REPORT

# MILLER AGGREGATES PARIS PLAINS CHURCH RD. PIT

COUNTY OF BRANT, ONTARIO

**AIR QUALITY ASSESSMENT**

RWDI # 2204263

December 1, 2023


## SUBMITTED TO

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# REPORT SIGNATURES

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# 1 INTRODUCTION

RWDI AIR Inc. (RWDI) was retained by Miller Aggregates ("Miller") to complete an air quality assessment in support of an Aggregate Resources Act (ARA) Class A License application for their proposed Paris Plains Church Road Pit (Paris Plains Pit) in the County of Brant, Ontario. This assessment quantifies and evaluates air quality impacts from the various air emission sources for the proposed Paris Plains Pit considering operations including aggregate extraction, hauling, processing, handling, shipping, and all associated equipment. **Figure 1** shows the location of the site and phasing of operations.

# 2 SITE DESCRIPTION

The Paris Plains Pit is proposed to be located at 699 Paris Plains Church Road, in the County of Brant. Operations at the Paris Plains Pit will consist of aggregate extraction, processing, washing, stockpiling and shipping. **Figure 1** illustrates the location and overall layout of the site.

# 3 OPERATIONS

It is proposed that the Paris Plains Pit will have an annual extraction limit of up to 1,000,000 tonnes per year of aggregate and will include extraction and processing operations from March to November (inclusive) and shipping operations year-round. If extraction and processing does occur during the winter months, production is expected to be intermittent and infrequent.

Aggregate extraction and processing begin with excavators and front-end loaders loading material from the working face into a portable crushing unit and subsequently onto pit trucks and/or conveyors, which transport the material to the processing plant. At the plant, the material is crushed, screened, classified, and stockpiled for shipment off-site. A significant portion of the aggregate processed at the plant is also washed, which is insignificant with respect to emissions of particulates. Processed aggregate is loaded onto highway trucks of various configurations from the stockpiles located proximal to the processing area of the operation. The processing plant consists of crushers, screens, a wash plant, and associated conveyors & stackers, and is connected to the hydro grid. **Figures 2.1** and **2.2** provide the process flow diagram for the aggregate operation.

# 4 SENSITIVE RECEPTOR LOCATIONS

There are various rural homes located around the site, located on Paris Plains Church Road, Pinehurst Road, West Dumfries Road, and West River Road. Regardless of distance, the closest residences around the proposed Paris Plains Pit were included in the assessment. **Figure 3** illustrates the location of the residential receptors included in the assessment. Vacant lot receptors were also included, consistent with the acoustical assessment.

Adjacent to the proposed Paris Plains Pit is the historic Paris Plains Stone Church at 598-760 Paris Plains Church Road. This receptor is not considered to be a residential receptor however is a heritage site open to visitors. As a result, daytime impacts on this receptor were evaluated on the assessment.

# 5 CONTAMINANTS

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.

# 6 EMISSION SOURCES

The potential sources of emissions in the proposed Paris Plains Pit are as follows:

- Overburden stripping and rehabilitation operations;
- Material handling (loading haul and shipping trucks, dumping material at the processing plants);
- Material crushing, screening, washing, and stockpiling;
- Movement of equipment 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 will be addressed through Best Management Practice Plan for Fugitive Dust (BMPP).

**Figure 4.**1 and **4.2** presents modelled source locations for operations in both the West 1 and South Scenarios detailed below.

## 6.1 West Scenario

For the West Scenario, all activities at the site are operating simultaneously and at maximum capacity, with extraction occurring along the westernmost boundary of Phase 5. The West Scenario was initially assessed without the presence of any fugitive dust controls; the corresponding results were reviewed and used to develop a mitigation plan. The mitigation plan includes controls such as applying water for dust suppression portable crushing equipment, at the processing plant, and along unpaved roadways, as well as using conveyors to transport extracted material from the extraction face to the processing plant. The controlled West Scenario was subsequently assessed, with the inclusion of dust mitigation controls reflecting the implementation of a BMPP. For clarity, results are presented only for the controlled version of the West Scenario.

## 6.2 South Scenario

For the South Scenario, all activities at the site are operating simultaneously and at maximum capacity, with extraction occurring along the southern boundary of Phase 4, near the Church. The portable processing equipment was located at the border of the exclusion zone identified through the noise study. The South Scenario was initially assessed without the presence of any fugitive dust controls; the corresponding results were reviewed and used to develop a mitigation plan. The mitigation plan includes controls such as applying water for dust suppression at the portable crushing equipment, at the processing plant, and along unpaved roadways. The controlled South Scenario was subsequently assessed, with the inclusion of dust mitigation controls reflecting the implementation of a BMPP. For clarity, results are presented only for the controlled version of the South Scenario.

# 7 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), with the exception of $PM_{2.5}$, for which no AAQC exists. For that reason, the Canadian Ambient Air Quality Standard (CAAQS) for $PM_{2.5}$ was used.

It must be stressed that the CAAQS were developed as regional objectives for ambient concentrations of select air pollutants. These values are intended for use in a regional context and were not developed as facility level regulatory standards. While the study considers the CAAQS objective for comparison with predicted concentrations of $PM_{2.5,}$ it is only because there are currently no facility level assessment criteria for $PM_{2.5}$ under Ontario's AAQCs.

In contrast, there is currently an AAQC for $NO_2$, so comparison to the 2025 $NO_2$ CAAQS regional objective would be inappropriate in the context of this study.

RWDI's approach is consistent with MECP practice. The "Air Quality in Ontario 2020 Report", published by the MECP follow the same approach by including the CAAQS criteria for $PM_{2.5}$ but not including the CAAQS criteria for $NO_2$.

# 8 EMISSION CALCULATIONS

Emissions were estimated in accordance with relevant guidance, using published emission factors. Detailed emission calculations and emission factor references are provided in the appendices to this report for the controlled West and South Scenarios. The appendices contain details on assumptions, equipment types, sample calculations and other details that provide clarity as to RWDI's methodology.

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 used in the assessment.

All emission calculations are provided in **Appendix A** through **Appendix D**.

# 9 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 Paris Plains Pit 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 95% control efficiency reflects the strict application of these mitigation measures.

In some scenarios, material will be transferred from the extraction face to the processing plant via conveyors, rather than pit trucks to mitigate emissions from vehicle traffic.

Based on recent guidance provided by the MECP, a control efficiency of 95% may be applied to handling of washed stone and sand products due to the inherently low silt content.

The final dispersion modelling analysis reflects the implementation of controls.

# 10 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 22112. 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.

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[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,

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 West Central Ontario Region, for crop areas due to the significant agricultural lands in the area surrounding the site. This meteorological data includes surface data from London, Ontario and upper air data from White Lake, Michigan. The facility is surrounded by significant agricultural lands on all sides, and therefore the CROPS pre-processed data set was chosen. The meteorological data set were pre-processed by the MECP using the 22112 version of AERMET.

Terrain information for the area around the site was also obtained from the MECP, in accordance with Guideline A11. Base elevations for sources within the site reflect the pit floor elevations.

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. Extraction and processing operations were modelled during the months from March to November inclusive. Shipping operations can potentially occur year-round; however, shipping rates are lower during the months of December to April relative to the remainder of the 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.

The dispersion modelling files are available electronically upon request.

# 11 LOCAL EMISSION SOURCES

## 11.1 Review of Available Data

Environment Canada's National Pollutant Release Inventory (NPRI) is Canada's legislated, publicly accessible inventory of pollutant releases. Data for 2022 (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 is one (1) facility reporting emissions to NPRI within five (5) kilometres of the site, which is the CRH Canada Group Inc. – Paris Pit, located on the south side of Watts Pond Road. The next closest facility reporting to the NPRI is over seven (7) kilometres away.

With respect to identifying other aggregate operations near the subject site, the Ministry of Natural Resources and Forestry (MNRF) Pits and Quarries Online tool, as well as aerial photography for the area, was used. RWDI's extensive experience in modelling aggregate sites, mining sites, ready-mix concrete and cement plants, and other sources of fugitive dust, has consistently shown that impacts from such operations are more localized, and are typically indistinguishable from regional background air quality levels at distances beyond one (1) kilometer. RWDI has conducted hundreds of these assessments, as well as a number of ambient monitoring campaigns that support this observation. Therefore, as a conservative measure, RWDI used five (5) kilometres for this review. There are six (6) licensed sites located within this area, as shown on **Figure 5**. A description of each site is provided on **Table 1**.

[2] National Stone Sand and Gravel Association, "Modeling Fugitive Dust Sources with AERMOD", January 2007.

Of these, licenses only 5601 represented by Dufferin Aggregates (CRH Canada Group Inc.) report to the NPRI.

Finally, the MECP Access Environment system was also reviewed to identify any facilities with current Environmental Compliance Approvals (ECAs). The are no ECAs within the area of interest that are expected to emit similar emissions as the proposed Paris Plains Pit.

Other ECAs with the area include approvals for oxidized asphalt storage tanks and gluing exhaust at 50 Scott Avenue in Paris, a deep fryer and several pieces of combustion equipment used for cooking processes at 20 Scott Avenue in Paris, systems associated with the manufacturing of steel and iron alloyed castings at 20 Lee Avenue in Paris, a plastics moulding operation at 31 Woodslee Avenue in Paris, and a facility with ceramic tile cutting and welding stations at 34 Scott Avenue in Paris. These processes are not expected to emit contaminants in common with operations at the proposed Paris Plains Pit and are not carried forward in the assessment.

Based on this review, several facilities were selected for additional review, which are discussed in the following sections. Other facilities identified were not carried forward due to distance from the site or the lack of similar emissions relevant to the analysis.

## 11.2 Dufferin Aggregates (CRH Canada Group Inc.)

The aggregate processing operations at the Dufferin Aggregates Paris Pit are situated east of Pinehurst Road / Watts Pond Road and is located approximately 2 km to the south of the proposed Paris Plains Pit. This site does not currently have an ECA for a permanent aggregate processing plant but does report to the NPRI. This suggests that mobile plants are used at the facility, as an ECA is not necessarily required, in accordance with Ontario Regulation 524/98.

The annual extraction limit for the Dufferin Aggregates Paris Pit is 997,700 tonnes per year, essentially the same as the proposed Paris Plains Pit. Based on aerial imagery from June 2, 2023, operations at the Dufferin Aggregates Paris Pit are currently taking place south of Watts Pond Road, over 1.6 km from southernmost edge of the proposed license limit for the Paris Plains Pit. Although the license limit for the Dufferin Aggregates Paris Pit extends north of Watts Pond Road as far as Paris Plains Church Road, for the purposes of this assessment, the Dufferin Aggregates Paris Pit is considered to be sufficiently removed from the proposed Paris Plains Pit that it was not included explicitly in the dispersion modelling analysis.

# 12 BACKGROUND AIR QUALITY

Background ambient air monitoring data was used in conjunction with the emissions from the proposed operations the proposed Paris Plains Pit. The ambient background air monitoring data represents other background sources in the region, including the agricultural sources, long-range pollutant transport, and other ubiquitous sources in the environment.

For the purposes of this assessment, $90^{th}$ percentile background concentrations of particulate matter, nitrogen dioxide, and ozone were obtained from the closest MECP Air Quality Monitoring Station, MECP Station 21005 located at 324 Grand River Ave. in Brantford.

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.[3]. Silica was estimated using published data for cities in the northeast United States.[4].

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, agricultural location with no other significant industries nearby. There are no such monitoring stations operating anywhere in Ontario.

# 13 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 $NO_X$. Concentrations of $NO_X$ predicted by AERMOD are converted to $NO_2$ based on the background ozone concentration. To represent background ozone conditions, 90th percentile ozone concentrations by hour of day were derived from measurements recorded by the MECP at the Brantford 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%.

[3] 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.
[4] 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.

# 14 RESULTS

## 14.1 West Scenario

The results of the West Scenario assessment are presented in **Table 3.1**. Maximum predicted concentrations from the proposed extension are below the relevant criteria for all contaminants at the modelled receptors. When the 90th percentile background concentration from the MECP ambient monitoring stations were added to the predicted impacts from operations at the proposed extension, the cumulative concentrations remain below the relevant criteria at all receptor locations.

The modelling scenario is conducted using a 5-year period of meteorological data. The maximum predicted concentration is the single highest result occurring over the 5-years. This predicted concentration reflects a maximum production rate, adjusted by season, modelled as though it occurs every day during the respective operating seasons. This approach provides a conservative overestimate of the predicted impacts from the proposed pit. This demonstrates that with appropriate mitigation, predicted impacts due to operations at the proposed Paris Plains Pit can are within acceptable levels.

## 14.2 South Scenario

The results of the South Scenario assessment are presented in **Table 3.2**. Maximum predicted concentrations from the proposed extension are below the relevant criteria for all contaminants at the modelled receptors. When the 90th percentile background concentration from the MECP ambient monitoring stations were added to the predicted impacts from operations at the proposed extension, the cumulative concentrations remain below the relevant criteria at all receptor locations.

The modelling scenario is conducted using a 5-year period of meteorological data. The maximum predicted concentration is the single highest result occurring over the 5-years. This predicted concentration reflects a maximum production rate, adjusted by season, modelled as though it occurs every day during the respective operating seasons. This approach provides a conservative overestimate of the predicted impacts from the proposed pit. This demonstrates that with appropriate mitigation, predicted impacts due to operations at the proposed Paris Plains Pit can are within acceptable levels.

# 15 RECOMMENDATIONS

The Paris Plains Pit 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 a Best Management Practices Plan for Dust, which may be amended from time to time, considering actual impacts and operational considerations. The recommendations in the Best Management Practices Plan for Dust are based on the maximum daily production rates. At lower production rates, the control measures specified in the Best Management Practices Plan for Dust can be reduced accordingly, provided dust remains mitigated on site.

# 16 RECOMMENDED MANAGEMENT PRACTICES

RWDI recommends the following mitigation measures be incorporated into the Best Management Practices Plan for Dust for the Paris Pains Pit. A BMPP is meant to be a living document, reflecting operational experience at the site, and shall be reviewed periodically to ensure that mitigation measures are effective. Furthermore, if the site is operating at levels below maximum capacity, the mitigation measures may be adjusted accordingly.

## 16.1 Processing Plants

- The portable crushing equipment shall be equipped with dust suppressing or collection devices (such as a water spray system). If a water spray system is used, spray bars shall be located at crushers and screen decks.
- The primary processing plant shall be equipped with dust suppressing or collection devices (such as a water spray system). If a water spray system is used, spray bars shall be located at crushers and screen decks.
- 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.
- When sufficient precipitation is present, 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.

## 16.2 Unpaved Haul Roads

- Unpaved roads at the Paris Pains Pit are watered using a water truck or suitable alternative such as a water spray system. If water is used, the application of water to the unpaved roads will be dependent on weather conditions and the amount of traffic.
- During the winter months (December to March), watering shall not be conducted due to operational constraints and safety concerns as a result of cold/freezing temperatures. When temperatures are below, or predicted to fall below, 4ºC, chemical dust suppressants may be applied, or operations shall be curtailed.
- 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.
- When operations are occurring within Phase 5, conveyors will be used to transport the extracted aggregate from the extraction face to the processing plant.

## 16.3 Paved Haul Roads

- Paved roads at the Paris Pains Pit are flushed using a water truck or swept using a wet or vacuum sweeper. The cleaning of paved roads will be dependent on weather conditions and the amount of aggregate material on the paved road surface at the Pit.
- During the winter months (December to March), flushing shall not be conducted due to operational constraints and safety concerns as a result of cold/freezing temperatures. When temperatures are below, or predicted to fall below, 4ºC, vacuum sweeping shall be employed if needed.
- 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.

# 17 CONCLUSIONS

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

# TABLES

# Table 1: Ambient Air Quality Data

Project #2204263

| Year | TSP [2] | | PM10 [2] | | Silica | PM2.5 | | NO2 [4] | | | | | | O3 [4] | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 90th Percentile 24-hour (µg/m$^3$) | Annual Average (µg/m$^3$) | 90th Percentile 24-hour (µg/m$^3$) | Annual Average (µg/m$^3$) | 90th Percentile 24-hour [3] (µg/m$^3$) | 90th Percentile 24-hour (µg/m$^3$) | Annual Average (µg/m$^3$) | 90th Percentile 1-Hour | | 90th Percentile 24-Hour | | Annual Average | | 90th Percentile 1-Hour | | 90th Percentile 24-Hour | | Annual Average | |
| | | | | | | | | (ppb) | (µg/m$^3$) | (ppb) | (µg/m$^3$) | (ppb) | (µg/m$^3$) | (ppb) | (µg/m$^3$) | (ppb) | (µg/m$^3$) | (ppb) | (µg/m$^3$) |
| 2017 | 40 | 24 | 22 | 13 | 1.3 | 12 | 7.1 | 10 | 19 | 9 | 16 | 4.4 | 8 | 44 | 86 | 38 | 75 | 28 | 55 |
| 2018 | 44 | 25 | 25 | 14 | 1.5 | 13 | 7.6 | 10 | 32 | 9 | 17 | 5.1 | 14 | 45 | 88 | 39 | 77 | 28 | 55 |
| 2019 | 45 | 24 | 25 | 14 | 1.5 | 13 | 7.3 | 11 | 28 | 10 | 18 | 5.5 | 13 | 44 | 86 | 38 | 75 | 27 | 53 |
| 2020 | 37 | 22 | 20 | 12 | 1.2 | 11 | 6.7 | 8 | 17 | 7 | 14 | 4.2 | 8 | 43 | 84 | 38 | 74 | 28 | 55 |
| 2021 | 45 | 25 | 25 | 14 | 1.5 | 14 | 7.6 | 9 | 18 | 9 | 16 | 4.6 | 9 | 45 | 88 | 39 | 77 | 28 | 55 |
| Average | 42 | 24 | 23 | 13 | 1.4 | 13 | 7.3 | 10 | 23 | 9 | 16 | 5 | 11 | 44 | 87 | 38 | 75 | 28 | 55 |

Notes:

[1] All data from MECP Station 21005, in Brantford.

[2] Estimated from PM2.5 measurements using published factors (Lall, et al., 2004)

[3] Estimated as 6% of PM10, from published data for cities in the northeast US (U.S. EPA, 1996)

[4] Conversion from ppb to µg/m$^3$ based on 10°C.

Revision Date: 2023-11-14
Prepared by: SJP
Checked by: RB

# Table 2: Nearby Aggregate Licenses

Project #2204263

Miller Aggregates - Paris Pit

| ALPS ID | Operator | Site Name | Maximum Annual Tonnage |
|---|---|---|---|
| 5601 | Dufferin Aggregates, A Division of CRH Canada Group Inc. | Not Specified | 997,700 |
| 5707 | Corporation of the County of Brant | Not Specified | 30,000 |
| 5694 | Lafarge Canada Inc. | Not Specified | 900,000 |
| 5532 | Lafarge Canada Inc. | Not Specified | 99,999,999 |
| 5659 | Network Sand and Gravel Ltd. | Not Specified | 75,000 |
| 59707 | Corporation of the County of Brant | Keg Lane Pit | 50,000 |

# Table 3.1: West Scenario



Operations Located at the Western Extraction Limit in Phase 5

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 |
| | 32 | µg/m³ Annual CAAQS |

Background Concentrations

| | | |
|---|---|---|
| **TSP** | 42 | µg/m³ (24-hour) |
| | 24 | µg/m³ (Annual) |
| **$PM_{10}$** | 23 | µg/m³ (24-hour) |
| **$PM_{2.5}$** | 13 | µg/m³ (24-hour) |
| | 7.3 | µg/m³ (Annual) |
| **Silica** | 1.4 | µg/m³ (24-hour) |
| **$NO_2$** | 23 | µg/m³ (1-hour) |
| | 16 | µg/m³ (24-hour) |
| | 11 | µg/m³ (Annual) |
| **O3** | 87 | µg/m³ (1-hour) |
| | 75 | µg/m³ (24-hour) |
| | 55 | µg/m³ (Annual) |

Notes:

[1] 1-hour and 24-hour background concentrations are based on the 90th percentile value

[2] Annual average background concentrations are based on the 1-hour average concentration

| Receptor | | UTM Coordinates | | Contaminant | Averaging | Recommended | Incremental | | Cumulative | |
|---|---|---|---|---|---|---|---|---|---|---|
| ID | Type | X (m) | Y (m) | | Period (hours) | Criteria for Cumulative Effects Analysis (µg/m³) | Predicted Concentration (µg/m³) | Percentage of Revelant Criteria (%) | Predicted Concentration (µg/m³) | Percentage of Revelant Criteria (%) |
| R01 | Residence | 550,610 | 4,787,408 | TSP | 24 | 120 | 18 | 15% | 60 | 50% |
| | | | | | Annual | 60 | 2 | 3% | 26 | 43% |
| | | | | PM10 | 24 | 50 | 3 | 6% | 26 | 52% |
| | | | | PM2.5 | 24 | 27 | 1 | 2% | 26 | 96% |
| | | | | | Annual | 8.8 | 0.0 | 1% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 1 | 11% | 2 | 39% |
| | | | | NO2 | 1 | 400 | 15 | 4% | 38 | 9% |
| | | | | | 24 | 200 | 1 | 0% | 17 | 8% |
| | | | | | Annual | 32 | 0.0 | 0% | 11 | 33% |

| Receptor | | UTM Coordinates | | Contaminant | Averaging Period | Recommended Criteria for Cumulative Effects Analysis | Incremental | | Cumulative | |
|---|---|---|---|---|---|---|---|---|---|---|
| ID | Type | X (m) | Y (m) | | (hours) | (µg/m³) | Predicted Concentration (µg/m³) | Percentage of Revelant Criteria (%) | Predicted Concentration (µg/m³) | Percentage of Revelant Criteria (%) |
| R02 | Church | 550,204 | 4,787,409 | TSP | 24 | 120 | 20 | 17% | 62 | 52% |
| | | | | | Annual | 60 | 2 | 3% | 26 | 43% |
| | | | | PM10 | 24 | 50 | 4 | 9% | 27 | 55% |
| | | | | PM2.5 | 24 | 27 | 1 | 5% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.1 | 1% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 1 | 14% | 2 | 42% |
| | | | | NO2 | 1 | 400 | 21 | 5% | 44 | 11% |
| | | | | | 24 | 200 | 2 | 1% | 19 | 9% |
| | | | | | Annual | 32 | 0.1 | 0% | 11 | 33% |
| R03 | Church | 550,145 | 4,787,393 | TSP | 24 | 120 | 20 | 17% | 62 | 52% |
| | | | | | Annual | 60 | 2 | 3% | 26 | 43% |
| | | | | PM10 | 24 | 50 | 5 | 9% | 28 | 55% |
| | | | | PM2.5 | 24 | 27 | 2 | 6% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.1 | 1% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 1 | 14% | 2 | 42% |
| | | | | NO2 | 1 | 400 | 23 | 6% | 46 | 12% |
| | | | | | 24 | 200 | 3 | 1% | 19 | 10% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R04 | Residence | 549,842 | 4,787,228 | TSP | 24 | 120 | 19 | 16% | 61 | 51% |
| | | | | | Annual | 60 | 2 | 3% | 26 | 43% |
| | | | | PM10 | 24 | 50 | 3 | 6% | 26 | 52% |
| | | | | PM2.5 | 24 | 27 | 1 | 3% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.1 | 1% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 1 | 12% | 2 | 40% |
| | | | | NO2 | 1 | 400 | 31 | 8% | 54 | 14% |
| | | | | | 24 | 200 | 2 | 1% | 18 | 9% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R05 | Residence | 549,740 | 4,787,162 | TSP | 24 | 120 | 18 | 15% | 60 | 50% |
| | | | | | Annual | 60 | 1 | 2% | 25 | 42% |
| | | | | PM10 | 24 | 50 | 3 | 6% | 26 | 52% |
| | | | | PM2.5 | 24 | 27 | 1 | 3% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.1 | 1% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 1 | 11% | 2 | 39% |
| | | | | NO2 | 1 | 400 | 29 | 7% | 52 | 13% |
| | | | | | 24 | 200 | 2 | 1% | 18 | 9% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |

| Receptor | | UTM Coordinates | | Contaminant | Averaging Period | Recommended Criteria for Cumulative Effects Analysis | Incremental | | Cumulative | |
|---|---|---|---|---|---|---|---|---|---|---|
| ID | Type | X (m) | Y (m) | | (hours) | (µg/m³) | Predicted Concentration (µg/m³) | Percentage of Revelant Criteria (%) | Predicted Concentration (µg/m³) | Percentage of Revelant Criteria (%) |
| R06 | Residence | 551,390 | 4,788,783 | TSP | 24 | 120 | 8 | 7% | 50 | 42% |
| | | | | | Annual | 60 | 1 | 1% | 25 | 41% |
| | | | | PM10 | 24 | 50 | 2 | 4% | 25 | 50% |
| | | | | PM2.5 | 24 | 27 | 0 | 1% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 0 | 8% | 2 | 36% |
| | | | | NO2 | 1 | 400 | 7 | 2% | 29 | 7% |
| | | | | | 24 | 200 | 0 | 0% | 17 | 8% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R07 | Residence | 551,443 | 4,788,803 | TSP | 24 | 120 | 8 | 7% | 50 | 42% |
| | | | | | Annual | 60 | 1 | 1% | 25 | 41% |
| | | | | PM10 | 24 | 50 | 2 | 4% | 25 | 50% |
| | | | | PM2.5 | 24 | 27 | 0 | 1% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 0 | 8% | 2 | 36% |
| | | | | NO2 | 1 | 400 | 7 | 2% | 30 | 7% |
| | | | | | 24 | 200 | 0 | 0% | 17 | 8% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R08 | Residence | 549,095 | 4,787,363 | TSP | 24 | 120 | 57 | 47% | 99 | 82% |
| | | | | | Annual | 60 | 2 | 4% | 26 | 44% |
| | | | | PM10 | 24 | 50 | 9 | 17% | 32 | 63% |
| | | | | PM2.5 | 24 | 27 | 3 | 9% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.1 | 1% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 2 | 33% | 3 | 61% |
| | | | | NO2 | 1 | 400 | 71 | 18% | 93 | 23% |
| | | | | | 24 | 200 | 4 | 2% | 20 | 10% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R10 | Residence | 549,051 | 4,787,690 | TSP | 24 | 120 | 47 | 39% | 89 | 74% |
| | | | | TSP | Annual | 60 | 3 | 6% | 27 | 46% |
| | | | | PM10 | 24 | 50 | 13 | 27% | 36 | 73% |
| | | | | PM2.5 | 24 | 27 | 5 | 18% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.2 | 3% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 2 | 39% | 3 | 67% |
| | | | | NO2 | 1 | 400 | 113 | 28% | 136 | 34% |
| | | | | | 24 | 200 | 10 | 5% | 26 | 13% |
| | | | | | Annual | 32 | 0 | 1% | 11 | 34% |

| Receptor | | UTM Coordinates | | Contaminant | Averaging Period | Recommended Criteria for Cumulative Effects Analysis | Incremental | | Cumulative | |
|---|---|---|---|---|---|---|---|---|---|---|
| ID | Type | X (m) | Y (m) | | (hours) | (µg/m$^3$) | Predicted Concentration (µg/m$^3$) | Percentage of Revelant Criteria (%) | Predicted Concentration (µg/m$^3$) | Percentage of Revelant Criteria (%) |
| R11 | Residence | 549,094 | 4,787,604 | TSP | 24 | 120 | 75 | 63% | 117 | 98% |
| | | | | | Annual | 60 | 5 | 9% | 29 | 49% |
| | | | | PM10 | 24 | 50 | 14 | 28% | 37 | 74% |
| | | | | PM2.5 | 24 | 27 | 6 | 21% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.3 | 3% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 2 | 46% | 4 | 74% |
| | | | | NO2 | 1 | 400 | 140 | 35% | 163 | 41% |
| | | | | | 24 | 200 | 12 | 6% | 28 | 14% |
| | | | | | Annual | 32 | 0 | 1% | 11 | 34% |
| R12 | Residence | 548,975 | 4,787,911 | TSP | 24 | 120 | 21 | 18% | 63 | 53% |
| | | | | | Annual | 60 | 1 | 2% | 25 | 42% |
| | | | | PM10 | 24 | 50 | 5 | 10% | 28 | 56% |
| | | | | PM2.5 | 24 | 27 | 2 | 7% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.1 | 1% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 1 | 14% | 2 | 42% |
| | | | | NO2 | 1 | 400 | 72 | 18% | 95 | 24% |
| | | | | | 24 | 200 | 4 | 2% | 20 | 10% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R13 | Residence | 549,310 | 4,787,125 | TSP | 24 | 120 | 24 | 20% | 66 | 55% |
| | | | | | Annual | 60 | 1 | 2% | 25 | 42% |
| | | | | PM10 | 24 | 50 | 4 | 7% | 27 | 53% |
| | | | | PM2.5 | 24 | 27 | 1 | 5% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.1 | 1% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 1 | 13% | 2 | 41% |
| | | | | NO2 | 1 | 400 | 53 | 13% | 76 | 19% |
| | | | | | 24 | 200 | 3 | 1% | 19 | 9% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R14 | Residence | 549,000 | 4,788,425 | TSP | 24 | 120 | 10 | 8% | 52 | 43% |
| | | | | | Annual | 60 | 1 | 1% | 25 | 41% |
| | | | | PM10 | 24 | 50 | 2 | 4% | 25 | 50% |
| | | | | PM2.5 | 24 | 27 | 1 | 2% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 0 | 6% | 2 | 34% |
| | | | | NO2 | 1 | 400 | 23 | 6% | 46 | 12% |
| | | | | | 24 | 200 | 1 | 1% | 18 | 9% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |

| Receptor | | UTM Coordinates | | Contaminant | Averaging Period (hours) | Recommended Criteria for Cumulative Effects Analysis (µg/m³) | Incremental | | Cumulative | |
|---|---|---|---|---|---|---|---|---|---|---|
| ID | Type | X (m) | Y (m) | | | | Predicted Concentration (µg/m³) | Percentage of Revelant Criteria (%) | Predicted Concentration (µg/m³) | Percentage of Revelant Criteria (%) |
| R15 | Residence | 549,472 | 4,788,811 | TSP | 24 | 120 | 7 | 6% | 49 | 41% |
| | | | | | Annual | 60 | 1 | 1% | 25 | 41% |
| | | | | PM10 | 24 | 50 | 1 | 3% | 24 | 49% |
| | | | | PM2.5 | 24 | 27 | 0 | 1% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 0 | 5% | 2 | 33% |
| | | | | NO2 | 1 | 400 | 18 | 5% | 41 | 10% |
| | | | | | 24 | 200 | 1 | 0% | 17 | 9% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R16 | Residence | 552,318 | 4,787,811 | TSP | 24 | 120 | 12 | 10% | 54 | 45% |
| | | | | TSP | Annual | 60 | 0 | 1% | 24 | 41% |
| | | | | PM10 | 24 | 50 | 2 | 4% | 25 | 50% |
| | | | | PM2.5 | 24 | 27 | 0 | 2% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 0 | 8% | 2 | 36% |
| | | | | NO2 | 1 | 400 | 3 | 1% | 26 | 7% |
| | | | | | 24 | 200 | 0 | 0% | 17 | 8% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R17 | Residence | 549,120 | 4,787,168 | TSP | 24 | 120 | 20 | 17% | 62 | 52% |
| | | | | | Annual | 60 | 1 | 2% | 25 | 42% |
| | | | | PM10 | 24 | 50 | 4 | 7% | 27 | 53% |
| | | | | PM2.5 | 24 | 27 | 1 | 4% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 1 | 13% | 2 | 41% |
| | | | | NO2 | 1 | 400 | 41 | 10% | 64 | 16% |
| | | | | | 24 | 200 | 2 | 1% | 18 | 9% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R18 | Residence | 549,425 | 4,788,811 | TSP | 24 | 120 | 7 | 6% | 49 | 41% |
| | | | | TSP | Annual | 60 | 1 | 1% | 25 | 41% |
| | | | | PM10 | 24 | 50 | 1 | 3% | 24 | 49% |
| | | | | PM2.5 | 24 | 27 | 0 | 1% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 0 | 5% | 2 | 33% |
| | | | | NO2 | 1 | 400 | 17 | 4% | 40 | 10% |
| | | | | | 24 | 200 | 1 | 0% | 17 | 9% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |

| Receptor | | UTM Coordinates | | Contaminant | Averaging Period | Recommended Criteria for Cumulative Effects Analysis | Incremental | | Cumulative | |
|---|---|---|---|---|---|---|---|---|---|---|
| ID | Type | X (m) | Y (m) | | (hours) | (µg/m³) | Predicted Concentration (µg/m³) | Percentage of Revelant Criteria (%) | Predicted Concentration (µg/m³) | Percentage of Revelant Criteria (%) |
| R19 | Residence | 552,202 | 4,788,305 | TSP | 24 | 120 | 14 | 11% | 56 | 46% |
| | | | | | Annual | 60 | 1 | 1% | 25 | 41% |
| | | | | PM10 | 24 | 50 | 4 | 8% | 27 | 54% |
| | | | | PM2.5 | 24 | 27 | 1 | 2% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 1 | 14% | 2 | 42% |
| | | | | NO2 | 1 | 400 | 7 | 2% | 29 | 7% |
| | | | | | 24 | 200 | 1 | 0% | 17 | 8% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R20 | Residence | 552,339 | 4,787,567 | TSP | 24 | 120 | 10 | 8% | 52 | 43% |
| | | | | | Annual | 60 | 0 | 1% | 24 | 41% |
| | | | | PM10 | 24 | 50 | 3 | 6% | 26 | 52% |
| | | | | PM2.5 | 24 | 27 | 0 | 2% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 1 | 11% | 2 | 39% |
| | | | | NO2 | 1 | 400 | 3 | 1% | 26 | 6% |
| | | | | | 24 | 200 | 0 | 0% | 17 | 8% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R21 | Residence | 552,228 | 4,788,255 | TSP | 24 | 120 | 13 | 11% | 55 | 46% |
| | | | | | Annual | 60 | 1 | 1% | 25 | 41% |
| | | | | PM10 | 24 | 50 | 3 | 7% | 26 | 53% |
| | | | | PM2.5 | 24 | 27 | 1 | 2% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 1 | 12% | 2 | 40% |
| | | | | NO2 | 1 | 400 | 7 | 2% | 30 | 8% |
| | | | | | 24 | 200 | 0 | 0% | 17 | 8% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R22 | Residence | 552,035 | 4,788,722 | TSP | 24 | 120 | 6 | 5% | 48 | 40% |
| | | | | | Annual | 60 | 0 | 1% | 24 | 41% |
| | | | | PM10 | 24 | 50 | 2 | 4% | 25 | 50% |
| | | | | PM2.5 | 24 | 27 | 0 | 1% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 0 | 7% | 2 | 35% |
| | | | | NO2 | 1 | 400 | 5 | 1% | 28 | 7% |
| | | | | | 24 | 200 | 0 | 0% | 16 | 8% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |

| Receptor | | UTM Coordinates | | Contaminant | Averaging Period | Recommended Criteria for Cumulative Effects Analysis | Incremental | | Cumulative | |
|---|---|---|---|---|---|---|---|---|---|---|
| ID | Type | X (m) | Y (m) | | (hours) | (µg/m$^3$) | Predicted Concentration (µg/m$^3$) | Percentage of Revelant Criteria (%) | Predicted Concentration (µg/m$^3$) | Percentage of Revelant Criteria (%) |
| R23 | Residence | 549,130 | 4,787,053 | TSP | 24 | 120 | 15 | 13% | 57 | 48% |
| | | | | | Annual | 60 | 1 | 1% | 25 | 41% |
| | | | | PM10 | 24 | 50 | 3 | 5% | 26 | 51% |
| | | | | PM2.5 | 24 | 27 | 1 | 4% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 0 | 9% | 2 | 37% |
| | | | | NO2 | 1 | 400 | 31 | 8% | 53 | 13% |
| | | | | | 24 | 200 | 2 | 1% | 18 | 9% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R24 | Residence | 549,144 | 4,787,006 | TSP | 24 | 120 | 13 | 11% | 55 | 46% |
| | | | | | Annual | 60 | 1 | 1% | 25 | 41% |
| | | | | PM10 | 24 | 50 | 3 | 5% | 26 | 51% |
| | | | | PM2.5 | 24 | 27 | 1 | 3% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 0 | 8% | 2 | 36% |
| | | | | NO2 | 1 | 400 | 28 | 7% | 51 | 13% |
| | | | | | 24 | 200 | 2 | 1% | 18 | 9% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R25 | Residence | 550,593 | 4,789,160 | TSP | 24 | 120 | 7 | 6% | 49 | 41% |
| | | | | | Annual | 60 | 0 | 1% | 24 | 41% |
| | | | | PM10 | 24 | 50 | 1 | 3% | 24 | 49% |
| | | | | PM2.5 | 24 | 27 | 0 | 1% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 0 | 5% | 2 | 33% |
| | | | | NO2 | 1 | 400 | 8 | 2% | 31 | 8% |
| | | | | | 24 | 200 | 0 | 0% | 17 | 8% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R26 | Residence | 549,144 | 4,786,967 | TSP | 24 | 120 | 12 | 10% | 54 | 45% |
| | | | | | Annual | 60 | 1 | 1% | 25 | 41% |
| | | | | PM10 | 24 | 50 | 2 | 5% | 25 | 51% |
| | | | | PM2.5 | 24 | 27 | 1 | 3% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 0 | 8% | 2 | 36% |
| | | | | NO2 | 1 | 400 | 25 | 6% | 47 | 12% |
| | | | | | 24 | 200 | 2 | 1% | 18 | 9% |
| R26 | | | | | Annual | 32 | 0 | 0% | 11 | 33% |

| Receptor | | UTM Coordinates | | Contaminant | Averaging | Recommended | Incremental | | Cumulative | |
|---|---|---|---|---|---|---|---|---|---|---|
| ID | Type | X (m) | Y (m) | | Period (hours) | Criteria for Cumulative Effects Analysis (µg/m³) | Predicted Concentration (µg/m³) | Percentage of Revelant Criteria (%) | Predicted Concentration (µg/m³) | Percentage of Revelant Criteria (%) |
| R27 | Residence | 550,665 | 4,789,191 | TSP | 24 | 120 | 6 | 5% | 48 | 40% |
| | | | | | Annual | 60 | 0 | 1% | 24 | 41% |
| | | | | PM10 | 24 | 50 | 1 | 3% | 24 | 49% |
| | | | | PM2.5 | 24 | 27 | 0 | 1% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 0 | 5% | 2 | 33% |
| | | | | NO2 | 1 | 400 | 7 | 2% | 30 | 7% |
| | | | | | 24 | 200 | 0 | 0% | 17 | 8% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R28 | Residence | 549,145 | 4,786,939 | TSP | 24 | 120 | 11 | 9% | 53 | 44% |
| | | | | | Annual | 60 | 1 | 1% | 25 | 41% |
| | | | | PM10 | 24 | 50 | 2 | 5% | 25 | 51% |
| | | | | PM2.5 | 24 | 27 | 1 | 3% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 0 | 8% | 2 | 36% |
| | | | | NO2 | 1 | 400 | 23 | 6% | 46 | 11% |
| | | | | | 24 | 200 | 1 | 1% | 18 | 9% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R29 | Residence | 549,846 | 4,789,067 | TSP | 24 | 120 | 7 | 6% | 49 | 41% |
| | | | | | Annual | 60 | 0 | 1% | 24 | 41% |
| | | | | PM10 | 24 | 50 | 2 | 3% | 25 | 49% |
| | | | | PM2.5 | 24 | 27 | 0 | 1% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 0 | 6% | 2 | 34% |
| | | | | NO2 | 1 | 400 | 12 | 3% | 35 | 9% |
| | | | | | 24 | 200 | 1 | 0% | 17 | 8% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R30 | Residence | 549,809 | 4,789,059 | TSP | 24 | 120 | 7 | 6% | 49 | 41% |
| | | | | | Annual | 60 | 0 | 1% | 24 | 41% |
| | | | | PM10 | 24 | 50 | 1 | 3% | 24 | 49% |
| | | | | PM2.5 | 24 | 27 | 0 | 1% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 0 | 5% | 2 | 33% |
| | | | | NO2 | 1 | 400 | 12 | 3% | 35 | 9% |
| | | | | | 24 | 200 | 1 | 0% | 17 | 8% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |

| Receptor | | UTM Coordinates | | Contaminant | Averaging Period | Recommended Criteria for Cumulative Effects Analysis | Incremental | | Cumulative | |
|---|---|---|---|---|---|---|---|---|---|---|
| ID | Type | X (m) | Y (m) | | (hours) | (µg/m³) | Predicted Concentration (µg/m³) | Percentage of Revelant Criteria (%) | Predicted Concentration (µg/m³) | Percentage of Revelant Criteria (%) |
| R31 | Residence | 552,492 | 4,787,564 | TSP | 24 | 120 | 11 | 9% | 53 | 44% |
| | | | | | Annual | 60 | 0 | 1% | 24 | 41% |
| | | | | PM10 | 24 | 50 | 3 | 7% | 26 | 53% |
| | | | | PM2.5 | 24 | 27 | 0 | 2% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 1 | 12% | 2 | 40% |
| | | | | NO2 | 1 | 400 | 3 | 1% | 26 | 6% |
| | | | | | 24 | 200 | 0 | 0% | 17 | 8% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R32 | Residence | 549,044 | 4,788,902 | TSP | 24 | 120 | 5 | 5% | 47 | 40% |
| | | | | | Annual | 60 | 0 | 1% | 24 | 41% |
| | | | | PM10 | 24 | 50 | 1 | 3% | 24 | 49% |
| | | | | PM2.5 | 24 | 27 | 0 | 2% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 0 | 5% | 2 | 33% |
| | | | | NO2 | 1 | 400 | 16 | 4% | 39 | 10% |
| | | | | | 24 | 200 | 1 | 0% | 17 | 9% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R33 | Residence | 549,162 | 4,786,814 | TSP | 24 | 120 | 8 | 7% | 50 | 42% |
| | | | | | Annual | 60 | 1 | 1% | 25 | 41% |
| | | | | PM10 | 24 | 50 | 2 | 4% | 25 | 50% |
| | | | | PM2.5 | 24 | 27 | 1 | 2% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 0 | 6% | 2 | 34% |
| | | | | NO2 | 1 | 400 | 19 | 5% | 41 | 10% |
| | | | | | 24 | 200 | 1 | 1% | 17 | 9% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R34 | Residence | 551,544 | 4,789,261 | TSP | 24 | 120 | 5 | 4% | 47 | 39% |
| | | | | | Annual | 60 | 0 | 1% | 24 | 41% |
| | | | | PM10 | 24 | 50 | 1 | 2% | 24 | 48% |
| | | | | PM2.5 | 24 | 27 | 0 | 1% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 0 | 4% | 2 | 32% |
| | | | | NO2 | 1 | 400 | 4 | 1% | 27 | 7% |
| | | | | | 24 | 200 | 0 | 0% | 16 | 8% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |

| Receptor | | UTM Coordinates | | Contaminant | Averaging Period | Recommended Criteria for Cumulative Effects Analysis | Incremental | | Cumulative | |
|---|---|---|---|---|---|---|---|---|---|---|
| ID | Type | X (m) | Y (m) | | (hours) | (µg/m³) | Predicted Concentration (µg/m³) | Percentage of Revelant Criteria (%) | Predicted Concentration (µg/m³) | Percentage of Revelant Criteria (%) |
| R35 | Residence | 552,586 | 4,787,188 | TSP | 24 | 120 | 6 | 5% | 48 | 40% |
| | | | | | Annual | 60 | 0 | 1% | 24 | 41% |
| | | | | PM10 | 24 | 50 | 1 | 3% | 24 | 49% |
| | | | | PM2.5 | 24 | 27 | 0 | 1% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 0 | 5% | 2 | 33% |
| | | | | NO2 | 1 | 400 | 2 | 1% | 25 | 6% |
| | | | | | 24 | 200 | 0 | 0% | 16 | 8% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R36 | Residence | 552,539 | 4,786,969 | TSP | 24 | 120 | 5 | 4% | 47 | 39% |
| | | | | | Annual | 60 | 0 | 1% | 24 | 41% |
| | | | | PM10 | 24 | 50 | 1 | 2% | 24 | 48% |
| | | | | PM2.5 | 24 | 27 | 0 | 1% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 0 | 3% | 2 | 31% |
| | | | | NO2 | 1 | 400 | 3 | 1% | 25 | 6% |
| | | | | | 24 | 200 | 0 | 0% | 16 | 8% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |

# Table 3.2: South Scenario

RWDI Project# 2204263

Operations Located at the Southern Extraction Limit in Phase 4

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 |
| | 32 | µg/m³ Annual CAAQS |

Background Concentrations

| | | |
|---|---|---|
| **TSP** | 42 | µg/m³ (24-hour) |
| | 24 | µg/m³ (Annual) |
| **$PM_{10}$** | 23 | µg/m³ (24-hour) |
| **$PM_{2.5}$** | 13 | µg/m³ (24-hour) |
| | 7.3 | µg/m³ (Annual) |
| **Silica** | 1.4 | µg/m³ (24-hour) |
| **$NO_2$** | 23 | µg/m³ (1-hour) |
| | 16 | µg/m³ (24-hour) |
| | 11 | µg/m³ (Annual) |
| **O3** | 87 | µg/m³ (1-hour) |
| | 75 | µg/m³ (24-hour) |
| | 55 | µg/m³ (Annual) |

Notes:

[1] 1-hour and 24-hour background concentrations are based on the 90th percentile value

[2] Annual average background concentrations are based on the 1-hour average concentration

| Receptor | | UTM Coordinates | | Contaminant | Averaging | Recommended | Incremental | | Cumulative | |
|---|---|---|---|---|---|---|---|---|---|---|
| ID | Type | X (m) | Y (m) | | Period (hours) | Criteria for Cumulative Effects Analysis (µg/m³) | Predicted Concentration (µg/m³) | Percentage of Revelant Criteria (%) | Predicted Concentration (µg/m³) | Percentage of Revelant Criteria (%) |
| R01 | Residence | 550,610 | 4,787,408 | TSP | 24 | 120 | 54 | 45% | 96 | 80% |
| | | | | | Annual | 60 | 4 | 7% | 28 | 47% |
| | | | | PM10 | 24 | 50 | 13 | 25% | 36 | 71% |
| | | | | PM2.5 | 24 | 27 | 4 | 16% | 26 | 96% |
| | | | | | Annual | 8.8 | 0.2 | 3% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 2 | 40% | 3 | 68% |
| | | | | NO2 | 1 | 400 | 100 | 25% | 123 | 31% |
| | | | | | 24 | 200 | 9.1 | 5% | 25 | 13% |
| | | | | | Annual | 32 | 0.4 | 1% | 11 | 34% |

| Receptor | | UTM Coordinates | | Contaminant | Averaging Period | Recommended Criteria for Cumulative Effects Analysis | Incremental | | Cumulative | |
|---|---|---|---|---|---|---|---|---|---|---|
| ID | Type | X (m) | Y (m) | | (hours) | (µg/m³) | Predicted Concentration (µg/m³) | Percentage of Revelant Criteria (%) | Predicted Concentration (µg/m³) | Percentage of Revelant Criteria (%) |
| R02 | Church | 550,204 | 4,787,409 | TSP | 24 | 120 | 63 | 52% | 105 | 87% |
| | | | | | Annual | 60 | 5 | 8% | 29 | 48% |
| | | | | PM10 | 24 | 50 | 15 | 31% | 38 | 77% |
| | | | | PM2.5 | 24 | 27 | 5 | 17% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.2 | 3% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 2 | 48% | 4 | 76% |
| | | | | NO2 | 1 | 400 | 111 | 28% | 134 | 33% |
| | | | | | 24 | 200 | 9 | 5% | 26 | 13% |
| | | | | | Annual | 32 | 0 | 1% | 11 | 34% |
| R03 | Church | 550,145 | 4,787,393 | TSP | 24 | 120 | 70 | 59% | 112 | 94% |
| | | | | | Annual | 60 | 4 | 6% | 28 | 46% |
| | | | | PM10 | 24 | 50 | 18 | 36% | 41 | 82% |
| | | | | PM2.5 | 24 | 27 | 5 | 19% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.2 | 2% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 3 | 56% | 4 | 84% |
| | | | | NO2 | 1 | 400 | 109 | 27% | 132 | 33% |
| | | | | | 24 | 200 | 10 | 5% | 26 | 13% |
| | | | | | Annual | 32 | 0 | 1% | 11 | 34% |
| R04 | Residence | 549,842 | 4,787,228 | TSP | 24 | 120 | 39 | 32% | 81 | 67% |
| | | | | | Annual | 60 | 2 | 3% | 26 | 43% |
| | | | | PM10 | 24 | 50 | 9 | 18% | 32 | 64% |
| | | | | PM2.5 | 24 | 27 | 2 | 8% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.1 | 1% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 1 | 30% | 3 | 58% |
| | | | | NO2 | 1 | 400 | 43 | 11% | 66 | 16% |
| | | | | | 24 | 200 | 3 | 2% | 20 | 10% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R05 | Residence | 549,740 | 4,787,162 | TSP | 24 | 120 | 32 | 27% | 74 | 62% |
| | | | | | Annual | 60 | 2 | 3% | 26 | 43% |
| | | | | PM10 | 24 | 50 | 7 | 15% | 30 | 61% |
| | | | | PM2.5 | 24 | 27 | 2 | 6% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.1 | 1% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 1 | 25% | 3 | 53% |
| | | | | NO2 | 1 | 400 | 35 | 9% | 57 | 14% |
| | | | | | 24 | 200 | 3 | 1% | 19 | 9% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |

| Receptor | | UTM Coordinates | | Contaminant | Averaging Period | Recommended Criteria for Cumulative Effects Analysis | Incremental | | Cumulative | |
|---|---|---|---|---|---|---|---|---|---|---|
| ID | Type | X (m) | Y (m) | | (hours) | (µg/m³) | Predicted Concentration (µg/m³) | Percentage of Revelant Criteria (%) | Predicted Concentration (µg/m³) | Percentage of Revelant Criteria (%) |
| R06 | Residence | 551,390 | 4,788,783 | TSP | 24 | 120 | 13 | 11% | 55 | 46% |
| | | | | | Annual | 60 | 1 | 1% | 25 | 41% |
| | | | | PM10 | 24 | 50 | 3 | 5% | 26 | 51% |
| | | | | PM2.5 | 24 | 27 | 0 | 1% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 0 | 10% | 2 | 38% |
| | | | | NO2 | 1 | 400 | 12 | 3% | 34 | 9% |
| | | | | | 24 | 200 | 0 | 0% | 17 | 8% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R07 | Residence | 551,443 | 4,788,803 | TSP | 24 | 120 | 13 | 11% | 55 | 46% |
| | | | | | Annual | 60 | 1 | 1% | 25 | 41% |
| | | | | PM10 | 24 | 50 | 3 | 5% | 26 | 51% |
| | | | | PM2.5 | 24 | 27 | 0 | 1% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 0 | 10% | 2 | 38% |
| | | | | NO2 | 1 | 400 | 12 | 3% | 35 | 9% |
| | | | | | 24 | 200 | 1 | 0% | 17 | 8% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R08 | Residence | 549,095 | 4,787,363 | TSP | 24 | 120 | 57 | 47% | 99 | 82% |
| | | | | | Annual | 60 | 2 | 4% | 26 | 44% |
| | | | | PM10 | 24 | 50 | 9 | 18% | 32 | 64% |
| | | | | PM2.5 | 24 | 27 | 2 | 6% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.1 | 1% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 2 | 33% | 3 | 61% |
| | | | | NO2 | 1 | 400 | 17 | 4% | 40 | 10% |
| | | | | | 24 | 200 | 1 | 0% | 17 | 9% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R10 | Residence | 549,051 | 4,787,690 | TSP | 24 | 120 | 36 | 30% | 78 | 65% |
| | | | | | Annual | 60 | 3 | 5% | 27 | 45% |
| | | | | PM10 | 24 | 50 | 6 | 13% | 29 | 59% |
| | | | | PM2.5 | 24 | 27 | 1 | 4% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.1 | 1% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 1 | 23% | 3 | 51% |
| | | | | NO2 | 1 | 400 | 15 | 4% | 38 | 9% |
| | | | | | 24 | 200 | 1 | 1% | 17 | 9% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |

| Receptor ID | Receptor Type | UTM Coordinates X (m) | UTM Coordinates Y (m) | Contaminant | Averaging Period (hours) | Recommended Criteria for Cumulative Effects Analysis (µg/m³) | Incremental Predicted Concentration (µg/m³) | Incremental Percentage of Revelant Criteria (%) | Cumulative Predicted Concentration (µg/m³) | Cumulative Percentage of Revelant Criteria (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| R11 | Residence | 549,094 | 4,787,604 | TSP | 24 | 120 | 75 | 63% | 117 | 98% |
| | | | | | Annual | 60 | 5 | 8% | 29 | 48% |
| | | | | PM10 | 24 | 50 | 12 | 25% | 35 | 71% |
| | | | | PM2.5 | 24 | 27 | 2 | 7% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.1 | 2% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 2 | 46% | 4 | 74% |
| | | | | NO2 | 1 | 400 | 18 | 5% | 41 | 10% |
| | | | | | 24 | 200 | 2 | 1% | 18 | 9% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R12 | Residence | 548,975 | 4,787,911 | TSP | 24 | 120 | 21 | 18% | 63 | 53% |
| | | | | | Annual | 60 | 1 | 2% | 25 | 42% |
| | | | | PM10 | 24 | 50 | 4 | 7% | 27 | 53% |
| | | | | PM2.5 | 24 | 27 | 1 | 2% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 1 | 13% | 2 | 41% |
| | | | | NO2 | 1 | 400 | 13 | 3% | 36 | 9% |
| | | | | | 24 | 200 | 1 | 0% | 17 | 8% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R13 | Residence | 549,310 | 4,787,125 | TSP | 24 | 120 | 25 | 20% | 67 | 55% |
| | | | | | Annual | 60 | 1 | 2% | 25 | 42% |
| | | | | PM10 | 24 | 50 | 4 | 8% | 27 | 54% |
| | | | | PM2.5 | 24 | 27 | 1 | 3% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 1 | 14% | 2 | 42% |
| | | | | NO2 | 1 | 400 | 20 | 5% | 42 | 11% |
| | | | | | 24 | 200 | 1 | 1% | 17 | 9% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R14 | Residence | 549,000 | 4,788,425 | TSP | 24 | 120 | 10 | 8% | 52 | 43% |
| | | | | | Annual | 60 | 1 | 1% | 25 | 41% |
| | | | | PM10 | 24 | 50 | 2 | 4% | 25 | 50% |
| | | | | PM2.5 | 24 | 27 | 0 | 1% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 0 | 6% | 2 | 34% |
| | | | | NO2 | 1 | 400 | 8 | 2% | 31 | 8% |
| | | | | | 24 | 200 | 0 | 0% | 17 | 8% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |

| Receptor | | UTM Coordinates | | Contaminant | Averaging Period | Recommended Criteria for Cumulative Effects Analysis | Incremental | | Cumulative | |
|---|---|---|---|---|---|---|---|---|---|---|
| ID | Type | X (m) | Y (m) | | (hours) | (µg/m³) | Predicted Concentration (µg/m³) | Percentage of Revelant Criteria (%) | Predicted Concentration (µg/m³) | Percentage of Revelant Criteria (%) |
| R15 | Residence | 549,472 | 4,788,811 | TSP | 24 | 120 | 8 | 7% | 50 | 42% |
| | | | | | Annual | 60 | 1 | 1% | 25 | 41% |
| | | | | PM10 | 24 | 50 | 2 | 4% | 25 | 50% |
| | | | | PM2.5 | 24 | 27 | 0 | 1% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 0 | 7% | 2 | 35% |
| | | | | NO2 | 1 | 400 | 12 | 3% | 35 | 9% |
| | | | | | 24 | 200 | 1 | 0% | 17 | 8% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R16 | Residence | 552,318 | 4,787,811 | TSP | 24 | 120 | 12 | 10% | 54 | 45% |
| | | | | | Annual | 60 | 1 | 1% | 25 | 41% |
| | | | | PM10 | 24 | 50 | 2 | 5% | 25 | 51% |
| | | | | PM2.5 | 24 | 27 | 0 | 1% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 0 | 9% | 2 | 37% |
| | | | | NO2 | 1 | 400 | 7 | 2% | 30 | 7% |
| | | | | | 24 | 200 | 1 | 0% | 17 | 8% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R17 | Residence | 549,120 | 4,787,168 | TSP | 24 | 120 | 23 | 19% | 65 | 54% |
| | | | | | Annual | 60 | 1 | 2% | 25 | 42% |
| | | | | PM10 | 24 | 50 | 4 | 9% | 27 | 55% |
| | | | | PM2.5 | 24 | 27 | 1 | 3% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 1 | 16% | 2 | 44% |
| | | | | NO2 | 1 | 400 | 16 | 4% | 38 | 10% |
| | | | | | 24 | 200 | 1 | 0% | 17 | 9% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R18 | Residence | 549,425 | 4,788,811 | TSP | 24 | 120 | 8 | 7% | 50 | 42% |
| | | | | | Annual | 60 | 1 | 1% | 25 | 41% |
| | | | | PM10 | 24 | 50 | 2 | 3% | 25 | 49% |
| | | | | PM2.5 | 24 | 27 | 0 | 1% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 0 | 7% | 2 | 35% |
| | | | | NO2 | 1 | 400 | 13 | 3% | 35 | 9% |
| | | | | | 24 | 200 | 1 | 0% | 17 | 8% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |

| Receptor | | UTM Coordinates | | Contaminant | Averaging Period | Recommended Criteria for Cumulative Effects Analysis | Incremental | | Cumulative | |
|---|---|---|---|---|---|---|---|---|---|---|
| ID | Type | X (m) | Y (m) | | (hours) | (µg/m³) | Predicted Concentration (µg/m³) | Percentage of Revelant Criteria (%) | Predicted Concentration (µg/m³) | Percentage of Revelant Criteria (%) |
| R19 | Residence | 552,202 | 4,788,305 | TSP | 24 | 120 | 22 | 19% | 64 | 54% |
| | | | | | Annual | 60 | 1 | 1% | 25 | 41% |
| | | | | PM10 | 24 | 50 | 5 | 11% | 28 | 57% |
| | | | | PM2.5 | 24 | 27 | 1 | 3% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 1 | 20% | 2 | 48% |
| | | | | NO2 | 1 | 400 | 10 | 2% | 32 | 8% |
| | | | | | 24 | 200 | 1 | 0% | 17 | 9% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R20 | Residence | 552,339 | 4,787,567 | TSP | 24 | 120 | 15 | 12% | 57 | 47% |
| | | | | | Annual | 60 | 1 | 1% | 25 | 41% |
| | | | | PM10 | 24 | 50 | 4 | 7% | 27 | 53% |
| | | | | PM2.5 | 24 | 27 | 1 | 2% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 1 | 14% | 2 | 42% |
| | | | | NO2 | 1 | 400 | 7 | 2% | 30 | 7% |
| | | | | | 24 | 200 | 0 | 0% | 17 | 8% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R21 | Residence | 552,228 | 4,788,255 | TSP | 24 | 120 | 20 | 17% | 62 | 52% |
| | | | | | Annual | 60 | 1 | 1% | 25 | 41% |
| | | | | PM10 | 24 | 50 | 5 | 10% | 28 | 56% |
| | | | | PM2.5 | 24 | 27 | 1 | 3% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 1 | 18% | 2 | 46% |
| | | | | NO2 | 1 | 400 | 11 | 3% | 33 | 8% |
| | | | | | 24 | 200 | 1 | 0% | 17 | 8% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R22 | Residence | 552,035 | 4,788,722 | TSP | 24 | 120 | 9 | 7% | 51 | 42% |
| | | | | | Annual | 60 | 1 | 1% | 25 | 41% |
| | | | | PM10 | 24 | 50 | 3 | 5% | 26 | 51% |
| | | | | PM2.5 | 24 | 27 | 0 | 2% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 1 | 10% | 2 | 38% |
| | | | | NO2 | 1 | 400 | 11 | 3% | 33 | 8% |
| | | | | | 24 | 200 | 0 | 0% | 17 | 8% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |

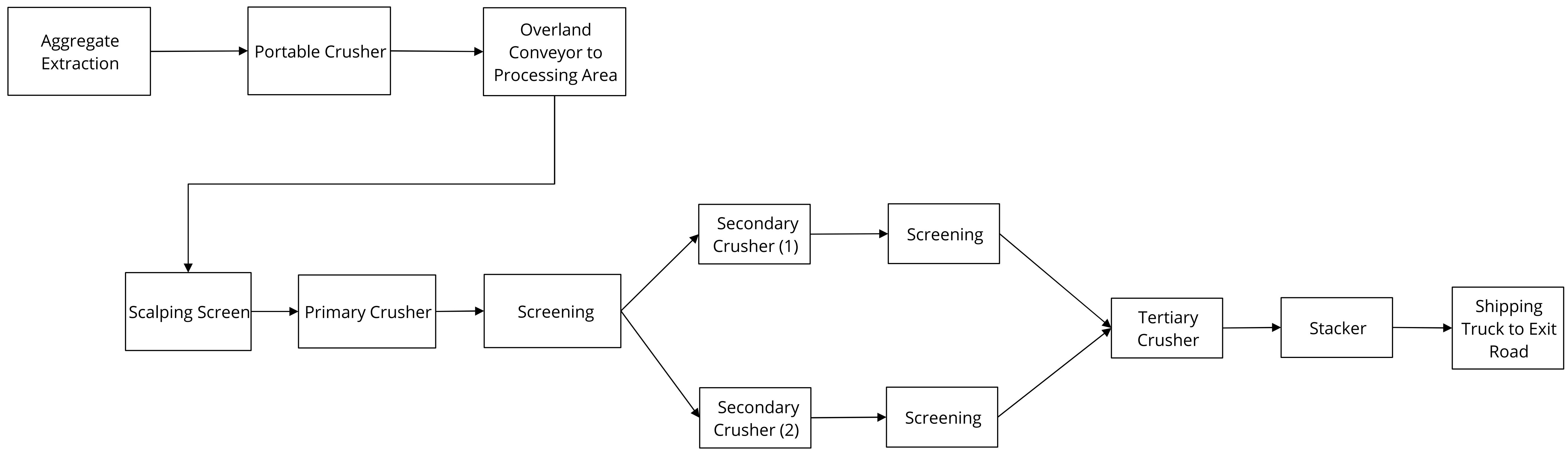
| Receptor | | UTM Coordinates | | Contaminant | Averaging Period | Recommended Criteria for Cumulative Effects Analysis | Incremental | | Cumulative | |
|---|---|---|---|---|---|---|---|---|---|---|
| ID | Type | X (m) | Y (m) | | (hours) | (µg/m³) | Predicted Concentration (µg/m³) | Percentage of Revelant Criteria (%) | Predicted Concentration (µg/m³) | Percentage of Revelant Criteria (%) |
| R23 | Residence | 549,130 | 4,787,053 | TSP | 24 | 120 | 18 | 15% | 60 | 50% |
| | | | | | Annual | 60 | 1 | 1% | 25 | 41% |
| | | | | PM10 | 24 | 50 | 4 | 7% | 27 | 53% |
| | | | | PM2.5 | 24 | 27 | 1 | 2% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 1 | 13% | 2 | 41% |
| | | | | NO2 | 1 | 400 | 14 | 4% | 37 | 9% |
| | | | | | 24 | 200 | 1 | 0% | 17 | 9% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R24 | Residence | 549,144 | 4,787,006 | TSP | 24 | 120 | 17 | 14% | 59 | 49% |
| | | | | | Annual | 60 | 1 | 1% | 25 | 41% |
| | | | | PM10 | 24 | 50 | 3 | 7% | 26 | 53% |
| | | | | PM2.5 | 24 | 27 | 1 | 2% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 1 | 12% | 2 | 40% |
| | | | | NO2 | 1 | 400 | 12 | 3% | 35 | 9% |
| | | | | | 24 | 200 | 1 | 0% | 17 | 8% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R25 | Residence | 550,593 | 4,789,160 | TSP | 24 | 120 | 8 | 7% | 50 | 42% |
| | | | | | Annual | 60 | 1 | 1% | 25 | 41% |
| | | | | PM10 | 24 | 50 | 2 | 3% | 25 | 49% |
| | | | | PM2.5 | 24 | 27 | 0 | 1% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 0 | 6% | 2 | 34% |
| | | | | NO2 | 1 | 400 | 11 | 3% | 34 | 9% |
| | | | | | 24 | 200 | 1 | 0% | 17 | 8% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R26 | Residence | 549,144 | 4,786,967 | TSP | 24 | 120 | 17 | 14% | 59 | 49% |
| | | | | | Annual | 60 | 1 | 1% | 25 | 41% |
| | | | | PM10 | 24 | 50 | 3 | 7% | 26 | 53% |
| | | | | PM2.5 | 24 | 27 | 1 | 2% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 1 | 12% | 2 | 40% |
| | | | | NO2 | 1 | 400 | 9 | 2% | 31 | 8% |
| | | | | | 24 | 200 | 1 | 0% | 17 | 8% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |

| Receptor | | UTM Coordinates | | Contaminant | Averaging Period | Recommended Criteria for Cumulative Effects Analysis | Incremental | | Cumulative | |
|---|---|---|---|---|---|---|---|---|---|---|
| ID | Type | X (m) | Y (m) | | (hours) | (µg/m³) | Predicted Concentration (µg/m³) | Percentage of Revelant Criteria (%) | Predicted Concentration (µg/m³) | Percentage of Revelant Criteria (%) |
| R27 | Residence | 550,665 | 4,789,191 | TSP | 24 | 120 | 8 | 7% | 50 | 42% |
| | | | | | Annual | 60 | 1 | 1% | 25 | 41% |
| | | | | PM10 | 24 | 50 | 2 | 3% | 25 | 49% |
| | | | | PM2.5 | 24 | 27 | 0 | 1% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 0 | 6% | 2 | 34% |
| | | | | NO2 | 1 | 400 | 11 | 3% | 33 | 8% |
| | | | | | 24 | 200 | 0 | 0% | 17 | 8% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R28 | Residence | 549,145 | 4,786,939 | TSP | 24 | 120 | 16 | 14% | 58 | 49% |
| | | | | | Annual | 60 | 1 | 1% | 25 | 41% |
| | | | | PM10 | 24 | 50 | 3 | 7% | 26 | 53% |
| | | | | PM2.5 | 24 | 27 | 1 | 2% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 1 | 12% | 2 | 40% |
| | | | | NO2 | 1 | 400 | 10 | 3% | 33 | 8% |
| | | | | | 24 | 200 | 1 | 0% | 17 | 9% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R29 | Residence | 549,846 | 4,789,067 | TSP | 24 | 120 | 8 | 7% | 50 | 42% |
| | | | | | Annual | 60 | 1 | 1% | 25 | 41% |
| | | | | PM10 | 24 | 50 | 2 | 4% | 25 | 50% |
| | | | | PM2.5 | 24 | 27 | 0 | 1% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 0 | 8% | 2 | 36% |
| | | | | NO2 | 1 | 400 | 10 | 2% | 32 | 8% |
| | | | | | 24 | 200 | 0 | 0% | 17 | 8% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R30 | Residence | 549,809 | 4,789,059 | TSP | 24 | 120 | 9 | 7% | 51 | 42% |
| | | | | | Annual | 60 | 1 | 1% | 25 | 41% |
| | | | | PM10 | 24 | 50 | 2 | 4% | 25 | 50% |
| | | | | PM2.5 | 24 | 27 | 0 | 1% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 0 | 8% | 2 | 36% |
| | | | | NO2 | 1 | 400 | 10 | 2% | 32 | 8% |
| | | | | | 24 | 200 | 1 | 0% | 17 | 8% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |

| Receptor | | UTM Coordinates | | Contaminant | Averaging | Recommended | Incremental | | Cumulative | |
|---|---|---|---|---|---|---|---|---|---|---|
| ID | Type | X (m) | Y (m) | | Period (hours) | Criteria for Cumulative Effects Analysis (µg/m³) | Predicted Concentration (µg/m³) | Percentage of Revelant Criteria (%) | Predicted Concentration (µg/m³) | Percentage of Revelant Criteria (%) |
| R31 | Residence | 552,492 | 4,787,564 | TSP | 24 | 120 | 15 | 13% | 57 | 48% |
| | | | | | Annual | 60 | 1 | 1% | 25 | 41% |
| | | | | PM10 | 24 | 50 | 4 | 8% | 27 | 54% |
| | | | | PM2.5 | 24 | 27 | 1 | 2% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 1 | 16% | 2 | 44% |
| | | | | NO2 | 1 | 400 | 6 | 2% | 29 | 7% |
| | | | | | 24 | 200 | 0 | 0% | 17 | 8% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R32 | Residence | 549,044 | 4,788,902 | TSP | 24 | 120 | 7 | 6% | 49 | 41% |
| | | | | | Annual | 60 | 0 | 1% | 24 | 41% |
| | | | | PM10 | 24 | 50 | 2 | 3% | 25 | 49% |
| | | | | PM2.5 | 24 | 27 | 0 | 1% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 0 | 6% | 2 | 34% |
| | | | | NO2 | 1 | 400 | 10 | 2% | 32 | 8% |
| | | | | | 24 | 200 | 1 | 0% | 17 | 8% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R33 | Residence | 549,162 | 4,786,814 | TSP | 24 | 120 | 16 | 13% | 58 | 48% |
| | | | | | Annual | 60 | 1 | 1% | 25 | 41% |
| | | | | PM10 | 24 | 50 | 3 | 7% | 26 | 53% |
| | | | | PM2.5 | 24 | 27 | 1 | 3% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 1 | 12% | 2 | 40% |
| | | | | NO2 | 1 | 400 | 13 | 3% | 36 | 9% |
| | | | | | 24 | 200 | 1 | 1% | 17 | 9% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R34 | Residence | 551,544 | 4,789,261 | TSP | 24 | 120 | 8 | 6% | 50 | 41% |
| | | | | | Annual | 60 | 0 | 1% | 24 | 41% |
| | | | | PM10 | 24 | 50 | 1 | 3% | 24 | 49% |
| | | | | PM2.5 | 24 | 27 | 0 | 1% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 0 | 5% | 2 | 33% |
| | | | | NO2 | 1 | 400 | 3 | 1% | 26 | 7% |
| | | | | | 24 | 200 | 0 | 0% | 16 | 8% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |

| Receptor | | UTM Coordinates | | Contaminant | Averaging Period | Recommended Criteria for Cumulative Effects Analysis | Incremental | | Cumulative | |
|---|---|---|---|---|---|---|---|---|---|---|
| ID | Type | X (m) | Y (m) | | (hours) | (µg/m³) | Predicted Concentration (µg/m³) | Percentage of Revelant Criteria (%) | Predicted Concentration (µg/m³) | Percentage of Revelant Criteria (%) |
| R35 | Residence | 552,586 | 4,787,188 | TSP | 24 | 120 | 11 | 9% | 53 | 44% |
| | | | | | Annual | 60 | 0 | 1% | 24 | 41% |
| | | | | PM10 | 24 | 50 | 2 | 4% | 25 | 50% |
| | | | | PM2.5 | 24 | 27 | 0 | 1% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 0 | 8% | 2 | 36% |
| | | | | NO2 | 1 | 400 | 4 | 1% | 27 | 7% |
| | | | | | 24 | 200 | 0 | 0% | 17 | 8% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |
| R36 | Residence | 552,539 | 4,786,969 | TSP | 24 | 120 | 9 | 8% | 51 | 43% |
| | | | | | Annual | 60 | 0 | 1% | 24 | 41% |
| | | | | PM10 | 24 | 50 | 2 | 4% | 25 | 50% |
| | | | | PM2.5 | 24 | 27 | 0 | 1% | 13 | 48% |
| | | | | | Annual | 8.8 | 0.0 | 0% | 7 | 83% |
| | | | | Silica (<10µm) | 24 | 5 | 0 | 6% | 2 | 34% |
| | | | | NO2 | 1 | 400 | 4 | 1% | 26 | 7% |
| | | | | | 24 | 200 | 0 | 0% | 17 | 8% |
| | | | | | Annual | 32 | 0 | 0% | 11 | 33% |

# FIGURES



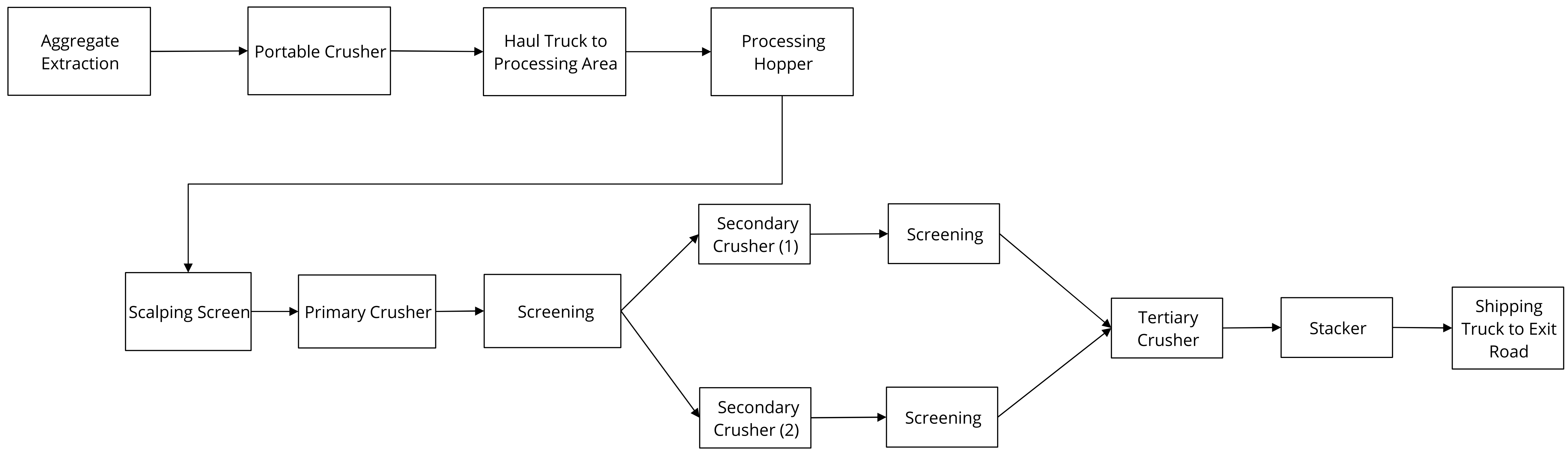

Process Flow Diagram

Miller Aggregates - Paris Pit - West Extraction Process Flow Diagram

Miller Aggregates - Paris Pit, Paris, Ontario

Project #2204263

| | |
|---|---|
| Drawn by: RB | Figure: 2.1 |
| Approx. Scale: not to scale | |
| Date Revised: | November 17, 2023 |

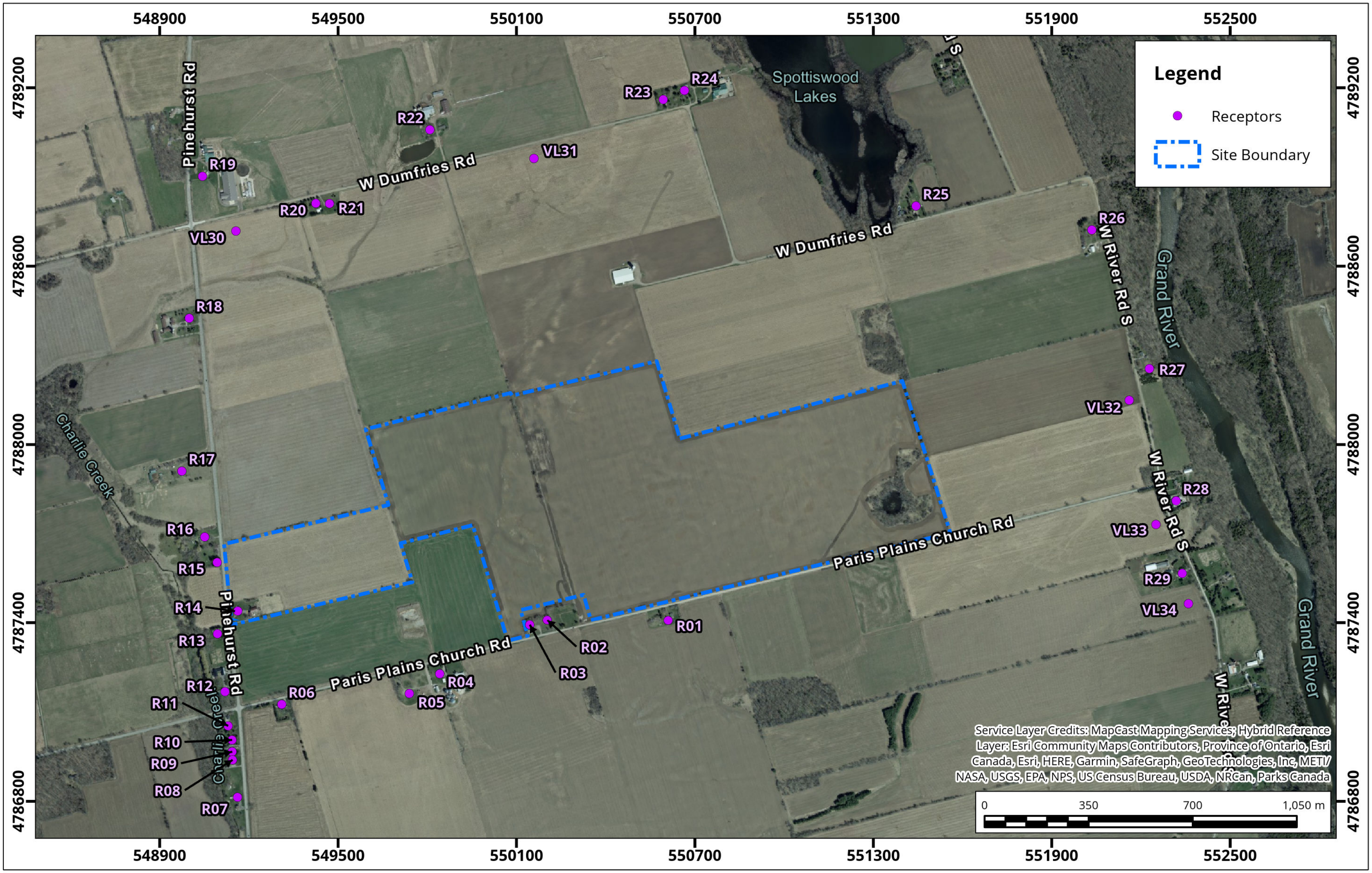



Process Flow Diagram
Miller Aggregates - Paris Pit - South Extraction Process Flow Diagram

Miller Aggregates - Paris Pit, Paris, Ontario

Project #2204263

| | |
|---|---|
| Drawn by: RB | Figure: 2.2 |
| Approx. Scale: not to scale | |
| Date Revised: | November 17, 2023 |




Map Document: C:\GIS\2204263_MillerGroupParisQuarry\P2204263_MillerGroupParisQuarry.aprx

## Site Plan Showing Site Boundary and Discrete Receptors

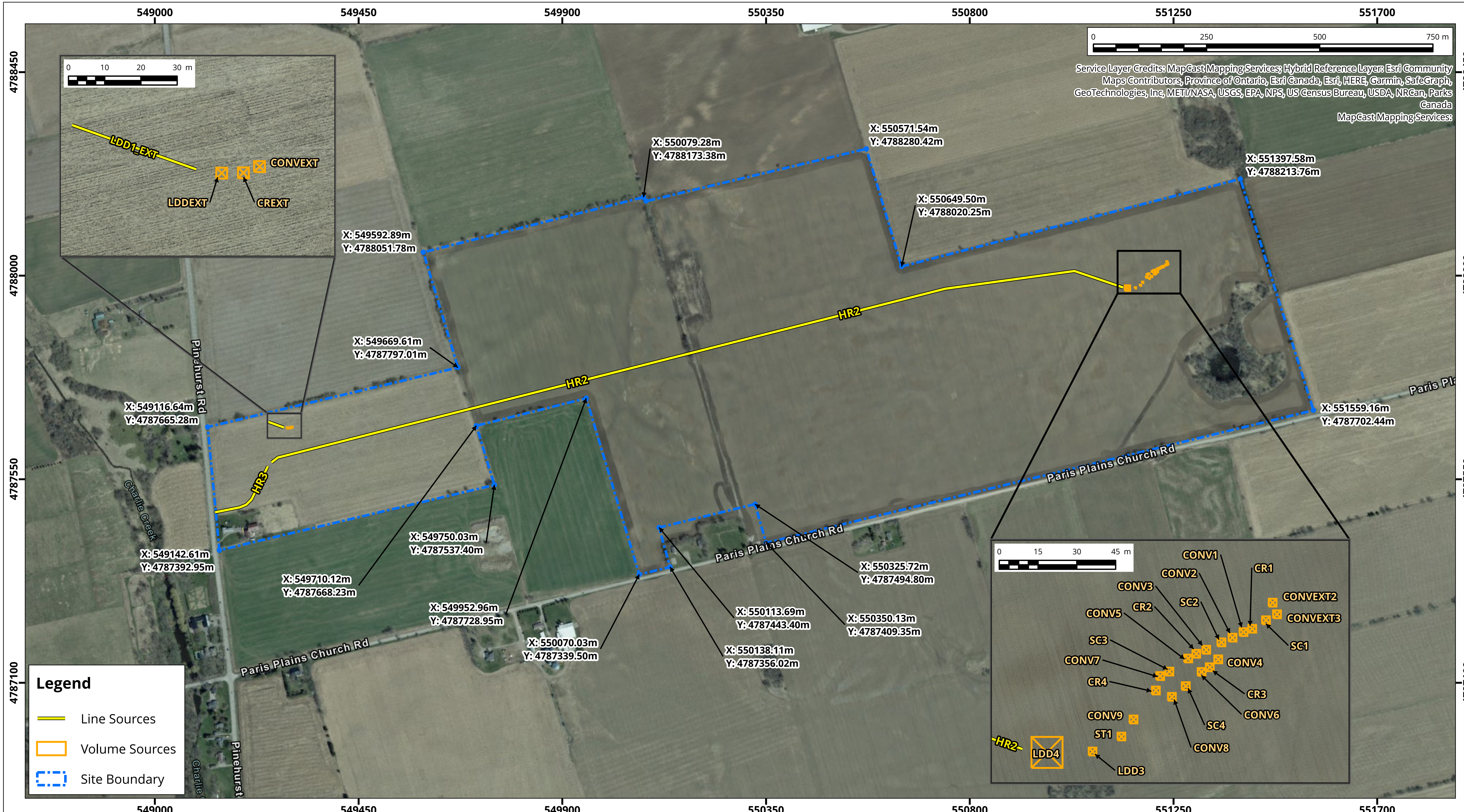
Map Projection: NAD 1983 UTM Zone 17N

Miller Group Paris Quarry - Brant, ON

True North

Project #: 2204263

| | |
|---|---|
| Drawn by: RCL | Figure: 3 |
| Approx. Scale: 1:18,000 | |
| Date Revised: Nov 23, 2023 | |




## Site Plan Showing Locations of Property Boundary and Significant Sources

**West Extraction Scenario**

Map Projection: NAD 1983 UTM Zone 17N

Miller Aggregates Paris Quarry - Brant, ON

True North

Project #: 2204263

| Drawn by: RCL | Figure: 4.1 |
|---|---|
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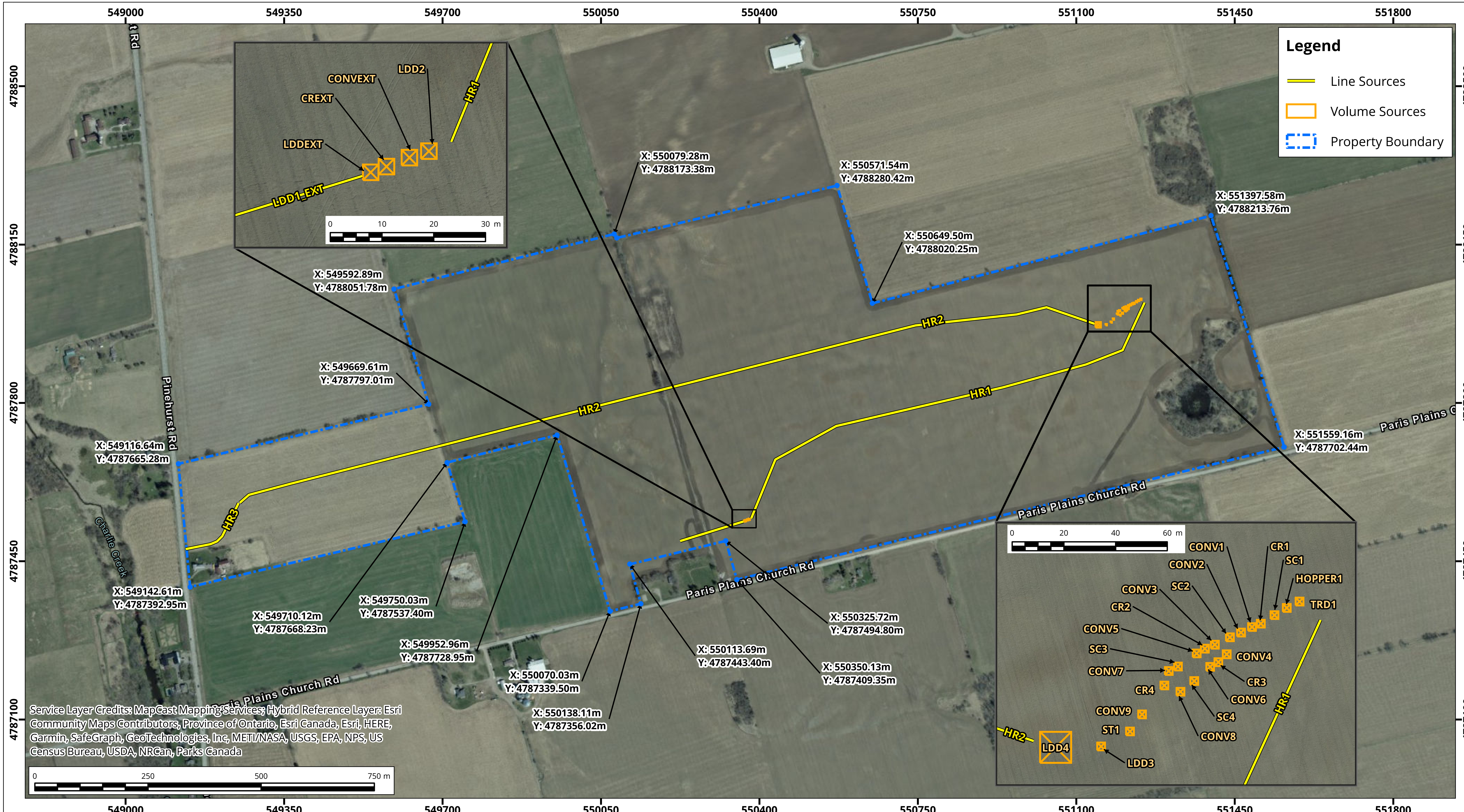
| Date Revised: | Nov 17, 2023 |




# Site Plan Showing Locations of Property Boundary and Significant Sources

**South Extraction Scenario**

Map Projection: NAD 1983 UTM Zone 17N

Miller Aggregates Paris Quarry - Brant, ON

True North

Project #: 2204263

| | |
|---|---|
| Drawn by: RCL | Figure: 4.2 |
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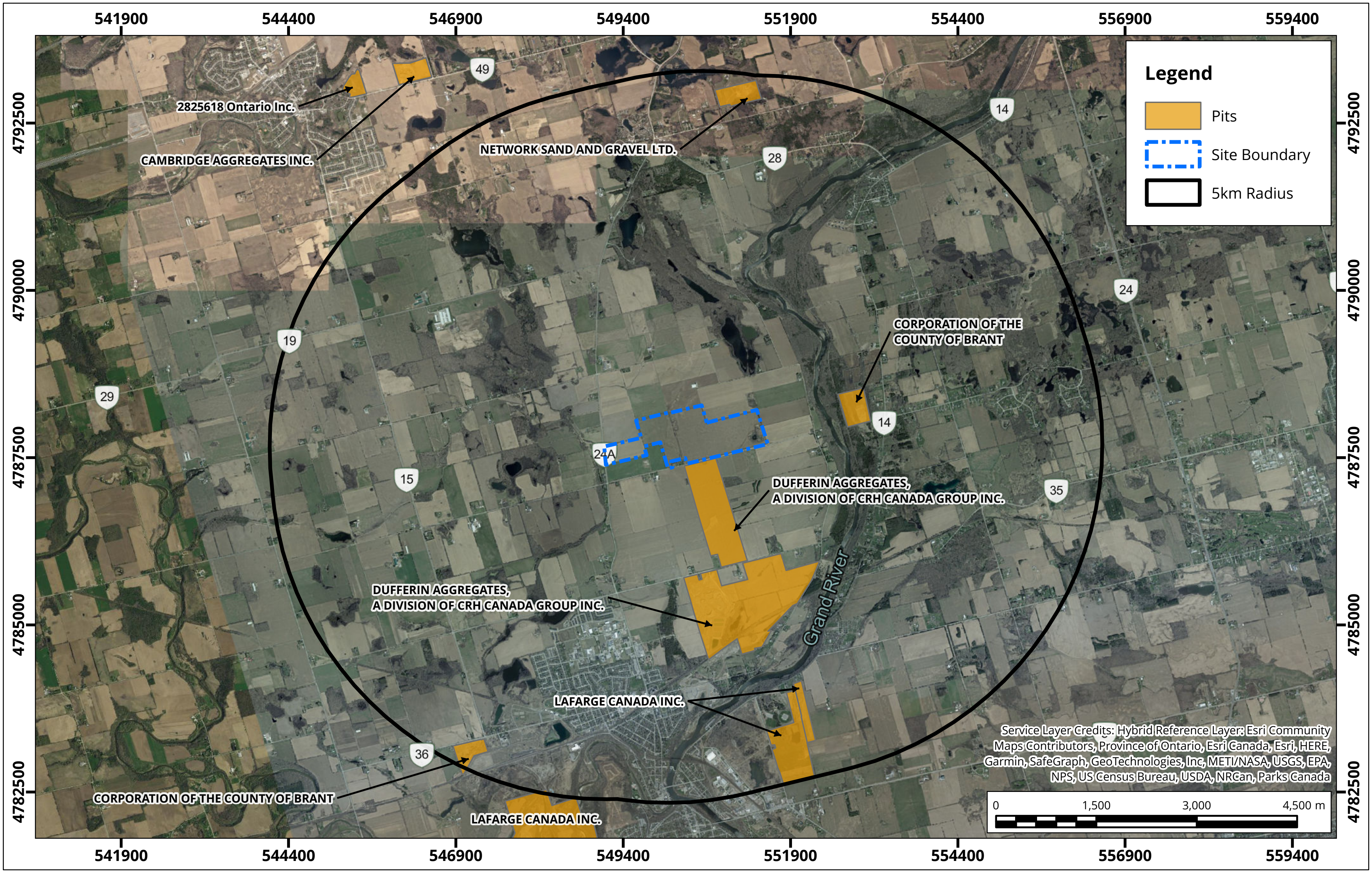
| Date Revised: | Nov 17, 2023 |




Map Document: C:\GIS\2204263_MillerGroupParisQuarry\P2204263_MillerGroupParisQuarry.aprx

# Site Plan Showing Nearby Aggregate Operations

Map Projection: NAD 1983 UTM Zone 17N

Miller Aggregates Paris Quarry - Brant, ON

True North

Project #: 2204263

| Drawn by: RCL | Figure: 5 |
|---|---|
| Approx. Scale: | 1:80,000 |
| Date Revised: | Nov 17, 2023 |

# APPENDIX A

# Appendix A: Bulk Material Handling Emissions Spreadsheet

Project #2204263

Miller Aggregates - Paris Pit

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

- **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) [3]
- **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):** 3.7
**(used for sample calculations & factor validation)**

| Source ID [1] | Description | Processing Rate | | | Site Data | | | | Base AP-42 Emission Factor | | | | Base Emission Rate | | | | Additional | Final Controlled Emission Rate at 3.7 m/s | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Hourly (Mg/h) | Daily (Mg/d) | Annual (Mg/y) | Site Specific Data? (y/n) | Silt Content (%) | Moisture Content (%) | Source Conditions Valid [2] | 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) | Control Efficiency Applied (%) | 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 |
| **South Extraction Only** | | | | | | | | | | | | | | | | | | | | | | | | | |
| LDD2 | Loader drop raw aggregate to haul trucks | 417 | 5000 | 1000000 | n | 6.4% | 4.1% | valid | 9.2E-04 | 4.0E-04 | 6.1E-05 | 8.1E-05 | 1.1E-01 | 4.7E-02 | 7.1E-03 | 9.3E-03 | | 1.1E-01 | B | 4.7E-02 | B | 7.1E-03 | B | 9.3E-03 | B |
| TRD1 | Haul truck unloading at processing w/ raw material | 417 | 5000 | 1000000 | n | 6.4% | 4.1% | valid | 9.2E-04 | 4.0E-04 | 6.1E-05 | 8.1E-05 | 1.1E-01 | 4.7E-02 | 7.1E-03 | 9.3E-03 | | 1.1E-01 | B | 4.7E-02 | B | 7.1E-03 | B | 9.3E-03 | B |
| HOPPER1 | Loader drop raw aggregate into Hopper | 417 | 5000 | 1000000 | n | 6.4% | 4.1% | valid | 9.2E-04 | 4.0E-04 | 6.1E-05 | 8.1E-05 | 1.1E-01 | 4.7E-02 | 7.1E-03 | 9.3E-03 | | 1.1E-01 | B | 4.7E-02 | B | 7.1E-03 | B | 9.3E-03 | B |
| **South and West Extraction** | | | | | | | | | | | | | | | | | | | | | | | | | |
| LDDEXT | Loader Drop after Extraction into Portable Crusher | 417 | 5000 | 1000000 | n | 6.4% | 4.1% | valid | 9.2E-04 | 4.0E-04 | 6.1E-05 | 8.1E-05 | 1.1E-01 | 4.7E-02 | 7.1E-03 | 9.3E-03 | | 1.1E-01 | B | 4.7E-02 | B | 7.1E-03 | B | 9.3E-03 | B |
| LDD3 | Loader depositing processed material in shipping truck | 417 | 5000 | 1000000 | n | 6.4% | 3.2% | valid | 1.3E-03 | 5.6E-04 | 8.5E-05 | 1.1E-04 | 1.5E-01 | 6.5E-02 | 9.8E-03 | 1.3E-02 | 95% | 7.4E-03 | B | 3.2E-03 | B | 4.9E-04 | B | 6.5E-04 | B |

**[1]** ID corresponds to process flow diagram for facility and / or material
**[2]** Relates to AP-42 Section 13.2.4-4
**[3]** k-factor for TSP (PM44) scaled up logarithmically to 0.8 from published k-factor of 0.74 which refers to PM30

| Comments |
|---|
| A silica content of: 20.0% was used, based on based on "PM4 Crystalline Silica and PM10 Particulate Matter Emission Factors for Aggregate 'Producing Sources'', 'Richards and Brozell, Air Control Techniques, July 31, 2007. X-Ray diffraction data obtained by RWDI for pits in Southwestern Ontario support this value. |
| Moisture and silt values of extracted raw aggregate reflect sampling conducted by RWDI at pits in Southern Ontario |
| - Average moisture content from stockpiles at sampled sites was 4.1%, silt was 6.4% |
| Moisture for processed material represent the average between MECP values for gravel and sand of 4.7% and 1.77% respectively. |
| Loading of processed material considers 95% control which reflects the washing of aggregate before shipping. |

Sample calculation for uncontrolled TSP emission factor for Source LDDEXT: Loader Drop after Extraction into Portable Crusher, 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 / ((4.1%) / 2)^1.4 = 9.2E-04 kg TSP / Mg handled

Sample calculation for TSP emission rate for Source LDD2: Loader drop raw aggregate to haul trucks - Uncontrolled, at a sample wind speed of 5 m/s

$$\frac{417\ Mg_{handled}}{1\ h} \times \frac{9.2E\text{-}04\ kg_{TSP}}{1\ Mg_{handled}} \times \frac{1\ h}{3600\ s} \times \frac{1000\ g_{TSP}}{1\ kg_{TSP}} \times \frac{1\ g_{TSP\ uncontrolled}}{1\ g_{TSP}} = 1.1E\text{-}01\ g_{TSP} / s$$

| | |
|---|---|
| Revision Date: | 2023-11-29 |
| Prepared by: | RB |
| Checked by: | SJP/BGS |

# APPENDIX B

# Appendix B: Processing Emissions Spreadsheet

Project #2204263

Miller Aggregates - Paris Pit

| 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 |
| **West Extraction Only** | | | | | | | | | | | | | | | | | | | | | | | |
| CONVEXT2 | Extraction Conveyor - Drop at Processing | Conveyor transfer point (controlled) | 11.19.2-1 | 417 | 5000 | 1000000 | 3.7E-05 | 2.3E-05 | 6.5E-06 | 4.6E-06 | 4.3E-03 | 2.7E-03 | 7.5E-04 | 5.3E-04 | | 4.3E-03 | E | 2.7E-03 | D | 7.5E-04 | E | 5.3E-04 | D |
| CONVEXT3 | Extraction Conveyor - transfer from overland conveyor to screen | Conveyor transfer point (controlled) | 11.19.2-1 | 417 | 5000 | 1000000 | 3.7E-05 | 2.3E-05 | 6.5E-06 | 4.6E-06 | 4.3E-03 | 2.7E-03 | 7.5E-04 | 5.3E-04 | | 4.3E-03 | E | 2.7E-03 | D | 7.5E-04 | E | 5.3E-04 | D |
| CREXT | Primary Crusher - Extraction | Primary crushing (controlled) | 11.19.2-1 | 417 | 5000 | 1000000 | 3.4E-04 | 2.7E-04 | 5.0E-05 | 5.4E-05 | 3.9E-02 | 3.1E-02 | 5.8E-03 | 6.3E-03 | | 3.9E-02 | E | 3.1E-02 | E | 5.8E-03 | E | 6.3E-03 | E |
| CONVEXT | Stacker after Primary Crusher at Extraction Face | Conveyor transfer point (controlled) | 11.19.2-1 | 417 | 5000 | 1000000 | 3.7E-05 | 2.3E-05 | 6.5E-06 | 4.6E-06 | 4.3E-03 | 2.7E-03 | 7.5E-04 | 5.3E-04 | | 4.3E-03 | E | 2.7E-03 | D | 7.5E-04 | E | 5.3E-04 | D |
| **South Extraction Only** | | | | | | | | | | | | | | | | | | | | | | | |
| CREXT | Primary Crusher - Extraction | Primary crushing (controlled) | 11.19.2-1 | 417 | 5000 | 1000000 | 3.4E-04 | 2.7E-04 | 5.0E-05 | 5.4E-05 | 3.9E-02 | 3.1E-02 | 5.8E-03 | 6.3E-03 | | 3.9E-02 | E | 3.1E-02 | E | 5.8E-03 | E | 6.3E-03 | E |
| CONVEXT | Stacker after Primary Crusher at Extraction Face | Conveyor transfer point (controlled) | 11.19.2-1 | 417 | 5000 | 1000000 | 3.7E-05 | 2.3E-05 | 6.5E-06 | 4.6E-06 | 4.3E-03 | 2.7E-03 | 7.5E-04 | 5.3E-04 | | 4.3E-03 | E | 2.7E-03 | D | 7.5E-04 | E | 5.3E-04 | D |
| **South and West Extraction** | | | | | | | | | | | | | | | | | | | | | | | |
| SC1 | Scalping Screen Before Primary Crusher | Screening (controlled) | 11.19.2-1 | 417 | 5000 | 1000000 | 5.6E-04 | 3.7E-04 | 2.5E-05 | 7.4E-05 | 6.5E-02 | 4.3E-02 | 2.9E-03 | 8.6E-03 | | 6.5E-02 | E | 4.3E-02 | C | 2.9E-03 | E | 8.6E-03 | C |
| CR1 | Primary Crusher | Primary crushing (controlled) | 11.19.2-1 | 42 | 500 | 100000 | 3.4E-04 | 2.7E-04 | 5.0E-05 | 5.4E-05 | 3.9E-03 | 3.1E-03 | 5.8E-04 | 6.3E-04 | | 3.9E-03 | E | 3.1E-03 | E | 5.8E-04 | E | 6.3E-04 | E |
| CONV1 | Conveyor - Primary Crusher to Screen after Primary Crusher | Conveyor transfer point (controlled) | 11.19.2-1 | 42 | 500 | 100000 | 3.7E-05 | 2.3E-05 | 6.5E-06 | 4.6E-06 | 4.3E-04 | 2.7E-04 | 7.5E-05 | 5.3E-05 | | 4.3E-04 | E | 2.7E-04 | D | 7.5E-05 | E | 5.3E-05 | D |
| CONV2 | Conveyor - Scalping Screen to SC2 | Conveyor transfer point (controlled) | 11.19.2-1 | 375 | 4500 | 900000 | 3.7E-05 | 2.3E-05 | 6.5E-06 | 4.6E-06 | 3.9E-03 | 2.4E-03 | 6.8E-04 | 4.8E-04 | | 3.9E-03 | E | 2.4E-03 | D | 6.8E-04 | E | 4.8E-04 | D |
| SC2 | Screen after Primary Crusher | Screening (controlled) | 11.19.2-1 | 417 | 5000 | 1000000 | 5.6E-04 | 3.7E-04 | 2.5E-05 | 7.4E-05 | 6.5E-02 | 4.3E-02 | 2.9E-03 | 8.6E-03 | | 6.5E-02 | E | 4.3E-02 | C | 2.9E-03 | E | 8.6E-03 | C |
| CONV3 | Conveyor - to Secondary Crusher (1) | Conveyor transfer point (controlled) | 11.19.2-1 | 104 | 1250 | 250000 | 3.7E-05 | 2.3E-05 | 6.5E-06 | 4.6E-06 | 1.1E-03 | 6.7E-04 | 1.9E-04 | 1.3E-04 | | 1.1E-03 | E | 6.7E-04 | D | 1.9E-04 | E | 1.3E-04 | D |
| CONV4 | Conveyor - to Secondary Crusher (2) | Conveyor transfer point (controlled) | 11.19.2-1 | 104 | 1250 | 250000 | 3.7E-05 | 2.3E-05 | 6.5E-06 | 4.6E-06 | 1.1E-03 | 6.7E-04 | 1.9E-04 | 1.3E-04 | | 1.1E-03 | E | 6.7E-04 | D | 1.9E-04 | E | 1.3E-04 | D |
| CR2 | Secondary Crusher (1) | Secondary crushing (controlled) | 11.19.2-1 | 104 | 1250 | 250000 | 3.4E-04 | 2.7E-04 | 5.0E-05 | 5.4E-05 | 9.8E-03 | 7.8E-03 | 1.4E-03 | 1.6E-03 | | 9.8E-03 | E | 7.8E-03 | E | 1.4E-03 | E | 1.6E-03 | E |
| CR3 | Secondary Crusher (2) | Secondary crushing (controlled) | 11.19.2-1 | 104 | 1250 | 250000 | 3.4E-04 | 2.7E-04 | 5.0E-05 | 5.4E-05 | 9.8E-03 | 7.8E-03 | 1.4E-03 | 1.6E-03 | | 9.8E-03 | E | 7.8E-03 | E | 1.4E-03 | E | 1.6E-03 | E |
| CONV5 | Conveyor - to Secondary Screen (1) | Conveyor transfer point (controlled) | 11.19.2-1 | 104 | 1250 | 250000 | 3.7E-05 | 2.3E-05 | 6.5E-06 | 4.6E-06 | 1.1E-03 | 6.7E-04 | 1.9E-04 | 1.3E-04 | | 1.1E-03 | E | 6.7E-04 | D | 1.9E-04 | E | 1.3E-04 | D |
| CONV6 | Conveyor - to Secondary Screen (2) | Conveyor transfer point (controlled) | 11.19.2-1 | 104 | 1250 | 250000 | 3.7E-05 | 2.3E-05 | 6.5E-06 | 4.6E-06 | 1.1E-03 | 6.7E-04 | 1.9E-04 | 1.3E-04 | | 1.1E-03 | E | 6.7E-04 | D | 1.9E-04 | E | 1.3E-04 | D |
| SC3 | Secondary Screen (1) | Screening (controlled) | 11.19.2-1 | 313 | 3750 | 750000 | 5.6E-04 | 3.7E-04 | 2.5E-05 | 7.4E-05 | 4.9E-02 | 3.2E-02 | 2.2E-03 | 6.4E-03 | | 4.9E-02 | E | 3.2E-02 | C | 2.2E-03 | E | 6.4E-03 | C |
| SC4 | Secondary Screen (2) | Screening (controlled) | 11.19.2-1 | 313 | 3750 | 750000 | 5.6E-04 | 3.7E-04 | 2.5E-05 | 7.4E-05 | 4.9E-02 | 3.2E-02 | 2.2E-03 | 6.4E-03 | | 4.9E-02 | E | 3.2E-02 | C | 2.2E-03 | E | 6.4E-03 | C |
| CONV7 | Conveyor - to Tertiary Crusher | Conveyor transfer point (controlled) | 11.19.2-1 | 208 | 2500 | 500000 | 3.7E-05 | 2.3E-05 | 6.5E-06 | 4.6E-06 | 2.1E-03 | 1.3E-03 | 3.8E-04 | 2.7E-04 | | 2.1E-03 | E | 1.3E-03 | D | 3.8E-04 | E | 2.7E-04 | D |
| CONV8 | Conveyor - from Secondary Screens to Wash Plant | Conveyor transfer point (controlled) | 11.19.2-1 | 208 | 2500 | 500000 | 3.7E-05 | 2.3E-05 | 6.5E-06 | 4.6E-06 | 2.1E-03 | 1.3E-03 | 3.8E-04 | 2.7E-04 | | 2.1E-03 | E | 1.3E-03 | D | 3.8E-04 | E | 2.7E-04 | D |
| CR4 | Tertiary Crusher | Tertiary crushing (controlled) | 11.19.2-1 | 208 | 2500 | 500000 | 3.4E-04 | 2.7E-04 | 5.0E-05 | 5.4E-05 | 2.0E-02 | 1.6E-02 | 2.9E-03 | 3.1E-03 | | 2.0E-02 | E | 1.6E-02 | C | 2.9E-03 | E | 3.1E-03 | C |
| CONV9 | Conveyor after Tertiary Crusher | Conveyor transfer point (controlled) | 11.19.2-1 | 208 | 2500 | 500000 | 3.7E-05 | 2.3E-05 | 6.5E-06 | 4.6E-06 | 2.1E-03 | 1.3E-03 | 3.8E-04 | 2.7E-04 | | 2.1E-03 | E | 1.3E-03 | D | 3.8E-04 | E | 2.7E-04 | D |
| ST1 | Stacker for Finished Sand | Conveyor transfer point (controlled) | 11.19.2-1 | 417 | 5000 | 1000000 | 3.7E-05 | 2.3E-05 | 6.5E-06 | 4.6E-06 | 4.3E-03 | 2.7E-03 | 7.5E-04 | 5.3E-04 | 95% | 2.1E-04 | E | 1.3E-04 | D | 3.8E-05 | E | 2.7E-05 | D |

Sample calculation for TSP emissions from Source SC1: Scalping Screen Before Primary Crusher

$$\frac{417\ Mg_{processed}}{1\ h} \times \frac{5.6E\text{-}04\ kg_{TSP}}{1\ Mg_{processed}} \times \frac{1\ h}{3600\ s} \times \frac{1000\ g_{TSP}}{1\ kg_{TSP}} \times \frac{100\%\ g_{TSP\ uncontrolled}}{1\ g_{TSP}} = 6.5E\text{-}02\ g_{TSP}/s$$

| Comments |
|---|
| A silica content of: 20.0% was used, based on based on "PM4 Crystalline Silica and PM10 Particulate Matter Emission Factors for Aggregate 'Producing Sources'', 'Richards and Brozell, Air Control Techniques, July 31, 2007. X-Ray diffraction data obtained by RWDI for pits in Southwestern Ontario support this value. |
| AP-42 Emission Factor for TSP is based on PM100. The values have been corrected to reflect PM44. |

| | |
|---|---|
| Revision Date: | 2023-11-29 |
| Prepared by: | RB |
| Checked by: | SJP/BGS |

# APPENDIX C

# Appendix C: On-Site Mobile Equipment Emissions Spreadsheet - Fugitive Dust

Miller Aggregates - Paris Pit

**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)
**k** particle size multiplier (see below)
**sL** road surface silt loading ($g/m^2$)
**W** average weight of the vehicles traveling the road (US short tons)
**s** surface material silt content (%)
**C** emission factor for 1980's vehicle fleet exhaust, brake wear and tire we
**M** surface material moisture content (%)
**S** mean vehicle speed (mph)
**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) | $PM_{10}$ (g/s) | $PM_{2.5}$ (g/s) | Silica (g/s) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **West Extraction** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LDD1_EXT | Loader movement from extraction face to portable crusher | 57 | 690 | -- | 36 | Unpaved | Industrial | 25 | 16 | 56 | - | 4.8% | - | 4.4E+03 | 6.9E+02 | 6.9E+01 | 1.4E+02 | 2.6E+00 | 4.0E-01 | 4.0E-02 | 8.0E-02 | 95% | 1.3E-01 | 2.0E-02 | 2.0E-03 | 4.0E-03 |
| HR2 | Road from processed material area to main haul road | 23 | 300 | -- | 1950 | Unpaved | Industrial | 25 | 16 | 37 | - | 4.8% | - | 3.7E+03 | 5.7E+02 | 5.7E+01 | 1.1E+02 | 4.6E+01 | 7.1E+00 | 7.1E-01 | 1.4E+00 | 95% | 2.3E+00 | 3.6E-01 | 3.6E-02 | 7.1E-02 |
| HR3 | Paved road for Shipping | 23 | 300 | -- | 169 | Paved | Industrial | 25 | 16 | 37 | - | 4.8% | 1.2 | 2.2E+02 | 2.9E+01 | 6.9E+00 | 5.7E+00 | 2.4E-01 | 3.1E-02 | 7.5E-03 | 6.2E-03 | | 2.4E-01 | 3.1E-02 | 7.5E-03 | 6.2E-03 |
| LDD4 | Loader movement from processed area to shipping trucks | 57 | 690 | -- | 25 | Unpaved | Industrial | 25 | 16 | 56 | - | 4.8% | - | 4.5E+03 | 6.9E+02 | 6.9E+01 | 1.4E+02 | 1.8E+00 | 2.8E-01 | 2.8E-02 | 5.5E-02 | 95% | 8.9E-02 | 1.4E-02 | 1.4E-03 | 2.8E-03 |
| **South Extraction** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LDD1_EXT | Loader movement from extraction face to portable crusher | 57 | 690 | -- | 133 | Unpaved | Industrial | 25 | 3 | 56 | - | 4.8% | - | 4.5E+03 | 6.9E+02 | 6.9E+01 | 1.4E+02 | 9.5E+00 | 1.5E+00 | 1.5E-01 | 3.0E-01 | 95% | 4.7E-01 | 7.4E-02 | 7.4E-03 | 1.5E-02 |
| HR1 | Haul road from extraction face to processing area | 23 | 276 | -- | 1065 | Unpaved | Industrial | 25 | 16 | 56 | - | 4.8% | - | 4.4E+03 | 6.9E+02 | 6.9E+01 | 1.4E+02 | 3.0E+01 | 4.7E+00 | 4.7E-01 | 9.4E-01 | 95% | 1.5E+00 | 2.3E-01 | 2.3E-02 | 4.7E-02 |
| HR2 | Road from processed material area to exit | 23 | 300 | -- | 1950 | Unpaved | Industrial | 25 | 16 | 37 | - | 4.8% | - | 3.7E+03 | 5.7E+02 | 5.7E+01 | 1.1E+02 | 4.6E+01 | 7.1E+00 | 7.1E-01 | 1.4E+00 | 95% | 2.3E+00 | 3.6E-01 | 3.6E-02 | 7.1E-02 |
| LDD4 | Loader movement from processed area to shipping trucks | 57 | 690 | -- | 13 | Unpaved | Industrial | 25 | 16 | 56 | - | 4.8% | - | 4.5E+03 | 6.9E+02 | 6.9E+01 | 1.4E+02 | 8.9E-01 | 1.4E-01 | 1.4E-02 | 2.8E-02 | 95% | 4.4E-02 | 6.9E-03 | 6.9E-04 | 1.4E-03 |
| HR3 | Paved road for Shipping | 23 | 300 | -- | 169 | Paved | Industrial | 25 | 16 | 37 | - | 4.8% | 1.2 | 2.2E+02 | 2.9E+01 | 6.9E+00 | 5.7E+00 | 2.4E-01 | 3.1E-02 | 7.5E-03 | 6.2E-03 | | 2.4E-01 | 3.1E-02 | 7.5E-03 | 6.2E-03 |

**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: 20.0% was used, based on based on "PM4 Crystalline Silica and PM10 Particulate Matter Emission Factors for Aggregate 'Producing Sources", 'Richards and Brozell, Air Control Techniques, July 31, 2007. X-Ray diffraction data obtained by RWDI for pits in Southwestern Ontario support this value.

Constants for TSP (PM44) extrapolated from published factors for PM30, PM10 and PM2.5. Data quality downgraded by one step

95% control applied to unpaved roads based on the watering as per the recommendations in the report.

Based on information from Miller's traffic consultants, the daily trucking volumes will be as follows:

- From December to April there will be between 140-200 truck passes each day (70-100 trucks)
- From May to November there will be 200-300 truck passes each day (100-150 trucks)

**[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.

Sample calculation for uncontrolled TSP emission factor for South Extraction Source HR1

EF = 281.9 x (4.9) x [(4.8% / 12)]^(0.7) x [(55.6955 tons) / 3]^(0.45) = 4434 g TSP / vehicle kilometer travelled (vkt)

Sample calculation for TSP emission rate for South Extraction Source HR1

$$\frac{23\ \text{vehicles}}{1\ \text{h}} \times \frac{1065\ \text{m}}{} \times \frac{1\ \text{km}}{1000\ \text{m}} \times \frac{4434\ g_{TSP}}{1\ \text{vehicle}} \times \frac{1\ \text{h}}{3600\ \text{s}} \times \frac{5\%\ g_{TSP\ uncontrolled}}{1\ g_{TSP}} = 1.5E+00\ g_{TSP} / s$$

| | |
|---|---|
| Revision Date: | 2023-11-29 |
| Prepared by: | RB |
| Checked by: | SJP/BGS |

# APPENDIX D

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

Project #2204263

Miller Aggregates - Paris Pit

| 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) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **West Extraction** | | | | | | | | | | | | | | | | | | | | | | | | |
| LDD1_EXT | Loader movement from extraction face to portable crusher | 405 | 1 | 57 | 690 | 36 | 25 | 0.59 | | 0.2 | | 0.2 | | 0.2 | | 4 | 1.3E-02 | 1.3E-02 | 1.3E-02 | 2.7E-01 | 1.4E-01 | 3.3E-02 | 1.5E-02 | 2.7E-01 |
| HR2 | Road from processed material area to main haul road | n/a | 1 | 23 | 300 | 1950 | 25 | | 1.78 | | 1.78 | | 1.11 | | 18.3 | | 2.2E-02 | 2.2E-02 | 1.4E-02 | 2.3E-01 | 2.3E+00 | 3.8E-01 | 5.0E-02 | 2.3E-01 |
| HR3 | Haul road from exit to main haul road | n/a | 1 | 23 | 300 | 169 | 25 | | 1.78 | | 1.78 | | 1.11 | | 18.3 | | 1.9E-03 | 1.9E-03 | 1.2E-03 | 2.0E-02 | 2.4E-01 | 3.3E-02 | 8.7E-03 | 2.0E-02 |
| LDD4 | Loader movement from processed area to shipping trucks | 405 | 1 | 57 | 690 | 30 | 25 | 0.59 | | 0.2 | | 0.2 | | 0.2 | | 4 | 1.3E-02 | 1.3E-02 | 1.3E-02 | 2.7E-01 | 1.0E-01 | 2.7E-02 | 1.5E-02 | 2.7E-01 |
| CREXT | Portable Crusher Engine | 600 | 1 | N/A | N/A | N/A | N/A | 1 | | 0.2 | | 0.2 | | 0.2 | | 6.4 | 3.3E-02 | 3.3E-02 | 3.3E-02 | 1.1E+00 | 7.3E-02 | 6.5E-02 | 3.9E-02 | 1.1E+00 |
| **South Extraction** | | | | | | | | | | | | | | | | | | | | | | | | |
| LDD1_EXT | Loader movement from extraction face to portable crusher | 405 | 1 | 57 | 690 | 133 | 25 | 0.59 | | 0.2 | | 0.2 | | 0.2 | | 4 | 1.3E-02 | 1.3E-02 | 1.3E-02 | 2.7E-01 | 4.9E-01 | 8.7E-02 | 2.1E-02 | 2.7E-01 |
| HR1 | Haul road from extraction face to processing area | n/a | 1 | 23 | 276 | 1065 | 25 | | 1.78 | | 1.78 | | 1.11 | | 18.3 | | 1.2E-02 | 1.2E-02 | 7.5E-03 | 1.2E-01 | 1.5E+00 | 2.5E-01 | 3.1E-02 | 1.2E-01 |
| HR2 | Road from processed material area to exit | n/a | 1 | 23 | 300 | 1950 | 25 | | 1.78 | | 1.78 | | 1.11 | | 18.3 | | 2.2E-02 | 2.2E-02 | 1.4E-02 | 2.3E-01 | 2.3E+00 | 3.8E-01 | 5.0E-02 | 2.3E-01 |
| LDD4 | Loader movement from processed area to shipping trucks | 405 | 1 | 57 | 690 | 13 | 25 | 0.59 | | 0.2 | | 0.2 | | 0.2 | | 4 | 1.3E-02 | 1.3E-02 | 1.3E-02 | 2.7E-01 | 5.8E-02 | 2.0E-02 | 1.4E-02 | 2.7E-01 |
| CREXT | Portable Crusher Engine | 600 | 1 | N/A | N/A | N/A | N/A | 1 | | 0.2 | | 0.2 | | 0.2 | | 6.4 | 3.3E-02 | 3.3E-02 | 3.3E-02 | 1.1E+00 | 7.3E-02 | 6.5E-02 | 3.9E-02 | 1.1E+00 |
| HR3 | Paved Exit Road | n/a | 1 | 23 | 300 | 169 | 25 | | 1.78 | | 1.78 | | 1.11 | | 18.3 | | 1.9E-03 | 1.9E-03 | 1.2E-03 | 2.0E-02 | 2.4E-01 | 3.3E-02 | 8.7E-03 | 2.0E-02 |

**[1]** ID should reflect Source ID or Route ID, as appropriate.
**[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 201(
**[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, PM10 and PM2.5 emissions from mobile equipment. Emissions rates for NOx and stationary sources do not change

**Comments**

Loaders assumed to be CAT 988.
Portable crusher engine assumed to be 600 kW.
Excavator and loader engine emissions based on Tier 3 emission limits.
Portable crusher engine emissions based on Tier 2 emission limits.
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

Sample Calculations

Extraction Loader Exhaust TSP Emissions, LDD1_EXT (West and South Extra

| 405 kW | 0.2 g | 59% Load | 1 h | | |
|---|---|---|---|---|---|
| | 1 kW h | | 3600 s | = | 1.3E-02 $g_{TSP}$ / s |

Shipping Truck Exhaust TSP Emissions, HR3 (for South Extraction):

| 23 Vehicles | 169 m | 1.78 g | 1 km | 1 h | | |
|---|---|---|---|---|---|---|
| 1 h | | 1 Veh. Km | 1000 m | 3600 s | = | 1.9E-03 $g_{TSP}$ / s |

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Checked by: SJP/BGS