NAPSCI
NORTHERN APPLIED SCIENCES INC.

May 1, 2025

Alex Wilkinson, P.Eng.
Project Engineer
Ainley Group
50 Grant Timmins Drive, Suite 1
Kingston, Ontario K7M 8N2

RE: Air Quality Assessment for Ross Memorial Hospital Ground Level Intakes
Ainley Group – Kent Street West and Angeline Street Intersection Improvements
Project Ref. 24-095

Dear Mr. Wilkinson:

Northern Applied Sciences Inc. (NAPSCI) has prepared this document to present Ainley Group (Ainley) the results of the *Air Quality Assessment* for the ground level intakes associated with Ross Memorial Hospital at 10 Angeline Street North in Lindsay, Ontario.

1.0 BACKGROUND

The Angeline Street North corridor in Lindsay, Ontario has been identified in the City of Kawartha Lakes Transportation Master Plan as requiring improvements in order to meet the projected 2031 traffic demands. Ainley is undertaking the detailed design activities and the Municipal Class Environmental Assessment (MCEA) for the proposed reconstruction of Angeline Street North.

During the consultation process of the MCEA, concerns were raised about the potential air quality impacts to the Ross Memorial Hospital ground level vents located in proximity to Angeline Street North. The vents serve a boiler room at the Hospital. Although the vents have been observed during recent site visits as exhausts, correspondence with the Hospital indicates that the vents may occasionally function as intakes under certain building conditions. NAPSCI therefore made the conservative assumption that the vents were valid intake receptors and conducted a preliminary air quality impact study to evaluate the impacts as a result of the redesigned and reconstructed Angeline Street North.

2.0 SCOPE OF ASSESSMENT

Ross Memorial Hospital is located at the northeast corner of Kent Street and Angeline Street, with the ground-mounted vents located west of the hospital, approximately 6.5 m east of the curb of the northbound lanes of Angeline Street. Based on the proximity of the Hospital ground-mounted vents to the intersection and that the proposed road improvements are primarily associated with intersection improvements, the assessment was limited to the air quality impacts from the vehicular traffic at the intersection and the segments of Kent Street West and Angeline Street within 300 m of the intersection.

3.0 METHODOLOGY

Onroad vehicle emissions from Kent Street, Angeline Street and the signalized intersection of these two roads are primarily the result of fuel combustion from vehicles, with particulate emissions also from brakewear and tirewear of the travelling vehicles. Emissions from vehicles vary based on several parameters, including the vehicle type (i.e., cars, medium trucks, heavy trucks), speed, engine/fuel type and vehicle activity (i.e., acceleration, deceleration, idling, cruising).

The chosen methodology for assessing the impacts from onroad vehicular traffic is based on the guidance provided in the Ministry of Transportation (MTO) document "Environmental Guide for Assessing and Mitigating the Air Quality Impacts and Greenhouse Gas Emissions of Provincial Transportation Projects", dated May 2020, and U.S. EPA guidelines.

In accordance with the MTO document, the following contaminants of concern were considered as part of this assessment:

- $PM_{2.5}$
- PM_{10}
- Carbon Monoxide (CO)
- Nitrogen Dioxide (NO_2)
- Acetaldehyde
- Formaldehyde
- 1,3-Butadiene
- Benzene
- Benzo(a)pyrene
- Acrolein

The applicable air quality criteria for each of the contaminants of concern are summarized in Table 1-1 in Attachment 1. The only ambient air monitoring station within a 50-km radius of the Project site is the ambient air monitoring station located in Peterborough, which only monitors for PM2.5 and NO2. A summary of the 3-year ambient air monitoring data for PM2.5 and NO2 from the Peterborough station is summarized in Table 1-2 in Attachment 1.

The following scenarios were assessed to evaluate the impacts of the intersection improvements:

- **Scenario 1**: Impacts from the existing traffic conditions for year 2027 under the existing intersection configuration (Baseline Scenario)
- **Scenario 2**: Impacts for forecasted traffic conditions for year 2051 under the existing intersection configuration (Future No-Build Scenario)
- **Scenario 3**: Impacts for the forecasted traffic conditions for year 2051 for the Preferred Alternative build (Future Build Scenario)

Emissions factors associated with fuel combustion (running tailpipe exhaust, running crankcase exhaust), breakwear and tirewear were estimated using U.S. EPA's Motor Vehicle Emission Simulator (MOVES) model, which is an MTO-approved emissions model for assessing emissions from transportation projects. The latest version of the MOVES emission model, MOVES5, was used to estimate the vehicular emission factors. A summary of model configuration and inputs are summarized in Table 1-3 in Attachment 1.

Traffic volumes and flow patterns for years 2027 and 2051 were obtained from the traffic study prepared by Ainley for the intersection improvements. The Traffic Study assessed the peak morning, mid-day and afternoon hours. To be conservative, this assessment used the maximum hourly traffic volumes to assess the worst-case air quality impacts.

Vehicle compositions, in terms of passenger vehicles, medium-duty vehicles and heavy-duty vehicles, were obtained from the turning movement counts from the Traffic Study. The vehicle compositions from the existing traffic conditions were assumed to be the same for years 2027 and 2051.

The MOVES model contains default historical and projected compositions of vehicles by fuel type, including electric vehicles. As electric vehicle adoption rates vary based on region, including between metropolitan areas and smaller towns, the default vehicle composition by fuel types was adjusted using total vehicle registration data for Peterborough county and electric vehicle registration data for Lindsay. Electric vehicles were estimated to be 0.3% of the total passenger vehicles in Lindsay in 2022 based on the available data, and were estimated to increase linearly to 25% in 2051. In absence of any existing data and forecasts, electric medium-duty trucks were conservatively estimated to be 0% in 2027 and increase to 5% in 2051, while electric heavy-duty trucks were conservatively set to 0% for all assessment years.

Refer to Table 1-4 in Attachment 1 for a summary of each individual component of the intersection ("link") and the corresponding road, traffic and signal data obtained from the Traffic Study or calculated based on the available information. The emission factors calculated using the MOVES5 model are summarized in Table 1-5 in Attachment 1 and are in terms of mass [grams] per vehicle-distance [km] travelled.

The emission factors were used in conjunction with the traffic volumes, length of each link, signal timing data and other traffic data to calculate the emission rates in terms of mass [g] per time [seconds] per unit area [m2]. The calculated emission rates, summarized in Table 1-6, were inputted into an air dispersion model to predict the worst-case air quality impacts at the Hospital's ground-mounted vents. For this preliminary assessment, the AERMOD air dispersion model was used to predict the impacts at the Hospital's ground-mounted vents from the vehicular activity at the intersection and connecting roads. AERMOD was chosen since the US-EPA has replaced the CAL3QHCR model as an approved model for transportation air dispersion and now recommends AERMOD. A summary of the model inputs for the road segments (links) are summarized in Table 1-6.

Air dispersion model was set-up in accordance with the Ministry of the Environment, Conservation and Parks (MECP) air dispersion modelling guidance and US EPA documents. The "RLINE" source type in AERMOD was developed by the U.S. EPA for near-surface (i.e., near-road) applications including mobile source modelling. Pre-processed five-year regional meteorological dataset obtained from the MECP was used with the model. The AERMOD model using the RLINE source type was set to 'FLAT' terrain in accordance with U.S. EPA's recommendations for transportation projects.

4.0 RESULTS AND DISCUSSION

The modelled impacts at the Hospital's ground-mounted vents for the three scenarios are summarized below in Table 1. Modelled impacts are normally added to the existing ambient monitored levels to determine the predicted cumulative impact of each compound at the receptors. Due to insufficient parameters monitored by the ambient monitoring stations within a 50-km radius of the Project Site, ambient concentrations were not added to the modelled impacts.

Table 1: Modelled Impacts at Most Affected Sensitive Receptor (Ground Vent)

Contaminant	Averaging Period	Ambient Air Quality Criteria (AAQC)	AAQC Reference	2027 - Existing Impacts		2051 - No Build Scenario		2051 - Build Scenario		
				Maximum Impact at Receptor [1]	Percent of AAQC	Maximum Impact at Receptor [1]	Percent of AAQC	Maximum Impact at Receptor [1]	Percent of AAQC	Percent Change from 2051 No-Build Scenario
		(ug/m^3)		(ug/m^3)	(%)	(ug/m^3)	(%)	(ug/m^3)	(%)	(%)
PM_{Total}	24-hour	120	Ontario AAQS	2.95	2%	7.14	6%	5.42	5%	-24%
PM_{10}	24-hour	50	Ontario AAQS	2.95	6%	7.14	14%	5.42	11%	-24%
$PM_{2.5}$	24-hour	27	Canada AAQS	3.05	11%	4.83	18%	3.71	14%	-23%
	Annual	8.8	Canada AAQS	0.53	6%	1.34	15%	0.933	11%	-30%
CO	1-hour	36200	Ontario AAQS	1,386	4%	3012	8%	2932	8%	-3%
	8-hour	15700	Ontario AAQS	1,197	8%	2637	17%	1940	12%	-26%
NO_2	1-hour	400	Ontario AAQS	176.1	44%	403.2	101%	366.2	92%	-9%
		79	Canada AAQS[2]	149.3	189%	354.0	448%	290.3	367%	-18%
	24-hour	200	Ontario AAQS	64.5	32%	149.2	75%	127.7	64%	-14%
	Annual	22.6	Canada AAQS	15.48	69%	37.37	165%	29.2	129%	-22%
1,3-Butadiene	24-hour	10	Ontario AAQS	2.98E-02	0%	7.71E-02	1%	5.52E-02	1%	-28%
	Annual	2	Ontario AAQS	8.20E-03	0%	2.25E-02	1%	1.42E-02	1%	-37%
Acetaldehyde	½-hour	500	Ontario AAQS	5.52E-01	0%	1.73E+00	0%	9.25E-01	0%	-47%
	24-hour	500	Ontario AAQS	1.52E-01	0%	3.98E-01	0%	2.77E-01	0%	-30%
Acrolein	1-hour	4.5	Ontario AAQS	3.96E-02	1%	1.29E-01	3%	6.33E-02	1%	-51%
	24-hour	0.4	Ontario AAQS	1.30E-02	3%	3.51E-02	9%	2.26E-02	6%	-36%
Benzo(a)pyrene	24-hour	0.00005	Ontario AAQS	2.75E-04	551%	6.80E-04	1361%	5.22E-04	1044%	-23%
	Annual	0.00001	Ontario AAQS	7.14E-05	714%	1.89E-04	1886%	1.28E-04	1279%	-32%
Benzene	24-hour	2.3	Ontario AAQS	2.80E-01	12%	6.96E-01	30%	5.37E-01	23%	-23%
	Annual	0.45	Ontario AAQS	7.38E-02	16%	1.96E-01	43%	1.34E-01	30%	-32%
Formaldehyde	24-hour	65	Ontario AAQS	2.08E-01	0%	5.47E-01	1%	3.71E-01	1%	-32%

[1] Does not include ambient air quality concentrations
[2] Per CAAQS, 98th percentile of 1-hour modelled concentrations

4.1 Results for Baseline Scenario

Under the baseline scenario (existing roadway configuration for the year 2027), the impacts at the ground-mounted vents are lower than the applicable ambient air quality criteria for all contaminants with the exception of the following:

- NO2 meets the applicable AAQC for the 24-hour and annual averaging periods and meets the applicable Ontario AAQC for the 1-hour. However, the NO2 impacts are predicted to be higher than the 1-hour Canada AAQC.
- Benzo(a)pyrene, which is a surrogate for Polycyclic Aromatic Hydrocarbons (PAHs) is predicted to be higher than the applicable 24-hour and annual averaging period AAQC.

4.2 Results for No-Build Scenario for Year 2051

Under the no-build scenario for year 2051, in which the forecasted year 2051 traffic volumes utilize the existing road configuration, the impacts at the ground-mounted vents are lower than the applicable ambient air quality criteria for all contaminants with the exception of the following:

- NO2 meets the applicable AAQC for the 24-hour averaging period. However, the NO2 impacts are predicted to be higher than both the 1-hour Canada AAQC and Ontario AAQC, as well as higher than the annual AAQC.
- Benzo(a)pyrene, which is a surrogate for Polycyclic Aromatic Hydrocarbons (PAHs) is predicted to be higher than the applicable 24-hour and annual averaging period AAQC.

The impacts of all contaminants at the ground-mounted vents under the no-build scenario are higher than the baseline scenario.

4.3 Results for Build Scenario for Year 2051

Under the build scenario for year 2051, in which the forecasted year 2051 traffic volumes utilize the built preferred alternative road improvements, the impacts at the ground-mounted vents are lower than the applicable ambient air quality criteria for all contaminants with the exception of the following:

- NO2 meets the applicable AAQC for the 24-hour averaging period and meets the applicable Ontario AAQC for the 1-hour. However, the NO2 impacts are predicted to be higher than the 1-hour Canada AAQC and the annual AAQC.
- Benzo(a)pyrene, which is a surrogate for Polycyclic Aromatic Hydrocarbons (PAHs) is higher than the applicable 24-hour and annual averaging period AAQC.

The impacts of all contaminants at the ground-mounted vents under the build scenario are higher than the baseline scenario but lower than the no-build scenario.

It should be noted that the AAQC for road projects are non-regulatory values that are intended to be used as indicators of air quality. Predicted impacts higher than the AAQC from road projects are not necessarily indicative of adverse impact or a cause for concern but may inform potential mitigative strategies and design alternatives where appropriate.

5.0 FINDINGS AND CONCLUDING REMARKS

This assessment has the following findings:

1. The dispersion modelling suggests that the proximity of the Hospital's ground-mounted vents to the road and intersection may potentially have existing elevated air quality impacts of NO2 and Benzo(a)pyrene.

2. Impacts to the Hospital's ground-mounted vents are lower under the Build Scenario relative to the No-Build Scenario for all contaminants.

3. The build scenario improves overall air quality impacts by reducing congestion and idling periods.

It is recommended that these findings be shared with Ross Memorial Hospital. If there are any further questions, please do not hesitate to contact us.

Respectfully,
Northern Applied Sciences Inc.

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Attachment 1 – Supporting Calculation and Data Tables

ATTACHMENT 1

Table 1-1: Contaminants of Concern and Applicable Air Quality Criteria

Contaminant	Averaging Period	Air Quality Criteria (ug/m^3)	Source
PM_{Total}	24 hour	120	Ontario AAQS
PM_{10}	24 hour	50	Ontario AAQS (interim)
$PM_{2.5}$	24 hour	27	CAAQS [1]
	Annual	8.8	CAAQS [2]
CO	1 hour	36,200 (30 ppm)	Ontario AAQS
	8 hour	15,700 (13 ppm)	Ontario AAQS
NO_2	1 hour	400	Ontario AAQS
		112.9 (60 ppb)	CAAQS (2020)
		79.0 (42 ppb)	CAAQS (2025)
	24 hour	200	Ontario AAQS
	Annual	32.0 (17 ppb)	CAAQS (2020)
		22.6 (12 ppb)	CAAQS (2025)
1,3-Butadiene	24 hour	10	Ontario AAQS
	Annual	2	Ontario AAQS
Acetaldehyde	½ hour	500	Ontario AAQS
	24 hour	500	Ontario AAQS
Acrolein	1 hour	4.5	Ontario AAQS
	24 hour	0.4	Ontario AAQS
Benzo(a)pyrene	24 hour	0.00005	Ontario AAQS
	Annual	0.00001	Ontario AAQS
Benzene	24 hour	2.3	Ontario AAQS
	Annual	0.45	Ontario AAQS
Formaldehyde	24 hour	65	Ontario AAQS

[1] $PM_{2.5}$ 24-hour CAAQS is a 3-year average of the 98th percentile of daily 24-hour concentrations

[2] $PM_{2.5}$ annual CAAQS is a 3-year average of the annual concentrations

Table 1-2: Background Air Quality Concentrations

Contaminant	Averaging Period	Air Quality Criteria (ug/m^3)	Background Concentration (ug/m^3)	% of Criteria
PM_{Total}	24 hour	120	N/A [2]	--
PM_{10}	24 hour	50	N/A [2]	--
$PM_{2.5}$ [3, 4]	24 hour	27	16.96	63
	Annual	8.8	6.22	71
CO	1 hour	36,200	N/A [2]	--
	8 hour	15,700		--
NO_2	1 hour	79	85.5	108
	24 hour	200	51.7	26
	Annual	22.6	8.5	38
1,3-Butadiene	24 hour	10	N/A [2]	--
	Annual	2		--
Acetaldehyde	½ hour	500	N/A [2]	--
	24 hour	500		--
Acrolein	1 hour	4.5	N/A [2]	--
	24 hour	0.4		--
Benzo(a)pyrene	24 hour	0.00005	N/A [2]	--
	Annual	0.00001		--
Benzene	24 hour	2.3	N/A [2]	--
	Annual	0.45		--
Formaldehyde	24 hour	65	N/A [2]	--

[1] Not monitored at any ambient monitoring stations within 50 km of Project

[2] Not monitored at any ambient monitoring stations within 50 km of Project

[3] $PM_{2.5}$ 24-hour CAAQS is a 3-year average of the 98th percentile of daily 24-hour concentrations

[4] $PM_{2.5}$ annual CAAQS is a 3-year average of the annual concentrations

Table 1-3: MOVES Setup and Input Parameters

Parameter	Inputs & Selections
Scale Panel	Model Type: Onroad
	Domain/Scale: Project
	Calculation Type: Emission Rates
Time Spans	Years: 2027 (Existing) and 2051 (future)
	Hour: 11:00 AM to 12:00 PM (Peak Hour)
Geographic Bounds	Region: Zone & Link, Michigan Clare County
Source Use Type & Fuel Combination	Default Combinations: Passenger Vehicles (Gasoline, Diesel, Ethanol, Electricity), Single Unit Short-haul Truck (Gasoline, Diesel, CNG, Electricity), Combination Long-haul Truck (Gasoline, Diesel, CNG, Electricity)
Road Type	Urban unrestricted access
Pollutants	$PM_{2.5}$, PM_{10}, CO, NO_2, Acetaldehyde, Formaldehyde, 1,3-Butadiene, Benzene, Benzo(a)pyrene and Acrolein
Age Distribution	MOVES default for years 2027 & 2051
Fuel	MOVES default with the exception of the compostion of electric passenger vehicles which were reduced to 0% for 2016 with linear growth to 25% for 2051
Meteorology Data	Data from Environment Canada for Peterborough meteorological station
Hotelling	N/A
I/M Programs	N/A
Retrofit Data	N/A
Generic	N/A
Links	Based on link length of 1 mile and link volume of 1, for average speeds in miles for five links
Link Source Types	Based on peak hour traffic data and composition from Ainley
Link Drive Schedules	N/A
Off-Network	N/A

Table 1-4: Model and Calculation Summary Data

ASSESSMENT SCENARIO 1: 2027 EXISTING ROAD CONFIGURATION

Free-flow Links

AERMOD Model Link ID	MOVES5 Link ID	Adjusted Flow (v/hr)	Traffic Percentage			Posted Speed Limit (km/hr)	Grade (%)	Estimated Average Link Velocity (m/s)	Estimated Average Link Velocity (km/h)	VSP
			Cars	Medium Truck	Heavy Trucks					
S1_SB_Arr_Cru	2027_4	478	95.5	1.9	2.6	50	0	13.89	50.00	1.69
S1_SB_Arr_Dec	2027_1	478	95.5	1.9	2.6	50	0	6.94	25.00	0.59
S1_SB_Dep_Acc	2027_3	460	94.8	1.7	3.5	50	0	6.94	25.00	14.51
S1_SB_Dep_Cru	2027_4	460	94.8	1.7	3.5	50	0	13.89	50.00	1.69
S1_NB_Arr_Cru	2027_4	409	97.7	1.2	1.1	50	0	13.89	50.00	1.66
S1_NB_Arr_Dec	2027_1	409	97.7	1.2	1.1	50	0	6.94	25.00	0.58
S1_NB_Dep_Acc	2027_3	476	97.1	1.2	1.7	50	0	6.94	25.00	14.01
S1_NB_Dep_Cru	2027_4	476	97.1	1.2	1.7	50	0	13.89	50.00	1.66
S1_WB_Arr_Cru	2027_5	827	97.8	1.1	1.1	50	1	13.89	50.00	3.11
S1_WB_Arr_Dec	2027_1	827	97.8	1.1	1.1	50	1	6.94	25.00	1.30
S1_WB_Dep_Acc	2027_3	1199	97.5	1.0	1.4	50	0	6.94	25.00	13.90
S1_WB_Dep_Cru	2027_4	1199	97.5	1.0	1.4	50	0	13.89	50.00	1.66
S1_EB_Arr_Cru	2027_4	1182	96.5	1.0	2.5	50	0	13.89	50.00	1.66
S1_EB_Arr_Dec	2027_1	1182	96.5	1.0	2.5	50	0	6.94	25.00	0.58
S1_EB_Dep_Acc	2027_3	761	97.0	1.2	1.9	50	-1	6.94	25.00	13.28
S1_EB_Dep_Cru	2027_4	761	97.0	1.2	1.9	50	-1	13.89	50.00	0.31

Queue Links

AERMOD Model Link ID	MOVES5 Link ID	Adjusted Flow (v/hr)	Traffic Percentage			Posted Speed Limit (km/hr)	Grade (%)	v/c Ratio	Traffic Memo 95th Queue Length (m)	Storage Bay Length (m)
			Cars	Medium Truck	Heavy Trucks					
S1_SB_Queue_TR	2027_2	381	95.2	1.8	3.0	50	0	0.85	119.3	--
S1_SB_Queue_L	2027_2	97	96.8	2.2	1.0	50	0	0.24	67	45
S1_NB_Queue_TR	2027_2	180	97.3	1.5	1.2	50	0	0.34	48.8	--
S1_NB_Queue_L	2027_2	229	98.0	1.0	1.0	50	0	0.73	48.8	58
S1_WB_Queue_TR	2027_2	792	97.8	1.1	1.1	50	1	0.68	90.4	--
S1_WB_Queue_L	2027_2	35	98.0	1.0	1.0	50	1	0.18	36	25
S1_EB_Queue_TR	2027_2	923	96.3	1.0	2.7	50	0	0.66	89.1	--
S1_EB_Queue_L	2027_2	259	98.0	1.0	1.0	50	0	0.82	63.5	41

ASSESSMENT SCENARIO 2: 2051 EXISTING ROAD CONFIGURATION ("NO-BUILD SCENARIO")

Free-flow Links

AERMOD Model Link ID	MOVES5 Link ID	Adjusted Flow (v/hr)	Traffic Percentage			Posted Speed Limit (km/hr)	Grade (%)	Estimated Average Link Velocity (m/s)	Estimated Average Link Velocity (km/h)	VSP
			Cars	Medium Truck	Heavy Trucks					
S2_SB_Arr_Cru	*2051_4*	*701*	*95.5*	*1.9*	*2.6*	*50*	*0*	*13.89*	*50.00*	*1.69*
S2_SB_Arr_Dec	2051_1	701	95.5	1.9	2.6	50	0	6.94	25.00	0.59
S2_SB_Dep_Acc	2051_3	675	94.8	1.7	3.5	50	0	6.94	25.00	14.51
S2_SB_Dep_Cru	2051_4	675	94.8	1.7	3.5	50	0	13.89	50.00	1.69
S2_NB_Arr_Cru	2051_4	597	97.7	1.2	1.1	50	0	13.89	50.00	1.66
S2_NB_Arr_Dec	2051_1	597	97.7	1.2	1.1	50	0	6.94	25.00	0.58
S2_NB_Dep_Acc	2051_3	697	97.1	1.2	1.7	50	0	6.94	25.00	14.01
S2_NB_Dep_Cru	2051_4	697	97.1	1.2	1.7	50	0	13.89	50.00	1.66
S2_WB_Arr_Cru	*2051_5*	*1209*	*97.8*	*1.1*	*1.1*	*50*	*1*	*13.89*	*50.00*	3.11
S2_WB_Arr_Dec	2051_1	1209	97.8	1.1	1.1	50	1	6.94	25.00	1.30
S2_WB_Dep_Acc	2051_3	1755	97.5	1.0	1.4	50	0	6.94	25.00	13.90
S2_WB_Dep_Cru	2051_4	1755	97.5	1.0	1.4	50	0	13.89	50.00	1.66
S2_EB_Arr_Cruise	*2051_4*	*1332*	*96.5*	*1.0*	*2.5*	*50*	*0*	*13.89*	*50.00*	1.66
S2_EB_Arr_Dec	*2051_1*	*1332*	*96.5*	*1.0*	*2.5*	*50*	*0*	*6.94*	*25.00*	0.58
S2_EB_Dep_Acc	2051_3	1114	97.0	1.2	1.9	50	-1	6.94	25.00	13.28
S2_EB_Dep_Cru	2051_4	1114	97.0	1.2	1.9	50	-1	13.89	50.00	0.31

Notes:

1) Links in gray italicized font are not included in the assessment as they are estimated to be beyond 300 m from the receptors.

Queue Links

AERMOD Model Link ID	MOVES5 Link ID	Adjusted Flow (v/hr)	Traffic Percentage			Posted Speed Limit (km/hr)	Grade (%)	v/c Ratio	95th Queue Length (m)	Storage Bay Length (m)
			Cars	Medium Truck	Heavy Trucks					
S2_SB_Queue_TR	2051_2	559	95.2	1.8	3.0	50	0	1.28	243.6	--
S2_SB_Queue_L	2051_2	142	96.8	2.2	1.0	50	0	0.33	89.1	45
S2_NB_Queue_TR	2051_2	262	97.3	1.5	1.2	50	0	0.49	61.9	--
S2_NB_Queue_L	2051_2	335	98.0	1.0	1.0	50	0	0.97	78.7	58
S2_WB_Queue_TR	2051_2	1158	97.8	1.1	1.1	50	1	1.07	282.7	--
S2_WB_Queue_L	2051_2	51	98.0	1.0	1.0	50	1	0.34	64.9	25
S2_EB_Queue_TR	2051_2	1353	96.3	1.0	2.7	50	0	1.09	312.1	--
S2_EB_Queue_L	2051_2	379	98.0	1.0	1.0	50	0	1.49	60.9	41

ASSESSMENT SCENARIO 3: 2051 OPTION 2 ROAD CONFIGURATION ("BUILD SCENARIO")

Free-flow Links

AERMOD Model Link ID	MOVES5 Link ID	Adjusted Flow (v/hr)	Traffic Percentage			Posted Speed Limit (km/hr)	Grade (%)	Estimated Average Link Velocity (m/s)	Estimated Average Link Velocity (km/h)	VSP
			Cars	Medium Truck	Heavy Trucks					
S3_SB_Arr_Cruise	2051_4	701	95.5	1.9	2.6	50	0	13.9	50.0	1.69
S3_SB_Arr_Dec	2051_1	701	95.5	1.9	2.6	50	0	6.9	25.0	0.59
S3_SB_Dep_Acc	2051_3	675	94.8	1.7	3.5	50	0	6.9	25.0	14.51
S3_SB_Dep_Cru	2051_4	675	94.8	1.7	3.5	50	0	13.9	50.0	1.69
S3_NB_Arr_Cru	*2051_4*	*597*	*97.7*	*1.2*	*1.1*	*50*	*0*	*13.9*	*50.0*	*1.66*
S3_NB_Arr_Dec	2051_1	597	97.7	1.2	1.1	50	0	6.9	25.0	0.58
S3_NB_Dep_Acc	2051_3	697	97.1	1.2	1.7	50	0	6.9	25.0	14.01
S3_NB_Dep_Cru	2051_4	697	97.1	1.2	1.7	50	0	13.9	50.0	1.66
S3_WB_Arr_Cru	*2051_5*	*1209*	*97.8*	*1.1*	*1.1*	*50*	*1*	*13.9*	*50.0*	*3.11*
S3_WB_Arr_Dec	2051_1	1209	97.8	1.1	1.1	50	1	6.9	25.0	1.30
S3_WB_Dep_Acc	2051_3	1755	97.5	1.0	1.4	50	0	6.9	25.0	13.90
S3_WB_Dep_Cru	2051_4	1755	97.5	1.0	1.4	50	0	13.9	50.0	1.66
S3_EB_Arr_Cruise	2051_4	1732	96.5	1.0	2.5	50	0	13.9	50.0	1.66
S3_EB_Arr_Dec	2051_1	1732	96.5	1.0	2.5	50	0	6.9	25.0	0.58
S3_EB_Dep_Acc	2051_3	1114	97.0	1.2	1.9	50	-1	6.9	25.0	13.28
S3_EB_Dep_Cru	2051_4	1114	97.0	1.2	1.9	50	-1	13.9	50.0	0.31

Notes:

1) Links in gray italicized font are not included in the assessment as they are estimated to be beyond 300 m from the receptors.

Queue Links

AERMOD Model Link ID	MOVES5 Link ID	Adjusted Flow (v/hr)	Traffic Percentage			Posted Speed Limit (km/hr)	Grade (%)	v/c Ratio	Traffic Memo 95th Queue Length (m)	Storage Bay Length (m)
			Cars	Medium Truck	Heavy Trucks					
S3_SB_Queue_TR	2051_2	559	95.2	1.8	3.0	50	0	0.29	39.3	--
S3_SB_Queue_L	2051_2	142	96.8	2.2	1.0	50	0	0.46	35.8	50
S3_NB_Queue_TR	2051_2	262	97.3	1.5	1.2	50	0	0.40	250.7	--
S3_NB_Queue_L	2051_2	335	98.0	1.0	1.0	50	0	0.99	111.3	60
S3_WB_Queue_TR	2051_2	1158	97.8	1.1	1.1	50	1	0.91	295.3	--
S3_WB_Queue_L	2051_2	51	98.0	1.0	1.0	50	1	0.18	87.5	45
S3_EB_Queue_TR	2051_2	909	98.0	1.0	1.0	50	0	0.51	130.4	--
S3_EB_Queue_L	2051_2	379	98.0	1.0	1.0	50	0	0.96	103.9	60

Table 1-5: Emission Factors for Intersection Links

Year	Operating Condition	Average Link Speed (km/hr)	Road Grade (%)	Vehicle Type	Emission Rate (g/vehicle-km Travelled)										
					Carbon Monoxide	Nitrogen Oxides	Benzene	1,3-Butadiene	Formaldehyde	Acetaldehyde	Acrolein	Benzo(a)pyrene	PM2.5 Total	PM10 Total	PM10 Total
2027	Idling	0	0	Passenger Vehicle	2.23E+00	1.31E-01	4.74E-03	5.88E-04	2.26E-03	2.13E-03	1.15E-04	2.38E-06	1.41E-02	2.63E-02	2.63E-02
				Medium Truck	6.47E+00	6.89E+00	1.72E-02	3.58E-03	7.58E-02	3.84E-02	5.99E-03	6.04E-05	8.68E-01	4.27E-01	4.27E-01
				Heavy Truck	5.10E+00	1.59E+01	6.14E-03	2.18E-03	7.11E-02	3.89E-02	5.83E-03	6.29E-05	9.90E-01	5.45E-01	5.45E-01
	Braking	25	0	Passenger Vehicle	6.68E-01	2.07E-02	1.54E-03	1.53E-04	7.10E-04	6.13E-04	3.50E-05	4.49E-07	2.01E-02	8.39E-02	8.39E-02
				Medium Truck	1.53E+00	1.04E+00	4.95E-03	8.84E-04	1.72E-02	8.76E-03	1.33E-03	4.06E-06	1.84E-01	4.02E-01	4.02E-01
				Heavy Truck	1.09E+00	1.65E+00	1.21E-03	4.25E-04	1.39E-02	7.34E-03	1.09E-03	3.64E-06	5.21E-01	1.40E+00	1.40E+00
	Accelerating	25	0	Passenger Vehicle	9.31E+00	6.44E-01	3.96E-03	3.61E-04	1.80E-03	1.51E-03	8.79E-05	3.02E-06	1.62E-02	1.55E-02	1.55E-02
				Medium Truck	1.73E+01	1.07E+01	2.25E-02	2.66E-03	3.61E-02	2.11E-02	2.65E-03	4.40E-05	9.50E-01	4.68E-01	4.68E-01
				Heavy Truck	1.39E+01	2.32E+01	2.49E-03	8.55E-04	2.87E-02	1.67E-02	2.41E-03	4.51E-05	1.32E+00	6.60E-01	6.60E-01
	Cruise Speed	50	0	Passenger Vehicle	1.55E+00	5.10E-02	7.91E-04	8.18E-05	3.66E-04	3.21E-04	1.82E-05	4.57E-07	2.74E-03	7.86E-03	7.86E-03
				Medium Truck	1.74E+00	1.58E+00	3.14E-03	5.80E-04	1.36E-02	6.84E-03	1.02E-03	6.47E-06	1.54E-01	8.57E-02	8.57E-02
				Heavy Truck	1.52E+00	3.27E+00	1.09E-03	3.78E-04	1.32E-02	7.12E-03	9.81E-04	8.66E-06	2.47E-01	1.42E-01	1.42E-01
	Cruise Speed	50	1	Passenger Vehicle	2.02E+00	7.81E-02	9.19E-04	9.81E-05	4.27E-04	3.80E-04	2.13E-05	4.07E-07	2.35E-03	7.67E-03	7.67E-03
				Medium Truck	2.86E+00	2.34E+00	4.03E-03	6.88E-04	1.44E-02	7.29E-03	1.10E-03	8.06E-06	1.97E-01	1.06E-01	1.06E-01
				Heavy Truck	1.71E+00	4.82E+00	1.10E-03	3.82E-04	1.28E-02	6.79E-03	9.90E-04	1.12E-05	3.14E-01	1.75E-01	1.75E-01
2051	Idling	0	0	Passenger Vehicle	1.50E-01	1.40E-03	3.32E-04	0.00E+00	1.34E-04	6.53E-05	5.64E-06	2.81E-07	1.72E-03	2.07E-02	2.07E-02
				Medium Truck	2.38E+00	2.39E+00	9.51E-04	0.00E+00	3.96E-03	4.68E-03	2.90E-04	7.82E-07	1.41E-02	4.22E-02	4.22E-02
				Heavy Truck	4.17E+00	1.31E+01	7.14E-05	0.00E+00	8.36E-03	9.81E-03	5.12E-04	0.00E+00	4.77E-02	1.37E-01	1.37E-01
	Braking	25	0	Passenger Vehicle	1.40E-01	5.34E-04	2.21E-04	0.00E+00	8.94E-05	4.34E-05	3.75E-06	5.24E-08	1.44E-02	4.43E-02	4.43E-02
				Medium Truck	2.92E-01	1.11E-01	4.80E-04	0.00E+00	8.67E-04	8.09E-04	3.50E-05	2.80E-07	7.12E-02	2.09E-01	2.09E-01
				Heavy Truck	7.74E-01	5.07E-01	2.16E-05	0.00E+00	1.79E-03	1.81E-03	5.50E-05	0.00E+00	4.89E-01	1.41E+00	1.41E+00
	Accelerating	25	0	Passenger Vehicle	2.54E+00	1.85E-02	6.61E-04	0.00E+00	2.67E-04	1.30E-04	1.12E-05	1.66E-07	1.02E-03	8.76E-03	8.76E-03
				Medium Truck	3.98E+00	2.01E+00	3.11E-03	0.00E+00	3.40E-03	3.60E-03	2.75E-04	2.46E-06	5.41E-02	3.42E-02	3.42E-02
				Heavy Truck	1.36E+01	6.45E+00	2.26E-05	0.00E+00	3.74E-03	4.82E-03	3.10E-04	0.00E+00	8.96E-02	6.54E-02	6.54E-02
	Cruise Speed	50	0	Passenger Vehicle	4.14E-01	1.27E-03	1.03E-04	0.00E+00	4.18E-05	2.03E-05	1.75E-06	5.70E-08	3.49E-04	6.77E-03	6.77E-03
				Medium Truck	4.53E-01	1.90E-01	3.35E-04	0.00E+00	1.01E-03	9.43E-04	3.00E-05	3.32E-07	3.25E-03	1.15E-02	1.15E-02
				Heavy Truck	9.94E-01	5.46E-01	3.17E-05	0.00E+00	2.41E-03	2.32E-03	5.13E-05	0.00E+00	7.17E-03	2.65E-02	2.65E-02
	Cruise Speed	50	1	Passenger Vehicle	5.32E-01	1.92E-03	1.11E-04	0.00E+00	4.50E-05	2.19E-05	1.89E-06	4.12E-08	2.52E-04	6.73E-03	6.73E-03
				Medium Truck	6.15E-01	2.85E-01	4.26E-04	0.00E+00	8.54E-04	8.17E-04	3.60E-05	3.50E-07	4.18E-03	1.19E-02	1.19E-02
				Heavy Truck	1.21E+00	9.08E-01	2.13E-05	0.00E+00	1.75E-03	1.77E-03	5.24E-05	0.00E+00	7.39E-03	2.66E-02	2.66E-02

Table 1-6: Model and Calculation Summary Data

ASSESSMENT SCENARIO 1: 2027 EXISTING ROAD CONFIGURATION

Free-flow Links

AERMOD Model Free-flow link ID	Dispersion Modelling Emission Rates (g/s/m2)											
	2	3	33	20	24	25	26	27	74			
	CO	NOx	NO2	Benzene	1,3-Butadiene	Formaldehyde	Acetaldehyde	Acrolein	Benzo(a)pyrene	PM2.5	PM10	PM
S1_SB_Arr_Cru	1.62E-05	1.71E-06	1.65E-07	8.80E-09	1.03E-09	9.92E-09	6.49E-09	6.50E-10	8.19E-12	8.18E-08	1.52E-07	1.52E-07
S1_SB_Arr_Dec	7.26E-06	8.59E-07	7.69E-08	1.67E-08	1.81E-09	1.43E-08	9.84E-09	9.08E-10	6.27E-12	3.60E-07	1.31E-06	1.31E-06
S1_SB_Dep_Acc	9.29E-05	1.56E-05	1.68E-06	4.09E-08	4.04E-09	3.23E-08	2.30E-08	2.06E-09	5.03E-11	4.43E-07	5.58E-07	5.58E-07
S1_SB_Dep_Cru	1.50E-05	1.84E-06	1.81E-07	8.14E-09	9.74E-10	1.01E-08	6.50E-09	6.69E-10	8.20E-12	8.64E-08	1.53E-07	1.53E-07
S1_NB_Arr_Cru	1.18E-05	8.02E-07	7.53E-08	6.28E-09	6.96E-10	5.09E-09	3.63E-09	3.12E-10	4.74E-12	3.96E-08	8.72E-08	8.72E-08
S1_NB_Arr_Dec	5.22E-06	3.89E-07	3.48E-08	1.21E-08	1.26E-09	8.05E-09	6.00E-09	4.75E-10	4.03E-12	2.05E-07	7.89E-07	7.89E-07
S1_NB_Dep_Acc	9.82E-05	1.19E-05	1.24E-06	4.30E-08	4.10E-09	2.76E-08	2.07E-08	1.63E-09	4.36E-11	3.09E-07	4.14E-07	4.14E-07
S1_NB_Dep_Cru	1.60E-05	1.28E-06	1.23E-07	8.52E-09	9.60E-10	7.66E-09	5.32E-09	4.80E-10	6.92E-12	6.20E-08	1.28E-07	1.28E-07
S1_WB_Arr_Cru	3.17E-05	2.41E-06	2.18E-07	1.49E-08	1.68E-09	1.11E-08	8.17E-09	6.77E-10	9.47E-12	8.58E-08	1.83E-07	1.83E-07
S1_WB_Arr_Dec	1.07E-05	7.71E-07	6.93E-08	2.46E-08	2.55E-09	1.61E-08	1.21E-08	9.42E-10	8.15E-12	4.16E-07	1.60E-06	1.60E-06
S1_WB_Dep_Acc	3.11E-04	3.52E-05	3.63E-06	1.36E-07	1.29E-08	8.36E-08	6.34E-08	4.85E-09	1.33E-10	8.89E-07	1.21E-06	1.21E-06
S1_WB_Dep_Cru	5.08E-05	3.71E-06	3.54E-07	2.69E-08	3.00E-09	2.26E-08	1.60E-08	1.39E-09	2.09E-11	1.80E-07	3.87E-07	3.87E-07
S1_EB_Arr_Cru	4.94E-05	4.71E-06	4.62E-07	2.62E-08	3.01E-09	2.63E-08	1.78E-08	1.68E-09	2.31E-11	2.22E-07	4.32E-07	4.32E-07
S1_EB_Arr_Dec	2.19E-05	2.30E-06	2.09E-07	5.00E-08	5.33E-09	3.86E-08	2.76E-08	2.38E-09	1.81E-11	1.05E-06	3.87E-06	3.87E-06
S1_EB_Dep_Acc	1.26E-04	1.56E-05	1.64E-06	5.48E-08	5.24E-09	3.58E-08	2.67E-08	2.13E-09	5.66E-11	4.09E-07	5.45E-07	5.45E-07
S1_EB_Dep_Cru	2.05E-05	1.71E-06	1.64E-07	1.09E-08	1.23E-09	1.00E-08	6.94E-09	6.32E-10	9.00E-12	8.21E-08	1.67E-07	1.67E-07

Queue Links

AERMOD Model Queue Link ID	Dispersion Modelling Emission Rates (g/s/m2)											
	2	3	33	20	24	25	26	27	74			
	CO	NOx	NO2	Benzene	1,3-Butadiene	Formaldehyde	Acetaldehyde	Acrolein	Benzo(a)pyrene	PM2.5	PM10	PM
S1_SB_Queue_TR	4.18E-05	1.27E-05	1.49E-06	8.75E-08	1.21E-08	9.89E-08	6.79E-08	6.88E-09	9.18E-11	6.79E-07	1.08E-06	1.08E-06
S1_SB_Queue_L	5.21E-06	9.75E-07	9.93E-08	1.11E-08	1.48E-09	1.02E-08	7.32E-09	6.74E-10	9.50E-12	6.43E-08	1.10E-07	1.10E-07
S1_NB_Queue_TR	1.04E-05	1.90E-06	2.02E-07	2.21E-08	2.91E-09	1.87E-08	1.39E-08	1.22E-09	1.78E-11	1.18E-07	2.10E-07	2.10E-07
S1_NB_Queue_L	1.42E-05	2.20E-06	2.29E-07	3.01E-08	3.90E-09	2.27E-08	1.76E-08	1.43E-09	2.20E-11	1.39E-07	2.62E-07	2.62E-07
S1_WB_Queue_TR	2.52E-05	4.12E-06	4.35E-07	5.35E-08	6.97E-09	4.16E-08	3.19E-08	2.63E-09	4.01E-11	2.58E-07	4.77E-07	4.77E-07
S1_WB_Queue_L	1.49E-06	2.30E-07	2.40E-08	3.15E-09	4.10E-10	2.38E-09	1.85E-09	1.50E-10	2.31E-12	1.46E-08	2.75E-08	2.75E-08
S1_EB_Queue_TR	2.51E-05	6.62E-06	7.77E-07	5.23E-08	7.05E-09	5.17E-08	3.71E-08	3.49E-09	4.89E-11	3.49E-07	5.84E-07	5.84E-07
S1_EB_Queue_L	1.70E-05	2.64E-06	2.75E-07	3.61E-08	4.69E-09	2.73E-08	2.11E-08	1.71E-09	2.64E-11	1.67E-07	3.15E-07	3.15E-07

ASSESSMENT SCENARIO 2: 2051 EXISTING ROAD CONFIGURATION ("NO-BUILD SCENARIO"]

Free-flow Links

AERMOD Model Free-flow link ID	Dispersion Modelling Emission Rates (g/s/m2)											
	2	3	33	20	24	25	26	27	74			
	CO	NOx	NO2	Benzene	1,3-Butadiene	Formaldehyde	Acetaldehyde	Acrolein	Benzo(a)pyrene	PM2.5	PM10	PM
S2_SB_Arr_Cru												
S2_SB_Arr_Dec	1.56E-05	1.85E-06	1.65E-07	3.58E-08	3.90E-09	3.07E-08	2.12E-08	1.95E-09	1.35E-11	7.74E-07	2.81E-06	2.81E-06
S2_SB_Dep_Acc	2.00E-04	3.35E-05	3.61E-06	8.80E-08	8.69E-09	6.95E-08	4.95E-08	4.44E-09	1.08E-10	9.54E-07	1.20E-06	1.20E-06
S2_SB_Dep_Cru	3.22E-05	3.96E-06	3.89E-07	1.75E-08	2.10E-09	2.17E-08	1.40E-08	1.44E-09	1.77E-11	1.86E-07	3.30E-07	3.30E-07
S2_NB_Arr_Cru	2.52E-05	1.71E-06	1.60E-07	1.34E-08	1.48E-09	1.09E-08	7.73E-09	6.65E-10	1.01E-11	8.43E-08	1.86E-07	1.86E-07
S2_NB_Arr_Dec	1.11E-05	8.29E-07	7.42E-08	2.57E-08	2.68E-09	1.72E-08	1.28E-08	1.01E-09	8.59E-12	4.37E-07	1.68E-06	1.68E-06
S2_NB_Dep_Acc	2.11E-04	2.55E-05	2.65E-06	9.21E-08	8.79E-09	5.92E-08	4.44E-08	3.50E-09	9.36E-11	6.62E-07	8.87E-07	8.87E-07
S2_NB_Dep_Cru	3.43E-05	2.75E-06	2.64E-07	1.83E-08	2.06E-09	1.64E-08	1.14E-08	1.03E-09	1.48E-11	1.33E-07	2.75E-07	2.75E-07
S2_WB_Arr_Cru												
S2_WB_Arr_Dec	2.28E-05	1.65E-06	1.48E-07	5.25E-08	5.45E-09	3.44E-08	2.58E-08	2.01E-09	1.74E-11	8.88E-07	3.43E-06	3.43E-06
S2_WB_Dep_Acc	6.66E-04	7.54E-05	7.79E-06	2.91E-07	2.75E-08	1.79E-07	1.36E-07	1.04E-08	2.85E-10	1.90E-06	2.60E-06	2.60E-06
S2_WB_Dep_Cru	1.09E-04	7.95E-06	7.59E-07	5.76E-08	6.42E-09	4.83E-08	3.42E-08	2.98E-09	4.48E-11	3.87E-07	8.30E-07	8.30E-07
S2_EB_Arr_Cruise												
S2_EB_Arr_Dec												
S2_EB_Dep_Acc	2.69E-04	3.35E-05	3.51E-06	1.18E-07	1.12E-08	7.66E-08	5.73E-08	4.56E-09	1.21E-10	8.76E-07	1.17E-06	1.17E-06
S2_EB_Dep_Cru	4.39E-05	3.66E-06	3.52E-07	2.33E-08	2.64E-09	2.15E-08	1.49E-08	1.36E-09	1.93E-11	1.76E-07	3.58E-07	3.58E-07

Notes:

1) Links in gray italicized font are not included in the assessment as they are estimated to be beyond 300 m from the receptors.

Queue Links

AERMOD Model Queue Link ID	Project Scale Link Emission Factors (g/s-m2)											
	2	3	33	20	24	25	26	27	74			
	CO	NOx	NO2	Benzene	1,3-Butadiene	Formaldehyde	Acetaldehyde	Acrolein	Benzo(a)pyrene	PM2.5	PM10	PM
S2_SB_Queue_TR	1.16E-04	3.53E-05	4.13E-06	2.43E-07	3.35E-08	2.75E-07	1.89E-07	1.91E-08	2.55E-10	1.89E-06	3.00E-06	3.00E-06
S2_SB_Queue_L	7.00E-06	1.31E-06	1.33E-07	1.50E-08	2.00E-09	1.37E-08	9.84E-09	9.06E-10	1.28E-11	8.64E-08	1.48E-07	1.48E-07
S2_NB_Queue_TR	1.59E-05	2.91E-06	3.09E-07	3.38E-08	4.46E-09	2.86E-08	2.13E-08	1.86E-09	2.72E-11	1.81E-07	3.21E-07	3.21E-07
S2_NB_Queue_L	4.37E-05	6.78E-06	7.07E-07	9.27E-08	1.20E-08	7.00E-08	5.43E-08	4.40E-09	6.78E-11	4.30E-07	8.08E-07	8.08E-07
S2_WB_Queue_TR	9.00E-05	1.47E-05	1.55E-06	1.91E-07	2.49E-08	1.48E-07	1.14E-07	9.40E-09	1.43E-10	9.19E-07	1.70E-06	1.70E-06
S2_WB_Queue_L	2.64E-06	4.08E-07	4.26E-08	5.59E-09	7.26E-10	4.22E-09	3.27E-09	2.65E-10	4.09E-12	2.59E-08	4.87E-08	4.87E-08
S2_EB_Queue_TR	1.12E-04	2.95E-05	3.47E-06	2.33E-07	3.14E-08	2.30E-07	1.65E-07	1.56E-08	2.18E-10	1.56E-06	2.61E-06	2.61E-06
S2_EB_Queue_L	7.57E-05	1.17E-05	1.22E-06	1.60E-07	2.08E-08	1.21E-07	9.39E-08	7.61E-09	1.17E-10	7.44E-07	1.40E-06	1.40E-06

ASSESSMENT SCENARIO 3: 2051 OPTION 2 ROAD CONFIGURATION ("BUILD SCENARIO")

Free-flow Links

AERMOD Model Free-flow link ID	Project Scale Link Emission Factors (g/s-m2)											
	2	3	33	20	24	25	26	27	74			
	CO	NOx	NO2	Benzene	1,3-Butadiene	Formaldehyde	Acetaldehyde	Acrolein	Benzo(a)pyrene	PM2.5	PM10	PM
S3_SB_Arr_Cruise	3.48E-05	3.67E-06	3.54E-07	1.89E-08	2.22E-09	2.13E-08	1.40E-08	1.40E-09	1.76E-11	1.76E-07	3.26E-07	3.26E-07
S3_SB_Arr_Dec	1.56E-05	1.85E-06	1.65E-07	3.58E-08	3.90E-09	3.07E-08	2.12E-08	1.95E-09	1.35E-11	7.74E-07	2.81E-06	2.81E-06
S3_SB_Dep_Acc	2.00E-04	3.35E-05	3.61E-06	8.80E-08	8.69E-09	6.95E-08	4.95E-08	4.44E-09	1.08E-10	9.54E-07	1.20E-06	1.20E-06
S3_SB_Dep_Cru	3.22E-05	3.96E-06	3.89E-07	1.75E-08	2.10E-09	2.17E-08	1.40E-08	1.44E-09	1.77E-11	1.86E-07	3.30E-07	3.30E-07
S3_NB_Arr_Cru												
S3_NB_Arr_Dec	1.11E-05	8.29E-07	7.42E-08	2.57E-08	2.68E-09	1.72E-08	1.28E-08	1.01E-09	8.59E-12	4.37E-07	1.68E-06	1.68E-06
S3_NB_Dep_Acc	2.11E-04	2.55E-05	2.65E-06	9.21E-08	8.79E-09	5.92E-08	4.44E-08	3.50E-09	9.36E-11	6.62E-07	8.87E-07	8.87E-07
S3_NB_Dep_Cru	3.43E-05	2.75E-06	2.64E-07	1.83E-08	2.06E-09	1.64E-08	1.14E-08	1.03E-09	1.48E-11	1.33E-07	2.75E-07	2.75E-07
S3_WB_Arr_Cru												
S3_WB_Arr_Dec	2.28E-05	1.65E-06	1.48E-07	5.25E-08	5.45E-09	3.44E-08	2.58E-08	2.01E-09	1.74E-11	8.88E-07	3.43E-06	3.43E-06
S3_WB_Dep_Acc	6.66E-04	7.54E-05	7.79E-06	2.91E-07	2.75E-08	1.79E-07	1.36E-07	1.04E-08	2.85E-10	1.90E-06	2.60E-06	2.60E-06
S3_WB_Dep_Cru	1.09E-04	7.95E-06	7.59E-07	5.76E-08	6.42E-09	4.83E-08	3.42E-08	2.98E-09	4.48E-11	3.87E-07	8.30E-07	8.30E-07
S3_EB_Arr_Cruise	1.06E-04	1.01E-05	9.92E-07	5.63E-08	6.46E-09	5.64E-08	3.83E-08	3.60E-09	4.97E-11	4.77E-07	9.28E-07	9.28E-07
S3_EB_Arr_Dec	4.71E-05	4.93E-06	4.49E-07	1.07E-07	1.14E-08	8.29E-08	5.93E-08	5.12E-09	3.88E-11	2.26E-06	8.32E-06	8.32E-06
S3_EB_Dep_Acc	2.69E-04	3.35E-05	3.51E-06	1.18E-07	1.12E-08	7.66E-08	5.73E-08	4.56E-09	1.21E-10	8.76E-07	1.17E-06	1.17E-06
S3_EB_Dep_Cru	4.39E-05	3.66E-06	3.52E-07	2.33E-08	2.64E-09	2.15E-08	1.49E-08	1.36E-09	1.93E-11	1.76E-07	3.58E-07	3.58E-07

Notes:

1) Links in gray italicized font are not included in the assessment as they are estimated to be beyond 300 m from the receptors.

Queue Links

AERMOD Model Queue Link ID	Project Scale Link Emission Factors (g/s-m2)											
	2	3	33	20	24	25	26	27	74			
	CO	NOx	NO2	Benzene	1,3-Butadiene	Formaldehyde	Acetaldehyde	Acrolein	Benzo(a)pyrene	PM2.5	PM10	PM
S3_SB_Queue_TR	2.10E-05	6.38E-06	7.46E-07	4.39E-08	6.05E-09	4.96E-08	3.41E-08	3.45E-09	4.60E-11	3.41E-07	5.42E-07	5.42E-07
S3_SB_Queue_L	9.27E-06	1.74E-06	1.77E-07	1.98E-08	2.64E-09	1.81E-08	1.30E-08	1.20E-09	1.69E-11	1.14E-07	1.96E-07	1.96E-07
S3_NB_Queue_TR	1.96E-05	3.59E-06	3.81E-07	4.16E-08	5.49E-09	3.53E-08	2.62E-08	2.29E-09	3.35E-11	2.23E-07	3.96E-07	3.96E-07
S3_NB_Queue_L	5.37E-05	8.32E-06	8.68E-07	1.14E-07	1.48E-08	8.60E-08	6.67E-08	5.40E-09	8.33E-11	5.28E-07	9.93E-07	9.93E-07
S3_WB_Queue_TR	4.76E-05	7.77E-06	8.20E-07	1.01E-07	1.31E-08	7.84E-08	6.02E-08	4.97E-09	7.57E-11	4.86E-07	9.00E-07	9.00E-07
S3_WB_Queue_L	1.87E-06	2.90E-07	3.03E-08	3.97E-09	5.16E-10	3.00E-09	2.32E-09	1.88E-10	2.91E-12	1.84E-08	3.46E-08	3.46E-08
S3_EB_Queue_TR	3.73E-05	5.77E-06	6.02E-07	7.90E-08	1.03E-08	5.96E-08	4.62E-08	3.75E-09	5.78E-11	3.66E-07	6.88E-07	6.88E-07
S3_EB_Queue_L	1.39E-05	2.16E-06	2.25E-07	2.95E-08	3.83E-09	2.23E-08	1.73E-08	1.40E-09	2.16E-11	1.37E-07	2.57E-07	2.57E-07

Table 1-7: Summary of Cumulative Impacts at Most Affected Sensitive Receptor (Ground Vent)

Contaminant	Averaging Period	Ambient Air Quality Criteria	Criteria Source	2027 - Existing Impacts		2051 - No Build Scenario		2051 - Build Scenario		
				Maximum Local Traffic Impact	Percent of Ambient Air Quality Criteria	Maximum Local Traffic Impact	Percent of Ambient Air Quality Criteria	Maximum Local Traffic Impact	Percent of Ambient Air Quality Criteria	Percent Change from 2051 No-Build Scenario
		(ug/m^3)		(ug/m^3)	(%)	(ug/m^3)	(%)	(ug/m^3)	(%)	(%)
PM_{Total}	24 hour	120	Ontario AAQS (Provincial)	2.95	2%	7.14	6%	5.42	5%	-24%
PM_{10}	24 hour	50	Ontario AAQS (Provincial)	2.95	6%	7.14	14%	5.42	11%	-24%
$PM_{2.5}$	24 hour	27	CAAQS (Federal)	3.05	11%	4.83	18%	3.71	14%	-23%
	Annual	8.8	CAAQS (Federal)	0.53	6%	1.34	15%	0.933	11%	-30%
CO	1 hour	36200	Ontario AAQS (Provincial)	1,386	4%	3012	8%	2932	8%	-3%
	8 hour	15700	Ontario AAQS (Provincial)	1,197	8%	2637	17%	1940	12%	-26%
NO_2	1 hour	400	Ontario AAQS (Provincial)	176.1	44%	403.2	101%	366.2	92%	-9%
		79	CAAQS (Federal)	149.3	189%	354.0	448%	290.3	367%	-18%
	24 hour	200	Ontario AAQS (Provincial)	64.5	32%	149.2	75%	127.7	64%	-14%
	Annual	22.6	CAAQS (Federal)	15.48	69%	37.37	165%	29.2	129%	-22%
1,3-Butadiene	24 hour	10	Ontario AAQS (Provincial)	2.98E-02	0%	7.71E-02	1%	5.52E-02	1%	-28%
	Annual	2	Ontario AAQS (Provincial)	8.20E-03	0%	2.25E-02	1%	1.42E-02	1%	-37%
Acetaldehyde	½ hour	500	Ontario AAQS (Provincial)	5.52E-01	0%	1.73E+00	0%	9.25E-01	0%	-47%
	24 hour	500	Ontario AAQS (Provincial)	1.52E-01	0%	3.98E-01	0%	2.77E-01	0%	-30%
Acrolein	1 hour	4.5	Ontario AAQS (Provincial)	3.96E-02	1%	1.29E-01	3%	6.33E-02	1%	-51%
	24 hour	0.4	Ontario AAQS (Provincial)	1.30E-02	3%	3.51E-02	9%	2.26E-02	6%	-36%
Benzo(a)pyrene	24 hour	0.00005	Ontario AAQS (Provincial)	2.75E-04	551%	6.80E-04	1361%	5.22E-04	1044%	-23%
	Annual	0.00001	Ontario AAQS (Provincial)	7.14E-05	714%	1.89E-04	1886%	1.28E-04	1279%	-32%
Benzene	24 hour	2.3	Ontario AAQS (Provincial)	2.80E-01	12%	6.96E-01	30%	5.37E-01	23%	-23%
	Annual	0.45	Ontario AAQS (Provincial)	7.38E-02	16%	1.96E-01	43%	1.34E-01	30%	-32%
Formaldehyde	24 hour	65	Ontario AAQS (Provincial)	2.08E-01	0%	5.47E-01	1%	3.71E-01	1%	-32%

[1] Per CAAQS, 98th percentile of 1-hour modelled concentrations