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COLACEM CANADA INC.
L'Orignal, Ontario

Air Quality Environmental Compliance Approval Cumulative Effects Study

Submitted to:
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REPORT

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Distribution:

1 e-copy - Colacem Canada Inc.
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Executive Summary

Golder Associates Ltd. (Golder) was retained by Colacem Canada Inc. (Colacem) to prepare an air quality environmental compliance approval (ECA) cumulative effects assessment for the proposed Portland cement manufacturing facility located at Lot 217, Parcel M100, County Road 17, United Counties of Prescott-Russell; L'Orignal, Ontario (the Project). The proposed Project will have the capacity to produce 3,000 tonnes of clinker per day, with an estimated annual production of 1.16 Million tonnes of cement. It is anticipated that four types of Portland cement will be produced at the plant: general use cement (GU), general use limestone cement (GUL), high early strength cement (HE) and blended general use silica fume cement (GUbSF).

The location of the proposed Project is presented in Figure 1 – Site Location Plan. There is an active quarry located immediately to the west of the Project that is also owned and operated by Colacem.

This report is not intended to provide a status of air compliance for the proposed Project. For air compliance, please refer to the Emission Summary and Dispersion Modelling (ESDM) Report Version 1.1. (Golder 2017) that is required in order to obtain an operating permit for the Project. Rather, this report has been prepared to provide the public with a further analysis of the air quality impacts from the Project and to assist with providing answers to questions that they may have in regards to this new development. This is a more comprehensive assessment than the ESDM Report and goes beyond the requirements of O. Reg. 419/05 and section 9 of the *Environmental Protection Act* to consider the Environmental Compliance Approval (ECA) cumulative effects of the Project and other industrial air emission sources. This assessment uses where appropriate guidance provided in Guideline A10 – Procedure for Preparing an ESDM Report, Version 4.0, February 2017 (ESDM Procedure Document) and Guideline A11 – Air Dispersion Modelling Guide for Ontario (ADMGO), Version 3.0 March 2017 to prepare an estimate of overall industrial impacts in the Project Area. Based on the current Project design, the Project is in compliance with the current Ontario Ministry of the Environment and Climate Change (MOECC) Ontario Regulation (O. Reg.) 419/05: Air Pollution – Local Air Quality (O. Reg. 419/05).

The predicted ECA cumulative effects of the Project were assessed considering the following emissions sources:

- the identification and quantification of emissions of nearby industrial sources that report to the National Pollutant Release Inventory (NPRI)
- the significant Project air emission sources

The ECA cumulative effects assessment compares the results of the dispersion modelling of these sources to the selected Ambient Air Quality Criteria (AAQCs) for the Project, which include the lowest values from the Ontario AAQC, the National Ambient Air Quality Objectives (NAAQO) and the National Ambient Air Quality Standards (NAAQS), that are indicators of good air quality at selected receptor locations for the closest residences to the Project. The approach used in this ECA cumulative effects assessment was discussed and agreed to on a call with the MOECC on August 15, 2017.

The large industrial sources (Existing Facilities) that were within the defined Project Area and reported to the NPRI were considered in this assessment. These facilities were included in the dispersion modelling assessment. The most significant facilities included the quarry operated by Colacem to the west of the proposed Project and Ivaco Rolling Mills located in the town of L'Orignal.

All significant emissions from the proposed Project were considered in this assessment. These emission sources included the stationary sources and fugitive sources that were assessed and modelled in the ESDM Report and also included the modelling of dust from the onsite paved roads. The emissions from the Existing Facilities were obtained from NPRI and were apportioned for modelling using best information available. The emissions from the proposed Facility were obtained from the Facility ESDM. The AERMOD modelling system was used to carry out the air quality ECA cumulative dispersion modelling assessment. The maximum predicted concentrations of the selected compounds of concern were compared to the appropriate AAQC's. The maximum predicted concentrations at the closest receptors from the Project typically occurred at the residence to the south of the proposed Project identified as R1 (identified on Figure 3) for particulate emissions and R3 or R5 (identified on Figure 3) for other compounds assessed.

Based on the ECA cumulative effects air quality predictions and screening against selected indicators, the following conclusions are provided:

i) Cumulative concentrations of compounds of concern in ambient air at receptor locations (e.g., the residences across the street from the proposed cement plant property) were predicted considering contributions from the proposed project and contributions from other industrial emission sources in the area

ii) Predicted cumulative concentrations of shared compounds of concern show results that are below the selected air quality indicator (AAQC) for the assessment which indicates good air quality

Based on the results of this conservative ECA cumulative effects dispersion modelling assessment, the predicted concentrations are not predicted to impact the local air quality.

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1.0 INTRODUCTION

Golder Associates Ltd. (Golder) was retained by Colacem Canada Inc. (Colacem) to prepare an air quality cumulative effects assessment for the proposed Portland cement manufacturing facility located at Lot 217, Parcel M100, County Road 17, United Counties of Prescott-Russell; L'Orignal, Ontario (the Project). The proposed Project will have the capacity to produce 3,000 tonnes of clinker per day, with an estimated annual production of 1.16 Million tonnes of cement. It is anticipated that four types of Portland cement will be produced at the plant: general use cement (GU), general use limestone cement (GUL), high early strength cement (HE) and blended general use silica fume cement (GUbSF).

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The predicted ECA cumulative effects of the Project were assessed considering the following emissions sources:

- the identification and quantification of emissions of nearby industrial sources that report to the National Pollutant Release Inventory (NPRI)
- the significant Project air emission sources

The ECA cumulative effects assessment is the result of the dispersion modelling of these sources. The methodology and approach used in this ECA cumulative effects assessment was discussed and agreed to on a call with the MOECC on August 15, 2017.

2.0 SELECTION OF COMPOUNDS

The compounds that were considered in the ECA cumulative effects assessment were based on shared contaminants that were publically reported to be emitted by the Existing Facilities. The Existing Facilities were limited to facilities that reported to the NPRI for 2015 (NPRI 2016) and are located within 5 km of the proposed Project (the Project Area).

There are only two Existing Facilities that meet these criteria. The most notable of the Existing Facilities is the neighbouring quarry that is located directly to the west of the Project and Ivaco Rolling Mills located 4.1 km to the east of the Project. The facilities are presented in Table 1 below and on Figure 2 attached.

Table 1: NPRI Reporting Facilities within the Project Area.

Company Name	NPRI ID	Facility Description	Compounds Emitted	Distance from Facility
Ivaco Rolling Mills 2004 L.P., L'Orignal, ON (Ivaco Rolling Mills)	1520	Iron and Steel Mills and Ferro-Alloy Manufacturing	SPM, PM_{10}, $PM_{2.5}$, Arsenic, Cadmium, Carbon Monoxide (CO), Dioxins and Furans (D&F), Hexachlorobenzene, Lead, Manganese, Mercury, Nitrogen Oxides (NOx), Sulphur Dioxide (SO_2) and Zinc	4.1 km
Colacem Canada Inc., L'Orignal, ON (Colacem Quarry)	10198	Non-Metallic Mineral Mining and Quarrying	SPM, PM_{10} and $PM_{2.5}$	Adjacent to the west of the Project

The comparison of the NPRI emissions from these Facilities to the provincial totals is provided in Appendix A.

The list of compounds assessed (and expected to be emitted) from the proposed Portland cement plant is presented in the ESDM report (Golder 2017). Of the compounds assessed in the ESDM, only those presented in Table 2 are significant and shared with the Existing Facilities.

Table 2: Shared Compounds with Existing Facilities

Compound	Colacem Cement Plant	Colacem Quarry	Ivaco Rolling Mills
NO_X	*X*		*X*
SO_2	*X*		*X*
CO	*X*		*X*
SPM	*X*	*X*	*X*
PM_{10}	*X*	*X*	*X*
$PM_{2.5}$	*X*	*X*	*X*
D&F	*X*		*X*

NOx are defined to be the sum of nitrogen dioxide (NO_2) and nitric oxide (NO).

3.0 AIR QUALITY INDICATORS

The relevant air quality criteria used for assessing the effects of the Project on air emissions include the provincial guidelines where available, and federal objectives and standards where provincial guidelines are not available. The MOECC has established guidelines related to ambient air concentrations which are summarized in Ontario's Ambient Air Quality Criteria (AAQC) (MOECC 2012). The AAQCs are not regulatory limits, the AAQCs are used for screening the air quality effects in environmental assessments, in studies using ambient air monitoring data, and as assessment of general air quality in a community or across the province (MOECC 2012).

There are two sets of federal criteria: the National Ambient Air Quality Objectives (NAAQOs) and the National Ambient Air Quality Standards (NAAQSs). Similar to the Ontario AAQCs, the NAAQOs are benchmarks that can be used to facilitate air quality management on a regional scale, and provide goals for outdoor air quality that protect public health, the environment, or aesthetic properties of the environment (Canadian Council of Ministers of the Environment [CCME] 1999).

The federal government has established the following levels of NAAQOs (Health Canada 1994):

- the maximum desirable level defines the long-term goal for air quality and provides a basis for an anti-degradation policy for unpolluted parts of the country and for the continuing development of control technology
- the maximum acceptable level is intended to provide adequate protection against adverse effects on soil, water, vegetation, materials, animals, visibility, personal comfort, and well-being

The NAAQSs have been developed under the *Canadian Environmental Protection Act*, and includes a standard for SO_2 and $PM_{2.5}$ that will be phased in by 2020 (Government of Canada 2013). Like the Ontario AAQCs, the CAAQSs are not regulatory limits and are used as national targets for $PM_{2.5}$ and ozone, excluding Quebec (CCME 2014).

A summary of the applicable Ontario and federal objectives and standards for air quality are listed in Table 3 below.

Table 3: Ontario and Canadian Regulatory Air Quality Objectives and Standards

Compound	Averaging Period	Ontario Ambient Air Quality Criteria [(a)]	National Ambient Air Quality Standards[(b)]	National Ambient Air Quality Objectives[(c)]	
				Desirable	Acceptable
SPM[(d)] (µg/m^3)	24-Hour	120	—	—	120
	Annual	60^{++}	—	60	70
PM_{10} (µg/m^3)	24-Hour	50[(e)]	—	—	—
$PM_{2.5}$ (µg/m^3)	24-Hour	30[(f)]	27[(f)]	—	—
	Annual	—	8.8	—	—
NO_X (µg/m^3)	1-Hour	400	—	—	400
	24-Hour	200	—	—	200
	Annual	—	—	60	100
SO_2 (µg/m^3)	1-Hour	690	183[(g)]	450	900
	24-Hour	275	—	150	300
	Annual	55	13[(h)]	30	60

Compound	Averaging Period	Ontario Ambient Air Quality Criteria [(a)]	National Ambient Air Quality Standards[(b)]	National Ambient Air Quality Objectives[(c)]	
				Desirable	Acceptable
CO (µg/m³)	1-Hour	15,700	—	18 500 (15 ppm)	43 200 (35 ppm)
	8-Hour	36,200	—	7,400 (6 ppm)	18 500 (15 ppm)
D&F (pg/m³)	24-Hour	TEQ 0.1 (pg/m³)	—	—	—

Notes:
(a) MOE 2012.
(b) NAAQS published in the Canada Gazette Volume 147, No. 21 - May 25, 2013 (Government of Canada 2013). Final standard phase in date of 2020 used. The values presented in the table are for the 2020 phase-in date.
(c) CCME1999.
(d) SPM in Ontario is defined as Suspended Particulate Matter (less than 44 µm diameter).
(e) Interim Ambient Air Quality Criteria (MOECC 2012).
(f) Based on the 98th percentile of the annual monitored data averaged over three years of measurements.
(g) The 3-year average of the annual 99th percentile of the SO_2 daily maximum 1-hour concentrations.
(h) The arithmetic average over a single calendar year of all 1-hour average SO_2 concentrations.
++ Geometric Mean Value.
— = No guideline available.
TEQ = Toxics Equivalents.

The Ambient Air Quality Criteria are based on measurement values and are not intended to be used for direct comparison to modelled values. In addition measured values are frequently above these numerical indicators and therefore the values are often based on a long term average of measured values and compared to the geometric mean or a percentile of the long term measured data set. However, for the purpose of this Air Quality ECA Cumulative Effects Study, the simple numerical values were retained as indicators of good air quality. The values used for this are the lowest of the AAQC, NAAQO, and NAAQS, and are summarized in the table below.

Table 4: Summary of Ambient Air Quality Criteria Values Retained for the Assessment

Substance	Averaging Period	Ambient Air Quality Criteria	Data Source
SPM[(d)] (µg/m³)	24-Hour	120	Ontario Ambient Air Quality Criteria
	Annual	60	Ontario Ambient Air Quality Criteria
PM_{10} (µg/m³)	24-Hour	50	Ontario Ambient Air Quality Criteria
$PM_{2.5}$ (µg/m³)	24-Hour	27	National Ambient Air Quality Standards
	Annual	8.8	National Ambient Air Quality Standards
NO_X (µg/m³)	1-Hour	400	Ontario Ambient Air Quality Criteria
	24-Hour	200	Ontario Ambient Air Quality Criteria
	Annual	60	Ontario Ambient Air Quality Criteria
SO_2 (µg/m³)	1-Hour	183	National Ambient Air Quality Standards
	24-Hour	150	National Ambient Air Quality Objectives
	Annual	13	National Ambient Air Quality Standards
CO (µg/m³)	1-Hour	15,700	Ontario Ambient Air Quality Criteria
	8-Hour	7,400	National Ambient Air Quality Objectives
D&F (pg/m³)	24-Hour	TEQ 0.1 (pg/m³)	Ontario Ambient Air Quality Criteria

4.0 PROJECT EMISSIONS

In order to assess the Project effects as part of this cumulative effects assessment, the maximum emission rates for the proposed Project were estimated as presented in the ESDM report (Golder 2017). The maximum emissions scenario will occur during the maximum operating scenario for the Project. As mentioned in Section 2, only compounds that were emitted from the Project and reported as emitted from the nearby large industrial sources were included in this assessment. Please refer to the ESDM Report for a detailed explanation of the sources that were assessed in that report. Table III in the ESDM Report presents the maximum operating scenario and Figure 5 and 6 in the ESDM Report present additional details on the sources considered.

O. Reg. 419/05 focuses the assessment on emissions from process sources and requires fugitive emission from material handling and roads to be controlled by a Best Management Practices Plan. The dust emissions from the on-site paved roads, which were not modelled in the ESDM Report as per section 7-4 of Guideline A10 – Procedure for Preparing an ESDM Report, Version 4.0, February 2017 (ESDM Procedure Document), were included in the dispersion models for the Air Quality ECA Cumulative Effects Study. The fugitive road dust emissions calculations are presented in Appendix B – Emissions Calculations.

The table below presents the significant Project emission sources considered in this assessment.

Table 5: Project Sources

Source Category	Types of Sources	Compounds	Source ID
ESDM Sources			
Raw Materials Receiving	Dust collectors; fugitive dust sources	SPM, PM_{10} and $PM_{2.5}$	E1 to E4, FUG1 to FUG6
Materials Storage and Transfers	Dust collectors		E5 to E12
Raw Mill	Dust collectors		E13 to E17
Kiln	Hybrid dust collector and dust collector	SPM, PM10 and PM2.5, CO, NOx, SO2 and D&F	E18 and E27
Petcoke Receiving and Grinding	Dust collectors; fugitive dust sources	SPM, PM_{10} and $PM_{2.5}$	E19 to E25 and FUG7, FUG8
Clinker Storage and Transfer	Dust collectors		E28 to E32
Cement Mill	Dust collectors		E33 to E42
Finished Cement	Dust collectors		E43 to E54
Cement Packaging	Dust collectors		E55 to E56
Alternative Fuels	Dust collector	SPM, PM_{10} and $PM_{2.5}$	E26
Additional Fugitive Sources Modelled in this Assessment			
Roads (road dust)	On site roadways	SPM, PM_{10} and $PM_{2.5}$	Included in E18

The detailed emissions and sample calculation for these three source groups are presented in Appendix B.

4.1 Project Emission Summary

The maximum emission rates that correspond to the maximum operating scenario for each source group are presented in this section. The following two tables present the Project emissions summary. CO, NOx, SO_2, and D&F are only emitted from the kiln exhaust stack. The largest source of dust (SPM, PM_{10} and $PM_{2.5}$) emissions from the proposed Project is the kiln exhaust stack. Table 6 presents the dust emissions from the proposed Project. Table 7 presents the CO, NOx, SO_2 and D&F emissions from the Project.

Table 6: SPM, PM_{10} and $PM_{2.5}$ Emissions from the proposed Project

Source Group	Emission Rate [g/s]		
	SPM	PM_{10}	$PM_{2.5}$
ESDM Sources			
Raw Materials Receiving	9.00E-02	5.00E-02	3.00E-02
Raw Materials Storage and Transfers	8.00E-02	4.00E-02	3.00E-02
Raw Mill	1.80E-01	1.00E-01	6.00E-02
Kiln	3.85E+00	2.04E+00	1.39E+00
Petcoke Receiving and Grinding	2.00E-01	1.00E-01	7.00E-02
Clinker Storage and Transfer	1.50E-01	1.00E-01	7.00E-02
Cement Mill	1.28E+00	6.80E-01	4.60E-01
Finished Cement	2.60E-01	1.40E-01	1.00E-01
Cement Packaging	8.00E-02	4.00E-02	3.00E-02
Alternative Fuels	4.00E-02	2.00E-02	1.00E-02
Additional Sources			
Road Dust[1]	3.74E-01	7.17E-02	1.74E-02
Total	**6.58E+00**	**3.38E+00**	**2.26E+00**

1. Modeled from Kiln stack (E18)

The emissions associated with truck movements of petcoke and bauxite received at the Facility were excluded from the assessment as these activities occur for only approximately ten days each per year and do not represent the typical maximum operating scenario.

The table below presents the NOx, CO, SO_2 and D&F emissions from the project.

Table 7: CO, NOx, SO2 and D&F Emissions from the proposed Project

Source Group	CO Emission Rate [g/s]	NOx Emission Rate [g/s]	SO_2 Emission Rate [g/s]	D&F Emission Rate [pg/s]
Kiln	7.70E+01	2.31E+02	3.85E+01	1.53 E+04

Note: pg = picograms

Please refer to Appendix B for a detailed explanation and calculation of the additional sources assessed as part of the proposed Project.

5.0 EXISTING FACILITIES EMISSIONS SOURCES

In addition to the Project air emission sources, the emission contributions from nearby industrial sources (Existing Facilities) have been considered in this assessment.

The Existing Facilities included in the report are listed in Table 1 and their respective shared compounds are listed in Table 2. For this assessment, annual emissions were obtained from NPRI and were converted to emissions rates based on the hours of operations. It was assume that Ivaco Rolling Mills operates 365 days per year, 24 hours per day and that production is constant (i.e. operations do not vary significantly day-to-day). Operating schedule for activities at the Colacem Quarry were provided by Colacem and indicated that dust collectors for the different processes operated 12 hours per day (with their respective number of days of operations per year) while the quarry could operate 24 hours per day, 365 days per year. This information was used to convert the total emissions reported to NPRI to emission rates for use in dispersion modelling. The total emissions reported to the NPRI are provided in Appendix A – NPRI Emissions. The emission rate calculations are provided in Appendix B – Emission Calculations, and source configuration for the dispersion model assessment is presented in Appendix C – Model Sources. The emissions rates for the Existing Facilities are presented in Tables 8 to 10.

Table 8: SPM, PM_{10} and $PM_{2.5}$ Emissions from the Colacem Quarry

Source Group	Emission Rate [g/s]		
	SPM	PM_{10}	$PM_{2.5}$
Limestone Plant Dust Collector	2.62E-01	1.05E-01	1.80E-02
Asphalt Dust Collector	2.62E-01	1.05E-01	1.80E-02
Open Pit	7.56E-01	3.02E-01	5.20E-02
Total	1.28E+00	5.12E-01	8.81E-02

Table 9: SPM, PM_{10} and $PM_{2.5}$ Emissions from Ivaco Rolling Mills

Source Group	Emission Rate [g/s]		
	SPM	PM_{10}	$PM_{2.5}$
Main Stack	5.45E+00	2.22E+00	1.11E+00

Table 10: CO, NOx, SO2 and D&F Emissions from Ivaco Rolling Mills

Source Group	CO Emission Rate [g/s]	NOx Emission Rate [g/s]	SO_2 Emission Rate [g/s]	D&F Emission Rate [pg/s]
Main Stack	1.87E+00	3.61E+00	9.83E-01	4.12E+04

6.0 DISPERSION MODELLING ASSESSMENT

The emission sources described in Sections 4 and 5 were modelled using the U.S. EPA AERMOD model. The AERMOD modelling system is made up of the AERMOD dispersion model, the AERMET meteorological pre-processor, the AERMAP terrain pre-processor and the BPIP building downwash pre-processor. The AERMET pre-processor was not used in this assessment; however, the most recent pre-processed MOECC meteorological dataset was used. This data is available for download on the MOECC website, https://www.ontario.ca/environment-and-energy/map-regional-meteorological-and-terrain-data-air-dispersion-modelling.

6.1 Dispersion Modelling Inputs

The dispersion modelling was conducted in accordance with the ADMGO with the exception to the selection of the modelling coverage. A general description of the input data used in the dispersion model is provided below in Table 11.

Table 11: Dispersion Modelling Inputs

Modelling Input/Parameter	Description/Rationale
AERMOD dispersion model	■ v.14134
AERMAP surface pre-processor	■ v.09040
BPIP building downwash pre-processor	■ v.04274
Meteorological Conditions	■ MOECC's Regional Crops Dataset for Ottawa Region was used.
Area of Modelling Coverage (receptor locations)	■ Within 750 m of the kiln exhaust stack, five discrete sensitive receptors were identified and are presented on Figure 3 as R1 to R5. Four of these receptors are located to the southeast of the proposed Project and one located the southwest; these receptors are residences.
Sources	■ Emissions were apportioned as described in Appendix B; for consistency in modelling, emissions were assumed to come from the main sources of emissions at each of the Existing Facilities (i.e., the Quarry emissions were attributed to the dust collectors and the open pit source and the Ivaco Rolling Mills emissions were assumed to be emitted from their main emission source, the Air Emission Control System for the Steel Plant (Main stack). http://www.ceaa-acee.gc.ca/052/details-eng.cfm?pid=64633 ■ The sources included in the model are based on the emissions sources discussed in Sections 4 and 5. Please refer to Appendix C for a description on how those sources were modelled. ■ The emission rates used in the dispersion model correspond to the maximum operating scenario for the proposed Project. Please refer to Section 4 and Appendix B for further details.

6.2 Model Result Averaging Periods

The following are the assumptions related to the averaging periods of the predicted concentrations:

- The hourly and daily predicted modelled concentrations were based on the maximum emissions scenario presented in Sections 4 and 5.
- The emissions from the Existing Facilities were based on the annual emissions and converted to shorter averaging times assuming a 24/7 operation for Ivaco Rolling Mills, and the Quarry pit source. The Quarry dust collectors (QUARE1, QUARE2) were assumed to operate only 12 hours per day, 120 and 240 days per year respectively.
- For annual predicted concentrations, the annual emissions from the Project were assumed equal to the Project's emission rates. Predicted concentrations over an average of five years were converted to annual concentrations using the annual screening factor of 1.4 as per the ADMGO.

6.3 Results and Discussion

The results of the Project plus Existing Facilities dispersion modelling assessment are presented in Table 12. Table 12 provides the maximum concentration at a sensitive receptor.

Table 12: Maximum Concentration at Sensitive Receptor

Compound	Averaging Period	AAQC Criteria [µg/m3]	Maximum Cumulative Concentration at Sensitive Receptor [µg/m3]	Percent of Criteria at Sensitive Receptor [%]
SPM	24-hr	120	93.6	78%
	Annual	60	3.8	6%
PM_{10}	24-hr	50	37.2	74%
$PM_{2.5}$	24-hr	27	7.7	29%
	Annual	8.8	0.8	9%
CO	1-hr	15,700	95.2	1%
	8-hr	7,400	43.5	1%
NOx	1-hr	400	285.7	71%
	24-hr	200	43.5	22%
	Annual	60	2.8	5%
SO_2	1-hr	183	47.6	26%
	24-hr	150	7.2	5%
	Annual	13	0.4	3%
D&F	24-hr	0.1 [pg/m3]	0.009	9%

The maximum predicted 24-hour SPM, PM_{10} and $PM_{2.5}$ concentration resulting from the cumulative effects assessment occurred at R1 with a concentration of 93.6, 37.2 and 7.7 µg/m^3 respectively. The main source of emissions for these models are the Quarry pit source and the proposed cement plant kiln.

The maximum predicted concentration resulting from the cumulative effects assessment for CO, NOx and SO_2 occurred at R3 with the largest contributions from the Colacem cement plant kiln.

The maximum predicted concentration resulting from the cumulative effects assessment for D&F occurred at R5 with the largest contribution from the Ivaco Rolling Mills – Main Stack source.

Please note that the highest predicted concentrations outputted from the dispersion model are presented in the cumulative effects assessment; no concentrations were discarded due to meteorological anomalies as permitted in an ECA assessment.

7.0 CONCLUSIONS

This report was prepared to provide the public with further analysis of the air quality impacts from the proposed Project and to assist with providing answers that they may have in regards to the new development. This is a more comprehensive assessment than the ESDM Report and goes beyond the requirements of O. Reg. 419/05 and Section 9 of the *Environmental Protection Act* to consider the ECA cumulative effects of the Project and other industrial air emission sources. This assessment uses where appropriate guidance provided in the ESDM Procedure Document and the ADMGO to prepare an estimate of overall industrial impacts in the Project Area.

The predicted ECA cumulative effects of the Project were assessed considering the following emissions sources:

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All significant emissions from the proposed Project were considered in this assessment. These emission sources included the stationary sources and fugitive sources that were assessed and modelled in the ESDM Report and also included the dispersion modelling of dust from the onsite paved roads. The emissions from the Existing Facilities were obtained from NPRI and were apportioned for modelling using best information available. The emissions from the proposed Facility were obtained from the Facility ESDM. The AERMOD modelling system was used to carry out the air quality ECA cumulative dispersion modelling assessment. The maximum predicted concentrations of the selected compounds of concern were compared to AAQC. The maximum predicted concentrations at receptors typically occurred at the residence to the south of the proposed Project identified as R1 (identified on Figure 3) for particulate emissions and R3 or R5 (identified on Figure 3) for other compounds assessed.

The assessment has been completed to address public concerns related to the emission of compounds of concern (dusts and airborne compounds) as a result of the proposed cement plant. Based on the air quality ECA cumulative effects predictions and screening against selected indicators, the following conclusions are provided:

i) Cumulative concentrations of compounds of concern in ambient air at receptor locations (e.g., the residences across the street from the proposed cement plant property) were predicted considering contributions from the proposed project and contributions from other industrial emission sources in the area

ii) Predicted cumulative concentrations of shared compounds of concern show results that are below the selected air quality indicator (AAQC) for the assessment which indicates good air quality

Based on the results of this conservative ECA cumulative effects dispersion modelling assessment, the predicted concentrations are not predicted to impact the local air quality.

8.0 REFERENCES

CCME (Canadian Council of Ministers of the Environment). 1999. *Canadian National Ambient Air Quality Objectives: Process and Status 1999.* Available at: ceqg-rcqe.ccme.ca/download/en/133/

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Report Signature Page

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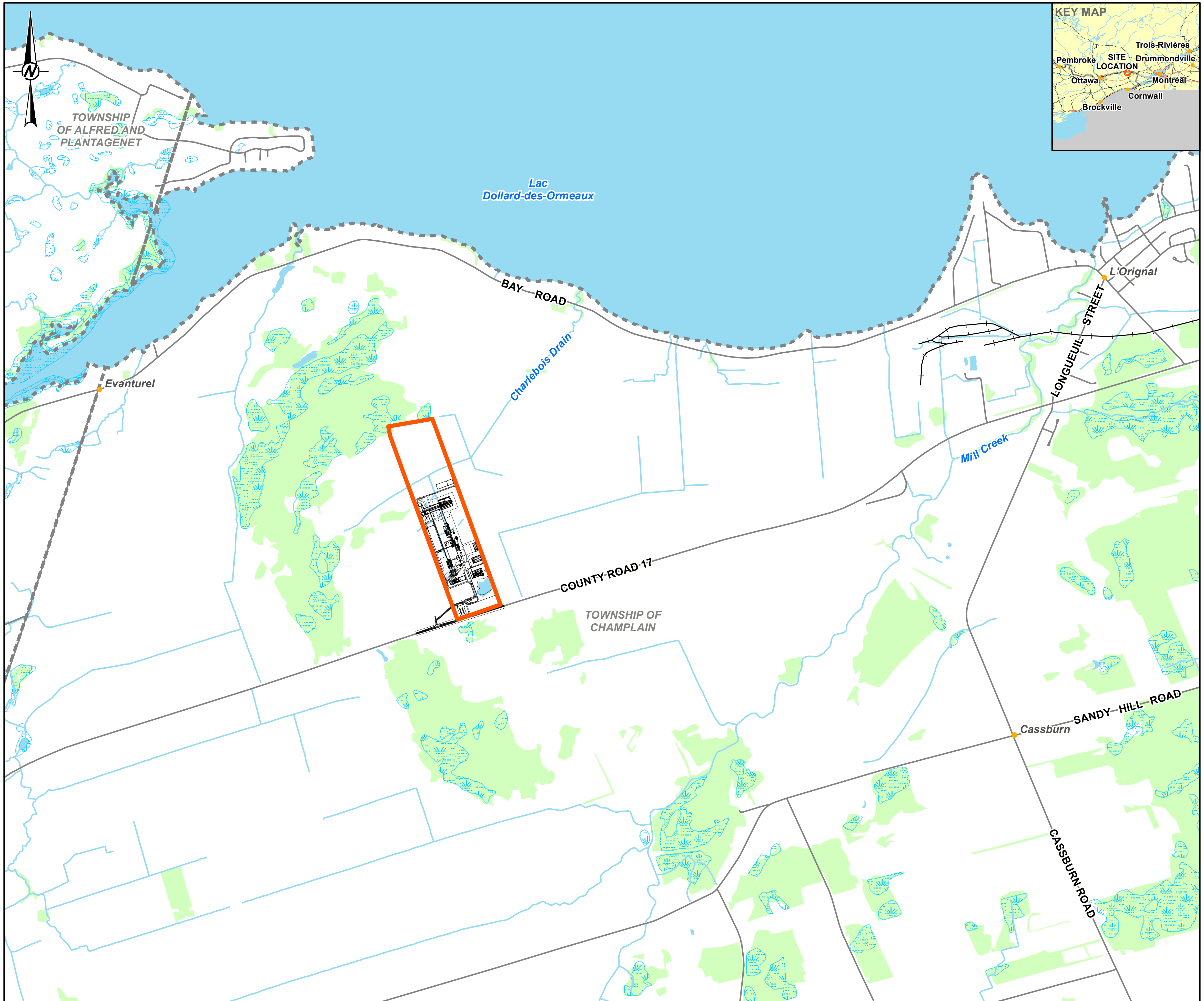
LGE/CST/RLG/FSC/md

\\golder.gds\gal\mississauga\active\2015\3 proj\1529718 colacem_l'orignal_champlain\07 technical studies\air\cumulative effect report\september 2017\gal-locpp-0037 draft air quality cumulative effects 30aug2017.docx

FIGURES



LEGEND

- LAYOUT
- ROAD
- WATERCOURSE
- WATERCOURSE, INTERMITTENT
- WATERBODY
- WETLAND
- WOODED AREA
- MUNICIPAL BOUNDARY
- SITE BOUNDARY OF PROPOSED PROJECT

0 1,000 2,000

1:30,000 METRES

REFERENCE(S)

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MNR LIO, OBTAINED 2015
PRODUCED BY GOLDER ASSOCIATES LTD UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2015
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 18

CLIENT
COLACEM CANADA INC.

PROJECT
AIR QUALITY ECA CUMULATIVE EFFECTS IMPACT ASESSMENT

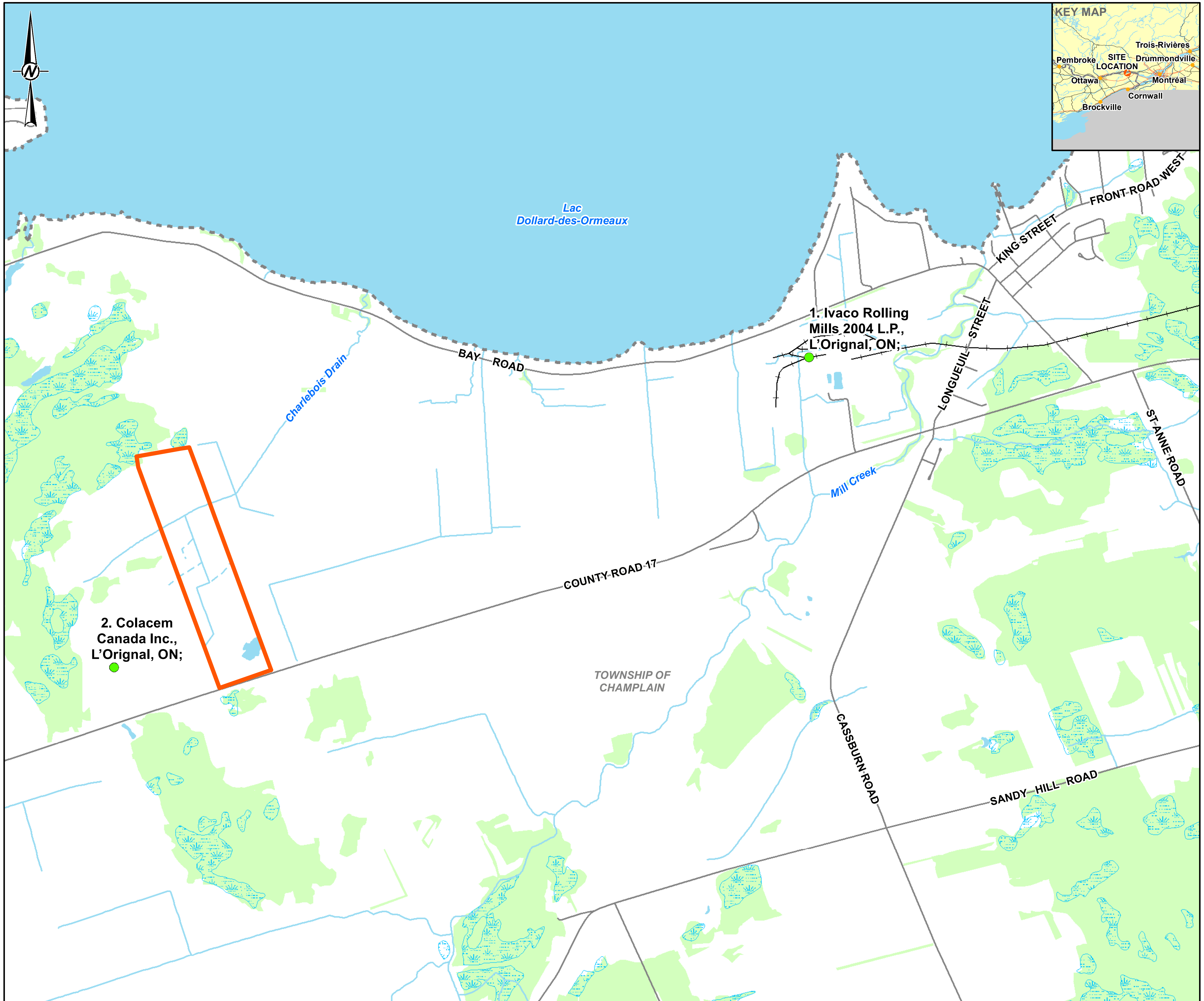
TITLE
SITE LOCATION PLAN

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-08-28
DESIGNED	JMC
PREPARED	JMC
REVIEWED	LGE
APPROVED	CST

PROJECT NO.	CONTROL	REV.	MAP
1529718	-	3	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM



LEGEND

- NPRI SOURCES
- ROAD
- RAILWAY
- WATERCOURSE
- WATERBODY
- WETLAND
- WOODED AREA
- MUNICIPAL BOUNDARY
- SITE BOUNDARY OF PROPOSED PROJECT

0 1 2
1:25,000 KILOMETRES

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PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 18

CLIENT
COLACEM CANADA INC.

PROJECT
AIR QUALITY ECA CUMULATIVE EFFECTS IMPACT ASESSMENT

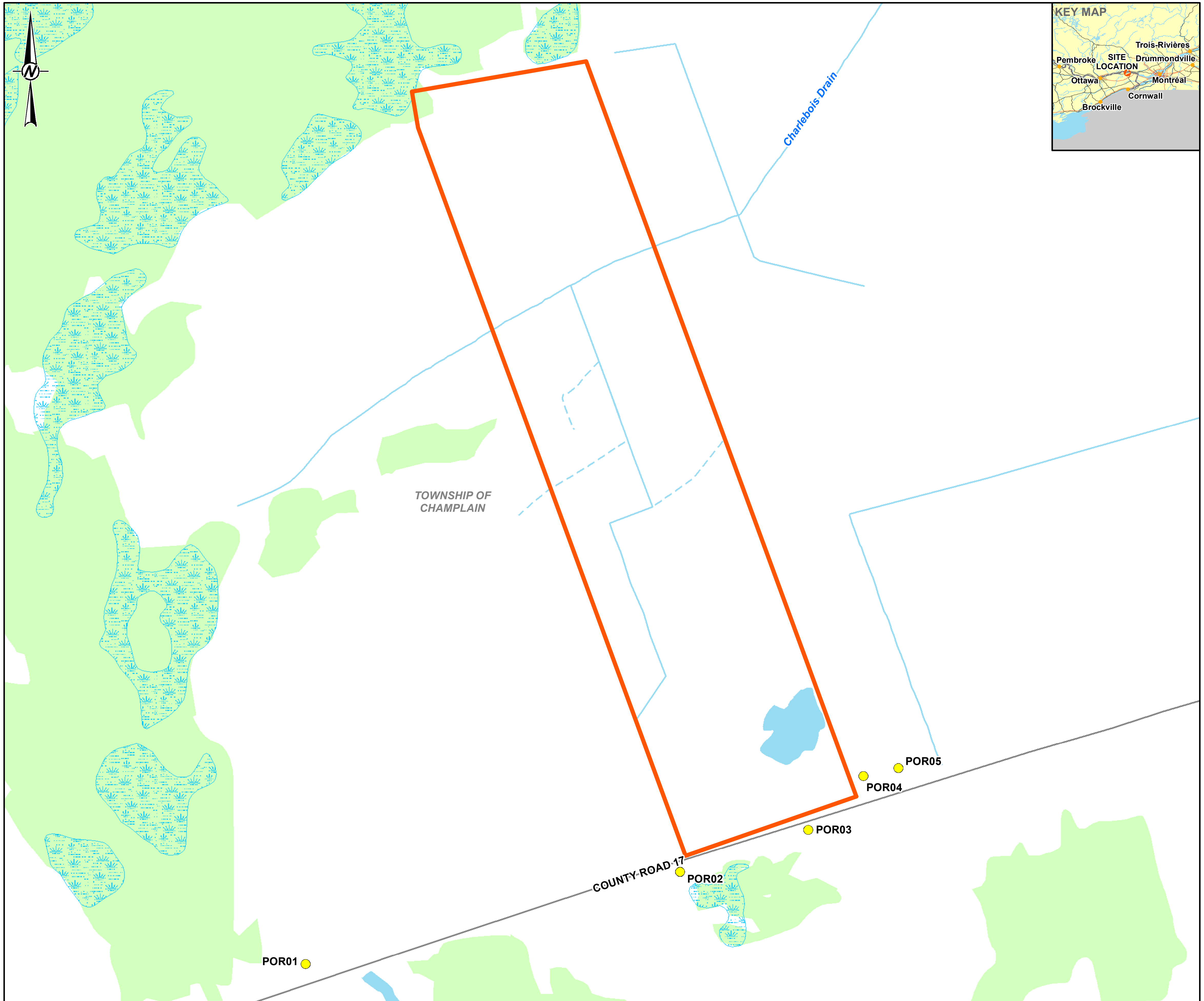
TITLE
NPRI REPORTING FACILITIES WITHIN THE PROJECT AREA

CONSULTANT

Golder Associates

YYYY-MM-DD	2017-08-28
DESIGNED	JMC
PREPARED	JMC
REVIEWED	LGE
APPROVED	CST

PROJECT NO.	CONTROL	REV.	MAP
1529718	-	3	2



LEGEND

- SENSITIVE RECEPTORS
- ROAD
- RAILWAY
- WATERCOURSE
- WATERBODY
- WETLAND
- WOODED AREA
- MUNICIPAL BOUNDARY
- SITE BOUNDARY OF PROPOSED PROJECT

0 200 400 600

1:7,561 METRES

REFERENCE(S)

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PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 18

CLIENT
COLACEM CANADA INC.

PROJECT
AIR QUALITY ENVIRONMENTAL COMPLIANCE APPROVAL
CUMULATIVE EFFECTS STUDY

TITLE
MODELLING RECEPTORS

CONSULTANT

Golder Associates

YYYY-MM-DD	2017-08-28
DESIGNED	JMC
PREPARED	JMC
REVIEWED	LGE
APPROVED	CST

PROJECT NO.	CONTROL	REV.	MAP
1529718	-	3	3

APPENDIX A

NPRI Emission Source Summary Table

Company NPRI ID	Company Name	2015 Annual Emission Rate[1] PM - Total Particulate Matter	PM10 - Particulate Matter <= 10 Microns	PM2.5 - Particulate Matter <= 2.5 Microns	Carbon monoxide	Dioxins and furans - total	Nitrogen oxides (expressed as NO2)	Sulphur dioxide
		tonnes/yr	tonnes/yr	tonnes/yr	tonnes/yr	g TEQ(ET)/yr	tonnes/yr	tonnes/yr
1520	IVACO ROLLING MILLS 2004 L. P.	1.72E+02	7.00E+01	3.50E+01	5.90E+01	1.30E+00	1.14E+02	3.10E+01
10198	COLACEM CANADA INC. (QUARRY)	1.40E+01	5.60E+00	9.64E-01	—	—	—	—

1 - Annual emission rates from NPRI online database for 2015 (http://ec.gc.ca/inrp-npri/donnees-data/index.cfm?lang=Endata/index.cfm?do=facility_substance_summary&lang=en&opt_npri_id=0000010198&opt_report_year=2016)

Company Information		2015 Annual Emission Rate Comparison [1]						
NPRI ID	Company Name	PM - Total Particulate Matter	PM10 - Particulate Matter <= 10 Microns	PM2.5 - Particulate Matter <= 2.5 Microns	Carbon monoxide	Dioxins and furans - total	Nitrogen oxides (expressed as NO2)[2]	Sulphur dioxide
		tonnes/yr	tonnes/yr	tonnes/yr	tonnes/yr	g TEQ(ET)/yr	tonnes/yr	tonnes/yr
1520	IVACO ROLLING MILLS 2004 L. P.	1.72E+02	7.00E+01	3.50E+01	5.90E+01	1.30E+00	1.14E+02	3.10E+01
10198	COLACEM CANADA INC. (QUARRY)	1.40E+01	5.60E+00	9.64E-01	—	—	—	—
N/A	COLACEM CANADA INC. (CEMENT PLANT)	2.09E+02	1.07E+02	7.13E+01	2.22E+03	4.86E-01	2.13E+03	1.11E+03
	TOTAL	3.95E+02	1.82E+02	1.07E+02	2.28E+03	1.79E+00	2.25E+03	1.14E+03
2015 PROVINCIAL TOTAL		**3.52E+04**	**1.91E+04**	**9.74E+03**	**6.99E+04**	**—[3]**	**6.72E+04**	**2.49E+05**
% OF PROVINCIAL TOTAL		**1.12%**	**0.96%**	**1.10%**	**3.26%**	**—[3]**	**3.34%**	**0.46%**

1 - Maximum emission rates presented in the ESDM report converted to annual emissions where used for consistency and conservatism.

2 - Emissions of Nitrogen Oxides from the Colacem Cement Plant are adjusted to account for the installation of the best available control technology

3 - Total reported Dioxins and Furans in TEQ are not publically available

Made By: AVW
Checked by: CST

APPENDIX B

Emission Calculations

Dust Collectors - Dust Emissions - E1 to E56

Description and Methodology

The facility has dust collectors throughout the Facility to perform various operations related to raw material receiving, material storage and transfers, raw mill, Petcoke receiving and grinding, cement costituents and cement receiving, clinker silo, cement mill, finished cement silos, cement packaging and alternative fuels. For each dust collector, data such as outlet loading concentration is provided in Appendix C. Figure 3 presents the locations of the dust collector stacks.

The emissions from each dust collector were estimated based on the maximum volumetric flow rate multiplied by the designed particulate mass outlet loading concentration. The daily emission rates were calculated based on each unit's maximum daily operating hours. Emissions of PM10 and PM2.5 were estimated based on Table B.2-3 from US EPA AP-42, Appendix B.2 - Generalized Particle Size Distributions. The data quality has been assumed to be Above Average.

Particle Size Distribution

Particle Size [µm]	Cumulative % Particle Distribution	Fabric Filter Collection Efficiencies
SPM	—	99.5%
PM10	53%	99.5%
PM2.5	18%	99.0%

Reference: US EPA AP-42 Appendix B.2 - GENERALIZED PARTICLE SIZE DISTRIBUTIONS
Cumulative % Particle Distribution Category 5
Fabric Filter Collection Efficiencies: Table B.2-3

Notes:
- SPM collection efficiency was conservatively assumed to equal the control efficiency of PM10
- SPM inlet emission rate was estimated using the SPM outlet concentration provided by Colacem and the assumed SPM collection efficiency
- PM10 and PM2.5 inlet emission rates were estimated using SPM inlet emission rates and the cumulative % particle distribution
- PM10 and PM2.5 outlet emission rates were estimated using the fabric filter collection efficiencies and their inlet emission rates

Sample Calculations

SPM Emission Rate

Outlet SPM Emission Rate = Flow Rate [Nm³/hr] x Output Concentration [mg/Nm³] x Conversion Factors

$$= \frac{9{,}832\ \text{Nm}^3}{\text{hr}} \times \frac{15\ \text{mg}}{\text{Nm}^3} \times \frac{1\ \text{g}}{1000\ \text{mg}} \times \frac{1\ \text{hr}}{3600\ \text{s}} \times \frac{8\ \text{hr/day operation}}{24\ \text{hr/day}}$$

$$= \frac{1.37\text{E-}02\ \text{g}}{\text{s}}$$

PM10 and PM2.5 Emission Rate

Inlet SPM Emission Rate = Outlet SPM Emission Rate [g/s] / (100% - Assumed Fabric Filter Collection Efficiency [%])

$$= \frac{1.37\text{E-}02\ \text{g}}{\text{s}} \Big/ (100\% - 99.5\%)$$

$$= \frac{2.73\ \text{g}}{\text{s}}$$

Inlet PM10 Emission Rate = Inlet SPM Emission Rate [g/s] x Cumulative % Particle Distribution of PM10

$$= \frac{2.73\ \text{g}}{\text{s}} \times 53\%$$

$$= \frac{1.45\ \text{g}}{\text{s}}$$

Outlet PM10 Emission Rate = Inlet PM10 Emission Rate [g/s] x (100% - Fabric Filter Collection Efficiency [%])

$$= \frac{1.45\ \text{g}}{\text{s}} \times (100\% - 99.5\%)$$

$$= \frac{0.0072\ \text{g}}{\text{s}}$$

Inlet PM2.5 Emission Rate = Inlet SPM Emission Rate [g/s] x Cumulative % Particle Distribution of PM2.5

$$= \frac{1.45\ \text{g}}{\text{s}} \times 18\%$$

$$= \frac{0.26\ \text{g}}{\text{s}}$$

Outlet PM2.5 Emission Rate = Inlet PM2.5 Emission Rate [g/s] x (100% - Fabric Filter Collection Efficiency [%])

$$= \frac{0.26\ \text{g}}{\text{s}} \times (100\% - 99.0\%)$$

$$= \frac{0.0026\ \text{g}}{\text{s}}$$

Conversion Factors

1 g =	1000 mg
1 hr =	3600 s
1 day =	24 hr
deg K =	273.15 + deg C

Assumed Flow Rate Conditions

Ambient Temp =	25 C
Ambient Temp =	298 K
Normalized Temp=	20 C
Normalized Temp=	293 K

*corrected only for temperature

Emissions Summary

Stack/ Modelling ID	Stack/Source Name	Actual Flow Rate [Am³/hr]	Exhaust Temperature [°C]	Normalized Flow Rate [Nm³/hr]	Outlet Concentration [mg/Nm³]	Daily Operating Hours [hours/day]	Daily Emission Rate [g/s]		
							SPM	PM_{10}	$PM_{2.5}$
							N/A-1	N/A-2	N/A-3
E1	Bauxite Receiving Dust Collector	10,000	Ambient	9,832	15	8	1.37E-02	7.24E-03	4.92E-03
E2	Shale, Silica, Iron Ore Receiving Dust Collector	10,000	Ambient	9,832	15	8	1.37E-02	7.24E-03	4.92E-03
E3	Gypsum Receiving Dust Collector	10,000	Ambient	9,832	15	8	1.37E-02	7.24E-03	4.92E-03
E4	Limestone Crusher Dust Collector	30,000	Ambient	29,497	15	8	4.10E-02	2.17E-02	1.47E-02
E5	Bauxite Storage Bin Dust Collector	3,000	Ambient	2,950	15	21	1.08E-02	5.70E-03	3.87E-03
E6	Iron Ore Hopper Dust Collector	5,000	Ambient	4,916	15	21	1.79E-02	9.50E-03	6.45E-03
E7	Silica Hopper Dust Collector	5,000	Ambient	4,916	15	21	1.79E-02	9.50E-03	6.45E-03
E8	Limestone Reclaimer Belt Dust Collector	3,000	Ambient	2,950	15	21	1.08E-02	5.70E-03	3.87E-03
E9	Limestone Reclaimer Belt Dust Collector	3,000	Ambient	2,950	15	21	1.08E-02	5.70E-03	3.87E-03
E10	Gypsum Reclaimer Belt Dust Collector	3,000	Ambient	2,950	15	4	2.05E-03	1.09E-03	7.37E-04
E11	Limestone & Gypsum Belt to Cement Hopper Dust Collector	3,000	Ambient	2,950	15	16	8.19E-03	4.34E-03	2.95E-03
E12	Constituents Belt to Cement Hopper Dust Collector	3,000	Ambient	2,950	15	4	2.05E-03	1.09E-03	7.37E-04
E13	Raw Mill Feeding Dust Collector	15,000	Ambient	14,748	15	21	5.38E-02	2.85E-02	1.94E-02
E14	Raw Meal Airslide Dust Collector	5,000	60	4,402	15	21	1.60E-02	8.51E-03	5.78E-03
E15	Raw Meal Silo Dust Collector	10,000	60	8,803	15	24	3.67E-02	1.94E-02	1.32E-02
E16	Raw Meal Silo Extraction Dust Collector	10,000	60	8,803	15	24	3.67E-02	1.94E-02	1.32E-02
E17	Air Lift Bin Dust Collector	10,000	60	8,803	15	24	3.67E-02	1.94E-02	1.32E-02
E18	Kiln Dust Collector	1,000,000	150	693,026	20	24	3.85E+00	2.04E+00	1.39E+00
E19	Petcoke Receiving Dust Collector	10,000	Ambient	9,832	15	8	1.37E-02	7.24E-03	4.92E-03
E20	Petcoke Silos Loading Bucket Elevator Dust Collector	3,000	Ambient	2,950	15	8	4.10E-03	2.17E-03	1.47E-03
E21	Petcoke (Coarse) Silo Dust Collector - 1	3,000	Ambient	2,950	15	8	4.10E-03	2.17E-03	1.47E-03
E22	Petcoke (Coarse) Silo Dust Collector - 2	3,000	Ambient	2,950	15	8	4.10E-03	2.17E-03	1.47E-03
E23	Petcoke Grinder Dust Collector	60,000	70	51,280	15	16	1.42E-01	7.55E-02	5.13E-02
E24	Petcoke (Pulverized) Silo Dust Collector - 1	3,000	70	2,564	15	24	1.07E-02	5.66E-03	3.85E-03
E25	Petcoke (Pulverized) Silo Dust Collector - 2	3,000	70	2,564	15	24	1.07E-02	5.66E-03	3.85E-03
E26	Alternative Fuel Dust Collector	10,000	Ambient	9,832	15	24	4.10E-02	2.17E-02	1.47E-02
E27	Clinker Cooler Dust Collector	10,000	150	6,930	15	24	2.89E-02	1.53E-02	1.04E-02
E28	Clinker Receiving Dust Collector	30,000	50	27,228	15	8	3.78E-02	2.00E-02	1.36E-02
E29	Clinker Silo Dust Collector	20,000	100	15,718	15	24	6.55E-02	3.47E-02	2.36E-02
E30	Clinker Extraction for Bulk Loading Dust Collector	5,000	50	4,538	15	8	6.30E-03	3.34E-03	2.27E-03
E31	Clinker Bulk Loading Dust Collector	15,000	50	13,614	15	8	1.89E-02	1.00E-02	6.81E-03
E32	Clinker Extraction for Cement Hopper Dust Collector	10,000	50	9,076	15	16	2.52E-02	1.34E-02	9.08E-03
E33	Cement Clinker Hopper Dust Collector	10,000	50	9,076	15	16	2.52E-02	1.34E-02	9.08E-03
E34	Cement Limestone Hopper Dust Collector	5,000	Ambient	4,916	15	16	1.37E-02	7.24E-03	4.92E-03
E35	Cement Gypsum Hopper Dust Collector	5,000	Ambient	4,916	15	16	1.37E-02	7.24E-03	4.92E-03
E36	Cement 4° Constituent Hopper Dust Collector	5,000	Ambient	4,916	15	16	1.37E-02	7.24E-03	4.92E-03
E37	Silica Fume Silo Dust Collector	5,000	Ambient	4,916	15	16	1.37E-02	7.24E-03	4.92E-03
E38	Fly Ash Silo Dust Collector	5,000	Ambient	4,916	15	16	1.37E-02	7.24E-03	4.92E-03
E39	Cement Mill Dust Collector - 1	260,000	90	209,970	15	16	5.83E-01	3.09E-01	2.10E-01
E40	Cement Mill Dust Collector - 2	260,000	90	209,970	15	16	5.83E-01	3.09E-01	2.10E-01
E41	Cement Mill Air Slide Dust Collector - 1	5,000	70	4,273	15	16	1.19E-02	6.29E-03	4.27E-03
E42	Cement Mill Air Slide Dust Collector - 2	5,000	70	4,273	15	16	1.19E-02	6.29E-03	4.27E-03
E43	Cement Silo Dust Collector - 1A	10,000	60	8,803	15	16	2.45E-02	1.30E-02	8.80E-03
E44	Cement Silo Dust Collector - 2A	10,000	60	8,803	15	16	2.45E-02	1.30E-02	8.80E-03
E45	Cement Silo Dust Collector - 1B	10,000	60	8,803	15	16	2.45E-02	1.30E-02	8.80E-03
E46	Cement Silo Dust Collector - 2B	10,000	60	8,803	15	16	2.45E-02	1.30E-02	8.80E-03
E47	Cement Silo Bulk Loading Dust Collector - 1A-A	8,000	40	7,493	15	16	2.08E-02	1.10E-02	7.49E-03
E48	Cement Silo Bulk Loading Dust Collector - 1A-B	8,000	40	7,493	15	16	2.08E-02	1.10E-02	7.49E-03
E49	Cement Silo Bulk Loading Dust Collector - 2A-A	8,000	40	7,493	15	16	2.08E-02	1.10E-02	7.49E-03
E50	Cement Silo Bulk Loading Dust Collector - 2A-B	8,000	40	7,493	15	16	2.08E-02	1.10E-02	7.49E-03
E51	Cement Silo Bulk Loading Dust Collector - 1B-A	8,000	40	7,493	15	16	2.08E-02	1.10E-02	7.49E-03
E52	Cement Silo Bulk Loading Dust Collector - 1B-B	8,000	40	7,493	15	16	2.08E-02	1.10E-02	7.49E-03
E53	Cement Silo Bulk Loading Dust Collector - 2B-A	8,000	40	7,493	15	16	2.08E-02	1.10E-02	7.49E-03
E54	Cement Silo Bulk Loading Dust Collector - 2B-B	8,000	40	7,493	15	16	2.08E-02	1.10E-02	7.49E-03
E55	Packing Plant Dust Collector - A	30,000	40	28,097	15	8	3.90E-02	2.07E-02	1.40E-02
E56	Packing Plant Dust Collector - B	30,000	40	28,097	15	8	3.90E-02	2.07E-02	1.40E-02

Dust Collectors - Non-Dust Emissions - E1 to E56

Methodology

The emissions from each dust collector were estimated based on the maximum volumetric flow rate multiplied by the designed particulate mass outlet loading concentration. The daily emission rates were calculated based on each unit's maximum daily operating hours. This is summarized in E1-E56 - Dust sheet. Based on the composition of the materials at the Facility, the emission rates of crystalline silica and ferric oxide were also estimated. For each source, the percent composition of the contaminant was provided as well as the source of the information. The percent composition of the contaminant was multiplied by the emission rate of PM10 (as estimated in source sheet E1-E56 - Dust.

Parameters

Percent of Crystalline Silica in PM10 =	6.6%	AWMA - PM4 Crystalline Silica Emission Factors and Ambient Concentrations at Aggregate-Producing Sources in California (Richards et al., 2012)
Percent Fe_2O_3 in Iron Ore =	100%	Assumed concentration
Percent of Iron in Raw Materials =	1.42%	Average of iron ore mass percentage in all raw materials received at Facility
Crystalline Silica in Clinker =	0.5%	Typical MSDSs
Portland Cement in Clinker =	100%	Typical MSDSs
Crystalline Silica in Silica Fume =	0.5%	Typical MSDS
Crystalline Silica in Fly Ash =	10%	Typical MSDS
Crystalline Silica in Portland Cement =	0.3%	Typical MSDS
Portland Cement in Portland Cement =	100.0%	Typical MSDS
Raw Mill Silica Sand Concentration =	3%	Typical MSDS

Emissions Summary

Stack/ Modelling ID	Stack/Source Name	Percent Composition (by Weight) [%]			Emission Rate [g/s]				
		Crystalline Silica	Ferric Oxide	Portland Cement	SPM	PM10	Crystalline Silica	Ferric Oxide	Portland Cement
		14808-60-7	1309-37-1	65997-15-1	N/A-1	N/A-2	14808-60-7	1309-37-1	65997-15-1
E1	Bauxite Receiving Dust Collector	—	—	—	1.37E-02	7.24E-03	—	—	—
E2	Shale, Silica, Iron Ore Receiving Dust Collector	6.6%	100%	—	1.37E-02	7.24E-03	4.76E-04	1.37E-02	—
E3	Gypsum Receiving Dust Collector	—	—	—	1.37E-02	7.24E-03	—	—	—
E4	Limestone Crusher Dust Collector	6.6%	—	—	4.10E-02	2.17E-02	1.43E-03	—	—
E5	Bauxite Storage Bin Dust Collector	—	—	—	1.08E-02	5.70E-03	—	—	—
E6	Iron Ore Hopper Dust Collector	—	100%	—	1.79E-02	9.50E-03	—	1.79E-02	—
E7	Silica Hopper Dust Collector	6.6%	—	—	1.79E-02	9.50E-03	6.25E-04	—	—
E8	Limestone Reclaimer Belt Dust Collector	6.6%	—	—	1.08E-02	5.70E-03	3.75E-04	—	—
E9	Limestone Reclaimer Belt Dust Collector	6.6%	—	—	1.08E-02	5.70E-03	3.75E-04	—	—
E10	Gypsum Reclaimer Belt Dust Collector	—	—	—	2.05E-03	1.09E-03	—	—	—
E11	Limestone & Gypsum Belt to Cement Hopper Dust Collector	6.6%	—	—	8.19E-03	4.34E-03	2.86E-04	—	—
E12	Constituents Belt to Cement Hopper Dust Collector	6.6%	—	—	2.05E-03	1.09E-03	7.14E-05	—	—
E13	Raw Mill Feeding Dust Collector	6.6%	1.42%	—	5.38E-02	2.85E-02	1.87E-03	7.64E-04	—
E14	Raw Meal Airslide Dust Collector	6.6%	1.42%	—	1.60E-02	8.51E-03	5.59E-04	2.28E-04	—
E15	Raw Meal Silo Dust Collector	6.6%	1.42%	—	3.67E-02	1.94E-02	1.28E-03	5.21E-04	—
E16	Raw Meal Silo Extraction Dust Collector	6.6%	1.42%	—	3.67E-02	1.94E-02	1.28E-03	5.21E-04	—
E17	Air Lift Bin Dust Collector	6.6%	1.42%	—	3.67E-02	1.94E-02	1.28E-03	5.21E-04	—
E19	Petcoke Receiving Dust Collector	—	—	—	1.37E-02	7.24E-03	—	—	—

Stack/ Modelling ID	Stack/Source Name	Percent Composition (by Weight) [%]			Emission Rate [g/s]				
		Crystalline Silica	Ferric Oxide	Portland Cement	SPM	PM10	Crystalline Silica	Ferric Oxide	Portland Cement
		14808-60-7	1309-37-1	65997-15-1	N/A-1	N/A-2	14808-60-7	1309-37-1	65997-15-1
E20	Petcoke Silos Loading Bucket Elevator Dust Collector	—	—	—	4.10E-03	2.17E-03	—	—	—
E21	Petcoke (Coarse) Silo Dust Collector - 1	—	—	—	4.10E-03	2.17E-03	—	—	—
E22	Petcoke (Coarse) Silo Dust Collector - 2	—	—	—	4.10E-03	2.17E-03	—	—	—
E23	Petcoke Grinder Dust Collector	—	—	—	1.42E-01	7.55E-02	—	—	—
E24	Petcoke (Pulverized) Silo Dust Collector - 1	—	—	—	1.07E-02	5.66E-03	—	—	—
E25	Petcoke (Pulverized) Silo Dust Collector - 2	—	—	—	1.07E-02	5.66E-03	—	—	—
E26	Alternative Fuel Dust Collector	—	—	—	4.10E-02	2.17E-02	—	—	—
E27	Clinker Cooler Dust Collector	0.5%	—	100%	2.89E-02	1.53E-02	7.65E-05	—	2.89E-02
E28	Clinker Receiving Dust Collector	0.5%	—	100%	3.78E-02	2.00E-02	1.00E-04	—	3.78E-02
E29	Clinker Silo Dust Collector	0.5%	—	100%	6.55E-02	3.47E-02	1.74E-04	—	6.55E-02
E30	Clinker Extraction for Bulk Loading Dust Collector	0.5%	—	100%	6.30E-03	3.34E-03	1.67E-05	—	6.30E-03
E31	Clinker Bulk Loading Dust Collector	0.5%	—	100%	1.89E-02	1.00E-02	5.01E-05	—	1.89E-02
E32	Clinker Extraction for Cement Hopper Dust Collector	0.5%	—	100%	2.52E-02	1.34E-02	6.68E-05	—	2.52E-02
E33	Cement Clinker Hopper Dust Collector	0.5%	—	100%	2.52E-02	1.34E-02	6.68E-05	—	2.52E-02
E34	Cement Limestone Hopper Dust Collector	6.6%	—	—	1.37E-02	7.24E-03	4.76E-04	—	—
E35	Cement Gypsum Hopper Dust Collector	—	—	—	1.37E-02	7.24E-03	—	—	—
E36	Cement 4° Constituent Hopper Dust Collector	0.5%	—	100%	1.37E-02	7.24E-03	3.62E-05	—	1.37E-02
E37	Silica Fume Silo Dust Collector	0.5%	—	—	1.37E-02	7.24E-03	3.62E-05	—	—
E38	Fly Ash Silo Dust Collector	10%	—	—	1.37E-02	7.24E-03	7.24E-04	—	—
E39	Cement Mill Dust Collector - 1	0.3%	—	100.0%	5.83E-01	3.09E-01	9.27E-04	—	5.83E-01
E40	Cement Mill Dust Collector - 2	0.3%	—	100.0%	5.83E-01	3.09E-01	9.27E-04	—	5.83E-01
E41	Cement Mill Air Slide Dust Collector - 1	0.3%	—	100.0%	1.19E-02	6.29E-03	1.89E-05	—	1.19E-02
E42	Cement Mill Air Slide Dust Collector - 2	0.3%	—	100.0%	1.19E-02	6.29E-03	1.89E-05	—	1.19E-02
E43	Cement Silo Dust Collector - 1A	0.3%	—	100.0%	2.45E-02	1.30E-02	3.89E-05	—	2.45E-02
E44	Cement Silo Dust Collector - 2A	0.3%	—	100.0%	2.45E-02	1.30E-02	3.89E-05	—	2.45E-02
E45	Cement Silo Dust Collector - 1B	0.3%	—	100.0%	2.45E-02	1.30E-02	3.89E-05	—	2.45E-02
E46	Cement Silo Dust Collector - 2B	0.3%	—	100.0%	2.45E-02	1.30E-02	3.89E-05	—	2.45E-02
E47	Cement Silo Bulk Loading Dust Collector - 1A-A	0.3%	—	100.0%	2.08E-02	1.10E-02	3.31E-05	—	2.08E-02
E48	Cement Silo Bulk Loading Dust Collector - 1A-B	0.3%	—	100.0%	2.08E-02	1.10E-02	3.31E-05	—	2.08E-02
E49	Cement Silo Bulk Loading Dust Collector - 2A-A	0.3%	—	100.0%	2.08E-02	1.10E-02	3.31E-05	—	2.08E-02
E50	Cement Silo Bulk Loading Dust Collector - 2A-B	0.3%	—	100.0%	2.08E-02	1.10E-02	3.31E-05	—	2.08E-02
E51	Cement Silo Bulk Loading Dust Collector - 1B-A	0.3%	—	100.0%	2.08E-02	1.10E-02	3.31E-05	—	2.08E-02
E52	Cement Silo Bulk Loading Dust Collector - 1B-B	0.3%	—	100.0%	2.08E-02	1.10E-02	3.31E-05	—	2.08E-02
E53	Cement Silo Bulk Loading Dust Collector - 2B-A	0.3%	—	100.0%	2.08E-02	1.10E-02	3.31E-05	—	2.08E-02
E54	Cement Silo Bulk Loading Dust Collector - 2B-B	0.3%	—	100.0%	2.08E-02	1.10E-02	3.31E-05	—	2.08E-02
E55	Packing Plant Dust Collector - A	0.3%	—	100.0%	3.90E-02	2.07E-02	6.20E-05	—	3.90E-02
E56	Packing Plant Dust Collector - B	0.3%	—	100.0%	3.90E-02	2.07E-02	6.20E-05	—	3.90E-02

Kiln - Dust, Carbon Monoxide, Nitrogen Oxides, Ammonia, Sulphur Dioxide, Dioxins & Furans Emissions - E18

Description and Methodology

The exhaust gas from the kiln is equipped with a waste gas treatment system that contains a state-of-the-art hybrid filter. The hybrid filter incorporates both baghouse filtering and an electrostatic precipitator technology into the same housing. The system is able to capture greater 99.99% of all particles sizes. Details of the pollution control system has been provided in Appendix C.

The kiln is proposed to operate 24 hours per day, 7 days per week and up to 11 months per year. The kiln has a daily production rate of 3,000 tons of clinker per day.

Particulate matter (SPM), carbon monoxide (CO), nitrogen oxides (NOx), ammonia (NH3) and sulfur dioxide (SOx) emissions from the waste gas treatment system were estimated based on the maximum outlet loading concentration and the maximum volumetric flow rate (capacity) provided by Colacem. The outlet loading concentrations are considered to be conservative as the waste gas treatment system is equipped with a state-of-the-art hybrid filter. Emissions of PM10 and PM2.5 were estimated based on Table B.2-3 from US EPA AP-42, Appendix B.2 - Generalized Particle Size Distributions. The emissions of Dioxins and Furans were estimated using the in-stack limits from the Canada Wide Status Report, October 2004. In the absence of real source testing data, other relevant trace contaminant emissions have been estimated based on the U.S. EPA's emission factors from Chapter 11.6 Portland Cement Manufacturing, Table 11.6-9: Summary of Noncriteria Pollutant Emission Factors for Portland Cement Kilns. These contaminants are calculated on the Kiln - Non-Dust source sheet.

The data quality has been assumed to be Above Average.

Sample Calculation

NOx Emission Rate = Capacity [Nm³/hr] x Output Concentration [mg/Nm³] x Conversion Factors

$$\text{NOx Emission Rate} = \frac{692{,}780\ \text{Nm}^3}{\text{hr}} \times \frac{1{,}200\ \text{mg}}{\text{Nm}^3} \times \frac{1\ \text{g}}{1000\ \text{mg}} \times \frac{1\ \text{hr}}{3600\ \text{s}}$$

$$\text{NOx Emission Rate} = \frac{2.31\text{E}+02\ \text{g}}{\text{s}}$$

Conversion Factors

1 g =	1000	mg
1 hr =	3600	s
1 day =	24	hr
1 pg =	1.00E-09	mg
deg K =	273.15	+ deg C

Dioxins and Furans In Stack Limit Assumption

Emission Source	In Stack Limit*
Cement Kilns	80

*In-stack expressed in units of pg/m³

Reference: Dioxins and Furans CWS Status Report, October 2004
http://www.ccme.ca/files/Resources/air/dioxins_furans/d_f_2004_sector_status_rpt_e.pdf

Assumed Flow Rate Conditions*

Normalized Temp=	20	C
Normalized Temp=	293	K

*corrected only for temperature

Particle Size Distribution

Particle Size [µm]	Cumulative % Particle Distribution	Fabric Filter Collection Efficiencies
SPM	—	99.5%
PM10	53%	99.5%
PM2.5	18%	99.0%

Reference: Cumulative % Particle Distribution — US EPA AP-42 Appendix B.2 - GENERALIZED PARTICLE SIZE DISTRIBUTIONS, Category 5
Fabric Filter Collection Efficiencies: Table B.2-3

Notes:
- SPM collection efficiency was conservatively assumed to equal the control efficiency of PM10
- SPM inlet emission rate was estimated using the SPM outlet concentration provided by Colacem and the assumed SPM collection efficiency
- PM10 and PM2.5 inlet emission rates were estimated using SPM inlet emission rates and the cumulative % particle distribution
- PM10 and PM2.5 outlet emission rates were estimated using the fabric filter collection efficiencies and their inlet emission rates

Emissions Summary

Stack/Modelling ID	Stack/Source Name	Actual Flow Rate [Am³/hr]	Stack Temperature [°C]	Normalized Flow Rate [Nm³/hr]	Contaminant	CAS	Outlet Concentration [mg/Nm³]	Daily Emission Rate [g/s]
E18	Kiln Dust Collector	1,000,000	150	692,780	SPM	N/A-1	20	3.85E+00
					PM_{10}	N/A-2	—	2.04E+00
					$PM_{2.5}$	N/A-3	—	1.39E+00
					Carbon Monoxide	630-08-0	400	7.70E+01
					Nitrogen Oxides	10102–44–0	1,200	2.31E+02
					Ammonia	7664-41-7	40	7.70E+00
					Sulfur Dioxide	7446-09-5	200	3.85E+01
					Dioxins and Furans (TEQ)	N/A-4	8.00E-08	1.54E-08

Kiln - Inorganics (including Metals) and Organics - E18

Parameters

Daily Throughput = 3,000 ton/day

Methodology

Emissions of organics and inorganics (including metals) were estimated using the method described in the US EPA AP-42 Chapter 11.6 Portland Cement Manufacturing (1/95), Table 11.6-9.
If an emission factor was available for both Fabric Filter (FF) and Electrostatic Percipitator (ESP), the lower value was used since the kiln has a hybrid filter (FF and ESP).

The emitted ions identified in the table have been assumed to be emitted from the kiln as a particulate. Therefore they have not been included in Table 2 - Source Summary Table.

Sample Calculation

Emission Rate [g/s] = Daily Throughput [ton/day] x Emission Factor [lb/ton] x Conversion Factors

Copper Emission Rate [g/s] = $\frac{3{,}000 \text{ ton}}{\text{day}} \times \frac{5.30\text{E-03 lb}}{\text{ton}} \times \frac{454 \text{ g}}{1 \text{ lb}} \times \frac{1 \text{ day}}{24 \text{ hr}} \times \frac{1 \text{ hr}}{3600 \text{ s}}$

Copper Emission Rate [g/s] = $\frac{8.35\text{E-02 g}}{\text{s}}$

Conversion Factors

1 lb =	454	g
1 hr =	3600	s
1 day =	24	hr

Emissions Summary

Source	Contaminant Type	Contaminant	CAS	Emission Factor [lb/ton]	Daily Emission Rate [g/s]	US EPA Data Quality	Comment
E18	Inorganics	Silver	7440-22-4	6.10E-07	9.61E-06	D	—
		Aluminum	7429-90-5	1.30E-02	2.05E-01	E	Assumed to be part of SPM emitted from the kiln
		Arsenic	7440-38-2	1.20E-05	1.89E-04	D	—
		Barium	7440-39-3	3.50E-04	5.51E-03	D	—
		Beryllium	7440-41-7	6.60E-07	1.04E-05	D	—
		Calcium Oxide	1305-78-8	2.40E-01	5.29E+00	E	Calcium emission factor
		Cadmium	7440-43-9	2.20E-06	3.46E-05	D	—
		Chloride	N/A-5	2.10E-03	3.31E-02	D	
		Chromium	7440-47-3	7.70E-06	1.21E-04	E	—
		Copper	7440-50-8	5.30E-03	8.35E-02	E	—
		Hydrogen Fluoride	7664-39-3	9.00E-04	1.49E-02	E	Fluoride emission factor
		Iron	15438-31-0	1.70E-02	2.68E-01	E	Metallic Iron
		Hydrogen Chloride	7647-01-0	4.90E-02	7.72E-01	E	—
		Mercury	7439-97-6	2.40E-05	3.78E-04	D	—
		Potassium	7440-09-7	1.80E-02	2.83E-01	D	—
		Manganese	7439-96-5	8.60E-04	1.35E-02	E	—
		Ammonia	7664-41-7	1.00E-02		E	Calculated with site EF
		Ammonium	N/A-6	1.10E-01	1.73E+00	D	Assumed to be part of SPM emitted from the kiln
		Nitrate	N/A-7	4.60E-03	7.24E-02	E	Assumed to be part of SPM emitted from the kiln
		Sodium	7440-23-5	3.80E-02	5.98E-01	D	Assumed to be part of SPM emitted from the kiln
		Lead	7439-92-1	7.50E-05	1.18E-03	D	—
		Sulfur trioxide	N/A-8	1.40E-02	2.20E-01	D	
		Sulfate	N/A-9	7.20E-03	1.13E-01	D	Assumed to be part of SPM emitted from the kiln
		Selenium	7782-49-2	1.50E-04	2.36E-03	E	—
		Thallium	7440-28-0	5.40E-06	8.50E-05	D	—
		Titanium	7440-32-6	3.70E-04	5.83E-03	E	—
		Zinc	7440-66-6	3.40E-04	5.35E-03	D	—
	Organics	C3 benzenes	N/A-10	2.60E-06	4.09E-05	E	—
		C4 benzenes	N/A-11	6.00E-06	9.45E-05	E	—
		C6 benzenes	N/A-12	9.20E-07	1.45E-05	E	—
		Acenaphthylene	208-96-8	1.20E-04	1.89E-03	E	—
		Acetone	67-64-1	3.70E-04	5.83E-03	D	—
		Benzaldehyde	100-52-7	2.40E-05	3.78E-04	E	—
		Benzene	71-43-2	3.10E-03	4.88E-02	D	—
		Benzo(a)anthracene	56-55-3	4.30E-08	6.77E-07	E	—
		Benzo(a)pyrene	50-32-8	1.30E-07	2.05E-06	E	—
		Benzo(b)fluoranthene	205-99-2	5.60E-07	8.82E-06	E	—
		Benzo(g,h,i)perylene	191-24-2	7.80E-08	1.23E-06	E	—
		Benzo(k)fluoranthene	207-08-9	1.50E-07	2.36E-06	E	—
		Benzoic acid	65-85-0	3.50E-03	5.51E-02	D	—
		Biphenyl	92-52-4	6.10E-06	9.61E-05	E	—
		Bis(2-ethylhexyl)phthalate	117-81-7	9.50E-05	1.50E-03	D	—
		Bromomethane	74-83-9	4.30E-05	6.77E-04	E	—
		Carbon disulfide	75-15-0	1.10E-04	1.73E-03	D	—
		Chlorobenzene	108-90-7	1.60E-05	2.52E-04	D	—
		Chloromethane	74-87-3	3.80E-04	5.98E-03	E	—
		Chrysene	218-01-9	1.60E-07	2.52E-06	E	—
		Di-n-butylphthalate	84-74-2	4.10E-05	6.46E-04	D	—
		Dibenz(a,h)anthracene	53-70-3	6.30E-07	9.92E-06	E	—
		Ethylbenzene	100-41-4	1.90E-05	2.99E-04	D	—
		Fluoranthene	206-44-0	8.80E-06	1.39E-04	E	—
		Fluorene	86-73-7	1.90E-05	2.99E-04	E	—
		Formaldehyde	50-00-0	4.60E-04	7.24E-03	E	—
		Freon 113	76-13-1	5.00E-05	7.87E-04	E	—
		Indeno(1,2,3-cd)pyrene	193-39-5	8.70E-08	1.37E-06	E	—
		Methyl ethyl ketone	78-93-3	3.00E-05	4.72E-04	E	—
		Methylene chloride	75-09-2	4.90E-04	7.72E-03	E	—
		Methylnaphthalene	90-12-0	4.20E-06	6.61E-05	E	—
		Naphthalene	91-20-3	2.20E-04	3.46E-03	D	—
		Phenanthrene	85-01-8	3.90E-04	6.14E-03	E	—
		Phenol	108-95-2	1.10E-04	1.73E-03	D	—
		Pyrene	129-00-0	4.40E-06	6.93E-05	E	—
		Styrene	100-42-5	1.50E-06	2.36E-05	E	—
		Toluene	108-88-3	1.90E-04	2.99E-03	D	—
		Xylenes	1330-20-7	1.30E-04	2.05E-03	D	—

*Calcium has been assessed as Calcium Oxide
** Fluoride has been assessed as Hydrogen Fluoride
*** Metallic iron
The ions identified in the table above have been assumed to be emitted from the kiln as a particulate. Therefore they have not been included in Table 2 - Source Summary Table.

Raw Materials Fugitive Emissions - FUG1 - FUG8

Description and Methodology

The following facility operations have the potential to emit fugitive dust:
- the facility receives various raw materials at the Raw Material Receiving area;
- the facility receives Petcoke at the Petcoke Receiving area; and
- the Petcoke is stored in a below-grade storage area and loaded onto the Petcoke hopper.

All raw material transfers are completed in covered buildings that are equipped with dust collectors (see E1 to E4) and the potential fugitive emissions are conservatively assessed as part of FUG1 - FUG6. Petcoke receiving takes place outside while Petcoke loading onto hopper takes place below grade. These fugitive sources are conservatively assessed as part of FUG7 and FUG8, respectively. These emissions were estimated using the drops equation presented in U.S. EPA Chapter 13.2.4 Aggregate Handling and Storage Piles. With the exception of Petcoke receiving, all materials received at the facility will either be controlled by dust collectors, covered sheds/structures, carried out inside of buildings or in below-grade structures. A control factor of 75% has been applied accordingly.

The emission rate for crystalline silica released from material receiving (silica sand and limestone) were estimated using the percentage of emissions provided in AWMA's article for crystalline silica compared to PM10, which was calculated to be 6.6%. The crystalline silica emissions were calculated by multiplying the estimated emission rate of PM10 by 6.6%. The AWMA article has been provided in Appendix C.

For the purpose of this assessment, worst case material receiving was assumed to occur in November. However, Bauxite is received at its maximum amount in October. The project monthly throughputs can be found in Appendix C. It has been conservatively assumed that all materials will be received simultaneously.

The data quality was assumed to be Above Average.

Specifications and Operating Rate

Fugitive ID	Source Name	Moisture Content (M) [%]	Mean Wind Speed (U) [m/s]	Maximum Monthly Throughput [ton/month]	Maximum Daily Throughput [ton/day]
FUG1	Limestone Receiving	1	1.0	117,739	5352
FUG2	Bauxite Receiving	14	1.0	25,032	1138
FUG3	Shale Receiving	4	1.0	7,729	351
FUG4	Iron Ore Receiving	4.3	1.0	2,045	93
FUG5	Silica Receiving	2.5	1.0	12,789	581
FUG6	Gypsum Receiving	2	1.0	6,955	316
FUG7	Petcoke Receiving	8	8.0	49,565	2253
FUG8	Petcoke Loading to Hopper	8	1.0	49,565	2253

Notes:
1. Trucks bring bauxite and petcoke only two months per year.
2. Moisture Content provided by Colacem on July 20, 2015 (Air and Noise IR).

Parameters

Annual Outdoor Wind Speed = 12.9 km/hr; 8.0 mph — Reference: Environment Canada, 1981 to 2010 Canadian Climate Normals station data - OTTAWA MACDONALD-CARTIER INT'L A

Enclosed/Below Grade Wind Speed = 1.0 mph

Operating Rate = 24 hr/day; 22 days/month

Percentage of crystalline silica in PM10 = 6.6% — Reference: AWMA - PM4 Crystalline Silica Emission Factors and Ambient Concentrations at Aggregate-Producing Sources in California (Richards et al., 2012)

Percent Fe_2O_3 in Iron Ore = 100% — Assumed concentration

Assumed Emission Control = 75% — Reference: Enclosed or Below Grade

Conversion Factors

1 g =	1000 mg
1 hr =	3600 s
1 lb =	454 g

Methodology

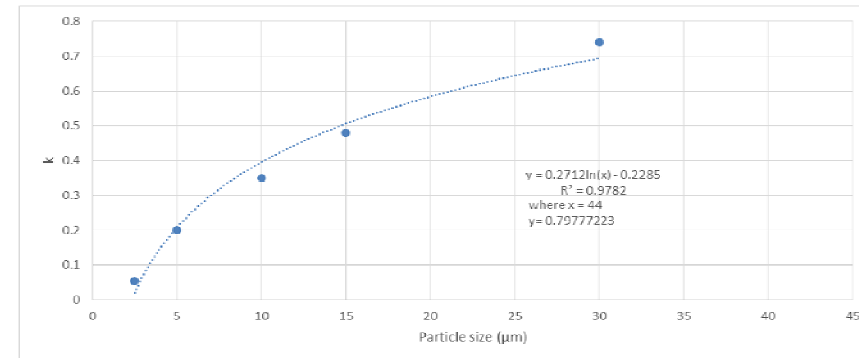
Reference: US EPA AP-42, Chapter 13.2.4 Aggregate Handling and Storage Piles

$$EF = \frac{k \quad 0.0032 \left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}$$

Where:
- EF = Emission Factor (lb/ton)
- k = Particle sized multiplier (dimesionless)
- U = Mean wind speed (mph)
- M = Material moisture content (%)

Aerodynamic Particle Size Multiplier (*k*)			
PM44	**PM30**	**PM10**	**PM2.5**
0.8	0.74	0.35	0.053

Where k for PM<44 µm was extrapolated using the logarithmic regression for the particle size versus particle size multiplier (k).



Sample Calculations - FUG1

Emission Factor [lb/ton]

$$\text{SPM Emission Factor} = \frac{0.8 \quad 0.0032 \left(\frac{1.0}{5}\right)^{1.3}}{\left(\frac{1}{2}\right)^{1.4}}$$

$$\text{SPM Emission Factor} = \frac{8.34E\text{-}04 \ \text{lb}}{\text{ton}}$$

Emission Rate [g/s]

SPM Emission Rate = Emission Factor [lb/ton] x Movement Rate [ton/hr] x Conversion Factors

$$\text{SPM Emission Rate} = \frac{8.34E\text{-}04 \ \text{lb}}{\text{ton}} \left| \frac{5352 \ \text{ton}}{\text{day}} \right| \frac{454 \ \text{g}}{\text{lb}} \left| \frac{1 \ \text{day}}{24 \ \text{hr}} \right| \frac{1 \ \text{hr}}{3600 \ \text{s}} \left| (100\% - 75\%) \right.$$

$$\text{SPM Emission Rate} = \frac{5.86E\text{-}03 \ \text{g}}{\text{s}}$$

Emissions Summary

Stack ID	Source Name	Moisture Content (M) [%]	Mean Wind Speed (U) [m/s]	Maximum Daily Throughput [ton/day]	SPM Emission Factor [lb/ton]	Emission Control Efficiency [%]	Daily Emission Rate [g/s]				
							SPM	**PM_{10}**	**$PM_{2.5}$**	**Crystalline Silica**	**Ferric Oxide**
							N/A-1	**N/A-2**	**N/A-3**	**14808-60-7**	**1309-37-1**
FUG1	Limestone Receiving	1	1.0	5352	7.71E-04	75%	5.42E-03	2.56E-03	3.88E-04	1.68E-04	—
FUG2	Bauxite Receiving	14	1.0	1138	1.92E-05		2.86E-05	1.35E-05	2.05E-06	—	—
FUG3	Shale Receiving	4	1.0	351	1.11E-04		5.11E-05	2.41E-05	3.66E-06	—	—
FUG4	Iron Ore Receiving	4.3	1.0	93	1.00E-04		1.22E-05	5.77E-06	8.74E-07	—	1.22E-05
FUG5	Silica Receiving	2.5	1.0	581	2.14E-04		1.63E-04	7.72E-05	1.17E-05	5.07E-06	—
FUG6	Gypsum Receiving	2	1.0	316	2.92E-04		1.21E-04	5.73E-05	8.68E-06	—	—
FUG7	Petcoke Receiving	8	8.0	2253	6.28E-04	0%	7.43E-03	3.51E-03	5.32E-04	—	—
FUG8	Petcoke Loading to Hopper	8	1.0	2253	4.20E-05	75%	1.24E-04	5.87E-05	8.89E-06	—	—

Paved Road Dust Emissions

Description and Methodology

All roads at the facility will be paved. It has been assumed that any potential dust emissions will be mitigated; therefore a control efficiency of 80% has been applied to emissions from paved roads. Emissions of particulate matter (SPM, PM10 and PM2.5) were estimated using the method described in the US EPA AP-42 Chapter 13.2.1 Paved Roads (11/06) using the equation for an industrial site.

Type of Vehicle	Truck Capacity [ton]	Empty Truck Weight [ton]	Maximum Truck Weight [ton]	Mean Truck Weight [ton]
On-Highway	39	21	60	41
Off-Highway	65	44	109	77

Notes: On-Highway: On-highway truck paramters were used for truck with higher mean weight
Off-Highway: http://www.perlini-equipment.com/index.php?option=com_content&view=article&id=74&Itemid=102

Paved Roads Control Efficiency = 80%

Methodology

PM emissions due to vehicle traffic on paved roads are estimated using the method described in the US EPA AP-42 Chapter 13.2.1 Paved Roads (11/06) as per the following equation:

$$E = k\,(sL)^{0.91}(W)^{1.02}$$

Where:
E = Emission Factor [g/VKT]
k = Particle size multiplier
sL = Road Surface Silt Loading [g/m²]
W = Average Vehicle Weight [tons]

Table 13.2.1-1: Particle Size Multipliers for Paved Road Equation

Constant	PM2.5	PM10	PM30
k [g/VKT]	0.15	0.62	3.23

Note: SPM = PM30

Mean Road Surface Silt Loading (sL) 2 g/m²

Conversion Factors

1 hr = 3600 s
1 day = 24 hr

Emission Factors

Contaminant	CAS	Particle Size Multiplier [g/VKT]	Road Surface Silt Loading [g/m²]	Control Efficiency	On-Highway Vehicle: Average Vehicle Weight [tons]	On-Highway Vehicle: Emission Factor [g/VKT]	Off-Highway Vehicle: Average Vehicle Weight [tons]	Off-Highway Vehicle: Emission Factor [g/VKT]	Total Emissions (g/s)
SPM	N/A-1	3.23	2	80%	41	265	77	506	3.74E-01
PM10	N/A-2	0.62	2	80%	41	51	77	97	7.17E-02
PM2.5	N/A-3	0.15	2	80%	41	12	77	24	1.74E-02

Sample Calculation - Daily SPM Emission Rate for RS-11

The following parameters were used to calculate Emission rates of SPM:

k = 3.23 g/VKT
sL = 2 g/m²
W = 77 tons

SPM Emission Factor

$$EF = \frac{3.23\ g}{VKT}\left(\frac{2\ g}{m^2}\right)^{0.91}(77\ tons)^{1.02}$$

$$EF = \frac{506\ g}{VKT}$$

SPM Emission Rate (Daily)

$$ER_{PM} = \frac{506\ g}{VKT} \times \frac{7\ VKT}{day} \times \frac{1\ day}{24\ hour} \times \frac{1\ hr}{3600\ s} \times 20\%^{*}$$

$$ER_{PM} = \frac{8.72E\text{-}03\ g}{s}$$

*The factor of 0.20 represents an emissions reduction factor of 80% due to the implementation of the Facility's dust control practices.

Paved Road Dust Emissions Calculations

Table C4-1: Road Lengths of Segments

Segment ID	Segment #	IDs	# of Model Segments [Count]	Model Spacing	Road Length [km]
RS-1	1	CT, SF, AF, RM, PC	8	16.7	0.13
RS-2	2	CT, SF, AF, RM, PC	7	22.0	0.15
RS-3	3	CT, SF, AF, RM, PC	7	16.7	0.12
RS-4	4	PC, RM	61	16.7	1.02
RS-5	5	CT	23	11.3	0.26
RS-6	6	PC	76	11.3	0.86
RS-7	7	RM	22	11.3	0.25
RS-8	8	AF	3	11.3	0.03
RS-9	9	SF	29	11.3	0.33
RS-10	10	CT, SF, AF, PC	18	16.7	0.30
RS-11	11	LS	8	11.3	0.09

Table C4-2: Truck Throughputs

Truck Activities	Code	Truck Trips/Month	Days/Month	Hours/Day	Trips/Day	Trips/hour
Limestone	LS	1,811.4	22	8	82.3	10.3
Petcoke	PC		3	24	0.0	0.0
Iron	RM	58.4	22	8	2.7	0.3
Bauxite	RM		3	24	0.0	0.0
Shale	RM	220.8	22	8	10.0	1.3
Gypsum	RM	198.7	3	24	66.2	2.8
Silica	RM	365.4	22	8	16.6	2.1
Silica fume and fly ash	SF	119.1	22	8	5.4	0.7
Cement Truck	CT	3,476.3	22	8	158.0	19.8
LS cement	LSC	94.4	22	8	4.3	0.5

Notes: Limestone is based on maximum throughput and 65-ton trucks.
Alternative FUels and Limestone Cement were not considered.
Assumed Pet Coke represents worst-case scenario.

Table C4-3: VKT/hour

Activity Code	LS	PC	RM	AF	SF	CT	Trips/hour/segment	Road Length [km]	VKT/hour
Segment/# Trips-hr	10.3	0.0	6.4	0.0	0.7	19.8			
RS-1	No	Yes x 2	Yes x 2	Yes x 2	Yes x 2	Yes x 2	54	0.13	7
RS-2	No	Yes x 2	Yes x 2	Yes x 2	Yes x 2	Yes x 2	54	0.15	8
RS-3	No	Yes x 1	Yes x 2	Yes x 2	Yes x 2	Yes x 2	54	0.12	6
RS-4	No	Yes x 1	Yes x 2	No	No	No	13	1.02	13
RS-5	No	No	No	No	No	Yes x 1	20	0.26	5
RS-6	No	Yes x 1	No	No	No	No	0	0.86	0
RS-7	No	No	Yes x 2	No	No	No	13	0.25	3
RS-8	No	No	No	Yes x 1	Yes x 1	No	0.68	0.03	0
RS-9	No	No	No	No	Yes x 1	Yes x 1	20	0.33	7
RS-10	No	Yes x 1	No	No	Yes x 1	Yes x 1	20	0.30	6
RS-11	Yes x 1	No	No	No	No	No	10	0.09	1

Note: any trucks travelling in both directions (i.e., Yes x 2) take the same route for both directions of travel.

Table C4-4: VKT/day

Activity Code	LS	PC	RM	AF	SF	CT	Trips/day/segment	Road Length [km]	VKT/day
Segment/# Trips-hr	82.3	0.0	95.5	0.0	5.4	158.0			
RS-1	No	Yes x 2	Yes x 2	Yes x 2	Yes x 2	Yes x 2	518	0.1336	69.20
RS-2	No	Yes x 2	Yes x 2	Yes x 2	Yes x 2	Yes x 2	518	0.154	79.76
RS-3	No	Yes x 1	Yes x 2	Yes x 2	Yes x 2	Yes x 2	518	0.1169	60.55
RS-4	No	Yes x 1	Yes x 2	No	No	No	191	1.0187	194.65
RS-5	No	No	No	No	No	Yes x 1	158	0.2599	41.07
RS-6	No	Yes x 1	No	No	No	No	0	0.8588	0.00
RS-7	No	No	Yes x 2	No	No	No	191	0.2486	47.50
RS-8	No	No	No	Yes x 1	Yes x 1	No	5	0.0339	0.18
RS-9	No	No	No	No	Yes x 1	Yes x 1	163	0.3277	53.55
RS-10	No	Yes x 1	No	No	Yes x 1	Yes x 1	163	0.3006	49.13
RS-11	Yes x 1	No	No	No	No	No	82	0.0904	7.44

Table C4-6: Emissions Summary - Daily Road Dust and Tailpipe

Paved Roads Control Efficiency = 80%

Activity Code	VKT/day	Road Dust [g/s]		
		SPM	PM10	PM2.5
		265	51	12
RS-1	69	4.24E-02	8.14E-03	1.97E-03
RS-2	80	4.89E-02	9.38E-03	2.27E-03
RS-3	61	3.71E-02	7.12E-03	1.72E-03
RS-4	195	1.1927E-01	2.29E-02	5.54E-03
RS-5	41	2.52E-02	4.83E-03	1.17E-03
RS-6	0	0.00E+00	0.00E+00	0.00E+00
RS-7	47.5	2.91E-02	5.59E-03	1.35E-03
RS-8	0	1.12E-04	2.16E-05	5.22E-06
RS-9	54	3.28E-02	6.30E-03	1.52E-03
RS-10	49	3.01E-02	5.78E-03	1.40E-03
		3.65E-01	**7.00E-02**	**1.69E-02**
Limestone Trucks		506	97	24
RS-11	7	8.72E-03	1.67E-03	4.05E-04

Conversion Factors

1 hr =	3600	s
1 day =	24	hr

Colacem Canada Quarry- Dust Collectors (Lime and Asphalt Plants)

Description and Methodology

The Lime Plant is permitted to operate 24 hours per day, 7 days per week and up to 12 months per year. However, it generally only operates 12 hours per day, from September to December. The lime plant has a daily production rate of 432 tons per day. The Asphalt Plant is permitted to operate 24 hours per day, 7 days per week and up to 12 months per year. However, it generally only operates 12 hours per day, from May to December. The Asphalt plant has a daily production rate of 1400 tons per day.

Particulate matter (SPM) emissions from the system were estimated based on the maximum volumetric flow rate (capacity) provided by Colacem and the maximum outlet loading concentration from the MOECC Procedure Document. The outlet loading concentrations are considered to be conservative as the system is equipped with a bag filter. Emissions of PM10 and PM2.5 were estimated based on the relative emissions of PM10 and PM2.5 to SPM reported under the NPRI.

Sample Calculation

SPM Emission Rate = Capacity [Nm³/hr] x Output Concentration [mg/Nm³] x Conversion Factors

$$\text{SPM Emission Rate} = \frac{47{,}137\ \text{Nm}^3}{\text{hr}} \times \frac{20\ \text{mg}}{\text{Nm}^3} \times \frac{1\ \text{g}}{1000\ \text{mg}} \times \frac{1\ \text{hr}}{3600\ \text{s}}$$

$$\text{SPM Emission Rate} = 2.62\text{E-01}\ \frac{\text{g}}{\text{s}}$$

Conversion Factors

1 g =	1000 mg
1 tonne =	1000000 g
1 hr =	3600 s
1 day =	24 hr
deg K =	273.15 + deg C

Assumed Flow Rate Conditions*

Normalized Temp=	20 C
Normalized Temp=	293 K

*corrected only for temperature

Particle Size Distribution

Particle Size [µm]	Cumulative % Particle Distribution
SPM	—
PM10	40%
PM2.5	17%

Notes:
- SPM inlet emission rate was estimated using the SPM outlet concentration of 20 mg/m3 from the MOECC ESDM Procedure Document.
- PM10 and PM2.5 inlet emission rates were estimated using SPM inlet emission rates and the cumulative % particle distribution
- Particle size distribution of PM10 is calculated as the amount of PM10 reported from Colacem Quarry to the NPRI divided by the total amount of SPM reported to the NPRI. PM2.5 is calculated as PM2.5 reported divided by the PM10 reported.

Emissions Summary

Stack/Modelling ID	Stack/Source Name	Stack Diameter [m]	Exit Flow Rate [m³/s]	Actual Flow Rate [Am³/hr]	Stack Temperature [°C]	Normalized Flow Rate [Nm³/hr]	Hours of operation per day	Days of operation per year	Contaminant	CAS	Outlet Concentration [mg/Nm³]	Emission Rate [g/hr]	Annual emissions [tonne/year]	Emission Rate [g/s]
QUARE1	Lime Plant Dust Collector	1.69	18.9	68,040	150	47,137	12	120	SPM	N/A-1	20	9.43E+02	1.36E+00	2.62E-01
									PM_{10}	N/A-2	—	3.77E+02	5.43E-01	1.05E-01
									$PM_{2.5}$	N/A-3	—	6.49E+01	9.35E-02	1.80E-02
QUARE2	Asphalt Plant Dust Collector	1.69	18.9	68,040	150	47,137	12	240	SPM	N/A-1	20	9.43E+02	2.72E+00	2.62E-01
									PM_{10}	N/A-2	—	3.77E+02	1.09E+00	1.05E-01
									$PM_{2.5}$	N/A-3	—	6.49E+01	1.87E-01	1.80E-02

Made by: LGE
Checked by: CST

Colacem Canada Quarry - Open Pit

Description and Methodology

All other activities on site at the quarry are modelled within the Quarry Pit. The dimensions of the quarry pit were obtained from Colacem Canada Inc. The quarry is assumed to operate 24 hours per day, 365 days per year. Calculated emissions of SPM, PM10 and PM2.5 from the two dust collectors are subtracted from the total reported SPM, PM10 and PM2.5 to the NPRI total to obtain emission rates from the quarry pit.

Sample Calculation

SPM Emission Rate = (Total NPRI SPM emissions [tonnes/year] - Lime Plant SPM emissions [tonnes/year] - Asphalt Plant SPM emissions [tonnes/year])x Conversion Factors

$$\text{SPM Emission Rate} = \left(\frac{14\ \text{tonne}}{\text{year}} - \frac{1.4\ \text{tonne}}{\text{year}} - \frac{2.7\ \text{tonne}}{\text{year}}\right) \times \frac{1000000\ \text{g}}{\text{tonne}} \times \frac{1\ \text{year}}{365\ \text{day}} \times \frac{1\ \text{day}}{10\ \text{hours}} \times \frac{1\ \text{hour}}{3600\ \text{s}}$$

$$\text{SPM Emission Rate} = 7.56\text{E-01}\ \frac{\text{g}}{\text{s}}$$

	SPM	PM10	PM2.5
Total Emissions from Colacem Quarry (tonne/year)	1.40E+01	5.60E+00	9.64E-01
Total Emissions from Dust Collectors (tonne/year)	4.07E+00	1.63E+00	2.80E-01
Unassigned emissions - Pits (tonnes/yr)	9.93E+00	3.97E+00	6.84E-01

Stack/Modelling ID	Stack/Source Name	Hours of operation per day	Days of operation per year	Contaminant	CAS	Emission Rate [g/s]	Location [x]	Location [y]	Release Height [m]	Length of Side [m]	Width of Side [m]	Pit Volume [m3]	Pit Area [m2]	Depth of Pit [m]	
QUARPit1	Main Pit	10	365	SPM	N/A-1	7.56E-01	518428.77	5049470.75	2	93	93	139200	8699	16	8.69E-05
				PM_{10}	N/A-2	3.02E-01									3.47E-05
				$PM_{2.5}$	N/A-3	5.20E-02									5.98E-06

Made by: LGE
Checked by: CST

Ivaco Rolling Mills - Main Stack

Description and Methodology

All emissions from Ivaco Rolling Mills is assumed to be emitted from the main stack of Ivaco Rolling Mills. The facility is assumed to operate 24 hours per day, 365 days per year.

Sample Calculation

SPM Emission Rate Total NPRI SPM emissions [tonnes/year]x Conversion Factors

SPM Emission Rate =

$$\frac{172 \text{ tonne}}{\text{year}} \times \frac{1000000 \text{ g}}{\text{tonne}} \times \frac{1 \text{ year}}{365 \text{ day}} \times \frac{1 \text{ day}}{24 \text{ hours}} \times \frac{1 \text{ hour}}{3600 \text{ s}}$$

SPM Emission Rate =

$$\frac{5.45E+00 \text{ g}}{\text{s}}$$

Stack/Modelling ID	Stack/Source Name	Location [x]	Location [y]	Release Height [m]	Stack Temperature [°K]	Stack Inside Diameter [m]	Stack Exit Velocity [m/s]	Contaminant	CAS	Emission Rate [g/s]
IRME1	Main Stack	522776.03	5051223.47	35	333.15	4.5	15	SPM	N/A-1	5.45E+00
								PM_{10}	N/A-2	2.22E+00
								$PM_{2.5}$	N/A-3	1.11E+00
								Carbon monoxide	630-08-0	1.87E+00
								Dioxins and furans - total (TEQ)	N/A-4	4.12E-08
								Nitrogen oxides (expressed as NO2)	10102-44-0	3.61E+00
								Sulphur dioxide	7446-09-5	9.83E-01

Made by: LGE
Checked by: CST

APPENDIX C

Model Sources

Appendix C
Model Sources

Modelling ID	Source ID(s)	Source Type	Modelling Source Data					Emission Data			
			Release Height [m]	Initial Lateral Dimension [m]	Initial Vertical Dimension [m]	Centroid X-Coordinate [m]	Centroid Y-Coordinate [m]	Contaminant	CAS No.	Maximum Emission Rate [g/s]	Averaging Period [hours]
Raw Materials Receiving											
V1	FUG1, FUG3, FUG4, FUG5	Volume	15	5.8	4.7	518709.4	5049927.7	SPM	N/A-1	5.64E-03	24, Annual
								PM10	N/A-2	2.67E-03	24
								PM2.5	N/A-3	4.04E-04	24, Annual
V2	FUG2	Volume	15	2.2	4.7	518707.8	5049952.7	SPM	N/A-1	2.86E-05	24, Annual
								PM10	N/A-2	1.35E-05	24
								PM2.5	N/A-3	2.05E-06	24, Annual
V3	FUG6	Volume	15	2.2	4.7	518698.5	5049900.1	SPM	N/A-1	1.21E-04	24, Annual
								PM10	N/A-2	5.73E-05	24
								PM2.5	N/A-3	8.68E-06	24, Annual
V4	FUG7	Volume	1.5	1.3	1.4	518755.7	5049809.8	SPM	N/A-1	7.43E-03	24, Annual
								PM10	N/A-2	3.51E-03	24
								PM2.5	N/A-3	5.32E-04	24, Annual
V5	FUG8	Volume	0	1.3	1.4	518843.5	5049633.9	SPM	N/A-1	1.24E-04	24, Annual
								PM10	N/A-2	5.87E-05	24
								PM2.5	N/A-3	8.89E-06	24, Annual

Modelling ID	Source ID(s)	Source Type	Modelling Source Data						Emission Data			
			Stack Height Above Grade [m]	Stack Gas Exit Velocity [m/s]	Stack Gas Exit Temperature [K]	Stack Inner Diameter [m]	Source X-Coordinate [m]	Source Y-Coordinate [m]	Contaminant	CAS No.	Maximum Emission Rate [g/s]	Averaging Period [hours]
Raw Materials Receiving												
E1	E1	Point	15	14.15	Ambient	0.5	518710	5049945	SPM	N/A-1	1.37E-02	24, Annual
									PM10	N/A-2	7.24E-03	24
									PM2.5	N/A-3	4.92E-03	24, Annual
E2	E2	Point	15	14.15	Ambient	0.5	518705	5049918	SPM	N/A-1	1.37E-02	24, Annual
									PM10	N/A-2	7.24E-03	24
									PM2.5	N/A-3	4.92E-03	24, Annual
E3	E3	Point	15	14.15	Ambient	0.5	518702	5049893	SPM	N/A-1	1.37E-02	24, Annual
									PM10	N/A-2	7.24E-03	24
									PM2.5	N/A-3	4.92E-03	24, Annual
E4	E4	Point	20	14.69	Ambient	0.85	518713	5049929	SPM	N/A-1	4.10E-02	24, Annual
									PM10	N/A-2	2.17E-02	24
									PM2.5	N/A-3	1.47E-02	24, Annual
Raw Materials Storage and Transfers												
E5	E5	Point	5	11.79	Ambient	0.3	518824	5050007	SPM	N/A-1	1.08E-02	24, Annual
									PM10	N/A-2	5.70E-03	24
									PM2.5	N/A-3	3.87E-03	24, Annual
E6	E6	Point	26	14.44	Ambient	0.35	518834	5049980	SPM	N/A-1	1.79E-02	24, Annual
									PM10	N/A-2	9.50E-03	24
									PM2.5	N/A-3	6.45E-03	24, Annual
E7	E7	Point	26	14.44	Ambient	0.35	518837	5049971	SPM	N/A-1	1.79E-02	24, Annual
									PM10	N/A-2	9.50E-03	24
									PM2.5	N/A-3	6.45E-03	24, Annual
E8	E8	Point	5	11.79	Ambient	0.3	518835	5049976	SPM	N/A-1	1.08E-02	24, Annual
									PM10	N/A-2	5.70E-03	24
									PM2.5	N/A-3	3.87E-03	24, Annual
E9	E9	Point	5	11.79	Ambient	0.3	518839	5049967	SPM	N/A-1	1.08E-02	24, Annual
									PM10	N/A-2	5.70E-03	24
									PM2.5	N/A-3	3.87E-03	24, Annual
E10	E10	Point	5	11.79	Ambient	0.3	518841	5049962	SPM	N/A-1	2.05E-03	24, Annual
									PM10	N/A-2	1.09E-03	24
									PM2.5	N/A-3	7.37E-04	24, Annual
E11	E11	Point	5	11.79	Ambient	0.3	518752	5049938	SPM	N/A-1	8.19E-03	24, Annual
									PM10	N/A-2	4.34E-03	24
									PM2.5	N/A-3	2.95E-03	24, Annual
E12	E12	Point	5	11.79	Ambient	0.3	518755	5049932	SPM	N/A-1	2.05E-03	24, Annual
									PM10	N/A-2	1.09E-03	24
									PM2.5	N/A-3	7.37E-04	24, Annual
Raw Mill												
E13	E13	Point	20	14.74	Ambient	0.6	518887	5049824	SPM	N/A-1	5.38E-02	24, Annual
									PM10	N/A-2	2.85E-02	24
									PM2.5	N/A-3	1.94E-02	24, Annual
E14	E14	Point	15	14.44	333.15	0.35	518926	5049778	SPM	N/A-1	1.60E-02	24, Annual
									PM10	N/A-2	8.51E-03	24
									PM2.5	N/A-3	5.78E-03	24, Annual
E15	E15	Point	65	14.15	333.15	0.5	518940	5049780	SPM	N/A-1	3.67E-02	24, Annual
									PM10	N/A-2	1.94E-02	24
									PM2.5	N/A-3	1.32E-02	24, Annual
E16	E16	Point	15	14.15	333.15	0.5	518934	5049773	SPM	N/A-1	3.67E-02	24, Annual
									PM10	N/A-2	1.94E-02	24
									PM2.5	N/A-3	1.32E-02	24, Annual
E17	E17	Point	15	14.15	333.15	0.5	518922	5049762	SPM	N/A-1	3.67E-02	24, Annual
									PM10	N/A-2	1.94E-02	24
									PM2.5	N/A-3	1.32E-02	24, Annual
Kiln												
E18	E18	Point	125	14.15	423.15	5	518903	5049756	SPM	N/A-1	4.22E+00	24, Annual
									PM10	N/A-2	2.11E+00	24
									PM2.5	N/A-3	1.40E+00	24, Annual
									Carbon Monoxide	630-08-0	7.70E+01	1,8
									Nitrogen Oxides	10102-44-0	2.31E+02	1, 24, Annual
									Sulfur Dioxide	7446-09-5	3.85E+01	1, 24, Annual
									Dioxins and Furans (TEQ)	N/A-4	1.54E-08	24
E27	E27	Point	10	14.15	423.15	0.5	518948	5049665	SPM	N/A-1	2.89E-02	24, Annual
									PM10	N/A-2	1.53E-02	24
									PM2.5	N/A-3	1.04E-02	24, Annual
Petcoke Receiving and Grinding												
E19	E19	Point	10	14.15	Ambient	0.5	518846	5049630	SPM	N/A-1	1.37E-02	24, Annual
									PM10	N/A-2	7.24E-03	24
									PM2.5	N/A-3	4.92E-03	24, Annual
E20	E20	Point	10	11.79	Ambient	0.3	518922	5049656	SPM	N/A-1	4.10E-03	24, Annual
									PM10	N/A-2	2.17E-03	24
									PM2.5	N/A-3	1.47E-03	24, Annual
E21	E21	Point	35	11.79	Ambient	0.3	518933	5049663	SPM	N/A-1	4.10E-03	24, Annual
									PM10	N/A-2	2.17E-03	24
									PM2.5	N/A-3	1.47E-03	24, Annual
E22	E22	Point	35	11.79	Ambient	0.3	518928	5049661	SPM	N/A-1	4.10E-03	24, Annual
									PM10	N/A-2	2.17E-03	24
									PM2.5	N/A-3	1.47E-03	24, Annual
E23	E23	Point	35	13.58	343.15	1.25	518921	5049691	SPM	N/A-1	1.42E-01	24, Annual
									PM10	N/A-2	7.55E-02	24
									PM2.5	N/A-3	5.13E-02	24, Annual
E24	E24	Point	35	11.79	343.15	0.3	518939	5049654	SPM	N/A-1	1.07E-02	24, Annual
									PM10	N/A-2	5.66E-03	24
									PM2.5	N/A-3	3.85E-03	24, Annual
E25	E25	Point	35	11.79	343.15	0.3	518931	5049654	SPM	N/A-1	1.07E-02	24, Annual
									PM10	N/A-2	5.66E-03	24
									PM2.5	N/A-3	3.85E-03	24, Annual
Clinker Storage and Transfer												
E28	E28	Point	10	14.69	323.15	0.85	518982	5049672	SPM	N/A-1	3.78E-02	24, Annual
									PM10	N/A-2	2.00E-02	24
									PM2.5	N/A-3	1.36E-02	24, Annual
E29	E29	Point	75	14.44	373.15	0.7	518984	5049574	SPM	N/A-1	6.55E-02	24, Annual
									PM10	N/A-2	3.47E-02	24
									PM2.5	N/A-3	2.36E-02	24, Annual
E30	E30	Point	10	14.44	323.15	0.35	518996	5049545	SPM	N/A-1	6.30E-03	24, Annual
									PM10	N/A-2	3.34E-03	24
									PM2.5	N/A-3	2.27E-03	24, Annual
E31	E31	Point	27	14.74	323.15	0.6	518999	5049514	SPM	N/A-1	1.89E-02	24, Annual
									PM10	N/A-2	1.00E-02	24
									PM2.5	N/A-3	6.81E-03	24, Annual
E32	E32	Point	10	14.15	323.15	0.5	518959	5049559	SPM	N/A-1	2.52E-02	24, Annual
									PM10	N/A-2	1.34E-02	24
									PM2.5	N/A-3	9.08E-03	24, Annual
Cement Mill												
E33	E33	Point	36	14.15	323.15	0.5	518913	5049542	SPM	N/A-1	2.52E-02	24, Annual
									PM10	N/A-2	1.34E-02	24
									PM2.5	N/A-3	9.08E-03	24, Annual
E34	E34	Point	36	14.44	Ambient	0.35	518905	5049539	SPM	N/A-1	1.37E-02	24, Annual
									PM10	N/A-2	7.24E-03	24
									PM2.5	N/A-3	4.92E-03	24, Annual
E35	E35	Point	36	14.44	Ambient	0.35	518901	5049538	SPM	N/A-1	1.37E-02	24, Annual
									PM10	N/A-2	7.24E-03	24
									PM2.5	N/A-3	4.92E-03	24, Annual
E36	E36	Point	36	14.44	Ambient	0.35	518893	5049535	SPM	N/A-1	1.37E-02	24, Annual

									PM10	N/A-2	7.24E-03	24
									PM2.5	N/A-3	4.92E-03	24, Annual
E37	E37	Point	36	14.44	Ambient	0.35	518912	5049552	SPM	N/A-1	1.37E-02	24, Annual
									PM10	N/A-2	7.24E-03	24
									PM2.5	N/A-3	4.92E-03	24, Annual
E38	E38	Point	36	14.44	Ambient	0.35	518903	5049549	SPM	N/A-1	1.37E-02	24, Annual
									PM10	N/A-2	7.24E-03	24
									PM2.5	N/A-3	4.92E-03	24, Annual
E39	E39	Point	40	14.71	363.15	2.5	518909	5049530	SPM	N/A-1	5.83E-01	24, Annual
									PM10	N/A-2	3.09E-01	24
									PM2.5	N/A-3	2.10E-01	24, Annual
E40	E40	Point	40	14.71	363.15	2.5	518905	5049528	SPM	N/A-1	5.83E-01	24, Annual
									PM10	N/A-2	3.09E-01	24
									PM2.5	N/A-3	2.10E-01	24, Annual
E41	E41	Point	15	14.44	343.15	0.35	518917	5049472	SPM	N/A-1	1.19E-02	24, Annual
									PM10	N/A-2	6.29E-03	24
									PM2.5	N/A-3	4.27E-03	24, Annual
E42	E42	Point	15	14.44	343.15	0.35	518913	5049470	SPM	N/A-1	1.19E-02	24, Annual
									PM10	N/A-2	6.29E-03	24
									PM2.5	N/A-3	4.27E-03	24, Annual
Finished Cement												
E43	E43	Point	62	14.15	333.15	0.5	518944	5049472	SPM	N/A-1	2.45E-02	24, Annual
									PM10	N/A-2	1.30E-02	24
									PM2.5	N/A-3	8.80E-03	24, Annual
E44	E44	Point	62	14.15	333.15	0.5	518913	5049461	SPM	N/A-1	2.45E-02	24, Annual
									PM10	N/A-2	1.30E-02	24
									PM2.5	N/A-3	8.80E-03	24, Annual
E45	E45	Point	62	14.15	333.15	0.5	518955	5049441	SPM	N/A-1	2.45E-02	24, Annual
									PM10	N/A-2	1.30E-02	24
									PM2.5	N/A-3	8.80E-03	24, Annual
E46	E46	Point	62	14.15	333.15	0.5	518925	5049430	SPM	N/A-1	2.45E-02	24, Annual
									PM10	N/A-2	1.30E-02	24
									PM2.5	N/A-3	8.80E-03	24, Annual
E47	E47	Point	15	13.97	313.15	0.45	518948	5049471	SPM	N/A-1	2.08E-02	24, Annual
									PM10	N/A-2	1.10E-02	24
									PM2.5	N/A-3	7.49E-03	24, Annual
E48	E48	Point	15	13.97	313.15	0.45	518952	5049468	SPM	N/A-1	2.08E-02	24, Annual
									PM10	N/A-2	1.10E-02	24
									PM2.5	N/A-3	7.49E-03	24, Annual
E49	E49	Point	15	13.97	313.15	0.45	518918	5049460	SPM	N/A-1	2.08E-02	24, Annual
									PM10	N/A-2	1.10E-02	24
									PM2.5	N/A-3	7.49E-03	24, Annual
E50	E50	Point	15	13.97	313.15	0.45	518921	5049457	SPM	N/A-1	2.08E-02	24, Annual
									PM10	N/A-2	1.10E-02	24
									PM2.5	N/A-3	7.49E-03	24, Annual
E51	E51	Point	15	13.97	313.15	0.45	518959	5049441	SPM	N/A-1	2.08E-02	24, Annual
									PM10	N/A-2	1.10E-02	24
									PM2.5	N/A-3	7.49E-03	24, Annual
E52	E52	Point	15	13.97	313.15	0.45	518963	5049437	SPM	N/A-1	2.08E-02	24, Annual
									PM10	N/A-2	1.10E-02	24
									PM2.5	N/A-3	7.49E-03	24, Annual
E53	E53	Point	15	13.97	313.15	0.45	518929	5049430	SPM	N/A-1	2.08E-02	24, Annual
									PM10	N/A-2	1.10E-02	24
									PM2.5	N/A-3	7.49E-03	24, Annual
E54	E54	Point	15	13.97	313.15	0.45	518933	5049426	SPM	N/A-1	2.08E-02	24, Annual
									PM10	N/A-2	1.10E-02	24
									PM2.5	N/A-3	7.49E-03	24, Annual
Cement Packaging												
E55	E55	Point	20	14.69	313.15	0.85	518933	5049382	SPM	N/A-1	3.90E-02	24, Annual
									PM10	N/A-2	2.07E-02	24
									PM2.5	N/A-3	1.40E-02	24, Annual
E56	E56	Point	20	14.69	313.15	0.85	518935	5049377	SPM	N/A-1	3.90E-02	24, Annual
									PM10	N/A-2	2.07E-02	24
									PM2.5	N/A-3	1.40E-02	24, Annual
Alternative Fuels												
E26	E26	Point	20	14.15	Ambient	0.5	518950.362	5049662.285	SPM	N/A-1	4.10E-02	24, Annual
									PM10	N/A-2	2.17E-02	24
									PM2.5	N/A-3	1.47E-02	24, Annual

Ivaco Rolling Mills

			Modelling Source Data						Emission Data			
Modelling ID	**Source ID(s)**	**Source Type**	**Stack Height Above Grade [m]**	**Stack Gas Exit Velocity [m/s]**	**Stack Gas Exit Temperature [K]**	**Stack Inner Diameter [m]**	**Source X-Coordinate [m]**	**Source Y-Coordinate [m]**	**Contaminant**	**CAS No.**	**Maximum Emission Rate [g/s]**	**Averaging Period [hours]**
IRME1	IRME1	Point	35	15	333.15	4.5	522776	5051223	SPM	N/A-1	5.45E+00	24, Annual
									PM10	N/A-2	2.22E+00	24
									PM2.5	N/A-3	1.11E+00	24, Annual
									Carbon monoxide	630-08-0	1.87E+00	1, 8
									Dioxins and furans - total (TEQ)	N/A-4	4.12E-08	24
									Nitrogen oxides (expressed as NO2)	10102-44-0	3.61E+00	1, 24, Annual
									Sulphur dioxide	7446-09-5	9.83E-01	1, 24, Annual

QUARRY

			Modelling Source Data						Emission Data			
Modelling ID	**Source ID(s)**	**Source Type**	**Stack Height Above Grade [m]**	**Stack Gas Exit Velocity [m/s]**	**Stack Gas Exit Temperature [K]**	**Stack Inner Diameter [m]**	**Source X-Coordinate [m]**	**Source Y-Coordinate [m]**	**Contaminant**	**CAS No.**	**Maximum Emission Rate [g/s]**	**Averaging Period [hours]**
QUARE1	QUARE1	Point	8.4	8.4	150	1.69	518758	5049197	SPM	N/A-1	2.62E-01	24, Annual
									PM10	N/A-2	1.05E-01	24
									PM2.5	N/A-3	1.80E-02	24, Annual
QUARE2	QUARE2	Point	9	8.4	150	1.69	518723	5049162	SPM	N/A-1	2.62E-01	24, Annual
									PM10	N/A-2	1.05E-01	24
									PM2.5	N/A-3	1.80E-02	24, Annual

			Modelling Source Data						Emission Data			
Modelling ID	**Source ID(s)**	**Source Type**	**Release Height [m]**	**Length of Side [m]**	**Width of Side [m]**	**Volume of Pit [m3]**	**Centroid X-Coordinate [m]**	**Centroid Y-Coordinate [m]**	**Contaminant**	**CAS No.**	**Maximum Emission Rate [g/s]**	**Averaging Period [hours]**
QUARPit1	QUARPit1	Pit	3	93.3	93.3	139200	518429	5049471	SPM	N/A-1	7.56E-01	24, Annual
									PM10	N/A-2	3.02E-01	24
									PM2.5	N/A-3	5.20E-02	24, Annual

Note: Emission rates of SPM, PM10 and PM2.5 from the Kiln (E18) include emissions from paved roads

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