BCX ENVIRONMENTAL CONSULTING

Executive Summary and EST – February 2021

St. Marys Cement Inc. (Canada) – Bowmanville Cement Plant

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EXECUTIVE SUMMARY

This Emission Summary and Dispersion Modelling (ESDM) Report is being submitted by St. Marys Cement Inc. [Canada] (SMC) in support of an Alternative Low-Carbon Fuel Application under Ontario Regulation (O. Reg.) 79/15 to amend their Environmental Compliance Approval (ECA) with Limited Operational Flexibility (LOF), ECA number 0469-9YUNSK, dated November 25, 2015, including Notice No. 1 dated June 21, 2017 and Notice No. 2 dated May 8, 2019, for their Portland cement manufacturing plant (Facility) located in Bowmanville, Ontario.

The site-wide ESDM Report has been prepared in accordance with Section 26 of O. Reg. 419/05; the Ministry of the Environment, Conservation and Park's (Ministry's) *Procedure for Preparing an Emission Summary and Dispersion Modelling Report (March 2018)*; the Ministry's *Air Dispersion Modelling Guideline for Ontario (February 2017) and Basic Comprehensive Certificates of Approval (Air) User Guide (March 2011)*.

The Facility is located at 410 Bowmanville Avenue in Bowmanville, Ontario. The plant produces Portland cement by combining materials bearing calcium carbonate, silica, alumina and iron oxide at high temperatures to produce cement clinker. The clinker is subsequently ground with finishing materials such as gypsum and limestone to produce cement.

The Facility is currently approved to use up to 96 tonnes per day of a limited suite of low carbon fuels (ALCF) as follows:

- Woodwaste (referred to as Clean Wood in this report) as defined in O. Reg. 347/90; and
- Low Carbon Fuels (referred to in the report as LCF) defined as woody biomass consisting mainly of wood chips with some fragments of plastic, shingles, laminate, surface coatings obtained from industrial and post-consumer sources such as construction and demolition waste, which does not contain asbestos and hazardous waste as defined under O. Reg. 347/90, and contains:
    a) Less than 10% non-woody material such as plastic, shingles, laminate, surface coatings and other material;
    b) Less than 5% treated wood;
    c) Less than or equal to 1% total halogen content; and
    d) Less than 25% moisture by weight

The Facility is applying under O. Reg. 79/15 and to amend their existing ECA (air) with LOF to support the following:

- Expanding the list of approved fuels to allow ALCF (referred to in this report as ALCF-2019 to reflect the demonstration study) defined as biomass, cellulosic and plastic materials derived from industrial and/or post-consumer sources, which cannot be recycled, are not considered hazardous and are not derived from animals or the processing and preparations of food, based on the recent demonstration project at the Facility;
- Increasing the replacement of conventional fuels (coal, petroleum coke) currently used at the Facility from 96 tonnes of clean wood/LCF per day, to 400 tonnes of clean wood/LCF/ALCF-2019 per day;

- Installing new equipment at the Facility to accommodate the increased quantity of clean wood/LCF/ALCF-2019; and
- Increasing the capacity of the current alternative fuels storage at the Facility using enclosed containers and buildings.

In addition, the Facility would like to request the following environmentally insignificant changes in the ECA (air):

- Replacing 1000˚C in the back end of the kiln, referenced in Condition 12.2.1 (b) and Schedule E with 800˚C at the top of Cyclone K5; and
- Adding total hydrocarbon (THC) in the gases leaving the kiln stack in Condition 10.3.

The primary emissions from this Facility are particulate, nitrogen oxides, sulphur dioxide and carbon monoxide. These primary emissions along with trace amounts of metals/metal oxides and organic compounds as well as ammonia and hydrogen chloride are generated from the use/processing of raw materials and the combustion of fuel required for cement production.

Emissions of both primary and trace contaminants were estimated using a combination of published emission factors, stack test results, mass balance, and manufacturer's performance specifications. With respect to the kiln stack emissions, the highest emission rate from the use of conventional fuel, clean wood/LCF and ALCF-2019 was very conservatively assumed for the maximum emissions scenario.

Maximum emissions were modelled for all contaminants using the Ministry approved US EPA AERMOD system (Version 19191) using site-specific meteorological data provided by the Ministry in combination with the CALPUFF model (Version 7) to assess shoreline fumigation for the kiln stack.

The resulting Point-of-Impingement (POI) concentrations were compared to the standards, guidelines and screening levels in the Ministry Air Contaminants Benchmark (ACB) List, dated April 2018 as summarized in Table ES-1 below.

Table ES-1 Emission Summary Table

Contaminant Name	CAS #	Total Facility Emission Rate (g/s)	Air Dispersion Model(s) Used	Maximum POI Concentration (ug/m^3)	Averaging Period Emission Rate	Averaging Period POI Concentration	Ministry POI Limit (µg/m^3)	Limiting Effect	Regulation Schedule #	Percentage of Ministry POI Limit (%)
Particulate										
PM	PM	1.07E+01	CALPUFF/AERMOD	9.76E+01	24 hr	24 hr	120	Visibility	Standard	81.4%
RCS	14808-60-7	3.06E-01	AERMOD	3.98E+00	24 hr	24 hr	120	Visibility	Standard	3.3%
Combustion Gases										
Nitrogen Oxides	10102-44-0	1.10E+02	CALPUFF/AERMOD	2.84E+02	1 hr	1 hr	400	Health	Standard	71.0%
Nitrogen Oxides	10102-44-0	9.92E+01	CALPUFF/AERMOD	1.63E+02	24 hr	24 hr	200	Health	Standard	81.7%
Sulphur Dioxide	7446-09-5	1.69E+02	CALPUFF/AERMOD	4.75E+02	1 hr	1 hr	690	Health & Vegetation	Standard	68.9%
Sulphur Dioxide	7446-09-5	1.69E+02	CALPUFF/AERMOD	2.10E+02	24 hr	24 hr	275	Health & Vegetation	Standard	76.5%
Carbon Monoxide	630-08-0	1.70E+02	CALPUFF/AERMOD	3.25E+03	1 hr	0.5 hr	6000	Health	Standard	54.2%
Ammonia										
Ammonia	7664-41-7	5.95E+00	CALPUFF	7.00E+00	24 hr	24 hr	100	Health	Standard	7.0%
Hydrogen Chloride										
Hydrogen Chloride	7647-01-0	1.90E+00	CALPUFF	2.24E+00	24 hr	24 hr	20	Health	Standard	11.2%
Metals and Metal Oxides										
Aluminum	7429-90-5	6.07E-02	CALPUFF	7.14E-02	24 hr	24 hr	12	Health	SL-JSL	0.6%
Aluminum Oxide	1344-28-1	1.15E-01	CALPUFF	1.35E-01	24 hr	24 hr	120	Particulate	Guideline	0.1%
Antimony	7440-36-0	8.58E-04	CALPUFF/AERMOD	1.30E-03	24 hr	24 hr	25	Health	Standard	<0.1%
Arsenic	7440-38-2	2.71E-04	CALPUFF/AERMOD	1.49E-03	24 hr	24 hr	0.3	Health	Guideline	0.5%
Barium	7440-39-3	4.82E-03	CALPUFF/AERMOD	4.41E-02	24 hr	24 hr	10	Health	Guideline	0.4%
Beryllium	7440-41-7	5.52E-05	CALPUFF/AERMOD	1.39E-04	24 hr	24 hr	0.01	Health	Standard	1.4%
Cadmium	7440-43-9	5.72E-05	CALPUFF/AERMOD	2.23E-04	24 hr	24 hr	0.025	Health	Standard	0.9%
Calcium Oxide	1305-78-8	9.69E-01	CALPUFF	1.14E+00	24 hr	24 hr	10	Corrosion	Standard	11.4%
Chromium	7440-47-3	1.17E-03	CALPUFF/AERMOD	7.47E-03	24 hr	24 hr	0.5	Health	Standard	1.5%
Cobalt	7440-48-4	3.49E-04	CALPUFF/AERMOD	2.91E-03	24 hr	24 hr	0.1	Health	Guideline	2.9%
Iron	7439-89-6	4.56E-02	CALPUFF	5.36E-02	24 hr	24 hr	4	Health	Standard	1.3%
Ferric Oxide	1309-37-1	5.44E-01	CALPUFF/AERMOD	5.32E+00	24 hr	24 hr	25	Soiling	Standard	21.3%
Lead	7439-92-1	1.89E-03	CALPUFF/AERMOD	2.86E-03	24 hr	30 day	0.2	Health	Standard	1.4%
Lead	7439-92-1	1.89E-03	CALPUFF/AERMOD	7.40E-03	24 hr	24 hr	0.5	Health	Standard	1.5%
Manganese	7439-96-5	1.15E-02	CALPUFF/AERMOD	1.32E-01	24 hr	24 hr	0.4	Health	Standard	33.0%
Mercury	7439-97-6	7.67E-04	CALPUFF/AERMOD	1.17E-03	24 hr	24 hr	2	Health	Standard	<0.1%
Nickel	7440-02-0	5.49E-03	CALPUFF/AERMOD	8.84E-03	Annual	Annual	0.04	Health	Standard	22.1%
Nickel	7440-02-0	5.49E-03	CALPUFF/AERMOD	8.84E-03	24 hr	Annual	0.4	Health	AAV	2.2%
Nickel	7440-02-0	5.49E-03	CALPUFF/AERMOD	6.92E-02	24 hr	24 hr	2	Health	URT/DAV	3.5%
Phosphorus	7723-14-0	2.56E-02	CALPUFF	3.01E-02	24 hr	24 hr	0.5	Health	SL-MD	6.0%
Potassium	7440-09-7	1.07E-01	CALPUFF	1.26E-01	24 hr	24 hr	1	Health	SL-JSL	12.6%
Selenium	7782-49-2	5.93E-04	CALPUFF/AERMOD	1.15E-03	24 hr	24 hr	10	Health	Guideline	<0.1%
Silver	7440-22-4	4.00E-04	CALPUFF/AERMOD	1.00E-03	24 hr	24 hr	1	Health	Standard	0.1%
Tin	7440-31-5	1.25E-02	CALPUFF/AERMOD	1.67E-02	24 hr	24 hr	10	Health	Standard	0.2%
Vanadium	7440-62-2	6.78E-04	CALPUFF/AERMOD	1.01E-02	24 hr	24 hr	2	Health	Standard	0.5%
Volatile Organic Matter										
Acrolein	107-02-8	1.90E-02	CALPUFF	2.24E-02	24 hr	24 hr	0.4	Health	Standard	5.6%
Acrolein	107-02-8	1.90E-02	CALPUFF	1.00E-01	1 hr	1 hr	4.5	Health	Standard	2.2%
Benzene	71-43-2	3.56E-01	CALPUFF	5.00E-02	Annual	Annual	0.45	Health	Standard	11.1%
Benzene	71-43-2	3.56E-01	CALPUFF	5.00E-02	24 hr	Annual	4.5	Health	AAV	1.1%
Benzene	71-43-2	3.56E-01	CALPUFF	4.19E-01	24 hr	24 hr	100	Health	URT/DAV	0.4%
1,3-Butadiene	106-99-0	6.73E-02	CALPUFF	9.45E-03	Annual	Annual	2	Health	Standard	0.5%
1,3-Butadiene	106-99-0	6.73E-02	AERMOD	9.45E-03	24 hr	Annual	20	Health	AAV	<0.1%
1,3-Butadiene	106-99-0	6.73E-02	AERMOD	7.92E-02	24 hr	24 hr	300	Health	URT/DAV	<0.1%
Dibromochloromethane	124-48-1	1.56E-04	CALPUFF	1.83E-04	24 hr	24 hr	0.2	Health	SL-JSL	<0.1%
Ethylbenzene	100-41-4	5.37E-02	CALPUFF	4.67E-01	1 hr	10 min	1900	Odour	Guideline	<0.1%
Mesitylene	108-67-8	2.02E-01	CALPUFF	2.38E-01	24 hr	24 hr	220	Health	Standard	0.1%
1,1,2,2-Tetrachloroethane	79-34-5	2.41E-04	CALPUFF	2.83E-04	24 hr	24 hr	0.1	Health	SL-JSL	0.3%
1,1,2-Trichloroethane	79-00-5	2.77E-04	CALPUFF	3.25E-04	24 hr	24 hr	0.3	Health	SL-JSL	0.1%
Vinyl Chloride	75-01-4	1.86E-03	CALPUFF	2.18E-03	24 hr	24 hr	1	Health	Standard	0.2%
Xylene	1330-20-7	2.58E-01	CALPUFF	1.22E+00	24 hr	10 min	3000	Odour	Guideline	<0.1%
Dioxins, Furans and Dioxin-like PCBs										
Dioxins, Furans and Dioxin-like PCBs	CDD	2.88E-09	CALPUFF	3.39E-09	24 hr	24 hr	1E-07	Health	Standard	3.4%
Polycyclic Aromatic Hydrocarbons (PAHs)										
Benzo(a)pyrene	50-32-8	2.54E-05	CALPUFF	3.56E-06	Annual	Annual	0.00001	Health	Standard	35.6%
Benzo(a)pyrene	50-32-8	2.54E-05	CALPUFF	3.56E-06	24 hr	Annual	0.0001	Health	AAV	3.6%
Benzo(a)pyrene	50-32-8	2.54E-05	CALPUFF	2.99E-05	24 hr	24 hr	0.005	Health	URT/DAV	0.6%
Biphenyl	92-52-4	1.57E-02	CALPUFF	8.24E-02	1 hr	1 hr	60	Odour	Guideline	0.1%
2-Chloronaphthalene	91-58-7	1.19E-03	CALPUFF	1.39E-03	24 hr	24 hr	1	Health	SL-JSL	0.1%
1-Methylnaphthalene	90-12-0	4.64E-02	CALPUFF	5.46E-02	24 hr	24 hr	35.5	Health	SL-JSL	0.2%
Naphthalene	91-20-3	8.94E-02	CALPUFF	4.23E-01	24 hr	10 min	50	Odour	Guideline	0.8%
Naphthalene	91-20-3	8.94E-02	CALPUFF	1.05E-01	24 hr	24 hr	22.5	Health	Guideline	0.5%

JSL - Jurisdictional Screening Level; URT - Upper Risk Threshold; AAV - Annual Assessment Values; DAV - Daily Assessment Values