REPORT

DUFFERIN MILTON QUARRY EAST EXTENSION

TOWN OF MILTON, ONTARIO

AIR QUALITY ASSESSMENT
RWDI # 2102093
November 16, 2021

SUBMITTED TO

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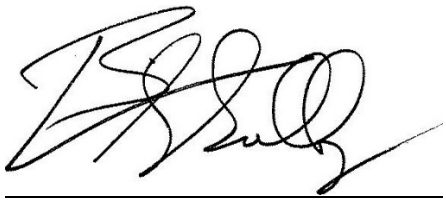

1 INTRODUCTION

RWDI was retained by CRH Canada Group Inc. ("CRH") to complete an air quality assessment in support of an Aggregate Resources Act (ARA) Class A License application for their proposed Milton Quarry East Extension ("MQEE") in the Town of Halton Hills, Ontario. This assessment quantifies and evaluates air quality impacts from the various air emission sources for the existing Milton Quarry and the proposed MQEE operations including aggregate extraction, hauling, processing, handling, shipping, and all associated equipment.

2 SITE DESCRIPTION & OPERATIONS

The existing Milton Quarry is located on Lots 7 through 14, Concession 7 in the Town of Milton, and Part Lots 9 and 10 Concession 1 in the Town of Halton Hills, including a previous extension located on Part of Lots 13, 14, Concession 1 in the Town of Halton Hills. The MQEE will be located east of the existing Milton Quarry, and south of the previous extension, and is located on Part of Lots 11 and 12, Concession 1, in the Town of Halton Hills.

The site has the capability of operating 24 hours per day. It is proposed that the MQEE will also have an unlimited annual extraction limit, however for the purposes of the air quality assessment, a maximum daily production scenario was developed in conjunction with CRH. This scenario reflects the reality of the equipment that is currently used, or will be used, at the existing Milton Quarry and MQEE.

In general, operations consist of site preparation, drilling blast holes, blasting, extraction of shot rock from the much pile and loading of haul rucks via front-end loader or excavator, hauling of shot rock from the muck pile to the processing plants, processing, transportation, washing, stockpiling, and shipping of finished aggregate. Portable processing plants used in the existing Milton Quarry and the MQEE will be powered by a diesel-fired generator. Stripping and rehabilitation activities will also occur throughout both sites, however these generally occur during periods of lower extraction during the shoulder seasons. In addition, extraction, processing, and shipping rates vary throughout the year, and this was included in the assessment.

Figure 1 illustrates the location and overall layout of the site.

Depending on the timing of the license, the operations will occur either under Scenario 1 or 2.

2.1 Scenario 1

In this scenario, operations in the MQEE will consist of site preparation, drilling blast holes, blasting, extraction of blasted material from the muck pile and loading of haul rucks via front-end loader or excavator, hauling of shot rock from the muck pile, and site rehabilitation. Material will be hauled back to the main processing area in the existing Milton Quarry for processing, stockpiling, and shipping. A portion of the material will be washed. Operations in the East Cell will wind down as the MQEE begins operation, with the only significant overlap being rehabilitation activities in the East Cell.

2.2 Scenario 2

In this scenario, the main processing area in the existing Milton Quarry will wind down. Processing in this area will consist only of one or two portable plants used to process recycled or material from under the main plant.

Operations in the MQEE will consist of site preparation, drilling blast holes, blasting, extraction of blasted material from the muck pile and loading of haul rucks via front-end loader or excavator, hauling of shot rock from the muck pile to the processing plants (located in both the East Cell), processing, transportation, washing, stockpiling, and shipping of finished aggregate. A portion of the material will be washed.

3 SENSITIVE RECEPTOR LOCATIONS

There are various rural homes located around the site, located on Nassagaweya 6th Line, 15 Side Road, Highway 25, and at the north end of Dublin Line and Tremaine Road. The closest is well over 1,000m from the MQEE. Regardless of distance, the closest residences around the Milton Quarry and MQEE were included in the assessment. **Figure 1** illustrates the location of the residential receptors included in the assessment.

4 CONTAMINANTS & SOURCES

The primary contaminant of interest is airborne dust generated by operations at the site, as follows:

- Suspended particulate matter (PM), consisting of particles with an aerodynamic diameter of 44 micrometres (µm) or less (known as TSP);
- Inhalable PM, consisting of particles with an aerodynamic diameter of 10 µm or less (PM_{10});
- Crystalline silica within the PM_{10} portion of the dust; and,
- Respirable PM, consisting of particles with an aerodynamic diameter of 2.5 µm or less ($PM_{2.5}$).

In addition to dust, on-site vehicles and heavy equipment also emit products of combustion. Nitrogen dioxide gas (NO_2), TSP, PM_{10}, and $PM_{2.5}$ were modelled as the key representatives of combustion products.

The potential sources of emissions in the existing Milton Quarry, Milton Quarry Extension, and MQEE are as follows:

- Overburden stripping and rehabilitation operations;
- Drilling, blasting, and extraction of shot rock from the muck pile;
- Material handling (loading haul and shipping trucks, dumping material at the processing plants);
- Material crushing, screening, washing, and stockpiling;
- Equipment travel over unpaved surfaces (front end loaders, haul trucks and highway trucks); and,
- Tailpipe emissions from on-site vehicles and heavy equipment.

Overburden stripping and rehabilitation operations do not occur during maximum production periods. These operations were therefore considered insignificant and not included in the assessment but are addressed through the Best Management Practice Plan for Fugitive Dust.

Figure 2 presents modelled source locations for operations in representative locations.

5 AIR QUALITY THRESHOLDS

This air quality assessment involves predicting maximum and average concentrations of the identified contaminants and comparing those predicted concentrations to thresholds that have been established either provincially or nationally. The relevant objectives are the Ontario Ambient Air Quality Criteria (AAQC) and the Canadian Ambient Air Quality Standards (CAAQS). Table 1 shows the applicable AAQC and CAAQS objectives.

6 EMISSION CALCULATIONS

Emissions were estimated in accordance with relevant guidance, using published emission factors. Detailed emission calculations are provided in the appendices to this report. The appendices contain details on assumptions, equipment types, sample calculations and other details that provide clarity as to RWDI's methodology. The emissions from sources that are wind-speed dependent (e.g., material handling) were calculated on an hour-by-hour basis, using the wind speed for each hour in the meteorological record. The emission values shown in the appendices for the wind-speed dependent emissions sources are example values, based on the average wind speed from the meteorological data. Emission calculations are provided in **Appendix A** through **Appendix E**.

7 DISCUSSION OF MITIGATION MEASURES

The volume of truck and heavy equipment movement on unpaved surfaces within some areas of the site require above-average level of control, especially when operations are near sensitive receptors.

The level of control used in the assessment for dust on the internal haul route is an outcome of the modelling, not an input assumption requiring justification. It represents the level of control found to be needed to achieve acceptable results at the nearest receptors. Published studies show that it is achievable. Rosbury (1985)[1] summarized results from various studies showing that levels of control as high as 98% were attained in some cases. Rosbury went on to prescribe a watering rate that would achieve near 100% control (approximately 1.7 L/m²/h). The U.S. EPA (AP-42, Chapter 13.2.2) showed that by maintaining a road surface moisture level of five times that of the ambient soil, a 95% level of control could be achieved. This finding of the studies is consistent with RWDI's experience in observing the effect of intensive watering programs. With respect to the paved road leading into the site, a combination of strict controls on surface silt and watering are required to ensure that potential impacts remain within acceptable levels. The Milton Quarry has a truck wash facility and uses a street sweeper to reduce the silt levels on the paved entrance route, while a water truck also flushes the paved surface. The combination of silt loading and 75% control efficiency reflects the strict application of these mitigation measures.

The final dispersion modelling analysis reflects the implementation of controls.

[1] Rosbury, Keith D. "Dust Control at Hazardous Waste Sites". Hazardous Waste Engineering Research Laboratory, Office of Research and Development, U.S. EPA. EPA/540/2-85/003,

8 ATMOSPHERIC DISPERSION MODELLING

The dispersion modelling was conducted to confirm that the proposed dust control recommendations will be sufficient to control off-site impacts at the sensitive impact locations. The modelling was conducted in accordance with the Ministry of the Environment, Conservation and Parks (MECP) Guideline A11: Air Dispersion Modelling Guideline for Ontario, using the U.S. EPA AERMOD dispersion model, version 19191. AERMOD assesses multiple sources of emissions at discrete off-site receptors and is the current state-of-the-art regulatory model accepted for use in Ontario by the MECP.

Regional meteorological data obtained from the MECP website were used within the model, in accordance with the MECP's Guideline A11. Specifically, the data were those applicable to the Central Ontario Region, for forested areas due to the significant forest cover in the area surrounding the site.

Terrain information for the site was also obtained from the MECP, in accordance with Guideline A11. Base elevations for sources within the site reflect the quarry floor or appropriate elevations as provided by the proponent.

The model was run using the regulatory default options, without the addition of the dry depletion algorithms for particulate matter. The AERMOD model produced 1-hour, 24-hour, and annual average concentrations, as appropriate for each contaminant. As a conservative simplification, all sources were modelled as operating over the entire year, when in fact extraction and processing operations do not occur for the entire year.

Handling and processing sources were generally modelled using volume sources, in accordance with guidance from the National Stone Sand and Gravel Association (NSSGA)[2]. Haul routes and heavy equipment movements were modelled using adjacent volume sources, in accordance with guidance from the MECP and NSSGA. Point sources were modelled using the appropriate source parameters. **Appendix F** provides a summary of the dispersion modelling input parameters.

The results predicted at all receptors are considered to be highly conservative due to the fact that all receptors are separated from the emission source's locations by dense forest, especially along the main haul routes, which are the major source of fugitive dust emissions from the facility. The AERMOD dispersion model does not take forest cover into account; however, studies have shown that dense vegetation along haul routes leads to a significant reduction in the transport of fugitive dust.[3] As a result, the predicted concentrations, which are already within acceptable levels, are expected to be overestimated.

The dispersion modelling files are available electronically upon request.

[2] National Stone Sand and Gravel Association, "Modeling Fugitive Dust Sources with AERMOD", January 2007.
[3] Cowherd, C. Jr. Transportability Assessment of PM Emissions. Midwest Research Institute Report, Kansas City, MO. 2008.

9 LOCAL EMISSION SOURCES

Environment Canada's National Pollutant Release Inventory (NPRI) is Canada's legislated, publicly accessible inventory of pollutant releases. Data for 2019 (the most recent available at the time of this report) were reviewed for locally significant emission sources that would have similar emission profiles to the site. There are four (4) facilities reporting emissions to NPRI within five (5) kilometres of the site, including the existing Milton Quarry.

- Magna Structural Systems Inc., Modatek Systems on Chisholm Drive, an automotive crane, axle, and frame manufacturing facility, consisting of hydroforming; metal welding; laser and plasma cutting; acid pickling; e-coating and curing; and wax application. Reported emissions from this facility in common with the MQEE emissions are PM_{10} and $PM_{2.5}$. There are no tall stacks at this facility however, so there is not expected to be any significant cumulative impacts at receptors near the MQEE.
- Versacold Logistics on Holgate Crescent, which does not report any emissions that are in common with those emitted by the MQEE.
- Recochem Inc. on Holgate Crescent, which does not report any emissions that are in common with those emitted by the MQEE.

With respect to other aggregate operations near the subject site, impacts from such operations are more localized, and, in RWDI's experience, are typically indistinguishable from regional background air quality levels at distances beyond one (1) kilometer. As a conservative measure, RWDI used two (2) kilometres for this review. The Ministry of Natural Resources and Forestry (MNRF) Pits and Quarries Online tool, as well as aerial photography for the area, was used to identify other aggregate operations. There are no licensed sites located within two (2) kilometres of the site. In fact, there are no licensed sites located within five (5) kilometres of the site, with the closest being the CRH Acton Quarry, the closest part of which is over five (5) kilometres from the extreme northern boundary of the previous Milton Quarry extension.

With respect to the lack of other aggregate operations in the area, the combination of size and distance indicates that a reasonable background air quality estimate will also provide a sufficient estimate of cumulative impacts.

The only significant local source of emissions is Highway 401, which is located over four (4) kilometres from the MQEE. RWDI's experience in conducting Class Environmental Assessments for highways indicates that air quality impacts due to emissions from highways decrease rapidly with distance. However, since several residential receptors are located less than two (2) kilometres from the highway, the highway was included as a local source of emissions for the purposes of establishing a potential background air quality environment.

10 BACKGROUND AIR QUALITY

Background ambient air monitoring data was used in conjunction with the emissions from the proposed operations. For the purposes of this assessment, 90th percentile background concentrations of particulate matter, nitrogen dioxide, and ozone were obtained from the MECP Brampton monitoring station at 525 Main Street North, in Brampton (MECP Station 46089). This data is provided in **Table 2**. TSP and PM_{10} were estimated from station-measured $PM_{2.5}$ data using factors derived from the analysis of extensive monitoring data from other sites, as presented by the 2004 report by Lall et. al.[4]. Silica was estimated using published data for cities in the northeast United States.[5].

The use of historical data from a representative monitoring station operated by the MECP somewhere in the surrounding region is a widely accepted approach to estimating background air quality conditions. In the present case, the most representative station would be one that is in a rural, forested location near a major highway, with no other significant industries nearby. There are no such monitoring stations operating anywhere in Ontario.

As noted previously, Highway 401 was considered to influence the local air quality environment. The MECP monitoring station in Brampton is located at a similar distance from Highway 404 but is in a heavily urbanized environment compared to the area around the MQEE. Data from this station is therefore expected to be highly conservative, providing an overestimation of background concentrations of all contaminants.

[4] Lall, R., M. Kendall, K. Ito, and G. D. Thurston (2004). Estimation of Historical Annual $PM_{2.5}$ Exposures for Health Effects Assessments, Atmos. Env., 38, pp. 5217-5226.
[5] United States Environmental Protection Agency (1996). Ambient Levels and Noncancer Health effects of Inhaled Crystalline Silica and Amorphous Silica: Health Issue Assessment. EPA/600/R-95-115.

11 CHEMICAL REACTIONS AMONG CONTAMINANTS

The only chemical reaction among the emitted contaminants of relevance to local air quality impacts is the conversion of nitric oxide (NO) to nitrogen dioxide (NO_2). Oxides of nitrogen (NO_X) emitted in diesel exhaust are composed primarily of NO. However, once the exhaust is emitted to the atmosphere and begins to mix with outside air, some of the NO is oxidized in reactions with other contaminants, principally ground-level ozone (O_3), to produce NO_2. This is important to the cumulative effects assessment, as the criteria used in this assessment apply only to NO_2, which has a much greater toxicity than NO.

The Ozone Limiting Method (OLM) was used in the cumulative effects assessment to estimate the maximum short-term NO_2 concentrations resulting from emissions of NO_X. The OLM assumes that the conversion of NO to NO_2 is limited only by the amount of O_3 present in the outside air. If the concentration of available O_3 is less than that of the NO contributed by the modelled roadway emissions, then the portion of NO that is converted to NO_2 equals the available O_3. If the concentration of available O_3 exceeds that of the NO contributed by the modelled roadway, then all NO is assumed to be converted to NO_2.

This calculation is performed within the AERMOD dispersion model. A simplified version of the OLM was used to estimate the short-term concentration of NO_2 resulting from emissions of NOX. Concentrations of NO_X predicted by AERMOD are converted to NO_2 based on the background ozone concentration. To represent background ozone conditions, 99th percentile ozone concentrations by hour of day were derived from measurements recorded by the MECP at the Newmarket monitoring station. The portion of emitted total NO_X that is already in the form of NO_2 before exiting the tailpipe was estimated to be 10%.

12 RESULTS

12.1 Scenario 1

The results of the Scenario 1 assessment are presented in **Table 3**. Maximum predicted concentrations from the proposed extension are below the relevant criteria for all contaminants at the modelled receptors. When the 90th percentile background concentration from the MECP Brampton ambient monitoring station was added to the predicted impacts from operations at the proposed extension, the cumulative concentrations remain below the relevant criteria at all receptor locations.

12.2 Scenario 2

The results of the Scenario 2 assessment are presented in **Table 4**. As with Scenario 1, maximum predicted concentrations from the proposed extension are below the relevant criteria for all contaminants at the modelled receptors. When the 90th percentile background concentration from the MECP Brampton ambient monitoring station was added to the predicted impacts from operations at the proposed extension, the cumulative concentrations remain below the relevant criteria at all receptor locations.

13 RECOMMENDATIONS

The MQEE must operate in accordance with the operating standards pertaining to dust outlined in section 0.12 (2) Ontario Regulation 244/97, which include:

- The licensee or permittee shall apply water or another provincially approved dust suppressant to internal haul roads and processing areas, as necessary to mitigate dust, if the pit or quarry is located within 1,000 metres of a sensitive receptor.
- The licensee or permittee shall equip any processing equipment that creates dust with dust suppressing or collection devices if it is located within 300 metres of a sensitive receptor.
- The licensee or permittee shall obtain an environmental compliance approval under the Environmental Protection Act where required to carry out operations at the pit or quarry.

Furthermore, this assessment is based on the following recommendation, which is to be included on the Site Plans:

- The site will operate in accordance with CRH's Dust Control Work Instruction, which functions as a Best Management Practices Plan for fugitive dust, which may be amended from time to time, considering actual impacts and operational considerations. The recommendations in the Work Instruction are based on the maximum daily production rates. At lower production rates, the control measures specified in the Dust Control Work Instruction can be reduced accordingly, provided dust remains mitigated on site.

14 RECOMMENDED MANAGEMENT PRACTICES

RWDI recommends the following mitigation measures be incorporated into the Dust Control Work Instruction:

14.1 Portable Processing Plant

- The portable processing plants shall be equipped with a water spray system.
- Watering rate will be set as needed to suppress visible dust.
- If the natural moisture content of the virgin aggregate is sufficiently high, watering may not be required.
- During wet conditions (rain, drizzle, or fog), watering may not be required.
- For screenings and other high-fines materials, stackers will be kept as close to the tops of stockpiles as is feasible, to achieve a drop height of approximately 1m or less.

14.2 Unpaved Haul Roads

- Unpaved roads at the Milton Quarry and MQEE are watered using a water truck. The application of water to the unpaved roads will be dependent on weather conditions and the amount of aggregate material on the paved road surface at the Quarry. Water shall not be applied to the roads when temperatures are below, or predicted to fall below, 4°C.
- The watering system shall be designed to deliver the water evenly over the haul route surface and shall have the capacity to deploy water on all active haul routes at a rate of at least 1.5 L/m²/hour.
- Site staff will conduct visual inspections of the unpaved roads for dust emissions and the opacity of the dust emissions on a daily basis. If there is a significant amount of dust being emitted and/or the dust being emitted is of a high opacity, the water truck will be implemented.
- A speed limit of 25 km/h on all on-site roads shall be posted near the site entrance. Haul truck and highway truck operators will be directed to observe the speed limit.

14.3 Paved Haul Roads – General

- The site is equipped with a truck wash station. The truck wash station shall be used except when temperatures fall below 4°C.
- The Milton Quarry's paved roads are washed using a water truck. The application of water to the paved roads will be dependent on weather conditions and the amount of aggregate material on the paved road surface at the Quarry. Water shall not be applied to the roads when temperatures are below, or predicted to fall below, 4°C.
- The water truck will not be employed on days where there is significant precipitation occurring or insignificant fugitive dust emissions being generated from paved roads. Dust suppression using a water truck involves water being sprayed directly onto the paved road from a spray bar located on the back of the truck.
- During the winter months (December to March), the water truck will not be used on paved roads due to operational constraints and safety concerns as a result of cold/freezing temperatures.

- A mobile sweeper unit shall also be employed throughout the year to complement dust mitigation activities for the on-site paved roads and off-site paved roads adjacent to the quarry. Site staff will conduct visual inspections of the paved roads for dust emissions and the opacity of the dust emissions on a daily basis and will conduct visual inspections of the on-site paved roads and adjacent off-site paved roads for gravel material at least once a week. If there is a significant amount of gravel material on the road, the sweeper will be implemented. If there is a significant amount of dust being emitted and/or the dust emitted is of a high opacity, the water truck and/or the sweeper will be implemented.
- A speed limit of 25 km/h on all on-site roads shall be posted near the site entrance. Haul truck and highway truck operators will be directed to observe the speed limit.
- Visual inspections of the paved roads for maintenance (i.e., fixing potholes) will be conducted on a monthly basis. Road maintenance involves placing material (i.e., asphalt, aggregates, etc.) into the potholes to level the surface of the road.

15 CONCLUSIONS

Based on these conservative modelling results, the predicted impacts associated with the proposed MQEE will remain below the relevant air quality criteria at all receptors. As a result, the MQEE will not result in any adverse impact to surrounding sensitive receptors, with appropriate mitigation measures in place.

TABLES

Table 1: Relevant Air Quality Thresholds

Contaminant	Averaging Period	Numerical Value ($\mu g/m^3$)	Statistical Form
Ontario Ambient Air Quality Criteria			
TSP	24 hours	120	none specified
	Annual	60	none specified
PM_{10}	24 hours	50	none specified
Silica (in PM_{10})	24 hours	5	none specified
NO_2	1 hour	400	none specified
	24 hours	200	none specified
Canadian Ambient Air Quality Standard			
$PM_{2.5}$ (2020)	24 hours [1]	27	The 3-year average of the annual 98th percentile of the daily 24-hour average concentrations.
	Annual [2]	8.8	The 3-year average of the annual average concentrations.

Table 2: Ambient Air Quality Data [1]

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Year	TSP [2]		PM_{10} [2]	Silica	$PM_{2.5}$		NO_2 [4]						O_3 [4]	
	90th Percentile 24-hour (µg/m³)	Annual Average (µg/m³)	90th Percentile 24-hour (µg/m³)	90th Percentile 24-hour (µg/m³)	90th Percentile 24-hour (µg/m³)	Annual Average (µg/m³)	90th Percentile 1-Hour		90th Percentile 24-Hour		Annual Average		99th Percentile 1-Hour	
							(ppb)	(µg/m³)	(ppb)	(µg/m³)	(ppb)	(µg/m³)	(ppb)	(µg/m³)
2016	43	23	24	1.4	13	6.8	23	46	20.0	40	10	19	64	132
2017	43	23	24	1.4	13	7.0	20	40	16.7	33	8	16	60	124
2018	47	24	26	1.6	14	7.3	19	37	15.6	31	8	16	64	132
2019	47	23	26	1.6	14	6.8	20	39	16.4	33	9	17	55	114
2020	43	22	24	1.4	13	6.6	16	31	13.4	27	7	13	62	128
Average	45	23	25	1.5	13	6.9	20	39	16	33	8	16	61	126

Notes:

[1] All data from MECP Station 46089 in Brampton, Ontario, downloaded from http://www.airqualityontario.com/history/

[2] Estimated from $PM_{2.5}$ measurements using published factors (Lall et al., 2004)

[3] Estimated as 6% of PM_{10}, from published data for cities in the northeast US (U.S. EPA, 1996)

[4] Conversion from ppb to µg/m³ based on 10°C

Table 3: Cumulative Effects Assessment - Scenario 1

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Modelled Values & Frequency of Excursions above the Relevant Criteria

Days of Valid Meteorological Data: 1745

Relevant Criteria:			
	TSP	120	µg/m³ 24-Hour AAQC
		60	µg/m³ Annual AAQC
	PM_{10}	50	µg/m³ Interim AAQC
	$PM_{2.5}$	27	µg/m³ 24-Hour CAAQS
		8.8	µg/m³ Annual CAAQS
	Silica	5	µg/m³ AAQC
	NO_2	400	µg/m³ 1-Hour AAQC
		200	µg/m³ 24-Hour AAQC

Background Concentrations (90th Percentile, all except O_3) (O_3 99th percentile)			
	TSP	45	µg/m³ (24-hour)
		23	µg/m³ (Annual)
	PM_{10}	25	µg/m³ (24-hour)
	$PM_{2.5}$	13	µg/m³ (24-hour)
		6.9	µg/m³ (Annual)
	Silica	1.5	µg/m³ (24-hour)
	NO_2	39	µg/m³ (1-hour)
		33	µg/m³ (24-hour)
	O_3	126	µg/m³ (1-hour)

Receptor		UTM Coordinates		Contaminant	Averaging Period	With No Background Concentration				With Additional Background Concentrations			
ID	Type	X (m)	Y (m)		(hours)	Maximum Predicted 24-Hour Concentration (µg/m³)	Percentage of Revelant Criteria (%)	Number of Predicted Excursions Above Criteria over 5 Years	Frequency of Predicted Excursions Above Criteria (%)	Maximum Predicted 24-Hour Concentration (µg/m³)	Percentage of Revelant Criteria (%)	Number of Predicted Excursions Above Criteria over 5 Years	Frequency of Predicted Excursions Above Criteria (%)
R01	Residence	584035	4824155	TSP	24	32	26%	0	0.0%	77	64%	0	0.0%
					Annual	2	3%	0	0.0%	25	42%	0	0.0%
				PM10	24	19	38%	0	0.0%	44	88%	0	0.0%
				PM2.5	24	3	13%	0	0.0%	16	61%	0	0.0%
					Annual	0	2%	0	0.0%	7	81%	0	0.0%
				Silica	24	0	7%	0	0.0%	1.9	37%	0	0.0%
				NO2	1	114	28%	0	0.0%	153	38%	0	0.0%
					24	19	10%	0	0.0%	52	26%	0	0.0%
R02	Residence	584228	4823982	TSP	24	26	22%	0	0.0%	71	60%	0	0.0%
					Annual	2	4%	0	0.0%	25	42%	0	0.0%
				PM10	24	15	31%	0	0.0%	40	81%	0	0.0%
				PM2.5	24	3	11%	0	0.0%	16	59%	0	0.0%
					Annual	0	2%	0	0.0%	7	81%	0	0.0%
				Silica	24	0	6%	0	0.0%	1.8	36%	0	0.0%
				NO2	1	103	26%	0	0.0%	142	35%	0	0.0%
					24	16	8%	0	0.0%	49	24%	0	0.0%
R03	Residence	584607	4823321	TSP	24	29	24%	0	0.0%	74	61%	0	0.0%
					Annual	3	5%	0	0.0%	26	43%	0	0.0%
				PM10	24	16	31%	0	0.0%	41	81%	0	0.0%
				PM2.5	24	3	11%	0	0.0%	16	59%	0	0.0%
					Annual	0	3%	0	0.0%	7	81%	0	0.0%
				Silica	24	0	6%	0	0.0%	1.8	36%	0	0.0%
				NO2	1	103	26%	0	0.0%	142	35%	0	0.0%
					24	18	9%	0	0.0%	51	25%	0	0.0%

Receptor		UTM Coordinates		Contaminant	Averaging Period	With No Background Concentration				With Additional Background Concentrations			
ID	Type	X (m)	Y (m)		(hours)	Maximum Predicted 24-Hour Concentration (µg/m³)	Percentage of Revelant Criteria (%)	Number of Predicted Excursions Above Criteria over 5 Years	Frequency of Predicted Excursions Above Criteria (%)	Maximum Predicted 24-Hour Concentration (µg/m³)	Percentage of Revelant Criteria (%)	Number of Predicted Excursions Above Criteria over 5 Years	Frequency of Predicted Excursions Above Criteria (%)
R04	Residence	584734	4822088	TSP	24	45	38%	0	0.0%	90	75%	0	0.0%
					Annual	8	13%	0	0.0%	31	51%	0	0.0%
				PM10	24	26	51%	0	0.0%	51	**101%**	**3**	**0.2%**
				PM2.5	24	5	17%	0	0.0%	18	65%	0	0.0%
					Annual	1	8%	0	0.0%	8	86%	0	0.0%
				Silica	24	0	10%	0	0.0%	2.0	40%	0	0.0%
				NO2	1	130	33%	0	0.0%	169	42%	0	0.0%
					24	33	16%	0	0.0%	66	33%	0	0.0%
R05	Residence	584832	4821596	TSP	24	86	72%	0	0.0%	131	**109%**	**2**	**0.1%**
					Annual	13	21%	0	0.0%	36	59%	0	0.0%
				PM10	24	54	**108%**	**2**	**0.1%**	79	**158%**	**16**	**0.9%**
				PM2.5	24	10	35%	0	0.0%	23	83%	0	0.0%
					Annual	1	13%	0	0.0%	8	91%	0	0.0%
				Silica	24	1	21%	0	0.0%	2.5	51%	0	0.0%
				NO2	1	135	34%	0	0.0%	174	44%	0	0.0%
					24	48	24%	0	0.0%	81	41%	0	0.0%
R06	Residence	584898	4821564	TSP	24	85	71%	0	0.0%	130	**109%**	**2**	**0.1%**
					Annual	12	20%	0	0.0%	35	58%	0	0.0%
				PM10	24	53	**107%**	**1**	**0.1%**	78	**157%**	**16**	**0.9%**
				PM2.5	24	9	35%	0	0.0%	22	83%	0	0.0%
					Annual	1	12%	0	0.0%	8	90%	0	0.0%
				Silica	24	1	21%	0	0.0%	2.5	51%	0	0.0%
				NO2	1	136	34%	0	0.0%	175	44%	0	0.0%
					24	49	25%	0	0.0%	82	41%	0	0.0%
R07	Residence	585418	4820889	TSP	24	60	50%	0	0.0%	105	87%	0	0.0%
					Annual	10	17%	0	0.0%	33	55%	0	0.0%
				PM10	24	27	54%	0	0.0%	52	**104%**	**1**	**0.1%**
				PM2.5	24	5	20%	0	0.0%	18	68%	0	0.0%
					Annual	1	8%	0	0.0%	8	86%	0	0.0%
				Silica	24	1	10%	0	0.0%	2.0	40%	0	0.0%
				NO2	1	134	33%	0	0.0%	173	43%	0	0.0%
					24	32	16%	0	0.0%	65	32%	0	0.0%
R08	Residence	584996	4820359	TSP	24	54	45%	0	0.0%	99	82%	0	0.0%
					Annual	10	17%	0	0.0%	33	55%	0	0.0%
				PM10	24	26	52%	0	0.0%	51	**102%**	**1**	**0.1%**
				PM2.5	24	5	17%	0	0.0%	18	65%	0	0.0%
					Annual	1	8%	0	0.0%	8	87%	0	0.0%
				Silica	24	1	10%	0	0.0%	2.0	40%	0	0.0%
				NO2	1	125	31%	0	0.0%	164	41%	0	0.0%
					24	25	13%	0	0.0%	58	29%	0	0.0%

Receptor		UTM Coordinates		Contaminant	Averaging Period	With No Background Concentration				With Additional Background Concentrations			
ID	Type	X (m)	Y (m)		(hours)	Maximum Predicted 24-Hour Concentration (µg/m³)	Percentage of Revelant Criteria (%)	Number of Predicted Excursions Above Criteria over 5 Years	Frequency of Predicted Excursions Above Criteria (%)	Maximum Predicted 24-Hour Concentration (µg/m³)	Percentage of Revelant Criteria (%)	Number of Predicted Excursions Above Criteria over 5 Years	Frequency of Predicted Excursions Above Criteria (%)
R09	Rental property owned by CRH	583436	4820134	TSP	24	53	44%	0	0.0%	98	82%	0	0.00%
					Annual	4	7%	0	0.0%	27	46%	0	0.0%
				PM10	24	35	70%	0	0.0%	60	**120%**	**6**	**0.34%**
				PM2.5	24	6	21%	0	0.0%	19	69%	0	0.0%
					Annual	0	5%	0	0.0%	7	83%	0	0.0%
				Silica	24	1	14%	0	0.0%	2.2	44%	0	0.0%
				NO2	1	137	34%	0	0.0%	176	44%	0	0.0%
					24	24	12%	0	0.0%	57	28%	0	0.0%
R10	Residence	581725	4821620	TSP	24	41	34%	0	0.0%	86	72%	0	0.0%
					Annual	3	4%	0	0.0%	26	43%	0	0.0%
				PM10	24	25	51%	0	0.0%	50	**101%**	**1**	**0.1%**
				PM2.5	24	5	17%	0	0.0%	18	65%	0	0.0%
					Annual	0	3%	0	0.0%	7	81%	0	0.0%
				Silica	24	0	10%	0	0.0%	2.0	40%	0	0.0%
				NO2	1	136	34%	0	0.0%	175	44%	0	0.0%
					24	21	11%	0	0.0%	54	27%	0	0.0%
R11	Residence	581589	4821662	TSP	24	36	30%	0	0.0%	81	68%	0	0.0%
					Annual	2	4%	0	0.0%	25	42%	0	0.0%
				PM10	24	22	44%	0	0.0%	47	94%	0	0.0%
				PM2.5	24	4	15%	0	0.0%	17	63%	0	0.0%
					Annual	0	3%	0	0.0%	7	81%	0	0.0%
				Silica	24	0	8%	0	0.0%	1.9	38%	0	0.0%
				NO2	1	135	34%	0	0.0%	174	44%	0	0.0%
					24	22	11%	0	0.0%	55	27%	0	0.0%
R12	Residence	581519	4821803	TSP	24	56	47%	0	0.0%	101	84%	0	0.0%
					Annual	2	4%	0	0.0%	25	42%	0	0.0%
				PM10	24	35	70%	0	0.0%	60	**120%**	**1**	**0.1%**
				PM2.5	24	6	23%	0	0.0%	19	71%	0	0.0%
					Annual	0	3%	0	0.0%	7	81%	0	0.0%
				Silica	24	1	14%	0	0.0%	2.2	44%	0	0.0%
				NO2	1	117	29%	0	0.0%	156	39%	0	0.0%
					24	25	13%	0	0.0%	58	29%	0	0.0%
R13	Residence	581594	4821943	TSP	24	43	36%	0	0.0%	88	73%	0	0.0%
					Annual	3	4%	0	0.0%	26	43%	0	0.0%
				PM10	24	27	55%	0	0.0%	52	**105%**	**2**	**0.1%**
				PM2.5	24	5	18%	0	0.0%	18	66%	0	0.0%
					Annual	0	3%	0	0.0%	7	81%	0	0.0%
				Silica	24	1	11%	0	0.0%	2.0	41%	0	0.0%
				NO2	1	135	34%	0	0.0%	174	44%	0	0.0%
					24	26	13%	0	0.0%	59	29%	0	0.0%

Receptor		UTM Coordinates		Contaminant	Averaging Period	With No Background Concentration				With Additional Background Concentrations			
ID	Type	X (m)	Y (m)		(hours)	Maximum Predicted 24-Hour Concentration (µg/m³)	Percentage of Revelant Criteria (%)	Number of Predicted Excursions Above Criteria over 5 Years	Frequency of Predicted Excursions Above Criteria (%)	Maximum Predicted 24-Hour Concentration (µg/m³)	Percentage of Revelant Criteria (%)	Number of Predicted Excursions Above Criteria over 5 Years	Frequency of Predicted Excursions Above Criteria (%)
R14	Rental property owned by CRH	581523	4822032	TSP	24	42	35%	0	0.0%	87	73%	0	0.0%
					Annual	2	4%	0	0.0%	25	42%	0	0.0%
				PM10	24	27	54%	0	0.0%	52	**104%**	**2**	**0.1%**
				PM2.5	24	5	18%	0	0.0%	18	66%	0	0.0%
					Annual	0	3%	0	0.0%	7	81%	0	0.0%
				Silica	24	1	11%	0	0.0%	2.0	41%	0	0.0%
				NO2	1	135	34%	0	0.0%	174	43%	0	0.0%
					24	22	11%	0	0.0%	55	28%	0	0.0%
R15	Rental property owned by CRH	581575	4822346	TSP	24	52	43%	0	0.0%	97	81%	0	0.0%
					Annual	3	4%	0	0.0%	26	43%	0	0.0%
				PM10	24	31	61%	0	0.0%	56	**111%**	**3**	**0.2%**
				PM2.5	24	5	20%	0	0.0%	18	68%	0	0.0%
					Annual	0	3%	0	0.0%	7	81%	0	0.0%
				Silica	24	1	12%	0	0.0%	2.1	42%	0	0.0%
				NO2	1	135	34%	0	0.0%	174	43%	0	0.0%
					24	25	12%	0	0.0%	58	29%	0	0.0%
R16	Residence	581153	4822487	TSP	24	46	39%	0	0.0%	91	76%	0	0.0%
					Annual	2	3%	0	0.0%	25	42%	0	0.0%
				PM10	24	26	53%	0	0.0%	51	**103%**	**1**	**0.1%**
				PM2.5	24	5	17%	0	0.0%	18	65%	0	0.0%
					Annual	0	2%	0	0.0%	7	80%	0	0.0%
				Silica	24	1	10%	0	0.0%	2.0	40%	0	0.0%
				NO2	1	118	30%	0	0.0%	157	39%	0	0.0%
					24	20	10%	0	0.0%	53	27%	0	0.0%
R17	Residence	581509	4822941	TSP	24	41	34%	0	0.0%	86	71%	0	0.0%
					Annual	2	4%	0	0.0%	25	42%	0	0.0%
				PM10	24	21	43%	0	0.0%	46	93%	0	0.0%
				PM2.5	24	4	14%	0	0.0%	17	62%	0	0.0%
					Annual	0	2%	0	0.0%	7	81%	0	0.0%
				Silica	24	0	8%	0	0.0%	1.9	38%	0	0.0%
				NO2	1	125	31%	0	0.0%	164	41%	0	0.0%
					24	17	8%	0	0.0%	50	25%	0	0.0%
R18	Residence	581462	4823494	TSP	24	40	34%	0	0.0%	85	71%	0	0.0%
					Annual	2	3%	0	0.0%	25	42%	0	0.0%
				PM10	24	25	49%	0	0.0%	50	99%	0	0.0%
				PM2.5	24	4	15%	0	0.0%	17	63%	0	0.0%
					Annual	0	2%	0	0.0%	7	80%	0	0.0%
				Silica	24	0	10%	0	0.0%	2.0	40%	0	0.0%
				NO2	1	134	34%	0	0.0%	173	43%	0	0.0%
					24	16	8%	0	0.0%	49	25%	0	0.0%

Receptor		UTM Coordinates		Contaminant	Averaging Period	With No Background Concentration				With Additional Background Concentrations			
ID	Type	X (m)	Y (m)		(hours)	Maximum Predicted 24-Hour Concentration (µg/m³)	Percentage of Revelant Criteria (%)	Number of Predicted Excursions Above Criteria over 5 Years	Frequency of Predicted Excursions Above Criteria (%)	Maximum Predicted 24-Hour Concentration (µg/m³)	Percentage of Revelant Criteria (%)	Number of Predicted Excursions Above Criteria over 5 Years	Frequency of Predicted Excursions Above Criteria (%)
R19	Residence	581458	4823569	TSP	24	37	31%	0	0.0%	82	69%	0	0.0%
					Annual	2	3%	0	0.0%	25	41%	0	0.0%
				PM10	24	22	44%	0	0.0%	47	94%	0	0.0%
				PM2.5	24	4	14%	0	0.0%	17	62%	0	0.0%
					Annual	0	2%	0	0.0%	7	80%	0	0.0%
				Silica	24	0	9%	0	0.0%	1.9	39%	0	0.0%
				NO2	1	135	34%	0	0.0%	174	43%	0	0.0%
					24	17	9%	0	0.0%	50	25%	0	0.0%
R20	Rental property owned by CRH	581626	4823527	TSP	24	34	28%	0	0.0%	79	66%	0	0.0%
					Annual	2	4%	0	0.0%	25	42%	0	0.0%
				PM10	24	18	37%	0	0.0%	43	87%	0	0.0%
				PM2.5	24	3	11%	0	0.0%	16	59%	0	0.0%
					Annual	0	2%	0	0.0%	7	81%	0	0.0%
				Silica	24	0	7%	0	0.0%	1.9	37%	0	0.0%
				NO2	1	135	34%	0	0.0%	174	43%	0	0.0%
					24	19	10%	0	0.0%	52	26%	0	0.0%
R21	Residence	581570	4823893	TSP	24	35	29%	0	0.0%	80	67%	0	0.0%
					Annual	2	3%	0	0.0%	25	41%	0	0.0%
				PM10	24	18	35%	0	0.0%	43	85%	0	0.0%
				PM2.5	24	3	11%	0	0.0%	16	59%	0	0.0%
					Annual	0	2%	0	0.0%	7	80%	0	0.0%
				Silica	24	0	7%	0	0.0%	1.8	37%	0	0.0%
				NO2	1	137	34%	0	0.0%	176	44%	0	0.0%
					24	19	10%	0	0.0%	52	26%	0	0.0%
R22	Residence	581865	4824212	TSP	24	54	45%	0	0.0%	99	82%	0	0.0%
					Annual	2	3%	0	0.0%	25	41%	0	0.0%
				PM10	24	29	57%	0	0.0%	54	**107%**	**1**	**0.06%**
				PM2.5	24	4	16%	0	0.0%	17	64%	0	0.0%
					Annual	0	2%	0	0.0%	7	80%	0	0.0%
				Silica	24	1	11%	0	0.0%	2.1	41%	0	0.0%
				NO2	1	137	34%	0	0.0%	176	44%	0	0.0%
					24	21	11%	0	0.0%	54	27%	0	0.0%
R23	Residence	581748	4824244	TSP	24	51	43%	0	0.0%	96	80%	0	0.0%
					Annual	2	3%	0	0.0%	25	41%	0	0.0%
				PM10	24	27	54%	0	0.0%	52	**104%**	**1**	**0.1%**
				PM2.5	24	4	15%	0	0.0%	17	63%	0	0.0%
					Annual	0	2%	0	0.0%	7	80%	0	0.0%
				Silica	24	1	10%	0	0.0%	2.0	40%	0	0.0%
				NO2	1	138	34%	0	0.0%	177	44%	0	0.0%
					24	21	10%	0	0.0%	54	27%	0	0.0%

Receptor		UTM Coordinates		Contaminant	Averaging Period	With No Background Concentration				With Additional Background Concentrations			
ID	Type	X (m)	Y (m)		(hours)	Maximum Predicted 24-Hour Concentration (µg/m³)	Percentage of Revelant Criteria (%)	Number of Predicted Excursions Above Criteria over 5 Years	Frequency of Predicted Excursions Above Criteria (%)	Maximum Predicted 24-Hour Concentration (µg/m³)	Percentage of Revelant Criteria (%)	Number of Predicted Excursions Above Criteria over 5 Years	Frequency of Predicted Excursions Above Criteria (%)
R24	Residence	581692	4824333	TSP	24	47	39%	0	0.0%	92	76%	0	0.0%
					Annual	2	3%	0	0.0%	25	41%	0	0.0%
				PM10	24	24	49%	0	0.0%	49	99%	0	0.0%
				PM2.5	24	4	14%	0	0.0%	17	62%	0	0.0%
					Annual	0	2%	0	0.0%	7	80%	0	0.0%
				Silica	24	0	9%	0	0.0%	2.0	39%	0	0.0%
				NO2	1	136	34%	0	0.0%	175	44%	0	0.0%
					24	19	10%	0	0.0%	52	26%	0	0.0%

Notes:

Values in bold indicate excursions above the relevant crtieria

Table 4: Cumulative Effects Assessment - Scenario 2

RWDI# 2102093

Modelled Values & Frequency of Excursions above the Relevant Criteria

Days of Valid Meteorological Data: 1745

Relevant Criteria:			
	TSP	120	µg/m³ 24-Hour AAQC
		60	µg/m³ Annual AAQC
	PM_{10}	50	µg/m³ Interim AAQC
	$PM_{2.5}$	27	µg/m³ 24-Hour CAAQS
		8.8	µg/m³ Annual CAAQS
	Silica	5	µg/m³ AAQC
	NO_2	400	µg/m³ 1-Hour AAQC
		200	µg/m³ 24-Hour AAQC

Background Concentrations (90th Percentile, all except O_3) (O_3 99th percentile)			
	TSP	45	µg/m³ (24-hour)
		23	µg/m³ (Annual)
	PM_{10}	25	µg/m³ (24-hour)
	$PM_{2.5}$	13	µg/m³ (24-hour)
		6.9	µg/m³ (Annual)
	Silica	1.5	µg/m³ (24-hour)
	NO_2	39	µg/m³ (1-hour)
		33	µg/m³ (24-hour)
	O_3	126	µg/m³ (1-hour)

Receptor		UTM Coordinates		Contaminant	Averaging Period	With No Background Concentration				With Additional Background Concentrations			
ID	Type	X (m)	Y (m)		(hours)	Maximum Predicted 24-Hour Concentration (µg/m³)	Percentage of Revelant Criteria (%)	Number of Predicted Excursions Above Criteria over 5 Years	Frequency of Predicted Excursions Above Criteria (%)	Maximum Predicted 24-Hour Concentration (µg/m³)	Percentage of Revelant Criteria (%)	Number of Predicted Excursions Above Criteria over 5 Years	Frequency of Predicted Excursions Above Criteria (%)
R01	Residence	584035	4824155	TSP	24	37	31%	0	0.0%	82	68%	0	0.0%
					Annual	4	6%	0	0.0%	27	44%	0	0.0%
				PM10	24	21	41%	0	0.0%	46	91%	0	0.0%
				PM2.5	24	4	16%	0	0.0%	17	64%	0	0.0%
					Annual	1	14%	0	0.0%	8	92%	0	0.0%
				Silica	24	1	27%	0	0.0%	2.9	57%	0	0.0%
				NO2	1	135	34%	0	0.0%	174	43%	0	0.0%
					24	20	10%	0	0.0%	53	27%	0	0.0%
R02	Residence	584228	4823982	TSP	24	29	24%	0	0.0%	74	62%	0	0.0%
					Annual	4	6%	0	0.0%	27	44%	0	0.0%
				PM10	24	16	31%	0	0.0%	41	81%	0	0.0%
				PM2.5	24	4	14%	0	0.0%	17	62%	0	0.0%
					Annual	1	14%	0	0.0%	8	92%	0	0.0%
				Silica	24	1	26%	0	0.0%	2.8	56%	0	0.0%
				NO2	1	134	34%	0	0.0%	173	43%	0	0.0%
					24	22	11%	0	0.0%	55	27%	0	0.0%
R03	Residence	584607	4823321	TSP	24	39	33%	0	0.0%	84	70%	0	0.0%
					Annual	4	7%	0	0.0%	27	45%	0	0.0%
				PM10	24	20	40%	0	0.0%	45	90%	0	0.0%
				PM2.5	24	5	17%	0	0.0%	18	65%	0	0.0%
					Annual	1	14%	0	0.0%	8	93%	0	0.0%
				Silica	24	1	27%	0	0.0%	2.9	57%	0	0.0%
				NO2	1	135	34%	0	0.0%	174	43%	0	0.0%
					24	24	12%	0	0.0%	57	28%	0	0.0%

Receptor		UTM Coordinates		Contaminant	Averaging Period	With No Background Concentration				With Additional Background Concentrations			
ID	Type	X (m)	Y (m)		(hours)	Maximum Predicted 24-Hour Concentration (µg/m³)	Percentage of Revelant Criteria (%)	Number of Predicted Excursions Above Criteria over 5 Years	Frequency of Predicted Excursions Above Criteria (%)	Maximum Predicted 24-Hour Concentration (µg/m³)	Percentage of Revelant Criteria (%)	Number of Predicted Excursions Above Criteria over 5 Years	Frequency of Predicted Excursions Above Criteria (%)
R04	Residence	584734	4822088	TSP	24	38	32%	0	0.0%	83	69%	0	0.0%
					Annual	4	7%	0	0.0%	27	45%	0	0.0%
				PM10	24	19	38%	0	0.0%	44	88%	0	0.0%
				PM2.5	24	4	16%	0	0.0%	17	64%	0	0.0%
					Annual	1	14%	0	0.0%	8	92%	0	0.0%
				Silica	24	1	26%	0	0.0%	2.8	56%	0	0.0%
				NO2	1	144	36%	0	0.0%	183	46%	0	0.0%
					24	25	12%	0	0.0%	58	29%	0	0.0%
R05	Residence	584832	4821596	TSP	24	24	20%	0	0.0%	69	57%	0	0.0%
					Annual	4	7%	0	0.0%	27	45%	0	0.0%
				PM10	24	11	22%	0	0.0%	36	72%	0	0.0%
				PM2.5	24	3	11%	0	0.0%	16	59%	0	0.0%
					Annual	1	14%	0	0.0%	8	92%	0	0.0%
				Silica	24	1	24%	0	0.0%	2.7	54%	0	0.0%
				NO2	1	143	36%	0	0.0%	182	46%	0	0.0%
					24	18	9%	0	0.0%	51	26%	0	0.0%
R06	Residence	584898	4821564	TSP	24	23	19%	0	0.0%	68	57%	0	0.0%
					Annual	4	6%	0	0.0%	27	45%	0	0.0%
				PM10	24	11	21%	0	0.0%	36	71%	0	0.0%
				PM2.5	24	3	11%	0	0.0%	16	59%	0	0.0%
					Annual	1	14%	0	0.0%	8	92%	0	0.0%
				Silica	24	1	23%	0	0.0%	2.7	53%	0	0.0%
				NO2	1	142	36%	0	0.0%	181	45%	0	0.0%
					24	18	9%	0	0.0%	51	25%	0	0.0%
R07	Residence	585418	4820889	TSP	24	18	15%	0	0.0%	63	52%	0	0.0%
					Annual	3	6%	0	0.0%	26	44%	0	0.0%
				PM10	24	7	14%	0	0.0%	32	64%	0	0.0%
				PM2.5	24	2	9%	0	0.0%	15	57%	0	0.0%
					Annual	1	13%	0	0.0%	8	92%	0	0.0%
				Silica	24	1	22%	0	0.0%	2.6	52%	0	0.0%
				NO2	1	139	35%	0	0.0%	178	44%	0	0.0%
					24	15	7%	0	0.0%	48	24%	0	0.0%
R08	Residence	584996	4820359	TSP	24	22	18%	0	0.0%	67	56%	0	0.0%
					Annual	4	6%	0	0.0%	27	44%	0	0.0%
				PM10	24	11	22%	0	0.0%	36	72%	0	0.0%
				PM2.5	24	3	11%	0	0.0%	16	59%	0	0.0%
					Annual	1	13%	0	0.0%	8	92%	0	0.0%
				Silica	24	1	24%	0	0.0%	2.7	54%	0	0.0%
				NO2	1	144	36%	0	0.0%	183	46%	0	0.0%
					24	17	9%	0	0.0%	50	25%	0	0.0%

Receptor		UTM Coordinates		Contaminant	Averaging Period	With No Background Concentration				With Additional Background Concentrations			
ID	Type	X (m)	Y (m)		(hours)	Maximum Predicted 24-Hour Concentration (µg/m³)	Percentage of Revelant Criteria (%)	Number of Predicted Excursions Above Criteria over 5 Years	Frequency of Predicted Excursions Above Criteria (%)	Maximum Predicted 24-Hour Concentration (µg/m³)	Percentage of Revelant Criteria (%)	Number of Predicted Excursions Above Criteria over 5 Years	Frequency of Predicted Excursions Above Criteria (%)
R09	Rental property owned by CRH	583436	4820134	TSP	24	37	31%	0	0.0%	82	68%	0	0.0%
					Annual	4	6%	0	0.0%	27	45%	0	0.0%
				PM10	24	20	39%	0	0.0%	45	89%	0	0.0%
				PM2.5	24	4	16%	0	0.0%	17	64%	0	0.0%
					Annual	1	14%	0	0.0%	8	92%	0	0.0%
				Silica	24	1	27%	0	0.0%	2.8	57%	0	0.0%
				NO2	1	163	41%	0	0.0%	202	50%	0	0.0%
					24	27	14%	0	0.0%	60	30%	0	0.0%
R10	Residence	581725	4821620	TSP	24	51	43%	0	0.0%	96	80%	0	0.0%
					Annual	4	6%	0	0.0%	27	45%	0	0.0%
				PM10	24	31	62%	0	0.0%	56	**112%**	**3**	**0.2%**
				PM2.5	24	7	24%	0	0.0%	20	72%	0	0.0%
					Annual	1	14%	0	0.0%	8	92%	0	0.0%
				Silica	24	2	32%	0	0.0%	3.1	62%	0	0.0%
				NO2	1	146	36%	0	0.0%	185	46%	0	0.0%
					24	37	19%	0	0.0%	70	35%	0	0.0%
R11	Residence	581589	4821662	TSP	24	52	43%	0	0.0%	97	81%	0	0.0%
					Annual	4	6%	0	0.0%	27	44%	0	0.0%
				PM10	24	30	60%	0	0.0%	55	**110%**	**3**	**0.2%**
				PM2.5	24	6	21%	0	0.0%	19	69%	0	0.0%
					Annual	1	14%	0	0.0%	8	92%	0	0.0%
				Silica	24	2	30%	0	0.0%	3.0	60%	0	0.0%
				NO2	1	145	36%	0	0.0%	184	46%	0	0.0%
					24	31	15%	0	0.0%	64	32%	0	0.0%
R12	Residence	581519	4821803	TSP	24	104	87%	0	0.0%	149	**124%**	**1**	**0.1%**
					Annual	4	6%	0	0.0%	27	45%	0	0.0%
				PM10	24	66	**131%**	**1**	**0.1%**	91	**181%**	**5**	**0.3%**
				PM2.5	24	12	44%	0	0.0%	25	92%	0	0.0%
					Annual	1	14%	0	0.0%	8	92%	0	0.0%
				Silica	24	2	45%	0	0.0%	3.7	75%	0	0.0%
				NO2	1	146	36%	0	0.0%	185	46%	0	0.0%
					24	37	19%	0	0.0%	70	35%	0	0.0%
R13	Residence	581594	4821943	TSP	24	107	89%	0	0.0%	152	**126%**	**2**	**0.1%**
					Annual	4	7%	0	0.0%	27	45%	0	0.0%
				PM10	24	67	**134%**	**1**	**0.1%**	92	**184%**	**9**	**0.5%**
				PM2.5	24	12	46%	0	0.0%	25	94%	0	0.0%
					Annual	1	14%	0	0.0%	8	93%	0	0.0%
				Silica	24	2	45%	0	0.0%	3.8	75%	0	0.0%
				NO2	1	146	36%	0	0.0%	185	46%	0	0.0%
					24	47	23%	0	0.0%	80	40%	0	0.0%

Receptor		UTM Coordinates		Contaminant	Averaging Period	With No Background Concentration				With Additional Background Concentrations			
ID	Type	X (m)	Y (m)		(hours)	Maximum Predicted 24-Hour Concentration (µg/m³)	Percentage of Revelant Criteria (%)	Number of Predicted Excursions Above Criteria over 5 Years	Frequency of Predicted Excursions Above Criteria (%)	Maximum Predicted 24-Hour Concentration (µg/m³)	Percentage of Revelant Criteria (%)	Number of Predicted Excursions Above Criteria over 5 Years	Frequency of Predicted Excursions Above Criteria (%)
R14	Rental property owned by CRH	581523	4822032	TSP	24	84	70%	0	0.0%	129	**107%**	**1**	**0.1%**
					Annual	4	7%	0	0.0%	27	45%	0	0.0%
				PM10	24	51	**101%**	**1**	**0.1%**	76	**151%**	**9**	**0.5%**
				PM2.5	24	10	35%	0	0.0%	23	84%	0	0.0%
					Annual	1	14%	0	0.0%	8	93%	0	0.0%
				Silica	24	2	39%	0	0.0%	3.5	69%	0	0.0%
				NO2	1	145	36%	0	0.0%	184	46%	0	0.0%
					24	40	20%	0	0.0%	73	36%	0	0.0%
R15	Rental property owned by CRH	581575	4822346	TSP	24	88	73%	0	0.0%	133	**111%**	**2**	**0.1%**
					Annual	5	8%	0	0.0%	28	47%	0	0.0%
				PM10	24	48	96%	0	0.0%	73	**146%**	**12**	**0.7%**
				PM2.5	24	10	36%	0	0.0%	23	84%	0	0.0%
					Annual	1	15%	0	0.0%	8	94%	0	0.0%
				Silica	24	2	37%	0	0.0%	3.4	67%	0	0.0%
				NO2	1	153	38%	0	0.0%	192	48%	0	0.0%
					24	51	25%	0	0.0%	84	42%	0	0.0%
R16	Residence	581153	4822487	TSP	24	61	51%	0	0.0%	106	89%	0	0.0%
					Annual	4	7%	0	0.0%	27	45%	0	0.0%
				PM10	24	39	78%	0	0.0%	64	**128%**	**10**	**0.6%**
				PM2.5	24	8	28%	0	0.0%	21	76%	0	0.0%
					Annual	1	14%	0	0.0%	8	93%	0	0.0%
				Silica	24	2	35%	0	0.0%	3.2	65%	0	0.0%
				NO2	1	147	37%	0	0.0%	186	47%	0	0.0%
					24	35	18%	0	0.0%	68	34%	0	0.0%
R17	Residence	581509	4822941	TSP	24	101	84%	0	0.0%	146	**122%**	**4**	**0.2%**
					Annual	6	10%	0	0.0%	29	49%	0	0.0%
				PM10	24	55	**109%**	**2**	**0.1%**	80	**159%**	**28**	**1.6%**
				PM2.5	24	11	39%	0	0.0%	24	87%	0	0.0%
					Annual	1	17%	0	0.0%	8	95%	0	0.0%
				Silica	24	2	41%	0	0.0%	3.5	71%	0	0.0%
				NO2	1	158	40%	0	0.0%	197	49%	0	0.0%
					24	61	30%	0	0.0%	94	47%	0	0.0%
R18	Residence	581462	4823494	TSP	24	59	49%	0	0.0%	104	86%	0	0.0%
					Annual	5	8%	0	0.0%	28	46%	0	0.0%
				PM10	24	32	64%	0	0.0%	57	**114%**	**2**	**0.1%**
				PM2.5	24	7	26%	0	0.0%	20	74%	0	0.0%
					Annual	1	15%	0	0.0%	8	94%	0	0.0%
				Silica	24	2	31%	0	0.0%	3.1	61%	0	0.0%
				NO2	1	172	43%	0	0.0%	211	53%	0	0.0%
					24	57	28%	0	0.0%	90	45%	0	0.0%

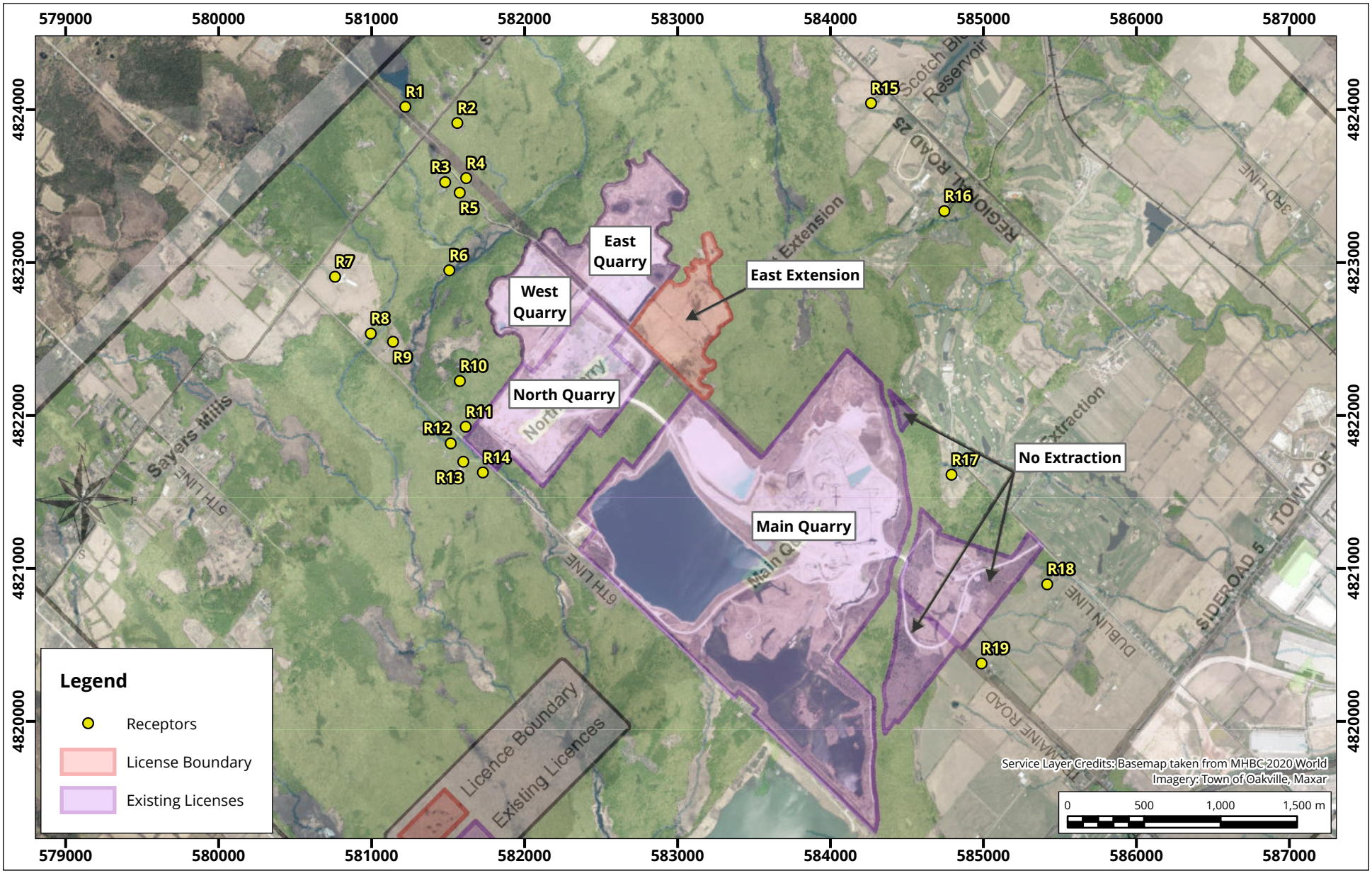
Receptor		UTM Coordinates		Contaminant	Averaging Period	With No Background Concentration				With Additional Background Concentrations			
ID	Type	X (m)	Y (m)		(hours)	Maximum Predicted 24-Hour Concentration (µg/m³)	Percentage of Revelant Criteria (%)	Number of Predicted Excursions Above Criteria over 5 Years	Frequency of Predicted Excursions Above Criteria (%)	Maximum Predicted 24-Hour Concentration (µg/m³)	Percentage of Revelant Criteria (%)	Number of Predicted Excursions Above Criteria over 5 Years	Frequency of Predicted Excursions Above Criteria (%)
R19	Residence	581458	4823569	TSP	24	62	52%	0	0.0%	107	89%	0	0.0%
					Annual	5	8%	0	0.0%	28	46%	0	0.0%
				PM10	24	31	63%	0	0.0%	56	**113%**	**3**	**0.2%**
				PM2.5	24	7	25%	0	0.0%	20	74%	0	0.0%
					Annual	1	15%	0	0.0%	8	93%	0	0.0%
				Silica	24	2	31%	0	0.0%	3.1	61%	0	0.0%
				NO2	1	172	43%	0	0.0%	211	53%	0	0.0%
					24	57	29%	0	0.0%	90	45%	0	0.0%
R20	Rental property owned by CRH	581626	4823527	TSP	24	91	76%	0	0.0%	136	**113%**	**1**	**0.1%**
					Annual	5	9%	0	0.0%	28	47%	0	0.0%
				PM10	24	45	90%	0	0.0%	70	**140%**	**6**	**0.34%**
				PM2.5	24	9	34%	0	0.0%	22	82%	0	0.0%
					Annual	1	16%	0	0.0%	8	94%	0	0.0%
				Silica	24	2	36%	0	0.0%	3.3	66%	0	0.0%
				NO2	1	177	44%	0	0.0%	216	54%	0	0.0%
					24	76	38%	0	0.0%	109	54%	0	0.0%
R21	Residence	581570	4823893	TSP	24	74	62%	0	0.0%	119	99%	0	0.0%
					Annual	4	7%	0	0.0%	27	46%	0	0.0%
				PM10	24	34	69%	0	0.0%	59	**119%**	**3**	**0.2%**
				PM2.5	24	7	26%	0	0.0%	20	75%	0	0.0%
					Annual	1	15%	0	0.0%	8	93%	0	0.0%
				Silica	24	2	32%	0	0.0%	3.1	62%	0	0.0%
				NO2	1	167	42%	0	0.0%	206	51%	0	0.0%
					24	50	25%	0	0.0%	83	42%	0	0.0%
R22	Residence	581865	4824212	TSP	24	51	42%	0	0.0%	96	80%	0	0.0%
					Annual	4	7%	0	0.0%	27	45%	0	0.0%
				PM10	24	28	55%	0	0.0%	53	**105%**	**1**	**0.1%**
				PM2.5	24	6	23%	0	0.0%	19	71%	0	0.0%
					Annual	1	15%	0	0.0%	8	93%	0	0.0%
				Silica	24	1	30%	0	0.0%	3.0	60%	0	0.0%
				NO2	1	157	39%	0	0.0%	196	49%	0	0.0%
					24	38	19%	0	0.0%	71	35%	0	0.0%
R23	Residence	581748	4824244	TSP	24	72	60%	0	0.0%	117	97%	0	0.0%
					Annual	4	7%	0	0.0%	27	45%	0	0.0%
				PM10	24	36	72%	0	0.0%	61	**122%**	**1**	**0.1%**
				PM2.5	24	7	26%	0	0.0%	20	74%	0	0.0%
					Annual	1	14%	0	0.0%	8	93%	0	0.0%
				Silica	24	2	33%	0	0.0%	3.1	63%	0	0.0%
				NO2	1	157	39%	0	0.0%	196	49%	0	0.0%
					24	39	20%	0	0.0%	72	36%	0	0.0%

Receptor		UTM Coordinates		Contaminant	Averaging Period	With No Background Concentration				With Additional Background Concentrations			
ID	Type	X (m)	Y (m)		(hours)	Maximum Predicted 24-Hour Concentration (µg/m³)	Percentage of Revelant Criteria (%)	Number of Predicted Excursions Above Criteria over 5 Years	Frequency of Predicted Excursions Above Criteria (%)	Maximum Predicted 24-Hour Concentration (µg/m³)	Percentage of Revelant Criteria (%)	Number of Predicted Excursions Above Criteria over 5 Years	Frequency of Predicted Excursions Above Criteria (%)
R24	Residence	581692	4824333	TSP	24	63	52%	0	0.0%	108	90%	0	0.0%
					Annual	4	6%	0	0.0%	27	44%	0	0.0%
				PM10	24	31	62%	0	0.0%	56	**112%**	**1**	**0.1%**
				PM2.5	24	6	23%	0	0.0%	19	71%	0	0.0%
					Annual	1	14%	0	0.0%	8	93%	0	0.0%
				Silica	24	2	31%	0	0.0%	3.0	61%	0	0.0%
				NO2	1	154	38%	0	0.0%	193	48%	0	0.0%
					24	36	18%	0	0.0%	69	34%	0	0.0%

Notes:

Values in bold indicate excursions above the relevant crtieria

FIGURES



Site Plan and Receptors

True North

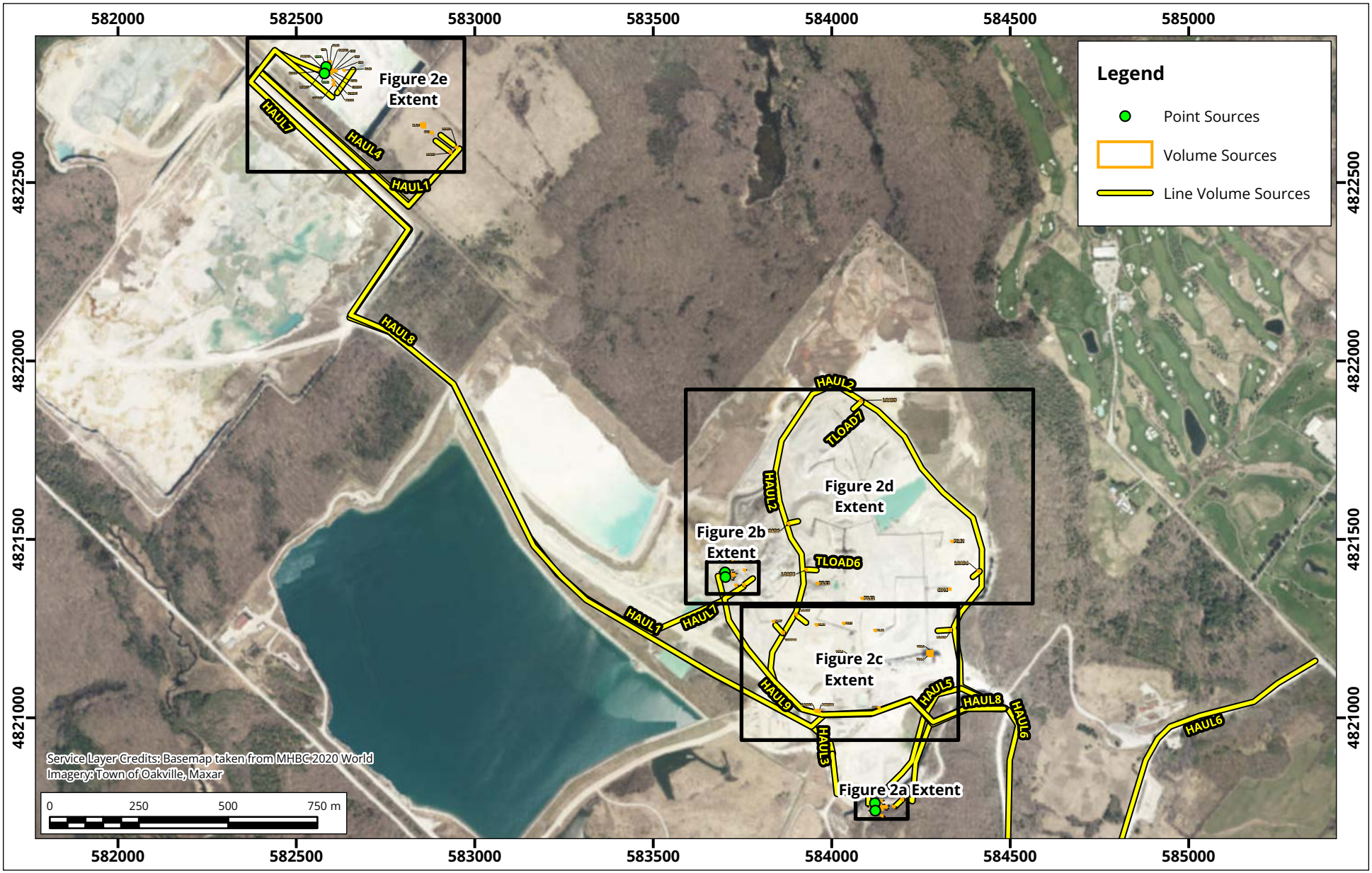
Map Projection: NAD 1983 UTM Zone 17N

Dufferin Milton Quarry East Extension - Halton Hills, Ontario

Project #: 2102093

Drawn by: DJH	Figure: 1
Approx. Scale:	1:35,000
Date Revised:	Jun 24, 2021

Map Document: C:\GIS Temp - Copy\2102093\P2102093_CRH_Quarry.aprx



Source Locations Index Map

True North

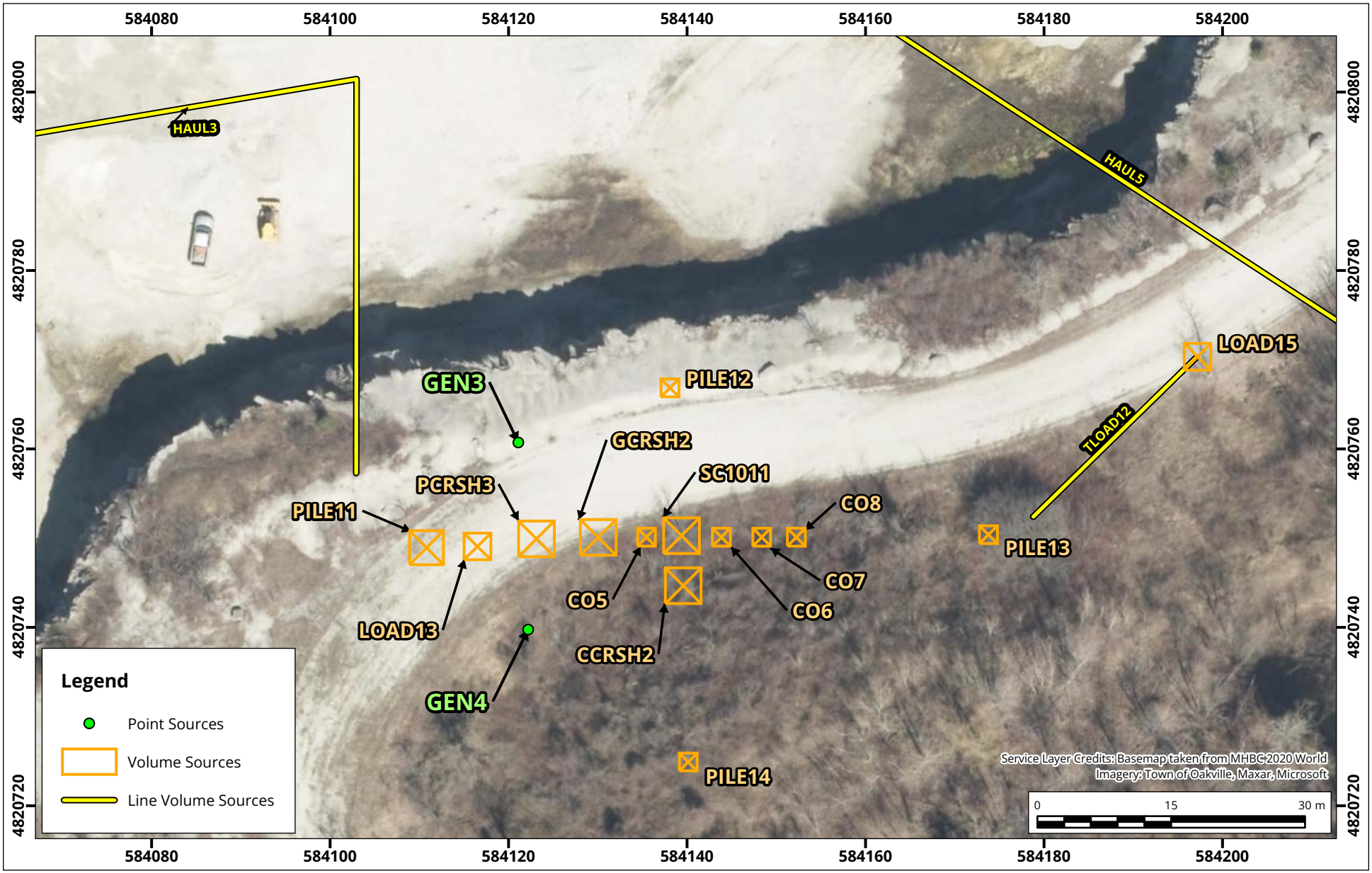
Drawn by:	RL	Figure:	2
Approx. Scale:	1:15,000		
Date Revised:	Oct 18, 2021		

Map Projection: NAD 1983 UTM Zone 17N

Dufferin Milton Quarry East Extension - Halton Hills, Ontario

Project #: 2102093

Map Document: C:\GIS\2102093_CRH-Quarry\99 GIS\CRH Quarry - Figures\P2102093_CRH_Quarry-Option2.aprx



Source Locations

True North

Drawn by: RL | Figure: 2a

Approx. Scale: 1:600

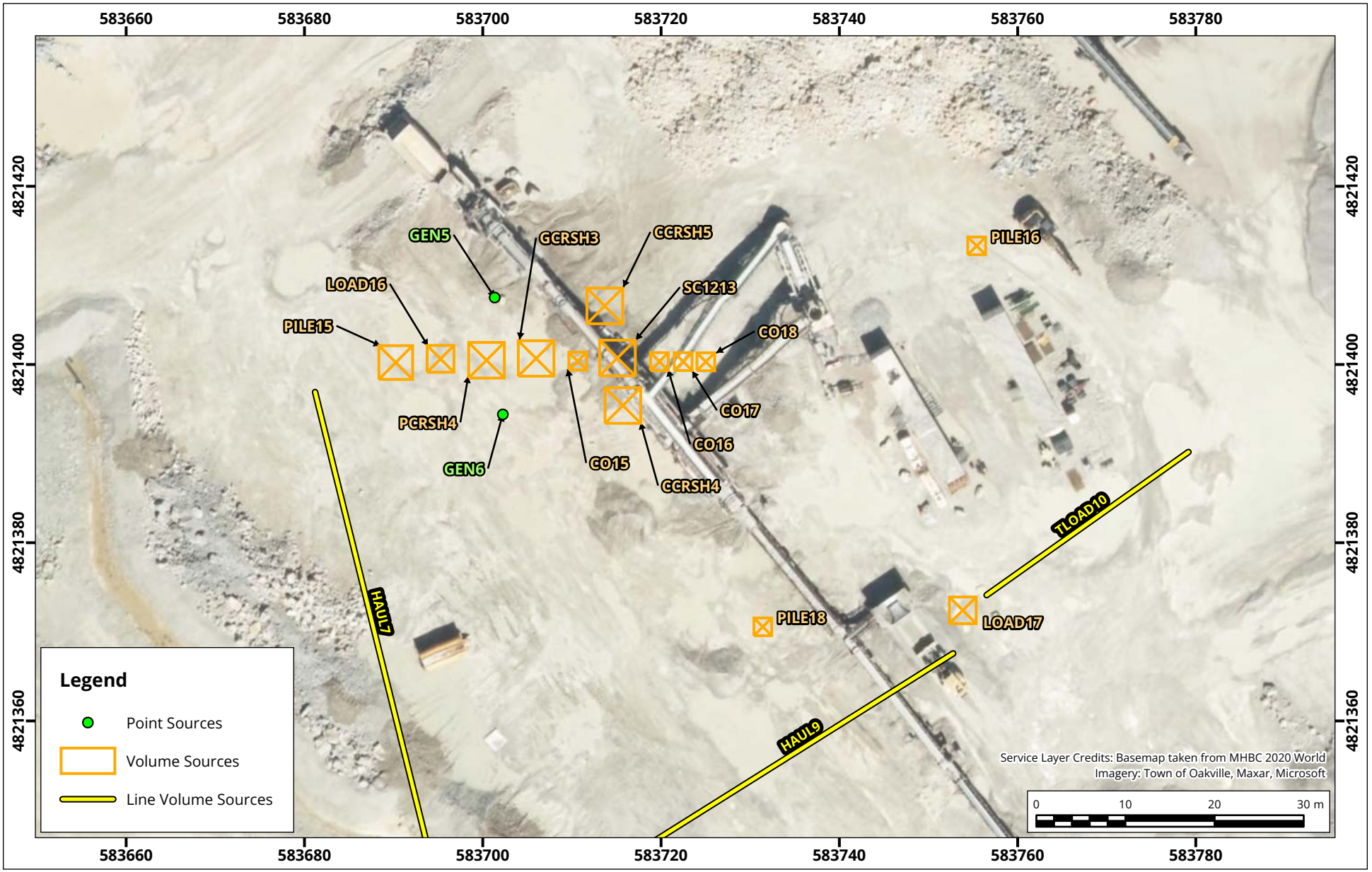
Date Revised: Oct 18, 2021

Map Projection: NAD 1983 UTM Zone 17N

Dufferin Milton Quarry East Extension - Halton Hills, Ontario

Project #: 2102093

Map Document: C:\GIS\2102093_CRH-Quarry\99 GIS\CRH Quarry - Figures\P2102093_CRH_Quarry-Option2.aprx



Source Locations

True North

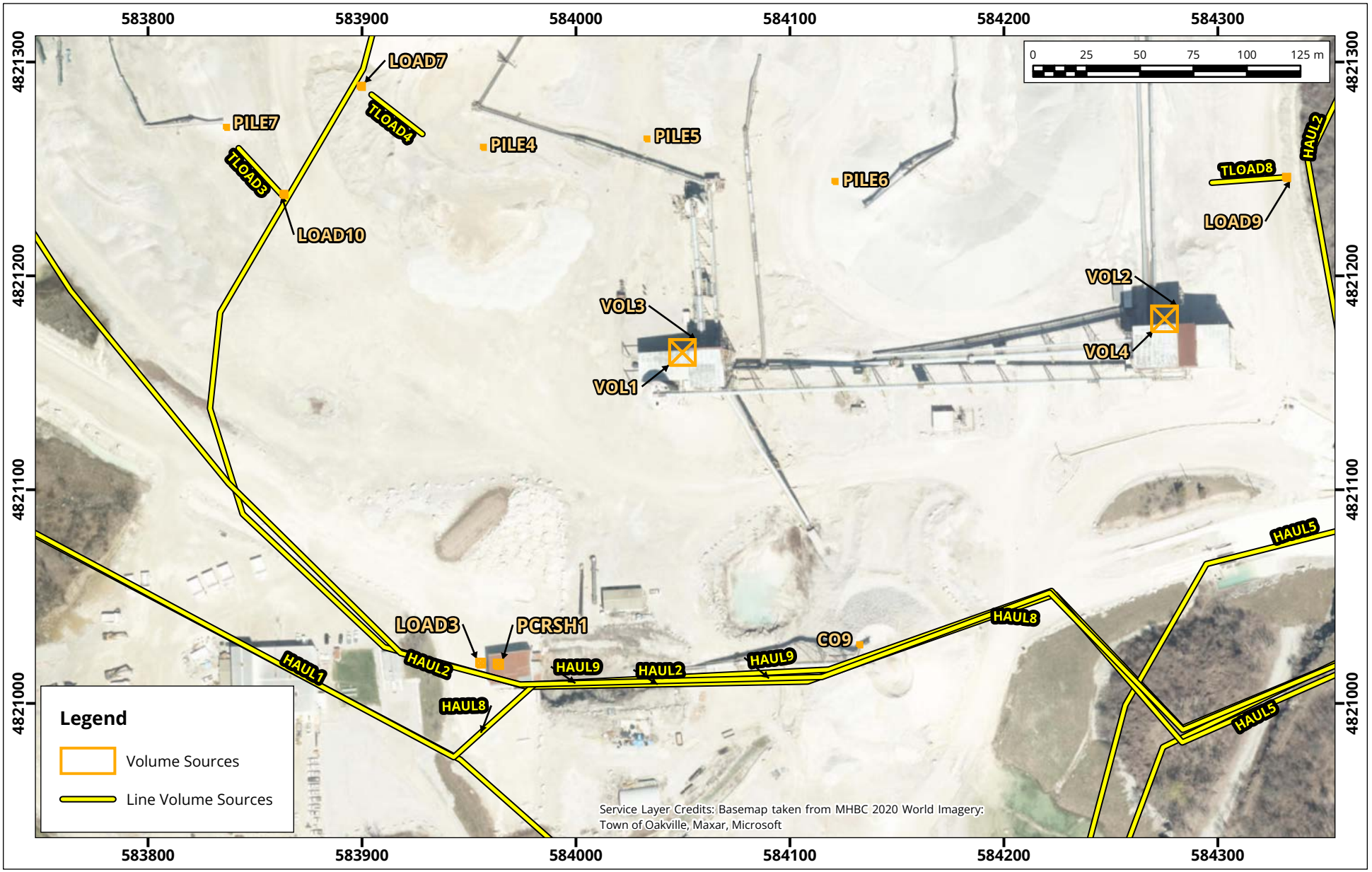
Drawn by:	RL	Figure:	2b
Approx. Scale:	1:600		
Date Revised:	Oct 18, 2021		

Map Projection: NAD 1983 UTM Zone 17N

Dufferin Milton Quarry East Extension - Halton Hills, Ontario

Project #: 2102093

Map Document: C:\GIS\2102093_CRH-Quarry\99 GIS\CRH Quarry - Figures\P2102093_CRH_Quarry-Option2.aprx



Source Locations

True North

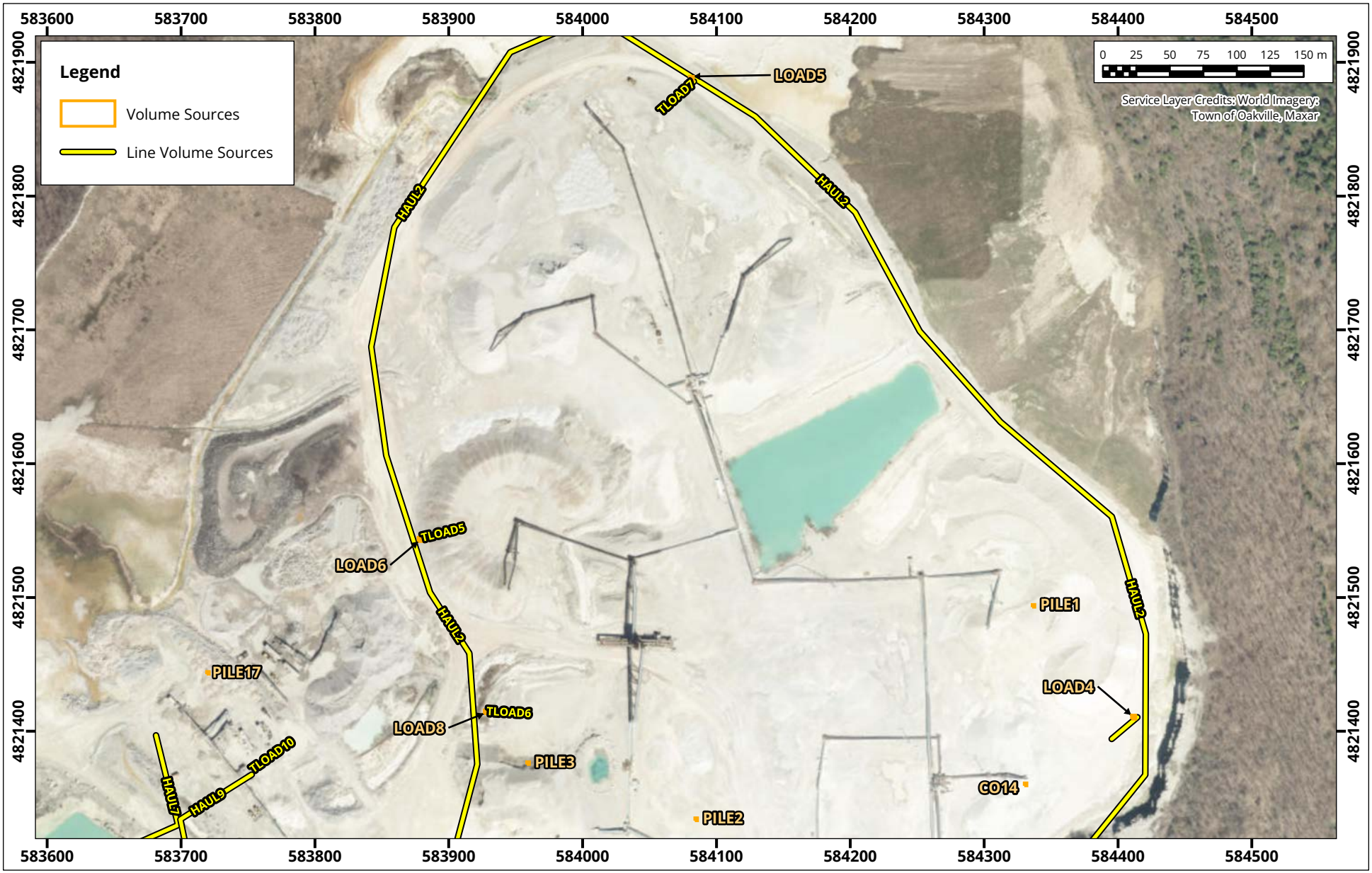
Drawn by: RL	Figure: 2c
Approx. Scale:	1:2,500
Date Revised:	Oct 18, 2021

Map Projection: NAD 1983 UTM Zone 17N

Dufferin Milton Quarry East Extension - Halton Hills, Ontario

Project #: 2102093

Map Document: C:\GIS\2102093_CRH-Quarry\99 GIS\CRH Quarry - Figures\P2102093_CRH_Quarry-Option2.aprx



Point Sources

True North

Drawn by: RL | Figure: 2d

Approx. Scale: 1:4,000

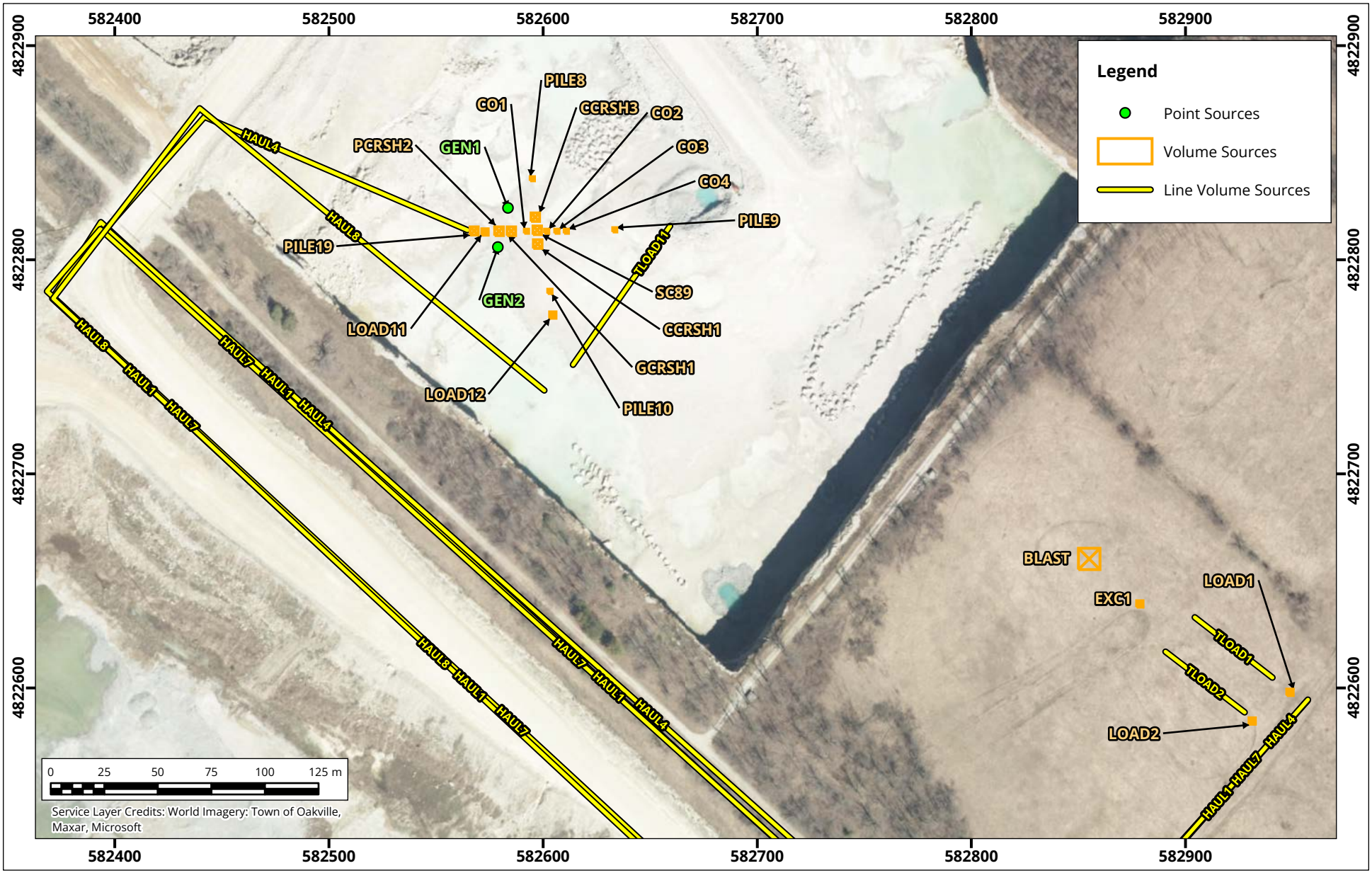
Date Revised: Oct 18, 2021

Map Projection: NAD 1983 UTM Zone 17N

Dufferin Milton Quarry East Extension - Halton Hills, Ontario

Project #: 2102093

Map Document: C:\GIS\2102093_CRH-Quarry\99 GIS\CRH Quarry - Figures\P2102093_CRH_Quarry-Option2.aprx



Source Locations

True North

Drawn by: RL | Figure: 2e

Approx. Scale: 1:2,500

Date Revised: Oct 18, 2021

Map Projection: NAD 1983 UTM Zone 17N

Dufferin Milton Quarry East Extension - Halton Hills, Ontario

Project #: 2102093

Map Document: C:\GIS\2102093_CRH-Quarry\99 GIS\CRH Quarry - Figures\P2102093_CRH_Quarry-Option2.aprx

APPENDIX A

Appendix A: Blasting Operations Emission Spreadsheet

Project #2102093

CRH Milton Quarry Extension

WESTERN SURFACE COAL MINING - AP-42 Section 11.9

Blasting operation particulate emissions: $E = 0.00022\ k * A^{1.5}$

E emission factor
k particle size multiplier (1.13, 1.0, 0.52 and 0.03 for TSP, PM_{30}, PM_{10} and $PM_{2.5}$, respectively)
A blast surface area (m^2)

Source ID	Source Description	Total Blast Area (m^2)	Number of Blasts			Base AP 42 Emission Factor				Base Emission Rate				Additional Control Efficiency Applied (%)	Final Controlled Emission Rate							
			Hourly	Daily	Annual	TSP (kg/blast)	PM_{10} (kg/blast)	$PM_{2.5}$ (kg/blast)	Silica (kg/blast)	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)	Silica (g/s)		TSP (g/s)	Data Quality Rating	PM_{10} (g/s)	Data Quality Rating	$PM_{2.5}$ (g/s)	Data Quality Rating	Silica (g/s)	Data Quality Rating
BLAST	Blasting at working face	1000	1	2	160	6.96E+00	3.62E+00	2.09E-01	7.24E-02	1.93E+00	1.00E+00	5.80E-02	2.01E-02		1.93E+00	C	1.00E+00	C	5.80E-02	C	2.01E-02	C

Sample calculation for uncontrolled TSP emission factor for Source BLAST: Blasting at working face.

EF = 0.00022 x (1) x (1000 m)^1.5 = 6.96E+00 kg TSP / blast

Sample calculation for TSP emission rate for Source BLAST: Blasting at working face.

$$\frac{1\ \text{blast}}{1\ \text{h}} \times \frac{6.96\text{E+00}\ \text{kg}_{TSP}}{1\ \text{blast}} \times \frac{1\ \text{h}}{3600\ \text{s}} \times \frac{1000\ \text{g}_{TSP}}{1\ \text{kg}_{TSP}} \times \frac{1\ \text{g}_{TSP\ \text{uncontrolled}}}{1\ \text{g}_{TSP}} = 1.93\text{E+00}\ \text{g}_{TSP}/\text{s}$$

Comments

A silica content of: 2% was used in the assessment, based on the document titled "The Limestone Industries of Ontario: Industrial Mineral Report 39" by the Ontario Division of Mines 1971, which indicates that the area is primarily dolomite with a silica content of less than 2%.
A silt content of: 1.6% was used in the assessment, based on the AP-42 CH 13.2.4 values for Stone quarrying and processing - Crushed Limestone.
k-factor for TSP (PM_{44}) scaled up logarithmically to 1.13 from published k-factor of 1.0 which refers to PM_{30}.

APPENDIX B

Appendix B: Bulk Material Handling Emissions Spreadsheet

CRH Milton Quarry Extension

Project #2102093

AGGREGATE HANDLING AND STORAGE PILES - AP-42 Section 13.2.4

Average recorded hourly wind speed (m/s):
(used for sample calculations & factor validation) 3.7

Material handling emissions: $E = 0.0016\ k\ (U / 2.2)^{1.3} / (M / 2)^{1.4}$

E emission factor
k particle size multiplier (0.8, 0.74, 0.35 and 0.053 for TSP, PM_{30}, PM_{10} and $PM_{2.5}$, respectively) [2]
U mean wind speed, meters per second (m/s)
M material moisture content (%)

Source ID	Description	Processing Rate			Site Data				Base AP 42 Emission Factor				Base Emission Rate				Additional Control Efficiency Applied (%)	Final Controlled Emission Rate at 3.7 m/s							
		Hourly (Mg/h)	Daily (Mg/d)	Annual (Mg/y)	Site Specific Data? (y/n)	Silt Content (%)	Moisture Content (%)	Source Condition Valid [1]	TSP (kg/Mg)	PM_{10} (kg/Mg)	$PM_{2.5}$ (kg/Mg)	Silica (kg/Mg)	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)	Silica (g/s)		TSP (g/s)	Data Quality Rating	PM_{10} (g/s)	Data Quality Rating	$PM_{2.5}$ (g/s)	Data Quality Rating	Silica (g/s)	Data Quality Rating
SCENARIO 1 - Operations at MQEE																									
LOAD1	Loader transfer of raw material to haul truck	641	6,410	1,666,667	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	1.3E-01	5.8E-02	8.7E-03	1.2E-03		1.3E-01	A	5.8E-02	A	8.7E-03	A	1.2E-03	A
LOAD2	Loader transfer of raw material to haul truck	641	6,410	1,666,667	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	1.3E-01	5.8E-02	8.7E-03	1.2E-03		1.3E-01	A	5.8E-02	A	8.7E-03	A	1.2E-03	A
EXC1	Excavator transfer of material to haul truck	641	6,410	1,666,667	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	1.3E-01	5.8E-02	8.7E-03	1.2E-03		1.3E-01	A	5.8E-02	A	8.7E-03	A	1.2E-03	A
SCENARIO 1 - Operations at Main Plant																									
LOAD3	Transfer from haul truck to crusher	1,905	45,720	11,430,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	3.9E-01	1.7E-01	2.6E-02	3.4E-03	70%	1.2E-01	A	5.1E-02	A	7.8E-03	A	1.0E-03	A
CO9	Conveyor from primary crusher - drop to pile	1,905	45,720	11,430,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	3.9E-01	1.7E-01	2.6E-02	3.4E-03		3.9E-01	A	1.7E-01	A	2.6E-02	A	3.4E-03	A
Processes Contained in the Main Crushing Building - VOL3																									
CO10	Conveyor pick up from main pile and drop to screens	1,905	45,720	11,430,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	3.9E-01	1.7E-01	2.6E-02	3.4E-03	70%	1.2E-01	A	5.1E-02	A	7.8E-03	A	1.0E-03	A
BIN1	Conveyor drop into bin for Secondary Crusher	1,297	31,128	7,782,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	2.7E-01	1.2E-01	1.8E-02	2.3E-03	70%	8.0E-02	A	3.5E-02	A	5.3E-03	A	7.0E-04	A
BIN2	Conveyor drop into bin for Secondary Crushers	1,341	32,184	8,046,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	2.8E-01	1.2E-01	1.8E-02	2.4E-03	70%	8.3E-02	A	3.6E-02	A	5.5E-03	A	7.2E-04	A
Processes Contained in the Main Screening Building - VOL4																									
CO11	Conveyor from secondary crushers and drop into screening plant	2,638	63,312	15,828,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	5.4E-01	2.4E-01	3.6E-02	4.7E-03	70%	1.6E-01	A	7.1E-02	A	1.1E-02	A	1.4E-03	A
CO12a	Conveyor drop from screen set 1 to 2 in Screening plant	466	11,190	2,797,500	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	9.6E-02	4.2E-02	6.3E-03	8.4E-04	70%	2.9E-02	A	1.3E-02	A	1.9E-03	A	2.5E-04	A
CO12b	Conveyor drop from screen set 1 to 2 in Screening plant	466	11,190	2,797,500	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	9.6E-02	4.2E-02	6.3E-03	8.4E-04	70%	2.9E-02	A	1.3E-02	A	1.9E-03	A	2.5E-04	A
CO12c	Conveyor drop from screen set 1 to 2 in Screening plant	466	11,190	2,797,500	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	9.6E-02	4.2E-02	6.3E-03	8.4E-04	70%	2.9E-02	A	1.3E-02	A	1.9E-03	A	2.5E-04	A
CO12d	Conveyor drop from screen set 1 to 2 in Screening plant	466	11,190	2,797,500	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	9.6E-02	4.2E-02	6.3E-03	8.4E-04	70%	2.9E-02	A	1.3E-02	A	1.9E-03	A	2.5E-04	A
CO13a	Conveyor drop from screen set 2 to 3 in Screening plant	182	4,374	1,093,500	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	3.7E-02	1.6E-02	2.5E-03	3.3E-04	70%	1.1E-02	A	4.9E-03	A	7.4E-04	A	9.8E-05	A
CO13b	Conveyor drop from screen set 2 to 3 in Screening plant	182	4,374	1,093,500	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	3.7E-02	1.6E-02	2.5E-03	3.3E-04	70%	1.1E-02	A	4.9E-03	A	7.4E-04	A	9.8E-05	A
CO13c	Conveyor drop from screen set 2 to 3 in Screening plant	182	4,374	1,093,500	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	3.7E-02	1.6E-02	2.5E-03	3.3E-04	70%	1.1E-02	A	4.9E-03	A	7.4E-04	A	9.8E-05	A
CO13d	Conveyor drop from screen set 2 to 3 in Screening plant	182	4,374	1,093,500	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	3.7E-02	1.6E-02	2.5E-03	3.3E-04	70%	1.1E-02	A	4.9E-03	A	7.4E-04	A	9.8E-05	A
BIN3	Screenings dropped from screening plant to bin	396	9,504	2,376,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	8.1E-02	3.6E-02	5.4E-03	7.1E-04	70%	2.4E-02	A	1.1E-02	A	1.6E-03	A	2.1E-04	A
Other Sources at Main Plant																									
CO14	Conveyor drop to wash plant	775	18,600	4,650,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	1.6E-01	7.0E-02	1.1E-02	1.4E-03		1.6E-01	A	7.0E-02	A	1.1E-02	A	1.4E-03	A
PILE1	Stacker drop to pile - 772 - LI, SCREENINGS	396	9,504	2,376,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	8.1E-02	3.6E-02	5.4E-03	7.1E-04		8.1E-02	A	3.6E-02	A	5.4E-03	A	7.1E-04	A
PILE2	Stacker drop to pile - 783 - LI, 50 mm, CLEAR	80	1,920	480,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	1.6E-02	7.2E-03	1.1E-03	1.4E-04		1.6E-02	A	7.2E-03	A	1.1E-03	A	1.4E-04	A
PILE3	Stacker drop to pile - 785 - LI, 19mm, CRUSHER RUN	149	3,584	896,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	3.1E-02	1.3E-02	2.0E-03	2.7E-04		3.1E-02	A	1.3E-02	A	2.0E-03	A	2.7E-04	A
PILE4	Stacker drop to pile - 786 - LI, 19mm, CRUSHER RUN	149	3,584	896,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	3.1E-02	1.3E-02	2.0E-03	2.7E-04		3.1E-02	A	1.3E-02	A	2.0E-03	A	2.7E-04	A
PILE5	Stacker drop to pile - 789 - LI, 19mm, CRUSHER RUN	149	3,584	896,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	3.1E-02	1.3E-02	2.0E-03	2.7E-04		3.1E-02	A	1.3E-02	A	2.0E-03	A	2.7E-04	A
PILE6	Stacker drop to pile - 790 - LI, 50mm, CLEAR	80	1,920	480,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	1.6E-02	7.2E-03	1.1E-03	1.4E-04		1.6E-02	A	7.2E-03	A	1.1E-03	A	1.4E-04	A
PILE7	Stacker drop to pile - 791 - LI, SCREENINGS	396	9,504	2,376,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	8.1E-02	3.6E-02	5.4E-03	7.1E-04		8.1E-02	A	3.6E-02	A	5.4E-03	A	7.1E-04	A
WPILE1	Stacker drop to pile - 782 - LI, 19MM, WASH CONCRETE STONE	757	18,168	4,542,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	1.6E-01	6.8E-02	1.0E-02	1.4E-03	100%	0.0E+00	A	0.0E+00	A	0.0E+00	A	0.0E+00	A
WPILE2	Stacker drop to pile - 788 - LI, FINE SCREENINGS	13	312	78,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	2.7E-03	1.2E-03	1.8E-04	2.3E-05	100%	0.0E+00	A	0.0E+00	A	0.0E+00	A	0.0E+00	A
LOAD4	Loader transfer of finished product to offsite truck	82	1,970	571,429	y	1.6%	2.1%	valid	2.3E-03	1.0E-03	1.6E-04	2.1E-05	5.4E-02	2.3E-02	3.6E-03	4.7E-04		5.4E-02	A	2.3E-02	A	3.6E-03	A	4.7E-04	A
LOAD5	Loader transfer of finished product to offsite truck	82	1,970	571,429	y	1.6%	2.1%	valid	2.3E-03	1.0E-03	1.6E-04	2.1E-05	5.4E-02	2.3E-02	3.6E-03	4.7E-04		5.4E-02	A	2.3E-02	A	3.6E-03	A	4.7E-04	A
LOAD6	Loader transfer of finished product to offsite truck	82	1,970	571,429	y	1.6%	2.1%	valid	2.3E-03	1.0E-03	1.6E-04	2.1E-05	5.4E-02	2.3E-02	3.6E-03	4.7E-04		5.4E-02	A	2.3E-02	A	3.6E-03	A	4.7E-04	A
LOAD7	Loader transfer of finished product to offsite truck	82	1,970	571,429	y	1.6%	2.1%	valid	2.3E-03	1.0E-03	1.6E-04	2.1E-05	5.4E-02	2.3E-02	3.6E-03	4.7E-04		5.4E-02	A	2.3E-02	A	3.6E-03	A	4.7E-04	A
LOAD8	Loader transfer of finished product to offsite truck	82	1,970	571,429	y	1.6%	2.1%	valid	2.3E-03	1.0E-03	1.6E-04	2.1E-05	5.4E-02	2.3E-02	3.6E-03	4.7E-04		5.4E-02	A	2.3E-02	A	3.6E-03	A	4.7E-04	A
LOAD9	Loader transfer of finished product to offsite truck	82	1,970	571,429	y	1.6%	2.1%	valid	2.3E-03	1.0E-03	1.6E-04	2.1E-05	5.4E-02	2.3E-02	3.6E-03	4.7E-04		5.4E-02	A	2.3E-02	A	3.6E-03	A	4.7E-04	A
LOAD10	Loader transfer of finished product to offsite truck	82	1,970	571,429	y	1.6%	2.1%	valid	2.3E-03	1.0E-03	1.6E-04	2.1E-05	5.4E-02	2.3E-02	3.6E-03	4.7E-04		5.4E-02	A	2.3E-02	A	3.6E-03	A	4.7E-04	A
SCENARIO 1 - Operations at South of Main Plant - Portable Plant 2																									
PILE11	Haul truck dump to pile at portable plant 2	167	2,000	500,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	3.4E-02	1.5E-02	2.3E-03	3.0E-04		3.4E-02	A	1.5E-02	A	2.3E-03	A	3.0E-04	A
LOAD13	Load from pile to portable plant 2	167	2,000	500,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	3.4E-02	1.5E-02	2.3E-03	3.0E-04		3.4E-02	A	1.5E-02	A	2.3E-03	A	3.0E-04	A
PILE12	Stacker to pile - Portable Plant 2	42	500	125,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	8.5E-03	3.7E-03	5.7E-04	7.5E-05		8.5E-03	A	3.7E-03	A	5.7E-04	A	7.5E-05	A
PILE13	Stacker to pile - Portable Plant 2	42	500	125,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	8.5E-03	3.7E-03	5.7E-04	7.5E-05		8.5E-03	A	3.7E-03	A	5.7E-04	A	7.5E-05	A
PILE14	Stacker to pile - Portable Plant 2	42	500	125,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	8.5E-03	3.7E-03	5.7E-04	7.5E-05		8.5E-03	A	3.7E-03	A	5.7E-04	A	7.5E-05	A
LOAD15	Loader transfer of finished product to offsite truck	72	1,724	500,000	y	1.6%	2.1%	valid	2.3E-03	1.0E-03	1.6E-04	2.1E-05	4.7E-02	2.1E-02	3.1E-03	4.1E-04		4.7E-02	A	2.1E-02	A	3.1E-03	A	4.1E-04	A
WPILE6	Conveyor Transfer Point to Pile - Wash Plant 2	42	500	125,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	8.5E-03	3.7E-03	5.7E-04	7.5E-05	100%	0.0E+00	A	0.0E+00	A	0.0E+00	A	0.0E+00	A
WPILE7	Conveyor Transfer Point to Pile - Wash Plant 2	42	500	125,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	8.5E-03	3.7E-03	5.7E-04	7.5E-05	100%	0.0E+00	A	0.0E+00	A	0.0E+00	A	0.0E+00	A

Source ID	Description	Processing Rate			Site Data				Base AP 42 Emission Factor				Base Emission Rate				Additional Control Efficiency Applied (%)	Final Controlled Emission Rate at 3.7 m/s							
		Hourly (Mg/h)	Daily (Mg/d)	Annual (Mg/y)	Site Specific Data? (y/n)	Silt Content (%)	Moisture Content (%)	Source Condition Valid [1]	TSP (kg/Mg)	PM_{10} (kg/Mg)	$PM_{2.5}$ (kg/Mg)	Silica (kg/Mg)	TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)	Silica (g/s)		TSP (g/s)	Data Quality Rating	PM_{10} (g/s)	Data Quality Rating	$PM_{2.5}$ (g/s)	Data Quality Rating	Silica (g/s)	Data Quality Rating
WPILE8	Conveyor Transfer Point to Pile - Wash Plant 2	42	500	125,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	8.5E-03	3.7E-03	5.7E-04	7.5E-05	100%	0.0E+00	A	0.0E+00	A	0.0E+00	A	0.0E+00	A
SCENARIO 1 - Operations at Main Plant - Portable Plant 3																									
PILE15	Haul truck dump to pile at portable plant 3	250	4,000	1,000,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	5.1E-02	2.2E-02	3.4E-03	4.5E-04		5.1E-02	A	2.2E-02	A	3.4E-03	A	4.5E-04	A
LOAD16	Load from pile to portable plant 3	250	4,000	1,000,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	5.1E-02	2.2E-02	3.4E-03	4.5E-04		5.1E-02	A	2.2E-02	A	3.4E-03	A	4.5E-04	A
PILE16	Stacker to pile - Portable Plant 3	42	667	166,667	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	8.5E-03	3.7E-03	5.7E-04	7.5E-05		8.5E-03	A	3.7E-03	A	5.7E-04	A	7.5E-05	A
PILE17	Stacker to pile - Portable Plant 3	42	667	166,667	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	8.5E-03	3.7E-03	5.7E-04	7.5E-05		8.5E-03	A	3.7E-03	A	5.7E-04	A	7.5E-05	A
PILE18	Stacker to pile - Portable Plant 3	42	667	166,667	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	8.5E-03	3.7E-03	5.7E-04	7.5E-05		8.5E-03	A	3.7E-03	A	5.7E-04	A	7.5E-05	A
LOAD17	Loader transfer of finished product to offsite truck	144	3,448	1,000,000	y	1.6%	2.1%	valid	2.3E-03	1.0E-03	1.6E-04	2.1E-05	9.4E-02	4.1E-02	6.2E-03	8.2E-04		9.4E-02	A	4.1E-02	A	6.2E-03	A	8.2E-04	A
WPILE9	Conveyor Transfer Point to Pile - Wash Plant 3	42	667	166,667	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	8.5E-03	3.7E-03	5.7E-04	7.5E-05	100%	0.0E+00	A	0.0E+00	A	0.0E+00	A	0.0E+00	A
WPILE10	Conveyor Transfer Point to Pile - Wash Plant 3	42	667	166,667	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	8.5E-03	3.7E-03	5.7E-04	7.5E-05	100%	0.0E+00	A	0.0E+00	A	0.0E+00	A	0.0E+00	A
WPILE11	Conveyor Transfer Point to Pile - Wash Plant 3	42	667	166,667	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	8.5E-03	3.7E-03	5.7E-04	7.5E-05	100%	0.0E+00	A	0.0E+00	A	0.0E+00	A	0.0E+00	A
SCENARIO 2 - Operations at MQEE																									
LOAD1	Loader transfer of raw material to haul truck	128	1,282	333,333	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	2.6E-02	1.2E-02	1.7E-03	2.3E-04		2.6E-02	A	1.2E-02	A	1.7E-03	A	2.3E-04	A
LOAD2	Loader transfer of raw material to haul truck	128	1,282	333,333	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	2.6E-02	1.2E-02	1.7E-03	2.3E-04		2.6E-02	A	1.2E-02	A	1.7E-03	A	2.3E-04	A
EXC1	Excavator transfer to haul truck	128	1,282	333,333	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	2.6E-02	1.2E-02	1.7E-03	2.3E-04		2.6E-02	A	1.2E-02	A	1.7E-03	A	2.3E-04	A
SCENARIO 2 - Operations at East Cell - Portable Plant 1																									
PILE19	Haul truck dump to pile at portable plant 1	250	4,000	1,000,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	5.1E-02	2.2E-02	3.4E-03	4.5E-04		5.1E-02	A	2.2E-02	A	3.4E-03	A	4.5E-04	A
LOAD11	Loader or excavator transfer of raw material to portable plant 1	250	4,000	1,000,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	5.1E-02	2.2E-02	3.4E-03	4.5E-04		5.1E-02	A	2.2E-02	A	3.4E-03	A	4.5E-04	A
PILE8	Stacker to pile - Portable Plant 1	42	667	166,667	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	8.5E-03	3.7E-03	5.7E-04	7.5E-05		8.5E-03	A	3.7E-03	A	5.7E-04	A	7.5E-05	A
PILE9	Stacker to pile - Portable Plant 1	42	667	166,667	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	8.5E-03	3.7E-03	5.7E-04	7.5E-05		8.5E-03	A	3.7E-03	A	5.7E-04	A	7.5E-05	A
PILE10	Stacker to pile - Portable Plant 1	42	667	166,667	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	8.5E-03	3.7E-03	5.7E-04	7.5E-05		8.5E-03	A	3.7E-03	A	5.7E-04	A	7.5E-05	A
LOAD12	Loader transfer of finished product to offsite truck	144	3,448	1,000,000	y	1.6%	2.1%	valid	2.3E-03	1.0E-03	1.6E-04	2.1E-05	9.4E-02	4.1E-02	6.2E-03	8.2E-04		9.4E-02	A	4.1E-02	A	6.2E-03	A	8.2E-04	A
WPILE3	Conveyor Transfer Point to Pile - Wash Plant 1	42	667	166,667	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	8.5E-03	3.7E-03	5.7E-04	7.5E-05	100%	0.0E+00	A	0.0E+00	A	0.0E+00	A	0.0E+00	A
WPILE4	Conveyor Transfer Point to Pile - Wash Plant 1	42	667	166,667	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	8.5E-03	3.7E-03	5.7E-04	7.5E-05	100%	0.0E+00	A	0.0E+00	A	0.0E+00	A	0.0E+00	A
WPILE5	Conveyor Transfer Point to Pile - Wash Plant 1	42	667	166,667	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	8.5E-03	3.7E-03	5.7E-04	7.5E-05	100%	0.0E+00	A	0.0E+00	A	0.0E+00	A	0.0E+00	A
SCENARIO 2 - Operations at South of Main Plant - Portable Plant 2																									
PILE11	Haul truck dump to pile at portable plant 2	167	2,000	500,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	3.4E-02	1.5E-02	2.3E-03	3.0E-04		3.4E-02	A	1.5E-02	A	2.3E-03	A	3.0E-04	A
LOAD13	Load from pile to portable plant 2	167	2,000	500,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	3.4E-02	1.5E-02	2.3E-03	3.0E-04		3.4E-02	A	1.5E-02	A	2.3E-03	A	3.0E-04	A
PILE12	Stacker to pile - Portable Plant 2	42	500	125,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	8.5E-03	3.7E-03	5.7E-04	7.5E-05		8.5E-03	A	3.7E-03	A	5.7E-04	A	7.5E-05	A
PILE13	Stacker to pile - Portable Plant 2	42	500	125,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	8.5E-03	3.7E-03	5.7E-04	7.5E-05		8.5E-03	A	3.7E-03	A	5.7E-04	A	7.5E-05	A
PILE14	Stacker to pile - Portable Plant 2	42	500	125,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	8.5E-03	3.7E-03	5.7E-04	7.5E-05		8.5E-03	A	3.7E-03	A	5.7E-04	A	7.5E-05	A
LOAD15	Loader transfer of finished product to offsite truck	72	1,724	500,000	y	1.6%	2.1%	valid	2.3E-03	1.0E-03	1.6E-04	2.1E-05	4.7E-02	2.1E-02	3.1E-03	4.1E-04		4.7E-02	A	2.1E-02	A	3.1E-03	A	4.1E-04	A
WPILE6	Conveyor Transfer Point to Pile - Wash Plant 2	42	500	125,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	8.5E-03	3.7E-03	5.7E-04	7.5E-05	100%	0.0E+00	A	0.0E+00	A	0.0E+00	A	0.0E+00	A
WPILE7	Conveyor Transfer Point to Pile - Wash Plant 2	42	500	125,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	8.5E-03	3.7E-03	5.7E-04	7.5E-05	100%	0.0E+00	A	0.0E+00	A	0.0E+00	A	0.0E+00	A
WPILE8	Conveyor Transfer Point to Pile - Wash Plant 2	42	500	125,000	y	1.6%	4.8%	valid	7.4E-04	3.2E-04	4.9E-05	6.5E-06	8.5E-03	3.7E-03	5.7E-04	7.5E-05	100%	0.0E+00	A	0.0E+00	A	0.0E+00	A	0.0E+00	A

Notes:

[1] Relates to AP-42 Section 13.2.4-4

[2] k-factor for TSP (PM44) scaled up logarithmically to 0.8 from published k-factor of 0.74 which refers to PM30.

Sample calculation for uncontrolled TSP emission factor for Source LOAD1, at a sample wind speed of 3.7 m/s

EF = 0.0016 x (0.8) x ((3.7 m/s) / 2.2)^1.3 / ((4.8%) / 2)^1.4 = 7.4E-04 kg TSP / Mg handled

Sample calculation for TSP emission rate for Source LOAD1, at a sample wind speed of 5 m/s

$$\frac{641\ Mg_{handled}}{1\ h} \times \frac{7.39E\text{-}04\ kg_{TSP}}{1\ Mg_{handled}} \times \frac{1\ h}{3600\ s} \times \frac{1000\ g_{TSP}}{1\ kg_{TSP}} \times \frac{1\ g_{TSP\ uncontrolled}}{1\ g_{TSP}} = 1.32E\text{-}01\ g_{TSP}/s$$

Comments

A silica content of: 2% was used, based on "The Limestone Industries of Ontario: Indsutrial Mineral Report 39" by the Ontario Division of Mines 1971, which indicates that the area is prmarily dolomite with a silica content of less than 2%.

A silt content of: 1.6% was used, based on the AP-42 CH 13.2.4 values for Stone quarrying and processing - Crushed Limestone.

A raw material moisture content of: 4.8% was used, due to the high saturation level of the raw extracted material.

A finished product moisture content of 2.1% was used, based on the AP-42 CH 13.2.4 values for Stone Quarrying and Processing, "Various Limestone Products".

Scenario 1: Typical Main Plant hours of operation: 24 hours per day and 250 days per year.
Portable Plant 2 (South of Main Plant) hours of operation: 0700h to 1900h. Plant does not operate during January, February and December.
Portable Plant 3 (Main Plant Portable Plant) hours of operation: 0700h to 2300h, 250 days per year.
Quarry Haul Truck dumping into primary crusher buidling at main plant assigned 50% control due to shielding.
Process operations at main plant (including crushers and screens) are located within two enclosed buildings. A control factor of 70% was applied.
Additionally these sources will be combined and assigned to one of the two volume sources to represent emissions in each building.

Scenario 2: Portable Plant 1 (East Cell) hours of operation: 0700h to 2300h, 250 days per year.
Portable Plant 2 (South of Main Plant) hours of operation: 0700h to 1900h. Plant does not operate during January, February and December.

All Scenarios: The typical hours of operation for extraction are 10 hours per day and 260 days per year.
The typical hours of operation for shipping are 24 hours per day and 290 days per year.
Handling sources that occur after the wash plant in the process are assumed to have no emissions due to the aggregate being saturated with water.
Shipping operations occur 24 hours per day but vary monthly due to seasonal variation.

APPENDIX C

Appendix C: Processing Emissions Spreadsheet

CRH Milton Quarry Extension

Project #2102093

Source ID	Source Description / Process Decription	AP-42 Process Description	AP-42 Chapter	Processing Rate			Base AP-42 Emission Factor				Base Emission Rate				Additional Control Efficiency Applied	Final Controlled Emission Rate							
				Hourly	Daily	Annual	TSP	PM_{10}	$PM_{2.5}$	Silica	TSP	PM_{10}	$PM_{2.5}$	Silica		TSP	Data Quality Rating	PM_{10}	Data Quality Rating	$PM_{2.5}$	Data Quality Rating	Silica	Data Quality Rating
				(Mg/h)	(Mg/d)	(Mg/a)	(kg/Mg)	(kg/Mg)	(kg/Mg)	(kg/Mg)	(g/s)	(g/s)	(g/s)	(g/s)	(%)	(g/s)		(g/s)		(g/s)		(g/s)	
SCENARIO 1 - Operations at MQEE																							
DRILL1 [1]	Drilling at working face	Wet drilling: unfragmented stone	11.19.2-1	2	20	5207	5.7E-05	4.0E-05	6.0E-06	8.0E-07	3.2E-05	2.2E-05	3.3E-06	4.5E-07		3.2E-05	E	2.2E-05	E	3.3E-06	E	4.5E-07	E
DRILL2 [1]	Drilling at working face	Wet drilling: unfragmented stone	11.19.2-1	2	20	5207	5.7E-05	4.0E-05	6.0E-06	8.0E-07	3.2E-05	2.2E-05	3.3E-06	4.5E-07		3.2E-05	E	2.2E-05	E	3.3E-06	E	4.5E-07	E
DRILL3 [1]	Drilling at working face	Wet drilling: unfragmented stone	11.19.2-1	2	20	5207	5.7E-05	4.0E-05	6.0E-06	8.0E-07	3.2E-05	2.2E-05	3.3E-06	4.5E-07		3.2E-05	E	2.2E-05	E	3.3E-06	E	4.5E-07	E
SCENARIO 1 - Operations at Main Plant																							
PCRSH1	Primary Crusher	Primary crushing (controlled)	11.19.2-1	1905	45720	11430000	3.4E-04	2.7E-04	5.0E-05	5.4E-06	1.8E-01	1.4E-01	2.6E-02	2.9E-03	70%	5.4E-02	E	4.3E-02	E	7.9E-03	E	8.6E-04	E
Processes Contained in the Main Crushing Building - VOL1																							
SC1	First Set of Screens	Screening (controlled)	11.19.2-1	953	22860	5715000	5.6E-04	3.7E-04	2.5E-05	7.4E-06	1.5E-01	9.8E-02	6.6E-03	2.0E-03	70%	4.4E-02	E	2.9E-02	C	2.0E-03	E	5.9E-04	C
SC2	First Set of Screens	Screening (controlled)	11.19.2-1	953	22860	5715000	5.6E-04	3.7E-04	2.5E-05	7.4E-06	1.5E-01	9.8E-02	6.6E-03	2.0E-03	70%	4.4E-02	E	2.9E-02	C	2.0E-03	E	5.9E-04	C
SC3	Second Set of Screens	Screening	11.19.2-1	304	7296	1824000	6.5E-03	4.3E-03	6.5E-04	8.6E-05	5.5E-01	3.6E-01	5.4E-02	7.3E-03	70%	1.6E-01	E	1.1E-01	C	1.6E-02	E	2.2E-03	C
SC4	Second Set of Screens	Screening (controlled)	11.19.2-1	304	7296	1824000	5.6E-04	3.7E-04	2.5E-05	7.4E-06	4.7E-02	3.1E-02	2.1E-03	6.2E-04	70%	1.4E-02	E	9.4E-03	C	6.3E-04	E	1.9E-04	C
SCRSH1	Secondary Crusher - Nordberg (HP 700 S/M)	Secondary crushing (controlled)	11.19.2-1	1297	31128	7782000	3.4E-04	2.7E-04	5.0E-05	5.4E-06	1.2E-01	9.7E-02	1.8E-02	1.9E-03	70%	3.7E-02	E	2.9E-02	E	5.4E-03	E	5.8E-04	E
SCRSH2	Secondary Crusher - Nordberg (HP 700 SH/M)	Secondary crushing (controlled)	11.19.2-1	510	12230	3057480	3.4E-04	2.7E-04	5.0E-05	5.4E-06	4.8E-02	3.8E-02	7.1E-03	7.6E-04	70%	1.4E-02	E	1.1E-02	E	2.1E-03	E	2.3E-04	E
SCRSH3	Secondary Crusher - Nordberg (HP 700 SH/M)	Secondary crushing (controlled)	11.19.2-1	496	11908	2977020	3.4E-04	2.7E-04	5.0E-05	5.4E-06	4.7E-02	3.7E-02	6.9E-03	7.4E-04	70%	1.4E-02	E	1.1E-02	E	2.1E-03	E	2.2E-04	E
SCRSH4	Secondary Crusher - Nordberg (HP 500 S/F)	Secondary crushing (controlled)	11.19.2-1	335	8046	2011500	3.4E-04	2.7E-04	5.0E-05	5.4E-06	3.2E-02	2.5E-02	4.7E-03	5.0E-04	70%	9.5E-03	E	7.5E-03	E	1.4E-03	E	1.5E-04	E
Processes Contained in the Main Screening Building - VOL2																							
SC5a	First Set of Screens in Screening Building	Screening (controlled)	11.19.2-1	660	15828	3957000	5.6E-04	3.7E-04	2.5E-05	7.4E-06	1.0E-01	6.8E-02	4.6E-03	1.4E-03	70%	3.1E-02	E	2.0E-02	C	1.4E-03	E	4.1E-04	C
SC5b	First Set of Screens in Screening Building	Screening (controlled)	11.19.2-1	660	15828	3957000	5.6E-04	3.7E-04	2.5E-05	7.4E-06	1.0E-01	6.8E-02	4.6E-03	1.4E-03	70%	3.1E-02	E	2.0E-02	C	1.4E-03	E	4.1E-04	C
SC5c	First Set of Screens in Screening Building	Screening (controlled)	11.19.2-1	660	15828	3957000	5.6E-04	3.7E-04	2.5E-05	7.4E-06	1.0E-01	6.8E-02	4.6E-03	1.4E-03	70%	3.1E-02	E	2.0E-02	C	1.4E-03	E	4.1E-04	C
SC5d	First Set of Screens in Screening Building	Screening (controlled)	11.19.2-1	660	15828	3957000	5.6E-04	3.7E-04	2.5E-05	7.4E-06	1.0E-01	6.8E-02	4.6E-03	1.4E-03	70%	3.1E-02	E	2.0E-02	C	1.4E-03	E	4.1E-04	C
SC6a	Second Set of Screens in Screening Building	Screening (controlled)	11.19.2-1	466	11190	2797500	5.6E-04	3.7E-04	2.5E-05	7.4E-06	7.3E-02	4.8E-02	3.2E-03	9.6E-04	70%	2.2E-02	E	1.4E-02	C	9.7E-04	E	2.9E-04	C
SC6b	Second Set of Screens in Screening Building	Screening (controlled)	11.19.2-1	466	11190	2797500	5.6E-04	3.7E-04	2.5E-05	7.4E-06	7.3E-02	4.8E-02	3.2E-03	9.6E-04	70%	2.2E-02	E	1.4E-02	C	9.7E-04	E	2.9E-04	C
SC6c	Second Set of Screens in Screening Building	Screening (controlled)	11.19.2-1	466	11190	2797500	5.6E-04	3.7E-04	2.5E-05	7.4E-06	7.3E-02	4.8E-02	3.2E-03	9.6E-04	70%	2.2E-02	E	1.4E-02	C	9.7E-04	E	2.9E-04	C
SC6d	Second Set of Screens in Screening Building	Screening (controlled)	11.19.2-1	466	11190	2797500	5.6E-04	3.7E-04	2.5E-05	7.4E-06	7.3E-02	4.8E-02	3.2E-03	9.6E-04	70%	2.2E-02	E	1.4E-02	C	9.7E-04	E	2.9E-04	C
SC7a	Third Set of Screens in Screening Building	Screening (controlled)	11.19.2-1	182	4374	1093500	5.6E-04	3.7E-04	2.5E-05	7.4E-06	2.8E-02	1.9E-02	1.3E-03	3.7E-04	70%	8.5E-03	E	5.6E-03	C	3.8E-04	E	1.1E-04	C
SC7b	Third Set of Screens in Screening Building	Screening (controlled)	11.19.2-1	182	4374	1093500	5.6E-04	3.7E-04	2.5E-05	7.4E-06	2.8E-02	1.9E-02	1.3E-03	3.7E-04	70%	8.5E-03	E	5.6E-03	C	3.8E-04	E	1.1E-04	C
SC7c	Third Set of Screens in Screening Building	Screening (controlled)	11.19.2-1	182	4374	1093500	5.6E-04	3.7E-04	2.5E-05	7.4E-06	2.8E-02	1.9E-02	1.3E-03	3.7E-04	70%	8.5E-03	E	5.6E-03	C	3.8E-04	E	1.1E-04	C
SC7d	Third Set of Screens in Screening Building	Screening (controlled)	11.19.2-1	182	4374	1093500	5.6E-04	3.7E-04	2.5E-05	7.4E-06	2.8E-02	1.9E-02	1.3E-03	3.7E-04	70%	8.5E-03	E	5.6E-03	C	3.8E-04	E	1.1E-04	C
WASH1	Washplant			Material completely saturated and no emissions expected.																			
SCENARIO 1 - Operations at South of Main Plant - Portable Plant 2																							
PCRSH3	Primary Jaw Plant - Portable Plant 2	Primary crushing (controlled)	11.19.2-1	167	2000	500000	3.4E-04	2.7E-04	5.0E-05	5.4E-06	1.6E-02	1.3E-02	2.3E-03	2.5E-04		1.6E-02	E	1.3E-02	E	2.3E-03	E	2.5E-04	E
GCRSH2	Gyratory Crusher - Portable Plant 2	Primary crushing (controlled)	11.19.2-1	167	2000	500000	3.4E-04	2.7E-04	5.0E-05	5.4E-06	1.6E-02	1.3E-02	2.3E-03	2.5E-04		1.6E-02	E	1.3E-02	E	2.3E-03	E	2.5E-04	E
CO5	Conveyor transfer point to Screening plant	Conveyor transfer point (controlled)	11.19.2-1	167	2000	500000	3.7E-05	2.3E-05	6.5E-06	4.6E-07	1.7E-03	1.1E-03	3.0E-04	2.1E-05		1.7E-03	E	1.1E-03	D	3.0E-04	E	2.1E-05	D
SC10	Screen Plant - Portable Plant 2	Screening (controlled)	11.19.2-1	250	3000	750000	5.6E-04	3.7E-04	2.5E-05	7.4E-06	3.9E-02	2.6E-02	1.7E-03	5.1E-04		3.9E-02	E	2.6E-02	C	1.7E-03	E	5.1E-04	C
SC11	Screen Plant - Portable Plant 2	Screening (controlled)	11.19.2-1	250	3000	750000	5.6E-04	3.7E-04	2.5E-05	7.4E-06	3.9E-02	2.6E-02	1.7E-03	5.1E-04		3.9E-02	E	2.6E-02	C	1.7E-03	E	5.1E-04	C
CCRSH2	Cone Crusher - Portable Plant 2	Secondary crushing (controlled)	11.19.2-1	83	1000	250000	3.4E-04	2.7E-04	5.0E-05	5.4E-06	7.9E-03	6.3E-03	1.2E-03	1.3E-04		7.9E-03	E	6.3E-03	E	1.2E-03	E	1.3E-04	E
CO6	Conveyor Transfer Point - Intermediate Conveyor - Portable Plant 2	Conveyor transfer point (controlled)	11.19.2-1	83	1000	250000	3.7E-05	2.3E-05	6.5E-06	4.6E-07	8.6E-04	5.3E-04	1.5E-04	1.1E-05		8.6E-04	E	5.3E-04	D	1.5E-04	E	1.1E-05	D
CO7	Conveyor Transfer Point - Intermediate Conveyor - Portable Plant 2	Conveyor transfer point (controlled)	11.19.2-1	83	1000	250000	3.7E-05	2.3E-05	6.5E-06	4.6E-07	8.6E-04	5.3E-04	1.5E-04	1.1E-05		8.6E-04	E	5.3E-04	D	1.5E-04	E	1.1E-05	D
CO8	Conveyor Transfer Point - Intermediate Conveyor - Portable Plant 2	Conveyor transfer point (controlled)	11.19.2-1	83	1000	250000	3.7E-05	2.3E-05	6.5E-06	4.6E-07	8.6E-04	5.3E-04	1.5E-04	1.1E-05		8.6E-04	E	5.3E-04	D	1.5E-04	E	1.1E-05	D
WASH3	Washplant at Portable Plant 2			Material completely saturated and no emissions expected.																			
SCENARIO 1 - Operations at Main Plant - Portable Plant 3																							
PCRSH4	Primary Jaw Plant - Portable Plant 3	Primary crushing (controlled)	11.19.2-1	800	12800	3200000	3.4E-04	2.7E-04	5.0E-05	5.4E-06	7.6E-02	6.0E-02	1.1E-02	1.2E-03		7.6E-02	E	6.0E-02	E	1.1E-02	E	1.2E-03	E
GCRSH3	Gyratory Crusher - Portable Plant 3	Primary crushing (controlled)	11.19.2-1	383	6128	1532000	3.4E-04	2.7E-04	5.0E-05	5.4E-06	3.6E-02	2.9E-02	5.3E-03	5.7E-04		3.6E-02	E	2.9E-02	E	5.3E-03	E	5.7E-04	E
CO15	Conveyor transfer point to Screening plant	Conveyor transfer point (controlled)	11.19.2-1	800	12800	3200000	3.7E-05	2.3E-05	6.5E-06	4.6E-07	8.2E-03	5.1E-03	1.4E-03	1.0E-04		8.2E-03	E	5.1E-03	D	1.4E-03	E	1.0E-04	D
SC12 [4]	Screen Plant - Portable Plant 3	Screening (controlled)	11.19.2-1	1025	16400	4100000	5.6E-04	3.7E-04	2.5E-05	7.4E-06	1.6E-01	1.1E-01	7.1E-03	2.1E-03		1.6E-01	E	1.1E-01	C	7.1E-03	E	2.1E-03	C
SC13 [4]	Screen Plant - Portable Plant 3	Screening (controlled)	11.19.2-1	1025	16400	4100000	5.6E-04	3.7E-04	2.5E-05	7.4E-06	1.6E-01	1.1E-01	7.1E-03	2.1E-03		1.6E-01	E	1.1E-01	C	7.1E-03	E	2.1E-03	C
CCRSH4	Cone Crusher - Portable Plant 3	Secondary crushing (controlled)	11.19.2-1	442	7072	1768000	3.4E-04	2.7E-04	5.0E-05	5.4E-06	4.2E-02	3.3E-02	6.1E-03	6.6E-04		4.2E-02	E	3.3E-02	E	6.1E-03	E	6.6E-04	E
CCRSH5	Cone Crusher - Portable Plant 3	Secondary crushing (controlled)	11.19.2-1	225	3600	900000	3.4E-04	2.7E-04	5.0E-05	5.4E-06	2.1E-02	1.7E-02	3.1E-03	3.4E-04		2.1E-02	E	1.7E-02	E	3.1E-03	E	3.4E-04	E
CO16	Conveyor Transfer Point - Intermediate Conveyor - Portable Plant 3	Conveyor transfer point (controlled)	11.19.2-1	800	12800	3200000	3.7E-05	2.3E-05	6.5E-06	4.6E-07	8.2E-03	5.1E-03	1.4E-03	1.0E-04		8.2E-03	E	5.1E-03	D	1.4E-03	E	1.0E-04	D
CO17	Conveyor Transfer Point - Intermediate Conveyor - Portable Plant 3	Conveyor transfer point (controlled)	11.19.2-1	800	12800	3200000	3.7E-05	2.3E-05	6.5E-06	4.6E-07	8.2E-03	5.1E-03	1.4E-03	1.0E-04		8.2E-03	E	5.1E-03	D	1.4E-03	E	1.0E-04	D
CO18	Conveyor Transfer Point - Intermediate Conveyor - Portable Plant 3	Conveyor transfer point (controlled)	11.19.2-1	800	12800	3200000	3.7E-05	2.3E-05	6.5E-06	4.6E-07	8.2E-03	5.1E-03	1.4E-03	1.0E-04		8.2E-03	E	5.1E-03	D	1.4E-03	E	1.0E-04	D
WASH4	Washplant at Portable Plant 3			Material completely saturated and no emissions expected.																			

Source ID	Source Description / Process Decription	AP-42 Process Description	AP-42 Chapter	Processing Rate			Base AP-42 Emission Factor				Base Emission Rate				Additional Control Efficiency Applied	Final Controlled Emission Rate							
				Hourly	Daily	Annual	TSP	PM_{10}	$PM_{2.5}$	Silica	TSP	PM_{10}	$PM_{2.5}$	Silica		TSP	Data Quality Rating	PM_{10}	Data Quality Rating	$PM_{2.5}$	Data Quality Rating	Silica	Data Quality Rating
				(Mg/h)	(Mg/d)	(Mg/a)	(kg/Mg)	(kg/Mg)	(kg/Mg)	(kg/Mg)	(g/s)	(g/s)	(g/s)	(g/s)	(%)	(g/s)		(g/s)		(g/s)		(g/s)	
SCENARIO 2 - Operations at MQEE																							
DRILL4 [1]	Drilling at working face	Wet drilling: unfragmented stone	11.19.2-1	2	20	5207	5.7E-05	4.0E-05	6.0E-06	8.0E-07	3.2E-05	2.2E-05	3.3E-06	4.5E-07		3.2E-05	E	2.2E-05	E	3.3E-06	E	4.5E-07	E
DRILL5 [1]	Drilling at working face	Wet drilling: unfragmented stone	11.19.2-1	2	20	5207	5.7E-05	4.0E-05	6.0E-06	8.0E-07	3.2E-05	2.2E-05	3.3E-06	4.5E-07		3.2E-05	E	2.2E-05	E	3.3E-06	E	4.5E-07	E
SCENARIO 2 - Operations at East Cell - Portable Plant 1																							
PCRSH2	Primary Jaw Plant - Portable Plant 1	Primary crushing (controlled)	11.19.2-1	800	12800	3200000	3.4E-04	2.7E-04	5.0E-05	5.4E-06	7.6E-02	6.0E-02	1.1E-02	1.2E-03		7.6E-02	E	6.0E-02	E	1.1E-02	E	1.2E-03	E
GCRSH1	Gyratory Crusher - Portable Plant 1	Primary crushing (controlled)	11.19.2-1	383	6128	1532000	3.4E-04	2.7E-04	5.0E-05	5.4E-06	3.6E-02	2.9E-02	5.3E-03	5.7E-04		3.6E-02	E	2.9E-02	E	5.3E-03	E	5.7E-04	E
CO1	Conveyor transfer point to Screening plant	Conveyor transfer point (controlled)	11.19.2-1	800	12800	3200000	3.7E-05	2.3E-05	6.5E-06	4.6E-07	8.2E-03	5.1E-03	1.4E-03	1.0E-04		8.2E-03	E	5.1E-03	D	1.4E-03	E	1.0E-04	D
SC8 [2]	Screen Plant - Portable Plant 1	Screening (controlled)	11.19.2-1	1025	16400	4100000	5.6E-04	3.7E-04	2.5E-05	7.4E-06	1.6E-01	1.1E-01	7.1E-03	2.1E-03		1.6E-01	E	1.1E-01	C	7.1E-03	E	2.1E-03	C
SC9 [2]	Screen Plant - Portable Plant 1	Screening (controlled)	11.19.2-1	1025	16400	4100000	5.6E-04	3.7E-04	2.5E-05	7.4E-06	1.6E-01	1.1E-01	7.1E-03	2.1E-03		1.6E-01	E	1.1E-01	C	7.1E-03	E	2.1E-03	C
CCRSH1	Cone Crusher - Portable Plant 1	Secondary crushing (controlled)	11.19.2-1	442	7072	1768000	3.4E-04	2.7E-04	5.0E-05	5.4E-06	4.2E-02	3.3E-02	6.1E-03	6.6E-04		4.2E-02	E	3.3E-02	E	6.1E-03	E	6.6E-04	E
CCRSH3	Cone Crusher - Portable Plant 1	Secondary crushing (controlled)	11.19.2-1	225	3600	900000	3.4E-04	2.7E-04	5.0E-05	5.4E-06	2.1E-02	1.7E-02	3.1E-03	3.4E-04		2.1E-02	E	1.7E-02	E	3.1E-03	E	3.4E-04	E
CO2	Conveyor Transfer Point - Intermediate Conveyor - Portable Plant 1	Conveyor transfer point (controlled)	11.19.2-1	800	12800	3200000	3.7E-05	2.3E-05	6.5E-06	4.6E-07	8.2E-03	5.1E-03	1.4E-03	1.0E-04		8.2E-03	E	5.1E-03	D	1.4E-03	E	1.0E-04	D
CO3	Conveyor Transfer Point - Intermediate Conveyor - Portable Plant 1	Conveyor transfer point (controlled)	11.19.2-1	800	12800	3200000	3.7E-05	2.3E-05	6.5E-06	4.6E-07	8.2E-03	5.1E-03	1.4E-03	1.0E-04		8.2E-03	E	5.1E-03	D	1.4E-03	E	1.0E-04	D
CO4	Conveyor Transfer Point - Intermediate Conveyor - Portable Plant 1	Conveyor transfer point (controlled)	11.19.2-1	800	12800	3200000	3.7E-05	2.3E-05	6.5E-06	4.6E-07	8.2E-03	5.1E-03	1.4E-03	1.0E-04		8.2E-03	E	5.1E-03	D	1.4E-03	E	1.0E-04	D
WASH2	Washplant at Portable Plant 1			Material completely saturated and no emissions expected.																			
SCENARIO 2 - Operations at South of Main Plant - Portable Plant 2																							
PCRSH3	Primary Jaw Plant - Portable Plant 2	Primary crushing (controlled)	11.19.2-1	167	2000	500000	3.4E-04	2.7E-04	5.0E-05	5.4E-06	1.6E-02	1.3E-02	2.3E-03	2.5E-04		1.6E-02	E	1.3E-02	E	2.3E-03	E	2.5E-04	E
GCRSH2	Gyratory Crusher - Portable Plant 2	Primary crushing (controlled)	11.19.2-1	167	2000	500000	3.4E-04	2.7E-04	5.0E-05	5.4E-06	1.6E-02	1.3E-02	2.3E-03	2.5E-04		1.6E-02	E	1.3E-02	E	2.3E-03	E	2.5E-04	E
CO5	Conveyor transfer point to Screening plant	Conveyor transfer point (controlled)	11.19.2-1	167	2000	500000	3.7E-05	2.3E-05	6.5E-06	4.6E-07	1.7E-03	1.1E-03	3.0E-04	2.1E-05		1.7E-03	E	1.1E-03	D	3.0E-04	E	2.1E-05	D
SC10 [3]	Screen Plant - Portable Plant 2	Screening (controlled)	11.19.2-1	250	3000	750000	5.6E-04	3.7E-04	2.5E-05	7.4E-06	3.9E-02	2.6E-02	1.7E-03	5.1E-04		3.9E-02	E	2.6E-02	C	1.7E-03	E	5.1E-04	C
SC11 [3]	Screen Plant - Portable Plant 2	Screening (controlled)	11.19.2-1	250	3000	750000	5.6E-04	3.7E-04	2.5E-05	7.4E-06	3.9E-02	2.6E-02	1.7E-03	5.1E-04		3.9E-02	E	2.6E-02	C	1.7E-03	E	5.1E-04	C
CCRSH2	Cone Crusher - Portable Plant 2	Secondary crushing (controlled)	11.19.2-1	83	1000	250000	3.4E-04	2.7E-04	5.0E-05	5.4E-06	7.9E-03	6.3E-03	1.2E-03	1.3E-04		7.9E-03	E	6.3E-03	E	1.2E-03	E	1.3E-04	E
CO6	Conveyor Transfer Point - Intermediate Conveyor - Portable Plant 2	Conveyor transfer point (controlled)	11.19.2-1	83	1000	250000	3.7E-05	2.3E-05	6.5E-06	4.6E-07	8.6E-04	5.3E-04	1.5E-04	1.1E-05		8.6E-04	E	5.3E-04	D	1.5E-04	E	1.1E-05	D
CO7	Conveyor Transfer Point - Intermediate Conveyor - Portable Plant 2	Conveyor transfer point (controlled)	11.19.2-1	83	1000	250000	3.7E-05	2.3E-05	6.5E-06	4.6E-07	8.6E-04	5.3E-04	1.5E-04	1.1E-05		8.6E-04	E	5.3E-04	D	1.5E-04	E	1.1E-05	D
CO8	Conveyor Transfer Point - Intermediate Conveyor - Portable Plant 2	Conveyor transfer point (controlled)	11.19.2-1	83	1000	250000	3.7E-05	2.3E-05	6.5E-06	4.6E-07	8.6E-04	5.3E-04	1.5E-04	1.1E-05		8.6E-04	E	5.3E-04	D	1.5E-04	E	1.1E-05	D
WASH3	Washplant at Portable Plant 2			Material completely saturated and no emissions expected.																			

Sample calculation for TSP emissions from Source DRILL1 [1]: Drilling at working face

$$\frac{2\ Mg_{processed}}{1\ h} \left| \frac{5.70E\text{-}05\ kg_{TSP}}{1\ Mg_{processed}} \right| \frac{1\ h}{3600\ s} \left| \frac{1000\ g_{TSP}}{1\ kg_{TSP}} \right| \frac{100\%\ g_{TSP\ uncontrolled}}{1\ g_{TSP}} = 3.2E\text{-}05\ g_{TSP}/s$$

Notes:

[1] Emissions from drilling deemed insignificant because they contribute less than 0.001% of overall emissions.

[2] Sources SC8 and SC9 were modelled together as one source.

[3] Sources SC10 and SC11 were modelled together as one source.

[4] Sources SC12 and SC13 were modelled together as one source.

Comments	
AP-42 Emission Factor for TSP is based on PM100. The values have been corrected to reflect PM44.	
A silica content of:	2% was used, based on "The Limestone Industries of Ontario: Indsutrial Mineral Report 39" by the Ontario Division of Mines 1971, which indicates that the Amabel dolostone mined at Milton has a silica content of less than 2%.
A silt content of:	1.6% was used, based on the AP-42 CH 13.2.4 values for Stone quarrying and processing - Crushed Limestone.
Scenario 1:	Typical Main Plant hours of operation: 24 hours per day and 250 days per year.
	Portable Plant 2 (South of Main Plant) hours of operation: 0700h to 1900h. Plant does not operate during January, February and December.
	Portable Plant 3 (Main Plant Portable Plant) hours of operation: 0700h to 2300h, 250 days per year.
	Quarry Haul Truck dumping into primary crusher buidling at main plant assigned 50% control due to shielding.
	Process operations at main plant (including crushers and screens) are located within two enclosed buildings. A control factor of 70% was applied. Additionally these sources will be combined and assigned to one of the two volume sources to represent emissions in each building.
Scenario 2:	Portable Plant 1 (East Cell) hours of operation: 0700h to 2300h, 250 days per year.
	Portable Plant 2 (South of Main Plant) hours of operation: 0700h to 1900h. Plant does not operate during January, February and December.
All Scenarios:	The typical hours of operation for extraction are 10 hours per day and 260 days per year.
	The typical hours of operation for shipping are 24 hours per day and 290 days per year.
	Process Emissions are calculated based on controlled emission factors due to the high moisture content of the virgin aggregate.
	Wash plant operations are assumed to have no emissions due to the aggregate being saturated with water.
	Drilling reflects hole 4 1/2" diameter, 15m deep, assumed density of 2670kg/m³, 5 holes / hour

APPENDIX D

Appendix D: On-Site Mobile Equipment Emissions Spreadsheet - Fugitive Dust

CRH Milton Quarry Extension

Project #2102093

UNPAVED ROAD SECTIONS - AP-42 Section 13.2.2
PAVED ROAD SECTIONS - AP-42 Section 13.2.1

Paved Roads:	$E = k\ (sL)^{0.91}\ (W)^{1.02}$
Unpaved Roads - Industrial:	$E = 281.9\ k\ (s / 12)^{a}\ (W / 3)^{b}$
Unpaved Roads - Public:	$E = 281.9\ k\ (s / 12)^{a}\ (S / 30)^{d} / (M / 0.5)^{c} - C$

E particulate emission factor (g/VKT) — **W** average weight of the vehicles traveling the road (US short tons) — **M** surface material moisture content (%)
k particle size multiplier (see below) — **s** surface material silt content (%) — **S** mean vehicle speed (mph)
sL road surface silt loading (g/m^2) — **C** emission factor for 1980's vehicle fleet exhaust, brake wear and tire wear — **a,b,c,d** constants (see below)

Route ID [1]	Route Description	Traffic Passes [2] Hourly (#/h)	Daily (#/d)	Annual (#/a)	Segment Length [2] (m)	Road Surface [3]	Roadway Type [4]	Mean Vehicle Speed (km/h)	(mph)	Average Vehicle Weight [5] (tons)	Surface Material Moisture Content [6] (%)	Surface Silt Content [7] (%)	Road Surface Silt Loading [8] (g/m^2)	Base AP 42 Emission Factor TSP (g/VKT)	PM_{10} (g/VKT)	$PM_{2.5}$ (g/VKT)	Silica (g/VKT)	Base Emission Rate TSP (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)	Silica (g/s)	Additional Control Efficiency Applied (%)	Final Controlled Emission Rate TSP (g/s)	Data Quality Rating	PM_{10} (g/s)	Data Quality Rating	$PM_{2.5}$ (g/s)	Data Quality Rating	Silica (g/s)	Data Quality Rating
Scenario 1																														
HAUL1	Haul Truck Traffic from MQEE to Main Plant / Portable Plant 2	14	346	90000	3628	Unpaved	Industrial	25	16	126		8.3%		8.9E+03	1.6E+03	1.6E+02	3.3E+01	1.3E+02	2.4E+01	2.4E+00	4.7E-01	95%	6.5E+00	C	1.2E+00	B	1.2E-01	C	2.4E-02	B
HAUL2	Main Plant Shipping Loop - One Way	47	1137	149265	2848	Unpaved	Industrial	30	19	28.1		8.3%		4.5E+03	8.3E+02	8.3E+01	1.7E+01	1.7E+02	3.1E+01	3.1E+00	6.2E-01	95%	8.5E+00	C	1.6E+00	B	1.6E-01	C	3.1E-02	B
HAUL3	Haul Truck Traffic from Main Plant Crusher to Portable Plant 2	3	38	10000	248	Unpaved	Industrial	25	16	126		8.3%		8.9E+03	1.6E+03	1.6E+02	3.3E+01	2.0E+00	3.6E-01	3.6E-02	7.2E-03	95%	9.8E-02	C	1.8E-02	B	1.8E-03	C	3.6E-04	B
HAUL5	Portable Plant 2 Shipping Loop - One Way	6	142	18658	1018	Unpaved	Industrial	30	19	28.1		8.3%		4.5E+03	8.3E+02	8.3E+01	1.7E+01	7.6E+00	1.4E+00	1.4E-01	2.8E-02	95%	3.8E-01	C	7.0E-02	B	7.0E-03	C	1.4E-03	B
HAUL6	Shipping Traffic on Paved Site Entrance Road	53	1564	205239	1699	Paved	Industrial	30	19	28.1			1.2	1.7E+02	2.2E+01	5.3E+00	4.4E-01	4.3E+00	5.5E-01	1.3E-01	1.1E-02	75%	1.1E+00		1.4E-01		3.3E-02		2.8E-03	
HAUL7	Haul Truck Traffic between MQEE and Portable Plant 3	5	77	20000	3291	Unpaved	Industrial	25	16	126		8.3%		8.9E+03	1.6E+03	1.6E+02	3.3E+01	3.9E+01	7.2E+00	7.2E-01	1.4E-01	95%	2.0E+00	C	3.6E-01	B	3.6E-02	C	7.2E-03	B
HAUL9	Shipping Traffic from Portable Plant 3 to Pavement	18	284	37316	1059	Unpaved	Industrial	25	16	28.1		8.3%		4.5E+03	8.3E+02	8.3E+01	1.7E+01	2.4E+01	4.3E+00	4.3E-01	8.7E-02	95%	1.2E+00	C	2.2E-01	B	2.2E-02	C	4.3E-03	B
TLOAD1	Working face loader traffic for loading haul trucks	85	855	222222	50	Unpaved	Industrial	25	16	61.5		8.3%		6.4E+03	1.2E+03	1.2E+02	2.4E+01	7.6E+00	1.4E+00	1.4E-01	2.8E-02	95%	3.8E-01	C	7.0E-02	B	7.0E-03	C	1.4E-03	B
TLOAD2	Working face loader traffic for loading haul trucks	85	855	222222	50	Unpaved	Industrial	25	16	61.5		8.3%		6.4E+03	1.2E+03	1.2E+02	2.4E+01	7.6E+00	1.4E+00	1.4E-01	2.8E-02	95%	3.8E-01	C	7.0E-02	B	7.0E-03	C	1.4E-03	B
TLOAD3	Main Plant loader traffic for loading highway trucks	14	328	95238	25	Unpaved	Industrial	25	16	61.5		8.3%		6.4E+03	1.2E+03	1.2E+02	2.4E+01	6.1E-01	1.1E-01	1.1E-02	2.2E-03	95%	3.1E-02	C	5.6E-03	B	5.6E-04	C	1.1E-04	B
TLOAD4	Main Plant loader traffic for loading highway trucks	14	328	95238	25	Unpaved	Industrial	25	16	61.5		8.3%		6.4E+03	1.2E+03	1.2E+02	2.4E+01	6.1E-01	1.1E-01	1.1E-02	2.2E-03	95%	3.1E-02	C	5.6E-03	B	5.6E-04	C	1.1E-04	B
TLOAD5	Main Plant loader traffic for loading highway trucks	14	328	95238	25	Unpaved	Industrial	25	16	61.5		8.3%		6.4E+03	1.2E+03	1.2E+02	2.4E+01	6.1E-01	1.1E-01	1.1E-02	2.2E-03	95%	3.1E-02	C	5.6E-03	B	5.6E-04	C	1.1E-04	B
TLOAD6	Main Plant loader traffic for loading highway trucks	14	328	95238	25	Unpaved	Industrial	25	16	61.5		8.3%		6.4E+03	1.2E+03	1.2E+02	2.4E+01	6.1E-01	1.1E-01	1.1E-02	2.2E-03	95%	3.1E-02	C	5.6E-03	B	5.6E-04	C	1.1E-04	B
TLOAD7	Main Plant loader traffic for loading highway trucks	14	328	95238	25	Unpaved	Industrial	25	16	61.5		8.3%		6.4E+03	1.2E+03	1.2E+02	2.4E+01	6.1E-01	1.1E-01	1.1E-02	2.2E-03	95%	3.1E-02	C	5.6E-03	B	5.6E-04	C	1.1E-04	B
TLOAD8	Main Plant loader traffic for loading highway trucks	14	328	95238	25	Unpaved	Industrial	25	16	61.5		8.3%		6.4E+03	1.2E+03	1.2E+02	2.4E+01	6.1E-01	1.1E-01	1.1E-02	2.2E-03	95%	3.1E-02	C	5.6E-03	B	5.6E-04	C	1.1E-04	B
TLOAD9	Main Plant loader traffic for loading highway trucks	14	328	95238	25	Unpaved	Industrial	25	16	61.5		8.3%		6.4E+03	1.2E+03	1.2E+02	2.4E+01	6.1E-01	1.1E-01	1.1E-02	2.2E-03	95%	3.1E-02	C	5.6E-03	B	5.6E-04	C	1.1E-04	B
TLOAD10	Portable Plant 3 Loader Traffic for Loading Highway Trucks	24	575	166667	25	Unpaved	Industrial	25	16	61.5		8.3%		6.4E+03	1.2E+03	1.2E+02	2.4E+01	1.1E+00	2.0E-01	2.0E-02	3.9E-03	95%	5.4E-02	C	9.8E-03	B	9.8E-04	C	2.0E-04	B
TLOAD12	Portable Plant 2 Loader Traffic for Loading Highway Trucks	12	287	83333	25	Unpaved	Industrial	25	16	61.5		8.3%		6.4E+03	1.2E+03	1.2E+02	2.4E+01	5.4E-01	9.8E-02	9.8E-03	2.0E-03	95%	2.7E-02	C	4.9E-03	B	4.9E-04	C	9.8E-05	B
Scenario 2																														
HAUL1	Haul Truck Traffic from MQEE to Main Plant	3	38	10000	3628	Unpaved	Industrial	25	16	126		8.3%		8.9E+03	1.6E+03	1.6E+02	3.3E+01	2.9E+01	5.3E+00	5.3E-01	1.1E-01	95%	1.4E+00	C	2.6E-01	B	2.6E-02	C	5.3E-03	B
HAUL3	Haul Truck Traffic from Main Plant Crusher to Portable Plant 2	3	38	10000	248	Unpaved	Industrial	25	16	126		8.3%		8.9E+03	1.6E+03	1.6E+02	3.3E+01	2.0E+00	3.6E-01	3.6E-02	7.2E-03	95%	9.8E-02	C	1.8E-02	B	1.8E-03	C	3.6E-04	B
HAUL4	Haul Truck Traffic from MQEE to East Extension	5	80	20000	977	Unpaved	Industrial	30	19	126		8.3%		8.9E+03	1.6E+03	1.6E+02	3.3E+01	1.2E+01	2.2E+00	2.2E-01	4.4E-02	95%	6.0E-01	C	1.1E-01	B	1.1E-02	C	2.2E-03	B
HAUL5	Portable Plant 2 Shipping Loop - One Way	5	113	29412	1018	Unpaved	Industrial	30	19	28.1		8.3%		4.5E+03	8.3E+02	8.3E+01	1.7E+01	6.0E+00	1.1E+00	1.1E-01	2.2E-02	95%	3.0E-01	C	5.5E-02	B	5.5E-03	C	1.1E-03	B
HAUL6	Shipping Traffic on Paved Site Entrance Road	14	339	88235	1699	Paved	Industrial	30	19	28.1			1.2	1.7E+02	2.2E+01	5.3E+00	4.4E-01	1.1E+00	1.5E-01	3.5E-02	2.9E-03	75%	2.8E-01		3.7E-02		8.9E-03		7.3E-04	
HAUL8	Shipping Trafic from East Extension and Pavement	9	226	58824	3614	Unpaved	Industrial	30	19	28.1		8.3%		4.5E+03	8.3E+02	8.3E+01	1.7E+01	4.3E+01	7.9E+00	7.9E-01	1.6E-01	95%	2.1E+00		3.9E-01		3.9E-02		7.9E-03	
TLOAD1	Working face loader traffic for loading haul trucks	53	533	133333	50	Unpaved	Industrial	25	16	61.5		8.3%		6.4E+03	1.2E+03	1.2E+02	2.4E+01	4.8E+00	8.8E-01	8.8E-02	1.8E-02	95%	2.4E-01	C	4.4E-02	B	4.4E-03	C	8.8E-04	B
TLOAD2	Working face loader traffic for loading haul trucks	53	533	133333	50	Unpaved	Industrial	25	16	61.5		8.3%		6.4E+03	1.2E+03	1.2E+02	2.4E+01	4.8E+00	8.8E-01	8.8E-02	1.8E-02	95%	2.4E-01	C	4.4E-02	B	4.4E-03	C	8.8E-04	B
TLOAD11	Portable Plant 1 Loader Traffic for Loading Highway Trucks	24	575	166667	25	Unpaved	Industrial	25	16	61.5		8.3%		6.4E+03	1.2E+03	1.2E+02	2.4E+01	1.1E+00	2.0E-01	2.0E-02	3.9E-03	95%	5.4E-02	C	9.8E-03	B	9.8E-04	C	2.0E-04	B
TLOAD12	Portable Plant 2 Loader Traffic for Loading Highway Trucks	12	287	83333	25	Unpaved	Industrial	25	16	61.5		8.3%		6.4E+03	1.2E+03	1.2E+02	2.4E+01	5.4E-01	9.8E-02	9.8E-03	2.0E-03	95%	2.7E-02	C	4.9E-03	B	4.9E-04	C	9.8E-05	B

Constants for Mobile Emission Equations

Roadway Type	Contaminant	k	a	b	c	d	Quality
Paved Roads:	**$PM_{2.5}$**	0.15	-	-	-	-	-
	PM_{10}	0.62	-	-	-	-	-
	PM_{30}	3.23	-	-	-	-	-
	TSP	4.79	-	-	-	-	-
Unpaved Roads - Industrial:	**$PM_{2.5}$**	0.15	0.9	0.45	-	-	C
	PM_{10}	1.5	0.9	0.45	-	-	B
	PM_{30}	4.9	0.7	0.45	-	-	B
	TSP	7.32	0.6	0.45	-	-	C
Unpaved Roads - Public:	**$PM_{2.5}$**	0.18	1	-	0.2	0.5	C
	PM_{10}	1.8	1	-	0.2	0.5	B
	PM_{30}	6	1	-	0.3	0.3	B
	TSP	8.96	1	-	0.49	0.2	C

Comments

A silica content of: 2% was used in the assessment, based on the document titled "The Limestone Industries of Ontario: Industrial Mineral Report 39" by the Ontario Division of Mines 1971, which indicates that the area is primarily dolomite with a silica content of less than 2%.
A surface silt content of: 8.3% was used in the assessment for unpaved roads, based on the AP-42 CH 13.2.2, Table 13.2.2-1 values for Stone quarrying and processing - Haul road to/from pit.
A surface silt loading of: 1.2 g/m^2 was used in the assessment for paved roads.
Constants for TSP (PM44) extrapolated from published factors for PM30, PM10 and PM2.5. Data quality downgraded by one step.
Control efficiencies were assumed based on watering activities, and reflect the required level of control at peak production and shipping, under worst-case meteorology and dry conditions. Paved roads were assumed to have a control efficiency of 75% and unpaved roads were assumed to have a control efficiency of 95%.
Loaders at working face assumed to be CAT 988 or similar
Scenario 1: Quarry Haul Truck traffic volume based on production rates and assumes a CAT777 or similar unit with 100 tonne payload.
Shipping operations based on 1,665 trucks per day shipping material off-site (highest shipping volume in a single day seen in 2020).
Scenario 2: Quarry Haul Truck traffic volume based on production rates and assumes a CAT777 or similar unit with 100 tonne payload.
Shipping operations based on production rates and assume an average highway truck paylod of 34 tonnes.

Sample calculation for uncontrolled TSP emission factor for Source HAUL1: Haul Truck Traffic from MQEE to Main Plant / Portable Plant 2

EF = 281.9 x (4.9) x [(8.3% / 12)]^(0.7) x [(126 tons) / 3]^(0.45) = 8892 g TSP / vehicle kilometer travelled (vkt)

Sample calculation for TSP emission rate for Source HAUL1: Haul Truck Traffic from MQEE to Main Plant / Portable Plant 2

$$\frac{14\ \text{vehicles}}{1\ \text{h}} \times \frac{3628\ \text{m}}{} \times \frac{1\ \text{km}}{1000\ \text{m}} \times \frac{8892\ g_{TSP}}{1\ \text{vehicle}} \times \frac{1\ \text{h}}{3600\ \text{s}} \times \frac{5\%\ g_{TSP\ uncontrolled}}{1\ g_{TSP}} = 6.5E{+}00\ g_{TSP}/\text{s}$$

Notes:

[1] Route ID numbers provided on site plan.

[2] Length of a specific road segment. A separate segment should be used whenever one or more parameters change.

[3] Paved surfaces include asphalt, concrete, and recycled asphalt (if it forms a relatively consistent surface).

[4] Publicly accessible and dominated by light vehicles, or industrial, and dominated by heavy vehicles.

[5] The average vehicle weight reflects the average of the empty and loaded vehicle weight, for travel in both directions.

[6] Required only for publicly accessible unpaved roads.

[7] Required only for unpaved roads (public and industrial).

[8] Required only for industrial paved roads.

APPENDIX E

Appendix E: Summary of Combustion Exhaust Emissions (Mobile and Stationary Sources)

CRH Milton Quarry Extension

Project #2102093

Source ID	Description	Gross Power Rating (kW)	Number Of Units	Traffic Passes [2]		Segment Length [3] (m)	Mean Vehicle Speed (km/h)	Load Factor [4] (%)	Tailpipe Emission Factor [5]								Tailpipe Emission Rate				Tailpipe + Fugitive Emission Rate [6]			
				Hourly (#/h)	Daily (#/d)				TSP		PM10		PM2.5		NOx		TSP (g/s)	PM10 (g/s)	PM2.5 (g/s)	NOx (g/s)	TSP (g/s)	PM10 (g/s)	PM2.5 (g/s)	NOx (g/s)
									(g/vkt)	(g/kW h)	(g/vkt)	(g/kW h)	(g/vkt)	(g/kW h)	(g/vkt)	(g/kW h)								
Scenario 1																								
TLOAD1	Working face loader traffic for loading haul trucks	280	1	85	855	50	25	48%	--	0.54	--	0.54	--	0.54	--	9.2	2.0E-02	2.0E-02	2.0E-02	3.4E-01	4.0E-01	9.0E-02	2.7E-02	3.4E-01
TLOAD2	Working face loader traffic for loading haul trucks	280	1	85	855	50	25	48%	--	0.54	--	0.54	--	0.54	--	9.2	2.0E-02	2.0E-02	2.0E-02	3.4E-01	4.0E-01	9.0E-02	2.7E-02	3.4E-01
HAUL1	Haul Truck Traffic from MQEE to Main Plant / Portable Plant 2	765	8	14	346	3628	25	48%	--	0.54	--	0.54	--	0.54	--	9.2	4.4E-01	4.4E-01	4.4E-01	7.5E+00	6.9E+00	1.6E+00	5.6E-01	7.5E+00
HAUL2	Main Plant Shipping Loop - One Way	n/a	1	47	1137	2848	30	n/a	0.95	--	0.95	--	0.75	--	11.4	--	3.6E-02	3.6E-02	2.8E-02	4.3E-01	8.5E+00	1.6E+00	1.8E-01	4.6E-01
HAUL3	Haul Truck Traffic from Main Plant Crusher to Portable Plant 2	765	1	3	38	248	25	48%	--	0.54	--	0.54	--	0.54	--	9.2	5.5E-02	5.5E-02	5.5E-02	9.4E-01	1.5E-01	7.3E-02	5.7E-02	9.4E-01
HAUL5	Portable Plant 2 Shipping Loop - One Way	n/a	1	6	142	1018	30	n/a	0.95	--	0.95	--	0.75	--	11.4	--	1.6E-03	1.6E-03	1.3E-03	1.9E-02	3.8E-01	7.1E-02	8.2E-03	2.0E-02
HAUL6	Shipping Traffic on Paved Site Entrance Road	n/a	1	53	1564	1699	30	n/a	0.95	--	0.95	--	0.75	--	11.4	--	2.4E-02	2.4E-02	1.9E-02	2.9E-01	1.1E+00	1.6E-01	5.2E-02	2.9E-01
HAUL7	Haul Truck Traffic between MQEE and Portable Plant 3	765	2	5	77	3291	25	48%	--	0.54	--	0.54	--	0.54	--	9.2	1.1E-01	1.1E-01	1.1E-01	1.9E+00	2.1E+00	4.7E-01	1.5E-01	1.9E+00
HAUL9	Shipping Traffic from Portable Plant 3 to Pavement	n/a	1	18	284	1059	30	n/a	0.95	--	0.95	--	0.75	--	11.4	--	5.0E-03	5.0E-03	3.9E-03	6.0E-02	1.2E+00	2.2E-01	2.6E-02	6.4E-02
TLOAD3	Main Plant loader traffic for loading highway trucks	260	1	14	328	25	30	48%	--	0.54	--	0.54	--	0.54	--	9.2	1.9E-02	1.9E-02	1.9E-02	3.2E-01	4.9E-02	2.4E-02	1.9E-02	3.2E-01
TLOAD4	Main Plant loader traffic for loading highway trucks	260	1	14	328	25	30	48%	--	0.54	--	0.54	--	0.54	--	9.2	1.9E-02	1.9E-02	1.9E-02	3.2E-01	4.9E-02	2.4E-02	1.9E-02	3.2E-01
TLOAD5	Main Plant loader traffic for loading highway trucks	260	1	14	328	25	30	48%	--	0.54	--	0.54	--	0.54	--	9.2	1.9E-02	1.9E-02	1.9E-02	3.2E-01	4.9E-02	2.4E-02	1.9E-02	3.2E-01
TLOAD6	Main Plant loader traffic for loading highway trucks	260	1	14	328	25	30	48%	--	0.54	--	0.54	--	0.54	--	9.2	1.9E-02	1.9E-02	1.9E-02	3.2E-01	4.9E-02	2.4E-02	1.9E-02	3.2E-01
TLOAD7	Main Plant loader traffic for loading highway trucks	260	1	14	328	25	30	48%	--	0.54	--	0.54	--	0.54	--	9.2	1.9E-02	1.9E-02	1.9E-02	3.2E-01	4.9E-02	2.4E-02	1.9E-02	3.2E-01
TLOAD8	Main Plant loader traffic for loading highway trucks	260	1	14	328	25	30	48%	--	0.54	--	0.54	--	0.54	--	9.2	1.9E-02	1.9E-02	1.9E-02	3.2E-01	4.9E-02	2.4E-02	1.9E-02	3.2E-01
TLOAD9	Main Plant loader traffic for loading highway trucks	260	1	14	328	25	30	48%	--	0.54	--	0.54	--	0.54	--	9.2	1.9E-02	1.9E-02	1.9E-02	3.2E-01	4.9E-02	2.4E-02	1.9E-02	3.2E-01
TLOAD10	Portable Plant 3 Loader Traffic for Loading Highway Trucks	260	1	24	575	25	30	48%	--	0.54	--	0.54	--	0.54	--	9.2	1.9E-02	1.9E-02	1.9E-02	3.2E-01	7.2E-02	2.9E-02	2.0E-02	3.2E-01
TLOAD12	Portable Plant 2 Loader Traffic for Loading Highway Trucks	260	1	12	287	25	30	48%	--	0.54	--	0.54	--	0.54	--	9.2	1.9E-02	1.9E-02	1.9E-02	3.2E-01	4.5E-02	2.4E-02	1.9E-02	3.2E-01
GEN3	Generator for Portable Plant 2	600	1	n/a	n/a	n/a	n/a	100%	--	0.2	--	0.2	--	0.2	--	6.4	3.3E-02	3.3E-02	3.3E-02	1.1E+00	3.3E-02	3.3E-02	3.3E-02	1.1E+00
GEN4	Generator for Portable Plant 2	600	1	n/a	n/a	n/a	n/a	100%	--	0.2	--	0.2	--	0.2	--	6.4	3.3E-02	3.3E-02	3.3E-02	1.1E+00	3.3E-02	3.3E-02	3.3E-02	1.1E+00
GEN5	Generator for Portable Plant 3	800	1	n/a	n/a	n/a	n/a	100%	--	0.2	--	0.2	--	0.2	--	6.4	4.4E-02	4.4E-02	4.4E-02	1.4E+00	4.4E-02	4.4E-02	4.4E-02	1.4E+00
GEN6	Generator for Portable Plant 3	800	1	n/a	n/a	n/a	n/a	100%	--	0.2	--	0.2	--	0.2	--	6.4	4.4E-02	4.4E-02	4.4E-02	1.4E+00	4.4E-02	4.4E-02	4.4E-02	1.4E+00
Scenario 2																								
TLOAD1	Working face loader traffic for loading haul trucks	280	1	53	533	50	25	48%	--	0.54	--	0.54	--	0.54	--	9.2	2.0E-02	2.0E-02	2.0E-02	3.4E-01	4.0E-01	9.0E-02	2.7E-02	3.4E-01
TLOAD2	Working face loader traffic for loading haul trucks	280	1	53	533	50	25	48%	--	0.54	--	0.54	--	0.54	--	9.2	2.0E-02	2.0E-02	2.0E-02	3.4E-01	4.0E-01	9.0E-02	2.7E-02	3.4E-01
HAUL1	Haul Truck Traffic from MQEE to Main Plant	765	4	3	38	3628	25	48%	--	0.54	--	0.54	--	0.54	--	9.2	2.2E-01	2.2E-01	2.2E-01	3.8E+00	2.2E-01	2.2E-01	2.2E-01	3.8E+00
HAUL3	Haul Truck Traffic from Main Plant Crusher to Portable Plant 2	765	4	3	38	248	25	48%	--	0.54	--	0.54	--	0.54	--	9.2	2.2E-01	2.2E-01	2.2E-01	3.8E+00	3.2E-01	2.4E-01	2.2E-01	3.8E+00
TLOAD11	Portable Plant 1 Loader Traffic for Loading Highway Trucks	260	1	24	575	25	30	48%	--	0.54	--	0.54	--	0.54	--	9.2	1.9E-02	1.9E-02	1.9E-02	3.2E-01	7.2E-02	2.9E-02	2.0E-02	3.2E-01
HAUL4	Haul Truck Traffic from MQEE to East Extension	765	4	5	80	977	30	48%	--	0.54	--	0.54	--	0.54	--	9.2	2.2E-01	2.2E-01	2.2E-01	3.8E+00	8.2E-01	3.3E-01	2.3E-01	3.8E+00
HAUL5	Portable Plant 2 Shipping Loop - One Way	n/a	1	5	113	1018	30	n/a	0.95	--	0.95	--	0.75	--	11.4	--	1.3E-03	1.3E-03	1.0E-03	1.5E-02	3.8E-01	7.1E-02	8.0E-03	1.7E-02
HAUL6	Shipping Traffic on Paved Site Entrance Road	n/a	1	14	339	1699	30	n/a	0.95	--	0.95	--	0.75	--	11.4	--	6.3E-03	6.3E-03	5.0E-03	7.6E-02	1.1E+00	1.4E-01	3.8E-02	7.9E-02
HAUL8	Shipping Trafic from East Extension and Pavement	n/a	1	9	226	3614	30	n/a	0.95	--	0.95	--	0.75	--	11.4	--	9.0E-03	9.0E-03	7.1E-03	1.1E-01	2.2E+00	4.0E-01	4.6E-02	1.2E-01
TLOAD12	Portable Plant 2 Loader Traffic for Loading Highway Trucks	260	1	12	287	25	30	48%	--	0.54	--	0.54	--	0.54	--	9.2	1.9E-02	1.9E-02	1.9E-02	3.2E-01	4.5E-02	2.4E-02	1.9E-02	3.2E-01
GEN1	Generator for Portable Plant 1	800	1	n/a	n/a	n/a	n/a	100%	--	0.2	--	0.2	--	0.2	--	6.4	4.4E-02	4.4E-02	4.4E-02	1.4E+00	4.4E-02	4.4E-02	4.4E-02	1.4E+00
GEN2	Generator for Portable Plant 1	800	1	n/a	n/a	n/a	n/a	100%	--	0.2	--	0.2	--	0.2	--	6.4	4.4E-02	4.4E-02	4.4E-02	1.4E+00	4.4E-02	4.4E-02	4.4E-02	1.4E+00
GEN3	Generator for Portable Plant 2	600	1	n/a	n/a	n/a	n/a	100%	--	0.2	--	0.2	--	0.2	--	6.4	3.3E-02	3.3E-02	3.3E-02	1.1E+00	3.3E-02	3.3E-02	3.3E-02	1.1E+00
GEN4	Generator for Portable Plant 2	600	1	n/a	n/a	n/a	n/a	100%	--	0.2	--	0.2	--	0.2	--	6.4	3.3E-02	3.3E-02	3.3E-02	1.1E+00	3.3E-02	3.3E-02	3.3E-02	1.1E+00

Notes:

[1] ID should reflect Source ID or Route ID, as approprite.

[2] Where applicable, this value reflects travel in both directions (e.g., 1 round-trip = 2 passes)

[3] Length of a specific road segment. A separate segment should be used whenever one or more parameters change.

[4] Load Factors from "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling", EPA-420-R-10-016, NR-005d, July 2010

[5] Emissions are input on either a vehicle distance or power rating basis. Load factor applies only to emissions based on power ratings.

[6] Applicable only for TSP, PM_{10} and $PM_{2.5}$ emissions from mobile equipment. Emissions rates for NOx and stationary sources do not change.

Comments
Emission factor from highway trucks based on U.S. EPA MOVES model at relevant speed for roadway segment.
Factors reflect highest of early morning, mid-day, and late-afternoon emission estimates provided by MOVES.
Working face loader rating based on Cat 988B Loader (www.ritchiespecs.com), Tier 1
Plant loader rating based on Cat 980H Loader (www.ritchiespecs.com), Tier 1
TSP (and $PM_{2.5}$ emissions for loaders and generator sets) assumed to be equal to PM_{10} emissions.
Generator emissions were updated to reflect Tier 2 standards.
Generator exhaust data: 892.4°F = 478 °C = 751 K
4,626.23 cfm = 2.18 m³/s
Assume stack exit diameter of 12" = 0.3 m
Calculated velocity = 30.80 m/s

Sample Calculations

TLOAD1 TSP Emissions:

$$\frac{280\ \text{kW}}{1}\times\frac{0.54\ \text{g}}{1\ \text{kW h}}\times\frac{48\%\ \text{Load}}{}\times\frac{1\ \text{h}}{3600\ \text{s}} = 2.0\text{E-}02\ g_{TSP}/\text{s}$$

HAUL2 TSP Emissions:

$$\frac{47.39\ \text{Vehicles}}{1\ \text{h}}\times\frac{2848\ \text{m}}{}\times\frac{0.95\ \text{g}}{1\ \text{Veh. Km}}\times\frac{1\ \text{km}}{1000\ \text{m}}\times\frac{1\ \text{h}}{3600\ \text{s}} = 3.6\text{E-}02\ g_{TSP}/\text{s}$$

APPENDIX F

Suggested Volume and Line Source Model Parameters

ID	Description	Base Elevation (m)	Release Height (m)	Physical or Drop Height (m)	Physical Width or Length of Side (m)	Initial Lateral Dimension (m)	Elevated or Surface Based	On or Adjacent to Building?	Vertical Dimension or Building Height (m)	Initial Vertical Dimension (m)	Comments
Blasting											
BLAST	Blasting at working face	340	5	5	10	2.33	surface	no	15	6.98	Assumed 10m x 100m blast pattern, emissions primarily generated at base of lift during blast
SCENARIO 1 - Processing											
PRCRSH1	Primary Jaw Crusher	305	2	4	4	0.93	elevated	yes	4	1.86	Centre of volume = 2m, physical width = 4m, physical height = 4m
VOL1,3	Building 1 at Main Plant (SC1-4, SCRSH1-4, CO10, BIN1-2)	305	8	16	12	2.79	surface	yes	16	7.44	Building ht = 16m, building width = 12m
VOL2,4	Building 2 at Main Plant (SC5-7, CO11-13, BIN3)	305	20	16	12	2.79	elevated	yes	16	7.44	Ht of open portion of building = 16m, ht above ground of open portion = 12m, building width = 12m
SCENARIO 2 - Processing											
PCRSH2-3	Primary Jaw Plant	303	2	4	4	0.93	elevated	yes	4	1.86	Centre of volume = 2m, physical width = 4m, physical height = 4m
GCRSH1-2	Gyratory Crusher	303	2	4	4	0.93	elevated	yes	4	1.86	Centre of volume = 2m, physical width = 4m, physical height = 4m
CO1-8	Conveyor Tansfer Point	303	3	2	2	0.47	elevated	no	0.47	0.11	Typical parameters for conveyors - 3m release height with 0.47 initial dimensions
SC8-11	Screen Plant	303	3	6	4	0.93	elevated	yes	6	2.79	Centre of volume = 3m, physical width = 4m, physical height = 6m
CCRSH1-2	Cone Crusher	303	3	4	4	0.93	elevated	yes	4	1.86	Centre of volume = 3m, physical width = 4m, physical height = 4m
SCENARIO 1 - Handling											
LOAD1-2	Loader transfer to haul truck	303	3	2	3	0.7	elevated	no	2	0.47	Bucket width = 3m, drop height = 2m, release height = 3m, truck height = 4m
EXC1	Excavator transfer to haul truck	303	3	2	3	0.7	elevated	no	2	0.47	Bucket width = 3m, drop height = 2m, release height = 3m, truck height = 4m
LOAD3	Transfer from haul truck to crusher	303	3.45	4.15	3.8	0.88	elevated	no	8.3	1.93	See image down below - CAT 773 dump truck
CO9	Conveyor from primary crusher - drop to pile	305	10	2	2	0.47	elevated	no	0.47	0.11	Typical parameters for stackers - 10m release height with 0.47 initial dimensions
CO14	Conveyor drop to wash plant	308	3	3	2	0.47	elevated	no	0.47	0.11	3m release height, 3m vertical dimension with 0.47 initial dimensions
PILE1-7	Stacker drop to pile	305-308	10	2	2	0.47	elevated	no	0.47	0.11	Typical parameters for stackers - 10m release height with 0.47 initial dimensions
LOAD4-10	Loader transfer to offsite truck	305-308	3	2	3	0.7	elevated	no	2	0.47	Bucket width = 3m, drop height = 2m, release height = 3m, truck height = 4m
SCENARIO 2 - Handling											
LOAD11,13	Loader or excavator transfer to portable plant	303	2	4	3	0.7	elevated	no	2	0.47	Bucket width = 3m, crusher height = 4m
PILE8-10, 12-15	Stacker drop to pile	303	10	2	2	0.47	elevated	no	0.47	0.11	Typical parameters for stackers - 10m release height with 0.47 initial dimensions
LOAD12,15	Loader transfer to highway truck	303	3	2	3	0.7	elevated	no	2	0.47	Bucket width = 3m, drop height = 2m, release height = 3m, truck height = 4m
PILE11	Haul truck dump to pile at portable plant 2	303	3.45	4.15	3.8	0.88	elevated	no	8.3	1.93	See image down below - CAT 773 dump truck
SCENARIO 1 - Line Volume Sources											
HAUL1,7	Haul road between MQEE and Main Plant and Portable Plant 3 - Haul Trucks	--	--	--	--	--	--	--	--	--	Line Source - Vehicle height 4.2m, vehicle width 3.8m, two lane (based on CAT 773)
HAUL2, 9	Haul road between Main Plant and Portable Plant 3 to the Exit - Highway Truck	--	--	--	--	--	--	--	--	--	Line Source - Vehicle height 4.15m, 2-lane roadway, 7.5m wide
HAUL6	Haul road between Main Plant Exit and Main Exit	--	--	--	--	--	--	--	--	--	Line Source - Vehicle height 4.15m, 2-lane roadway, 7.5m wide
SCENARIO 2 - Line Volume Sources											
HAUL3,4	Haul route between main plant crusher and portable plants	--	--	--	--	--	--	--	--	--	Line Source - Vehicle height 4.2m, vehicle width 3.8m, two lane (based on CAT 773)
HAUL5,6,8	Haul road between Portable Plants and Exit - Highway Truck	--	--	--	--	--	--	--	--	--	Line Source - Vehicle height 4.15m, 2-lane roadway, 7.5m wide
SCENARIO 1 - Line Volume Sources for Heavy Equipment Tailpipe Emissions											
TLOAD1-9	Loader traffic at working face	308	--	--	--	--	--	--	--	--	Line Source - Vehicle ht = 3.425m, Width = 2.940m, single lane
TEXC1	Excavator at working face loading haul trucks	303	--	--	--	--	--	--	--	--	Line Source - Vehicle ht = 3.170m, Width = 2.550m, single lane
SCENARIO 2 - Line Volume Sources for Heavy Equipment Tailpipe Emissions											
TLOAD2	Loader traffic at working face	308	--	--	--	--	--	--	--	--	Line Source - Vehicle ht = 3.425m, Width = 2.940m, single lane
TEXC1	Excavator at working face loading haul trucks	303	--	--	--	--	--	--	--	--	Line Source - Vehicle ht = 3.170m, Width = 2.550m, single lane
TLOAD10	Working face loader traffic for transfer to portable plant 1	303	--	--	--	--	--	--	--	--	Line Source - Vehicle ht = 3.425m, Width = 2.940m, single lane
TLOAD11	Portable Plant 1 Loader Traffic for Loading Highway Trucks	303	--	--	--	--	--	--	--	--	Line Source - Vehicle ht = 3.425m, Width = 2.940m, single lane
TLOAD12	Portable Plant 2 Loader Traffic for Loading Highway Trucks	303	--	--	--	--	--	--	--	--	Line Source - Vehicle ht = 3.425m, Width = 2.940m, single lane

Model Parameters for Point Sources

ID	Description	Base Elevation (masl)	Release Height (m)	Stack Exit Temp. (K)	Stack Exit Flow Rate (m^3/s)	Stack Exit Velocity (m/s)	Stack Exit Diameter (m)	Comments
GEN1-4	Portable Plant Generators	303	2	751	2.18	30.8	0.30	Typical generator stack specifications for generators of this size

APPENDIX G

BRIAN SULLEY, B.A.SC., P.ENG.

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Brian is a Technical Director and Principal whose air quality emissions and dispersion modelling work, as well as his chemical process quantitative risk analysis work, has benefitted our clients in almost every industrial and institutional sector served by RWDI. Brian's experience includes heavy industry such as mining, aggregate extraction, hot mix asphalt production, cement plants, pulp and paper mills, petrochemical facilities, and automotive production, through to institutional facilities such as hospitals and universities. Brian's experience in chemical process quantitative risk analysis spans his work with his previous employer in the chemical process industry and with RWDI. His work in chemical process engineering provides a strong foundation for both his air quality and risk assessment work.

Brian sits on the Board of the Ontario Section of the Air & Waste Management Association and is an active member with the Ontario Environmental Industry Association. Brian also sits on the Environment Committee of the Ontario Stone Sand and Gravel Association, providing guidance and training to members on fugitive dust management and control and regulatory compliance requirements.

In addition to working directly with clients to meet air quality objectives and comply with regulations, Brian acts as a technical lead for our Air Quality modelling group, coaching and mentoring scientists and engineers across Canada at work on a range of emissions inventory, monitoring and modelling projects.

Employment History

2001 – Present
Technical Director – Air Quality, Principal, RWDI

2016 – Present
Instructor: Air and Water Quality Analysis, Environmental Building Science Program, Conestoga College

2003 – Present
Instructor: Introduction to Air Quality, Environmental Engineering Applications Program, Conestoga College

2011 – 2018
Instructor: Air Pollution Control, Environmental Control Program, Sheridan College

1999 – 2001
Process Engineering Associate, Huntsman Corporation Canada Inc.

Affiliations

A&WMA - Air & Waste Management Association

OSSGA – Ontario Stone Sand and Gravel Association

Ontario Air Practitioners Group.

Licensed Professional Engineer (P.Eng.) Professional Engineers of Ontario

Licensed Professional Engineer (P.Eng.) Association of Professional Engineers and Geoscientists of Saskatchewan

Licensed Professional Engineer (P.Eng.) Association of Professional Engineers of Nova Scotia

Education

Bachelor of Applied Science (Environmental [Chemical] Engineering), University of Waterloo, 2000

Courses Taught

Controlling Dust from Process Equipment. Ontario Agri Business Association

Evolution of the Ontario Approvals Process. Ontario Association of Physical Plant Administrators

Emission Sources, From Boilers to Bulldozers. A&WMA Ontario Section

Emission Estimation & Data Quality, Good Emissions Data Makes for Good Decisions. A&WMA Ontario Section

Controlling Fugitive Dust. OSSGA Bi-Annual Environmental Management Workshop

BRIAN SULLEY, B.A.SC., P.ENG.

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Selected Project Experience

Hearings

- Albion Hills Automotive, Palgrave, ON, (OMB File PL070637)
- Crestwood Subdivision OMB Appeal, London, ON (OMB File PL080059)
- SASE Aggregates Ltd., Uxbridge, ON (OMB File PL160852)
- Blythe Holsteins Ltd., Municipality of Thames Centre, ON (LPAT File PL161154)
- Atlantic Power Corporation, Williams Lake, BC (EAB file 2016-EMA-G05)
- James Dick Construction Limited, Township of Guelph-Eramosa, ON (LPAT File PL170688)
- Colacem Canada Inc., Township of Champlain, ON (LPAT File PL170756)
- C. H. Demill Holdings Inc., Township of Tyendinaga (LPAT File MM180027)
- Halton Crushed Stone, Town of Erin, ON (LPAT File MM190008)
- Zircon Design and Development Inc., Toronto, ON Hearing of Necessity under the Expropriations Act.
- MJJJ Developments Inc., Town of Caledon, ON (LPAT File PL190106, PL190107)
- RioTrin Properties (Burnhamthorpe) Inc., Mississauga, ON (LPAT File PL190221, PL190222)

Land-Use Planning Air Quality Assessments

- Active Wellness Products, London, ON
- 225 Birmingham Street Redevelopment, Toronto, ON
- 6 Cuddy Boulevard, London, ON
- Dundas & Shorncliffe, Toronto, ON
- 5507-5509 Dundas Street Redevelopment, Toronto, ON
- 328-374 Dupont Street, Toronto, ON
- 176-178 Front Street Redevelopment, Toronto, ON
- 250 Front Street East Redevelopment, Toronto, ON
- 105 Garden Avenue Development, Brantford, ON
- Hansler Rd. Development, Thorold, ON
- iPoly, St. Catharines, ON
- 6 Lloyd Avenue, Toronto, ON
- Niagara Stone Rd. Development, Niagara-on-the-Lake, ON
- Nyon Energy Park Review, Port Colborne, ON
- Portage Rd. Development, Niagara Falls, ON
- Portuguese Cheese, Toronto, ON
- 933-935 Queensway Redevelopment, Toronto, ON
- Riverside Waste Transfer Facility, Centre, Wellington, ON
- 383 Sorauren Avenue Peer Review, Toronto, ON
- Thorold Park Redevelopment, Thorold, ON
- Xinyi Glass Canada, Guelph Eramosa Township, ON
- Xinyi Glass Canada, Stratford, ON
- 771 Yonge Street Redevelopment, Toronto, ON

Federal Government

- Cliff Hill Central Heating Plant, Ottawa, ON
- Revision to NPRI Welding Emission Factors, Gatineau, PQ
- Tunney's Pasture Central Heating Plant, Ottawa, ON

Transportation / Roadway Air Quality

- Bluewater Bridge, Sarnia, ON
- CN MacMillan Yard, Vaughan, ON
- GO Milton Expansion, ON
- Highway 400 Improvements, Barrie, ON
- Highway 417 Widening, Ottawa, ON
- Highway 69 Widening North of Parry Sound, ON
- Jebel Ali Airport, Dubai, UAE
- Metrolinx Network Expansion, ON
- North Channel Seaway Bridge, Cornwall, ON
- QEW Widening, Oakville, ON

Odour Assessments

- Active Wellness Products, London, ON
- Arnprior Sewage Treatment Plant, Arnprior, ON
- Colonial Sewage Pumping Station, Waterloo, ON
- Creemore Springs Brewery Peer Review, Creemore, ON
- Guelph Composting Facility, Guelph, ON
- Guelph Wet/Dry Facility, Guelph, ON
- Elora Wastewater Treatment Plant, Elora, ON
- IGPC Ethanol, Aylmer, ON
- Kawartha Ethanol, Kawartha Lakes, ON
- Keswick Wastewater Treatment Plant, Keswick, ON
- Lush Cosmetics, Toronto, ON
- Nitta Gelatin, Toronto, ON
- Parry Sound Sewage Treatment Plant, Parry Sound, ON
- Peel Composting Facility Management Plan, Caledon, ON
- Portuguese Cheese, Toronto, ON
- Ravensview Water Pollution Control Plant, Kingston, ON
- Royal Canin Pet Foods, Puslinch, ON
- S.C. Johnson, Brantford, ON
- Symplastics Engineering Plastics, Orangeville, ON
- Trail Road Landfill, Ottawa, ON
- Zircon Design and Development Inc., Toronto, ON
- Redecan Odour Assessment, Fenwick, ON

Building Design Reviews

- 81 Bay Street, Toronto, ON
- 141 Bay Street, Toronto, ON
- 280 King Street East, Toronto, ON
- 17 Prince Arthur Street, Toronto, ON

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Institutional

- Bridgepoint Hospital, Toronto, ON
- Brock University, St Catharines, ON
- Carleton University, Ottawa, ON
- Centre for Addiction and Mental Health, Toronto, ON
- Centre Wellington Sportsplex, Fergus, ON
- Fanshaw College, London, ON
- Joseph Brant Hospital, Burlington, ON
- London Health Sciences Centre, London, ON
- Mackenzie Health Care, Multiple Sites, ON
- Milton District Hospital, Milton, ON
- North Bay Aquatic Centre, North Bay, ON
- North Bay Regional Health Centre, North Bay, ON
- St. Joseph's Health Centre, Hamilton, ON
- St. Michael's Hospital, Toronto, ON
- Stratford General Hospital, ON
- Trillium Health Care, Multiple Sites, ON
- Toronto Western Hospital, Toronto, ON
- University of Guelph, Guelph, ON
- University of Ottawa, Ottawa, ON
- Women's College Hospital, Toronto, ON
- Fanshaw College, London, ON

Industrial Facilities

- Anchor-Danly, Cambridge, ON
- Anchor-Danly, Windsor, ON
- Arcelor Mittal Hamilton East Works, Hamilton, ON
- Ar-Razi Methanol Plant, Jubail, Kingdom of Saudi Arabia
- Breeze Dried Flooring, Tilsonburg, ON
- Cooper Plating, Newmarket, ON
- Enbridge Gas Storage and Transfer Operations, ON
- Fiat Chrysler, Multiple Sites, ON
- Gateway Pet Memorial, Guelph, ON
- Gateway Pet Memorial, Ottawa, ON
- General Motors of Canada Limited, Multiple Sites, ON
- IMBC Blow Molding, Orangeville, ON
- Kuntz Electroplating, Kitchener, ON
- L.J. Barton, Hamilton, ON
- Mitten Vinyl, Paris, ON
- NOVA Chemicals, Corunna, Sarnia & St. Clair, ON
- Peel Plastics, Brampton, ON
- Pestell Pet Products, New Hamburg, ON
- Resolute Iroquois Falls Mill, Iroquois Falls, ON
- Resolute Thunder Bay Mill, Thunder Bay, ON
- Rochling Engineering Plastics, Orangeville, ON
- Sithe Energy, Mississauga and Brampton, ON
- Stelco, Hamilton & Nanticoke, ON
- TBay Tel Generators, Multiple Sites, ON
- Weston Bakeries, Multiple Sites, ON

Ready-Mix Concrete Facilities

- Dufferin Construction, Burlington, ON
- Dufferin Construction, Hamilton, ON
- Dufferin Construction, Bowmanville, ON
- Ontario Redi-Mix, Pickering, ON
- Ontario Redi-Mix, Toronto, ON

Hot-Mix Asphalt Facilities

- AECON, Brampton, ON
- Walker Aggregates, Thorold, ON
- Ingram Asphalt, Toronto, ON
- Walker Aggregates, Vineland, ON
- Dufferin Aggregates, Mosport, ON
- Waterford Group, Port Colborne, ON
- Coco Paving, Windsor, ON

Mining

- Vale, Sudbury, ON
- Kirkland Lake Gold, Kirkland Lake, ON
- Rubicon Minerals Phoenix Gold Mine, Red Lake, ON
- Treasury Metals Goliath Gold, Wabigoon, ON

Air Quality Monitoring Studies

- SaskPower Boundary Dam Power Station, Estevan, SK

Environmental Protection Plans

- Pound-Maker Bioethanol, Lanigan, SK
- North West Bio-Energy Ltd, Unity, SK

Fugitive Dust Monitoring Studies

- Summit Aggregates, Ayr Pit, Ayr, ON
- CBM Sunderland Pit, Sunderland, ON
- CBM Codrington Pit, Codrington, ON
- CBM Westwood Pit, Peterborough, ON
- CBM Thamesford Pit, Thamesford, ON
- CBM St. Mary's Quarry, St. Mary's ON
- CBM Osprey Quarry, Duntoon, ON
- CBM Hillsburgh Pit, Hillsburgh, ON
- CBM David Pit, North Dumfries, ON
- CBM Buckhorn Quarry, Buckhorn, ON
- CBM Bowmanville Quarry, Bowmanville, ON
- CBM Aberfoyle South Pit, Puslinch, ON
- CBM Aberfoyle North Pit, Puslinch, ON
- Waterford Group Dunnville Rock Products, Dunnville, ON
- Waterford Group Law Crushed Stone, Port Colborne, ON
- Waterford Group Norfolk Aggregates, Norfolk, ON
- Waterford Group Vinemount Quarry, Vinemount, ON
- Waterford Group Waterford Pit, Waterford, ON

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Fugitive Dust Studies

- 5W Farms, Victoria Road Quarry, Victoria Road, ON
- AECON Ottawa Quarry, Ottawa, ON
- Blythe Dale Agg. Leitch Gover Pit, Thames Centre, ON
- Brampton Brick Hillsdale Plant, Hillsdale, ON
- Brampton Brick Norval Quarry Review, Brampton, ON
- Bruno's Contracting, Trout Lake Pit, Thunder Bay, ON
- Capital Paving, Aikensville Pit, Puslinch, ON
- Capital Paving, West Montrose Pit, West Montrose, ON
- Capital Paving, Shantz Station Pit, Maryhill, ON
- CBM Sunderland Pit Dust Control, Sunderland, ON
- C.H. Demill Melrose Quarry, Shannonville, ON
- City of Ottawa Trail Road Landfill, Ottawa, ON
- Cressy Quarry Review, Cressy, ON
- D&J Lockhart Martin Pit Expansion, Woolwich, ON
- Dufferin Aggregates Aberfoyle Pit, Puslinch, ON
- Dufferin Aggregates Acton Quarry, Acton, ON
- Dufferin Aggregates Alps Pit, North Dumfries, ON
- Dufferin Aggregates Butler Pit, North Dumfries, ON
- Dufferin Aggregates Carden Quarry, Carden, ON
- Dufferin Aggregates Cayuga Quarry, Cayuga, ON
- Dufferin Aggregates Cedar Creek Pit, North Dumfries, ON
- Dufferin Aggregates Chudyk Pit, North Dumfries, ON
- Dufferin Aggregates Flamboro Quarry, Dundas, ON
- Dufferin Aggregates Maple Yard, Maple, ON
- Dufferin Aggregates Mill Creek Pit, Puslinch, ON
- Dufferin Aggregates Milton Quarry, Milton, ON
- Dufferin Aggregates Mosport Pit, Mosport, ON
- Dufferin Aggregates Mill Creek Pit, Puslinch, ON
- Dufferin Agg. Richmond Hill Yard, Richmond Hill, ON
- Dufferin Aggregates Pickering Yard, Pickering, ON
- Duncor Portable Plant, Barrie, ON
- Duncor Emulsions, Shanty Bay, ON
- E.C. King Transfer Yard, Owen Sound, ON
- Farrish Crushing Portable Plant, Listowel, ON
- Federal Marine Terminals, Hamilton, ON
- Halton Crushed Stone, Town of Erin, ON
- Hanson Brick Burlington Review, Burlington, ON
- Highlands Group Melancthon Quarry, Melancthon, ON
- Hillway Equipment Limited, Orillia, ON
- James Dick Rockfort Quarry, Rockfort, ON
- James Dick Erin Pit Extension, Erin, ON
- James Dick Hidden Quarry, Guelph Eramosa, ON
- James Dick Reid Road Reservoir Quarry, Campbellville, ON
- Jennison Construction Clinton Pit, Clinton, ON
- Johnson Brothers McGuigan Pit, Cedar Springs, ON
- Johnson Brothers Erwin South Pit, Putnam, ON
- Lafarge Cement, Bath, ON
- Lafarge Cement, Exshaw, AB
- Lafarge Goodwood Pit, Goodwood, ON
- Lippa Quarry, Skeleton Lake, ON
- Livingston Excavating & Trucking Inc., Simcoe, ON
- Lower Mattagami River Project, Mattagami, ON
- Lowndes Holdings, Mountsberg Quarry, Mountsberg, ON
- McCann Redi-Mix Durst Pit, Benmiller, ON
- NJ Excavating Martin Pit, Woolwich, ON
- SASE Aggregates, Uxbridge, ON
- Thames Valley Agg., Banner Rd. Pit, Thamesford, ON
- Thames Valley Aggregates, Golding Pit, Putnam, ON
- The Murray Group, Cole Pit, Inverhaugh, ON
- The Murray Group, Devin Pit, Inverhaugh, ON
- Trent Valley Sand & Gravel Norfolk Quary, Norfolk, ON
- Try Aggregates Byron Pit Review, London, ON
- Preston Sand & Gravel Roszell Pit, Puslinch, ON
- Preston Sand & Gravel Henning Pit, North Dumfries, ON
- VicDom Sand and Gravel, Uxbridge, ON
- VicDom Sand and Gravel, Sunderland, ON
- VicDom Sand and Gravel, Utica, ON
- Walker Aggregates Walker Brothers Quarry, Thorold, ON
- Walker Aggregates Severn Pines Quarry, Orillia, ON
- Walker Aggregates Duntroon Quarry, Duntroon, ON
- Walker Aggregates Uppers Lane Quarry, Niagara Falls, ON
- Walker Aggregates Vineland Quarry, Vineland, ON
- Waterford Group Vinemount Quarry, Vinemount, ON
- Waterford Group Law Crushed Stone, Port Colborne, ON
- Wilson Quarry, Monck, ON

BRIAN SULLEY, B.A.SC., P.ENG.

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Chemical Engineering Experience

- Process Design, Optimization and Control Relating to the Chemical Process Industry
- Two years in the process-engineering group of Huntsman Corporation Canada Inc.

Chemical Process Quantitative Risk Analysis

- Quantitative Hazard Assessment Sulphur Dioxide Storage and Transfer Systems, Huntsman Corporation Canada Inc., Guelph, ON
- Quantitative Hazard Assessment Hydrogen Chloride Storage and Transfer Systems, Huntsman Corporation Canada Inc., Guelph, ON
- Quantitative Hazard Assessment Ethylene Oxide Storage and Transfer Systems, Huntsman Corporation Canada Inc., Guelph, ON
- Peer Review of Cytec Canada Risk Assessment, Niagara Falls, ON
- Edmonton Air Quality Assessment, Edmonton, AB
- Madoc Co-Operative Association, Madoc, ON
- Screening Level Risk Assessment of a Propane Facility, St. George, ON
- RioTrin Grand Park Redevelopment Hazard Consequence Modelling, Mississauga, ON

Air Pollution Control Technologies

- Flue Gas Desulphurization Technology and Design Review, Moa Nickel, Cuba
- City of Guelph Waste Resource Innovation Centre Biofilter Replacement, Guelph, ON