



**Bovaird Drive Class Environmental Assessment  
Air Quality  
Assessment Report**

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## Executive Summary

The Halton Peel Boundary Area Transportation Study, prepared in 2009, identified the need to expand the transportation network within the two Regions. The need to address the congestion along Bovaird Drive (formerly Highway 7) was one development of the transportation study.

AMEC Earth & Environmental was retained to complete a study of the effects of traffic on Bovaird Drive with the defined study area on the air quality in the surrounding area.

This study contributes to the overall Municipal Class Environmental Assessment, with the following objectives:

- provide estimates of the air emissions resulting from vehicular traffic;
- predict the resulting air quality effects on ambient air, with consideration of existing background air quality;
- provide a qualitative discussion of the significance of potential effects and a qualitative comparison of the future air quality effects (2021 and 2031) to the current scenario.

The findings of the air quality study were as follow:

- The potential effect associated with air emissions is an increase in the airborne concentrations of the key pollutants NO<sub>x</sub>, PM<sub>2.5</sub>, PM<sub>10</sub>, CO, and SO<sub>2</sub>, in the vicinity of the project, with the potential to adversely affect air quality;
- The incremental (project) effects for PM<sub>2.5</sub> and PM<sub>10</sub> were predicted to be below the respective ambient air quality criteria, and lower than the existing background concentrations for these parameters;
- The incremental (project) effects for CO were predicted to be well below the respective ambient air quality criteria;
- The highest predicted NO<sub>x</sub> concentrations (1-hour averaging time) were found to exceed the ambient air quality criteria within the bounds of the intersection and the immediate vicinity, but decrease to below the AAQC within approximately 10 metres or less of the roadside;
- The predicted effects for PM<sub>10</sub>, and CO were highest for the 2031 scenario without the NSTC, and for PM<sub>2.5</sub> the effects were highest when the NSTC and the new Creditview Road were considered;
- The predicted effects for NO<sub>x</sub> were highest for the 2010 scenario, as the NO<sub>x</sub> emissions reductions achieved as older vehicles are removed from service off-set the increased traffic volumes for 2031;

- The cumulative effects of the roadway PM<sub>2.5</sub>, PM<sub>10</sub>, CO, and SO<sub>2</sub> emissions within the study area and the background concentrations were below the respective ambient air quality criteria for all averaging times under each scenario;
- The cumulative effects of the roadway NO<sub>x</sub> emissions within the study area and the background concentrations were found to be slightly higher than the respective ambient air quality criteria for the 1-hour averaging times at receptors located on the roadway itself or within close proximity to an intersection.

Based upon these findings, the future traffic volumes along Bovaird Drive are not expected to have a significant negative cumulative effect on local air quality.

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## **1 Introduction**

The Halton Peel Boundary Area Transportation Study, prepared in 2009, identified the need to expand the transportation network within the two Regions. The need to address the congestion along Bovaird Drive (formerly Highway 7) was one development of the transportation study.

AMEC Earth & Environmental was retained to complete a study of the effects of traffic on Bovaird Drive with the defined study area on the air quality in the surrounding area.

This study contributes to the overall Municipal Class Environmental Assessment.

The purposes of this report are to:

- provide estimates of the air emissions resulting from vehicular traffic;
- predict the resulting air quality effects on ambient air, with consideration of existing background air quality;
- provide a qualitative discussion of the significance of potential effects and a qualitative comparison of the future air quality effects (2021 and 2031) to the current scenario.

The assessment addresses the potential for the site to have an effect on the air quality, discusses the likelihood of such air quality effects occurring, and the significance of any effects predicted.

### **1.1 Key Components of Study**

The key components of the study include:

1. Development of a baseline scenario considering the current air quality;
2. Develop an emission scenario for the 2021 and 2031 level of service along Bovaird Drive, considering scenarios with and without the construction of the proposed North South Transit Corridor (hereafter referred to as the 'NSTC');
3. Provide a qualitative and quantitative analysis of the effects of on air quality; the qualitative analysis will include the use of modeling to predict off-site air concentrations that result from site activities; and
4. Provide a qualitative discussion of the significance of air quality effects.

## 1.2 Definition of Study Area

The study area comprised of approximately five (5) kilometers of Bovaird Drive. The western extent of the study area was Caseley Street, and the eastern extent was the intersection of Bovaird Drive with Worthington Avenue / Lake Louise Drive.

The study area is presented in Figure 1.1.

## 2 Identification Of Potential Air Quality Effects

There is the potential for vehicular emissions to increase the ambient air concentrations of certain pollutants in the local study area.

The air quality effects of the airborne pollutants may be classified as health effects, environmental effects, or nuisance effects. The health and environmental effects are of significance in the ambient air in general. Nuisance effects are not generally expected to result in health or environmental effects and are considered at locations where people reside or frequent; such locations are deemed 'sensitive receptors' for the purposes of air quality studies. In Ontario, the Environmental Protection Act prohibits the release of a contaminant into the natural environment, if the discharge causes or may cause an adverse effect, and encompasses potential health, environmental, and nuisance effects.

Nitrogen oxides, carbon monoxide, sulphur dioxide, and fine particulate matter have standards in Ontario that were set based upon health or environmental effects of exposure to these pollutants. Greenhouse gases are not regulated in the same manner, but are of interest due to global climate change and municipal GHG inventory development.

### 2.1.1 Particulate Matter

Particulate Matter, in the context of outdoor activities, is regulated and assessed in three forms:

- Total suspended particulate (TSP) which usually considers the particle size range of up to 44 micrometres ( $\mu\text{m}$ ) in aerodynamic diameter, and includes the smaller particle size fractions  $\text{PM}_{10}$  and  $\text{PM}_{2.5}$ . The larger particles are more likely to settle quickly and proximate to the source; it is the particles that are less than 44 micrometres in diameter that are generally considered as TSP.

The coarser particulate matter in road dusts has a standard based upon the nuisance effects that may result from site emissions. The potential exists for road dust generated to lead to reduced air quality, impaired visibility, and deposition in the surrounding area. The proximity of the site to residences increases the likelihood that, if unmitigated, dust may become a nuisance to residents in the community. This particulate size fraction was not considered in the study as the roadways are paved and road dust thereby minimized.



- Inhalable particulate (PM<sub>10</sub>) which has a particle size range up to 10 µm in aerodynamic diameter. PM<sub>10</sub> includes the smaller particles referred to as PM<sub>2.5</sub>. In addition to the nuisance effects, there are possible health effects that may be attributed to PM<sub>10</sub>.
- Respirable particulate (PM<sub>2.5</sub>) with a particle size range up to 2.5 µm in aerodynamic diameter. PM<sub>2.5</sub> is considered to be the most important particle size range from a respiratory public health perspective.

For this study, PM<sub>10</sub> and PM<sub>2.5</sub> vehicle tailpipe emissions, as well as PM<sub>10</sub> and PM<sub>2.5</sub> emissions from brake, and tire wear were considered.

### **2.1.2 Nitrogen Oxides (NO<sub>x</sub>)**

Nitrogen oxides (NO<sub>x</sub>) are a mixture of compounds of oxygen and nitrogen, including nitric oxide (NO), nitrous oxide (N<sub>2</sub>O), nitrogen dioxide (NO<sub>2</sub>), and others. These compounds are formed during fuel combustion, and are emitted from vehicles, boilers, and diesel generators. Nitrogen oxides may contribute to the formation of smog, or may affect human health at higher concentrations.

### **2.1.3 Carbon Monoxide**

Carbon monoxide (CO) is a colorless, odorless, tasteless gas, which is produced primarily through the combustion of fossil fuels as a result of incomplete combustion. Over 75% of the CO produced in Ontario is from the transportation sector and 25% is due to the combined effect of power generation, buildings, heating and industrial operations. Exposures at 100 ppm or greater can be dangerous to human health, and larger exposures can lead to significant toxicity of the central nervous system and heart.

The Ontario Regulation 419/05 CO standard is for the ½ hour averaging time; AAQC exist for the 1 hour and 8 hour averaging times. The standards and AAQC for CO are all based upon potential health effects, and are presented in Table 3.1.

### **2.1.4 Sulphur Dioxide**

Sulphur oxides, or SO<sub>x</sub>, comprise sulphur dioxide (SO<sub>2</sub>), sulphur trioxide (SO<sub>3</sub>) and solid sulphate forms. Sulphur dioxide is a non-flammable, non-explosive colourless gas. In connection with fuel burning, where the majority is in the form of SO<sub>2</sub>, SO<sub>x</sub> is normally expressed in terms of the equivalent mass concentration of SO<sub>2</sub> and sometimes as total sulphur. Sulphur oxide has an odour threshold limit of 0.47 to 3.0 ppm, and has pungent irritating odour above 3 ppm. SO<sub>x</sub> compounds are significant contributors to acid rain and also precursors to the formation of secondary fine particulate matter.

SO<sub>2</sub> is irritating to the eyes and respiratory system above 5 ppm (exposure for 10 minutes), in the form of higher airway resistance. The effects of SO<sub>2</sub> on human health with respect to the short-term (acute) respiratory effects have been extensively studied. No clear evidence of long term or chronic effects is apparent.

Air quality standards for SO<sub>2</sub> have been set for the 1-hour and 24-hour averaging times, with equivalent AAQCs, as shown in Table 3.1. In addition, Ontario has an annual AAQC of 55 µg/m<sup>3</sup> for SO<sub>2</sub>. The standards and AAQC are based upon potential health effects of SO<sub>2</sub>, as well as potential effects on vegetation.

### **2.1.5 Greenhouse Gases**

Greenhouse Gas (GHG) emissions, such as methane and carbon dioxide, are a potential contributor to long-term, global climate change effects. However, the offsite effects are not modelled because the ambient air quality criteria are intended to provide limits on short-term effects, with the longest averaging time being an annual average. Tailpipe emission from cars and truck on public roadways release greenhouse gases, and are a consideration in municipal inventory preparation. Short term health or environmental effects of GHG emissions are not assessed in the same manner as the other key pollutants NO<sub>x</sub>, CO, and particulate matter.

### **2.1.6 Other Pollutants**

This study is intended to cover the substances that may be released to the atmosphere in quantities significant enough to affect the air quality. There may be a number of other pollutants released from the site as a result of the activities carried out, such as VOCs in tailpipe emissions or trace metals in the particulate matter; these other pollutants have not been considered in the modelling assessment due to the low emission rates relative to the criteria air contaminants of NO<sub>x</sub>, CO, PM<sub>10</sub> and PM<sub>2.5</sub>.

### 3 Project Setting

#### 3.1 Regulatory Framework and Assessment Criteria

The relevant air quality criteria for Ontario are listed in Table 3.1. This table lists the contaminants, the relevant averaging period for each standard and the standard as a numerical value (where appropriate).

Table 3.1 - Air Quality Criteria Used for Study

Contaminant	Averaging Time	Ontario Ambient Air Quality Criteria
NO <sub>2</sub>	1 hr	400 (0.2ppm)
	24 hr	200 (0.1 ppm)
SO <sub>2</sub>	1 hr	690
	24 hr	275
	Annual	55
CO	0.5 hr	-
	1 hr	36,200 (30 ppm)
	8 hr	15,700 (13ppm)
PM <sub>10</sub> (<10µm)	24-hour	50 (Interim)
PM <sub>2.5</sub> (<2.5 µm)	24-hour	30 (based upon CWS)

\* Ontario Jurisdictional Screening Level JSL (2008)

The criterion of 50 µg/m<sup>3</sup> as a 24 hour average for PM<sub>10</sub> is an interim ambient air quality criteria provided as a guide for decision making<sup>1</sup>. For PM<sub>2.5</sub>, the Ontario AAQC is equivalent to the Canada-Wide Standard (CWS), at 30 µg/m<sup>3</sup>, noting that the CWS is for the 98<sup>th</sup> percentile not the peak or maximum concentration. This level has been set for the protection of health and to reduce environmental risk. As a guide for decision making near individual sources, the contribution of primary PM<sub>2.5</sub> from a single facility to ambient levels of PM<sub>2.5</sub> should be no more than 25 µg/m<sup>3</sup> as a 24 hour average.<sup>2</sup>

<sup>1</sup> Ontario's Ambient Air Quality Criteria, Standards Development Branch Ontario Ministry Of The Environment, February 2008

<sup>2</sup> IBID

### 3.2 Background Conditions

The background concentrations of the parameters considered in this assessment were obtained from the MOE Brampton Air Monitoring Station located at 525 Main St. N. (Peel Manor). This station is located approximately 3 kilometers northeast of the study area, is currently operational, and continuously monitors the ambient concentration of a number of pollutants including carbon monoxide, nitrogen oxides, ozone, and PM<sub>2.5</sub>.

The fine particulate matter fraction PM<sub>2.5</sub> and nitrogen oxides are monitored continuously at this station. The data presented in Table 3.2 is for 2008; note that there is no monitoring data for PM<sub>10</sub> at the Brampton Air Monitoring Station.

Table 3.2 - Background Concentrations

Parameter	Background Concentration (90 <sup>th</sup> Percentile)	Source of Criteria
PM <sub>2.5</sub>	16 µg/m <sup>3</sup>	Air Quality Ontario, 2008
PM <sub>10</sub>	32 µg/m <sup>3</sup>	Estimated (No monitoring data available)
CO	0.35 ppm	Air Quality Ontario, 2008
SO <sub>2</sub>	4 ppb	Air Quality Ontario, 2008
Nitrogen Dioxide (NO <sub>2</sub> )	28 ppb	Air Quality Ontario, 2008

### 3.3 Regional Climate and Meteorology

Air quality is affected by both the emission sources that release pollutants into the air, and by the climate, or atmospheric conditions, such as wind speed, wind direction, and temperature. The climate in the Greater Toronto Area consists of fairly cold and windy winters and typically hot, humid summers.

For the air quality study, five years of surface meteorological data were obtained for Toronto, Ontario. The 5-year period of record for meteorological data is not considered a climate record, but rather a meteorological data set. The term “climate normal” is the arithmetic average of a meteorological parameter during a 30-year period. A summary of the 1971 – 2000 climate normals is provided in Appendix C.

#### 3.3.1 Wind Speed and Direction (1971-2000 Climate Normal)

The monthly average wind speeds, most frequent wind direction, and maximum wind speeds, recorded at Toronto Pearson Airport for the 1971-2000 period of record are presented in Table 3.3. The annual average wind speed for this period was 4.1 m/s (14.8 km/h).

Table 3.3 – Wind Speed and Wind Direction (1971-2000 Climate Normal)

	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
Average Speed (m/s)	4.9	4.6	4.8	4.8	3.9	3.6	3.4	3.1	3.4	3.7	4.3	4.4
Most Frequent Wind Direction	SW	N	NW	NW	NW	NW	NW	NW	NW	NW	SW	SW
Maximum Hourly Speed (m/s)	21.4	21.4	26.9	22.5	19.7	17.5	16.9	19.7	21.4	25.6	22.2	19.4

### 3.3.2 Wind Speed and Direction (1996-2000)

The wind rose depicted in Figure 3.1 for the Toronto Pearson Airport meteorological data set details the distribution of wind directions and wind speeds for the 1996-2000 record. A wind rose depicts the predominant wind patterns for a site by graphically illustrating the distribution of wind speed and wind direction. The wind rose is comprised of two parts: the frequency of winds from specified direction around the rose, and the distribution of wind speed indicated by the colours on each bar that represent wind speed ranges. Winds from the west and northwest were most common, and the average wind speed for the period was 4.0 m/s (14.3 km/h).

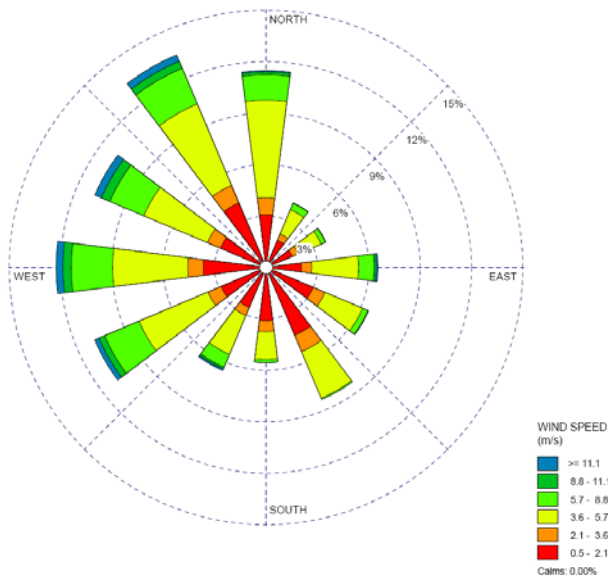


Figure 3.1: Wind Rose (Toronto Pearson 1996-2000)

### 3.3.3 Temperature

The temperature in the greater Toronto area fluctuates significantly with the seasons. The climate normal annual average temperature reported for Pearson Airport was 7.5 °C; the January daily average was -6.3 °C and a July average 20.8°C. The daily maximum and minimum temperatures are also demonstrative of the large fluctuations in temperature typical of this climate zone. In July, the daily average temperatures ranged from 14.8 to 26.8 °C. In January, the range was -10.5 to -2.1°C, as shown in Figure 3.2.

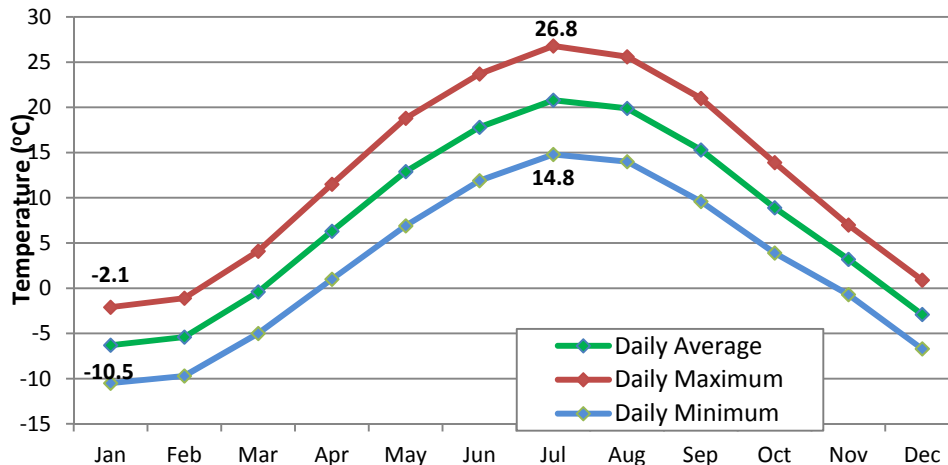


Figure 3.2: Monthly Average Temperatures (Daily Temperatures 1971-2000)

### 3.3.4 Precipitation

Mean annual precipitation for the Project site is estimated at 793 mm, with the greatest precipitation contribution occurring as rainfall during the spring and summer. The monthly precipitation is depicted in Figure 3.3.

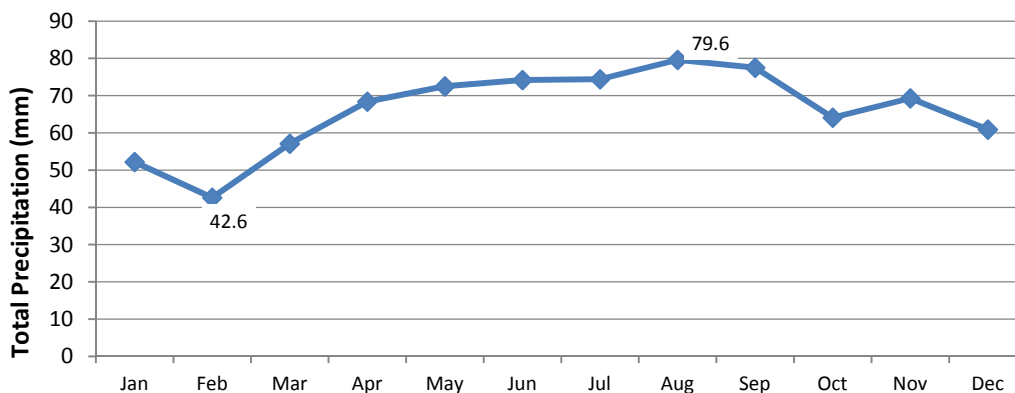


Figure 3.3: Monthly Precipitation (Toronto Average Precipitation 1971-2000 Climate Normals)

### **3.4 Surrounding Land Uses**

The lands surrounding the study area include predominantly low density residential and agricultural, as well as industrial, commercial, and institutional land uses. A number of commercial plazas located along this stretch of Bovaird and the intersections, as well as places of worship.

The lands to the west of Heritage Road are subject to an Interim Control By-Law (306-2003), as well as those lands which lie between Heritage Road and Mississauga Road to the north of Bovaird. The lands to the south of Bovaird are subject to a specific exemption to this Interim Control By-Law. The interim by-laws are in place as the replacement by-laws was appealed to the OMB.

A GO Transit commuter train station is located in the study area, at Ashby Field Road.

## **4 Traffic Volumes and Emission Rate Estimation**

### **4.1 Existing and Future Traffic Scenarios**

Five scenarios were considered as part of the air quality assessment:

1. Current Conditions (2010);
2. Future Conditions (2021) considering traffic volumes forecast with, and without, the construction of a North-South Transit Corridor; and
3. Future conditions (2031) considering traffic volumes forecast with, and without, the construction of a North-South Transit Corridor.

The traffic volumes, intersection data, and traffic profile (passenger cars, trucks), detailed in the Bovaird Drive Environmental Assessment: Traffic Study Final Report (Entra, 2010) were used for the dispersion modelling assessment and the discussion of the air quality effects of traffic along Bovaird Drive and along the cross-streets in the study area (Caseley Road, Heritage Road, Mississauga Road, Ashby Field Road, and Lake Louise Drive / Worthington Avenue).

The traffic profile, or the distribution of vehicles by passenger car and truck, was tabulated by traffic counts in 2009; the distribution was assumed to be applicable to the future years considered in the assessment (2021 and 2031).

## 4.2 Emission Rate Estimation

The tailpipe emissions, and particulate emissions from brake and tire wear, for passenger vehicles and heavy-duty diesel vehicles were estimated using the Mobile 6.2C database. The Mobile 6.2C database is the Canadian version of the US EPA Mobile Source Emission Factor Model. This model provides estimates of emissions for current and future years, with consideration for gradual fleet replacement as the higher polluting vehicles are removed from service. Idling emissions, required for assessing air quality for queuing vehicles at intersections, were estimated using the recommended practice of dividing the emission factors for a vehicle speed of 2.5 mph by 2.5 to provide a factor in g/hour (US EPA, 2003).

The emissions calculations and a summary of the raw traffic data is provided in Appendix B.

## 5 Dispersion Modelling

The off-site effects were predicted using the CAL3QHCR dispersion model, using the Tier I approach.

CALINE-3 is designed to predict air pollutant concentrations near highways and arterial streets due to emissions from motor vehicles operating under free flow conditions. However, it does not permit the direct estimation of the contribution of emissions from idling vehicles. CAL3QHC enhances CALINE-3 by incorporating methods for estimating queue lengths and the contribution of emissions from idling vehicles, to allow for total air pollution concentrations from both moving and idling vehicles. CAL3QHCR further enhances the model by incorporating local meteorological data rather than the default wind speed and wind directions used by CAL3QHC.

The meteorological data used for the modelling was obtained from the Ministry of the Environment for the five years 1996-2000. This consisted of hourly surface data from a met station at Toronto Pearson Airport. This is located approximately 15 kilometres to the east of the study area. The meteorological data incorporated into the model included wind speed, wind direction, stability category, air temperature, rural mixing height, and urban mixing height. For the CAL3HQCR modelling, each run considers one year of meteorological data.

The model was run for the target pollutants ( $PM_{10}$ ,  $PM_{2.5}$ ,  $NO_x$ ,  $CO$ , and  $SO_2$ ). Note that the model runs for  $NO_x$  do not take into account any atmospheric reactions or transformations. The CALRoads Version 4.0.0 model is designed to model the effects of particulate matter or carbon monoxide; the effects of  $NO_x$  and  $SO_2$  were estimated using a model run for  $CO$  with the emission factors for  $NO_x$ , and converting the model output from ppm  $CO$  to ppm  $NO_x$ .



## 6 Assessment Findings

Table A.1 in Appendix A provides a summary of the maximum modelled concentration for each of the target pollutants for the current scenario, the forecast 2021 scenarios, and the forecast 2031 scenarios. For each of 2021 and 2031, the effects with and without the influence of the North South Transit Corridor are presented.

For each of the parameters modelled, for each scenario, it was found that the maximum concentrations occurred at the intersection of Bovaird Drive and Mississauga Road, or along Bovaird Drive (within the road extents).

Traffic volumes for the roadways considered in this study were relatively low when compared with traffic volumes on major arterial roads or highways. Further, the profile of vehicles was dominated by passenger cars, which accounted for 88% to 95% of the vehicles on the road at the time of the traffic survey in 2009. Heavy-duty diesel engines contribute significantly more to roadway air quality effects than gasoline fueled passenger cars.

Under existing road conditions, the maximum concentrations predicted for each parameter were well below the respective air quality criteria with the exception of NO<sub>x</sub> for the 1-hour averaging time. The NO<sub>x</sub> concentration exceeded the AAQC of 0.2 ppm at receptors located on the roadway, within an intersection, or within close proximity to an intersection. In each scenario modelled, the NO<sub>x</sub> concentrations decreased to less than 0.2 ppm within 10 metres of the roadway and in most cases to less than 0.2 ppm at the roadside.

Sulphur dioxide emissions were found to be negligible. With the traffic volumes considered, all air quality effects were below levels that can reasonably be modelled with any confidence (below 0.00 ppm).

The isopleths plots for PM<sub>2.5</sub> and PM<sub>10</sub> (Figures 5.1 to 5.3) illustrate how localized the areas are where the maximum predicted concentrations lie, and how the concentrations decrease quickly with distance from the roadway. For example, the maximum PM<sub>2.5</sub> concentration predicted for the 2031 scenario without the NSTC was found to be 3.4 µg/m<sup>3</sup> within the intersection of Bovaird Drive and Mississauga Road. As depicted in the isopleths, this concentration dropped to 2.0 µg/m<sup>3</sup> at 14 metres from the roadside, and to 1.0 µg/m<sup>3</sup> at 57 metres from the roadside.

The two residences on the west side of Mississauga Drive and north of Bovaird Drive were found to have maximum PM<sub>2.5</sub> concentrations of less than 1 µg/m<sup>3</sup> for the 'worst-case' 2031 scenario with the highest overall maximum concentration (no NSTC).

The effects on air quality along the free-flowing stretches of Bovaird Drive were not found to be significant.

The predicted effects for each of the five scenarios modelled were compared, and it was found that for PM<sub>2.5</sub>, PM<sub>10</sub>, and CO, slightly higher concentrations were predicted for the 2031 scenario in the absence of the NSTC, which is the scenario with the highest traffic volumes. For NO<sub>x</sub>,

however, the highest concentrations were predicted for the current year, as the emission reductions achieved from the gradual replacement of older vehicles with lower-NOx vehicles offset the higher traffic volumes in 2031. In all cases, the differences between the various scenarios were minor and distinguishable only at the intersection of Mississauga Road and Bovaird Drive, and at a few other locations along Bovaird Drive. For PM<sub>2.5</sub>, the maximum predicted effects ranged from 2.5 µg/m<sup>3</sup> (current) to 3.5 µg/m<sup>3</sup> (2031), or from 8.3% to 11.7% of the 24-hour CWS of 30 µg/m<sup>3</sup>.

## 6.1 Cumulative Effects

Cumulative effects, in this case considered to be the incremental effects of local traffic considered together with the background air quality measured at a distance from the study area and unaffected by local sources. The standard practice of using the 90<sup>th</sup> percentile of the ambient monitoring data for a station located within reasonable proximity to the study area was used, which in this case was the MOE monitoring station on Main Street in Brampton. This station is likely to have similar air concentrations for the macroscale, affected by transboundary pollution and larger local emitters.

The predicted concentrations presented in Table 6.1 for the current and the future 2031 scenario (without the NSTC) are conservative, as they represent the highest hour or day over the one year of meteorological data used for the modelling. A summary table presenting these results for all the scenarios considered is provided in Appendix A.

For PM<sub>2.5</sub>, the background concentrations of 16 µg/m<sup>3</sup>, was significantly greater than the maximum predicted effects for the traffic scenarios within the study area (maximum predicted effect was 3.5 µg/m<sup>3</sup>). This is also true for PM<sub>10</sub>, where the background concentration was estimated to be 32 µg/m<sup>3</sup>, and the maximum predicted PM<sub>10</sub> effect from local traffic was 8.5 µg/m<sup>3</sup>.

In the case of CO, the background concentration of 0.4 ppm was less than the maximum predicted concentration of 4.9 ppm (at the intersection of Bovaird Dr. and Mississauga Road). The combined concentration of 5.3 ppm (background + modelled) is equivalent to 18 % of the 30 ppm Regulatory Limit for the 1-hour averaging time.

For NOx, the background concentration for the study area was estimated to be 28 ppb (0.028 ppm), or 14% of the ambient air quality criteria. Therefore, some receptors located on the roadway itself and proximate to the intersections had maximum predicted effects that would exceed the respective air quality criteria if the background 28 ppb were considered. These predicted 'exceedances' are limited to the roadway itself, and the NOx concentrations predicted at the roadsides were below 0.2 ppm in all cases except the current 2011 scenario where the concentrations fall below 0.2 ppm within 10 metres of the roadway.



Table 6.1: Results of Dispersion Modelling

			Ontario AAQC or Canada-wide Standard (CWS)	Scenario							
				Current		2021		2031			
						without NSTC		with NTSC		without NSTC	
				Max Concentration	% of criteria	Max Concentration	% of criteria	Max Concentration	% of criteria	Max Concentration	% of criteria
PM <sub>2.5</sub>	24hr	µg/m <sup>3</sup>	30	2.48	8.3%	2.95	9.8%	3.51	11.7%	3.43	11.4%
	Annual	µg/m <sup>3</sup>	n/a	1.16	n/a	1.3	n/a	1.67	n/a	1.5	n/a
PM <sub>10</sub>	24hr	µg/m <sup>3</sup>	50	3.30	6.6%	7.12	14.2%	8.25	16.5%	8.47	16.9%
	Annual	µg/m <sup>3</sup>	n/a	1.56	n/a	3.18	n/a	3.92	n/a	3.73	n/a
NO <sub>x</sub>	1 hr	ppm	0.2	0.43	214%	0.30	148%	0.26	131%	0.26	131%
	8 hr	ppm	n/a	0.22	n/a	0.16	n/a	0.11	n/a	0.14	n/a
SO <sub>2</sub>	1 hr	µg/m <sup>3</sup>	690 (0.25ppm)	no significant effects (>0.0 ppm)		no significant effects (>0.0 ppm)		no significant effects (>0.0 ppm)		no significant effects (>0.0 ppm)	
CO	1 hr	ppm	30	2.9	9.7%	4.5	15.0%	4.7	15.7%	4.9	16.3%
	8 hr	ppm	13	1.5	11.2%	2.26	17.4%	2.46	18.9%	2.59	19.9%

Table 6.2: Combined Effect of Modelled Effects and Background Air Concentrations

	Averaging Period	AAQC	Units	Current				2031 (without North South Transit Corridor NSTC)				2031 (with North South Transit Corridor NSTC)			
				Modelled Effect (Maximum Concentration)	Background Concentration	Modelled + Background	% of criteria	Modelled Effect (Maximum Concentration)	Background Concentration	Modelled + Background	% of criteria	Modelled Effect (Maximum Concentration)	Background Concentration	Modelled + Background	% of criteria
PM <sub>2.5</sub>	24hr	30	µg/m <sup>3</sup>	2.5	16.0	18.5	62%	3.43	16.0	19.4	65%	3.51	16.0	19.5	65%
PM <sub>10</sub>	24hr	50	µg/m <sup>3</sup>	3.30	32	35.3	71%	8.47	32.0	40.5	81%	8.25	32.0	40.3	81%
NO <sub>x</sub>	1 hr	0.2	ppm	0.43	0.028	0.46	228%	0.26	0.028	0.29	145%	0.26	0.028	0.29	145%
CO	1 hr	30	ppm	2.9	0.35	3.3	11%	4.9	0.35	5.3	18%	4.7	0.35	5.1	17%
	8 hr	13	ppm	1.5	0.35	1.8	14%	2.59	0.35	2.9	23%	2.46	0.35	2.8	22%

## 7 Conclusions and Recommendations

This Air Quality Assessment Report has been prepared in support of the Bovaird Drive Class EA.

The findings of the air quality study were as follow:

- The potential effect associated with air emissions is an increase in the airborne concentrations of the key pollutants NO<sub>x</sub>, PM<sub>2.5</sub>, PM<sub>10</sub>, CO, and SO<sub>2</sub>, in the vicinity of the project, with the potential to impact air quality;
- The incremental (project) effects for PM<sub>2.5</sub> and PM<sub>10</sub> were predicted to be below the respective ambient air quality criteria, and lower than the existing background concentrations for these parameters;
- The incremental (project) effects for CO were predicted to be well below the respective ambient air quality criteria;
- The highest predicted NO<sub>x</sub> concentrations (1-hour averaging time) were found to exceed the ambient air quality criteria within the bounds of the intersection and the immediate vicinity, but decrease to below the AAQC within approximately 10 metres or less of the roadside;
- The predicted effects for PM<sub>10</sub>, and CO were highest for the 2031 scenario without the NSTC, and for PM<sub>2.5</sub> the effects were highest when the NSTC and the new Creditview Road were considered;
- The predicted effects for NO<sub>x</sub> were highest for the 2011 scenario, as the NO<sub>x</sub> emissions reductions achieved as older vehicles are removed from service were significant and off-set the increased traffic volumes for 2031. Although the emission factors for the other target pollutants (PM<sub>2.5</sub>, PM<sub>10</sub>, CO, SO<sub>2</sub>) also decreased over time, the reductions were not as significant as for NO<sub>x</sub> and the increased traffic volumes resulted in higher effects on air quality in 2021 and 2031;
- The cumulative effects of the roadway PM<sub>2.5</sub>, PM<sub>10</sub>, CO, and SO<sub>2</sub> emissions within the study area and the background concentrations were below the respective ambient air quality criteria for all averaging times under each scenario;
- The cumulative effects of the roadway NO<sub>x</sub> emissions within the study area and the background concentrations were found to be slightly higher than the respective ambient air quality criteria for the 1-hour averaging times at receptors located on the roadway itself or within close proximity to an intersection.

Based upon these findings, the future traffic volumes along Bovaird Drive are not expected to have a significant negative cumulative effect on local air quality.

## **8 References**

Entra (2011) Bovaird Drive Environmental Assessment Traffic Study Final Report

US EPA (2003) User's Guide to MOBILE6.1 and MOBILE6.2 Mobile Source Emission Factor Model, EPA420-R-03-010

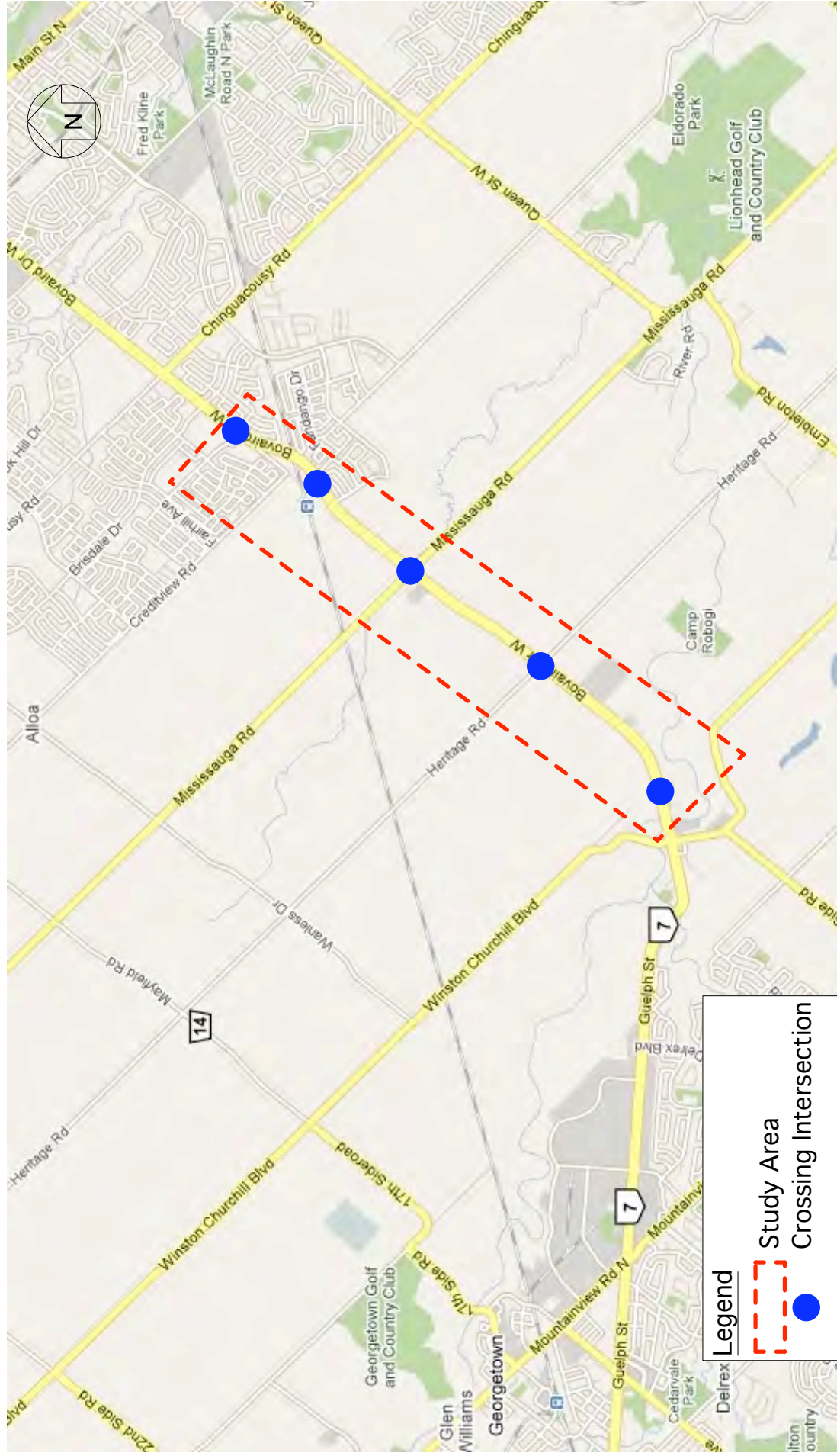


## Figures





Figure 1.1: Study Area



Source: Google Maps

Exhibit 1  
Study Area  
Bovaird Drive Class EA

Schematic





PROJECT TITLE:

**Figure 5.1: Incremental PM2.5 Concentrations Resulting from Study Area Traffic 2031 Scenario with North South Transit Corridor (24-hour Averaging Time)**



COMMENTS:

Canada-wide Standard for PM2.5: 30 ug/m3

MODEL:

**CAL3QHCR**

POLLUTANT:

**Particulate**

MAX:

**3.51**

UNITS:

**ug/m\*\*3**

LINKS:

**76**

RECEPTORS:

**2110**

COMPANY NAME:

**AMEC**

DATE:

**9/15/2011**

SCALE:

1:29,877



PROJECT / PLOT NO.:

**TC101715**

ug/m\*\*3

Contours

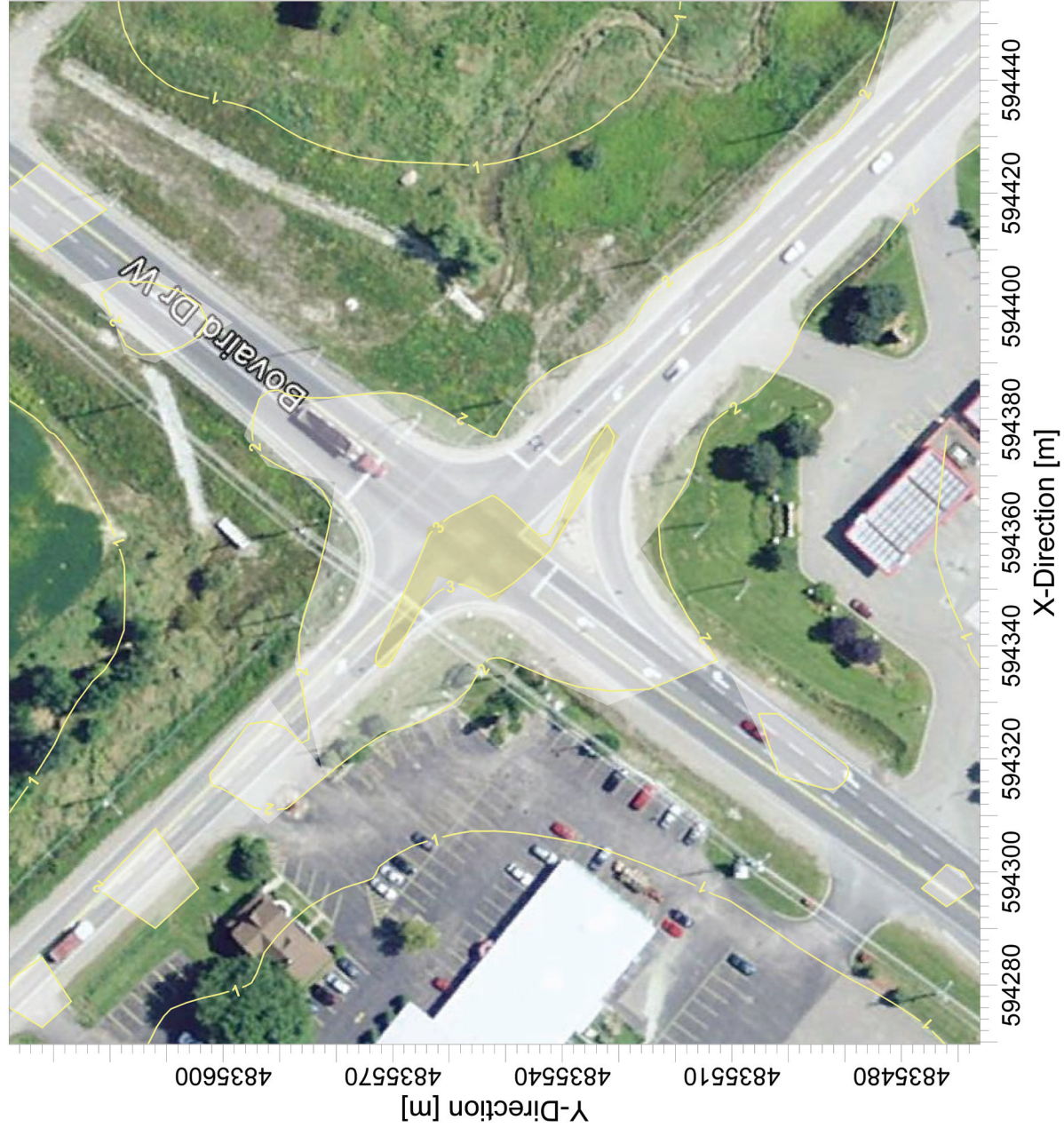
1.00

0.00



PROJECT TITLE:

**Figure 5.2: Incremental PM2.5 Concentrations Resulting from Study Area Traffic 2031 Scenario without North-South Transit Corridor (24-hour Averaging Time)**



COMMENTS:

Intersection of Bovalrd Drive and Mississauga Road

Concentrations in ug/m<sup>3</sup>  
Canada-wide Standard for PM<sub>2.5</sub>: 30 ug/m<sup>3</sup>

MODEL: **CAL3QHCR**

POLLUTANT: **Particulate**

MAX: **4.19**  
UNITS: **ug/m\*\*3**

LINKS: **68**  
RECEPTORS: **265**

COMPANY NAME: **AMEC**

DATE: **11/12/2010**

SCALE: **1:1,186**  
0 0.04 m



PROJECT / PLOT NO.:

**TC101715**



PROJECT TITLE:

**Figure 5.3: Incremental PM10 Concentrations Resulting from Study Area Traffic 2031 Scenario without North South Transit Corridor NSTC (24-hour Averaging Time)**



ug/m<sup>3</sup>

Contours

COMMENTS:

Intersection of Bovaird Drive and Mississauga Road

Concentrations in ug/m<sup>3</sup>

PM10 AAQC: 50 ug/m<sup>3</sup>

MODEL:

**CAL3QHCR**

POLLUTANT:

**Particulate**

MAX:

**8.47**

UNITS:

**ug/m<sup>3</sup>**

LINKS:

**68**

RECEPTORS:

**1989**

COMPANY NAME:

**AMEC**

DATE:

**11/12/2010**

SCALE:

1:1,223

0.04 m

0



PROJECT / PLOT NO.:

**TC101715**

## **Appendix A**

### **Dispersion Modelling Output**



**Table A.1: CAL3QHCR Results Summary Table (Incremental Effects from Study Area Traffic)**

			Ontario AAQC or Canada-wide Standard (CWS)	Scenario							
				Current		2021		2031			
						without NSTC		with NTSC		without NSTC	
				Max Concentration	% of criteria	Max Concentration	% of criteria	Max Concentration	% of criteria	Max Concentration	% of criteria
PM <sub>2.5</sub>	24hr	µg/m <sup>3</sup>	30	2.48	8.3%	2.95	9.8%	3.51	11.7%	3.43	11.4%
	Annual	µg/m <sup>3</sup>	n/a	1.16	n/a	1.3	n/a	1.67	n/a	1.5	n/a
PM <sub>10</sub>	24hr	µg/m <sup>3</sup>	50	3.30	6.6%	7.12	14.2%	8.25	16.5%	8.47	16.9%
	Annual	µg/m <sup>3</sup>	n/a	1.56	n/a	3.18	n/a	3.92	n/a	3.73	n/a
NO <sub>x</sub>	1 hr	ppm	0.2	0.43	214%	0.30	148%	0.26	131%	0.26	131%
	8 hr	ppm	n/a	0.22	n/a	0.16	n/a	0.11	n/a	0.14	n/a
SO <sub>2</sub>	1 hr	µg/m <sup>3</sup>	690 (0.25ppm)	no significant effects (>0.0 ppm)		no significant effects (>0.0 ppm)		no significant effects (>0.0 ppm)		no significant effects (>0.0 ppm)	
CO	1 hr	ppm	30	2.9	9.7%	4.5	15.0%	4.7	15.7%	4.9	16.3%
	8 hr	ppm	13	1.5	11.2%	2.26	17.4%	2.46	18.9%	2.59	19.9%

**Notes:**

NSTC - North South Transit Corridor

The maximum concentrations cited were predicted within the intersection of Bovaird Drive and Mississauga Road, except for the 2031 scenario with NSTC where the maximum concentrations were predicted at the intersection of Bovaird Drive and Creditview.

The sulphur dioxide effects were found to be insignificant.

Figure 6.2: Maximum PM<sub>2.5</sub> Concentration (24-hour Averaging Time)

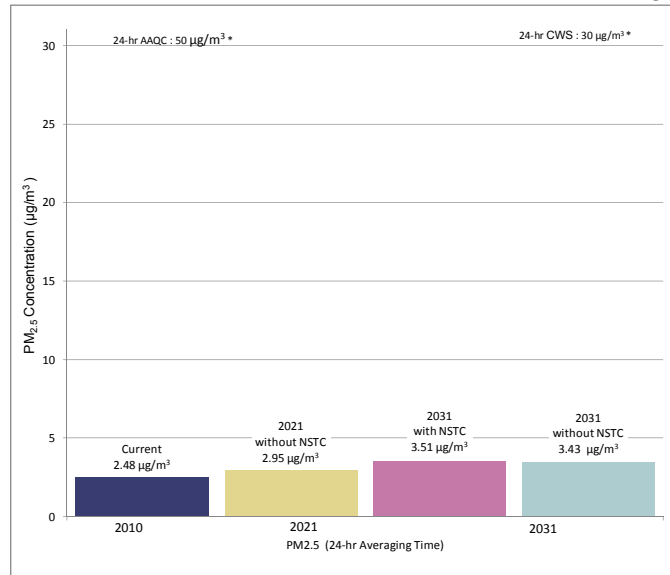


Figure 6.3: Maximum PM<sub>10</sub> Concentration (24-hour Averaging Time)

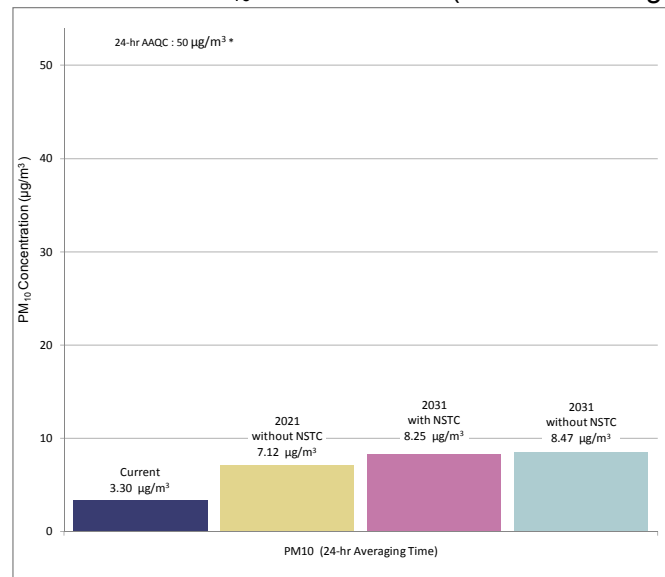




Figure 6.4: Maximum NO<sub>x</sub> Concentration (1-hour Averaging Time)

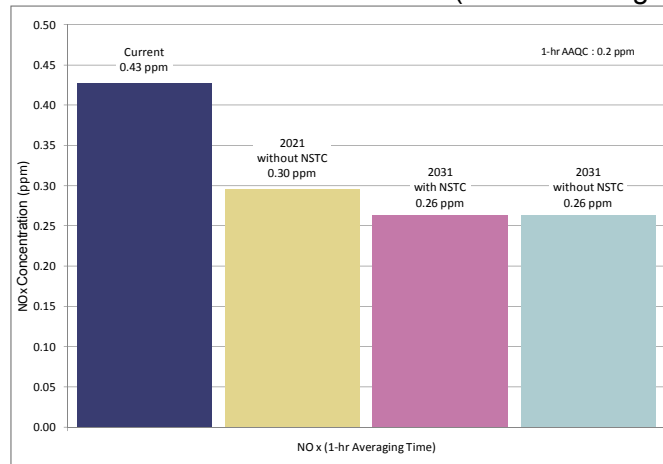


Figure 6.5: Maximum CO Concentration (1-hour Averaging Time)

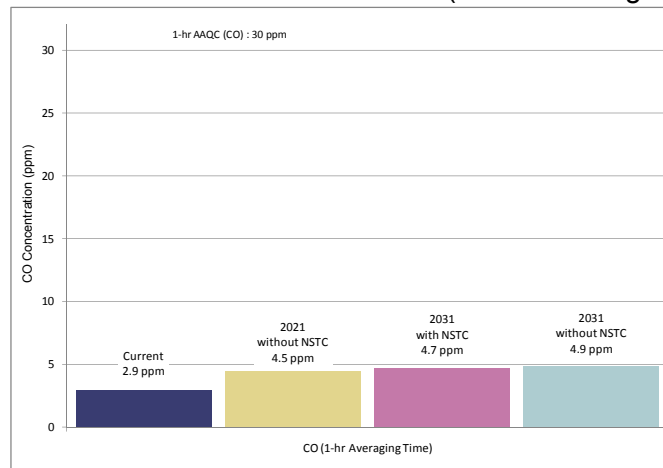
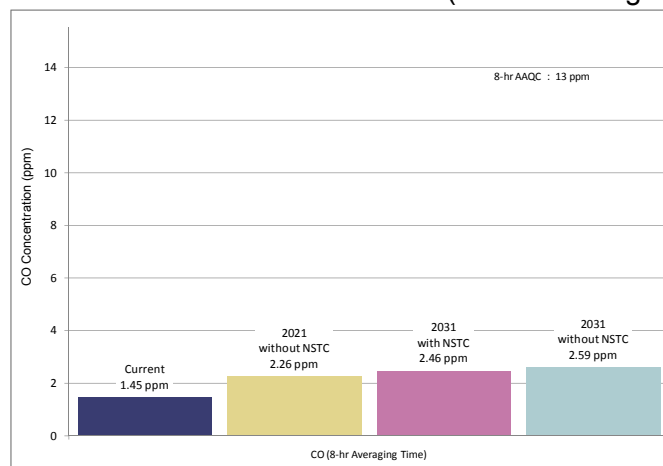


Figure 6.6: Maximum CO Concentration (8-hour Averaging Time)





## **Appendix B**

### **Emission Rate Calculations**



**Table B.1: Mobile 6.2C Emission Factors**

Emission Factors - 2010

ID	Description	Direction	Speed (km/h)	Speed (mph)	% Cars - AM/PM Peak	PM <sub>2.5</sub>			PM10			NO <sub>x</sub>		
						Emission Factor - Car (g/veh-mile)	Emission Factor - Truck (g/veh-mile)	Effective Emission Factor AM/PM (g/veh-mile)	Emission Factor - Car (g/veh-mile)	Emission Factor - Truck (g/veh-mile)	Effective Emission Factor AM/PM (g/veh-mile)	Emission Factor - Car (g/veh-mile)	Emission Factor - Truck (g/veh-mile)	Effective Emission Factor AM/PM (g/veh-mile)
B1E	Bovaird West of Caseley	East	50	31	95%	0.011	0.164	0.019	0.025	0.204	0.033	0.542	5.849	0.799
B1W	Bovaird West of Caseley	West	50	31	95%	0.011	0.164	0.019	0.025	0.204	0.033	0.542	5.849	0.799
B2E	Bovaird East of Caseley	East	60	37	95%	0.011	0.164	0.019	0.025	0.204	0.033	0.542	5.849	0.799
B2W	Bovaird East of Caseley	West	60	37	95%	0.011	0.164	0.019	0.025	0.204	0.033	0.542	5.849	0.799
C1N	Caseley South of Bovaird	North	50	31	95%	0.011	0.164	0.019	0.025	0.204	0.033	0.548	5.826	0.804
C1S	Caseley South of Bovaird	South	50	31	95%	0.011	0.164	0.019	0.025	0.204	0.033	0.548	5.826	0.804
B3E	Bovaird East of Heritage	East	70	43	95%	0.011	0.164	0.019	0.025	0.204	0.033	0.552	6.144	0.823
B3W	Bovaird East of Heritage	West	70	43	95%	0.011	0.164	0.019	0.025	0.204	0.033	0.552	6.144	0.823
H1N	Heritage North of Bovaird	North	50	31	95%	0.011	0.164	0.019	0.025	0.204	0.033	0.548	5.826	0.804
H1S	Heritage North of Bovaird	South	50	31	95%	0.011	0.164	0.019	0.025	0.204	0.033	0.548	5.826	0.804
H2N	Heritage South of Bovaird	North	60	37	95%	0.011	0.164	0.019	0.025	0.204	0.033	0.542	5.849	0.799
H2S	Heritage South of Bovaird	South	60	37	95%	0.011	0.164	0.019	0.025	0.204	0.033	0.542	5.849	0.799
B4E	Bovaird East of Mississauga Road	East	70	43	95%	0.011	0.164	0.019	0.025	0.204	0.033	0.552	6.144	0.823
B4W	Bovaird East of Mississauga Road	West	70	43	95%	0.011	0.164	0.019	0.025	0.204	0.033	0.552	6.144	0.823
M1N	Mississauga Road North of Bovaird	North	80	50	95%	0.011	0.164	0.019	0.025	0.204	0.033	0.566	6.859	0.871
M1S	Mississauga Road North of Bovaird	South	80	50	95%	0.011	0.164	0.019	0.025	0.204	0.033	0.566	6.859	0.871
M2N	Mississauga Road South of Bovaird	North	80	50	95%	0.011	0.164	0.019	0.025	0.204	0.033	0.566	6.859	0.871
M2S	Mississauga Road South of Bovaird	South	80	50	95%	0.011	0.164	0.019	0.025	0.204	0.033	0.566	6.859	0.871
B5E	Bovaird East of Ashby Field Road	East	70	43	95%	0.011	0.164	0.019	0.025	0.204	0.033	0.552	6.144	0.823
B5W	Bovaird East of Ashby Field Road	West	70	43	95%	0.011	0.164	0.019	0.025	0.204	0.033	0.552	6.144	0.823
A1N	Ashby Field Road North of Bovaird	North	50	31	95%	0.011	0.164	0.019	0.025	0.204	0.033	0.548	5.826	0.804
A1S	Ashby Field Road North of Bovaird	South	50	31	95%	0.011	0.164	0.019	0.025	0.204	0.033	0.548	5.826	0.804
A2N	Ashby Field Road South of Bovaird	North	50	31	95%	0.011	0.164	0.019	0.025	0.204	0.033	0.548	5.826	0.804
A2S	Ashby Field Road South of Bovaird	South	50	31	95%	0.011	0.164	0.019	0.025	0.204	0.033	0.548	5.826	0.804
B6E	Bovaird East of Worthington	East	70	43	95%	0.011	0.164	0.019	0.025	0.204	0.033	0.552	6.144	0.823
B6W	Bovaird East of Worthington	West	70	43	95%	0.011	0.164	0.019	0.025	0.204	0.033	0.552	6.144	0.823
W1N	Worthington Avenue North of Bovaird	North	50	31	95%	0.011	0.164	0.019	0.025	0.204	0.033	0.548	5.826	0.804
W1S	Worthington Avenue North of Bovaird	South	50	31	95%	0.011	0.164	0.019	0.025	0.204	0.033	0.548	5.826	0.804
LLN	Lake Louise Drive South of Bovaird	North	50	31	95%	0.011	0.164	0.019	0.025	0.204	0.033	0.548	5.826	0.804
LLS	Lake Louise Drive South of Bovaird	South	50	31	95%	0.011	0.164	0.019	0.025	0.204	0.033	0.548	5.826	0.804

Idle Emission Rate

Speed (mph)	% Cars - AM/PM Peak	Idle Emission Factor - Car (g/hr)	Idle Emission Factor - Truck (g/hr)	Effective Idle Emission Factor - AM/PM (g/hr)	Idle Emission Factor - Car (g/hr)	Idle Emission Factor - Truck (g/hr)	Effective Idle Emission Factor - AM/PM (g/hr)	Idle Emission Factor - Car (g/hr)	Idle Emission Factor - Truck (g/hr)	Effective Idle Emission Factor - AM/PM (g/hr)
2.5	95%	0.0046	1.0477	0.0552	0.0100	1.1388	0.0647	0.4428	4.4256	0.6360

**Table B.1: Mobile 6.2C Emission Factors**

Emission Factors - 2010

ID	Description	Direction	Speed (km/h)	Speed (mph)	% Cars - AM/PM Peak	SO2			CO		
						Emission Factor - Car (g/veh-mile)	Emission Factor - Truck (g/veh-mile)	Effective Emission Factor AM/PM (g/veh-mile)	Emission Factor - Car (g/veh-mile)	Emission Factor - Truck (g/veh-mile)	Effective Emission Factor AM/PM (g/veh-mile)
B1E	Bovaird West of Caseley	East	50	31	95%	0.006	0.013	0.0061	8.910	1.293	8.540
B1W	Bovaird West of Caseley	West	50	31	95%	0.006	0.013	0.0061	8.910	1.293	8.540
B2E	Bovaird East of Caseley	East	60	37	95%	0.006	0.013	0.0061	8.910	1.293	8.540
B2W	Bovaird East of Caseley	West	60	37	95%	0.006	0.013	0.0061	8.910	1.293	8.540
C1N	Caseley South of Bovaird	North	50	31	95%	0.006	0.013	0.0061	8.720	1.510	8.370
C1S	Caseley South of Bovaird	South	50	31	95%	0.006	0.013	0.0061	8.720	1.510	8.370
B3E	Bovaird East of Heritage	East	70	43	95%	0.006	0.013	0.0061	9.330	1.181	8.935
B3W	Bovaird East of Heritage	West	70	43	95%	0.006	0.013	0.0061	9.330	1.181	8.935
H1N	Heritage North of Bovaird	North	50	31	95%	0.006	0.013	0.0061	8.720	1.510	8.370
H1S	Heritage North of Bovaird	South	50	31	95%	0.006	0.013	0.0061	8.720	1.510	8.370
H2N	Heritage South of Bovaird	North	60	37	95%	0.006	0.013	0.0061	8.910	1.293	8.540
H2S	Heritage South of Bovaird	South	60	37	95%	0.006	0.013	0.0061	8.910	1.293	8.540
B4E	Bovaird East of Mississauga Road	East	70	43	95%	0.006	0.013	0.0061	9.330	1.181	8.935
B4W	Bovaird East of Mississauga Road	West	70	43	95%	0.006	0.013	0.0061	9.330	1.181	8.935
M1N	Mississauga Road North of Bovaird	North	80	50	95%	0.006	0.013	0.0061	9.810	1.149	9.390
M1S	Mississauga Road North of Bovaird	South	80	50	95%	0.006	0.013	0.0061	9.810	1.149	9.390
M2N	Mississauga Road South of Bovaird	North	80	50	95%	0.006	0.013	0.0061	9.810	1.149	9.390
M2S	Mississauga Road South of Bovaird	South	80	50	95%	0.006	0.013	0.0061	9.810	1.149	9.390
B5E	Bovaird East of Ashby Field Road	East	70	43	95%	0.006	0.013	0.0061	9.330	1.181	8.935
B5W	Bovaird East of Ashby Field Road	West	70	43	95%	0.006	0.013	0.0061	9.330	1.181	8.935
A1N	Ashby Field Road North of Bovaird	North	50	31	95%	0.006	0.013	0.0061	8.720	1.510	8.370
A1S	Ashby Field Road North of Bovaird	South	50	31	95%	0.006	0.013	0.0061	8.720	1.510	8.370
A2N	Ashby Field Road South of Bovaird	North	50	31	95%	0.006	0.013	0.0061	8.720	1.510	8.370
A2S	Ashby Field Road South of Bovaird	South	50	31	95%	0.006	0.013	0.0061	8.720	1.510	8.370
B6E	Bovaird East of Worthington	East	70	43	95%	0.006	0.013	0.0061	9.330	1.181	8.935
B6W	Bovaird East of Worthington	West	70	43	95%	0.006	0.013	0.0061	9.330	1.181	8.935
W1N	Worthington Avenue North of Bovaird	North	50	31	95%	0.006	0.013	0.0061	8.720	1.510	8.370
W1S	Worthington Avenue North of Bovaird	South	50	31	95%	0.006	0.013	0.0061	8.720	1.510	8.370
LLN	Lake Louise Drive South of Bovaird	North	50	31	95%	0.006	0.013	0.0061	8.720	1.510	8.370
LLS	Lake Louise Drive South of Bovaird	South	50	31	95%	0.006	0.013	0.0061	8.720	1.510	8.370

Idle Emission Rate

Speed (mph)	% Cars - AM/PM Peak	Idle Emission Factor - Car (g/hr)	Idle Emission Factor - Truck (g/hr)	Effective Idle Emission Factor - AM/PM (g/hr)	Idle Emission Factor - Car (g/hr)	Idle Emission Factor - Truck (g/hr)	Effective Idle Emission Factor - (g/hr)
2.5	95%	0.0022	0.0053	0.0024	10.8520	3.1056	10.4762

**Table B.1: Mobile 6.2C Emission Factors**

Emission Factors - 2021

ID	Description	Direction	Speed (km/h)	Speed (mph)	% Cars - AM/PM Peak	PM2.5			PM10			NO x		
						Emission Factor - Car (g/veh-mile)	Emission Factor - Truck (g/veh-mile)	Effective Emission Factor AM/PM (g/veh-mile)	Emission Factor - Car (g/veh-mile)	Emission Factor - Truck (g/veh-mile)	Effective Emission Factor AM/PM (g/veh-mile)	Emission Factor - Car (g/veh-mile)	Emission Factor - Truck (g/veh-mile)	Effective Emission Factor AM/PM (g/veh-mile)
B1E	Bovaird West of Caseley	East	60	37	95%	0.0112	0.0457	0.0129	0.0247	0.0752	0.0272	0.231	1.265	0.2812
B1W	Bovaird West of Caseley	West	60	37	95%	0.0112	0.0457	0.0129	0.0247	0.0752	0.0272	0.231	1.265	0.2812
B2E	Bovaird East of Caseley	East	60	37	95%	0.0112	0.0457	0.0129	0.0247	0.0752	0.0272	0.231	1.265	0.2812
B2W	Bovaird East of Caseley	West	60	37	95%	0.0112	0.0457	0.0129	0.0247	0.0752	0.0272	0.231	1.265	0.2812
C1N	Caseley South of Bovaird	North	50	31	95%	0.0112	0.0457	0.0129	0.0247	0.0752	0.0272	0.233	1.260	0.2828
C1S	Caseley South of Bovaird	South	50	31	95%	0.0112	0.0457	0.0129	0.0247	0.0752	0.0272	0.233	1.260	0.2828
B3E	Bovaird East of Heritage	East	70	43	95%	0.0112	0.0457	0.0129	0.0247	0.0752	0.0272	0.235	1.330	0.2881
B3W	Bovaird East of Heritage	West	70	43	95%	0.0112	0.0457	0.0129	0.0247	0.0752	0.0272	0.235	1.330	0.2881
H1N	Heritage North of Bovaird	North	50	31	95%	0.0112	0.0457	0.0129	0.0247	0.0752	0.0272	0.233	1.260	0.2828
H1S	Heritage North of Bovaird	South	50	31	95%	0.0112	0.0457	0.0129	0.0247	0.0752	0.0272	0.233	1.260	0.2828
H2N	Heritage South of Bovaird	North	60	37	95%	0.0112	0.0457	0.0129	0.0247	0.0752	0.0272	0.231	1.265	0.2812
H2S	Heritage South of Bovaird	South	60	37	95%	0.0112	0.0457	0.0129	0.0247	0.0752	0.0272	0.231	1.265	0.2812
B4E	Bovaird East of Mississauga Road	East	70	43	95%	0.0112	0.0457	0.0129	0.0247	0.0752	0.0272	0.235	1.330	0.2881
B4W	Bovaird East of Mississauga Road	West	70	43	95%	0.0112	0.0457	0.0129	0.0247	0.0752	0.0272	0.235	1.330	0.2881
M1N	Mississauga Road North of Bovaird	North	80	50	95%	0.0112	0.0457	0.0129	0.0247	0.0752	0.0272	0.241	1.488	0.3015
M1S	Mississauga Road North of Bovaird	South	80	50	95%	0.0112	0.0457	0.0129	0.0247	0.0752	0.0272	0.241	1.488	0.3015
M2N	Mississauga Road South of Bovaird	North	80	50	95%	0.0112	0.0457	0.0129	0.0247	0.0752	0.0272	0.241	1.488	0.3015
M2S	Mississauga Road South of Bovaird	South	80	50	95%	0.0112	0.0457	0.0129	0.0247	0.0752	0.0272	0.241	1.488	0.3015
B5E	Bovaird East of Ashby Field Road	East	70	43	95%	0.0112	0.0457	0.0129	0.0247	0.0752	0.0272	0.235	1.330	0.2881
B5W	Bovaird East of Ashby Field Road	West	70	43	95%	0.0112	0.0457	0.0129	0.0247	0.0752	0.0272	0.235	1.330	0.2881
A1N	Ashby Field Road North of Bovaird	North	50	31	95%	0.0112	0.0457	0.0129	0.0247	0.0752	0.0272	0.233	1.260	0.2828
A1S	Ashby Field Road North of Bovaird	South	50	31	95%	0.0112	0.0457	0.0129	0.0247	0.0752	0.0272	0.233	1.260	0.2828
A2N	Ashby Field Road South of Bovaird	North	50	31	95%	0.0112	0.0457	0.0129	0.0247	0.0752	0.0272	0.233	1.260	0.2828
A2S	Ashby Field Road South of Bovaird	South	50	31	95%	0.0112	0.0457	0.0129	0.0247	0.0752	0.0272	0.233	1.260	0.2828
B6E	Bovaird East of Worthington	East	70	43	95%	0.0112	0.0457	0.0129	0.0247	0.0752	0.0272	0.235	1.330	0.2881
B6W	Bovaird East of Worthington	West	70	43	95%	0.0112	0.0457	0.0129	0.0247	0.0752	0.0272	0.235	1.330	0.2881
W1N	Worthington Avenue North of Bovaird	North	50	31	95%	0.0112	0.0457	0.0129	0.0247	0.0752	0.0272	0.233	1.260	0.2828
W1S	Worthington Avenue North of Bovaird	South	50	31	95%	0.0112	0.0457	0.0129	0.0247	0.0752	0.0272	0.233	1.260	0.2828
LLN	Lake Louise Drive South of Bovaird	North	50	31	95%	0.0112	0.0457	0.0129	0.0247	0.0752	0.0272	0.233	1.260	0.2828
LLS	Lake Louise Drive South of Bovaird	South	50	31	95%	0.0112	0.0457	0.0129	0.0247	0.0752	0.0272	0.233	1.260	0.2828

Idle Emission Rate

Speed (mph)	% Cars - AM/PM Peak	Idle Emission Factor - Car (g/hr)	Idle Emission Factor - Truck (g/hr)	Effective Idle Emission Factor - AM/PM (g/hr)	Idle Emission Factor - Car (g/hr)	Idle Emission Factor - Truck (g/hr)	Effective Idle Emission Factor - AM/PM (g/hr)	Idle Emission Factor - Car (g/hr)	Idle Emission Factor - Truck (g/hr)	Effective Idle Emission Factor - AM/PM (g/hr)
2.5	95%	0.0045	0.9237	0.0491	0.0099	1.0040	0.0581	0.1936	0.9676	0.2312

**Table B.1: Mobile 6.2C Emission Factors**

Emission Factors - 2021

ID	Description	Direction	Speed (km/h)	Speed (mph)	% Cars - AM/PM Peak	SO2			CO		
						Emission Factor - Car (g/veh-mile)	Emission Factor - Truck (g/veh-mile)	Effective Emission Factor AM/PM (g/veh-mile)	Emission Factor - Car (g/veh-mile)	Emission Factor - Truck (g/veh-mile)	Effective Emission Factor AM/PM (g/veh-mile)
B1E	Bovaird West of Caseley	East	60	37	95%	0.0057	0.0131	0.00606	6.68	0.313	6.371
B1W	Bovaird West of Caseley	West	60	37	95%	0.0057	0.0131	0.00606	6.68	0.313	6.371
B2E	Bovaird East of Caseley	East	60	37	95%	0.0057	0.0131	0.00606	6.68	0.313	6.371
B2W	Bovaird East of Caseley	West	60	37	95%	0.0057	0.0131	0.00606	6.68	0.313	6.371
C1N	Caseley South of Bovaird	North	50	31	95%	0.0057	0.0131	0.00606	6.55	0.365	6.250
C1S	Caseley South of Bovaird	South	50	31	95%	0.0057	0.0131	0.00606	6.55	0.365	6.250
B3E	Bovaird East of Heritage	East	70	43	95%	0.0057	0.0131	0.00606	6.98	0.286	6.655
B3W	Bovaird East of Heritage	West	70	43	95%	0.0057	0.0131	0.00606	6.98	0.286	6.655
H1N	Heritage North of Bovaird	North	50	31	95%	0.0057	0.0131	0.00606	6.55	0.365	6.250
H1S	Heritage North of Bovaird	South	50	31	95%	0.0057	0.0131	0.00606	6.55	0.365	6.250
H2N	Heritage South of Bovaird	North	60	37	95%	0.0057	0.0131	0.00606	6.68	0.313	6.371
H2S	Heritage South of Bovaird	South	60	37	95%	0.0057	0.0131	0.00606	6.68	0.313	6.371
B4E	Bovaird East of Mississauga Road	East	70	43	95%	0.0057	0.0131	0.00606	6.98	0.286	6.655
B4W	Bovaird East of Mississauga Road	West	70	43	95%	0.0057	0.0131	0.00606	6.98	0.286	6.655
M1N	Mississauga Road North of Bovaird	North	80	50	95%	0.0057	0.0131	0.00606	7.33	0.278	6.988
M1S	Mississauga Road North of Bovaird	South	80	50	95%	0.0057	0.0131	0.00606	7.33	0.278	6.988
M2N	Mississauga Road South of Bovaird	North	80	50	95%	0.0057	0.0131	0.00606	7.33	0.278	6.988
M2S	Mississauga Road South of Bovaird	South	80	50	95%	0.0057	0.0131	0.00606	7.33	0.278	6.988
B5E	Bovaird East of Ashby Field Road	East	70	43	95%	0.0057	0.0131	0.00606	6.98	0.286	6.655
B5W	Bovaird East of Ashby Field Road	West	70	43	95%	0.0057	0.0131	0.00606	6.98	0.286	6.655
A1N	Ashby Field Road North of Bovaird	North	50	31	95%	0.0057	0.0131	0.00606	6.55	0.365	6.250
A1S	Ashby Field Road North of Bovaird	South	50	31	95%	0.0057	0.0131	0.00606	6.55	0.365	6.250
A2N	Ashby Field Road South of Bovaird	North	50	31	95%	0.0057	0.0131	0.00606	6.55	0.365	6.250
A2S	Ashby Field Road South of Bovaird	South	50	31	95%	0.0057	0.0131	0.00606	6.55	0.365	6.250
B6E	Bovaird East of Worthington	East	70	43	95%	0.0057	0.0131	0.00606	6.98	0.286	6.655
B6W	Bovaird East of Worthington	West	70	43	95%	0.0057	0.0131	0.00606	6.98	0.286	6.655
W1N	Worthington Avenue North of Bovaird	North	50	31	95%	0.0057	0.0131	0.00606	6.55	0.365	6.250
W1S	Worthington Avenue North of Bovaird	South	50	31	95%	0.0057	0.0131	0.00606	6.55	0.365	6.250
LLN	Lake Louise Drive South of Bovaird	North	50	31	95%	0.0057	0.0131	0.00606	6.55	0.365	6.250
LLS	Lake Louise Drive South of Bovaird	South	50	31	95%	0.0057	0.0131	0.00606	6.55	0.365	6.250

Idle Emission Rate

Speed (mph)	% Cars - AM/PM Peak	Idle Emission Factor - Car (g/hr)	Idle Emission Factor - Truck (g/hr)	Effective Idle Emission Factor - AM/PM (g/hr)	Idle Emission Factor - Car (g/hr)	Idle Emission Factor - Truck (g/hr)	Effective Idle Emission Factor - (g/hr)
2.5	95%	0.0022	0.0052	0.0024	7.7080	0.7508	7.3705



**Table B.1: Mobile 6.2C Emission Factors**

Emission Factors - 2031

ID	Description	Direction	Speed (km/h)	Speed (mph)	% Cars - AM/PM Peak	PM2.5			PM10			NO x		
						Emission Factor - Car (g/veh-mile)	Emission Factor - Truck (g/veh-mile)	Effective Emission Factor AM/PM (g/veh-mile)	Emission Factor - Car (g/veh-mile)	Emission Factor - Truck (g/veh-mile)	Effective Emission Factor AM/PM (g/veh-mile)	Emission Factor - Car (g/veh-mile)	Emission Factor - Truck (g/veh-mile)	Effective Emission Factor AM/PM (g/veh-mile)
B1E	Bovaird West of Caseley	East	60	37	95%	0.0112	0.0336	0.0123	0.0247	0.0620	0.0265	0.2030	0.4610	0.2155
B1W	Bovaird West of Caseley	West	60	37	95%	0.0112	0.0336	0.0123	0.0247	0.0620	0.0265	0.2030	0.4610	0.2155
B2E	Bovaird East of Caseley	East	60	37	95%	0.0112	0.0336	0.0123	0.0247	0.0620	0.0265	0.2030	0.4610	0.2155
B2W	Bovaird East of Caseley	West	60	37	95%	0.0112	0.0336	0.0123	0.0247	0.0620	0.0265	0.2030	0.4610	0.2155
C1N	Caseley South of Bovaird	North	50	31	95%	0.0112	0.0336	0.0123	0.0247	0.0620	0.0265	0.2060	0.4590	0.2183
C1S	Caseley South of Bovaird	South	50	31	95%	0.0112	0.0336	0.0123	0.0247	0.0620	0.0265	0.2060	0.4590	0.2183
B3E	Bovaird East of Heritage	East	70	43	95%	0.0112	0.0336	0.0123	0.0247	0.0620	0.0265	0.2070	0.4870	0.2206
B3W	Bovaird East of Heritage	West	70	43	95%	0.0112	0.0336	0.0123	0.0247	0.0620	0.0265	0.2070	0.4870	0.2206
H1N	Heritage North of Bovaird	North	50	31	95%	0.0112	0.0336	0.0123	0.0247	0.0620	0.0265	0.2060	0.4590	0.2183
H1S	Heritage North of Bovaird	South	50	31	95%	0.0112	0.0336	0.0123	0.0247	0.0620	0.0265	0.2060	0.4590	0.2183
H2N	Heritage South of Bovaird	North	60	37	95%	0.0112	0.0336	0.0123	0.0247	0.0620	0.0265	0.2030	0.4610	0.2155
H2S	Heritage South of Bovaird	South	60	37	95%	0.0112	0.0336	0.0123	0.0247	0.0620	0.0265	0.2030	0.4610	0.2155
B4E	Bovaird East of Mississauga Road	East	70	43	95%	0.0112	0.0336	0.0123	0.0247	0.0620	0.0265	0.2070	0.4870	0.2206
B4W	Bovaird East of Mississauga Road	West	70	43	95%	0.0112	0.0336	0.0123	0.0247	0.0620	0.0265	0.2070	0.4870	0.2206
M1N	Mississauga Road North of Bovaird	North	80	50	95%	0.0112	0.0336	0.0123	0.0247	0.0620	0.0265	0.2120	0.5490	0.2284
M1S	Mississauga Road North of Bovaird	South	80	50	95%	0.0112	0.0336	0.0123	0.0247	0.0620	0.0265	0.2120	0.5490	0.2284
M2N	Mississauga Road South of Bovaird	North	80	50	95%	0.0112	0.0336	0.0123	0.0247	0.0620	0.0265	0.2120	0.5490	0.2284
M2S	Mississauga Road South of Bovaird	South	80	50	95%	0.0112	0.0336	0.0123	0.0247	0.0620	0.0265	0.2120	0.5490	0.2284
B5E	Bovaird East of Ashby Field Road	East	70	43	95%	0.0112	0.0336	0.0123	0.0247	0.0620	0.0265	0.2070	0.4870	0.2206
B5W	Bovaird East of Ashby Field Road	West	70	43	95%	0.0112	0.0336	0.0123	0.0247	0.0620	0.0265	0.2070	0.4870	0.2206
A1N	Ashby Field Road North of Bovaird	North	50	31	95%	0.0112	0.0336	0.0123	0.0247	0.0620	0.0265	0.2060	0.4590	0.2183
A1S	Ashby Field Road North of Bovaird	South	50	31	95%	0.0112	0.0336	0.0123	0.0247	0.0620	0.0265	0.2060	0.4590	0.2183
A2N	Ashby Field Road South of Bovaird	North	50	31	95%	0.0112	0.0336	0.0123	0.0247	0.0620	0.0265	0.2060	0.4590	0.2183
A2S	Ashby Field Road South of Bovaird	South	50	31	95%	0.0112	0.0336	0.0123	0.0247	0.0620	0.0265	0.2060	0.4590	0.2183
B6E	Bovaird East of Worthington	East	70	43	95%	0.0112	0.0336	0.0123	0.0247	0.0620	0.0265	0.2070	0.4870	0.2206
B6W	Bovaird East of Worthington	West	70	43	95%	0.0112	0.0336	0.0123	0.0247	0.0620	0.0265	0.2070	0.4870	0.2206
W1N	Worthington Avenue North of Bovaird	North	50	31	95%	0.0112	0.0336	0.0123	0.0247	0.0620	0.0265	0.2060	0.4590	0.2183
W1S	Worthington Avenue North of Bovaird	South	50	31	95%	0.0112	0.0336	0.0123	0.0247	0.0620	0.0265	0.2060	0.4590	0.2183
LLN	Lake Louise Drive South of Bovaird	North	50	31	95%	0.0112	0.0336	0.0123	0.0247	0.0620	0.0265	0.2060	0.4590	0.2183
LLS	Lake Louise Drive South of Bovaird	South	50	31	95%	0.0112	0.0336	0.0123	0.0247	0.0620	0.0265	0.2060	0.4590	0.2183
CV1N	Creditview	North	70	43	95%	0.0112	0.0336	0.0123	0.0247	0.0620	0.0265	0.2070	0.4870	0.2206
CV1S	Creditview	South	70	43	95%	0.0112	0.0336	0.0123	0.0247	0.0620	0.0265	0.2070	0.4870	0.2206
JP2	James Potter	North	70	43	95%	0.0112	0.0336	0.0123	0.0247	0.0620	0.0265	0.2070	0.4870	0.2206
JP1S	James Potter	South	70	43	95%	0.0112	0.0336	0.0123	0.0247	0.0620	0.0265	0.2070	0.4870	0.2206

\*Creditview/James Potter Speed estimated to be 70 km/hr

Idle Emission Rate

Speed (mph)	% Cars - AM/PM Peak	PM2.5			PM10			NO x		
		Idle Emission Factor - Car (g/hr)	Idle Emission Factor - Truck (g/hr)	Effective Idle Emission Factor - AM/PM	Idle Emission Factor - Car (g/hr)	Idle Emission Factor - Truck (g/hr)	Effective Idle Emission Factor - AM/PM	Idle Emission Factor - Car (g/hr)	Idle Emission Factor - Truck (g/hr)	Effective Idle Emission Factor - AM/PM
2.5	95%	0.0045	0.9237	0.0491	0.0099	1.0040	0.0581	0.1728	0.3652	0.1821

**Table B.1: Mobile 6.2C Emission Factors**

Emission Factors - 2031

ID	Description	Direction	Speed (km/h)	Speed (mph)	% Cars - AM/PM Peak	SO2			CO		
						Emission Factor - Car (g/veh-mile)	Emission Factor - Truck (g/veh-mile)	Effective Emission Factor AM/PM (g/veh-mile)	Emission Factor - Car (g/veh-mile)	Emission Factor - Truck (g/veh-mile)	Effective Emission Factor AM/PM (g/veh-mile)
B1E	Bovaird West of Caseley	East	60	37	95%	0.0057	0.0131	0.0061	6.5100	0.1590	6.202
B1W	Bovaird West of Caseley	West	60	37	95%	0.0057	0.0131	0.0061	6.5100	0.1590	6.202
B2E	Bovaird East of Caseley	East	60	37	95%	0.0057	0.0131	0.0061	6.5100	0.1590	6.202
B2W	Bovaird East of Caseley	West	60	37	95%	0.0057	0.0131	0.0061	6.5100	0.1590	6.202
C1N	Caseley South of Bovaird	North	50	31	95%	0.0057	0.0131	0.0061	6.3900	0.1850	6.089
C1S	Caseley South of Bovaird	South	50	31	95%	0.0057	0.0131	0.0061	6.3900	0.1850	6.089
B3E	Bovaird East of Heritage	East	70	43	95%	0.0057	0.0131	0.0061	6.8100	0.1450	6.487
B3W	Bovaird East of Heritage	West	70	43	95%	0.0057	0.0131	0.0061	6.8100	0.1450	6.487
H1N	Heritage North of Bovaird	North	50	31	95%	0.0057	0.0131	0.0061	6.3900	0.1850	6.089
H1S	Heritage North of Bovaird	South	50	31	95%	0.0057	0.0131	0.0061	6.3900	0.1850	6.089
H2N	Heritage South of Bovaird	North	60	37	95%	0.0057	0.0131	0.0061	6.5100	0.1590	6.202
H2S	Heritage South of Bovaird	South	60	37	95%	0.0057	0.0131	0.0061	6.5100	0.1590	6.202
B4E	Bovaird East of Mississauga Road	East	70	43	95%	0.0057	0.0131	0.0061	6.8100	0.1450	6.487
B4W	Bovaird East of Mississauga Road	West	70	43	95%	0.0057	0.0131	0.0061	6.8100	0.1450	6.487
M1N	Mississauga Road North of Bovaird	North	80	50	95%	0.0057	0.0131	0.0061	7.1500	0.1410	6.810
M1S	Mississauga Road North of Bovaird	South	80	50	95%	0.0057	0.0131	0.0061	7.1500	0.1410	6.810
M2N	Mississauga Road South of Bovaird	North	80	50	95%	0.0057	0.0131	0.0061	7.1500	0.1410	6.810
M2S	Mississauga Road South of Bovaird	South	80	50	95%	0.0057	0.0131	0.0061	7.1500	0.1410	6.810
B5E	Bovaird East of Ashby Field Road	East	70	43	95%	0.0057	0.0131	0.0061	6.8100	0.1450	6.487
B5W	Bovaird East of Ashby Field Road	West	70	43	95%	0.0057	0.0131	0.0061	6.8100	0.1450	6.487
A1N	Ashby Field Road North of Bovaird	North	50	31	95%	0.0057	0.0131	0.0061	6.3900	0.1850	6.089
A1S	Ashby Field Road North of Bovaird	South	50	31	95%	0.0057	0.0131	0.0061	6.3900	0.1850	6.089
A2N	Ashby Field Road South of Bovaird	North	50	31	95%	0.0057	0.0131	0.0061	6.3900	0.1850	6.089
A2S	Ashby Field Road South of Bovaird	South	50	31	95%	0.0057	0.0131	0.0061	6.3900	0.1850	6.089
B6E	Bovaird East of Worthington	East	70	43	95%	0.0057	0.0131	0.0061	6.8100	0.1450	6.487
B6W	Bovaird East of Worthington	West	70	43	95%	0.0057	0.0131	0.0061	6.8100	0.1450	6.487
W1N	Worthington Avenue North of Bovaird	North	50	31	95%	0.0057	0.0131	0.0061	6.3900	0.1850	6.089
W1S	Worthington Avenue North of Bovaird	South	50	31	95%	0.0057	0.0131	0.0061	6.3900	0.1850	6.089
LLN	Lake Louise Drive South of Bovaird	North	50	31	95%	0.0057	0.0131	0.0061	6.3900	0.1850	6.089
LLS	Lake Louise Drive South of Bovaird	South	50	31	95%	0.0057	0.0131	0.0061	6.3900	0.1850	6.089
CV1N	Creditview	North	70	43	95%	0.0057	0.0131	0.0061	6.8100	0.1450	6.487
CV1S	Creditview	South	70	43	95%	0.0057	0.0131	0.0061	6.8100	0.1450	6.487
JP2	James Potter	North	70	43	95%	0.0057	0.0131	0.0061	6.8100	0.1450	6.487
JP1S	James Potter	South	70	43	95%	0.0057	0.0131	0.0061	6.8100	0.1450	6.487

\*Creditview/James Potter Speed estimated to be 70 km/hr

Idle Emission Rate

Speed (mph)	% Cars - AM/PM Peak	SO2			CO		
		Idle Emission Factor - Car (g/hr)	Idle Emission Factor - Truck (g/hr)	Effective Idle Emission Factor - AM/PM (g/hr)	Idle Emission Factor - Car (g/hr)	Idle Emission Factor - Truck (g/hr)	Effective Idle Emission Factor - AM/PM (g/hr)
2.5	95%	0.0022	0.0052	0.0024	7.4760	0.3812	7.1318

## **Appendix C**

### **Dispersion Modelling Input Data and Assumptions**



**Table C.1: Raw Traffic Data - Current (2010)**

ID	Description	Direction	Link Type	Length (m)	Mixing Zone Width (m)	Direction	AM Peak			Midday Peak		
							Cars	Trucks	Total	Cars	Trucks	Total
B1E	Bovaird West of Caseley	East	At-Grade	500	12	East	901	38	939	384	58	442
B1W	Bovaird West of Caseley	West	At-Grade	500	12	West	438	35	473	367	58	425
B2E	Bovaird East of Caseley	East	At-Grade	G-links	15	East	903	36	939	386	58	444
B2W	Bovaird East of Caseley	West	At-Grade	G-links	15	West	435	34	469	364	57	421
C1N	Caseley South of Bovaird	North	At-Grade	60	12	East	12	4	16	10	1	11
C1S	Caseley South of Bovaird	South	At-Grade	60	12	West	7	5	12	5	0	5
B3E	Bovaird East of Heritage	East	At-Grade	G-links	15	East	902	33	935	377	51	428
B3W	Bovaird East of Heritage	West	At-Grade	G-links	15	West	485	30	515	375	60	435
H1N	Heritage North of Bovaird	North	At-Grade	250	13	North	41	2	43	14	1	15
H1S	Heritage North of Bovaird	South	At-Grade	250	13	South	158	1	159	13	1	14
H2N	Heritage South of Bovaird	North	At-Grade	260	13	East	32	2	34	13	0	13
H2S	Heritage South of Bovaird	South	At-Grade	260	13	West	201	2	203	37	1	38
B4E	Bovaird East of Mississauga Road	East	At-Grade	G-links	15/21	North	787	43	830	415	65	480
B4W	Bovaird East of Mississauga Road	West	At-Grade	G-links	15/21	South	709	66	775	426	70	496
M1N	Mississauga Road North of Bovaird	North	At-Grade	250	15	North	103	13	116	93	18	111
M1S	Mississauga Road North of Bovaird	South	At-Grade	250	15	South	486	20	506	98	17	115
M2N	Mississauga Road South of Bovaird	North	At-Grade	250	15	East	344	24	368	245	43	288
M2S	Mississauga Road South of Bovaird	South	At-Grade	250	15	West	956	50	1006	254	49	303
B5E	Bovaird East of Ashby Field Road	East	At-Grade	G-links	36	North	876	48	924	493	50	543
B5W	Bovaird East of Ashby Field Road	West	At-Grade	G-links	36	South	875	49	924	514	54	568
A1N	Ashby Field Road North of Bovaird	North	At-Grade	120	19	North	215	3	218	26	2	28
A1S	Ashby Field Road North of Bovaird	South	At-Grade	120	19	South	53	1	54	29	2	31
A2N	Ashby Field Road South of Bovaird	North	At-Grade	120	21	East	153	2	155	76	5	81
A2S	Ashby Field Road South of Bovaird	South	At-Grade	120	21	West	87	3	90	87	5	92
B6E	Bovaird East of Worthington	East	At-Grade	500	36	East	1024	39	1063	664	89	753
B6W	Bovaird East of Worthington	West	At-Grade	500	36	West	725	33	758	544	65	609
W1N	Worthington Avenue North of Bovaird	North	At-Grade	120	24	North	133	7	140	205	9	214
W1S	Worthington Avenue North of Bovaird	South	At-Grade	120	24	South	589	5	594	304	43	347
LLN	Lake Louise Drive South of Bovaird	North	At-Grade	120	18	North	95	2	97	147	7	154
LLS	Lake Louise Drive South of Bovaird	South	At-Grade	120	18	South	73	0	73	117	3	120

**Table C.1: Raw Traffic Data - Current (2010)**

ID	Description	Direction	PM Peak			Total		
			Cars	Trucks	Total	Cars	Trucks	Total
B1E	Bovaird West of Caseley	East	504	39	543	4322	369	4691
B1W	Bovaird West of Caseley	West	913	36	949	4272	347	4619
B2E	Bovaird East of Caseley	East	498	39	537	4321	364	4685
B2W	Bovaird East of Caseley	West	917	36	953	4273	339	4612
C1N	Caseley South of Bovaird	North	0	0	0	45	12	57
C1S	Caseley South of Bovaird	South	10	0	10	47	9	56
B3E	Bovaird East of Heritage	East	549	29	578	4384	331	4715
B3W	Bovaird East of Heritage	West	919	22	941	4396	332	4728
H1N	Heritage North of Bovaird	North	148	0	148	399	5	404
H1S	Heritage North of Bovaird	South	20	0	20	375	5	380
H2N	Heritage South of Bovaird	North	222	0	222	515	7	522
H2S	Heritage South of Bovaird	South	38	0	38	563	9	572
B4E	Bovaird East of Mississauga Road	East	775	35	810	5144	360	5504
B4W	Bovaird East of Mississauga Road	West	935	29	964	5155	419	5574
M1N	Mississauga Road North of Bovaird	North	487	21	508	1684	133	1817
M1S	Mississauga Road North of Bovaird	South	190	11	201	1706	152	1858
M2N	Mississauga Road South of Bovaird	North	948	46	994	3899	298	4197
M2S	Mississauga Road South of Bovaird	South	456	31	487	3895	329	4224
B5E	Bovaird East of Ashby Field Road	East	980	43	1023	5659	361	6020
B5W	Bovaird East of Ashby Field Road	West	951	33	984	5646	386	6032
A1N	Ashby Field Road North of Bovaird	North	56	0	56	460	14	474
A1S	Ashby Field Road North of Bovaird	South	280	0	280	531	11	542
A2N	Ashby Field Road South of Bovaird	North	131	2	133	843	24	867
A2S	Ashby Field Road South of Bovaird	South	214	1	215	863	21	884
B6E	Bovaird East of Worthington	East	670	48	718	5940	533	6473
B6W	Bovaird East of Worthington	West	1186	82	1268	6046	554	6600
W1N	Worthington Avenue North of Bovaird	North	441	27	468	1715	116	1831
W1S	Worthington Avenue North of Bovaird	South	279	64	343	2678	293	2971
LLN	Lake Louise Drive South of Bovaird	North	46	0	46	637	16	653
LLS	Lake Louise Drive South of Bovaird	South	122	2	124	827	25	852

**Table C.2: Raw Traffic Data - Current (2010)**

Queue Links					AM Peak							
ID	Segment Details	Link Type	Number of Lanes	Direction	Average Signal Cycle Length (s)	Green Time (s)	Average Red Time Length (s)	Clearance Lost Time (s)	Approach Traffic Volume (vph)	Saturation Flow Rate (v/hr/lane)	Signal Type	Arrival Type
B2EQ	Bovaird East of Caseley	At-Grade	3	East	86.7	58.7	15.6	7.4	962	1,412	Semiactuated	Best
H1SQ	Heritage North of Bovaird	At-Grade	1	South	86.7	14.4	61.1	6.2	159	1,811	Semiactuated	Best
H2NQ	Heritage South of Bovaird	At-Grade	1	North	86.7	14.4	61.1	6.2	34	1,618	Semiactuated	Below Avg.
B3WQ	Bovaird East of Heritage	At-Grade	3	West	86.7	58.7	15.6	7.4	515	1,713	Semiactuated	Best
B3EQ	Bovaird East of Heritage	At-Grade	3	East	118.6	43.5	63.5	6.6	859	1,358	Pretimed	Below Avg.
M1SQ	Mississauga Road North of Bovaird	At-Grade	2	South	118.6	33.4	73.6	6.6	506	1,395	Pretimed	Below Avg.
M2NQ	Mississauga Road South of Bovaird	At-Grade	2	North	118.6	41.9	65.1	6.6	368	892	Pretimed	Below Avg.
B4WQ	Bovaird East of Mississauga Road	At-Grade	2	West	118.6	63.5	43.5	6.6	775	945	Pretimed	Worst
B4EQ	Bovaird East of Mississauga Road	At-Grade	4	East	95.4	59.5	24.7	6.2	882	1,357	Semiactuated	Above Avg.
A1SQ	Ashby Field Road North of Bovaird	At-Grade	3	South	95.4	23	60.7	6.7	54	1,703	Semiactuated	Below Avg.
A2NQ	Ashby Field Road South of Bovaird	At-Grade	2	North	95.4	11.3	72.4	6.7	155	1,500	Semiactuated	Average
B5WQ	Bovaird East of Ashby Field Road	At-Grade	4	West	95.4	53.2	31	6.2	924	1,385	Semiactuated	Best
B5EQ	Bovaird East of Ashby Field Road	At-Grade	5	East	118.2	75.5	31.1	6.6	851	1,418	Semiactuated	Above Avg.
W1SQ	Worthington Avenue North of Bovaird	At-Grade	3	South	118.2	29.2	77.1	6.9	594	1,595	Semiactuated	Below Avg.
LLNQ	Lake Louise Drive South of Bovaird	At-Grade	3	North	118.2	29.2	77.1	6.9	97	1,555	Semiactuated	Average
B6WQ	Bovaird East of Worthington	At-Grade	5	West	118.2	75.5	31.1	6.6	758	1,409	Semiactuated	Best

3-metre width assumed for lanes

Parameter: <u>Link Type</u>	<u>Direction</u>	<u>Signal Type</u>	<u>Arrival Type:</u>
At-Grade	North	Pretimed	Worst
Depressed	East	Actuated	Below Avg.
Fill	South	Semiactuated	Average
Bridge	West		Above Avg.
			Best

Mixing Zone Width: width of the travelled way plus 3 metres on each side  
(area of uniform emissions and turbulence)

**Table C.2: Raw Traffic Data - Current (2010)**

Queue Links			Midday Peak							
ID	Segment Details	Link Type	Average Signal Cycle Length (s)	Green Time (s)	Average Red Time Length (s)	Clearance Lost Time (s)	Approach Traffic Volume (vph)	Saturation Flow Rate (v/hr/lan e)	Signal Type	Arrival Type
B2EQ	Bovaird East of Caseley	At-Grade	85.4	70.1	2.9	7.4	442	1,404	Semiactuated	Best
H1SQ	Heritage North of Bovaird	At-Grade	85.4	70.1	4.1	6.2	14	1,567	Semiactuated	Below Average
H2NQ	Heritage South of Bovaird	At-Grade	85.4	1.7	72.5	6.2	13	1,762	Semiactuated	Below Average
B3WQ	Bovaird East of Heritage	At-Grade	85.4	70.1	2.9	7.4	435	1,339	Semiactuated	Best
B3EQ	Bovaird East of Heritage	At-Grade	108.6	45.5	51.5	6.6	420	1,244	Pretimed	Average
M1SQ	Mississauga Road North of Bovaird	At-Grade	108.6	31.4	65.6	6.6	115	1,332	Pretimed	Average
M2NQ	Mississauga Road South of Bovaird	At-Grade	108.6	39.9	57.1	6.6	288	1,245	Pretimed	Average
B4WQ	Bovaird East of Mississauga Road	At-Grade	108.6	55.5	41.5	6.6	496	1,181	Pretimed	Above Average
B4EQ	Bovaird East of Mississauga Road	At-Grade	85.1	54.7	19.2	6.2	504	1,317	Semiactuated	Best
A1SQ	Ashby Field Road North of Bovaird	At-Grade	85.1	17.5	55.9	6.7	31	1,583	Semiactuated	Below Average
A2NQ	Ashby Field Road South of Bovaird	At-Grade	85.1	7.6	65.8	6.7	81	1,392	Semiactuated	Below Average
B5WQ	Bovaird East of Ashby Field Road	At-Grade	85.1	54.7	19.2	6.2	568	1,421	Semiactuated	Best
B5EQ	Bovaird East of Ashby Field Road	At-Grade	62.5	32.4	18.5	6.6	651	1,368	Semiactuated	Best
W1SQ	Worthington Avenue North of Bovaird	At-Grade	62.5	16.6	34	6.9	348	1,445	Semiactuated	Average
LLNQ	Lake Louise Drive South of Bovaird	At-Grade	62.5	16.6	34	6.9	154	1,529	Semiactuated	Above Avg.
B6WQ	Bovaird East of Worthington	At-Grade	62.5	32.4	18.5	6.6	616	1,372	Semiactuated	Best



**Table C.2: Raw Traffic Data - Current (2010)**

Queue Links			PM Peak							
ID	Segment Details	Link Type	Average Signal Cycle Length (s)	Green Time (s)	Average Red Time Length (s)	Clearance Lost Time (s)	Approach Traffic Volume (vph)	Saturation Flow Rate (v/hr/lane)	Signal Type	Arrival Type
B2EQ	Bovaird East of Caseley	At-Grade	87.2	57	17.8	7.4	542	1,232	Semiactuated	Above Average
H1SQ	Heritage North of Bovaird	At-Grade	87.2	16.6	59.4	6.2	20	1,648	Semiactuated	Average
H2NQ	Heritage South of Bovaird	At-Grade	87.2	16.6	59.4	6.2	222	1,668	Semiactuated	Below Average
B3WQ	Bovaird East of Heritage	At-Grade	87.2	57	17.8	7.4	941	1,407	Semiactuated	Above Average
B3EQ	Bovaird East of Heritage	At-Grade	120	40.4	68	6.6	569	1,161	Pretimed	Below Average
M1SQ	Mississauga Road North of Bovaird	At-Grade	120	32.6	75.8	6.6	201	990	Pretimed	Below Average
M2NQ	Mississauga Road South of Bovaird	At-Grade	120	51.4	57	6.6	994	1,308	Pretimed	Worst
B4WQ	Bovaird East of Mississauga Road	At-Grade	120	55.4	53	6.6	964	1,120	Pretimed	Below Average
B4EQ	Bovaird East of Mississauga Road	At-Grade	95.4	55	29.2	6.2	837	1,368	Semiactuated	Above Avg.
A1SQ	Ashby Field Road North of Bovaird	At-Grade	95.4	27.5	56.2	6.7	280	1,717	Semiactuated	Below Avg.
A2NQ	Ashby Field Road South of Bovaird	At-Grade	95.4	8.7	75	6.7	133	1,417	Semiactuated	Below Average
B5WQ	Bovaird East of Ashby Field Road	At-Grade	95.4	55	29.2	6.2	984	1,411	Semiactuated	Above Average
B5EQ	Bovaird East of Ashby Field Road	At-Grade	110	76.2	22.2	6.6	830	1,355	Semiactuated	Above Avg.
W1SQ	Worthington Avenue North of Bovaird	At-Grade	110	20.3	77.8	6.9	349	1,403	Semiactuated	Below Avg.
LLNQ	Lake Louise Drive South of Bovaird	At-Grade	110	20.3	77.8	6.9	46	1,569	Semiactuated	Below Avg.
B6WQ	Bovaird East of Worthington	At-Grade	110	76.2	22.2	6.6	1,275	1,411	Semiactuated	Best

**Table C.3: Raw Traffic Data (2021 and 2031)**

ID	Description	Direction	2021		2031	
			PM Peak (with NSTC)	PM Peak (without NSTC)	PM Peak (with NSTC)	PM Peak (without NSTC)
			Cars	Cars	Cars	Cars
B1E	Bovaird West of Caseley	East	25	392	31	482
B1W	Bovaird West of Caseley	West	177	306	216	375
B2E	Bovaird East of Caseley	East	903	1638	1101	1996
B2W	Bovaird East of Caseley	West	177	307	216	375
C1N	Caseley South of Bovaird	North	1	1	1	1
C1S	Caseley South of Bovaird	South	1	6	1	7
B3E	Bovaird East of Heritage	East	1904	1473	2321	1795
B3W	Bovaird East of Heritage	West	622	1239	758	1510
H1N	Heritage North of Bovaird	North	149	255	182	310
H1S	Heritage North of Bovaird	South	77	328	94	402
H2N	Heritage South of Bovaird	North	198	327	242	398
H2S	Heritage South of Bovaird	South	62	200	75	244
B4E	Bovaird East of Mississauga Road	East	2317	2014	2558	2225
B4W	Bovaird East of Mississauga Road	West	1741	1735	2122	2115
M1N	Mississauga Road North of Bovaird	North	718	886	876	1080
M1S	Mississauga Road North of Bovaird	South	766	1334	934	1627
M2N	Mississauga Road South of Bovaird	North	1242	1676	1514	2043
M2S	Mississauga Road South of Bovaird	South	1180	1808	1438	2118
B5E	Bovaird East of Ashby Field Road	East	1555	1396	1718	1542
B5W	Bovaird East of Ashby Field Road	West	1500	1636	1658	1807
A1N	Ashby Field Road North of Bovaird	North	88	91	96	100
A1S	Ashby Field Road North of Bovaird	South	315	315	348	348
A2N	Ashby Field Road South of Bovaird	North	150	150	166	166
A2S	Ashby Field Road South of Bovaird	South	387	376	428	415
B6E	Bovaird East of Worthington	East	1225	1119	1354	1236
B6W	Bovaird East of Worthington	West	1499	1631	1656	1802
W1N	Worthington Avenue North of Bovaird	North	721	694	796	766
W1S	Worthington Avenue North of Bovaird	South	393	393	434	434
LLN	Lake Louise Drive South of Bovaird	North	52	52	57	57
LLS	Lake Louise Drive South of Bovaird	South	165	165	183	183
CV1N	Creditview N of Bovaird N	North	n/a	n/a	1398	n/a
CV1S	Creditview N of Bovaird S	South	n/a	n/a	1000	n/a
JPN	James Potter N	North	n/a	n/a	1073	n/a
JPS	James Potter S	South	n/a	n/a	465	n/a

**Table C.4: Raw Traffic Data (2021)**

Queue Links					2021 PM Peak with NSTC							
ID	Segment Details	Link Type	Number of Lanes	Direction	Average Signal Cycle Length (s)	Green Time (s)	Average Red Time Length (s)	Clearance Lost Time (s)	Approach Traffic Volume (vph)	Saturation Flow Rate (v/hr/lane)	Signal Type	Arrival Type
B2EQ	Bovaird East of Caseley	At-Grade	3	East	79.7	56.1	11.2	7.4	903	1,441	Semiactuated	Best
H1SQ	Heritage North of Bovaird	At-Grade	1	South	79.7	10	58.5	6.2	77	1,495	Semiactuated	Average
H2NQ	Heritage South of Bovaird	At-Grade	1	North	79.7	10	58.5	6.2	198	1,556	Semiactuated	Average
B3WQ	Bovaird East of Heritage	At-Grade	3	West	79.7	56.1	11.2	7.4	622	1,430	Semiactuated	Best
B3EQ	Bovaird East of Heritage	At-Grade	3	East	119.5	42	65.9	6.6	1,904	1,306	Pretimed	Below Avg.
M1SQ	Mississauga Road North of Bovaird	At-Grade	2	South	119.5	29	78.9	6.6	766	1,409	Pretimed	Worst
M2NQ	Mississauga Road South of Bovaird	At-Grade	2	North	119.5	46	61.9	6.6	1,242	1,402	Pretimed	Worst
B4WQ	Bovaird East of Mississauga Road	At-Grade	2	West	119.5	49.1	58.8	6.6	1,741	1,339	Pretimed	Worst
B4EQ	Bovaird East of Mississauga Road	At-Grade	4	East	102	51.8	39	6.2	2,317	1,358	Semiactuated	Average
A1SQ	Ashby Field Road North of Bovaird	At-Grade	3	South	102	27.3	63	6.7	315	1,717	Semiactuated	Below Avg.
A2NQ	Ashby Field Road South of Bovaird	At-Grade	2	North	102	11.2	79.1	6.7	150	1,410	Semiactuated	Below Avg.
B5WQ	Bovaird East of Ashby Field Road	At-Grade	4	West	102	61.8	29	6.2	1,500	1,333	Semiactuated	Below Avg.
B5EQ	Bovaird East of Ashby Field Road	At-Grade	5	East	113	77.5	23.9	6.6	1,555	1,316	Semiactuated	Average
W1SQ	Worthington Avenue North of Bovaird	At-Grade	3	South	113	21.8	79.3	6.9	393	1,401	Semiactuated	Worst
LLNQ	Lake Louise Drive South of Bovaird	At-Grade	3	North	113	21.8	79.3	6.9	52	1,567	Semiactuated	Worst
B6WQ	Bovaird East of Worthington	At-Grade	5	West	113	50.4	51	6.6	1,499	1,347	Semiactuated	Average

**Table C.4: Raw Traffic Data (2021)**

Queue Links		2021 PM Peak without NSTC							
ID	Segment Details	Average Signal Cycle Length (s)	GreenTime (s)	Average Red Time Length (s)	Clearance Lost Time (s)	Approach Traffic Volume (vph)	Saturation Flow Rate (v/hr/lane)	Signal Type	Arrival Type
B2EQ	Bovaird East of Caseley	79.9	53.3	14.2	7.4	1,638	1,338	Semiactuated	Best
H1SQ	Heritage North of Bovaird	79.9	13	55.7	6.2	329	1,457	Semiactuated	Average
H2NQ	Heritage South of Bovaird	79.9	13	55.7	6.2	327	1,478	Semiactuated	Average
B3WQ	Bovaird East of Heritage	79.9	53.3	14.2	7.4	1,239	1,332	Semiactuated	Best
B3EQ	Bovaird East of Heritage	120.6	42.4	66.6	6.6	1,473	1,326	Pretimed	Below Avg.
M1SQ	Mississauga Road North of Bovaird	120.6	29	80	6.6	1,334	1,380	Pretimed	Worst
M2NQ	Mississauga Road South of Bovaird	120.6	46	63	6.6	1,676	1,346	Pretimed	Worst
B4WQ	Bovaird East of Mississauga Road	120.6	51.8	57.2	6.6	1,735	1,352	Pretimed	Worst
B4EQ	Bovaird East of Mississauga Road	102	51.8	39	6.2	2,014	1,349	Semiactuated	Average
A1SQ	Ashby Field Road North of Bovaird	102	27.3	63	6.7	315	1,717	Semiactuated	Below Avg.
A2NQ	Ashby Field Road South of Bovaird	102	11.2	79.1	6.7	150	1,410	Semiactuated	Below Avg.
B5WQ	Bovaird East of Ashby Field Road	102	61.8	29	6.2	1,636	1,333	Semiactuated	Average
B5EQ	Bovaird East of Ashby Field Road	113	77.7	23.7	6.6	1,396	1,308	Semiactuated	Average
W1SQ	Worthington Avenue North of Bovaird	113	21.8	79.3	6.9	393	1,401	Semiactuated	Below Avg.
LLNQ	Lake Louise Drive South of Bovaird	113	21.8	79.3	6.9	52	1,567	Semiactuated	Below Avg.
B6WQ	Bovaird East of Worthington	113	51.6	49.8	6.6	1,631	1,358	Semiactuated	Average

**Table C.4: Raw Traffic Data (2031)**

Queue Links					2031 PM Peak with NSTC							
ID	Segment Details	Link Type	Number of Lanes	Direction	Average Signal Cycle Length (s)	Green Time (s)	Average Red Time Length (s)	Clearance Lost Time (s)	Approach Traffic Volume (vph)	Saturation Flow Rate (v/hr/lane)	Signal Type	Arrival Type
B2EQ	Bovaird East of Caseley	At-Grade	4	East	80.3	56.1	11.8	7.4	1,101	1,417	Semiactuated	Best
H1SQ	Heritage North of Bovaird	At-Grade	3	South	80.3	10.6	58.5	6.2	94	1,481	Semiactuated	Average
H2NQ	Heritage South of Bovaird	At-Grade	3	North	80.3	10.6	58.5	6.2	242	1,550	Semiactuated	Average
B3WQ	Bovaird East of Heritage	At-Grade	4	West	80.3	56.1	11.8	7.4	758	1,397	Semiactuated	Best
B3EQ	Bovaird East of Heritage	At-Grade	5	East	140	52.5	75.9	6.6	2,321	1,292	Pretimed	Below Avg.
M1SQ	Mississauga Road North of Bovaird	At-Grade	5	South	140	29.3	99.1	6.6	934	1,390	Pretimed	Worst
M2NQ	Mississauga Road South of Bovaird	At-Grade	6	North	140	50.3	78.1	6.6	1,514	1,619	Pretimed	Worst
B4WQ	Bovaird East of Mississauga Road	At-Grade	6	West	140	63	65.4	6.6	2,122	1,333	Pretimed	Worst
B4EQ	Bovaird East of Mississauga Road	At-Grade	5	East	102.3	51.8	39.3	6.2	2,558	1,347	Semiactuated	Average
A1SQ	Ashby Field Road North of Bovaird	At-Grade	3	South	102.3	27.6	63	6.7	348	1,717	Semiactuated	Below Avg..
A2NQ	Ashby Field Road South of Bovaird	At-Grade	2	North	102.3	11.5	79.1	6.7	166	1,403	Semiactuated	Below Avg.
B5WQ	Bovaird East of Ashby Field Road	At-Grade	5	West	102.3	61.8	29.3	6.2	1,658	1,333	Semiactuated	Average
B5EQ	Bovaird East of Ashby Field Road	At-Grade	5	East	114.3	77.7	25	6.6	1,718	1,299	Semiactuated	Average
W1SQ	Worthington Avenue North of Bovaird	At-Grade	3	South	114.3	23.1	79.3	6.9	434	1,399	Semiactuated	Below Avg.
LLNQ	Lake Louise Drive South of Bovaird	At-Grade	3	North	114.3	23.1	79.3	6.9	57	1,565	Semiactuated	Below Avg.
B6WQ	Bovaird East of Worthington	At-Grade	5	West	114.3	45.6	57.1	6.6	1,656	1,336	Semiactuated	Average
B7EQ	Bovaird West of Creditview	At-Grade	6	East	138.6	60.2	55.4	6.6	2,451	1,665	Semiactuated	Average
CVQ	Creditview	At-Grade	4	South	138.6	55.4	60.2	6.6	1,000	1,704	Semiactuated	Average
JPQ	James Potter	At-Grade	4	North	138.6	38.3	60.2	6.6	1,073	1,704	Semiactuated	Below Avg.
B7WQ	Bovaird East of Creditview	At-Grade	5	West	138.6	46.6	55.4	6.6	1,548	1,669	Semiactuated	Below Avg.

