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July 14, 2017

Meghan Bratt, MCIP, RPP
Environmental Planner
Environmental Planning
MMM Group Limited
610 Chartwell Road, Suite 300
Oakville, ON L6J 4A5

**Re: Air Quality Screening Assessment**
**Lower Yonge Precinct Class Environmental Assessment**
**RWDI Reference No. 1600607**

**Email: BrattM@mmm.ca**

Dear Ms. Bratt,

RWDI was retained by MMM Group Limited (MMM) to provide an air quality screening assessment in support of Waterfront Toronto's Municipal Class EA for the Lower Yonge Precinct. The purpose of this report is to assess the impact of the various roadway and resulting traffic changes required to accommodate the development of the new mixed-use community within the Lower Yonge Precinct and to determine if a detailed air quality assessment is required. The following report outlines the study area, nearby receptors of concern, the background air quality in the area, and an estimate of future conditions based on changes in existing and future vehicular emissions in the area.

## STUDY AREA

The study area is positioned within Toronto's Central Waterfront and includes sections of roadway between Lower Simcoe Street to the west and Lower Jarvis Street to the east, and between Front Street to the north and Queens Quay to the south. This area is being developed to accommodate several new residential buildings, office and retail developments, as well as a community centre, school, and two daycare facilities, and therefore changes to the transportation infrastructure and streetscape are required. The study area and the specific changes being made to the roadways are shown in Figure 1.

Figure 1 also shows the locations of receptors in the vicinity of the study area, which are defined as residential dwellings, retirement homes, hospitals, childcare centres, schools, or similar institutional buildings. The nearby receptors are mainly residential buildings and include some that are currently built, and others that are part of future plans, and also the George Brown College Waterfront Campus located to the east of the study area. Other office or commercial spaces such as Corus Entertainment, the Toronto

Star Building, the future LCBO Office Tower, and a 2nd building as part of the future Daniels Development are not shown as they are deemed non-sensitive.

This study considers the following future developments within the study area, which propose residential towers north of Harbour Street (shown in Figure 1), and non-residential towers south of Harbour Street (not shown as they are not considered to be sensitive receptors):

- 1 Yonge Street;
- LCBO Lands; and
- Choice REIT Lands.

This study also considers the following future residential developments (shown in Figures 1), located near the study area:

- Pier 27 Phase II;
- Daniels Development;
- QQE Development; and
- Monde.

## CONTAMINANTS OF CONCERN

Previous studies of transportation-related emissions have consistently shown the key contaminants of concern to be carbon monoxide (CO), nitrogen dioxide ($NO_2$), respirable particulate matter ($PM_{2.5}$), inhalable particulate matter ($PM_{10}$), and a number of hydrocarbons (formaldehyde, acetaldehyde, acrolein, benzene, 1,3-butadiene, and benzo(a)pyrene). This list is also consistent with the Ontario Ministry of Transportation Guide for Assessing and Mitigating the Air Quality Impacts and Greenhouse Gas Emissions of Provincial Transportation Projects, June 2012.

## BACKGROUND CONDITIONS

The current background air quality in the study area was characterized using available summary statistics from up to five years of air quality monitoring stations located near the study area. These monitoring stations are operated by the Ontario Ministry of the Environment and Climate Change (MOECC), Environment Canada and Metrolinx. Figure 2 shows all the stations currently operating in the Toronto region; however, this study only used data from the stations closest to the study area (stations 4, 6, 8, 9, and 11 in the figure).

Table 1 presents a summary of the measured background values used for the contaminants under study. More detailed information can be found in Appendix A. Also shown in Table 1 is the relevant threshold for each contaminant. These thresholds are a compilation of either the Ontario Ambient Air Quality Criteria (AAQC's), or the Federal Canadian Ambient Air Quality Standards (CAAQS). In general, if the concentration of an airborne pollutant can be maintained below its threshold, then either no health effect is observed or the effect is small enough that it presents an acceptably low risk to the population and the environment.

**Table 1:** Background Concentrations

| Contaminant | Criterion (µg/m³) | | | | Percentile Concentrations [1] (µg/m³) | | Percentile Averaging Period | Annual Mean [1] (µg/m³) | Maximum Concentration [1] (µg/m³) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1-hr | 24-hr | Annual | Other | 50th | 90th | | | 1-hr | 24-hr | 8-hr |
| Carbon Monoxide | 36,200 | - | - | 15,700 (8-hr) | 215 | 378 | 1-hr | 240 | 2391 | N/A | 1363 |
| Nitrogen Dioxide | 400 | 200 | - | - | 26 | 55 | 1-hr | 30 | 156 | 84 | N/A |
| $PM_{2.5}$ | - | 27 | 8.8 | - | 6.4 | 17 | 1-hr | 8.0 | 85 | 32 | N/A |
| $PM_{10}$ | - | 50 | - | - | 10 | 23 | 24-hr | 12 | N/A | 47 | N/A |
| Formaldehyde | - | 65 | - | - | 3.7 | 6.9 | 24-hr | 4.1 | N/A | 10 | N/A |
| Acetaldehyde | - | 500 | - | 500 (½-hr) | 1.9 | 3.2 | 24-hr | 2.0 | N/A | 4.5 | N/A |
| Acrolein | 4.5 | 0.4 | - | - | 0.073 | 0.30 | 24-hr | 0.13 | N/A | 0.61 | N/A |
| Benzene | - | 2.3 | 0.45 | - | 0.64 | 1.0 | 24-hr | 0.75 | N/A | 2.5 | N/A |
| 1,3-Butadiene | - | 10 | 2 | - | 0.060 | 0.11 | 24-hr | 0.063 | N/A | 0.22 | N/A |
| Benzo(a)Pyrene | - | 0.00005 | 0.00001 | - | 0.00006 | 0.00013 | 24-hr | 0.00015 | N/A | 0.0013 | N/A |

**Notes:**

[1] Values shown in this table are averaged across the most recent five years of data available and all relevant stations as shown in Appendix A.

A comparison of the monitored concentrations to the air quality thresholds shows that the maximum background values for $PM_{2.5}$, $PM_{10}$, acrolein, benzene, and benzo(a)pyrene sometimes exceed their relevant thresholds. As shown in Appendix A, concentrations of $PM_{2.5}$ at the Metrolinx monitors consistently exceed the annual threshold and exceed the 24-hour threshold more than 1% of the time, but these locations would have more impact from the rail corridor and may therefore be less representative of conditions within the general study area. This indicates that current levels of these contaminants in the study area are above the desired levels. Concentrations of the pollutants listed in Table 1 are typically higher in urban centres as their main source is motor vehicle exhaust. As the study area is located in the centre of Toronto and near a busy highway (the Gardiner Expressway), concentrations of these pollutants are expected to be higher compared to areas of Toronto that experience less traffic, and compared to levels in Ontario in general.

Reviewing the general background concentrations based on historical data in the study area does not account for possible future changes in background levels in the airshed. The relevant contaminants have generally continued to exhibit declining trends over the past 10 years in Southern Ontario, mainly due to declining tailpipe emissions from motor vehicles. Reductions in these emissions are expected to continue.

Existing environmental assessments in the study area were also reviewed as part of the analysis of background conditions. A Noise, Odour & Air Quality Assessment (NOAQA) of the Lower Yonge Precinct ("City of Toronto Lower Yonge Precinct – Phase 3 – Modelling, Mapping, Analysis of Future Development Concepts", June 8, 2016), found that predicted concentrations are in excess of the relevant AAQC in the study area near the Gardiner Expressway and Rail corridor for NOx, $PM_{10}$, $PM_{2.5}$, benzene, and also for the trace metal cadmium. The main contributing sources were found to be the Gardiner Expressway and the Rail corridor. This study described the overall ambient air quality in the study area to be typical of an urban situation where several compounds potentially exceed the MOECC AAQC, with concentrations primarily due to non-industrial sources, such as highways and rail lines. This finding is consistent with the historical monitoring data reviewed as part of this study.

There are also other studies that have been completed for individual development projects in the precinct, but these studies focused on unique emissions of contaminants and odours from the Redpath facility, located at 95 Queens Quay East, and did not consider general air quality parameters associated with traffic emissions within the precinct[1].

## ANALYSIS

The screening level assessment of local air quality looked at the relative differences in emissions from traffic along different sections of roadway in order to predict how the air quality at the surrounding receptors may change in the future.

Vehicular emissions were considered from free flow traffic, as well as idling traffic at the intersections within the study area.

Emission factors were determined using the U.S. EPA model MOVES for the years 2016 and 2031. Vehicle exhaust emissions are sensitive to outside temperature conditions and MOVES allows the user to input temperature information. In the present case, temperature data was entered for January which typically results in the highest emissions. Exhaust emissions also vary widely by type of vehicle and MOVES provides emission factors for several different categories of vehicles. An average vehicle mix of 95% light duty and 5% heavy duty was used for the fleet. The individual vehicle emission factors were aggregated to produce a composite emission factor for each pollutant to represent the average vehicle. For $PM_{2.5}$ and $PM_{10}$, the free flow emissions also accounted for re-entrained road dust based on equations provided United States Environmental Protection Agency (U.S. EPA) AP-42 chapter 13.2.1 “Paved Roads”.

Morning peak-hour emissions were calculated using the emission factors in combination with traffic parameters provided by MMM. These parameters are summarized in Appendix B.

Free flow emissions were calculated using the AM peak hour traffic volumes and the MOVES fleet average emissions at a speed of 50 km/hr as traffic moves through the study area. Idling emissions for an intersection were calculated using the average delay times (interpreted as idle times). The sum of the free flow and idling emissions along different sections of roadway are discussed in the results section.

[1] Reviewed air quality studies for the 1-7 Yonge Street Development, the 130-132 Queens Quay East Development, and the 143-177 Lake Shore Boulevard East and 26 Richardson Street Development.

# RESULTS

## Air Quality

A summary of the total emissions by pollutant within the entire study area is included in Table 2 below. Appendix C lists the total emissions by pollutant along different sections of roadway.

**Table 2:** Total Study Area AM Peak Hour Emission Rates

| Contaminant | Total Existing (2016) Emissions (g/hour) | Total Future (2031) Emissions (g/hour) | % Difference |
|---|---|---|---|
| **Arterial Roads Only (Excludes Gardiner Expressway)** | | | |
| CO | 13,226 | 4,959 | -63% |
| NOx | 3,689 | 856 | -77% |
| PM2.5 | 279 | 177 | -37% |
| PM10 | 696 | 661 | -5% |
| Benzene | 26.5 | 6.1 | -77% |
| 1,3-Butadiene | 2.90 | 0.09 | -97% |
| Formaldehyde | 21.2 | 7.7 | -64% |
| Acrolein | 1.46 | 0.44 | -70% |
| Acetaldehyde | 12.0 | 3.0 | -75% |
| Benzo(a)Pyrene | 0.0447 | 0.0121 | -73% |
| **Arterial Roads and Gardiner Expressway from Bay Street to Jarvis Street** | | | |
| CO | 20,608 | 7,721 | -63% |
| NOx | 6,115 | 1,318 | -78% |
| PM2.5 | 392 | 228 | -42% |
| PM10 | 946 | 842 | -11% |
| Benzene | 37.3 | 8.4 | -78% |
| 1,3-Butadiene | 4.00 | 0.11 | -97% |
| Formaldehyde | 29.6 | 9.8 | -67% |
| Acrolein | 2.04 | 0.56 | -73% |
| Acetaldehyde | 16.7 | 3.9 | -77% |
| Benzo(a)Pyrene | 0.0676 | 0.0163 | -76% |

In general, the future air pollutant emissions in the study area are significantly reduced compared to the existing emissions. This is predominantly due to ongoing improvement in vehicle tailpipe emissions as older, higher emitting vehicles are gradually replaced by newer, cleaner vehicles. Canada's On-Road Vehicle and Engine Emission Regulations came into effect in 2004, replacing earlier regulations. At that time, the regulation was projected to achieve a 73% reduction in average $NO_X$ emissions from road vehicles by the year 2020, with significant reductions in other pollutants as well. More recently, the Federal government set its sights on greenhouse gas emissions from vehicles, introducing the Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations in 2010, and the Heavy-Duty Vehicle and Engine Greenhouse Gas Emission Regulations in 2012. Not only will these regulations reduce GHG emissions, but they will also affect toxic air pollutants in the vehicle exhausts, since the emissions of these pollutants are related to fuel consumption.

The anticipated reduction is less significant for $PM_{2.5}$ and $PM_{10}$, as the re-entrained road dust component of the particulate matter does not change in the future other than from changing traffic volumes.

Appendix C shows the change in emissions along specific sections of roadway. In general, future air pollutant emissions along all roadways are significantly reduced compared to the existing emissions and therefore the air quality at receptors along all existing roadways is expected to improve. The exception is for $PM_{10}$ which is predicted to increase slightly along Lakeshore Boulevard (2% increase) and Lower Jarvis Street (8% increase). The 2% increase in $PM_{10}$ emissions along Lakeshore Boulevard is small compared to the expected decrease in $PM_{10}$ emissions along the Gardiner Expressway, which runs alongside Lakeshore Boulevard. Therefore, $PM_{10}$ concentrations at receptors in this area (existing residential towers at Lakeshore Boulevard and Yonge Street and the future residences at 1 Yonge St.) are still expected to decrease overall. For the future Daniels residences located just east of Jarvis Street, although $PM_{10}$ is predicted to increase by 8% along Lower Jarvis Street, the absolute $PM_{10}$ emissions from this section are small compared to the other roadway segments in the study area, and therefore this change is not expected to significantly impact local concentrations. In addition, the maximum background $PM_{10}$ concentration is generally below the criterion in this area, and the 90$^{th}$ percentile background concentration is only around half the criterion. Therefore, a slight increase in the vehicular emissions on these two roadways is not expected to have a significant impact on the potential to exceed the criterion.

There are also three new roadway sections (i.e. New Street, Harbour Street, and the Cooper Street tunnel) that will be constructed in order to accommodate the new residential buildings and traffic demand in the area. In general, future emissions from these new roadways were found to be lower than the existing emissions from similar nearby roadways and therefore no mitigation measures are recommended.

Although not explicitly included in this study, the Metrolinx rail corridor is within the EA Study Area and will impact local air quality in the area. The development of the Lower Yonge Precinct area, however, is not expected to have an impact on the train volumes along the rail line. Train volumes are expected to increase in the future, but this is expected to balance with decreasing emissions from locomotives as Metrolinx phases out older locomotives to be replaced with newer ones that are compliant with stricter emission limits. Metrolinx also has plans to electrify some of the rail lines which will further decrease emissions. In general, local air quality at receptors within the study area is not expected to change significantly as a result of changes to the rail network.

## CONSTRUCTION

Air quality impacts from the construction phase are not included quantitatively. The air quality impacts are, however, considered in a qualitative manner and mitigation measures are discussed in this section. Construction activities will involve heavy equipment that generates air pollutants and dust; however, these impacts are temporary in nature.

Mitigation of construction emissions is normally achieved through diligent implementation of operating procedures such as application of dust suppressants, reduced travel speeds for heavy vehicles, efficient staging of activities and minimization of haul distances, covering up stockpiles, etc. It is recommended that to minimize potential air quality impacts during construction, the construction tendering process should include requirements for implementation of emissions management. Such a plan would set out established best management practices for dust and other emissions. Some of the best practices include the following:

- Use of reformulated fuels, emulsified fuels, exhaust catalyst and filtration technologies, cleaner engine repowers, and new alternative-fuelled trucks to reduce emissions from construction equipment.
- Regular cleaning of construction sites and access roads to remove construction-caused debris and dust.
- Dust suppression on unpaved haul roads and other traffic areas susceptible to dust, subject to the area being free of sensitive plant, water or other ecosystems that may be affected by dust suppression chemicals.
- Covered loads when hauling fine-grained materials.
- Prompt cleaning of paved streets/roads where tracking of soil, mud or dust has occurred.
- Tire washes and other methods to prevent trucks and other vehicles from tracking soil, mud or dust onto paved streets or roads.
- Covered stockpiles of soil, sand and aggregate as necessary.
- Compliance with posted speed limits and, as appropriate, further reductions in speeds when travelling sites on unpaved surfaces.
- Environmental Compliance Approvals (ECAs) from the Ministry of the Environment and appropriate dust controls/suppression for any portable crushers, asphalt plants or concrete batching plants.

## CONCLUSIONS

RWDI was retained by MMM Group Limited (MMM) to provide air quality services in support of Waterfront Toronto's Municipal Class EA for the Lower Yonge Precinct. This report outlines the study area, nearby receptors of concern, the background air quality in the area, an estimate of future conditions based on changes in existing and future vehicular emissions in the area.

Overall, the air quality within the study area is expected to improve due to ongoing improvement in vehicle tailpipe emissions as older, higher emitting vehicles are gradually replaced by newer, cleaner vehicles. $PM_{10}$ concentrations may increase alongside certain roadways, however these local increases are not expected to have a significant impact on the potential to exceed the $PM_{10}$ criterion. Emissions from new roadways are also predicted to be less than similar existing roadways and therefore no mitigation measures are recommended. During construction, however, it is recommended that the tendering process include the requirements for implementation of emissions management. A detailed air quality assessment is not recommended for this project.

We trust that this is the information that you require at this time. If you require any additional information, please do not hesitate to contact the undersigned.

Yours very truly,

**RWDI AIR Inc.**

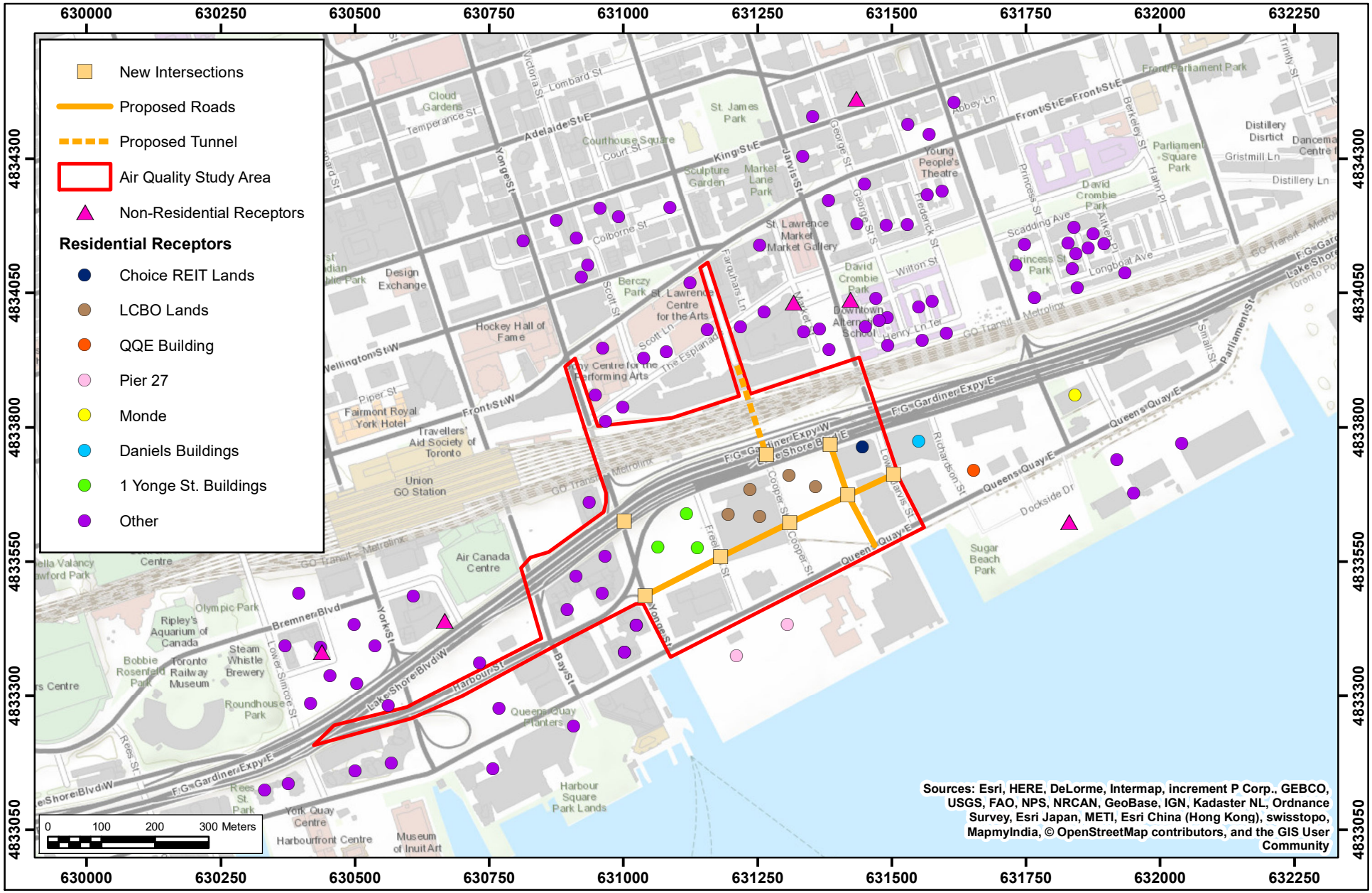
Melissa Annett, d.E.T.
Senior Project Manager, Associate

Mike Lepage, M.Sc., ACM, CCM
Senior Consultant

MEA/ph

Attach.

# FIGURES




## Study Area and Nearby Residential Receptor Locations

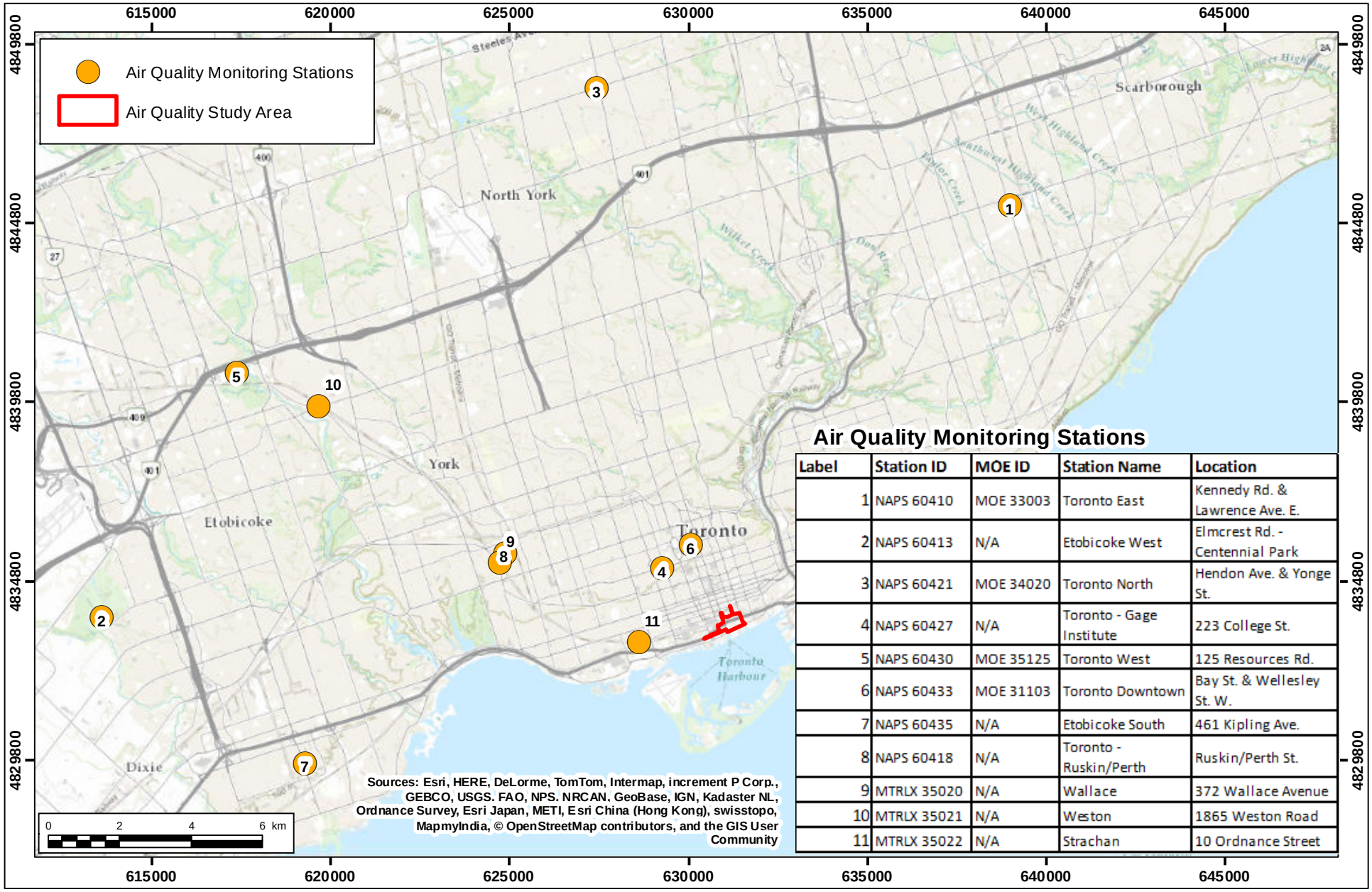
Map Projection: NAD 1983 UTM Zone 17N

Lower Yonge Precinct Class Environmental Assessment - Toronto, Ontario

True North

Project #1600607

| | | | |
|---|---|---|---|
| Drawn by: CAM | Fig: | 1 | |
| Approx. Scale: | 1:10,000 | | |
| Date Revised: | July 6, 2017 | | |




## Air Quality Monitoring Stations

| Label | Station ID | MOE ID | Station Name | Location |
|---|---|---|---|---|
| 1 | NAPS 60410 | MOE 33003 | Toronto East | Kennedy Rd. & Lawrence Ave. E. |
| 2 | NAPS 60413 | N/A | Etobicoke West | Elmcrest Rd. - Centennial Park |
| 3 | NAPS 60421 | MOE 34020 | Toronto North | Hendon Ave. & Yonge St. |
| 4 | NAPS 60427 | N/A | Toronto - Gage Institute | 223 College St. |
| 5 | NAPS 60430 | MOE 35125 | Toronto West | 125 Resources Rd. |
| 6 | NAPS 60433 | MOE 31103 | Toronto Downtown | Bay St. & Wellesley St. W. |
| 7 | NAPS 60435 | N/A | Etobicoke South | 461 Kipling Ave. |
| 8 | NAPS 60418 | N/A | Toronto - Ruskin/Perth | Ruskin/Perth St. |
| 9 | MTRLX 35020 | N/A | Wallace | 372 Wallace Avenue |
| 10 | MTRLX 35021 | N/A | Weston | 1865 Weston Road |
| 11 | MTRLX 35022 | N/A | Strachan | 10 Ordnance Street |

# Locations of Air Quality Monitoring Stations

Map Projection: NAD 1983 UTM Zone 17N

Lower Yonge Precinct Class Environmental Assessment - Toronto, Ontario

True North

Project #1600607

| | | | |
|---|---|---|---|
| Drawn by: CAM | Fig: | 2 | |
| Approx. Scale: | 1:150,000 | | |
| Date Revised: | Nov.10, 2016 | | |

RWDI

# ATTACHMENT A

**Summary of Ambient Air Quality Measurements for Carbon Monoxide**

Lower Yonge Precinct Class Environmental Assessment

| Station ID | MOE ID | Station Name | Location | Year | Concentration (ppm) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1-hr Percentiles | | | | Annual Mean | MAX | |
| | | | | | 50th | 70th | 90th | 99th | | 1-hr | 8-hr |
| NAPS 60433 | MOE 31103 | Toronto Downtown | Bay St. & Wellesley St. W. | 2009 | 0.16 | 0.21 | 0.30 | 0.49 | 0.17 | 1.10 | 0.93 |
| | | | | 2010 | 0.24 | 0.29 | 0.39 | 0.58 | 0.26 | 1.52 | 1.20 |
| | | | | 2011 | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| | | | | 2012 | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| | | | | 2013 | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| MTRLX 35020 | N/A | Wallace | 372 Wallace Avenue | 2012 | 0.13 | 0.18 | 0.27 | 0.66 | 0.15 | 1.95 | 0.85 |
| | | | | 2013 | 0.16 | 0.21 | 0.30 | 0.64 | 0.19 | 2.30 | 1.72 |
| | | | | 2014 | 0.19 | 0.22 | 0.32 | 0.64 | 0.21 | 2.18 | 1.38 |
| MTRLX 35022 | N/A | Strachan | 10 Ordnance Street | 2012 | 0.17 | 0.22 | 0.30 | 0.55 | 0.19 | 1.59 | 0.91 |
| | | | | 2013 | 0.18 | 0.22 | 0.30 | 0.59 | 0.20 | 2.34 | 0.94 |
| | | | | 2014 | 0.20 | 0.24 | 0.33 | 0.65 | 0.22 | 2.89 | 1.12 |
| Average - Overall (ppm) | | | | | 0.18 | 0.22 | 0.31 | 0.60 | 0.20 | 1.98 | 1.13 |
| Average - Overall ($\mu g/m^3$) | | | | | 215 | 270 | 378 | 723 | 240 | 2391 | 1363 |

**Notes:**

INS - Insufficient data to calculate valid statistics.

N/A - Data not available.

The 1-hour criterion for carbon monoxide is 36,200 $\mu g/m^3$.

The 8-hour criterion for carbon monoxide is 15,700 $\mu g/m^3$.

**Summary of Ambient Air Quality Measurements for Nitrogen Dioxide**

Lower Yonge Precinct Class Environmental Assessment

| Station ID | MOE ID | Station Name | Location | Year | Concentration (ppb) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1-hr Percentiles | | | | Annual | MAX | |
| | | | | | 50th | 70th | 90th | 99th | Mean | 1-hr | 24-hr |
| NAPS 60433 | MOE 31103 | Toronto Downtown | Bay St. & Wellesley St. W. | 2009 | 14 | 20 | 29 | 44 | 16.5 | 67 | 40 |
| | | | | 2010 | 14 | 19 | 29 | 48 | 16.1 | 69 | 41 |
| | | | | 2011 | 13 | 18 | 27 | 42 | 14.9 | 54 | 36 |
| | | | | 2012 | 11 | 16 | 25 | 38 | 13.4 | 57 | 36 |
| | | | | 2013 | 12 | 16 | 24 | 40 | 13.5 | 60 | 33 |
| MTRLX 35020 | N/A | Wallace | 372 Wallace Avenue | 2012 | 12 | 19 | 31 | 45 | 16 | 65 | 39 |
| | | | | 2013 | 12 | 17 | 26 | 47 | 14 | 88 | 53 |
| | | | | 2014 | 12 | 17 | 27 | 50 | 15 | 118 | 57 |
| MTRLX 35022 | N/A | Strachan | 10 Ordnance Street | 2012 | 15 | 20 | 31 | 47 | 17 | 106 | 41 |
| | | | | 2013 | 14 | 19 | 28 | 45 | 16 | 85 | 44 |
| | | | | 2014 | 13 | 18 | 27 | 44 | 15 | 95 | 46 |
| Average - Overall (ppb) | | | | | 13 | 18 | 28 | 45 | 15 | 79 | 42 |
| Average - Overall ($\mu g/m^3$) | | | | | 26 | 36 | 55 | 88 | 30 | 156 | 84 |

**Notes:**

INS - Insufficient data to calculate valid statistics.

N/A - Data not available.

The 1-hour criterion for nitrogen dioxide is 400 $\mu g/m^3$.

The 24-hour criterion for nitrogen dioxide is 200 $\mu g/m^3$.

**Summary of Ambient Air Quality Measurements for $PM_{2.5}$**

Lower Yonge Precinct Class Environmental Assessment

| Station ID | MOE ID | Station Name | Location | Year | Concentration (µg/m$^3$) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1-hr Percentiles | | | | Annual Mean | MAX | |
| | | | | | 50th | 70th | 90th | 99th | | 1-hr | 24-hr |
| NAPS 60433 | MOE 31103 | Toronto Downtown | Bay St. & Wellesley St. W. | 2009 | 4 | 7 | 12 | 23 | 5.6 | 44 | 35 |
| | | | | 2010 | 4 | 7 | 14 | 28 | 6.0 | 44 | 29 |
| | | | | 2011 | 5 | 8 | 14 | 24 | 6.2 | 45 | 21 |
| | | | | 2012 | 5 | 8 | 14 | 25 | 6.4 | 45 | 26 |
| | | | | 2013 | 7 | 10 | 16 | 30 | 8.3 | 75 | 33 |
| MTRLX 35020 | N/A | Wallace | 372 Wallace Avenue | 2012 | 7 | 11 | 18 | 35 | 9.0 | 54 | 35 |
| | | | | 2013 | 7 | 11 | 19 | 36 | 9.0 | 90 | 33 |
| | | | | 2014 | 8 | 12 | 20 | 43 | 10.0 | 223 | 39 |
| MTRLX 35022 | N/A | Strachan | 10 Ordnance Street | 2012 | 7 | 11 | 19 | 35 | 9.0 | 97 | 37 |
| | | | | 2013 | 8 | 11 | 19 | 36 | 9.0 | 113 | 35 |
| | | | | 2014 | 8 | 12 | 20 | 38 | 10.0 | 103 | 33 |
| Average - Overall (µg/m³) | | | | | 6 | 10 | 17 | 32 | 8.0 | 85 | 32 |

**Notes:**

INS - Insufficient data to calculate valid statistics.

N/A - Data not available.

The 24-hour criterion for $PM_{2.5}$ is 27 µg/m$^3$.

The annual criterion for $PM_{2.5}$ is 8.8 µg/m$^3$.

**Summary of Ambient Air Quality Measurements for $PM_{10}$**

Lower Yonge Precinct Class Environmental Assessment

| Station ID | MOE ID | Station Name | Location | Year | Concentration (µg/m$^3$) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 24-hr Percentiles | | | | Annual Mean | MAX | |
| | | | | | 50th | 70th | 90th | 99th | | 1-hr | 24-hr |
| NAPS 60427 | N/A | Toronto - Gage Institute | 223 College St. | 2009 | 9.6 | 12 | 18 | 33 | 11.0 | N/A | 41 |
| | | | | 2010 | 10 | 14 | 24 | 41 | 11.8 | N/A | 54 |
| | | | | 2011 | 8 | 13 | 22 | 37 | 10.9 | N/A | 38 |
| | | | | 2012 | 11 | 15 | 26 | 40 | 12.9 | N/A | 55 |
| | | | | 2013 | 11 | 15 | 26 | 39 | 12.6 | N/A | 48 |
| Average - Overall (µg/m³) | | | | | 10 | 14 | 23 | 38 | 11.8 | N/A | 47 |

**Notes:**

INS - Insufficient data to calculate valid statistics.

N/A - Data not available.

The 24-hour criterion for $PM_{10}$ is 50 µg/m$^3$.

**Summary of Ambient Air Quality Measurements for Formaldehyde**

Lower Yonge Precinct Class Environmental Assessment

| Station ID | MOE ID | Station Name | Location | Year | Concentration (µg/m$^3$) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 24-hr Percentiles | | | | Annual | MAX |
| | | | | | 50th | 70th | 90th | 99th | Mean | 24-hr |
| NAPS 60418 | N/A | Toronto - Ruskin/Perth | Ruskin/Perth St. | 2002 | 2.54 | 3.82 | 5.60 | 10.06 | 3.29 | 11.12 |
| | | | | 2003 | INS | INS | INS | INS | INS | INS |
| | | | | 2004 | 4.73 | 5.62 | 7.93 | 10.64 | 4.79 | 11.24 |
| | | | | 2005 | 3.94 | 5.77 | 7.21 | 8.27 | 4.11 | 8.31 |
| | | | | 2006 | INS | INS | INS | INS | INS | INS |
| Average - Overall (µg/m$^3$) | | | | | 3.74 | 5.07 | 6.91 | 9.65 | 4.06 | 10.22 |

**Notes:**

INS - Insufficient data to calculate valid statistics.

N/A - Data not available.

The 24-hour criterion for formaldehyde is 65 µg/m$^3$.

**Summary of Ambient Air Quality Measurements for Acetaldehyde**

Lower Yonge Precinct Class Environmental Assessment

| Station ID | MOE ID | Station Name | Location | Year | Concentration (µg/m$^3$) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 24-hr Percentiles | | | | Annual | MAX |
| | | | | | 50th | 70th | 90th | 99th | Mean | 24-hr |
| NAPS 60418 | N/A | Toronto - Ruskin/Perth | Ruskin/Perth St. | 2002 | 1.71 | 1.85 | 2.36 | 3.02 | 1.60 | 3.22 |
| | | | | 2003 | INS | INS | INS | INS | INS | INS |
| | | | | 2004 | 1.85 | 2.36 | 3.17 | 4.53 | 2.00 | 4.73 |
| | | | | 2005 | 2.17 | 3.07 | 3.98 | 5.21 | 2.36 | 5.58 |
| | | | | 2006 | INS | INS | INS | INS | INS | INS |
| Average - Overall (µg/m³) | | | | | 1.91 | 2.43 | 3.17 | 4.25 | 1.99 | 4.51 |

**Notes:**

INS - Insufficient data to calculate valid statistics.

N/A - Data not available.

The half-hour criterion for acetaldehyde is 500 µg/m$^3$.

The 24-hour criterion for acetaldehyde is 500 µg/m$^3$.

**Summary of Ambient Air Quality Measurements for Acrolein**

Lower Yonge Precinct Class Environmental Assessment

| Station ID | MOE ID | Station Name | Location | Year | Concentration (µg/m$^3$) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 24-hr Percentiles | | | | Annual | MAX |
| | | | | | 50th | 70th | 90th | 99th | Mean | 24-hr |
| NAPS 60418 | N/A | Toronto - Ruskin/Perth | Ruskin/Perth St. | 2002 | 0.11 | 0.13 | 0.20 | 0.29 | 0.12 | 0.29 |
| | | | | 2003 | INS | INS | INS | INS | INS | INS |
| | | | | 2004 | 0.06 | 0.09 | 0.14 | 0.29 | 0.09 | 0.35 |
| | | | | 2005 | 0.05 | 0.08 | 0.57 | 1.11 | 0.19 | 1.17 |
| | | | | 2006 | INS | INS | INS | INS | INS | INS |
| Average - Overall (µg/m³) | | | | | 0.07 | 0.10 | 0.30 | 0.56 | 0.13 | 0.61 |

**Notes:**

INS - Insufficient data to calculate valid statistics.

N/A - Data not available.

The 1-hour criterion for acrolein is 4.5 µg/m$^3$.

The 24-hour criterion for acrolein is 0.4 µg/m$^3$.

**Summary of Ambient Air Quality Measurements for Benzene**

Lower Yonge Precinct Class Environmental Assessment

| Station ID | MOE ID | Station Name | Location | Year | Concentration (µg/m$^3$) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 24-hr Percentiles | | | | Annual | MAX |
| | | | | | 50th | 70th | 90th | 99th | Mean | 24-hr |
| NAPS 60427 | N/A | Toronto - Gage Institute | 223 College St. | 2009 | 0.74 | 0.90 | 1.21 | 1.51 | 0.77 | 1.56 |
| | | | | 2010 | 0.76 | 0.92 | 1.16 | 1.47 | 0.77 | 1.57 |
| | | | | 2011 | 0.56 | 0.65 | 0.90 | 1.09 | 0.59 | 1.12 |
| | | | | 2012 | 0.56 | 0.74 | 0.98 | 1.24 | 0.62 | 1.34 |
| | | | | 2013 | 0.57 | 0.69 | 0.92 | 1.47 | 0.61 | 2.03 |
| MTRLX 35020 | N/A | Wallace | 372 Wallace Avenue | 2012 | N/A | N/A | N/A | N/A | 0.93 | 3.20 |
| | | | | 2013 | N/A | N/A | N/A | N/A | 0.91 | 5.40 |
| | | | | 2014 | N/A | N/A | N/A | N/A | 0.83 | 4.70 |
| MTRLX 35022 | N/A | Strachan | 10 Ordnance Street | 2012 | N/A | N/A | N/A | N/A | 0.82 | 2.30 |
| | | | | 2013 | N/A | N/A | N/A | N/A | 0.72 | 1.50 |
| | | | | 2014 | N/A | N/A | N/A | N/A | 0.73 | 3.30 |
| Average - Overall (µg/m³) | | | | | 0.64 | 0.78 | 1.03 | 1.36 | 0.75 | 2.55 |

**Notes:**

INS - Insufficient data to calculate valid statistics.

N/A - Data not available.

The 24-hour criterion for benzene is 2.3 µg/m$^3$.

The annual criterion for benzene is 0.45 µg/m$^3$.

**Summary of Ambient Air Quality Measurements for 1,3-Butadiene**

Lower Yonge Precinct Class Environmental Assessment

| Station ID | MOE ID | Station Name | Location | Year | Concentration (µg/m$^3$) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 24-hr Percentiles | | | | Annual | MAX |
| | | | | | 50th | 70th | 90th | 99th | Mean | 24-hr |
| NAPS 60427 | N/A | Toronto - Gage Institute | 223 College St. | 2009 | 0.07 | 0.10 | 0.13 | 0.17 | 0.08 | 0.19 |
| | | | | 2010 | 0.07 | 0.08 | 0.12 | 0.17 | 0.07 | 0.19 |
| | | | | 2011 | 0.06 | 0.07 | 0.10 | 0.15 | 0.06 | 0.17 |
| | | | | 2012 | 0.05 | 0.08 | 0.11 | 0.14 | 0.06 | 0.16 |
| | | | | 2013 | 0.05 | 0.07 | 0.09 | 0.14 | 0.05 | 0.14 |
| MTRLX 35020 | N/A | Wallace | 372 Wallace Avenue | 2012 | N/A | N/A | N/A | N/A | 0.06 | 0.06 |
| | | | | 2013 | N/A | N/A | N/A | N/A | 0.06 | 0.11 |
| | | | | 2014 | N/A | N/A | N/A | N/A | 0.06 | 0.06 |
| MTRLX 35022 | N/A | Strachan | 10 Ordnance Street | 2012 | N/A | N/A | N/A | N/A | 0.07 | 1.05 |
| | | | | 2013 | N/A | N/A | N/A | N/A | 0.06 | 0.11 |
| | | | | 2014 | N/A | N/A | N/A | N/A | 0.06 | 0.17 |
| Average - Overall (µg/m³) | | | | | 0.06 | 0.08 | 0.11 | 0.15 | 0.06 | 0.22 |

**Notes:**

INS - Insufficient data to calculate valid statistics.

N/A - Data not available.

The 24-hour criterion for 1,3-butadiene is 10 µg/m$^3$.

The annual criterion for 1,3-butadiene is 2 µg/m$^3$.

**Summary of Ambient Air Quality Measurements for Benzo(a)Pyrene**

Lower Yonge Precinct Class Environmental Assessment

| Station ID | MOE ID | Station Name | Location | Year | Concentration (ng/m3) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 24-hr Percentiles | | | | Annual Mean | MAX 24-hr |
| | | | | | 50th | 70th | 90th | 99th | | |
| NAPS 60427 | N/A | Toronto - Gage Institute | 223 College St. | 2009 | 0.05 | 0.07 | 0.11 | 0.16 | 0.06 | 0.16 |
| | | | | 2010 | 0.08 | 0.09 | 0.15 | 0.88 | 0.12 | 1.08 |
| | | | | 2011 | 0.06 | 0.07 | 0.15 | 0.50 | 0.09 | 0.57 |
| | | | | 2012 | 0.05 | 0.08 | 0.13 | 0.52 | 0.08 | 0.62 |
| | | | | 2013 | 0.05 | 0.07 | 0.10 | 0.18 | 0.06 | 0.19 |
| MTRLX 35020 | N/A | Wallace | 372 Wallace Avenue | 2012 | N/A | N/A | N/A | N/A | 0.18 | 0.51 |
| | | | | 2013 | N/A | N/A | N/A | N/A | <0.331 | 0.39 |
| | | | | 2014 | N/A | N/A | N/A | N/A | <0.492 | 10.00 |
| MTRLX 35022 | N/A | Strachan | 10 Ordnance Street | 2012 | N/A | N/A | N/A | N/A | 0.44 | 0.54 |
| | | | | 2013 | N/A | N/A | N/A | N/A | <0.331 | 0.36 |
| | | | | 2014 | N/A | N/A | N/A | N/A | <0.330 | 0.35 |
| Average - Overall (ng/m³) | | | | | 0.06 | 0.08 | 0.13 | 0.45 | 0.15 | 1.34 |

**Notes:**

INS - Insufficient data to calculate valid statistics.

N/A - Data not available.

Current analytical methods are not able to detect below 0.330 ng/m³, therefore, values at the detection limit were not included in the averaging calculations at the bottom of the table.

The 24-hour criterion for benzo(a)pyrene is 0.05 ng/$m^3$.

The annual criterion for benzo(a)pyrene is 0.01 ng/$m^3$.

# ATTACHMENT B

## Summary of Existing (2016) Traffic and Associated Emissions

### ARTERIAL ROADS

**Freeflow Emissions**

| Road | Section | Road Segment Length (m) | Free Flow Speed (km/hour) | AM Peak Hour Traffic (vehicles/hour) | Assumed Silt Loading ($g/m^2$) | Truck % | Emissions (g/hour) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | CO | NOx | PM2.5 | PM10 | Benzene | 1,3-Butadiene | Formaldehyde | Acrolein | Acetaldehyde | Benzo(a)Pyrene |
| Queens Quay | Yonge St. to Freeland St. | 160 | 50 | 1157 | 0.03 | 5 | 484 | 138 | 10 | 26 | 0.8 | 0.08 | 0.6 | 0.041 | 0.34 | 0.0015 |
| | Freeland St. to Cooper St. | 150 | 50 | 1157 | 0.03 | 5 | 454 | 129 | 9 | 24 | 0.7 | 0.08 | 0.6 | 0.039 | 0.32 | 0.0014 |
| | Cooper St. to New St. | 120 | 50 | 1218 | 0.03 | 5 | 383 | 109 | 8 | 20 | 0.6 | 0.07 | 0.5 | 0.033 | 0.27 | 0.0012 |
| | New St. to Lower Jarvis St. | 90 | 50 | 1218 | 0.03 | 5 | 287 | 82 | 6 | 15 | 0.5 | 0.05 | 0.4 | 0.025 | 0.20 | 0.0009 |
| Harbour St. | Lower Simcoe St. to York St. | 210 | 50 | 1710 | 0.03 | 5 | 940 | 267 | 19 | 50 | 1.5 | 0.16 | 1.2 | 0.080 | 0.67 | 0.0029 |
| | York St. to Bay St. | 280 | 50 | 1643 | 0.03 | 5 | 1,204 | 343 | 24 | 64 | 2.0 | 0.21 | 1.5 | 0.103 | 0.85 | 0.0037 |
| | Bay St. to Yonge St. | 200 | 50 | 1749 | 0.03 | 5 | 915 | 260 | 19 | 49 | 1.5 | 0.16 | 1.1 | 0.078 | 0.65 | 0.0028 |
| Lake Shore Blvd. EB | Yonge St. to Freeland St. | 170 | 50 | 579 | 0.06 | 5 | 258 | 73 | 7 | 20 | 0.4 | 0.04 | 0.3 | 0.022 | 0.18 | 0.0008 |
| | Freeland St. to Cooper St. | 150 | 50 | 579 | 0.06 | 5 | 227 | 65 | 6 | 17 | 0.4 | 0.04 | 0.3 | 0.019 | 0.16 | 0.0007 |
| | Cooper St. to Lower Jarvis St. | 210 | 50 | 893 | 0.03 | 5 | 491 | 140 | 10 | 26 | 0.8 | 0.08 | 0.6 | 0.042 | 0.35 | 0.0015 |
| Lake Shore Blvd. WB | Yonge St. to Bay St. | 200 | 50 | 1516 | 0.03 | 5 | 794 | 226 | 16 | 42 | 1.3 | 0.14 | 1.0 | 0.068 | 0.56 | 0.0024 |
| | Lower Jarvis St. to Yonge St. | 520 | 50 | 903 | 0.03 | 5 | 1,229 | 350 | 25 | 65 | 2.0 | 0.21 | 1.5 | 0.105 | 0.87 | 0.0038 |
| Bay St. | Harbour St. to Gardiner Expressway/Lakeshore | 130 | 50 | 1303 | 0.03 | 5 | 443 | 126 | 9 | 24 | 0.7 | 0.08 | 0.6 | 0.038 | 0.31 | 0.0014 |
| Yonge St. | Queens Quay E to Harbour St. | 160 | 50 | 561 | 0.06 | 5 | 235 | 67 | 6 | 18 | 0.4 | 0.04 | 0.3 | 0.020 | 0.17 | 0.0007 |
| | Harbour St. to Lake Shore Blvd. | 110 | 50 | 1540 | 0.03 | 5 | 443 | 126 | 9 | 24 | 0.7 | 0.08 | 0.6 | 0.038 | 0.31 | 0.0014 |
| | Lake Shore Blvd. to The Esplanade | 180 | 50 | 2015 | 0.03 | 5 | 949 | 270 | 19 | 50 | 1.6 | 0.16 | 1.2 | 0.081 | 0.67 | 0.0029 |
| | The Esplanade to Front St. | 120 | 50 | 2015 | 0.03 | 5 | 633 | 180 | 13 | 34 | 1.0 | 0.11 | 0.8 | 0.054 | 0.45 | 0.0019 |
| Freeland St. | Queens Quay E to Lake Shore Blvd. | 240 | 50 | 310 | 0.2 | 5 | 195 | 55 | 10 | 34 | 0.3 | 0.03 | 0.2 | 0.017 | 0.14 | 0.0006 |
| Cooper St. | Queens Quay E to Lake Shore Blvd. | 230 | 50 | 230 | 0.2 | 5 | 138 | 39 | 7 | 24 | 0.2 | 0.02 | 0.2 | 0.012 | 0.10 | 0.0004 |
| Church St. | The Esplanade to Front St. | 140 | 50 | 550 | 0.06 | 5 | 202 | 57 | 5 | 15 | 0.3 | 0.03 | 0.3 | 0.017 | 0.14 | 0.0006 |
| Jarvis St. | Queens Quay E to Lake Shore Blvd. | 190 | 50 | 403 | 0.06 | 5 | 200 | 57 | 5 | 15 | 0.3 | 0.03 | 0.3 | 0.017 | 0.14 | 0.0006 |
| **SUBTOTAL** | | | | | | | 11,104 | 3,159 | 241 | 655 | 18.3 | 1.89 | 13.9 | 0.949 | 7.89 | 0.0340 |

**Emissions From Intersection Delay**

| Intersection | Intersection Delay (s) | Vehicle Speed (km/hour) | AM Peak Hour Traffic (vehicles/hour) | Assumed Silt Loading ($g/m^2$) | Truck % | Emissions (g/hour) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | CO | NOx | PM2.5 | PM10 | Benzene | 1,3-Butadiene | Formaldehyde | Acrolein | Acetaldehyde | Benzo(a)Pyrene |
| Queens Quay E and Yonge St. | 10.9 | 0 | 1467 | N/A | 5 | 93 | 23 | 2 | 2 | 0.4 | 0.04 | 0.3 | 0.022 | 0.18 | 0.0005 |
| Queens Quay E and Lower Jarvis St. | 32.4 | 0 | 1373 | N/A | 5 | 258 | 64 | 5 | 5 | 1.0 | 0.12 | 0.9 | 0.062 | 0.50 | 0.0013 |
| Harbour St. and York St. | 23.4 | 0 | 2612 | N/A | 5 | 354 | 89 | 6 | 7 | 1.4 | 0.17 | 1.2 | 0.085 | 0.68 | 0.0018 |
| Harbour St. and Bay St. | 19.8 | 0 | 2249 | N/A | 5 | 258 | 64 | 5 | 5 | 1.0 | 0.12 | 0.9 | 0.062 | 0.50 | 0.0013 |
| Harbour St. and Yonge St. | 8.5 | 0 | 2195 | N/A | 5 | 108 | 27 | 2 | 2 | 0.4 | 0.05 | 0.4 | 0.026 | 0.21 | 0.0005 |
| Lake Shore Blvd. WB and Lower Bay St. | 20.3 | 0 | 2869 | N/A | 5 | 338 | 84 | 6 | 7 | 1.3 | 0.16 | 1.2 | 0.081 | 0.65 | 0.0017 |
| Lake Shore Blvd. WB and Yonge St. | 24.8 | 0 | 2869 | N/A | 5 | 413 | 103 | 7 | 8 | 1.6 | 0.19 | 1.4 | 0.099 | 0.80 | 0.0021 |
| Lake Shore Blvd. EB and Lower Jarvis St. | 17.9 | 0 | 1582 | N/A | 5 | 164 | 41 | 3 | 3 | 0.6 | 0.08 | 0.6 | 0.040 | 0.32 | 0.0008 |
| Lake Shore Blvd. WB and Lower Jarvis St. | 16.7 | 0 | 1399 | N/A | 5 | 135 | 34 | 2 | 3 | 0.5 | 0.06 | 0.5 | 0.033 | 0.26 | 0.0007 |
| **SUBTOTAL** | | | | | | 2,122 | 530 | 37 | 41 | 8.2 | 1.00 | 7.2 | 0.511 | 4.10 | 0.0107 |
| **TOTAL ARTERIAL** | | | | | | 13,226 | 3,689 | 279 | 696 | 26.5 | 2.90 | 21.2 | 1.460 | 11.98 | 0.0447 |

### HIGHWAYS

| Road | Section | Road Segment Length (m) | Free Flow Speed (km/hour) | AM Peak Hour Traffic (vehicles/hour) | Assumed Silt Loading ($g/m^2$) | Truck % | Emissions (g/hour) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | CO | NOx | PM2.5 | PM10 | Benzene | 1,3-Butadiene | Formaldehyde | Acrolein | Acetaldehyde | Benzo(a)Pyrene |
| Gardiner Expressway | Bay St. to Jarvis St. | 720 | 90 | 4968 | 0.015 | 5 | 7,382 | 2,426 | 114 | 251 | 10.8 | 1.11 | 8.4 | 0.579 | 4.73 | 0.0229 |
| **TOTAL HIGHWAY** | | | | | | | 7,382 | 2,426 | 114 | 251 | 10.8 | 1.11 | 8.4 | 0.579 | 4.73 | 0.0229 |
| **GRAND TOTAL** | | | | | | | **20,608** | **6,115** | **392** | **946** | **37.3** | **4.00** | **29.6** | **2.039** | **16.71** | **0.0676** |

## Summary of Future (2031) Traffic and Associated Emissions

**ARTERIAL ROADS**

**Freeflow Emissions**

| Road | Section | Road Segment Length (m) | Free Flow Speed (km/hour) | AM Peak Hour Traffic (vehicles/hour) | Assumed Silt Loading ($g/m^2$) | Truck % | Emissions (g/hour) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | CO | NOx | PM2.5 | PM10 | Benzene | 1,3-Butadiene | Formaldehyde | Acrolein | Acetaldehyde | Benzo(a)Pyrene |
| Queens Quay | Yonge St. to Freeland St. | 160 | 50 | 394 | 0.06 | 5 | 57 | 8 | 3 | 11 | 0.0 | 0.001 | 0.1 | 0.003 | 0.02 | 0.0001 |
| | Freeland St. to Cooper St. | 150 | 50 | 442 | 0.06 | 5 | 60 | 9 | 3 | 11 | 0.1 | 0.001 | 0.1 | 0.003 | 0.02 | 0.0001 |
| | Cooper St. to New St. | 120 | 50 | 479 | 0.06 | 5 | 52 | 8 | 2 | 10 | 0.0 | 0.001 | 0.0 | 0.003 | 0.02 | 0.0001 |
| | New St. to Lower Jarvis St. | 90 | 50 | 496 | 0.06 | 5 | 40 | 6 | 2 | 8 | 0.0 | 0.000 | 0.0 | 0.002 | 0.01 | 0.0001 |
| Harbour St. | Lower Simcoe St. to York St. | 210 | 50 | 2194 | 0.03 | 5 | 416 | 61 | 12 | 51 | 0.4 | 0.004 | 0.4 | 0.021 | 0.15 | 0.0007 |
| | York St. to Bay St. | 280 | 50 | 1466 | 0.03 | 5 | 371 | 55 | 11 | 45 | 0.3 | 0.004 | 0.3 | 0.019 | 0.13 | 0.0006 |
| | Bay St. to Yonge St. | 200 | 50 | 1200 | 0.03 | 5 | 217 | 32 | 6 | 26 | 0.2 | 0.002 | 0.2 | 0.011 | 0.08 | 0.0003 |
| | Yonge St. to Freeland St. | 160 | 50 | 750 | 0.06 | 5 | 108 | 16 | 5 | 20 | 0.1 | 0.001 | 0.1 | 0.006 | 0.04 | 0.0002 |
| | Freeland St. to Cooper St. | 150 | 50 | 750 | 0.06 | 5 | 102 | 15 | 5 | 19 | 0.1 | 0.001 | 0.1 | 0.005 | 0.04 | 0.0002 |
| | Cooper St. to New St. | 120 | 50 | 750 | 0.06 | 5 | 81 | 12 | 4 | 15 | 0.1 | 0.001 | 0.1 | 0.004 | 0.03 | 0.0001 |
| | New St. to Lower Jarvis St. | 90 | 50 | 750 | 0.06 | 5 | 61 | 9 | 3 | 11 | 0.1 | 0.001 | 0.1 | 0.003 | 0.02 | 0.0001 |
| Lake Shore Blvd. EB | Yonge St. to Freeland St. | 170 | 50 | 1150 | 0.03 | 5 | 177 | 26 | 5 | 22 | 0.2 | 0.002 | 0.2 | 0.009 | 0.06 | 0.0003 |
| | Freeland St. to Cooper St. | 150 | 50 | 1150 | 0.03 | 5 | 156 | 23 | 5 | 19 | 0.1 | 0.002 | 0.1 | 0.008 | 0.06 | 0.0002 |
| | Cooper St. to New St. | 120 | 50 | 1150 | 0.03 | 5 | 125 | 18 | 4 | 15 | 0.1 | 0.001 | 0.1 | 0.006 | 0.04 | 0.0002 |
| | New St. to Lower Jarvis St. | 90 | 50 | 1150 | 0.03 | 5 | 93 | 14 | 3 | 11 | 0.1 | 0.001 | 0.1 | 0.005 | 0.03 | 0.0001 |
| Lake Shore Blvd. WB | Yonge St. to Bay St. | 200 | 50 | 1356 | 0.03 | 5 | 245 | 36 | 7 | 30 | 0.2 | 0.002 | 0.2 | 0.013 | 0.09 | 0.0004 |
| | Lower Jarvis St. to Yonge St. | 520 | 50 | 1430 | 0.03 | 5 | 672 | 99 | 20 | 82 | 0.6 | 0.007 | 0.6 | 0.034 | 0.24 | 0.0011 |
| Bay St. | Harbour St. to Gardiner Expressway/Lakeshore | 130 | 50 | 800 | 0.03 | 5 | 94 | 14 | 3 | 11 | 0.1 | 0.001 | 0.1 | 0.005 | 0.03 | 0.0001 |
| Yonge St. | Queens Quay E to Harbour St. | 160 | 50 | 1100 | 0.03 | 5 | 159 | 23 | 5 | 19 | 0.1 | 0.002 | 0.1 | 0.008 | 0.06 | 0.0003 |
| | Harbour St. to Lake Shore Blvd. | 110 | 50 | 1100 | 0.03 | 5 | 109 | 16 | 3 | 13 | 0.1 | 0.001 | 0.1 | 0.006 | 0.04 | 0.0002 |
| | Lake Shore Blvd. to The Esplanade | 180 | 50 | 1500 | 0.03 | 5 | 244 | 36 | 7 | 30 | 0.2 | 0.002 | 0.2 | 0.012 | 0.09 | 0.0004 |
| | The Esplanade to Front St. | 120 | 50 | 1500 | 0.03 | 5 | 163 | 24 | 5 | 20 | 0.1 | 0.002 | 0.1 | 0.008 | 0.06 | 0.0003 |
| Freeland St. | Queens Quay E to Harbour St. | 110 | 50 | 250 | 0.2 | 5 | 25 | 4 | 3 | 12 | 0.0 | 0.000 | 0.0 | 0.001 | 0.01 | 0.0000 |
| | Harbour St. to Lake Shore Blvd. | 130 | 50 | 250 | 0.2 | 5 | 29 | 4 | 3 | 14 | 0.0 | 0.000 | 0.0 | 0.001 | 0.01 | 0.0000 |
| Cooper St. | Queens Quay E to Harbour St. | 110 | 50 | 150 | 0.2 | 5 | 15 | 2 | 2 | 7 | 0.0 | 0.000 | 0.0 | 0.001 | 0.01 | 0.0000 |
| | Harbour St. to Lake Shore Blvd. | 120 | 50 | 150 | 0.2 | 5 | 16 | 2 | 2 | 8 | 0.0 | 0.000 | 0.0 | 0.001 | 0.01 | 0.0000 |
| Church St. | Lake Shore Blvd. to The Esplanade | 260 | 50 | 350 | 0.2 | 5 | 82 | 12 | 10 | 39 | 0.1 | 0.001 | 0.1 | 0.004 | 0.03 | 0.0001 |
| | The Esplanade to Front St. | 140 | 50 | 586 | 0.06 | 5 | 74 | 11 | 3 | 14 | 0.1 | 0.001 | 0.1 | 0.004 | 0.03 | 0.0001 |
| New St. | Queens Quay E to Harbour St. | 100 | 50 | 300 | 0.2 | 5 | 27 | 4 | 3 | 13 | 0.0 | 0.000 | 0.0 | 0.001 | 0.01 | 0.0000 |
| | Harbour St. to Lake Shore Blvd. | 110 | 50 | 300 | 0.2 | 5 | 30 | 4 | 3 | 14 | 0.0 | 0.000 | 0.0 | 0.002 | 0.01 | 0.0000 |
| Jarvis St. | Queens Quay E to Harbour St. | 90 | 50 | 950 | 0.03 | 5 | 77 | 11 | 2 | 9 | 0.1 | 0.001 | 0.1 | 0.004 | 0.03 | 0.0001 |
| | Harbour St. to Lake Shore Blvd. | 100 | 50 | 950 | 0.03 | 5 | 86 | 13 | 3 | 10 | 0.1 | 0.001 | 0.1 | 0.004 | 0.03 | 0.0001 |
| **SUBTOTAL** | | | | | | | 4,261 | 629 | 158 | 640 | 3.7 | 0.043 | 3.9 | 0.218 | 1.53 | 0.0068 |

**Emissions From Intersection Delay**

| Intersection | Intersection Delay (s) | Vehicle Speed (km/hour) | AM Peak Hour Traffic (vehicles/hour) | Assumed Silt Loading ($g/m^2$) | Truck % | Emissions (g/hour) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | CO | NOx | PM2.5 | PM10 | Benzene | 1,3-Butadiene | Formaldehyde | Acrolein | Acetaldehyde | Benzo(a)Pyrene |
| Queens Quay E and Yonge St. | 11.3 | 0 | 497 | N/A | 5 | 4 | 1 | 0 | 0 | 0.0 | 0.000 | 0.0 | 0.001 | 0.01 | 0.0000 |
| Queens Quay E and Freeland St. | 12.9 | 0 | 591 | N/A | 5 | 6 | 2 | 0 | 0 | 0.0 | 0.000 | 0.0 | 0.002 | 0.01 | 0.0000 |
| Queens Quay E and Lower Jarvis St. | 12 | 0 | 1117 | N/A | 5 | 11 | 3 | 0 | 0 | 0.0 | 0.001 | 0.1 | 0.003 | 0.02 | 0.0001 |
| Harbour St. and York St. | 26 | 0 | 3145 | N/A | 5 | 65 | 21 | 2 | 2 | 0.2 | 0.005 | 0.4 | 0.020 | 0.14 | 0.0005 |
| Harbour St. and Bay St. | 21.1 | 0 | 2034 | N/A | 5 | 34 | 11 | 1 | 1 | 0.1 | 0.002 | 0.2 | 0.011 | 0.07 | 0.0003 |
| Harbour St. and Yonge St. | 27.2 | 0 | 1649 | N/A | 5 | 35 | 12 | 1 | 1 | 0.1 | 0.003 | 0.2 | 0.011 | 0.07 | 0.0003 |
| Lake Shore Blvd. WB and Lower Bay St. | 22.9 | 0 | 2356 | N/A | 5 | 43 | 14 | 1 | 1 | 0.1 | 0.003 | 0.2 | 0.013 | 0.09 | 0.0003 |
| Lake Shore Blvd. EB/WB and Yonge St. | 63.9 | 0 | 4344 | N/A | 5 | 219 | 71 | 6 | 7 | 0.8 | 0.016 | 1.2 | 0.069 | 0.46 | 0.0017 |
| Lake Shore Blvd. EB/WB and Lower Jarvis St. | 78.5 | 0 | 4110 | N/A | 5 | 255 | 83 | 7 | 8 | 0.9 | 0.018 | 1.4 | 0.080 | 0.54 | 0.0019 |
| Yonge St. and The Esplanade | 10 | 0 | 2389 | N/A | 5 | 19 | 6 | 1 | 1 | 0.1 | 0.001 | 0.1 | 0.006 | 0.04 | 0.0001 |
| Church St. and The Esplanade | 9 | 0 | 1142 | N/A | 5 | 8 | 3 | 0 | 0 | 0.0 | 0.001 | 0.0 | 0.003 | 0.02 | 0.0001 |
| **SUBTOTAL** | | | | | | 698 | 227 | 19 | 21 | 2.4 | 0.050 | 3.8 | 0.221 | 1.47 | 0.0053 |
| **TOTAL ARTERIAL** | | | | | | 4,959 | 856 | 177 | 661 | 6.1 | 0.092 | 7.7 | 0.438 | 3.01 | 0.0121 |

| HIGHWAYS | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Road | Section | Road Segment Length (m) | Free Flow Speed (km/hour) | AM Peak Hour Traffic (vehicles/hour) | Assumed Silt Loading ($g/m^2$) | Truck % | Emissions (g/hour) | | | | | | | | | |
| | | | | | | | CO | NOx | PM2.5 | PM10 | Benzene | 1,3-Butadiene | Formaldehyde | Acrolein | Acetaldehyde | Benzo(a)Pyrene |
| Gardiner Expressway | Bay St. to Jarvis St. | 720 | 90 | 4968 | 0.015 | 5 | 2,761 | 462 | 51 | 181 | 2.3 | 0.023 | 2.1 | 0.119 | 0.85 | 0.0042 |
| **TOTAL HIGHWAY** | | | | | | | 2,761 | 462 | 51 | 181 | 2.3 | 0.023 | 2.1 | 0.119 | 0.85 | 0.0042 |
| **GRAND TOTAL** | | | | | | | **7,721** | **1,318** | **228** | **842** | **8.4** | **0.115** | **9.8** | **0.558** | **3.86** | **0.0163** |

# ATTACHMENT C

## Summary of Emissions for Specific Roadway Segments

| Road | Section | Contaminant | Emissions (g/hour) | | |
|---|---|---|---|---|---|
| | | | Existing (2016) | Future (2031) | % Difference |
| Queens Quay | Yonge St. to Lower Jarvis St. | CO | 1,959 | 230 | -88% |
| | | NOx | 545 | 38 | -93% |
| | | PM2.5 | 39 | 10 | -73% |
| | | PM10 | 92 | 40 | -57% |
| | | Benzene | 4.00 | 0.25 | -94% |
| | | 1,3-Butadiene | 0.4399 | 0.0036 | -99% |
| | | Formaldehyde | 3.22 | 0.30 | -91% |
| | | Acrolein | 0.222 | 0.017 | -92% |
| | | Acetaldehyde | 1.82 | 0.12 | -93% |
| | | Benzo(a)Pyrene | 0.00670 | 0.00049 | -93% |
| Harbour St. | Lower Simcoe Street to Yonge St. | CO | 3,780 | 1,137 | -70% |
| | | NOx | 1,050 | 192 | -82% |
| | | PM2.5 | 75 | 34 | -55% |
| | | PM10 | 176 | 127 | -28% |
| | | Benzene | 7.8 | 1.3 | -83% |
| | | 1,3-Butadiene | 0.862 | 0.020 | -98% |
| | | Formaldehyde | 6.3 | 1.6 | -74% |
| | | Acrolein | 0.435 | 0.094 | -79% |
| | | Acetaldehyde | 3.57 | 0.64 | -82% |
| | | Benzo(a)Pyrene | 0.0130 | 0.0026 | -80% |
| | Yonge St. to Lower Jarvis St. | CO | N/A | 352 | N/A |
| | | NOx | N/A | 52 | N/A |
| | | PM2.5 | N/A | 16 | N/A |
| | | PM10 | N/A | 66 | N/A |
| | | Benzene | N/A | 0.30 | N/A |
| | | 1,3-Butadiene | N/A | 0.0035 | N/A |
| | | Formaldehyde | N/A | 0.32 | N/A |
| | | Acrolein | N/A | 0.018 | N/A |
| | | Acetaldehyde | N/A | 0.13 | N/A |
| | | Benzo(a)Pyrene | N/A | 0.00056 | N/A |
| Lake Shore Blvd. | Bay St. to Lower Jarvis St. | CO | 4,048 | 1,983 | -51% |
| | | NOx | 1,115 | 384 | -66% |
| | | PM2.5 | 82 | 58 | -29% |
| | | PM10 | 190 | 195 | 2% |
| | | Benzene | 9.0 | 3.0 | -66% |
| | | 1,3-Butadiene | 1.007 | 0.051 | -95% |
| | | Formaldehyde | 7.4 | 4.1 | -44% |
| | | Acrolein | 0.51 | 0.24 | -53% |
| | | Acetaldehyde | 4.2 | 1.6 | -61% |
| | | Benzo(a)Pyrene | 0.0145 | 0.0063 | -57% |
| Bay St. | Harbour St. to Gardiner Expressway/Lakeshore | CO | 1,039 | 170 | -84% |
| | | NOx | 275 | 39 | -86% |
| | | PM2.5 | 19.5 | 4.9 | -75% |
| | | PM10 | 35 | 14 | -61% |
| | | Benzene | 3.03 | 0.34 | -89% |
| | | 1,3-Butadiene | 0.3571 | 0.0064 | -98% |
| | | Formaldehyde | 2.59 | 0.50 | -81% |
| | | Acrolein | 0.181 | 0.029 | -84% |
| | | Acetaldehyde | 1.47 | 0.19 | -87% |
| | | Benzo(a)Pyrene | 0.00436 | 0.00073 | -83% |

| Road | Section | Contaminant | Emissions (g/hour) | | |
|---|---|---|---|---|---|
| | | | Existing (2016) | Future (2031) | % Difference |
| Yonge St. | Queens Quay to Front St. | CO | 2,874 | 952 | -67% |
| | | NOx | 796 | 190 | -76% |
| | | PM2.5 | 58 | 28 | -52% |
| | | PM10 | 137 | 91 | -34% |
| | | Benzene | 6.1 | 1.5 | -75% |
| | | 1,3-Butadiene | 0.675 | 0.027 | -96% |
| | | Formaldehyde | 4.9 | 2.1 | -57% |
| | | Acrolein | 0.34 | 0.12 | -64% |
| | | Acetaldehyde | 2.79 | 0.83 | -70% |
| | | Benzo(a)Pyrene | 0.0100 | 0.0032 | -68% |
| Freeland St. | Queens Quay to Lakeshore Blvd. | CO | 195 | 60 | -69% |
| | | NOx | 55 | 10 | -82% |
| | | PM2.5 | 9.8 | 6.5 | -34% |
| | | PM10 | 34 | 26 | -24% |
| | | Benzene | 0.321 | 0.067 | -79% |
| | | 1,3-Butadiene | 0.0332 | 0.0010 | -97% |
| | | Formaldehyde | 0.244 | 0.082 | -67% |
| | | Acrolein | 0.0166 | 0.0047 | -72% |
| | | Acetaldehyde | 0.138 | 0.032 | -77% |
| | | Benzo(a)Pyrene | 0.00060 | 0.00013 | -78% |
| Cooper St. | Queens Quay E to Lake Shore Blvd. | CO | 138 | 31 | -77% |
| | | NOx | 39.4 | 4.6 | -88% |
| | | PM2.5 | 6.9 | 3.6 | -48% |
| | | PM10 | 24 | 15 | -39% |
| | | Benzene | 0.228 | 0.027 | -88% |
| | | 1,3-Butadiene | 0.02361 | 0.00031 | -99% |
| | | Formaldehyde | 0.174 | 0.028 | -84% |
| | | Acrolein | 0.0118 | 0.0016 | -87% |
| | | Acetaldehyde | 0.098 | 0.011 | -89% |
| | | Benzo(a)Pyrene | 0.000424 | 0.000050 | -88% |
| Church St. | Lake Shore Blvd. to The Esplanade | CO | N/A | 90 | N/A |
| | | NOx | N/A | 15 | N/A |
| | | PM2.5 | N/A | 9.8 | N/A |
| | | PM10 | N/A | 39 | N/A |
| | | Benzene | N/A | 0.10 | N/A |
| | | 1,3-Butadiene | N/A | 0.0014 | N/A |
| | | Formaldehyde | N/A | 0.12 | N/A |
| | | Acrolein | N/A | 0.0068 | N/A |
| | | Acetaldehyde | N/A | 0.047 | N/A |
| | | Benzo(a)Pyrene | N/A | 0.00019 | N/A |
| | The Esplanade to Front St. | CO | 202 | 74 | -63% |
| | | NOx | 57 | 11 | -81% |
| | | PM2.5 | 5.2 | 3.4 | -34% |
| | | PM10 | 15 | 14 | -9% |
| | | Benzene | 0.332 | 0.064 | -81% |
| | | 1,3-Butadiene | 0.03437 | 0.00074 | -98% |
| | | Formaldehyde | 0.253 | 0.067 | -73% |
| | | Acrolein | 0.0172 | 0.0038 | -78% |
| | | Acetaldehyde | 0.143 | 0.027 | -81% |
| | | Benzo(a)Pyrene | 0.00062 | 0.00012 | -81% |

| Road | Section | Contaminant | Emissions (g/hour) | | |
|---|---|---|---|---|---|
| | | | Existing (2016) | Future (2031) | % Difference |
| New St. | Queens Quay E to Lake Shore Blvd. | CO | N/A | 57 | N/A |
| | | NOx | N/A | 8.4 | N/A |
| | | PM2.5 | N/A | 6.6 | N/A |
| | | PM10 | N/A | 27 | N/A |
| | | Benzene | N/A | 0.049 | N/A |
| | | 1,3-Butadiene | N/A | 0.00057 | N/A |
| | | Formaldehyde | N/A | 0.052 | N/A |
| | | Acrolein | N/A | 0.0029 | N/A |
| | | Acetaldehyde | N/A | 0.020 | N/A |
| | | Benzo(a)Pyrene | N/A | 0.000091 | N/A |
| Jarvis St. | Queens Quay E to Lake Shore Blvd. | CO | 758 | 428 | -44% |
| | | NOx | 196 | 110 | -44% |
| | | PM2.5 | 15 | 12 | -19% |
| | | PM10 | 26 | 28 | 8% |
| | | Benzene | 2.5 | 1.1 | -58% |
| | | 1,3-Butadiene | 0.298 | 0.021 | -93% |
| | | Formaldehyde | 2.2 | 1.6 | -26% |
| | | Acrolein | 0.151 | 0.092 | -39% |
| | | Acetaldehyde | 1.22 | 0.62 | -49% |
| | | Benzo(a)Pyrene | 0.0034 | 0.0023 | -34% |
| Gardiner Expressway | Bay St. to Jarvis St. | CO | 7,382 | 2,761 | -63% |
| | | NOx | 2,426 | 462 | -81% |
| | | PM2.5 | 114 | 51 | -55% |
| | | PM10 | 251 | 181 | -28% |
| | | Benzene | 10.8 | 2.3 | -79% |
| | | 1,3-Butadiene | 1.105 | 0.023 | -98% |
| | | Formaldehyde | 8.4 | 2.1 | -75% |
| | | Acrolein | 0.58 | 0.12 | -79% |
| | | Acetaldehyde | 4.73 | 0.85 | -82% |
| | | Benzo(a)Pyrene | 0.0229 | 0.0042 | -82% |

Note: The emissions from vehicles idling at intersections are included in the sum of emissions for both the intersecting streets.