REPORT

# DUFFERIN MILTON QUARRY EAST EXTENSION

TOWN OF MILTON, ONTARIO

AIR QUALITY ASSESSMENT
RWDI # 2102093
November 16, 2021

**SUBMITTED TO**

Kevin Mitchell
Director Property, Planning & Approvals
CRH Canada Group Inc.
Kevin.Mitchell@ca.crh.com

CRH Canada Group Inc.
Concord, ON L4K 1B6
T: 416-788-0015

**SUBMITTED BY**

Brian G. Sulley, B.A.Sc., P.Eng.
Technical Director, Principal
Brian.Sulley@rwdi.com

Monika Greenfield, M.Sc.
Sr Project Manager - Strategic Director
Monika.Greenfield@rwdi.com

**RWDI**
600 Southgate Drive
Guelph Ontario Canada N1G 4P6
T: 519.823.1311
F: 519.823.1316

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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 6$^{th}$ 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, 90$^{th}$ 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 90$^{th}$ 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 90$^{th}$ 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% |

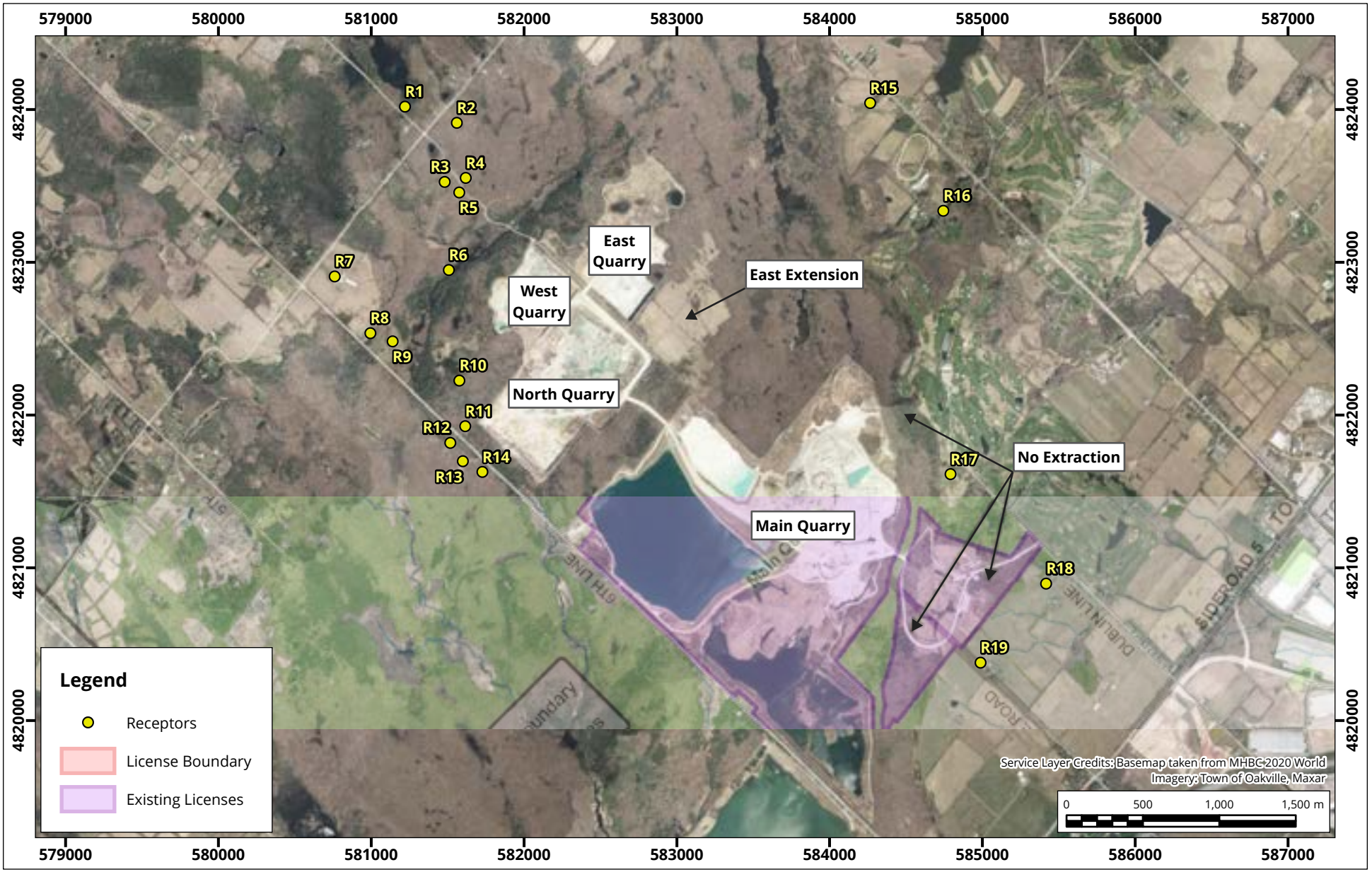
| Receptor | | UTM Coordinates | | Contaminant | Averaging Period | With No Background Concentration | | | | With Additional Background Concentrations | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ID | Type | X (m) | Y (m) | | (hours) | Maximum Predicted 24-Hour Concentration (µg/m³) | 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 |

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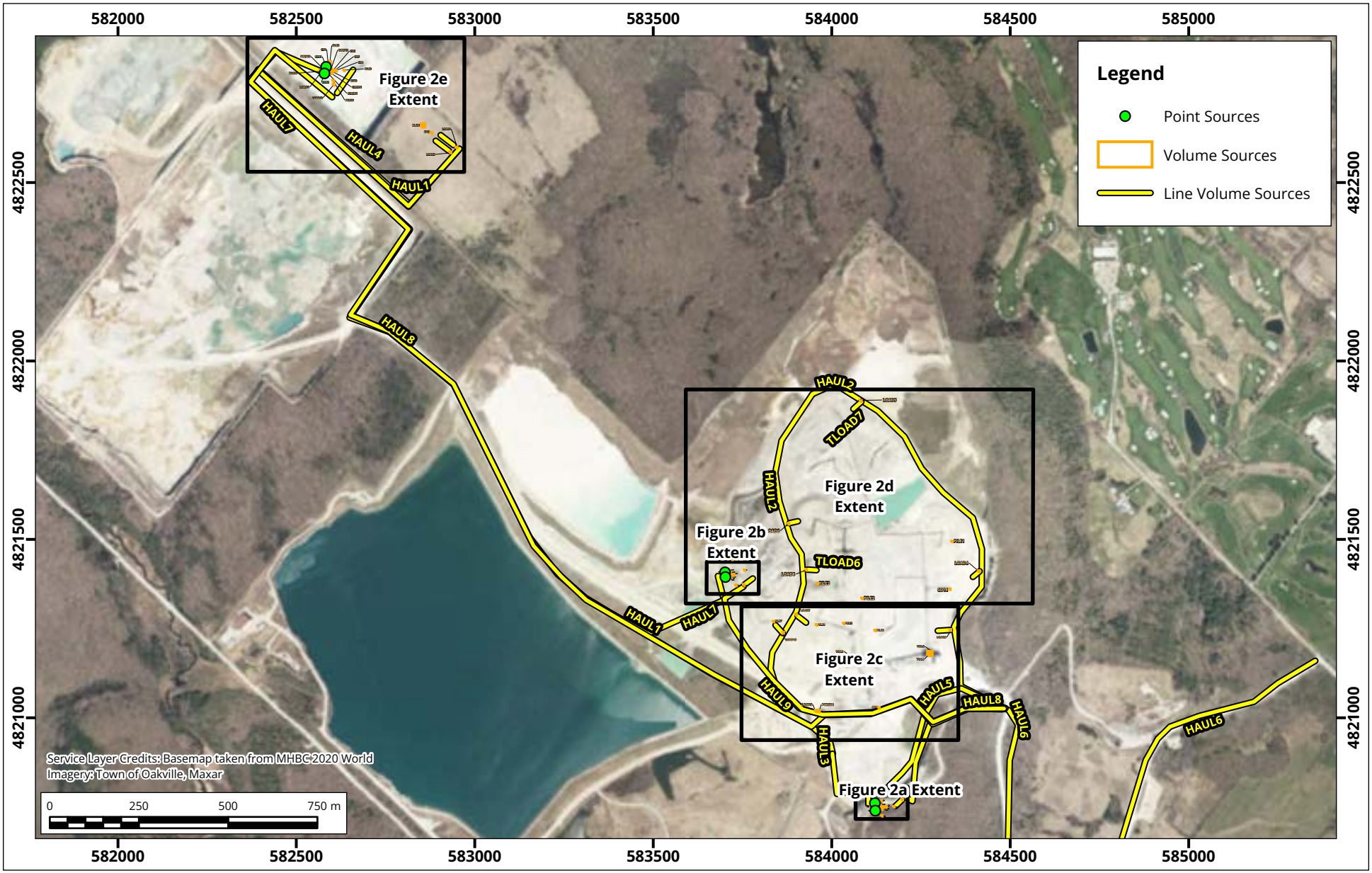



# Source Locations Index Map

True North

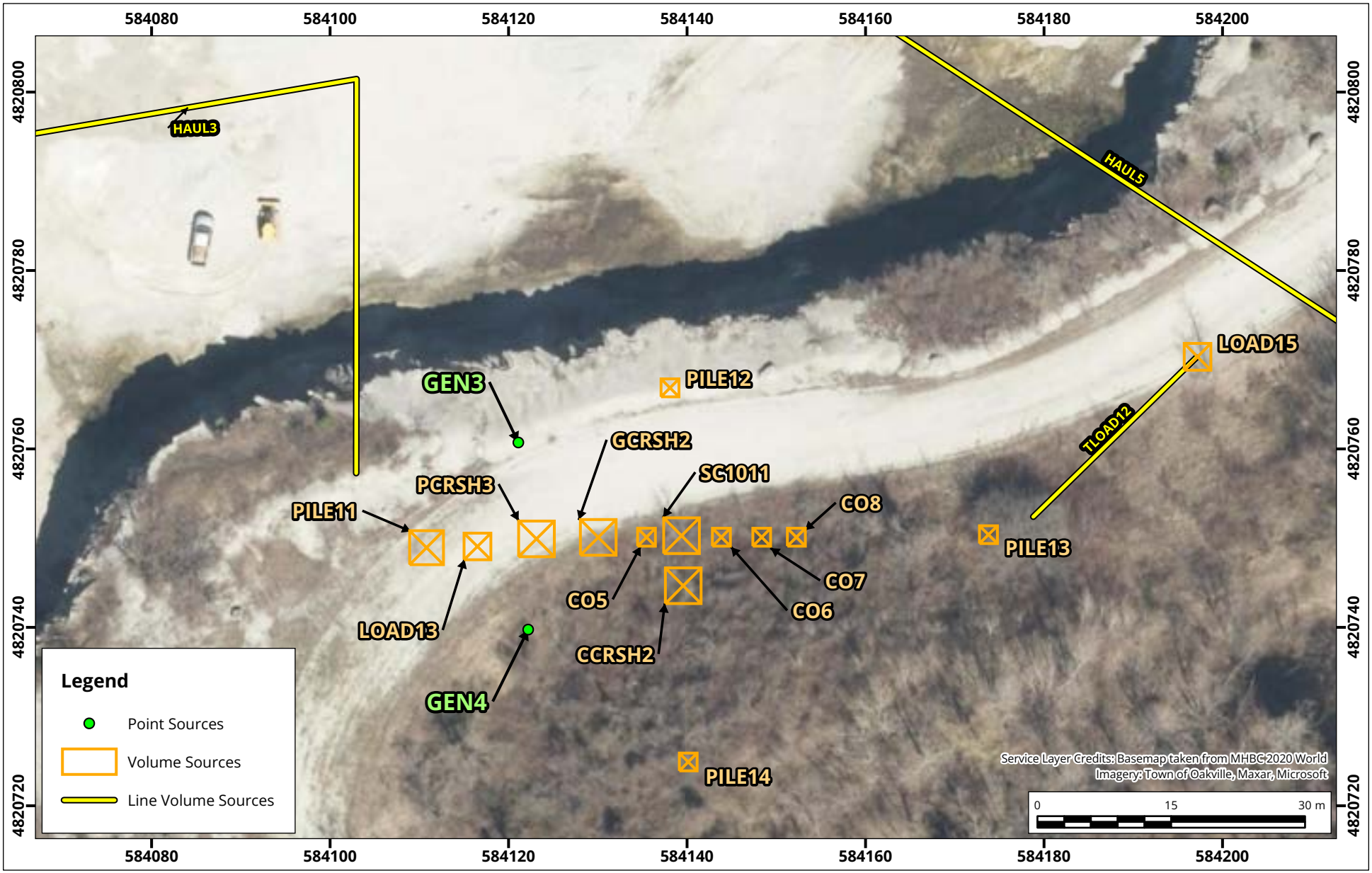
| | | | |
|---|---|---|---|
| Drawn by: | RL | Figure: | 2 |
| Approx. Scale: | 1:15,000 | | |
| Date Revised: | Oct 18, 2021 | | |

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

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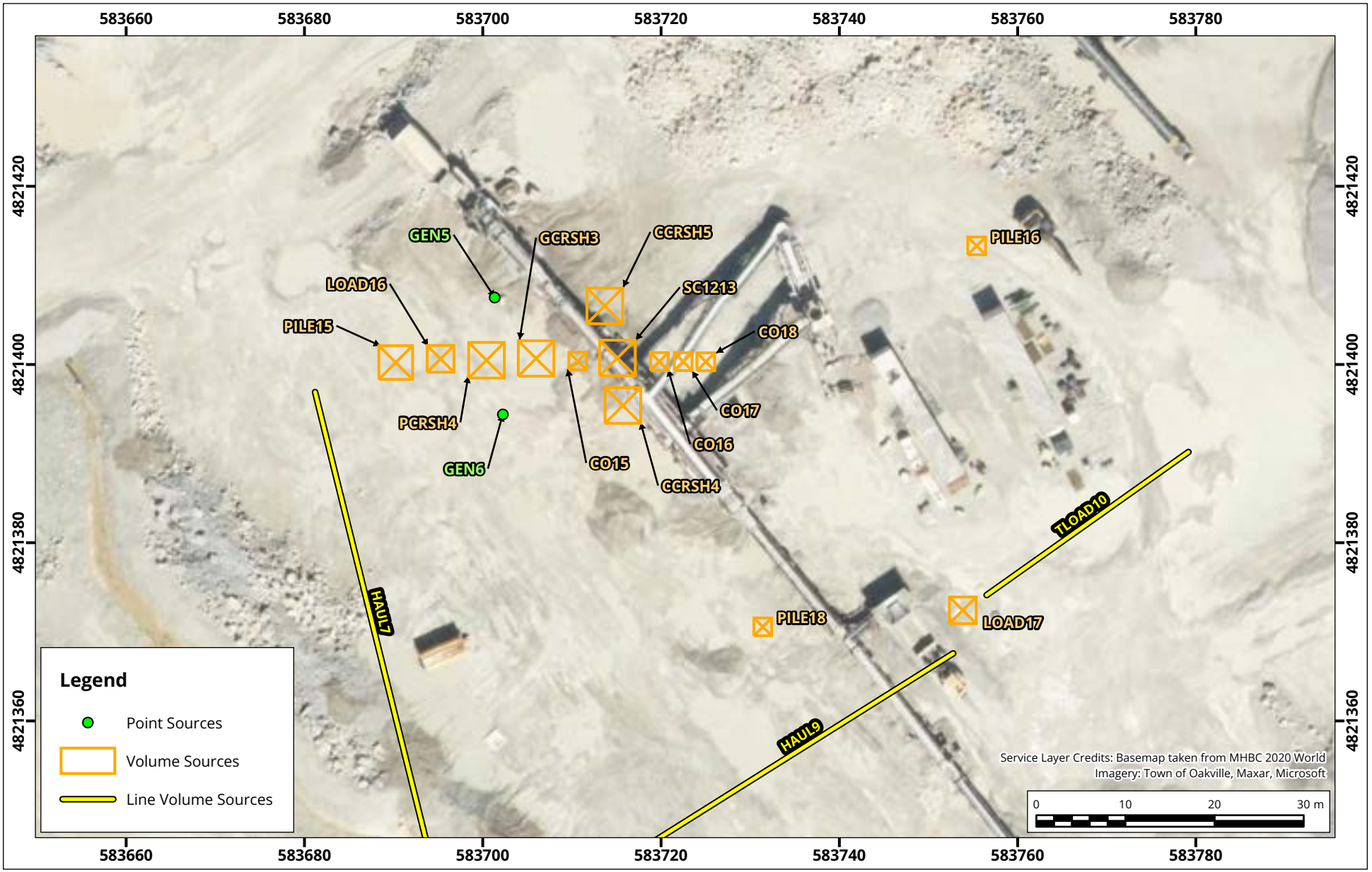



# Source Locations

True North

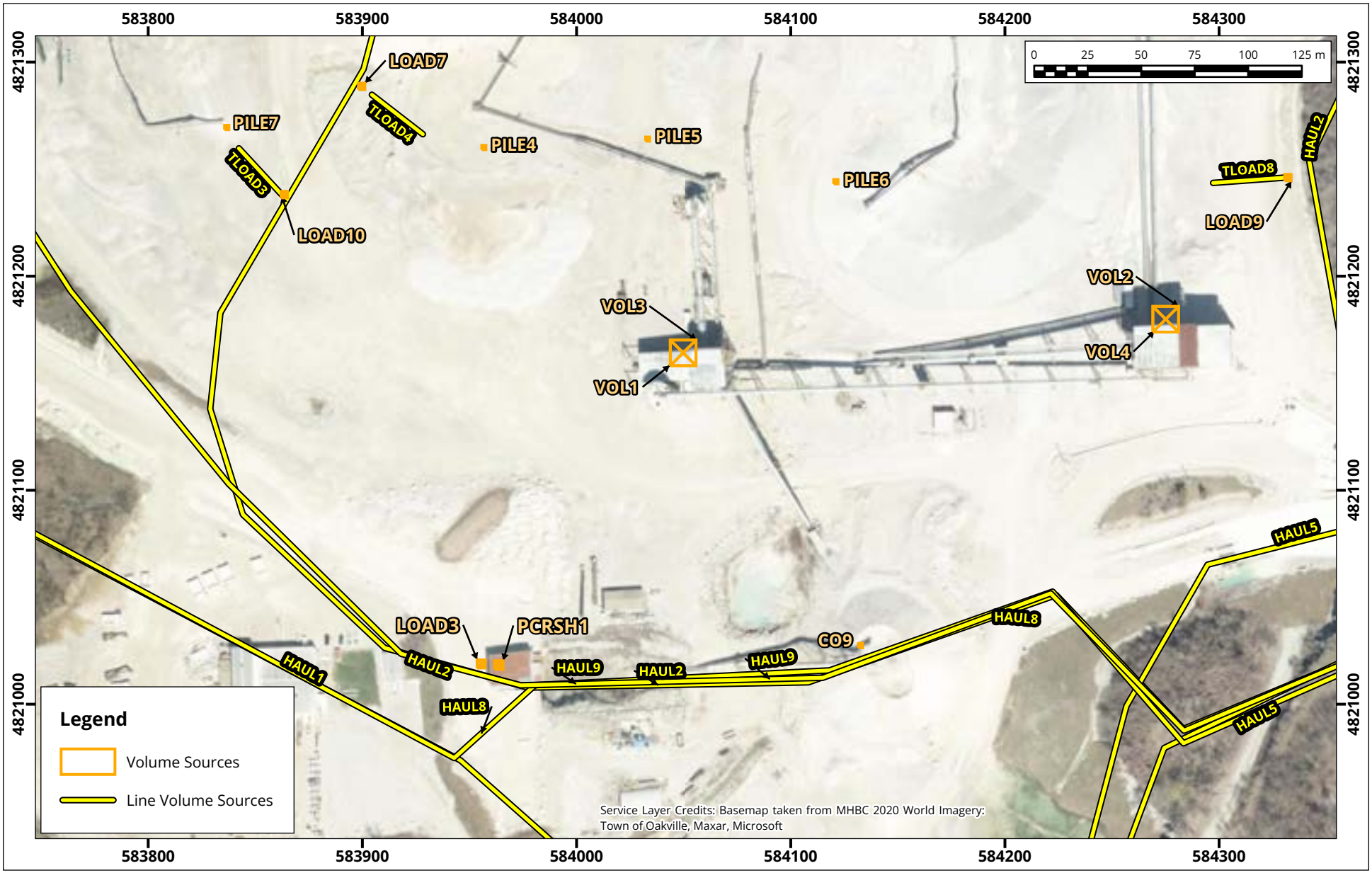
| | | | |
|---|---|---|---|
| Drawn by: RL | Figure: 2b | | |
| Approx. Scale: 1:600 | | | |
| Date Revised: Oct 18, 2021 | | | |

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

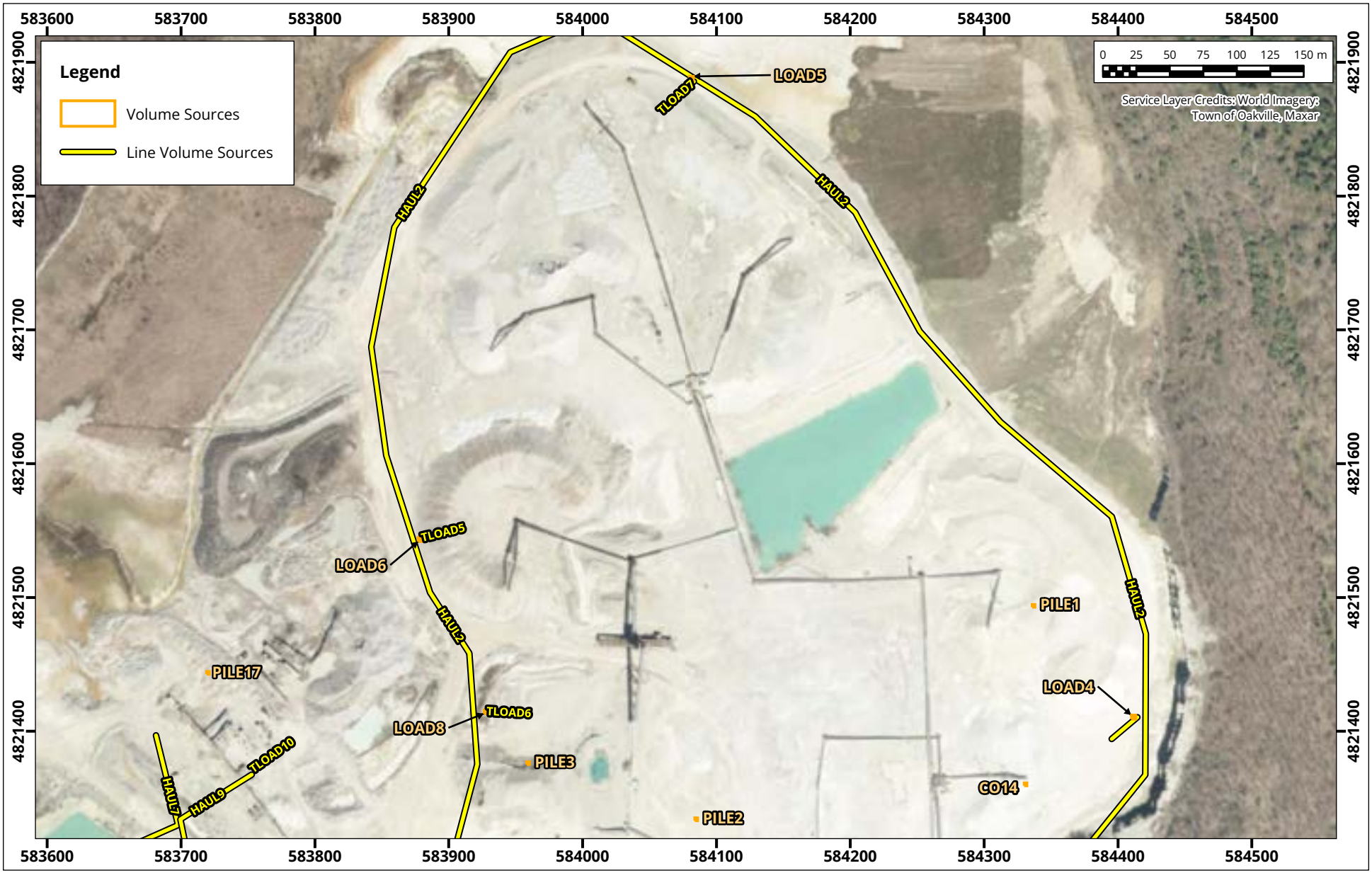
| | | | |
|---|---|---|---|
| Drawn by: | RL | Figure: | 2c |
| Approx. Scale: | 1:2,500 | | |
| Date Revised: | Oct 18, 2021 | | |

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

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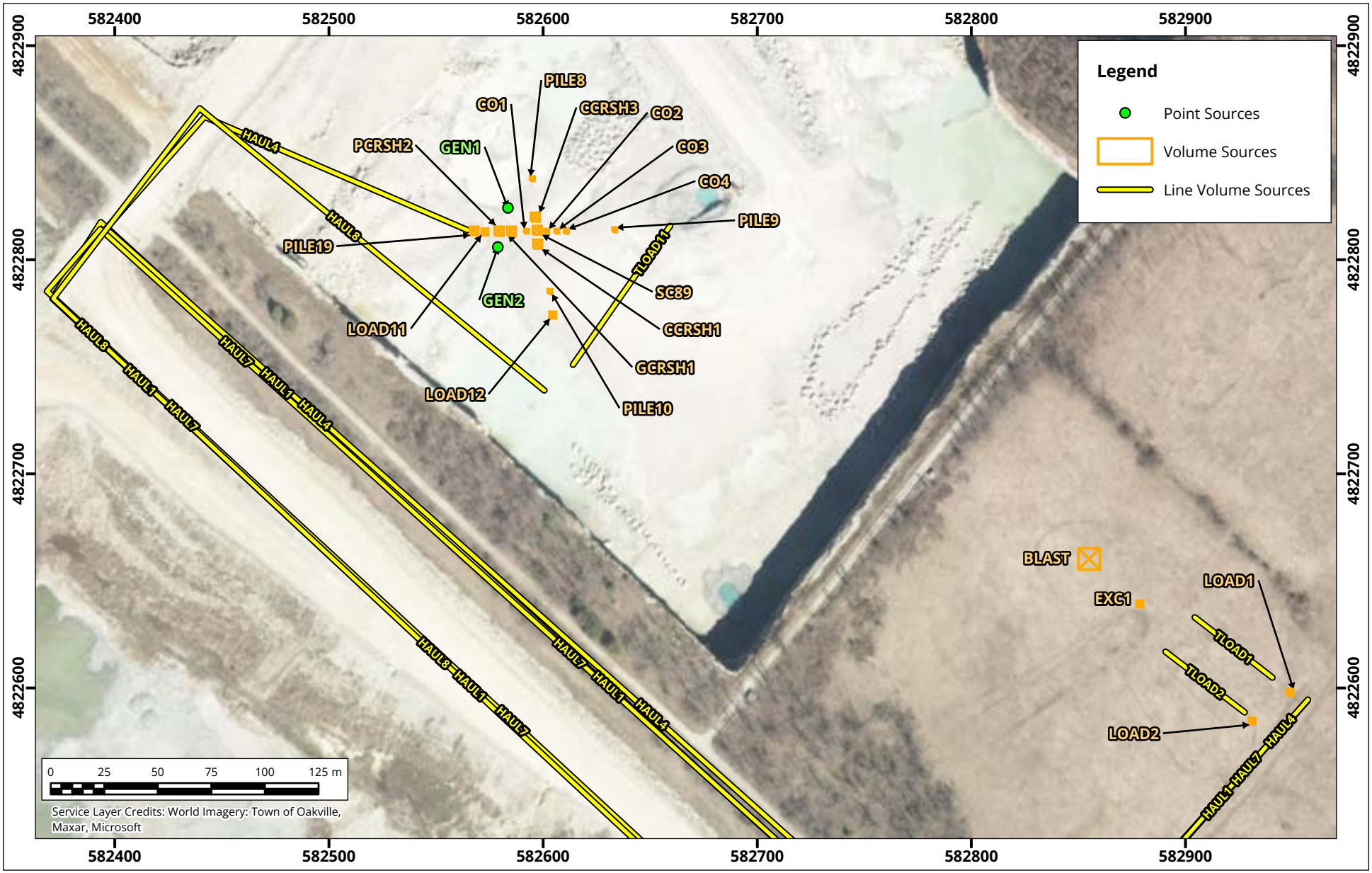


# Source Locations

True North

Map Projection: NAD 1983 UTM Zone 17N

Dufferin Milton Quarry East Extension - Halton Hills, Ontario

Project #: 2102093

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

Map Document: C:\GIS\2102093_CRH-Quarry\09 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

**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 (%)

**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

| 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 | Daily | Annual | Site Specific Data? | Silt Content | Moisture Content | Source Condition Valid [1] | 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/y) | (y/n) | (%) | (%) | | (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** | | | | | | | | | | | | | | | | | | | | | | | | | |
| 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 | Daily | Annual | Site Specific Data? | Silt Content | Moisture Content | Source Condition Valid [1] | 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/y) | (y/n) | (%) | (%) | | (kg/Mg) | (kg/Mg) | (kg/Mg) | (kg/Mg) | (g/s) | (g/s) | (g/s) | (g/s) | (%) | (g/s) | | (g/s) | | (g/s) | | (g/s) | |
| 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

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

| 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.<br>Portable Plant 2 (South of Main Plant) hours of operation: 0700h to 1900h. Plant does not operate during January, February and December.<br>Portable Plant 3 (Main Plant Portable Plant) hours of operation: 0700h to 2300h, 250 days per year.<br>Quarry Haul Truck dumping into primary crusher buidling at main plant assigned 50% control due to shielding.<br>Process operations at main plant (including crushers and screens) are located within two enclosed buildings. A control factor of 70% was applied.<br>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.<br>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.<br>The typical hours of operation for shipping are 24 hours per day and 290 days per year.<br>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.<br>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 (Mg/h) | Daily (Mg/d) | Annual (Mg/a) | 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 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] Hourly (#/h) | Traffic Passes [2] Daily (#/d) | Segment Length [3] (m) | Mean Vehicle Speed (km/h) | Load Factor [4] (%) | Tailpipe Emission Factor [5] TSP (g/vkt) | TSP (g/kW h) | PM10 (g/vkt) | PM10 (g/kW h) | PM2.5 (g/vkt) | PM2.5 (g/kW h) | NOx (g/vkt) | NOx (g/kW h) | Tailpipe Emission Rate TSP (g/s) | PM10 (g/s) | PM2.5 (g/s) | NOx (g/s) | Tailpipe + Fugitive Emission Rate [6] TSP (g/s) | PM10 (g/s) | PM2.5 (g/s) | NOx (g/s) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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:

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

HAUL2 TSP Emissions:

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

# 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.

## TECHNICAL DIRECTOR - AIR QUALITY | PRINCIPAL

T: 519.823.1311 X 2373 | Brian.Sulley@rwdi.com

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.

## TECHNICAL DIRECTOR - AIR QUALITY | PRINCIPAL

T: 519.823.1311 X 2373 | Brian.Sulley@rwdi.com

### 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

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

## TECHNICAL DIRECTOR - AIR QUALITY | PRINCIPAL

T: 519.823.1311 X 2373 | Brian.Sulley@rwdi.com

**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

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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