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Lafarge Canada Inc.

AIR QUALITY ASSESSMENT OF THE PROPOSED PIT 3 EXTENSION

February 2024

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Date:

February 2024

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EXECUTIVE SUMMARY

Atmospheric dispersion modelling was undertaken to determine the maximum impact of the proposed Lafarge Canada Inc. (Lafarge) Pit 3 Extension on ambient particulate matter concentrations in the area. The AERMOD dispersion model was used to simulate the emissions of all significant sources of particulate matter at the proposed site. The extraction phase that could most affect the sensitive receptors in the vicinity of the proposed pit was analyzed. The extraction phase selected was based on the activity levels occurring near sensitive receptor locations. The maximum 24-hour and annual average dust concentrations in three size ranges (TSP, PM_{10}, and $PM_{2.5}$) and nitrogen dioxide (NO_x) were evaluated specifically at eleven (11) sensitive receptors located closest to the boundary of the proposed site.

The analysis illustrated that even using a conservative emission scenario, the applicable standards for TSP, PM_{10}, $PM_{2.5}$ and NO_x were not predicted to be exceeded during the proposed site operations at any of the eleven (11) nearby receptor locations. In addition, due to the conservative modelling approach used in this study, and the presence of vegetation around the site (which will capture some of the dust in the air), the actual maximum concentrations will be lower than predicted.

1 INTRODUCTION

Arcadis Canada Inc. (Arcadis) was retained by Lafarge Canada Inc, (Lafarge) to assess the potential air quality impacts of the proposed sand and gravel extraction operation, in the town of Caledon, Region of Peel, Ontario. The proposed site is located south of the Elora Cataract Trailway and east of Shaws Creek Road (Figure 1) and is approximately 25.6 hectares (63 acres). The surrounding land use is a combination of agricultural, other aggregate extraction operations, the Trailway and some residences located immediately adjacent to the proposed Pit 3 Extension (Site).

Figure 1 – Site Location Map

Arcadis developed emission rates for particulate matter (PM) and nitrogen oxides (NO_x) for this assessment. PM is a term used for both solid and liquid particles in the atmosphere. Particulate matter varies considerably in size. Total Suspended Particulate (TSP) describes all particles with aerodynamic diameters less than 44 µm; PM_{10} describes all particles with aerodynamic diameters less than 10 µm; and $PM_{2.5}$ describes all particles with aerodynamic diameters less than 2.5 µm. The larger diameter fraction of PM is commonly made up of crustal material (for inland locations) and can be emitted to the atmosphere by erosion by the wind, or disturbance of soil due to anthropogenic activity. The smaller diameter fraction of PM is largely due to combustion sources. Whereas larger particulate matter tends to be deposited relatively close to the source of emission, fine particulate matter can stay airborne for days and can be transported significant distances from a source. Currently, there is a provincial ambient air quality criterion specified for TSP and NOx, but not for PM_{10} or $PM_{2.5}$. There is, however, a (federal) Canada Wide Standard for $PM_{2.5}$, and an Ontario Ministry of the Environment, Conservation and Parks (MECP) guideline for PM_{10}.

The objective of the air quality impact assessment was to predict the highest levels of airborne particulates (dust) and NOx that could result from the proposed Pit 3 Extension in combination with impacts from the existing Pit 3. The predicted air quality impacts were compared to relevant criteria and guidelines. The potential impact of PM and NO_x emissions on air quality in the vicinity of the operation was evaluated using dispersion modelling to determine the maximum predicted ambient air concentrations of TSP, inhalable particulate matter (PM_{10}), respirable particulate matter ($PM_{2.5}$) and nitrogen oxides (NO_x). The modelling analysis focused on the potential impacts at nearby residential properties, since these will be most sensitive to any air quality emissions originating from the proposed operation.

The AERMOD air dispersion model was used with the projected emissions to predict ambient PM and NO_2 concentrations in the area surrounding the site. The AERMOD model was developed for the U.S. Environmental Protection Agency (U.S. EPA). AERMOD was designed specifically to determine downwind air concentrations and deposition rates of various airborne pollutants from industrial sources. AERMOD simulates the dispersion of pollutants by advecting a plume of material with an assumed Gaussian profile. The dilution of the plume as it travels downstream is calculated based on wind speed and mixing caused by atmospheric conditions.

To evaluate the potential impact of the proposed pit at the nearby sensitive receptors, model predicted concentrations from proposed Site operations in combination with emissions from the existing Pit #3 were added to regional background concentrations and compared to applicable provincial and/or federal ambient air quality criteria, standards or guidelines. The air quality criteria used for this assessment are outlined below.

1.1 Air Quality Criteria

1.1.1 Total Suspended Particulate

Total Suspended Particulate (TSP) is often used to characterize air quality near a dust source. TSP is typically measured with a high-volume (Hi-Vol) sampler over 24-hours and consists of particles less than 44 µm in diameter. An annual average is typically calculated as the geometric mean of these samples measured every six days.

The MECP Standards Development Branch updated Ambient Air Quality Criteria (AAQC) in September 2018. The AAQC for TSP is 120 $\mu g/m^3$ averaged over 24-hours, and the annual geometric mean of the 24-hour samples is 60 $\mu g/m^3$.

The ambient TSP standards and criteria were set to prevent a reduction in visibility. Particles suspended in the atmosphere reduce visibility or the visual range by reducing the contrast between an object being viewed and its background. This reduction is a result of particles scattering or absorbing light coming from both the object and its background, and from particles scattering light into the line of sight (Robinson, 1977). Particles with a radius of 0.1 to 1.0 µm are most effective at reducing visibility. For example, in a rural area where particulate levels are typically on the order of 30 $\mu g/m^3$, the visibility would be about 40 km. At 150 $\mu g/m^3$, the range would be reduced to about 8 km (Robinson, 1977). The MECP 24-hour criterion of 120 $\mu g/m^3$ is based on a visual range of about 10 km.

1.1.2 Fine Particulate Matter (PM_{10} and $PM_{2.5}$)

Many studies over the past few years have indicated that fine PM (PM_{10} and $PM_{2.5}$) in the air is associated with various adverse health effects in people who already have compromised respiratory systems from conditions such as asthma, chronic pneumonia and cardiovascular disease. However, the available studies have not been able to link the adverse health effects in such people to any one component of the pollution mix. PM_{10} is a mixture of chemically and physically diverse dusts and droplets, and some of these components may be important in determining the effects of PM_{10} on health.

PM less than 2.5 µm ($PM_{2.5}$) is known as "respirable" particulate since the particles are generally small enough to be drawn in and deposited into the deepest portions of the lungs. Anthropogenic sources, such as combustion of fossil fuels, tend to be the largest contributor to $PM_{2.5}$ levels in the environment.

Table 1.1 – Particulate Matter Ambient Air Quality Assessment Criteria

Pollutant	Averaging Period	Objective	Air Quality Standard (µg/m³)
TSP	24-hour	Ontario AAQC	120
	Annual	Ontario AAQC	60
PM_{10}	24-hour	Ontario AAQC	50
$PM_{2.5}$	24-hour	Canadian Ambient Air Quality Standard (CAAQS)	27[a]
	Annual	CAAQS	8.8[b]

a. CAAQS in the year 2020. Compliance is based on the 98th percentile of 24-hour average concentrations averaged over 3 consecutive years.
b. CAAQS in the year 2020. Compliance is based on the 3-year average of the annual average concentrations.

1.2 Nitrogen Dioxide

Nitrogen dioxide (NO_2) is the primary component of concern in nitrogen oxides (NO_x). NO_x is the generic term for a group of highly reactive gases, all of which contain nitrogen and oxygen in varying ratios. NO_2 is a reddish-brown gas with a pungent odour, which upon reaction with other atmospheric compounds, becomes a major contributor to smog, acid rain, inhalable particulates and reduced visibility. NO_2 also plays a major role in atmospheric reactions that produce ground level ozone. Man-made sources of NO_2 include all fossil fuel combustion such as vehicle tailpipe emissions. While motor vehicle exhaust is a significant source of NO_x, only a small percentage is emitted as NO_2 directly from the tailpipe (X. Yao *et al.*, 2005). The main component of NO_x from tailpipes is NO, which reacts in the atmosphere over time and distance to form NO_2. The rate of reaction is influenced by many factors including initial concentration, sunlight, ozone concentrations and others.

The Ontario AAQC for NO_2 is 400 µg/m³ (213 ppb) over a 1-hour period and 200 µg/m³ (106 ppb) over a 24-hour period. Recently, the Canadian Council of Ministers of the Environment (CCME) published the new 1-hour and annual CAAQS for NO_2 which will be 60 ppb (113 µg/m³) and 17 ppb (32 µg/m³) and 42 ppb (79 µg/m³) and 12 ppb (23 µg/m³) in 2025, respectively. Since the Site will be operational past the year 2025, the 2025 CAAQS were used in this assessment.

Table 1.2 – NO_2 Ambient Air Quality Assessment Criteria

Pollutant	Averaging Period	Source	Air Quality Standard
NO_2	1-hour	CAAQS	42 ppb (79 µg/m³) [a]
	24-hour	AAQC	106 ppb (200 µg/m³)
	Annual	CAAQS	12 ppb (23 µg/m³) [b]

Notes:

a. The CAAQS for 1-hr NO_2 is based on the 3-year average of the annual 98th percentile of the daily maximum 1-hour average concentrations.

b. The CAAQS for annual NO_2 is based on the average over a single calendar year of all the 1-hour average NO_2 concentrations.

2 BACKGROUND CONCENTRATIONS

Existing air quality in the area surrounding the Site, is a combination of emissions from sources in the local area (i.e., other industry and traffic) plus a component that flows into the area from other areas (Toronto, the USA, etc.). When a modelling assessment is completed, all these other "background" sources must be included in order to get an accurate representation of the air quality after the Site is in operation. To account directly for some of the background levels of dust and NO_2, historical measured background concentrations for TSP, PM_{10}, $PM_{2.5}$ and NO_x were added to model-predicted concentrations to capture the upwind portions of background. Consequently, the concentrations presented in this report include potential effects from the background dust sources in the area as well as other upwind sources.

2.1 Air Concentrations

The proposed Pit 3 Extension will be located in a rural location, however, there are no MECP monitoring stations located in rural locations in the general vicinity of the Site. The nearest MECP monitoring station is located in an urban area of Brampton, approximately 24 km southeast of the Site and is considered to be representative of background concentrations due to its proximity to the Site.

Table 2.1 below presents five years of 90th percentile 24-hr measurements for $PM_{2.5}$, along with five years of annual average $PM_{2.5}$ concentrations. The average of the five years of data is provided at the bottom of the table. The 90th percentile values are values that will only be exceeded 10% of the time under adverse meteorological conditions.

Table 2.1 – $PM_{2.5}$ Measurements from the Brampton Station, 2017-2021

Year	24-hour 90th Percentile $PM_{2.5}$ (µg/m^3)	Annual Average $PM_{2.5}$ (µg/m^3)
2017	12	7
2018	13	7
2019	13	7
2020	11	7
2021	12	7
Average	12	7

Background concentrations of PM_{10} and TSP were estimated by applying a factor of 1.85 and 3.33 to the $PM_{2.5}$ background concentrations from the Brampton station (Lall *et al*., 2004), respectively, to complete Table 2.2.

Table 2.2 – Selected Background Concentrations for TSP, PM_{10} and $PM_{2.5}$

Averaging Time	Contaminant Background Concentration (µg/m³)		
	TSP	PM_{10}	$PM_{2.5}$
24-hour	40	22	12
Annual	23	n/a	7

Table 2.3 below presents five years of 90th percentile 1-hr and 24-hr measurements for NO_2. The average of the five years of data is provided at the bottom of the table. The 90th percentile values are values that will only be exceeded 10% of the time under adverse meteorological conditions.

Table 2.3 – NO_2 Measurements from the Brampton Station, 2017-2021

Year	1-hour 90th Percentile NO_2 (µg/m³)	24-hour 90th Percentile NO_2 (µg/m³)	Annual Average (µg/m³)
2017	37	31	15
2018	36	30	15
2019	38	31	16
2020	30	25	13
2021	29	25	12
Average	**34**	**28**	**14**

3 DISPERSION MODELLING PARAMETERS

3.1 Introduction

Arcadis used data provided by Lafarge and MHBC to obtain the site characteristics needed for air dispersion modelling. The data included an equipment list and an operational plan illustrating the phasing of the extraction activities for the lifetime of the pit operations. Figure 3.1b outlines the four extraction phases for the proposed Pit 3 Extension and Figure 3.1a shows the location of nearby receptor locations.

Figure 3.1a – Receptors Locations

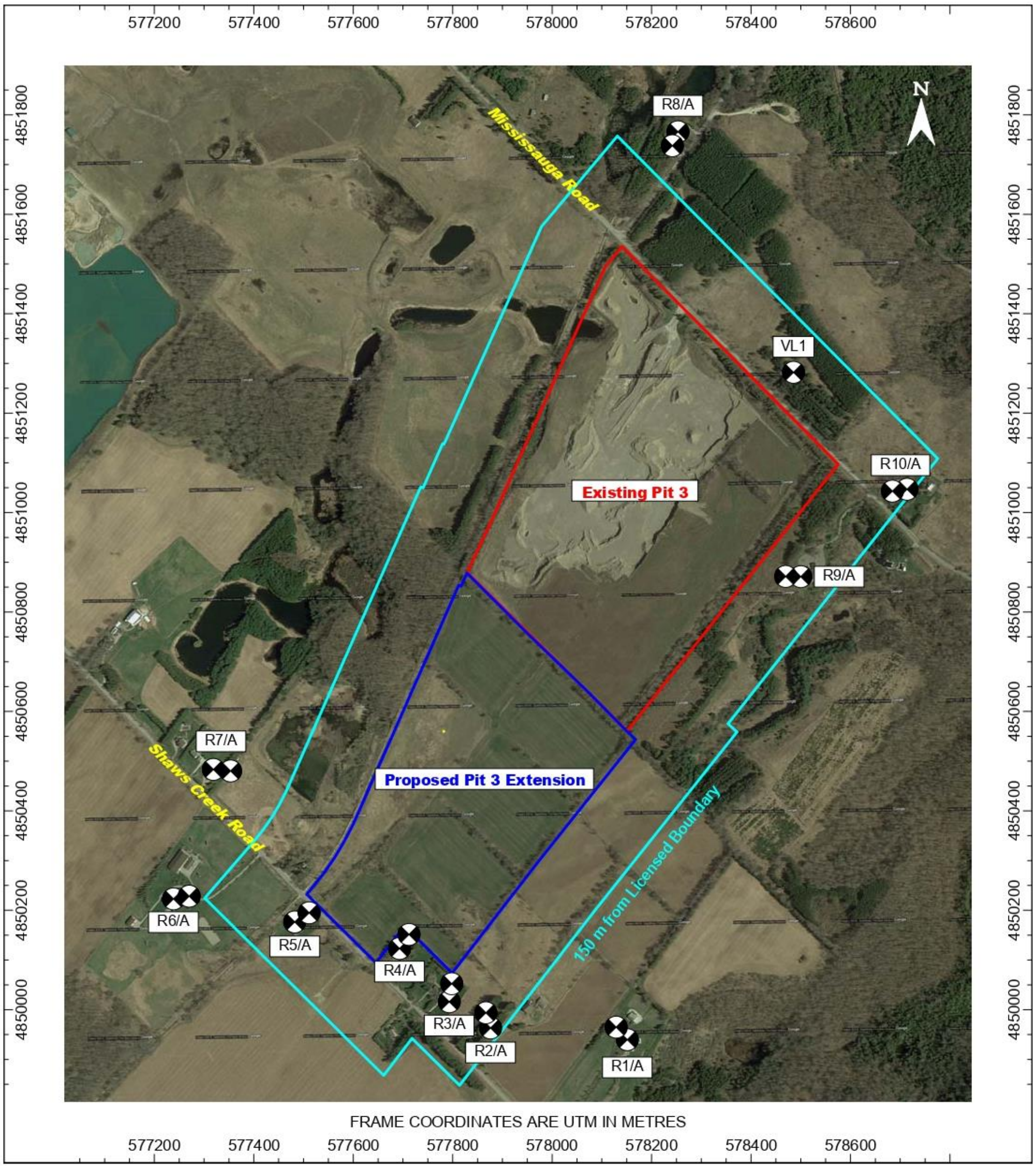
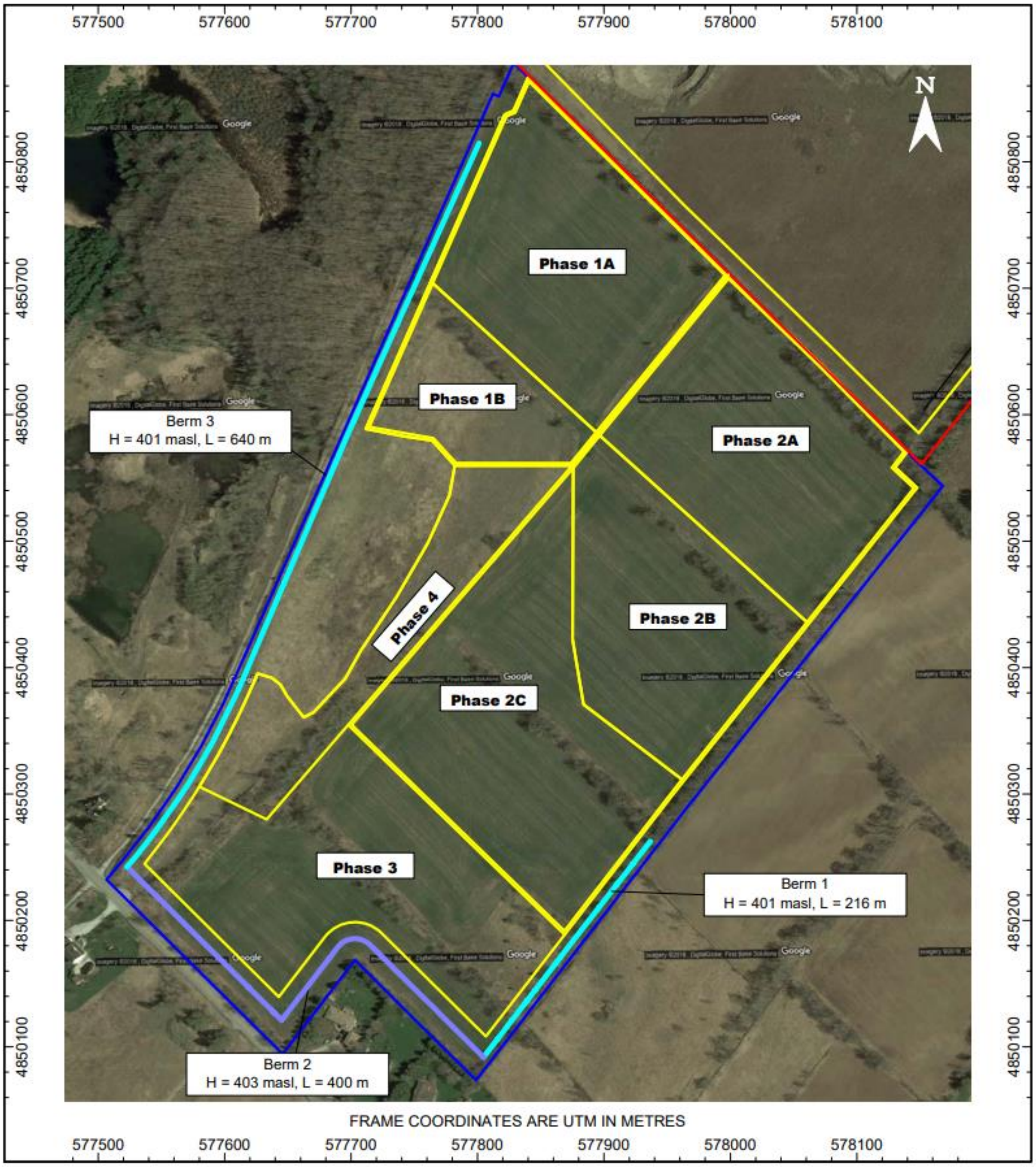


Figure 3.1b – Proposed Extraction Phasing



TSP, PM_{10}, $PM_{2.5}$ and NO_x were modelled separately using the AERMOD dispersion model. Maximum concentrations were modelled on sensitive receptors and a grid including the proposed Pit 3 Extension. Due to the proximity of several residences at the perimeter of the site, these locations were specifically used in the model as sensitive ('discrete') receptors.

During the lifetime of the proposed pit operations, the proposed processing plant will be limited to Phase 1 and the pit internal haul roads will move with the phasing of extraction. The main shipping haul road will change as the operations progress. Figure 3.1a and b provides a visualization of the proposed Pit 3 Extension showing the extraction areas and the residential discrete receptor locations. Berms will be constructed along the west, south, and southeast fence lines to reduce adverse noise and visual impacts. Berms and existing trees and shrubs surrounding the proposed Pit will act to reduce horizontal dust transport from the Pit area. Some of the mitigating effects of these features were taken into account by including the berm height when setting up the pit depths in the model.

Aggregate material will be extracted at the working face using a front-end loader (CAT 988K or equivalent) which will then either be stored in a stockpile or transported to the mobile processing plant where it is crushed and screened. The mobile processing plant will be limited to Phase 1. The finished product will be stockpiled and shipped off-site in highway trucks via Mississauga Road.

As outlined in Figure 3.1b, there will be four different phases of operation. During phases 1 through 4, progressive rehabilitation of processed areas will occur in addition to extraction. A basic description of each operating phase is provided in Table 3.1.

Table 3.1 – Operating Phases at Pit 3 Extension

Operating Phase	Description of Activities
1	- Up to two production loaders (for extraction) may operate anywhere within Phase 1. - One mobile crusher or one mobile screener (not both), serviced by one production loader, may operate anywhere within Phase 1, with localized shielding as described below. - One shipping loader may operate within Phase 1, 2A or 2B, loading up to 45 shipping trucks per hour.
2A	- Up to two production loaders (for extraction) may operate anywhere within Phase 2A. - One mobile crusher or one mobile screener (not both), serviced by one production loader, may operate anywhere within Phase 1, with localized shielding as described below. - One shipping loader may operate within Phase 1, 2A or 2B, loading up to 45 shipping trucks per hour.

Operating Phase	Description of Activities
2B	- One production loader (for extraction) may operate anywhere within Phase 2B. - One mobile crusher or one mobile screener (not both), serviced by one production loader, may operate anywhere within Phase 1, with localized shielding as described below. - One shipping loader may operate within Phase 1, 2A or 2B, loading up to 45 shipping trucks per hour.
2C	- One production loader (for extraction) may operate anywhere within Phase 2C. - One mobile crusher or one mobile screener (not both), serviced by one production loader, may operate anywhere within Phase 1A, with localized shielding as described below. - One shipping loader may operate within Phase 1A, loading up to 45 shipping trucks per hour.
3	- One production loader (for extraction) may operate anywhere within Phase 3. - One mobile crusher or one mobile screener (not both), serviced by one production loader, may operate anywhere within Phase 1A, with localized shielding as described below. - One shipping loader may operate within Phase 1A, loading up to 45 shipping trucks per hour.
4	- One production loader (for extraction) may operate anywhere within Phase 4. - One mobile crusher or one mobile screener (not both), serviced by one production loader, may operate anywhere within Phase 1A, with localized shielding as described below. - One shipping loader may operate within Phase 1A, loading up to 45 shipping trucks per hour.

Phase 3 was chosen to be modelled as it is the operating scenario that will potentially result in the highest particulate and NO_2 concentrations at each of the nearby sensitive receptors due to the proximity of the activities in this phase relative to these receptors. The mobile processing plant will be limited to Phase 1. Figure 3.1b (presented earlier) shows the operational Plan layout for all phases of operation. Phases 1,2 and 4 are expected to result in equivalent or lower ground-level dust and NO_2 concentrations due to the location of emission sources and the relative proximity of these sources to the sensitive receptors.

3.2 Meteorology

The AERMOD model uses hourly meteorological data records to define the conditions for plume rise, transport and dispersion. The model estimates the concentration or deposition value for each source-receptor combination, for each hour of input meteorology, and calculates one-hour, 24-hour and annual averaging periods. The default MECP Central Region – Toronto, York-Durham, Halton-Peel meteorological data was used for all AERMOD modelling scenarios.

Five years of hourly meteorological data was used for AERMOD model runs. The 5-year period is considered to be representative of all possible weather conditions that the proposed Pit 3 Extension would be subjected to during its operation. The AERMOD model requires hourly values of wind speed, wind direction, ambient temperature, atmospheric stability class[1], and mixing height[2] to determine the air concentrations of PM at sensitive receptors caused by dust emitted from the site. These meteorological variables are determined from hourly surface weather observations, and twice daily upper air soundings. For the purpose of this study, surface observations were obtained from MECP default Met Data set and upper air data was obtained from the National Weather Service station at Buffalo, N.Y (which is geographically the nearest upper-air station to the area being modelled).

Wind

Wind is the primary driver that carries air pollutants away from a source. The direction and speed of the wind dictates the location and distance from the source that a pollutant may travel, and the receptors that may be impacted. High wind speeds effectively disperse gases and particulates throughout the atmosphere. Concentrations generally decrease with increasing wind speed as a result of dilution. However, these conditions can lead to increased wind erosion and resuspension of surface-based dust sources. Low wind speeds or no winds can lead to very high pollutant concentrations near the ground. Wind speed also induces mechanical turbulence (which affects dispersion) as a result of flows around obstacles on the surface (topography, buildings, etc.). The amount of mechanical turbulence depended on the roughness of the surface and the wind speed.

Figure 3.2 presents a wind rose for the MECP default meteorological dataset at the Toronto Lester B. Pearson International Airport meteorological station. A wind rose simply documents the frequency of occurrence of various wind directions and speeds over the period of interest. The figure shows that the prevailing winds are from the west and north and each occurs approximately 10% of the time. Winds from the NW sector occur over 30% of the year. It should be noted that MECP meteorological datasets set all calm conditions to 1 m/s; therefore, calms are reported as 0%, which is conservative as the AERMOD dispersion model does not consider calm conditions (Figure 3.3).

[1] Relates to the ease of vertical motion for a parcel of air. Determined from cloud cover, wind speed and time of day.
[2] The maximum vertical distance through which a contaminant released at ground level is able to mix with surrounding volumes of air. Related to solar insolation (heating of the ground) and time of day.

Figure 3.2 – Wind Rose (1996-2000)

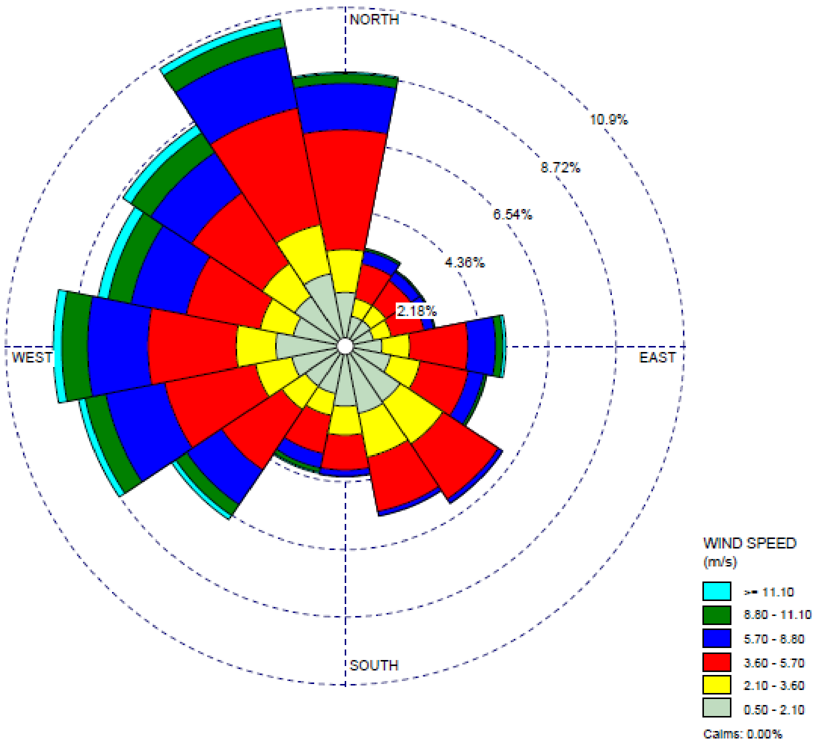
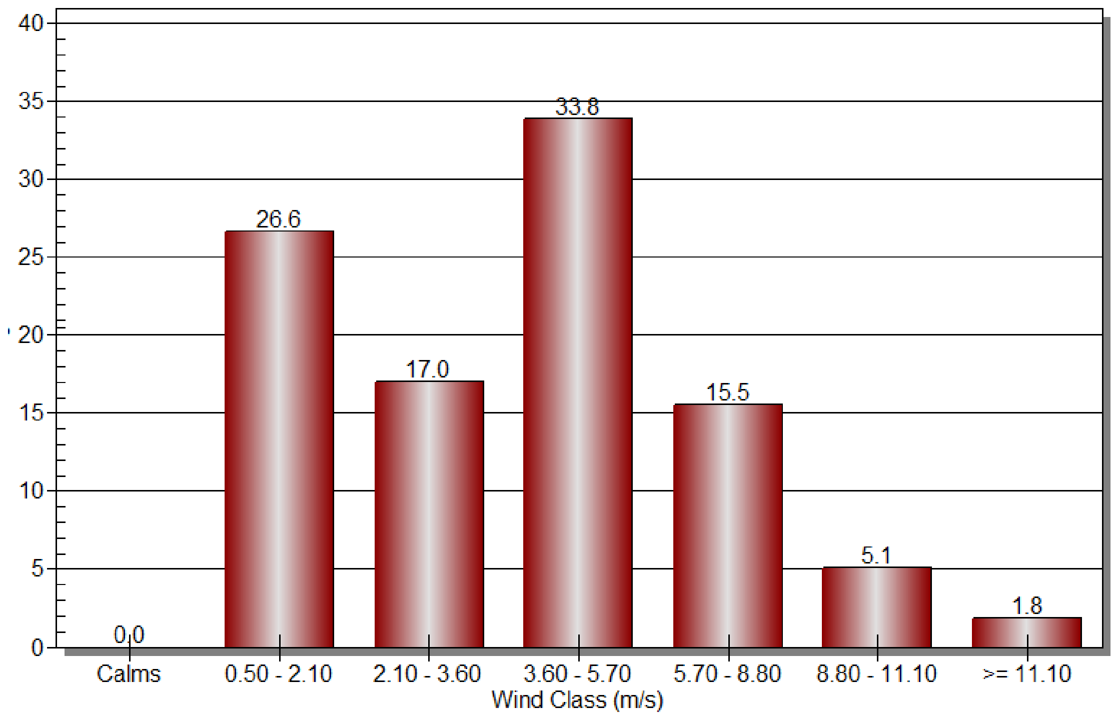


Figure 3.2 – Wind Speed Class Frequency Distribution (1996-2000)



3.2.1 Atmospheric Stability and Mixing Heights

Atmospheric stability is tied to vertical temperature structure and is a measure of the amount of vertical motion in the atmosphere, and hence its ability to mix pollutants. A stable atmosphere has little vertical motion (is less turbulent) and cannot disperse pollutants as well as a more turbulent, unstable atmosphere. The AERMOD model uses a series of calculated parameters to describe the stability of the atmosphere in a continuous manner which is different than previous models (such as the Industrial Source Complex [ISC] model) which used a series of 6 classes of stability.

3.3 Proposed Pit 3 Extension

Table 3.3 outlines the operating schedule of the proposed Pit 3 Extension which are defined in the dispersion model. According to Lafarge's 2022 production data, 73% of the production was from May to November. Only 27% 2022 production were from December to April. Air contaminants emission rates were developed based on this information.

Table 3.3 – Pit 3 Extension Site Activity Timings

Activity	Time of Day		
	Weekdays	Saturdays	Sunday
Shipping	06:00 – 19:00	06:00 – 19:00	None
Extraction and Processing	07:00 – 19:00	07:00 – 19:00	None

3.4 Existing Pit 3 Operations

Emissions from the existing Pit 3 operations were included in the dispersion model as local background sources of dust. Information pertaining to the existing Pit 3 operations was obtained directly from Lafarge. Figure 1 (presented earlier) provides a visualization of the existing Pit3 showing the extraction areas relative to the proposed Pit 3 Extension. The existing Pit 3 will operate on the same schedule (Tables 3.3) as the proposed Pit 3 Extension.

3.5 Mississauga Road Traffic

The main public road in the immediate vicinity of the Pit #3 is Mississauga Road, which runs adjacent to the northern boundary of Pit 3. All haul truck traffic leaving the Pit 3 and the proposed Pit 3 Extension will turn left (west) on Mississauga Rd and continue along this road. Traffic volumes were obtained from existing traffic data developed by Paradigm Transportation Solutions Limited for the future year 2031. Traffic data used in the assessment is outlined in Appendix A.

3.6 Emission Estimation Methodology

All significant sources of PM were characterized and included in the emission rates for the proposed Pit 3 Extension. Most of the emissions are fugitive in nature. Fugitive dust involves the suspension of dust by material or machinery movement, or erosion by wind. The source emissions are based on seasonal daily maximum extraction and shipping rates and include those due to operating machinery, conveyor transfers/drops, road-based emissions due to the movement of shipping trucks on-site, and emissions due to exhaust from internal combustion engines. Windblown dust due to the erosion of exposed road surfaces was also determined and included in the total emissions, with the approach outlined in Table 3.4 below.

In general, U.S. EPA AP-42 emission factors were applied and the specific equations used to estimate emissions of PM and NO_x are outlined in Table 3.4 below. The following sections provide an overview of the emissions sources and assumptions used in developing the emission rates. More detail about the data and calculations are provided in Appendix A.

Table 3.4 – Summary of Emission Sources Used in Dispersion Model

Activity	Emission Factor Equation	Units	Reference	Comments
Off-Highway Truck/Shipping Truck Travel on Unpaved Roads	$E_{24hr} = 281.9 \times k \times (s/12)^a \times (W/3)^b$	g/VKT	U.S. EPA AP-42 13.2.2, November 2006	Unpaved Roads at Phases1 through 4
Background Traffic/Shipping Truck Travel on Paved Roads	$E_{24hr} = k \times (sL)^{0.91} \times (W)^{1.02}$	g/VKT	U.S. EPA AP-42 13.2.1, January 2011	Paved Haul Road on Mississauga Road traffic counts provided by Paradigm Transport Solutions Limited
Primary and Secondary Crushing (Controlled)	TSP = 0.0027, PM_{10} = 0.0012 $PM_{2.5}$ = 0.0006	kg/tonne	U.S. EPA AP-42, Table 11.19.2-1, August 2004	Mobile Processing Plant Area
Screening	TSP = 0.0011, PM_{10} = 0.00037 $PM_{2.5}$ = 0.00005	kg/tonne	U.S. EPA AP-42, Table 11.19.2-1, August 2004	Mobile Processing Plant
Material Drops	$E = k \times (0.0016) \times (U/2.2)^{1.3} \times (M/2)^{-1.4}$	kg/tonne	U.S. EPA AP-42, 13.2.4, November 2006	Material Drops to truck at working face and hopper at Processing Plant, based on maximum extraction rate
Wind Erosion – Unpaved Roads	$E = k \times s/1.5 \times f/15$	kg/ha/day	WRAP 2006	Frequency of wind >5.4 m/s (f) obtained from Toronto Pearson Airport climate data
Non-Road Vehicle and Equipment Tailpipe Emissions (300-600 hp)	TSP = PM_{10} = $PM_{2.5}$ = 0.15 NO_x = 2.5	g/hp-hr	U.S. EPA Non-Road, July 2010, Tier 3	1 extraction loader at working face loading off-highway truck, 2 shipping loaders at Processing Plant Area
Tailpipe Emissions (diesel generator for crusher, screener and conveyor)	TSP = PM_{10} = $PM_{2.5}$ = 0.15 NO_x = 4.5	g/hp-hr	USEPA Emission Standards for Tier 1-3 Engines	1 Generator Processing Plant

Notes:
Unless otherwise stated, emissions were calculated for both existing and proposed Pit #3 operations.
AP-42 is a U.S. EPA compilation of air contaminant emissions due to various activities.
See https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors

EPA non-road is a compilation of (industrial) emissions from non-road activities. See above site

3.6.1 In-Pit Emissions

In order to be conservative, a maximum emission scenario was developed to capture expected worst-case maximum daily particulate emissions from the proposed Pit 3 Extension. The maximum operating scenario was based upon a maximum daily extraction rate of 3,322 tonnes/day for the entire year. It should be noted that 73% of the annual extraction is from May to November and 27% annual extraction is from December to April. This scenario also incorporated an estimated maximum 45 trucks per peak hour, approximately 143 new truck trips per day to reach 1 million tonnes.

On-Site Unpaved Road Dust Emissions

Fugitive emissions from unpaved surfaces within Pit 3 was estimated using the AP-42 emission factor equation (Table 3.4). Silt content and fleet average vehicle weight are the most important parameters needed for estimating fugitive roadway emissions. The silt content on the unpaved routes travelled by off highway and shipping/highway trucks was assumed to be 4.8%, which is the mean silt content from AP-42 Table 13.2.2-1 for sand and gravel processing plant road areas. A 95% combined total control efficiency was applied to on-site roads and includes a control of 30% for roads located within a cut below grade (TNRCC 1996) and 90% control for extensive watering.

The Site will operate using one extraction loader and one shipping loader during Phase 3. Trucks with a load capacity of approximately 56 tonnes were assumed to be used to transfer raw materials from the active pit areas to the processing area. Material was then assumed to be transferred off-property by 37.5 tonne capacity shipping/highway trucks.

On-Site Tailpipe Emissions

Tailpipe emissions for industrial machinery and heavy-duty vehicles were included in the fugitive particulate emissions from the Site. Emission factors were obtained for each vehicle type or piece of machinery from the U.S. EPA (U.S. EPA non-Road 2010). For roadworthy vehicles, the emissions estimates are proportional to the total vehicle kilometres travelled per day, which were calculated from the maximum daily number of loads shipped and the on-site road lengths (see Appendix A). A Tier 2 engine was assumed for the diesel generator whereas a Tier 3 engine was assumed for the loaders. For the diesel generator and loaders, the emissions estimates are proportional to the equipment power rating.

Material Handling and Processing Emissions

Fugitive dust emissions resulting from material handling, primarily from material drops to vehicles and unloading trucks and equipment, have been estimated using U.S. EPA AP-42 emission factors (U.S. EPA 2006) in conjunction with maximum hourly extraction rates. These emissions are based on the material moisture content and average wind speed (i.e., the higher the wind speed, the higher the emissions).

The particulate emissions resulting from the screeners and crushers were estimated using U.S. EPA emission factors (U.S. EPA 2006) in conjunction with the maximum hourly extraction rate. The moisture content of the raw material extracted from similar pits in the area is typically greater than 4%. When the moisture content is greater than 2.88%, “controlled” emission factors may be used to estimate the emissions from screening and handling operations, since less dust is generated from damp materials. Thus, controlled emission factors were used to estimate emissions from the primary and secondary screeners.

Wind Erosion

Wind erosion emissions along the unpaved haul routes within Pit 3 Extension in the pit areas were estimated following the short-term methodology outlined in the Western Regional Air Partnership (WRAP) Fugitive Dust Handbook (WRAP 2006). Since this method is intended for short-term averaging periods, it will result in a conservative estimate of PM emissions when applied on an annual basis.

The WRAP methodology requires an estimate of the percent of time that winds are greater than 5.4 m/s. 5.4 m/s is the threshold above which winds are able to suspend dust in air. For this assessment, the frequency was determined using data from the Toronto Pearson Airport climate station and was estimated to be about 23% of the time. The material silt content is also required to calculate wind erosion emissions. A default silt content of 4.8% obtained from AP-42 Table 13.2.2-1 for sand and gravel processing was used.

To calculate wind erosion emissions from the Site, it was conservatively assumed that one hundred percent of the unpaved road and conveyor surface areas were considered to be exposed to the wind at all times, and no additional controls were applied.

3.6.2 Local Area (Off-Site) Traffic Emissions

Public Roadway Emissions

Fugitive dust and tailpipe emissions from vehicles travelling on Mississauga Road were considered in this assessment. Projected future (2031) traffic volumes were obtained from the Traffic Impact Study prepared by Paradigm Transportation Solutions Limited. Estimated shipping traffic resulting from the proposed Pit 3 Extension as well as existing Pit# 3 were added to the predicted 2031 traffic to estimate the total emissions resulting from the vehicle traffic during future operations of the pits.

The projected 2031 peak AM and PM traffic counts provided to Arcadis in the Traffic Impact Study were incorporated into the emissions estimates. Since the average daily traffic was determined to be between 500 and 5,000, a default silt loading value of 0.2 g/m^2 from AP-42 was used to estimate emissions of re-suspended road dust. The AP-42 emission factor equation also requires an average vehicle weight, which was estimated to be 37.5 tonnes for northbound traffic (including background traffic and shipping trucks from the Site), and 4.7 tonnes for southbound background traffic.

Similar to on-site tailpipe emissions, tailpipe emissions from public roadways were estimated by applying a fleet averaged emission factor from the Mobile 6C Emissions Model for the year 2021.

4 DISPERSION MODELLING

The U.S. EPA AERMOD regulatory short-range air dispersion model, which is an approved model under the MECP O.Reg. 419/05 (Local Air Quality), was used to predict ambient PM concentrations and NO_2, in the area surrounding the Pit 3 Extension. AERMOD Version 22112 is a steady-state plume model that incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrain. It includes the capability to model emissions originating from open pit sources.

Using the emissions inventory for Lafarge's existing and proposed operations, each contaminant was modelled separately with AERMOD using a variable spaced receptor grid as defined in O.Reg. 419/05. Nearby residences were added as 'discrete' receptors and were numbered corresponding to the HGC Engineering Summary of Noise Impact Study. Regional background concentrations were then added to model predicted results in order to compare the resulting concentrations to applicable air quality criteria. An overview of the modelling approach is described below.

4.1 Meteorology

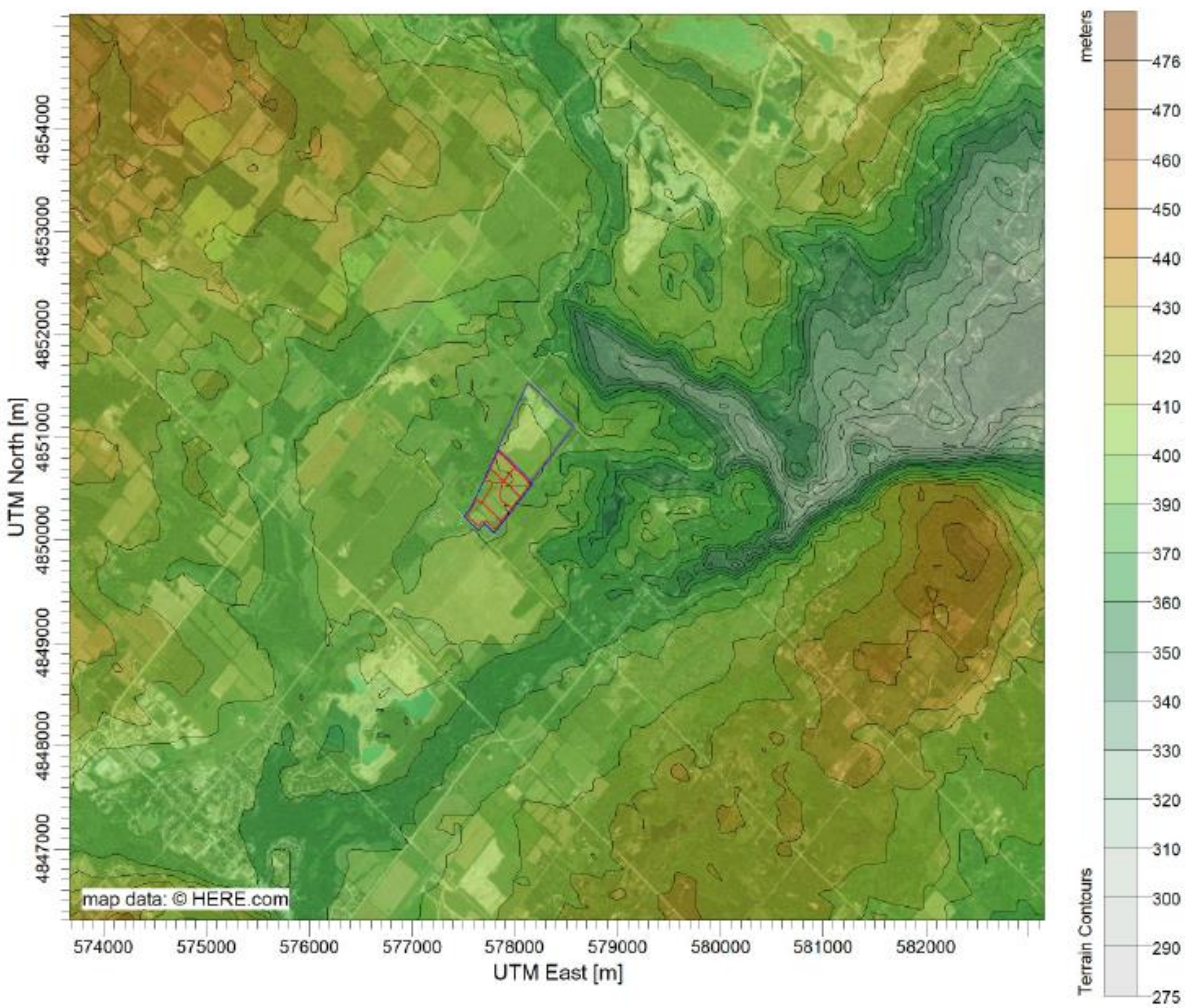
The AERMOD model accepts hourly meteorological data records to define the conditions for plume rise, transport and dispersion. The model estimates the concentration or deposition value for each source-receptor combination, for each hour of input meteorology, and calculates short term averages, such as 1-hour, 24-hour and annual averages.

MECP prepared AERMOD-ready Regional meteorological files applicable to the Caledon area with "crops" land use/surface characteristics were used in this assessment. These files are available for download from the MECP website and are based on 5 years (1996-2000) of surface data from the Toronto Pearson International Airport and upper air data from the National Weather Service station at Buffalo, N.Y. The MECP prepares these data sets to ensure that meteorological data used for air dispersion modelling assessments in Ontario is processed correctly and consistently.

4.2 Modelling Terrain and Grid

The AERMOD model can take advantage of terrain information with heights being applied to all receptors and sources. MECP prepared terrain data was used in the modelling and is presented in Figure 4.1.

Figure 4.1 – Terrain Data



The AERMOD model calculates outputs at a series of receptors entered into the model. A variable spaced grid was used in the assessment as specified in MECP O.Reg. 419/05 and the MECP Air Dispersion Modelling Guidelines for Ontario (MECP 2017). The grid spacing centred on the middle of the site is as follows:

- 0-200 m spaced at 20 m
- 200-500 m spaced at 50 m
- 500-1000 m spaced at 100 m
- 1000-2000 m spaced at 200 m
- 2000-5000 m spaced at 500 m

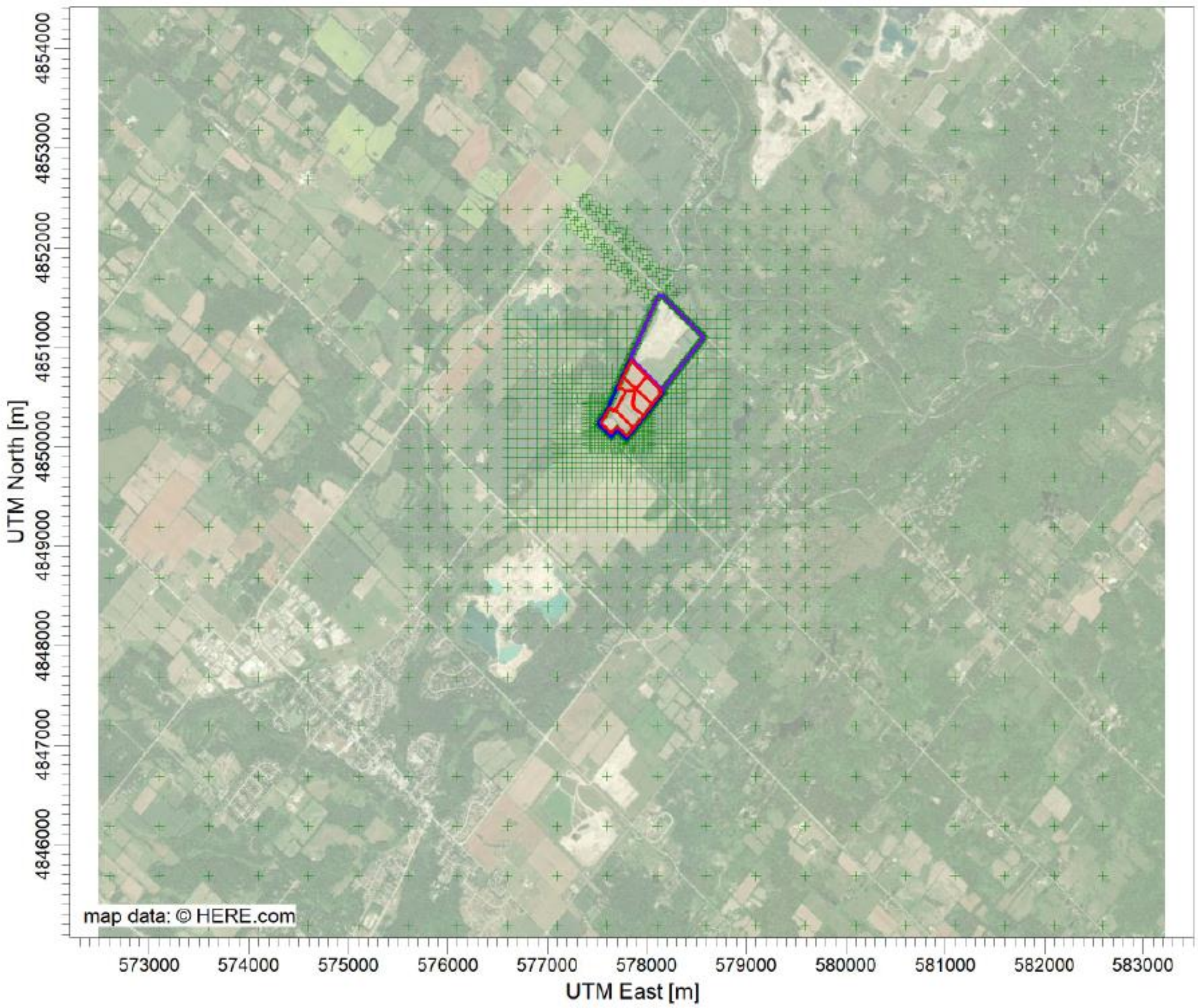
Following O.Reg. 419/05, receptors were also placed every 10 m along the Pit 3 Extension property line.

An additional series of grid points were added beside Mississauga Road to assess the effect of emissions due to vehicle travel. Since the modelled concentrations drop quickly from the edge of the road, it is important to have a series of equally spaced receptors along the road or modelling artefacts are introduced. Receptors were placed at the following distances from the edge of the road:

- 50 m
- 100 m
- 150 m

All of the variable spaced receptors that fell within the property boundary or within the right of way of the road were removed. Figure 4.2 graphically shows the receptor grid used.

Figure 4.2 – Modelling Receptor Grid



Another set of discrete sensitive receptors were added to represent the location of nearby residences (Figure 3.1a). The naming convention used for these receptors is consistent with that used in the noise control study (HGC Engineering, 2024) for this pit. These receptors and the phasing locations are shown in Figure 3.1b in Section 3.

4.3 Model Source Parameters

In the dispersion model, a variety of sources were used to simulate activities in the proposed Pit 3 Extension, which include volume and open pit sources. A summary of the modelled sources and their parameters are provided in Table 4.1.

Table 4.1 – Phase 3 Model Source Parameters from AERMOD

Type	ID	Description	Pit Volume (m^3)	Release Height (m)	Sigma Z (m)	Length of X (m)	Length of Y (m)
OPEN_PIT	PR_P3	Proposed Phase 3	440530	1.5	-	289	508
OPEN_PIT	PR_P3_WIND	Proposed Phase 3 Wind Erosion	440530	1	-	289	508
LINE_AREA	LPENT	On-site shipping haul entrance road (unpaved)	-	2.17	2.02	9	-
LINE_AREA	MISSRD	Mississauga Road	-	2.17	2.02	16	-
OPEN_PIT	LEX	Lafarge Existing Pit #3	701035	1.5	-	408	572
OPEN_PIT	LEX_WIND	Lafarge Existing Pit #3 Wind Erosion	701035	1.5	-	408	572

5 MODELLING RESULTS

The modelling results show that there is no exceedance for air contaminants of interest at all average periods. Air dispersion modelling runs were conducted to predict maximum 1-hour, 24 hour and annual ground-level concentrations of PM and NO_2 at both sensitive receptor and gridded receptor locations. For each contaminant, the model results are presented in tabular format at the sensitive receptors. In addition, the overall maximum concentration (i.e., the highest concentration predicted at any of the grid receptors) is also presented in the tables.

It should be noted that the 1-hour or 24-hour concentrations that are presented in the tables are the maximum modelled concentrations that occur only once in the 5 years (43,848 hours or 1,872 days) of meteorological data used.

It should also be noted that the emissions scenarios developed for Phase 3 assumed that all Pit #3 activities occur simultaneously at their maximum daily rates of production. In reality, this is not likely to occur. Therefore, maximum particulate or NO_2 concentrations are likely to be lower than the values predicted by the model. In addition, berms will also be constructed along the northwest, south, and southeast fence lines to reduce adverse noise and visual impacts for nearby sensitive receptors. Berms, and existing trees and shrubs surrounding the Pit 3 Extension will act to reduce horizontal dust transport from both Pit area.

5.1 Particulate Matter Concentrations

Table 5.1 presents the maximum predicted 24-hour average TSP, PM_{10} and $PM_{2.5}$ concentrations at modelled sensitive receptors for Phase 3. Annual concentrations of TSP and $PM_{2.5}$ are also presented in each of the Tables. The results show the total cumulative impact of Pit 3 operations, Proposed Phase 3 Extension, and Mississauga Road traffic.

Table 5.1 – Phase 3 Maximum Predicted 24-Hour, and Annual Particulate Matter Concentrations

Receptor	UTM Coordinates		TSP		PM_{10}	$PM_{2.5}$	
	X (m)	Y (m)	24-hr Max Concentration (µg/m³)	Annual Concentration (µg/m³)	24-hr Max Concentration (µg/m³)	24-hr Max Concentration (µg/m³)	Annual Max Concentration (µg/m³)
Overall maximum	577712.2	4850151.4	73.8	25.7	35.4	15.8	7.3
R1	578151.2	4849939.8	56.5	24.3	28.5	13.6	7.1
R1A	578128.9	4849965	57.2	24.4	28.8	13.7	7.1
R2	577876.2	4849963.3	67.9	24.8	33.1	14.6	7.2
R2A	577866.8	4849994	71.0	25.0	34.4	14.9	7.2
R3	577793.1	4850016	66.6	24.9	32.6	14.8	7.2
R3A	577798.1	4850052.4	72.0	25.3	34.7	15.2	7.3
R4	577693	4850123.2	67.2	25.0	33.1	15.2	7.2
R4A	577712.2	4850151.4	73.8	25.7	35.4	15.8	7.3
R5	577482.5	4850176.6	64.5	24.0	32.0	14.8	7.1
R5A	577511.4	4850194.8	66.6	24.1	32.8	15.0	7.1
R6	577238.4	4850223	52.3	23.7	27.1	13.3	7.0
R6A	577270	4850228.3	53.4	23.7	27.5	13.4	7.1
R7	577318.7	4850483.2	52.0	24.0	27.0	13.4	7.1
R7A	577353.4	4850480.3	52.7	24.1	27.3	13.4	7.1
R8	578253	4851765.9	56.1	24.4	27.6	13.6	7.1
R8A	578242	4851737.9	57.7	24.5	28.0	13.8	7.1
R9	578500.1	4850871.1	56.0	24.9	28.8	14.1	7.2
R9A	578469.8	4850871.5	57.5	25.1	29.5	14.3	7.3
R10	578713.9	4851046.9	54.4	24.2	28.3	14.0	7.1
R10A	578684.5	4851043.1	55.1	24.3	28.6	14.1	7.2
VL1	578485.6	4851282	56.8	24.6	28.9	14.4	7.2
***Regional Background Concentration (µg/m³)**			**40**	**23**	**22**	**12**	**7**
Ambient Air Quality Criterion (µg/m³)			**120**	**60**	**50**	**27**	**8.8**

Notes: [a] All concentrations presented include regional background concentrations.

TSP Concentrations

As can be seen in Table 5.1, all sensitive receptor locations have maximum predicted 24-hour and annual TSP concentrations which are well below the applicable MECP AAQC.

PM_{10} Concentrations

The maximum 24- hour PM_{10} concentration is 35 µg/m³ and is well below the ambient criteria 50 µg/m³.

$PM_{2.5}$ Concentrations

As shown in Table 5.1, even with the addition of a regional background concentration, there are no predicted exceedances of the CAAQS 24-hour and annual average for $PM_{2.5}$ at any of the sensitive receptor locations. The 24-hour and annual $PM_{2.5}$ contributions from the Lafarge Pit (without ambient background) are only 32% and 4% of the criteria.

5.2 Nitrogen Dioxide (NO_2)

Table 5.2 presents the maximum predicted 1-hour, 24-hour, and annual average NO_2 concentrations at the modelled receptors. The ozone limiting method was used to convert maximum NO_x concentrations resulting from combustion equipment to NO_2 concentrations. Even with the inclusion of the regional background NO_2 concentrations, the modelled maximum 1-hour, 24-hour, and annual NO_2 concentrations are below the MECP AAQC of 400 µg/m³, 200 µg/m3, and 22.6 µg/m³ at all receptor locations and maximum property line locations. Before adding the NO_2 background to the modelled results, the highest predicted NO_2 is only 39% of the AAQC.

Table 5.2 – Maximum Predicted 1-hour, 24-hour, and Annual NO_2 Concentrations

Receptor	UTM Coordinates		** NO_2		
	X (m)	Y (m)	1-hr Max Concentration (µg/m³)	24-hr Max Concentration (µg/m³)	Annual Max Concentration (µg/m³)
Overall maximum	577712.2	4850151.4	132	90	20
R1	578151.2	4849939.8	114	64	16
R1A	578128.9	4849965	114	65	16
R2	577876.2	4849963.3	124	82	17
R2A	577866.8	4849994.0	126	88	17
R3	577793.1	4850016.0	134	82	17
R3A	577798.1	4850052.4	138	91	18
R4	577693.0	4850123.2	138	82	17
R4A	577712.2	4850151.4	141	93	18
R5	577482.5	4850176.6	131	79	15
R5A	577511.4	4850194.8	133	85	16
R6	577238.4	4850223.0	120	56	15
R6A	577270	4850228.3	121	58	15
R7	577318.7	4850483.2	117	54	15
R7A	577353.4	4850480.3	117	56	15
R8	578253	4851765.9	122	62	15
R8A	578242	4851737.9	122	64	16
R9	578500.1	4850871.1	119	82	19
R9A	578469.8	4850871.5	120	89	20
R10	578713.9	4851046.9	117	81	17
R10A	578684.5	4851043.1	118	84	17
VL1	578485.6	4851282.0	130	82	17
***Regional Background Concentration (µg/m³)**			**34**	**28**	**14**
Ambient Air Quality Criterion (µg/m³)			**400**	**200**	**22.6**

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

Air dispersion modelling using AERMOD was undertaken following MECP dispersion modelling guidelines for Phase 3 of the proposed Pit 3 Extension operation since this phase is closest to surrounding sensitive receptors near the proposed pit. In order to predict the worst-case concentrations of PM and NO_2, dispersion modelling scenarios were selected to represent maximum daily operations of Pit 3 Extension during each month of production. It was conservatively assumed that Lafarge operations would occur concurrently at their maximum rates of production in each month. This is not likely in reality and as a result, the assessment is considered to be conservative. It should also be noted that use of AERMOD to model the impact of paved and unpaved haul roads is conservative. AERMOD does not consider mixing due to the wake effect behind vehicles as they travel, which overestimates predicted concentrations. Use of a specialty model specifically for road sources (such as CAL3QHC) that does take wake effect behind vehicles into consideration would result in more realistic predicted concentrations. As a result, the actual impacts from this pit at receptor locations downwind of the road sources are expected to be lower than predicted by AERMOD.

The modelling assessment showed that, all predicted maximum cumulative TSP, PM_{10}, $PM_{2.5}$ and NO_2 concentrations are all below their applicable criteria at all receptors.

6.2 Recommendations

The analysis was conducted considering a reasonable level of mitigation, including efficient dust control (e.g., watering) of unpaved roads and excavation areas as appropriate. In addition, good dust management practices will ensure that any effect associated with material handling and transportation of materials is minimized. These practices are outlined in the Best Management Plan (BMP) that is presented in Appendix C.

In order to ensure that the conclusions of this study remain valid, the following recommendations are made:

- Dust mitigation activities on site shall meet or exceed those specified in the Best Management Plan or any subsequent version of the Dust Management Plan.(see Appendix C).
- Ensure that the perimeter berms and surrounding areas are sufficiently vegetated to act as a barrier to dust transport.
- Comply with the dust control requirements stipulated in the *Ontario Aggregate Resources Act* (Ontario Regulation 244/97 under *Aggregate Resources Act*).

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Appendix A

Detailed Emissions Tables

Stationary Diesel Equipment Tailpipe Emissions **102827 Pit 3 Extension**

Use	Power Rating (hp)	Emissions (g/s)			
		TSP	PM_{10}	$PM_{2.5}$	NOx
Proposed Phase 1					
Diesel Generator for Crusher @ Processing Plant	430	0.0179	0.0179	0.0179	0.5733
Diesel Generator for Screener @ Processing Plant	130	0.0054	0.0054	0.0054	0.1733
Proposed Phase 2					
Diesel Generator for Crusher @ Processing Plant	430	0.0179	0.0179	0.0179	0.5733
Diesel Generator for Screener @ Processing Plant	130	0.0054	0.0054	0.0054	0.1733
Proposed Phase 3					
Diesel Generator for Crusher @ Processing Plant	430	0.0179	0.0179	0.0179	0.5733
Diesel Generator for Screener @ Processing Plant	130	0.0054	0.0054	0.0054	0.1733
Existing					
Diesel Generator for Crusher @ Processing Plant	430	0.0179	0.0179	0.0179	0.5733
Diesel Generator for Screener @ Processing Plant	130	0.0054	0.0054	0.0054	0.1733

Notes: 1 crusher or screener assumed operating on existing pit floor

Crushing and Screening Particulate Matter Emissions **102827 Pit 3 Extension**

Description	Emission Factor in kg/tonne			Tonnes Loaded per day*	Uncontrolled Emissions (g/s)			Assumed Control Efficiency (%)	Controlled Emissions (g/s)		
	TSP	PM_{10}	$PM_{2.5}$		TSP	PM_{10}	$PM_{2.5}$		TSP	PM_{10}	$PM_{2.5}$
Proposed Phase 1											
Primary Crushing @Processing Plant	0.0006	0.00027	0.00005	1,213	0.0168	0.0076	0.0014	0 %	0.0168	0.0076	0.0014
Secondary Crushing @Processing Plant	0.0006	0.00027	0.00005	1,213	0.0168	0.0076	0.0014	0 %	0.0168	0.0076	0.0014
Screening @Processing Plant	0.0011	0.00037	0.00003	1,213	0.0309	0.0104	0.0007	0 %	0.0309	0.0104	0.0007
Proposed Phase 2											
Primary Crushing @Processing Plant	0.0006	0.00027	0.00005	1,213	0.0168	0.0076	0.0014	0 %	0.0168	0.0076	0.0014
Secondary Crushing @Processing Plant	0.0006	0.00027	0.00005	1,213	0.0168	0.0076	0.0014	0 %	0.0168	0.0076	0.0014
Screening @Processing Plant	0.0011	0.00037	0.00003	1,213	0.0309	0.0104	0.0007	0 %	0.0309	0.0104	0.0007
Proposed Phase 3											
Primary Crushing @Processing Plant	0.0006	0.00027	0.00005	1,213	0.0168	0.0076	0.0014	0 %	0.0168	0.0076	0.0014
Secondary Crushing @Processing Plant	0.0006	0.00027	0.00005	1,213	0.0168	0.0076	0.0014	0 %	0.0168	0.0076	0.0014
Screening @Processing Plant	0.0011	0.00037	0.00003	1,213	0.0309	0.0104	0.0007	0 %	0.0309	0.0104	0.0007
Existing											
Primary Crushing @Processing Plant	0.0006	0.00027	0.00005	1,213	0.0168	0.0076	0.0014	0 %	0.0168	0.0076	0.0014
Secondary Crushing @Processing Plant	0.0006	0.00027	0.00005	1,213	0.0168	0.0076	0.0014	0 %	0.0168	0.0076	0.0014
Screening @Processing Plant	0.0011	0.00037	0.00003	1,213	0.0309	0.0104	0.0007	0 %	0.0309	0.0104	0.0007

*Assumed that the tonnes handled per day will be split evenly between the existing Pinkney Pit and the proposed Pinkney Pit South.

Notes: 1 crusher or screener assumed operating on existing pit floor

Worst-Case Emission Rate

EMISSION FACTORS (kg/Mg of material throughput)[1]			
Source	**TSP**	**PM_{10}**	**$PM_{2.5}$**
Primary Crushing (controlled)	0.00060	0.00027	0.00005
Secondary Crushing (controlled)	0.00060	0.00027	0.00005
Tertiary Crushing (controlled)	0.00060	0.00027	0.00005
Screening (controlled)	0.00110	0.00037	0.000025

(1) All emission factors from AP-42 Table 11.19.2-1

Note: AP-42 Section 11.19.2 describes the stages of the crushing process as follows:

Type of Crushing Activity	**Crusher Output Sizing**
Primary Crushing - Jaw, Impact or Gyratory Crusher	7.5 to 30 cm (3 to 12 inches) diameter
Secondary Crushing - Cone Crusher	2.5 to 10 cm (1 to 4 inches) diameter
Tertiary Crushing - Cone or Impact Crusher	0.5 to 2.5 cm (3/16th to 1 inch) diameter

uses tertiary EF's as upper limits as No Data was available for Primary or Secondary Crushing

SPM Emissions Sample Calculation for Controlled Crushing Emissions:

Material Handling Particulate Matter Emissions **102827 Pit 3 Extension**

Material Handling Emissions	k			M (%)	U (m/s)	Emission Factor in kg/tonne			Tonnes Handled per day*	Uncontrolled Emissions (g/s)			Assumed Control Efficiency (%)	Controlled Emissions (g/s)		
	TSP	PM_{10}	$PM_{2.5}$			TSP	PM_{10}	$PM_{2.5}$		TSP	PM_{10}	$PM_{2.5}$		TSP	PM_{10}	$PM_{2.5}$
Proposed Phase 1																
Loader drop to Processing Plant	0.74	0.35	0.053	4.6%	5	0.00107	0.00051	0.00008	1,213	0.0301	0.0142	0.0022	50 %	0.0151	0.0071	0.0011
Drop from Stacker to Surge Pile	0.74	0.35	0.053	4.6%	5	0.00107	0.00051	0.00008	1,213	0.0301	0.0142	0.0022	0 %	0.0301	0.0142	0.0022
Loader drop to Haul Truck for off-site shipment	0.74	0.35	0.053	4.6%	5	0.00107	0.00051	0.00008	1,213	0.0301	0.0142	0.0022	50 %	0.0151	0.0071	0.0011
Proposed Phase 2																
Loader drop to Processing Plant @ Face	0.74	0.35	0.053	4.6%	5	0.00107	0.00051	0.00008	1,213	0.0301	0.0142	0.0022	50 %	0.0151	0.0071	0.0011
Drop from Stacker to Surge Pile @ Face	0.74	0.35	0.053	4.6%	5	0.00107	0.00051	0.00008	1,213	0.0301	0.0142	0.0022	0 %	0.0301	0.0142	0.0022
Loader drop to Haul Truck for off-site shipment	0.74	0.35	0.053	4.6%	5	0.00107	0.00051	0.00008	1,213	0.0301	0.0142	0.0022	50 %	0.0151	0.0071	0.0011
Proposed Phase 3																
Loader drop to Processing Plant @ Face	0.74	0.35	0.053	4.6%	5	0.00107	0.00051	0.00008	1,213	0.0301	0.0142	0.0022	50 %	0.0151	0.0071	0.0011
Drop from Stacker to Surge Pile @ Face	0.74	0.35	0.053	4.6%	5	0.00107	0.00051	0.00008	1,213	0.0301	0.0142	0.0022	0 %	0.0301	0.0142	0.0022
Loader drop to Haul Truck for off-site shipment	0.74	0.35	0.053	4.6%	5	0.00107	0.00051	0.00008	1,213	0.0301	0.0142	0.0022	50 %	0.0151	0.0071	0.0011
Existing																
Haul Truck Drop to Crusher Hopper @Processing Plant	0.74	0.35	0.053	4.6%	5	0.00107	0.00051	0.00008	1,213	0.0301	0.0142	0.0022	0 %	0.0301	0.0142	0.0022
Drop from Production Loader	0.74	0.35	0.053	4.6%	5	0.00107	0.00051	0.00008	1,213	0.0301	0.0142	0.0022	50 %	0.0151	0.0071	0.0011

*Assumed that the tonnes handled per day will be split evenly between the existing Pinkney Pit and the proposed Pinkney Pit South.

Emission Factor Equation	Reference
$E = k \times (0.0016) \times (U/2.2)^{1.3} / (M/2)^{1.4}$	AP-42 13.2.4
	November 2006

Parameter	TSP	PM_{10}	$PM_{2.5}$
k	0.74	0.35	0.053

E = emission factor in kg/megagram

k = particle size multiplier for particulate size range and units of interest

U = mean wind speed (m/s)

M = material moisture content (%)

Tailpipe Emissions - Working Face Excavators and Loaders **102827 Pit 3 Extension**

Vehicle Use	Number of Units	Power Rating (hp)	Steady State Emission Factor per Unit in g/hp-hr				Load Factor %[1]	Emissions (g/s)			
			TSP	PM_{10}	$PM_{2.5}$	NOx		TSP	PM_{10}	$PM_{2.5}$	NOx
Phase 1											
Extraction Loader CAT 988K @Face	2	541	0.15	0.15	0.15	3.0	92 %	0.0415	0.0415	0.0415	0.8295
Shipping Loader CAT 980K @Processing Plant	1	386	0.15	0.15	0.15	3.0	92 %	0.0148	0.0148	0.0148	0.2959
Phase 2											
Production Loader CAT 988K @Face	2	541	0.15	0.15	0.15	3.0	92 %	0.0415	0.0415	0.0415	0.8295
Shipping Loader CAT 980K @Processing Plant	1	386	0.15	0.15	0.15	3.0	92 %	0.0148	0.0148	0.0148	0.2959
Phase 3											
Production Loader CAT 988K @Face	1	541	0.15	0.15	0.15	3.0	92 %	0.0207	0.0207	0.0207	0.4148
Existing											
Production Loader CAT 988K @Face	1	541	0.15	0.15	0.15	3.0	92 %	0.0207	0.0207	0.0207	0.4148

[1.] Assumption from URBEMIS2007 Model Appendix G for each piece of Equipment (equipment not listed in Appendix G assumed to be "Other Material Handling Equipment")

Emission Factors are from EPA420-R-10-018) page 5.
CAT 980 and 988 assumed to meet U.S. EPA Tier 3 emission ratings.
Tier 3 NOx Emission Factor (300 to 600 hp) is 3.0 gNOx/hp-hr (NOx and NMHC Combined).
Tier 2 PM Emission Factor (300 to 600 hp) is 0.15 gPM/hp-hr.

Daily Shipping Truck Tailpipe Emissions

Vehicle Use (see description on Soil & Truck Volumes worksheet)	One-way road length (km)	Total Number of Truck Passes per day (One-way)	Return Trips During Same Day	Emissions (g/s)			
				TSP	PM_{10}	$PM_{2.5}$	NOx
Proposed Phase 1							
Shipping Truck Driving Length of Phase 1	0.88	47	2	0.00063	0.00063	0.00058	0.01032
Proposed Phase 2							
Shipping Truck Driving Length of Phase 2	1.05	47	2	0.00075	0.00075	0.00069	0.01232
Proposed Phase 3							
Shipping Truck Driving Length of Phase 3	1.40	47	2	0.00100	0.00100	0.00092	0.01642
Existing							
Shipping Truck Driving Length of Existing	0.66	47	2	0.00047	0.00047	0.00043	0.00774

Hourly Shipping Truck Tailpipe Emissions

Vehicle Use (see description on Soil & Truck Volumes worksheet)	One-way road length (km)	Total Number of Truck Passes per hour (One-way)	Return Trips During Same Hour	NOx (g/s)
Proposed Phase 1				
Shipping Truck Driving Length of Phase 1	0.88	23	2	0.06362

On-Site Paved Roads Particulate Matter Emissions

May to Nov

Road Emissions - TSP	24 Hr AADT	sL (g/m^2)	Average Vehicle Weight (tonnes)	Road Dust Emission Factor in g/VKT	One way length (km)	Maximum Hourly Emission Rate (g/s)
				SPM		
All Phases						
Shipping Truck Travelling on Existing Entrance/Exit Road	69	0.6	37.5	81.8	0.06	0.0039
Shipping Trucks Travelling on Mississauga Rd North	69	0.6	37.5	81.8	1.40	0.0919
Mississauga Rd North + Pinkney South Shipping Trucks	1600	0.2	4.7	3.6	1.40	0.0944
Mississauga Rd South	1600	0.2	4.7	3.6	1.40	0.0944

Road Emissions - PM_{10}	24 Hr AADT	sL (g/m^2)	Average Vehicle Weight (tonnes)	Road Dust Emission Factor in g/VKT	One way length (km)	Maximum Hourly Emission Rate (g/s)
				PM_{10}		
All Phases						
Shipping Truck Travelling on Existing Entrance/Exit Road	69	0.6	37.5	15.7	0.06	0.0008
Shipping Trucks Travelling on Mississauga Rd North	69	0.6	37.5	15.7	1.40	0.0176
Mississauga Rd North + Pinkney South Shipping Trucks	1600	0.2	4.7	0.7	1.40	0.0181
Mississauga Rd South	1600	0.2	4.7	0.7	1.40	0.0181

Road Emissions - $PM_{2.5}$	24 Hr AADT	sL (g/m^2)	Average Vehicle Weight (tonnes)	Road Dust Emission Factor in g/VKT	One way length (km)	Maximum Hourly Emission Rate (g/s)
				$PM_{2.5}$		
All Phases						
Shipping Truck Travelling on Existing Entrance/Exit Road	69	0.6	37.5	3.8	0.06	0.0002
Shipping Trucks Travelling on Mississauga Rd North	69	0.6	37.5	3.8	1.40	0.0043
Mississauga Rd North + Pinkney South Shipping Trucks	1600	0.2	4.7	0.2	1.40	0.0044
Mississauga Rd South	1600	0.2	4.7	0.2	1.40	0.0044

Assumption: Average vehicle weight for off-site roads based on a weighted average of background vehicles and trucks
Traffic on Mississauga Road is smeared evenly over a 24 hour period.

Emission Factor Equation	Reference
$E_{paved} = k \times (sL/2)^{0.65} \times (W/3)^{1.5} - C$	AP-42 13.2.1.3 November 2006

E = particulate emission factor
k = particle size multilier for particulate size range and units of interest
sL = road surface silt loading (g/m^2)
W = average weight (tonnes) of vehicles travelling on the road
C = emission factor for 1980's vehicle fleet exhaust, brake wear and tire wear

Emission Factor Equation	Reference
$k(sL)^{0.91} \times (W)^{1.02}$	AP-42 13.2.1 January 2011

Silt Loading in g/m^2
Ubiquitous Baseline

Industrial Roads
Constant
k

Paved Road Tailpipe Emissions

Road Emissions - TSP	24 Hr AADT	One way length (km)
Proposed & Existing		
Shipping Truck Travelling on Existing Entrance/Exit Road	69	0.06
Mississauga Rd North + Pinkney South Shipping Trucks	1600	1.40

Road Emissions - PM_{10}	24 Hr AADT	One way length (km)
Proposed & Existing		
Shipping Truck Travelling on Existing Entrance/Exit Road	69	0.06
Mississauga Rd North + Pinkney South Shipping Trucks	1600	1.40

Road Emissions - $PM_{2.5}$	24 Hr AADT	One way length (km)
Proposed & Existing		
Shipping Truck Travelling on Existing Entrance/Exit Road	69	0.06
Mississauga Rd North + Pinkney South Shipping Trucks	1600	1.40

Road Emissions - 24-hr NOx	24 Hr AADT	One way length (km)
Proposed & Existing		
Shipping Truck Travelling on Existing Entrance/Exit Road	69	0.06
Mississauga Rd North + Pinkney South Shipping Trucks	1600	1.40

Road Emissions - 1-hr NOx	Max 1-hr traffic count	One way length (km)
Proposed & Existing		
Shipping Truck Travelling on Existing Entrance/Exit Road	23	0.06
Mississauga Rd North + Pinkney South Shipping Trucks	116	1.40

MOVES2014b Emission Factors - Year 2015		
Vehicle Type	**Average Vehicle Weight (tonnes)**	**TSP**
Heavy Duty Diesel Trucks - 60-70 kph	37.50	0.190
Cars - 60-70 kph	4.73	0.009

All Emission Fa
Used a weighte

On-Site Unpaved Haul Roads Particulate Matter Emissions

102827 Pit 3 Extension

Unpaved Road Emissions (see description on Soil & Truck Volumes worksheet)	s (%)	W (tonnes)	Emission Factor in g/VKT			Total Number of Vehicles per day	Return Trips During Same Day	One Way Length (km)	Uncontrolled Emissions (g/s)			Assumed Control Efficiency (%)	Controlled Emissions (g/s)		
			TSP	PM_{10}	$PM_{2.5}$				TSP	PM_{10}	$PM_{2.5}$		TSP	PM_{10}	$PM_{2.5}$
Proposed Phase 1															
Shipping Truck Driving Length of Phase 1	4.8	37.5	2,366	603	60	47	2	0.880	4.223	1.076	0.108	95 %	0.211	0.054	0.005
Proposed Phase 2															
Shipping Truck Driving Length of Phase 2	4.8	37.5	2,366	603	60	47	2	1.050	5.038	1.284	0.128	95 %	0.252	0.064	0.006
Proposed Phase 3															
Shipping Truck Driving Length of Phase 3	4.8	37.5	2,366	603	60	47	2	1.400	6.718	1.712	0.171	95 %	0.336	0.086	0.009
Existing															
Shipping Truck Driving Length of Existing	4.8	37.5	2,366	603	60	47	2	0.660	3.167	0.807	0.081	95 %	0.158	0.040	0.004

Emission Factor Equation	Reference	
$E_{unpaved} = k \times (s/12)^a \times (W/3)^b$	AP-42 13.2.2-4, November 2006	industrial sites

Constant	Industrial Roads		
	TSP	PM_{10}	$PM_{2.5}$
k (lb/VMT)	4.9	1.5	0.15
a	0.7	0.9	0.9
b	0.45	0.45	0.45

E = size speific emission factor (lb/VMT)
s = surface materal silt content (%)
W = mean vehicle weight (tons) where 1 tonne = 1.1 ton
1 lb/VMT = 281.9 g/VKT

SILT CONTENT (%)	Location	Low	High	Average
construction sites	scraper routes	0.6	23.0	4.8
sand and gravel processing	plant road	4.1	6.0	4.8

Wind Erosion Particulate Matter Emissions

Wind Erosion Source	s %	Road Length (m)	Road Width (m)	Area (ha)	E (kg/ha/day)			Uncontrolled Emissions (g/s)			Assumed Control Efficiency (%)	Controlled Emissions (g/s)		
					TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$		TSP	PM_{10}	$PM_{2.5}$
Proposed Phase 1														
Shipping Truck Driving Length of Phase 1	4.8	880	10	0.88	9.485	4.742	0.714	0.0966	0.0483	0.0073	0%	0.0966	0.0483	0.0073
Proposed Phase 2														
Shipping Truck Driving Length of Phase 2	4.8	1,050	10	1.05	9.485	4.742	0.714	0.1153	0.0576	0.0087	0%	0.1153	0.0576	0.0087
Proposed Phase 3														
Shipping Truck Driving Length of Phase 3	4.8	1,400	10	1.40	9.485	4.742	0.714	0.1537	0.0768	0.0116	0%	0.1537	0.0768	0.0116
Existing														
Shipping Truck Driving Length of Existing	4.8	660	10	0.66	9.485	4.742	0.714	0.0725	0.0362	0.0055	0%	0.0725	0.0362	0.0055

E = emission factor (kg/day)
k = particle size multilier for particulate size range of interest are from the WRAP handbook
s = Silt Content in %

Parameter	TSP	PM_{10}	$PM_{2.5}$
k	1.9	0.95	0.143
f	23.4	Pearson Airport Climate Normals	

Appendix B

Sample AEMOD Input File

```
**
****************************************
**
** AERMOD Input Produced by:
** AERMOD View Ver. 11.2.0
** Lakes Environmental Software Inc.
** Date: 2023-10-09
** File: C:\Wallace Project folder\Lafrange 2022 all Models\2023 Oct revised\2023_NOXGrid\2023_NOXGrid.ADI
**
****************************************
**
**
****************************************
** AERMOD Control Pathway
****************************************
**
**
CO STARTING
   TITLEONE Pinkney Pit #3 Extension October 2023 12 months use May to Nov
   TITLETWO Lafarge Canada, Caledon, ON no mobile plant NOx run 1-hr only
   MODELOPT DFAULT CONC NODRYDPLT NOWETDPLT
   AVERTIME 24 ANNUAL
   POLLUTID NOX
   RUNORNOT RUN
   SAVEFILE 2023_NOXGrid.sv1 5
CO FINISHED
**
```

```
***************************************
** AERMOD Source Pathway
***************************************
**
**
SO STARTING
** Source Location **
** Source ID - Type - X Coord. - Y Coord. **
** ----------------------------------------------------------------------
** Line Source Represented by Area Sources
** LINE AREA Source ID = LPENT
** DESCRSRC Pinkney Entrance Rd
** PREFIX
** Length of Side = 9.00
** Ratio = 10
** Vertical Dimension = 0.00
** Emission Rate = 1.1741E-06
** Nodes = 2
** 578237.980, 4851330.353, 396.11, 2.17
** 578271.240, 4851418.953, 396.45, 2.17
** ----------------------------------------------------------------------
   LOCATION A0000001     AREA     578242.193 4851328.772 396.19
   LOCATION A0000002     AREA     578258.823 4851373.072 396.37
** End of LINE AREA Source ID = LPENT
   LOCATION PR_P3       OPENPIT    577580.180  4850325.037      396.000
** DESCRSRC Phase 3
   LOCATION LEX         OPENPIT    577856.659  4850893.236      400.000
```

```
** DESCRSRC Pit 3 Existing
** ----------------------------------------------------------------------
** Line Source Represented by Area Sources
** LINE AREA Source ID = MISSRD
** DESCRSRC Missisauga Rd (North and South Bound)
** PREFIX
** Length of Side = 16.00
** Ratio = 10
** Vertical Dimension = 0.00
** Emission Rate = 7.7992E-06
** Nodes = 2
** 578276.462, 4851422.136, 396.96, 2.17
** 577275.715, 4852427.331, 400.91, 2.17
** ----------------------------------------------------------------------
   LOCATION A0000003     AREA     578282.131 4851427.780 397.18
   LOCATION A0000004     AREA     578170.937 4851539.469 397.62
   LOCATION A0000005     AREA     578059.743 4851651.157 398.06
   LOCATION A0000006     AREA     577948.549 4851762.845 398.50
   LOCATION A0000007     AREA     577837.355 4851874.534 398.94
   LOCATION A0000008     AREA     577726.161 4851986.222 399.37
   LOCATION A0000009     AREA     577614.967 4852097.910 399.81
   LOCATION A0000010     AREA     577503.773 4852209.599 400.25
   LOCATION A0000011     AREA     577392.578 4852321.287 400.69
** End of LINE AREA Source ID = MISSRD
** Source Parameters **
** LINE AREA Source ID = LPENT
   SRCPARAM A0000001     1.1741E-06     2.169    47.318     9.000   -69.424     0.000
```

```
   SRCPARAM A0000002     1.1741E-06     2.168    47.318     9.000   -69.424     0.000
** ----------------------------------------------------------------------
   SRCPARAM PR_P3       6.844E-06     1.500   289.250   507.670 440530.643    40.170
   SRCPARAM LEX         4.2623E-06     1.500   408.550   571.970 701035.031    36.610
** LINE AREA Source ID = MISSRD
   SRCPARAM A0000003     7.7992E-06     2.170   157.602    16.000  -134.873     0.000
   SRCPARAM A0000004     7.7992E-06     2.170   157.602    16.000  -134.873     0.000
   SRCPARAM A0000005     7.7992E-06     2.170   157.602    16.000  -134.873     0.000
   SRCPARAM A0000006     7.7992E-06     2.170   157.602    16.000  -134.873     0.000
   SRCPARAM A0000007     7.7992E-06     2.170   157.602    16.000  -134.873     0.000
   SRCPARAM A0000008     7.7992E-06     2.170   157.602    16.000  -134.873     0.000
   SRCPARAM A0000009     7.7992E-06     2.170   157.602    16.000  -134.873     0.000
   SRCPARAM A0000010     7.7992E-06     2.170   157.602    16.000  -134.873     0.000
   SRCPARAM A0000011     7.7992E-06     2.170   157.602    16.000  -134.873     0.000
** ----------------------------------------------------------------------

** Variable Emissions Type: "By Hour-of-Day (HROFDY)"
** Variable Emission Scenario: "Scenario 3"
   EMISFACT LEX         HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
   EMISFACT LEX         HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT LEX         HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT LEX         HROFDY 1.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT A0000001     HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
   EMISFACT A0000001     HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT A0000001     HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT A0000001     HROFDY 1.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT A0000002     HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
```

EMISFACT A0000002 HROFDY 1.0 1.0 1.0 1.0 1.0 1.0

EMISFACT A0000002 HROFDY 1.0 1.0 1.0 1.0 1.0 1.0

EMISFACT A0000002 HROFDY 1.0 0.0 0.0 0.0 0.0 0.0

EMISFACT A0000003 HROFDY 0.0 0.0 0.0 0.0 0.0 1.0

EMISFACT A0000003 HROFDY 1.0 1.0 1.0 1.0 1.0 1.0

EMISFACT A0000003 HROFDY 1.0 1.0 1.0 1.0 1.0 1.0

EMISFACT A0000003 HROFDY 1.0 0.0 0.0 0.0 0.0 0.0

EMISFACT A0000004 HROFDY 0.0 0.0 0.0 0.0 0.0 1.0

EMISFACT A0000004 HROFDY 1.0 1.0 1.0 1.0 1.0 1.0

EMISFACT A0000004 HROFDY 1.0 1.0 1.0 1.0 1.0 1.0

EMISFACT A0000004 HROFDY 1.0 0.0 0.0 0.0 0.0 0.0

EMISFACT A0000005 HROFDY 0.0 0.0 0.0 0.0 0.0 1.0

EMISFACT A0000005 HROFDY 1.0 1.0 1.0 1.0 1.0 1.0

EMISFACT A0000005 HROFDY 1.0 1.0 1.0 1.0 1.0 1.0

EMISFACT A0000005 HROFDY 1.0 0.0 0.0 0.0 0.0 0.0

EMISFACT A0000006 HROFDY 0.0 0.0 0.0 0.0 0.0 1.0

EMISFACT A0000006 HROFDY 1.0 1.0 1.0 1.0 1.0 1.0

EMISFACT A0000006 HROFDY 1.0 1.0 1.0 1.0 1.0 1.0

EMISFACT A0000006 HROFDY 1.0 0.0 0.0 0.0 0.0 0.0

EMISFACT A0000007 HROFDY 0.0 0.0 0.0 0.0 0.0 1.0

EMISFACT A0000007 HROFDY 1.0 1.0 1.0 1.0 1.0 1.0

EMISFACT A0000007 HROFDY 1.0 1.0 1.0 1.0 1.0 1.0

EMISFACT A0000007 HROFDY 1.0 0.0 0.0 0.0 0.0 0.0

EMISFACT A0000008 HROFDY 0.0 0.0 0.0 0.0 0.0 1.0

EMISFACT A0000008 HROFDY 1.0 1.0 1.0 1.0 1.0 1.0

EMISFACT A0000008 HROFDY 1.0 1.0 1.0 1.0 1.0 1.0

EMISFACT A0000008 HROFDY 1.0 0.0 0.0 0.0 0.0 0.0

```
   EMISFACT A0000009     HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
   EMISFACT A0000009     HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT A0000009     HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT A0000009     HROFDY 1.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT A0000010     HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
   EMISFACT A0000010     HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT A0000010     HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT A0000010     HROFDY 1.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT A0000011     HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
   EMISFACT A0000011     HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT A0000011     HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT A0000011     HROFDY 1.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT PR_P3        HROFDY 0.0 0.0 0.0 0.0 0.0 1.0
   EMISFACT PR_P3        HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT PR_P3        HROFDY 1.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT PR_P3        HROFDY 1.0 0.0 0.0 0.0 0.0 0.0
   SRCGROUP ALL
SO FINISHED
**
****************************************
** AERMOD Receptor Pathway
****************************************
**
**
RE STARTING
   INCLUDED 2023_NOXGrid.rou
RE FINISHED
```

```
**
****************************************
** AERMOD Meteorology Pathway
****************************************
**
**
ME STARTING
  SURFFILE Toronto_crops_22112.SFC
  PROFFILE Toronto_crops_22112.PFL
  SURFDATA 61587 1996 TORONTO
  UAIRDATA 725280 1996 BUFFALO
  PROFBASE 173.0 METERS
ME FINISHED
**
****************************************
** AERMOD Output Pathway
****************************************
**
**
OU STARTING
  RECTABLE ALLAVE 1ST
  RECTABLE 24 1ST
  MAXTABLE ALLAVE 50
** Auto-Generated Plotfiles
  PLOTFILE 24 ALL 1ST 2023_NOXGRID.AD\24H1GALL.PLT 31
  PLOTFILE ANNUAL ALL 2023_NOXGRID.AD\AN00GALL.PLT 32
  SUMMFILE 2023_NOXGrid.sum
```

OU FINISHED

*** Message Summary For AERMOD Model Setup ***

--------- Summary of Total Messages --------

A Total of 0 Fatal Error Message(s)

A Total of 1 Warning Message(s)

A Total of 0 Informational Message(s)

******** FATAL ERROR MESSAGES ********

*** NONE ***

******** WARNING MESSAGES ********

ME W187 175 MEOPEN: ADJ_U* Option for Stable Low Winds used in AERMET

****

*** SETUP Finishes Successfully ***

****

*** MODELOPTs: RegDFAULT CONC ELEV NODRYDPLT NOWETDPLT RURAL ADJ_U*

*** MODEL SETUP OPTIONS SUMMARY ***

- -

** Model Options Selected:

* Model Uses Regulatory DEFAULT Options
* Model Is Setup For Calculation of Average CONCentration Values.
* NO GAS DEPOSITION Data Provided.
* NO PARTICLE DEPOSITION Data Provided.
* Model Uses NO DRY DEPLETION. DDPLETE = F
* Model Uses NO WET DEPLETION. WETDPLT = F
* Stack-tip Downwash.
* Model Accounts for ELEVated Terrain Effects.
* Use Calms Processing Routine.
* Use Missing Data Processing Routine.
* No Exponential Decay.
* Model Uses RURAL Dispersion Only.
* ADJ_U* - Use ADJ_U* option for SBL in AERMET
* CCVR_Sub - Meteorological data includes CCVR substitutions
* TEMP_Sub - Meteorological data includes TEMP substitutions
* Model Assumes No FLAGPOLE Receptor Heights.
* The User Specified a Pollutant Type of: NOX

**Model Calculates 1 Short Term Average(s) of: 24-HR

and Calculates ANNUAL Averages

**This Run Includes: 13 Source(s); 1 Source Group(s); and 21 Receptor(s)

with: 0 POINT(s), including

0 POINTCAP(s) and 0 POINTHOR(s)

and: 0 VOLUME source(s)

and: 11 AREA type source(s)

and: 0 LINE source(s)

and: 0 RLINE/RLINEXT source(s)

and: 2 OPENPIT source(s)

and: 0 BUOYANT LINE source(s) with a total of 0 line(s)

and: 0 SWPOINT source(s)

**Model Set To Continue RUNning After the Setup Testing.

**The AERMET Input Meteorological Data Version Date: 22112

**Output Options Selected:

Model Outputs Tables of ANNUAL Averages by Receptor

Model Outputs Tables of Highest Short Term Values by Receptor (RECTABLE Keyword)

Model Outputs Tables of Overall Maximum Short Term Values (MAXTABLE Keyword)

Model Outputs External File(s) of High Values for Plotting (PLOTFILE Keyword)

Model Outputs Separate Summary File of High Ranked Values (SUMMFILE Keyword)

**NOTE: The Following Flags May Appear Following CONC Values: c for Calm Hours

m for Missing Hours

b for Both Calm and Missing Hours

**Misc. Inputs: Base Elev. for Pot. Temp. Profile (m MSL) =   173.00 ; Decay Coef. =   0.000   ; Rot. Angle =   0.0

Emission Units = GRAMS/SEC   ; Emission Rate Unit Factor =   0.10000E+07

Output Units   = MICROGRAMS/M**3

**Approximate Storage Requirements of Model =   3.5 MB of RAM.

**Input Runstream File: aermod.inp

**Output Print File: aermod.out

**File for Saving Result Arrays: 2023_NOXGrid.sv1

**File for Summary of Results: 2023_NOXGrid.sum

*** AREA SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC /METER**2)	COORD (SW CORNER) X (METERS)	Y (METERS)	BASE ELEV. (METERS)	RELEASE HEIGHT (METERS)	X-DIM OF AREA (METERS)	Y-DIM OF AREA (METERS)	ORIENT. OF AREA (DEG.)	INIT. SZ (METERS)	URBAN SOURCE	EMISSION RATE SCALAR VARY BY
A0000001	0	0.11741E-05	578242.2	4851328.8	396.2	2.17	47.32	9.00	-69.42	0.00	NO	HROFDY
A0000002	0	0.11741E-05	578258.8	4851373.1	396.4	2.17	47.32	9.00	-69.42	0.00	NO	HROFDY
A0000003	0	0.77992E-05	578282.1	4851427.8	397.2	2.17	157.60	16.00	-134.87	0.00	NO	HROFDY
A0000004	0	0.77992E-05	578170.9	4851539.5	397.6	2.17	157.60	16.00	-134.87	0.00	NO	HROFDY
A0000005	0	0.77992E-05	578059.7	4851651.2	398.1	2.17	157.60	16.00	-134.87	0.00	NO	HROFDY
A0000006	0	0.77992E-05	577948.5	4851762.8	398.5	2.17	157.60	16.00	-134.87	0.00	NO	HROFDY
A0000007	0	0.77992E-05	577837.4	4851874.5	398.9	2.17	157.60	16.00	-134.87	0.00	NO	HROFDY
A0000008	0	0.77992E-05	577726.2	4851986.2	399.4	2.17	157.60	16.00	-134.87	0.00	NO	HROFDY
A0000009	0	0.77992E-05	577615.0	4852097.9	399.8	2.17	157.60	16.00	-134.87	0.00	NO	HROFDY
A0000010	0	0.77992E-05	577503.8	4852209.6	400.2	2.17	157.60	16.00	-134.87	0.00	NO	HROFDY
A0000011	0	0.77992E-05	577392.6	4852321.3	400.7	2.17	157.60	16.00	-134.87	0.00	NO	HROFDY

*** MODELOPTs: RegDFAULT CONC ELEV NODRYDPLT NOWETDPLT RURAL ADJ_U*

*** OPENPIT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC /METER**2)	COORD (SW CORNER) X (METERS)	Y (METERS)	BASE ELEV. (METERS)	RELEASE HEIGHT (METERS)	X-DIM OF PIT (METERS)	Y-DIM OF PIT (METERS)	ORIENT. OF PIT (DEG.)	VOLUME OF PIT (M**3)	URBAN SOURCE	EMISSION RATE SCALAR VARY BY
PR_P3	0	0.68440E-05	577580.2	4850325.0	396.0	1.50	289.25	507.67	40.17	.44053E+06	NO	HROFDY
LEX	0	0.42623E-05	577856.7	4850893.2	400.0	1.50	408.55	571.97	36.61	.70104E+06	NO	HROFDY

*** MODELOPTs: RegDFAULT CONC ELEV NODRYDPLT NOWETDPLT RURAL ADJ_U*

*** SOURCE IDs DEFINING SOURCE GROUPS ***

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SRCGROUP ID                        SOURCE IDs
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 ALL      A0000001   , A0000002   , PR_P3      , LEX        , A0000003   , A0000004   , A0000005   , A0000006   ,

          A0000007   , A0000008   , A0000009   , A0000010   , A0000011   ,
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*** MODELOPTs: RegDFAULT CONC ELEV NODRYDPLT NOWETDPLT RURAL ADJ_U*

Appendix C

Best Management Practices Plan for the Control of Fugitive Dust Emissions

BEST MANAGEMENT PRACTICES PLAN FOR THE CONTROL OF FUGITIVE DUST EMISSIONS

Pinkney Pit
17952 Mississauga Road, Caledon, Ontario L0N 1B0

Revision 1, October 2021

INTRODUCTION

This Best Management Practices Plan (BMPP) for Fugitive Dust Control has been prepared in accordance with the requirements outlined under the Certificate of Approval or Environmental Compliance Approval issued by the Ministry of the Environment, Conservation, and Parks.

(1) Identification of the Main Sources of Fugitive Dust Emissions

The main sources of dust at Lafarge Aggregates sites are from the following:

Main source if Fugitive Dust Emissions	
A	On-site traffic
B	Paved and unpaved roads/areas
C	Material processing
D	Material stockpiles
E	Loading/unloading areas and loading/unloading techniques: • Raw material delivery and delivery techniques • Raw material transfer and transfer techniques • Product loading and unloading techniques

(2) Potential Causes for High Dust Emissions and Opacity Resulting from these Sources

The potential causes for high dust emissions from the above sources are as follows:

Main source of Fugitive Dust Emissions		**Potential Causes of High Dust/ Opacity Emissions**
A	On-site traffic	Traffic movement (raw material loading, trucks and loaders).
B	Paved and unpaved roads/areas	Accumulated dust and generated fines from raw material delivery, storage and transfer.
C	Material processing	Fines generated during the manufacturing process, screening and crushing.
D	Material stockpiles	Wind erosion.
E	Loading/unloading areas and loading/unloading techniques: • Raw material delivery and delivery techniques	Raw material drops.

	• Raw material transfer and transfer techniques	

(3) Preventative and Control Measures in Place or Under Development to Minimize the Likelihood of High Dust Emissions and Opacity from the Sources of Fugitive Dust Emissions Identified Above

A. ON SITE TRAFFIC

- The traffic speed around the scale house area will be limited to minimize the generation of fugitive dust. All traffic will be monitored for dust emissions, enforced by Plant Manager/Supervisor and roadways watered to prevent dust emissions as required*.
- Where possible, the travel distance of equipment will be assessed and traffic routes identified to minimize fugitive dust that is generated from on site equipment movement.

B. PAVED and UNPAVED ROADS AND AREAS

- Paved roads and areas are monitored (visual inspection) throughout the day, with particular attention to site entrances;
- Based on monitoring, paved roads and areas will be swept, have dust suppressant applied or be watered as required*;
    - Dust suppression measures should be used on a regular basis.
- High traffic unpaved roads and areas are treated with a water truck or equivalent dust suppression measures as required*; and
- As a part of on-going site activities, progressive rehabilitation is completed and this has the added benefit of minimizing the areas where fugitive dust could be generated.

* "As required" for this portion of the BMPP is defined as: The Plant Manager or acting Supervisor will assess conditions twice a day by standing at the downwind property line and making a qualitative assessment by visually inspecting the yard to ensure that dust is not leaving the property and that the dust on-site is adequately controlled. Additional inspections will take place if weather conditions change (winds picking up or changing direction).

C. MATERIAL PROCESSING

- Dust suppression (water) will be applied to control dust generation at all manufacturing points as required*

* "As required" for this portion of the BMPP is defined as: The Plant Manager or acting Supervisor will assess conditions twice a day by standing at the downwind property line and making a qualitative assessment by visually inspecting the yard to ensure that dust is not leaving the property and that the dust on-site is adequately controlled. Additional inspections will take place if weather conditions change (winds picking up or changing direction).

D. MATERIAL STOCKPILES

- The loading face of each stockpile is minimized.

E. LOADING/UNLOADING AREAS, LOADING/UNLOADING TECHNIQUES

- The loader minimizes travel and the material drop height to prevent fugitive dust being generated while loading customer's trucks;
- Spilled aggregate will be cleaned up as per housekeeping initiatives.

(4) An Implementation Schedule for the Best Management Practices Plan, including Training of Facility Personnel

The procedures outlined in this document are essentially in-place at the time of writing. Plant employees will be formally trained upon the implementation of this plan. All new staff will be trained at their hiring and plant personnel will review the plant training annually.

(5) Inspection and Maintenance Procedures and Monitoring Initiatives to Ensure Effective Implementation of the Preventative and Control Measures

The effective implementation of this plan will be the responsibility of the Plant Manager at the location. He/she will keep a master copy of the plan and associated documents in the main site office.

The Plant Manager or Supervisor will monitor the **on-going** performance of the Plan based on the BMPP records including the **Measures to Control Fugitive Dust, Fugitive Dust Incidents and Complaints, Suggestions for Improvement** records.

As an important feedback mechanism, the Site will keep a **Record of Incidents and Suggestions for Improvement** along side the Fugitive Dust Control Plan.

Retention: The company will retain these documents for a period of two years for audit/review purposes.

Appendices

FUGITIVE DUST CONTROL TRAINING ATTENDANCE SHEET

Lafarge Site: Stouffville Pit

Date	Name	Signature

NEW DUST CONTROLS / PREVENTION SUGGESTIONS

Date	Description of New or Improved Dust Control Measure	Action / Resolution
Date	**New or Improved Preventative Measures / Operating Procedures**	**Action / Resolution**

MECP COMMENTS

Date	MECP Comment	Action / Resolution

SITE LOG – DUST COMPLAINTS

Date	Suggestions for Improvement	Action / Resolution

RECORD OF ENVIRONMENTAL COMPLAINT AND RESPONSE

1. Location: ____

2. Date and Time Complaint Received: ____________________________

3. Name of Complainant: ______________________________________

   Address: ____

   Telephone Number: ______________________________________

4. Form of Complaint and Summary: Visit: [ ] Telephone Call: [ ] Letter: [ ] (Attach Copy)
   Other ____

5. Complaint Referred to Environment Department: No [ ] Yes [ ] and provide details:
   ____

6. Contact Made With Government Official(s): No [ ] Yes [ ]
   If Yes, Complete and Attach Record of Government Environmental Official Contact Form

7. Details Concerning Investigation Made by Company Concerning Complaint: (Include Wind Direction and Weather Conditions)

LAFARGE earthcare

____
____
____

8. Response to Complainant:
Letter [ ] Date ___________________________Attach copy of letter to this form.

Telephone Call [ ] Date ____________________Time __________________

Summary of Telephone Call:
____
____

9. Follow-up Action Required and/or Taken by Company and Personnel Responsible:
None [ ] Details:
____
____
____

10. Filed Original Form in the Plant Environmental Manual: Yes [ ]

Date ______________________ __________________________________
Employee Signature, Name & Position

FILE IN ENVIRONMENTAL O&M MANUAL FOR EASY REFERENCE

Appendix D

Curriculum Vitae

WASEF JAMIL, P.ENG, QP, TSRP

PRINCIPAL ENVIRONMENTAL ENGINEER

EDUCATION

B.Sc. Eng., Environmental Engineering, 2006, University of Guelph (Honours)

YEARS OF EXPERIENCE

Total – 18 years
With Arcadis > 3 years

PROFESSIONAL REGISTRATIONS

Professional Engineers Ontario

“Qualified Person” under Ontario Regulation 153/04 to submit Record of Site Conditions to the Environmental Site Registry in Ontario

Licenced Practitioner – Toxic Substance Reduction Planner, The Ontario Ministry of the Environment, Conservation and Parks

Qualified Personnel – RAQS approved by the Ontario Ministry of Transportation

TRAINING

WHMIS Training
40-hour Health and Safety

Wasef Jamil, P.Eng., is a Principal Environmental Engineer at Arcadis Canada with over 17 years of diverse environmental consulting experience. As part of air quality, greenhouse gas assessments and permitting portfolio, Wasef provides technical guidance and support to obtain Environmental Compliance Approval (ECA) permits from the Ontario Ministry of the Environment, Conservation and Parks (MECP) on behalf of industrial and commercial facilities. He also focuses on conducting technical studies for submissions under various government reporting programs including Environment and Climate Change Canada’s (ECCC) National Pollutant Release Inventory (NPRI), Greenhouse Gas (GHG) Emissions, National Emissions Reduction Masterplan (NERM) and City of Toronto’s ChemTRAC programs. Wasef is one of the key contributors in authoring the NPRI Guidance Manual for the Wastewater Sector on behalf on ECCC.

In addition to air quality regulatory compliance, Wasef also specializes in environmental impact assessment (EIA) and long-term Environmental, Social and Governance (ESG) projects relating to air quality studies. Wasef has led technical air quality assessments both nationally and internationally for pulp and paper, mining, oil & gas, sustainability and energy market sectors in Brazil, Chile, Colombia, the Dominican Republic, Ecuador and Uruguay. More specifically, he has completed air quality impact assessments (AQIA) for liquefied natural gas (LNG), Power Generation facilities in Canada, Brazil and the Bahamas.

Wasef is approved under the Ontario Ministry of Transportation RAQS list.

Project Experience Continued

Related Project Experience

Industrial & Commercial Air/Noise Compliance Approvals

As the Technical Lead out of Arcadis Canada's Air Quality discipline, Wasef provides technical guidance and support to Environmental team including completion of senior peer reviews of client deliverables. Wasef has prepared over 50 applications for seeking Environmental Compliance Approvals (formerly known as Certificates of Approval – Air (Cs of A)) and Environmental Activity and Sector Registry (EASR) on behalf of industrial and commercial clients which included: identifying contaminants based on Ministry requirements as set out in regulations; calculating emission rates and dispersion modelling for the contaminants from discharging sources including odour; and preparing written 'Emission Summary and Dispersion Modeling' report for submission to MECP for approvals. Key Projects Include:

Ontario Line South Light Rail Transit, Toronto Ontario. Air Quality Specialist role and Senior Technical Guidance of developing Construction Air Quality Management Plan (CAQMP), including Air Quality Monitoring Program in support of construction works for the proposed 16-km stretch transit system. The CAQMP is the component of the Environmental Management System (EMS) to minimize and mitigate air quality related impacts that might result from associated project related activities during the multiple year construction period. In the event, construction works-related activities that are likely to result in generation of significant amount of visible dust, an ambient air quality monitoring program is implemented to determine the level of particulate matter (PM) 10- and 2.5-microns during construction and demolition activities within the construction air quality impact zone. Client: Metrolinx. Date: 2022 to Ongoing

Kingston Inner Harbour, Kingston, Canada. Senior technical guidance on the assessment of Air Quality and Greenhouse Gas emissions due to sediment management initiatives. Leading with the identifications of carbon management sinks, climate adaptation and developing the Greenhouse Gas Emissions inventory as well as the overall assessment of impact using IPCC's Sixth Assessment GWP factors for estimating CO2e (Carbon Dioxide equivalent) for construction as well as operational scenarios. Date: 2022 – Ongoing.

EPCOR Utilities, US and Canada. Senior technical guidance on the compilation of Greenhouse Gas Emissions Inventory as well as assessment of impact using IPCC's Sixth Assessment GWP factors for estimating CO2e (Carbon Dioxide equivalent) for over 50+ facility operations across US and Canada. Date: 2020 – 2023.

Suzano – EIA Support for Air Quality Impact Analysis / Brazil. Senior technical assessment of the air quality modelling and monitoring tasks for existing, construction and operational scenarios to support the overall Environmental Impact Assessment for the Suzano Pulp and Paper Facility in Brazil. Date: 2022 – Ongoing.

Klabin PUMA I & II Facilities – Air Quality Impact Analysis / Brazil. - Senior Technical Guidance of the air quality related monitoring evaluation of two (2) paper mills for their operational impacts to support the overall Environmental, Social and Governance (ESG) commitments under IFC requirements. Date: 2020 – Ongoing.

CELSE – Air Quality Assessment / Brazil. Senior Technical Guidance of the air quality related tasks evaluating both existing and operational scenarios to support the overall Environmental Impact Assessment for the LNG facilities. Date: 2020 – Ongoing.

Bahamas Power & Light – Air Quality Impact Assessment / New Providence, Bahamas. Senior Technical Guidance of the air quality related tasks evaluating both existing and operational scenarios to support the overall Environmental Impact Assessment for the proposed new power station. In addition, climate change impacts were evaluated for the commissioning (construction activities), future operational and decommissioning phases through calculating emissions of greenhouse gas in the specific study area were also undertaken. Date: 2020 – 2021.

Shell – EIA Support Modelling / New Providence, Bahamas. Senior technical guidance and co-author of the air dispersion modelling for construction, operations, and decommissioning phases of the proposed Liquefied Natural Gas regasification facility project. In addition, assisted with the overall air quality evaluations in support of the Environmental Impact Assessment. Following World Bank Group/IFC EHS Guideline, detailed burden analysis of greenhouse gas emissions was undertaken to have a deeper understanding of the project impacts on the climate change during its commissioning, operational and future decommissioning stages. Date: 2021.

City of Toronto – Peer Review Services for Land Use Compatibility Studies, Ontario. Senior Technical Reviewer of Land Use Compatibility Studies for air quality related component on behalf of the City of Toronto. The review of the land use compatibility studies provides support to the City's planning staff as part of the City's Municipal Comprehensive Review. The review typically considers identification of relevant gaps, particularly on applicability of study design, data quality and methodology to achieve objectives, detailed analysis of potential land use compatibility and applicable proposed mitigation measures and finally, provide recommendations for improvement, as applicable. Client: City of Toronto. Completion Date: 2021 - Ongoing.

Hurontario Light Rail Transit, Brampton and Mississauga, Ontario. Senior Technical Guidance of developing Air Quality Management Plan (AQMP), including Air Quality Monitoring Program in support of construction works for the proposed 18-km stretch transit system. The AQMP is the component of the Environmental Management System (EMS) and has been prepared to identify and describe the environmental requirements, standards and procedures to be followed by the Hurontario Light Rail Transit (HULRT) project personnel, and its subcontractors to mitigate air quality effects that might result from associated project related activities. In the event, construction works-related activities that are likely to result in generation of significant amount of visible dust, an ambient air quality monitoring program will be implemented to determine the level of particulate matter (PM) 10- and 2.5-microns during construction and demolition activities in the vicinity of the areas. Client: Metrolinx.

Durham-Scarborough Bus Rapid Transit, Ontario. Senior Technical Guidance of conducting Air Quality Impact Assessment (AQIA) in support of construction works for the proposed 36-km stretch transit system. The AQIA is the component of the Environmental Management System (EMS) and has been prepared to identify and describe the environmental requirements, standards and procedures. The AQIA evaluated the air quality effects that might result from associated project related activities, baseline and in the horizon years 2031, 2041 with build and no-build scenarios. In addition, similar to the air quality emissions, a thorough greenhouse gas burden analysis were considered where baseline and the horizon years were evaluated with build and no-build scenarios to comment on anticipated impacts towards climate change. The Client: Metrolinx. Completion Date: 2020 - 2021.

Environmental Monitoring Advisory Board, Diavik Diamond Mines, Yellowknife. Senior Technical Reviewer of Environmental Air Quality Monitoring Program (EAQMP) on behalf of Environmental Monitoring Advisory Board (EMAB). The EMAB provides oversight of Diavik Diamond Mine and the regulatory process to ensure protection of the land, water, air and wildlife in the Lac de Gras area in Yellowknife. The review of the EAQMP provides support on compliance and best management practices gaps, particularly on applicability of study design and methodology to achieve objectives i.e. adequacy and effectiveness of total suspended particulate matter (TSP) samplers including their monitoring locations. In addition, review is geared for detailed analysis of data quality and provide recommendations for improvement, as applicable. Further than the EAQMP, the review also takes into consideration of the evaluation of Diavik's annual Greenhouse Gas (GHG) reporting under the Federal GHG annual submission requirements. Client: EMAB. Completion Date: Ongoing.

Emission Summary and Dispersion Model (ESDM) and Acoustic Assessment Report (AAR) Toronto General Hospital, Toronto, ON.

Senior Technical Guidance and Reviewer of Emission Summary and Dispersion Model (ESDM) and Acoustic Assessment Report (AAR) to support an amendment of ECA – Air & Noise for approval with the MOECC covering the operations at the Toronto General Hospital. Project elements include preparation of emission inventory, emission rate calculations, dispersion and noise propagation modelling to evaluate the effects of various activities producing emissions at the facility which included emissions from numerous fume hoods at the laboratories, standby generators, chillers &refrigeration equipment as well as typical air handling equipment throughout facility. Client: University Health Network. Completion Date: 2017 – 2019.

Environmental Activity and Sector Registry Application. Hamilton Health Sciences - Ron Joyce Children's Health Centre EASR Application, Hamilton ON.

Senior Technical Guidance and Reviewer of an Environmental Activity and Sector Registry Application. Project elements included preparation of emission estimates, advanced air dispersion modelling to determine if the effects of various emissions at the facility. Completion Date: 2018-2019.

Project Experience Continued

Municipal Class Environmental Assessment (MCEA), Yonge Street, City of Toronto

Senior Technical Management of air quality screening assessment for Yonge Street revitalization corridor study from Sheppard Avenue to Finch Avenue. Wasef collected and reviewed traffic volumes data, traffic lights, turning movements, lane expansions. Calculated criteria air contaminants and greenhouse gas emission for various scenarios with road expansion and to see what parking lot configuration produced the least amount of impact. Assessed local and regional air quality impacts and provided the results into an Air Quality Screening Assessment report for public presentation. Completion Date: 2017.

Bus Garage Facility, York Region Transit, Richmond Hill, ON.

Project Manager and MOECC's Technical Contact responsible for obtaining an ECA of the operation of a transit bus garage. Compiled the emission source inventory and modeled the site emissions using O.Reg. 346 dispersion modeling. The emission sources from the Site included paint booth exhausts and dust collectors. Using 346 dispersion modeling, the resulting POI contaminant concentrations were in compliance with the applicable POI criteria. Also completed ESDM report as part of the ECA application and submitted to MOECC. Completion Date: 2017.

Sewage Pumping Station, Forest Bay Homes Limited, Markham, ON.

Senior Independent Review and Technical Management of a detailed compilation of emission inventory sources, measurement of flow rates, evaluation of Material Safety Data Sheets (MSDS) and manufacturer specifications, calculation of emission rates for contaminants from sewage pumping operation and site emissions modelling using USEPA AERMOD dispersion model. Input parameters such as meteorological, terrain and contaminant emission data were evaluated to model POI impacts at the fenceline and neighbouring multi-tier receptors. In addition, evaluation of odorous emissions and acoustic assessments were also reviewed for technical accuracy and completeness for submission to the MOECC. Based on the input and the dispersion modelling, the resulting contaminants were below the MOECC's applicable limits. Completion Date: 2017.

Air & Noise Application, Green Lane Landfill, City of Toronto. St. Thomas, ON.

Senior Technical Review and overall direction of ECA – Air & Noise application for the amendment of existing C of A for Green Lane Landfill Gas Incineration Facility in St. Thomas. Provided technical assessment of dispersion modelling using USEPA AERMOD of contaminants from four enclosed flares at the landfill Site and demonstrated compliance at the property boundary and nearby-sensitive receptors. Also, performed QA/QC review of the ESDM report and the AAR report as part of the ECA application and submitted to the MOECC for approval. Completion Date: 2015.

Niagara College Canada – Niagara-On-The-Lake and Welland Campus, Niagara Falls, ON.

Project Management, Senior Technical Guidance and Reviewer of an Environmental Activity and Sector Registry applications for both campuses. Project elements included preparation of emission estimates, advanced air dispersion modelling to evaluate the effects of various emissions at the facilities, preparation of ESDM documents. Completion Date: 2016 - 2019.

Emission Source Inventory, Transit Bus Garages, Toronto Transit Commission (TTC).* As Project Engineer and MOE's Technical Contact, was responsible for obtaining ECA for two transit bus garages. Compiled the emission source inventory and modeled the site emissions using O.Reg. 346 dispersion modeling. The emission sources from the Site included tailpipe exhausts, paint booth exhausts and dust collectors. Using 346 dispersion modeling, the resulting POI contaminant concentrations were in compliance with the applicable POI criteria. Also completed ESDM report as part of the ECA application and submitted to MOE. Completion Date: 2013–2014.

Emissions Source Inventory, Durham Region Transit Bus Repair Garage, Ajax, ON.* As Project Engineer and MOECC's Technical Contact, compiled the emission source inventory and prepared ESDM report which included detailed supporting calculations and dispersion modeling using O.Reg. 346 dispersion modeling. The emission sources from the Site included tail pipe and bus maintenance related chemical exhausts. Using 346 dispersion modeling, the resulting POI contaminant concentrations were in compliance with the applicable POI criteria. Completion Date: 2010–2013.

ECA—Subway Yard and Maintenance Complex, Toronto Transit Commission (TTC), ON.* As Project Engineer, was responsible for obtaining ECA for a subway yard, maintenance and car house complex located in the City of Toronto. Compiled the emission source inventory for over 100 emission sources and modeled the site emissions using advanced AERMOD dispersion modeling. The emission sources from the Site included tail pipe exhausts, subway wash area exhausts, paint booth exhausts, dust collectors, maintenance welding, boiler emissions and various material handling. Using AERMOD modelling and ASHRAE Self Contamination model, the resulting POI contaminant concentrations were in compliance with the applicable POI criteria. Also completed ESDM report as part of the ECA application and submitted to MOE. Completion Date: 2010–2012.

Emissions Source Inventory at a Patrol Yard, The Ontario Ministry of Transportation (MTO), Sundridge, ON.* As Project Engineer, compiled the emission source inventory and modeled the site emissions using O.Reg. 346 dispersion modeling. The emissions from the Site included Quartz, Sodium Chloride, Nitrogen Oxides (NOx) and Suspended Particulate Matters (SPM). Of the SPM emitted from material handling at the facility, speciated each associated contaminants based on literature search and estimated the emissions. The resulting Point of Impingement contaminant concentrations were below the MOE's applicable limits. As preferred by the MOE, also completed Emission Summary and Dispersion Modeling report as part of the C of A application. Completion Date: 2009.

Emissions Source Inventory at a Public Transit Bus Garage, The City of Brampton, Brampton, ON.* As Project Scientist, compiled the emission source inventory and modeled the site emissions using O.Reg. 346 dispersion modeling. The emissions from the Site included Quartz, Sodium Chloride, Nitrogen Oxides (NOx) and Suspended Particulate Matters (SPM). Using346 dispersion modeling, the resulting POI contaminant concentrations for NOxwere above the MOE's applicable limits. As per MOE's comments on the submitted application, verified the information and completed advanced NOx dispersion modeling using AERMOD View. The resulting NOx concentrations from AERMOD were in compliance with the applicable POI criteria. Also completed ESDM report as part of the C of A application and submitted to the MOE. Completion Date: 2009.

Compliance Management Services

Federal and Provincial Government Reporting

National Pollutant Release Inventory (NPRI), Greenhouse Gas (GHG), ChemTRAC, National Emissions Reduction Masterplan (NERM) Assessment & Reporting: As per the government reporting programs, Mr. Jamil identified reportable substances, calculated substance usage and emission rates, prepared written reports documenting results, and completed forms under the Environment Canada's on-line NPRI, GHG, NERM and City of Toronto's ChemTRAC reporting systems. Have represented more than 50 industrial and municipal clients in preparation of the government reporting submissions. Key operations include: specialty chemical manufacturing, power generation, industrial mineral wool, landfill operations, wastewater treatment plants, printing operations, food and beverage manufacturing.

WALLACE LEE, MEng, INCE

ENVIRONMENTAL SPECIALIST

EDUCATION

- Bachelor of Science (Physics), University of Alberta 1991
- Diploma from the Faculty of Science (Meteorology), University of Alberta 1992
- Master of Engineering Science, Environmental Engineering, University of New South Wales 1998

YEARS OF EXPERIENCE

- Total – >15 years
- With Arcadis – 3 years

PROFESSIONAL REGISTRATIONS AND CERTIFICATIONS

- Institute of Noise Control Engineering
- USEPA - Motor Vehicle Emission Simulator (MOVES)
- Highway Traffic Noise Acoustics - Federal Highway Administration

Mr. Lee is an environmental scientist specialized in air quality, odour, energy and greenhouse gas (GHG) compliance assessments for federal, municipal and industrial clients projects. He has compiled air emission inventories, developed specific emission factors, performed air quality dispersion modelling, evaluated project compliance, and supported permit applications for a number of projects in North America. His range of air quality assessment experience includes monitoring and analyses programs in support of EISs, EAs, permtting, siting studies and construction activities for a wide variety of projects. Mr. Lee has successfully obtained Environmental Compliance Approvals (ECAs) for clients from natural resources, energy and manufacturing industry in Ontario. He has accumulated years of experience using air quality prediction models/tools such as AERMOD, SCREEN3, AERSCREEN, CAL3QHC/R, EPA's MOVES. Mr. Lee is also a member of the Institute of Noise Control Engineering (INCE).

Project Experience

Environmental Compliance Approval Applications/Updates for Private Sector

These clients include Cameco Corporation, Lafarge Cement, Graham Brothers Asphalt, Rockwool Inc., Cinta Corporation, FNX Mining, Honeywell Aerospace, Brighton Bridge Power LP, West Windsor Power, Trane Technologies, Steptodont Pharmaceutical, Trillium Health Care, Stelco Steel, Jungbunzlauer Canada, and Ecolab Inc. Tasks include sources and contaminants identification, emission rate estimation, dispersion modelling with AERMOD, Emission Summary and Dispersion Modelling (ESDM) Report, Annual Written Summary Report preparation, and National Pollutant Release Inventory (NPRI) annual reporting.

Key Projects:

Environmental Compliance Approval Update and DeSOx Facility Application for Rockwool Inc.

Conducted air dispersion modelling in support of the annual update and a DeSOx system Environmental Approval application for a fire and soundproofing insulation manufacturing plant in Milton, Ontario.

Cameco Blind River Refinery Environmental Compliance Approval Update

As a requirement of the ECA application, led the air dispersion modelling tasks for a nuclear grade uranium production facility in Blind River, Ontario. Emission sources modelled include incinerator, absorber, boiler, HVACs, fire pump, and emergency generators. Contaminants modelled include nitrogen oxides, carbon monoxide, hydrogen fluoride, cadmium, hexavalent chromium, and uranium.

Cameco Uranium Conversion Facilities Wastewater Treatment Plant Upgrade Air Quality Assessment

Conducted air quality assessment/modelling for a Uranium Conversion Facilities Wastewater Treatment Plant Upgrade and supported Environmental Compliance Approval application for a nuclear fuel bundles manufacturing plant in Ontario.

National Pollutant Release Inventory (NPRI) Annual Reporting and Annual Written Summary Reports

Prepared annual emission summary reports for annual NPRI reporting. Clients included Novelis Aluminum, Stelco Steel, Jungbunzlauer Canada, and EcoLab Inc. Tasks included data compilation and validation as well as report preparation.

Odour Assessment for Residential Development Projects on White Oaks Road, London, Ontario

Assessed the odour impacts at the proposed residential development from factories and workshops in the vicinity. Tasks included reviewing previous ESDM reports, conducting dispersion modelling and preparing the Emissions Summary Dispersion Model (ESDM) report. The AERMOD model was used in assessment.

Barrie-Simcoe Emergency Services Campus Emergency Generators

Conducted Air Quality Compliance Assessment with the AERMOD model for two on-site emergency generators. Prepared the Emissions Summary Dispersion Model (ESDM) in accordance with the guidelines developed by the Ministry of the Environment, Conservation and Parks.

Old Dundas Sewage Pumping Station Air Quality and Odor Assessment

Carried out air quality and odour dispersion modelling and assessment for the proposed emergency generator and Odour Control Unit (OCU). Played a key role in client and regulatory body collaboration during design phase. Also responsible for the Emissions Summary Dispersion Model (ESDM) report preparation. Air dispersion modelling was performed using the USEPA's AERMOD model.

Merrimack Valley Paediatric Asthma Study - Air Quality Consulting Services

Appointed by the Massachusetts Department of Health, conducted literature research and assisted in the air dispersion modelling task for stationary combustion sources in the Merrimack Valley Region. Emissions from municipal waste combustors and other stationary sources of air pollution have heightened concern about the health of residents living in the Merrimack Valley region in North-eastern Massachusetts.

Massachusetts Water Resource Authority (MWRA) Alewife Brook Pump Station Rehabilitation Project

The bypass system that was evaluated consisted of sixteen diesel driven pump sets with water-cooled diesel engines. The air quality assessment included identification of applicable regulations and criteria, an estimation of emissions from the diesel-powered bypass pump engines, a dispersion modelling analysis with AERMOD to estimate concentrations of criteria pollutants and odour impacts at sensitive receptors in the study area, and an assessment of potential mitigation measures.

Massachusetts Water Resources Authority (MWRA) The Upper Neponset Valley Relief Sewer Project

In response to residents' complaints, led the construction odour and noise investigation during construction phase of the project. Other tasks included proposing construction and operational odour mitigation measures to the contractor.

Air Quality/Odour and Human Health Risk Assessment for Crematoria Expansion Projects

Air Quality Team Leader for the project, led the air quality, odour, and human health risk assessments for two crematoria expansion projects in Hong Kong. The outcome of the study supported the compilation of Air Pollution Control Plans for air quality permit applications.

Training Courses:

- Industrial Waste Management – Hong Kong Productivity Council, 1995
- Odour Sampling, Measurement and Assessment – University of New South Wales. and Project Research Amsterdam BV, 1998
- Federal Highway Administration (FHWA) Webinar: Handbook for Estimating Transportation Greenhouse Gases for Integration into the Planning Process, 2015

Transportation Research Board (TRB) - Planning for Climate Change Adaptation at Airports, 2015

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