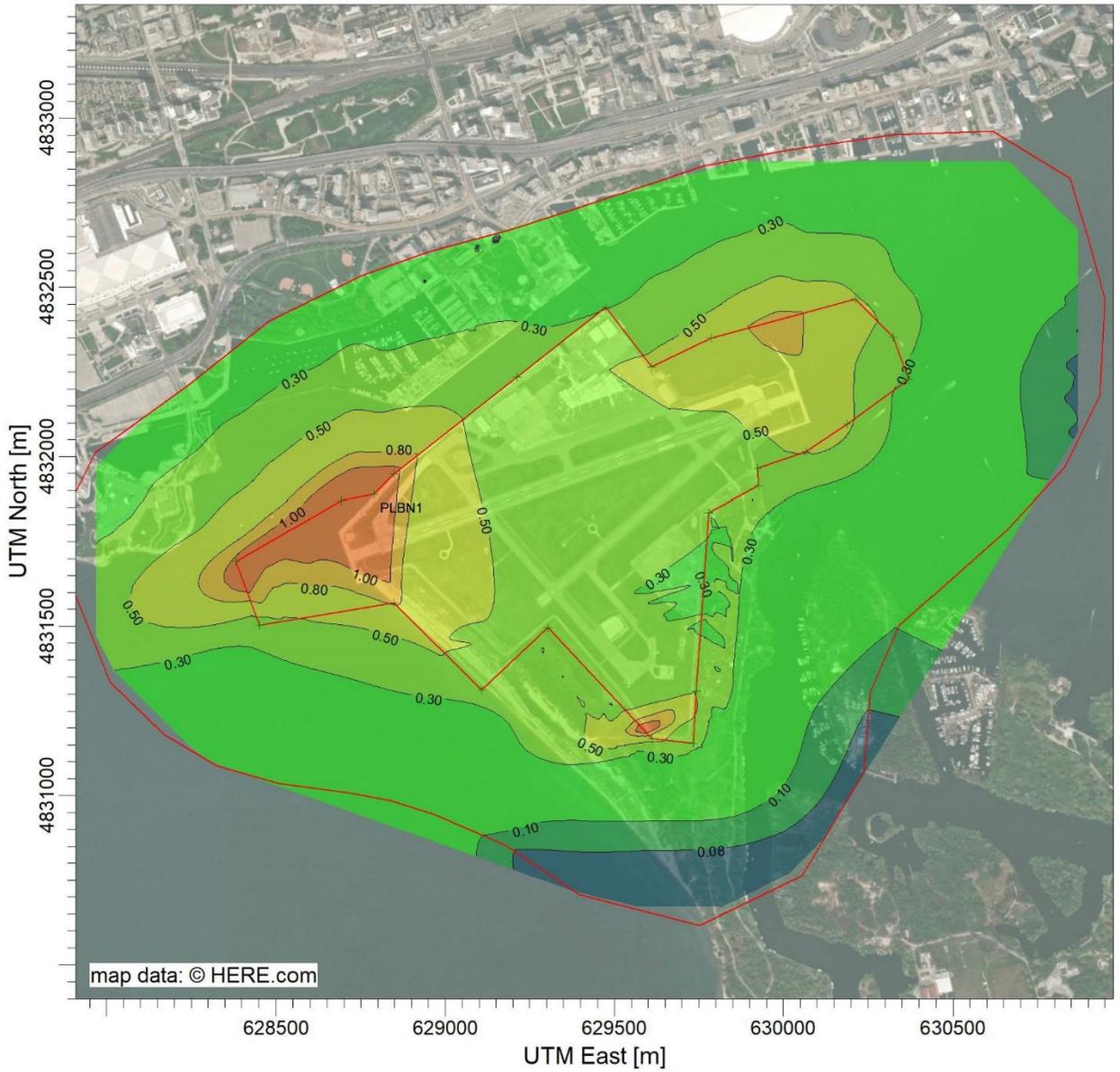
Max: 27.6 [ug/m^3] at (628649.18, 4831851.21)



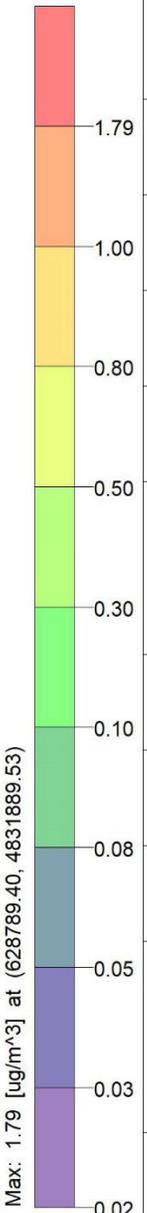
Concentration
27.6 ug/m³



Particulate matter (PM2.5) - Annual



PLOT FILE OF ANNUAL VALUES AVERAGED ACROSS 5 YEARS FOR SOURCE GROUP: ALL



7
5725
Concentration
1.79 ug/m³

