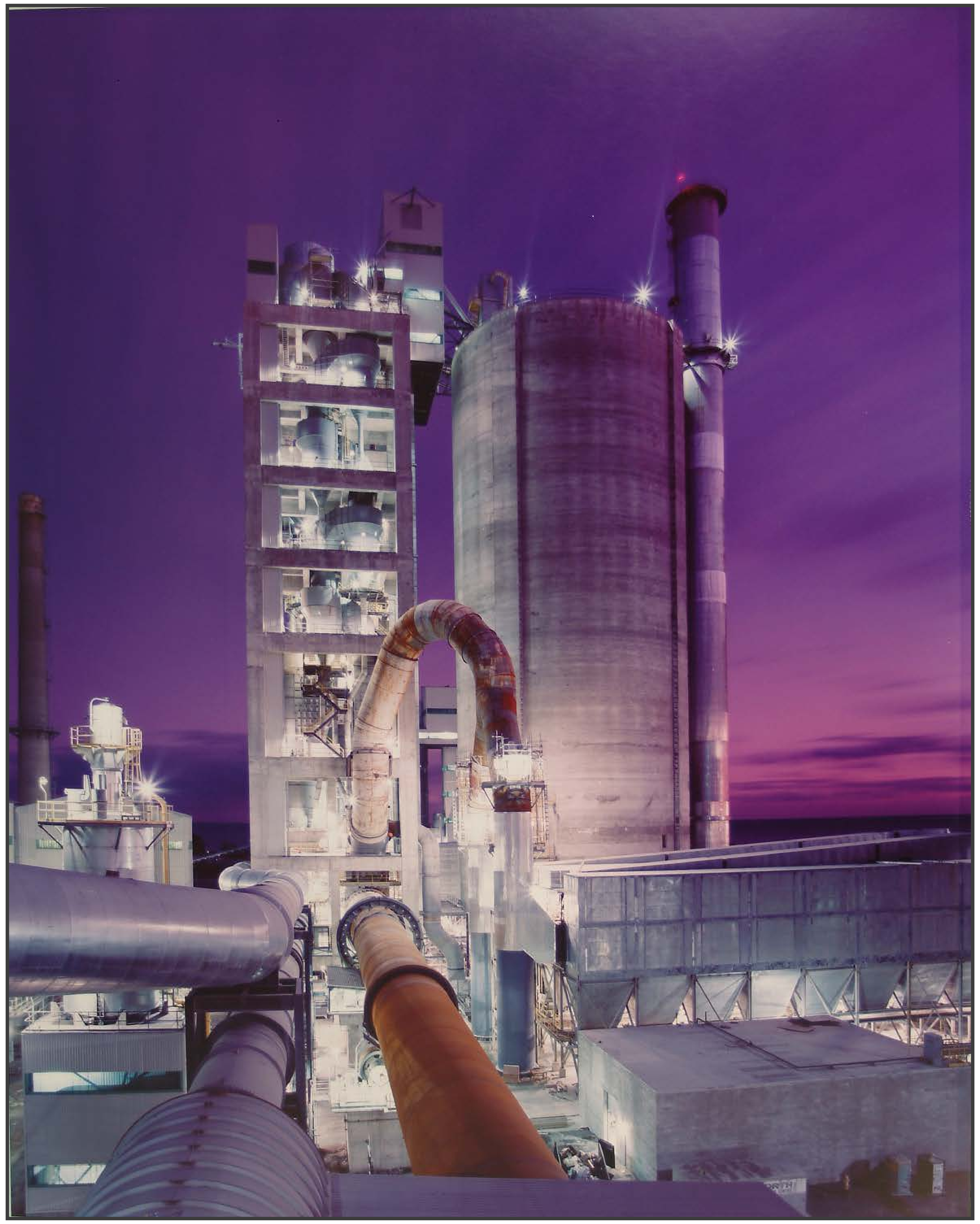
Welcome to Public Meeting #2

Alternative Low Carbon Fuel Use at St Marys Cement Bowmanville Plant

Tuesday December 17, 2019



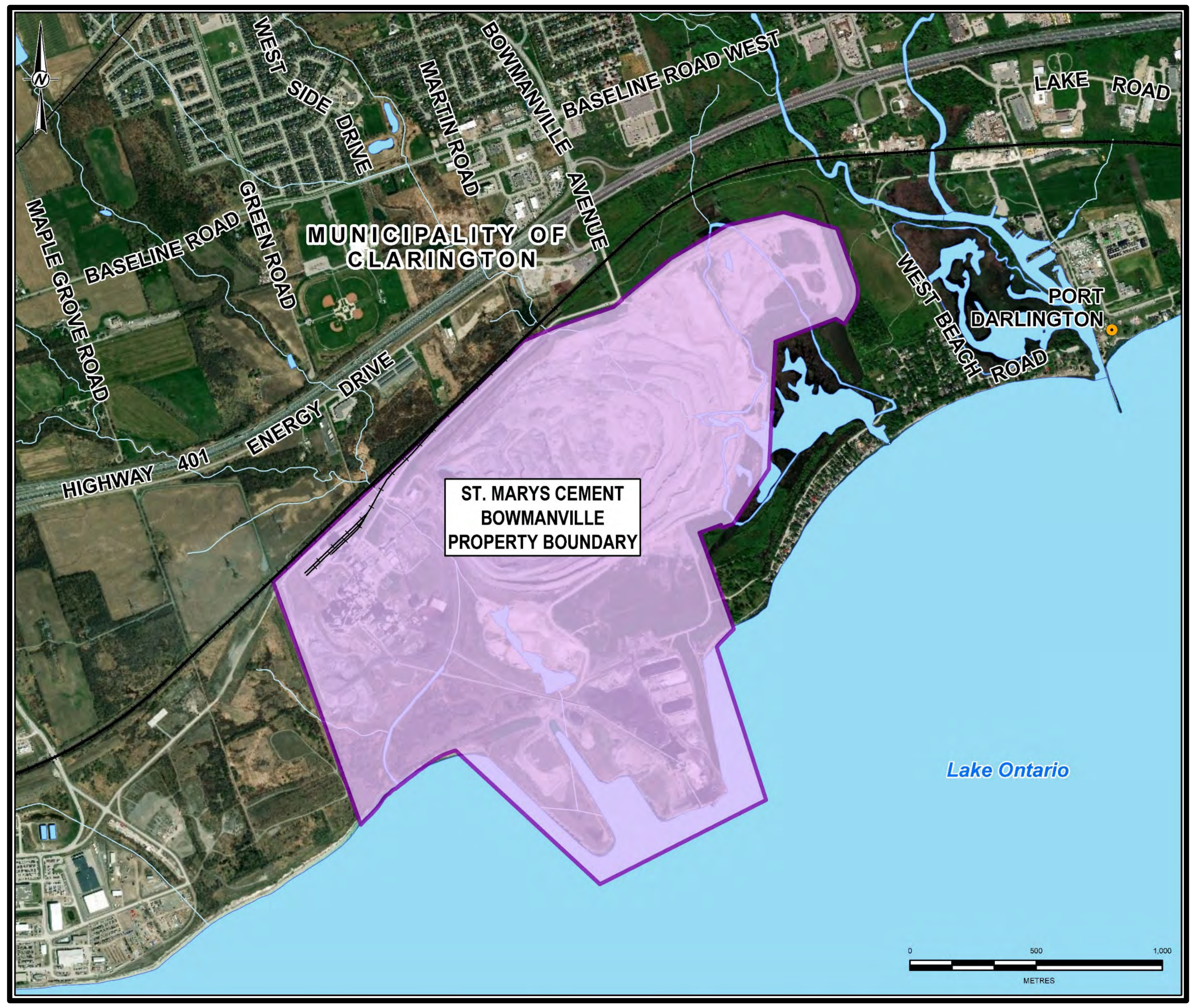
Votorantim Cimentos

St Marys Cement

St Marys Cement Bowmanville Plant

Site Overview

- St Marys Cement Bowmanville Plant (SMCB) is located at 410 Bowmanville Avenue, in Bowmanville, Ontario, within the Municipality of Clarington
- SMCB extracts limestone at the site, produces clinker and cement for the Ontario market and also exports to the US
- The cement produced at the plant contributes to building infrastructure (e.g. roads, bridges, buildings) across Ontario and North America:
  - Examples of projects include the CN Tower, Darlington Nuclear Station and Toronto-York Spadina Subway Extension



Site Facts

- Started operations over 50 years ago in 1968
- Upgraded in 1988 to modernize the plant to state of the art technology; dry process and preheater/precalciner kiln
- Current clinker capacity: 1,800,000 tonnes per year
- Current cement capacity: 1,250,000 tonnes per year
- Produces four types of cement:
  - General Use Type GU Cement
  - Contempra Type GUL Portland Limestone Cement
  - ASTM General Use Type I Cement
  - ASSTM General Use Type III Cement

Cement and Concrete Industry in Ontario

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Why is the cement industry important for Ontario?

- **The cement industry is a vital participant in Ontario's economy**
  - **54,000** direct and indirect jobs across Ontario
  - Generates over **$25 billion** in direct, indirect and induced economic activity
- **Six Cement Plants across Ontario**
  - St Marys Cement (St Marys, Bowmanville)
  - Lafarge (Bath)
  - Lehigh (Picton)
  - CRH (Mississauga)
  - Federal White (Woodstock)
- **Concrete operations across Ontario**
  - **285** ready mixed concrete plants
  - **20** precast concrete plants
  - **11** concrete pipe plants

- **Industry's priorities:**
  - Deliver solutions that stimulate the economy, create jobs and protect taxpayer investment
  - Innovation to enhance competitiveness and attract Ontario investment
  - Protect the environment for future generations by embracing innovation and focusing on initiatives that deliver results and build climate-resilient communities

1 cubic metre

Estimated amount of concrete per Canadian used per year to build our homes, office towers and public spaces; pave our roads, highways, sidewalks and parking lots; construct sewers and water treatment facilities; build our bridges, ports, airports, dams, power plants and oil wells.

Source: Cement Association of Canada (2019)

Concrete is the second substance used most in the world after water

St Marys Cement and Your Community

Votorantim Cimentos St Marys Cement

How does SMC participate in your community?

- **The site contributes to local jobs employing:**
  - 132 plant employees
  - 9 CBM Aggregates (a company of Votorantim Cimentos North America) employees
  - 11 dock employees
- **SMCB contributes to the local economy by working with numerous suppliers and contractors and creating in-direct jobs (e.g. truck drivers, electricians, millwrights, skill professionals)**
- **SMCB participates in local initiatives such as:**
  - Community Relations Committee
  - Clarington Board of Trade
  - Hospital Foundation
  - Partner with local schools
  - Clarington Family Safety Day
  - Take your Kid to Work Day
  - LAV Monument
  - Bowmanville fish ladder
  - Outdoor Classrooms

Project Overview

What is St. Marys Cement Proposing?

- As part of St Marys Cement's (SMC) strategy to reduce greenhouse gases (GHGs) and in keeping with best practices implemented around the world, SMC has prepared studies to support the preparation of an Alternative Low Carbon Fuel (ALCF) Application under Ontario Regulation (O. Reg) 79/15 of the *Environmental Protection Act* to expand the current use of ALCFs at the site.
- SMCB is proposing the following:
  - Add woody biomass, cellulosic and plastic materials from the recent demonstration project at the Site to the approved list of ALCFs at the Site with the intention to substitute conventional fuels (coal and petroleum coke) to approximately 30% thermal replacement. These materials:
    - Are derived from industrial and/or post-consumer sources
    - Cannot be recycled
    - Are not hazardous
    - Are not derived from animals
    - Are not derived from the processing and preparations of food,
  - The 30% thermal replacement will result in an increased throughput of ALCFs at the Site from approximately 96 tonnes per day to 400 tonnes per day
  - Install new equipment at the Site to accommodate the ALCFs
  - Increase the capacity of the current alternative fuels storage at the Site using enclosed containers and buildings

Enclosed ALCF Storage Container and Building

Alternative Low Carbon Fuels

What is Ontario Regulation (O. Reg) 79/15?

- O. Reg 79/15, Alternative Low Carbon Fuels, came into force as of May 1, 2015 under the *Environmental Protection Act*
- The Ontario Government put this regulation in place to:
  - Promote reduction of greenhouse gases (GHGs)
  - Help reduce the use of coal and petroleum coke in Ontario
  - Regulate the use of Alternative Low Carbon Fuels (ALCFs)
- The regulation defines the framework and controls for facilities that want to use the ALCFs in terms of types and quantity of materials that can be used

ALCF materials on conveyor belt

What is an Alternative Low Carbon Fuel (ALCF)?

ALCFs are fuels that have a carbon dioxide emission intensity, which is less than coal or petroleum coke when combusted, and meet one of the two following descriptions:

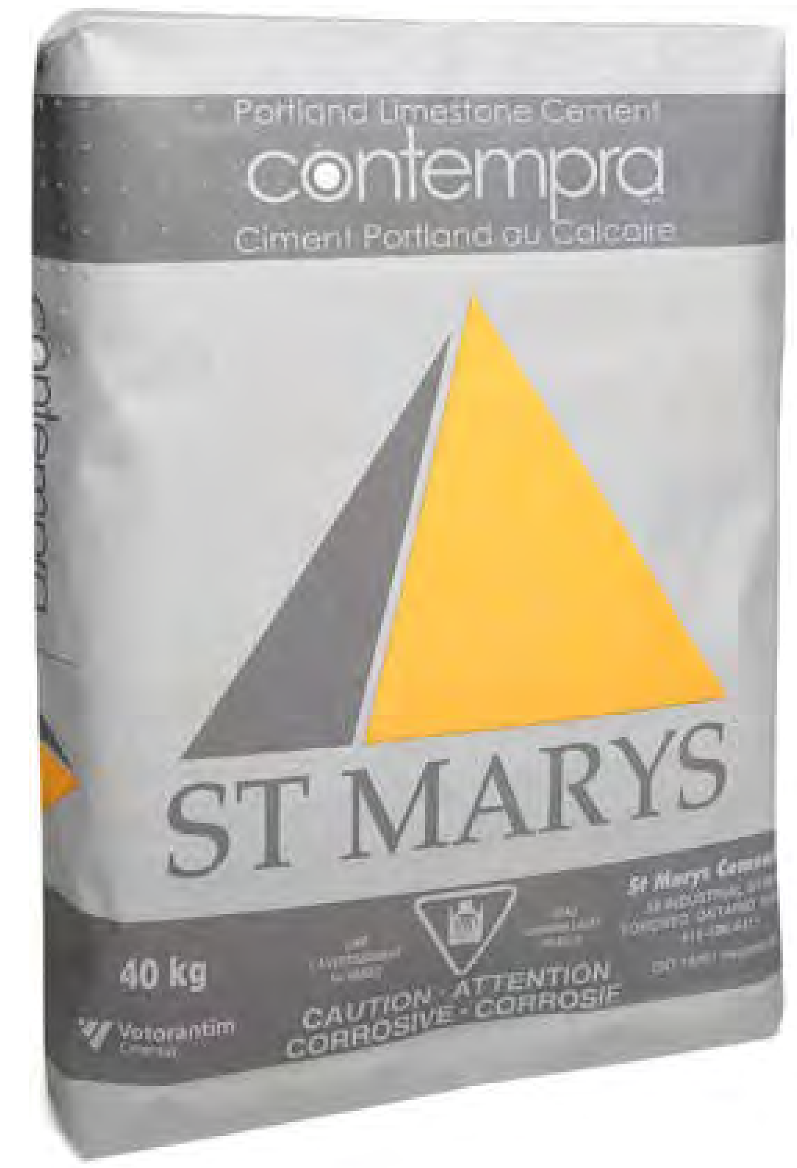
1. The fuel:
   - Must not be considered hazardous and must not be derived from animals or the processing and preparation of food
   - Must be wholly derived from (or composed of) materials that are biomass or municipal waste or a combination of both, and
   - Must have a high heat value of at least 10,000 megajoules per tonne if it is not derived from or composed of materials that are solid biomass.
2. The fuel must be derived from or composed of organic matter, (not including peat or peat derivatives), derived from a plant or micro-organism and grown or harvested for the purpose of being used as a fuel

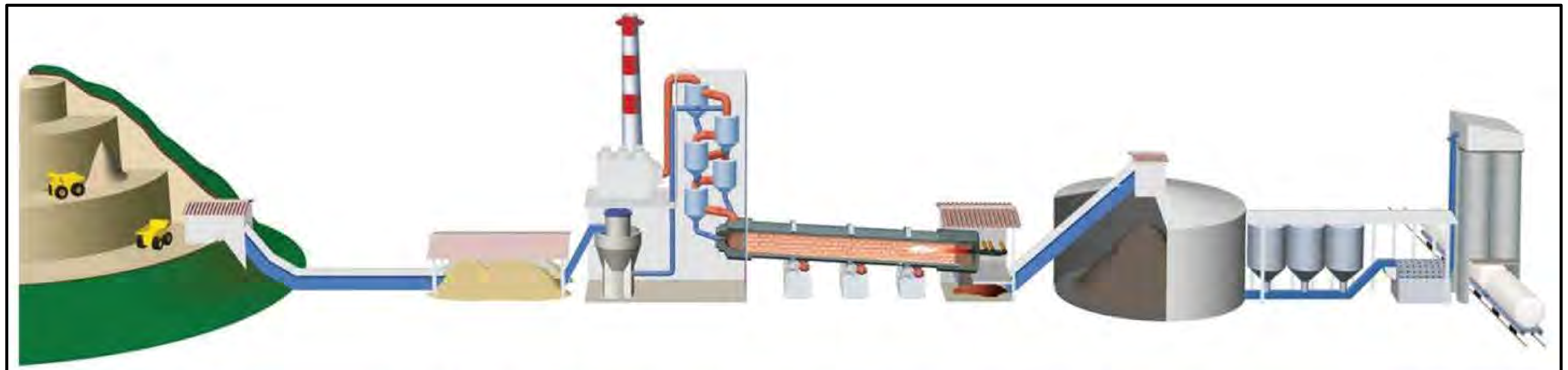
Enclosed ALCF Storage Container

Cement Production Process

How is Cement Made?

- At the Site, SMC produces Portland cements
  - Limestone that contains calcium carbonate is combined with other materials such as silica and iron oxides to provide the right chemistry then is heated to extremely high temperatures as high as 1,550 °C to produce clinker
  - The clinker is then ground with finishing materials such as gypsum and limestone to produce cement
- Portland cement is the binding ingredient to produce concrete when mixed with water and aggregates
- Concrete is widely used as a building material for structures and pavement.





Quarrying	Raw Materials Preparation	Clinker Production	Cement Grinding and Distribution
Limestone is extracted from the Quarry and mixed with small amounts of sand and iron.	The extracted materials are analyzed, blended with additional mineral components depending on the type of limestone available, and finely ground for further processing.	The materials are heated in a kiln reaching a temperature of 1,550 °C. The heat transforms the materials into a molten product called clinker which is then rapidly cooled.	The clinker is stored and then finely ground. Gypsum and Limestone are added to control setting time, to obtain a fine powder called cement, with the desired properties of strength and chemical resistance.

Source: Cement Association of Canada

Portland-Limestone Cement

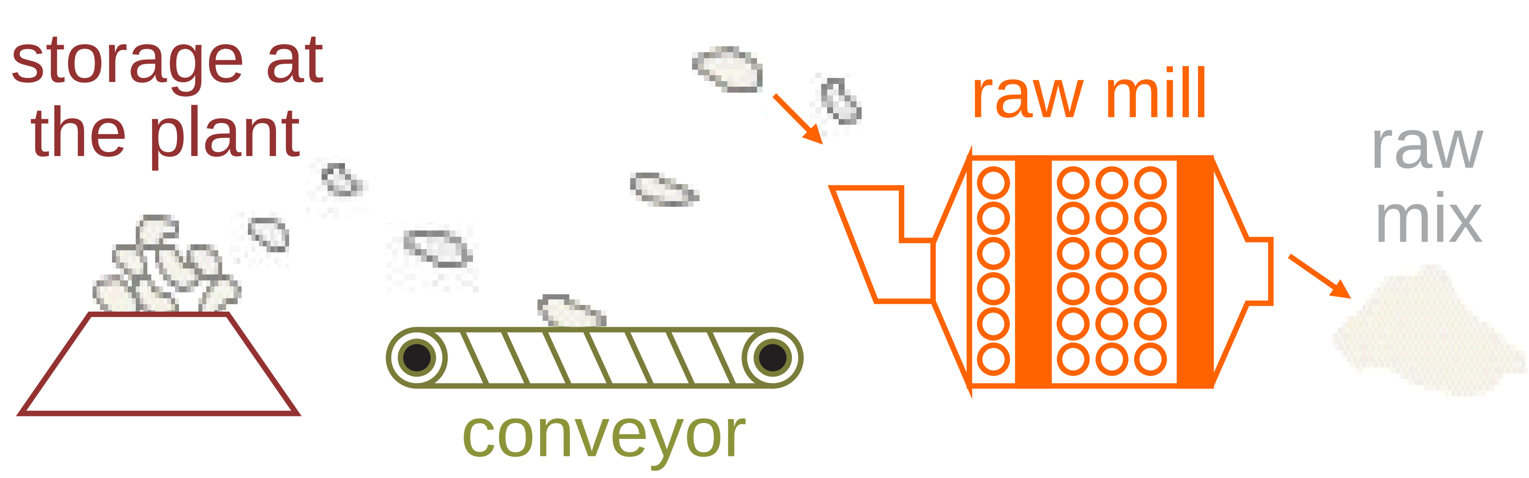
- Portland-Limestone Cement (PLC) or Contempra is a lower carbon intensity cement that reduces embodied greenhouse gases in concrete by 10%
- Produces concrete with the same strength, durability and performance

Cement Production Process

How is Cement Made?

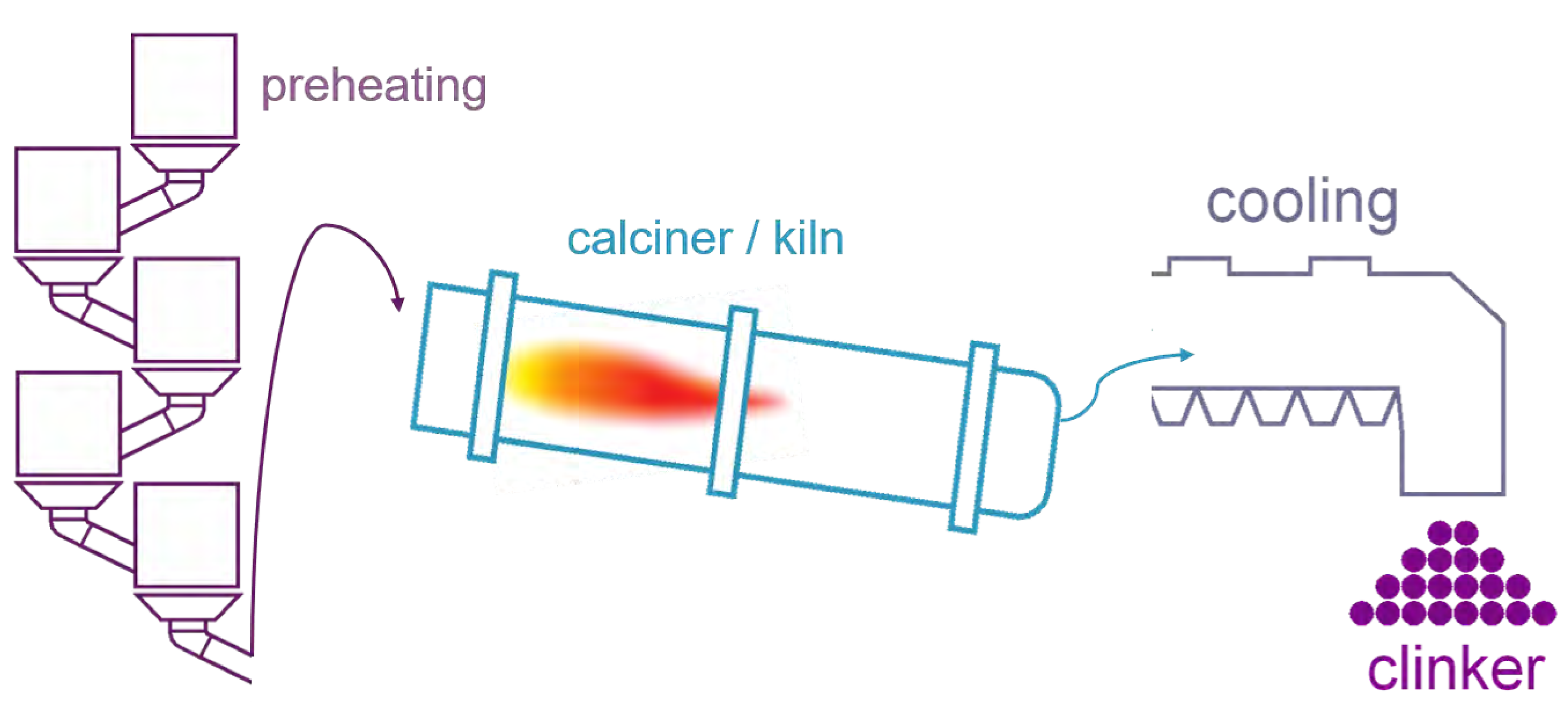
Raw Material Processing

- Limestone is blasted in the quarry
- Limestone is combined with other raw materials to get the chemical composition required for clinker production
- Fuel and raw material analysis are performed to verify that they meet quality production requirements



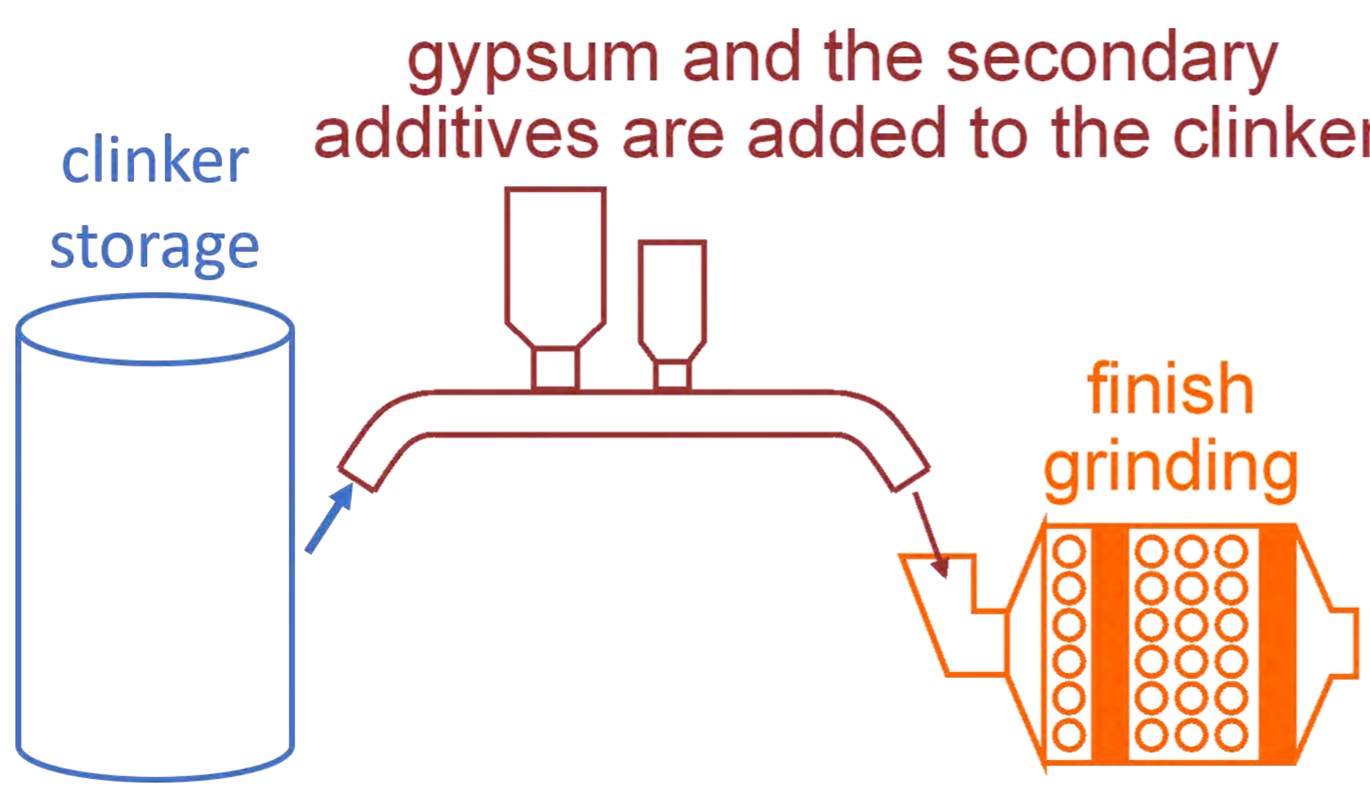
Clinker Process

- The mix of raw materials and the gases of combustion go through the process in a counter-flow system.
  - The mix of raw material goes through the raw mill and preheater tower into a rotary kiln which transforms the mixture into clinker.
  - The gases of combustion flow from the rotatory kiln to the preheater tower and raw mill.
- The counter-flow system promotes energy efficiency and reduces some air emissions by "scrubbing effect" of the raw feed
- The primary reaction in the rotary kiln is the conversion of calcium carbonate ($CaCO_3$) to Calcium Oxide (CaO) under very high temperatures (1,550 °C)



Clinker to Cement

- The clinker is cooled and combined with gypsum and limestone in grinding mills to make cement
- SMC manufactures 4 different types of cement, which a range of strengths and set times
- Cement is shipped in bulk by truck, rail and boat to different market locations



ALCFs and Cement Production

How are ALCFs used in the cement production process?

- SMC currently primarily uses a combination of conventional fuels (coal and petroleum coke) at the Site along with a limited amount of alternative fuels (i.e. woody biomass consisting primarily of wood chips) per their Environmental Compliance Approvals.
- The ALCF is introduced into a solid fuel delivery system, which would feed directly into the calciner, **operating at extremely high temperatures** along with conventional fuels
- The fuel delivery system is interlocked with the plant control system. The operator is able to set the feed rate for the alternative fuel, based on the system's performance
- Alternative Fuels will not be used during the start-up and shut-down of the kiln

Plant Control System Monitors

Conventional Fuels 430 tonnes / day

ALCFs 400 tonnes / day

Materials bearing calcium carbonate, silica, alumina, and iron oxide 9,300 tonnes / day

Processing at High temperatures (1,550 ºC)

Clinker 5,800 tonnes / day

Finishing materials: gypsum and limestone

Cement 4,320 tonnes / day

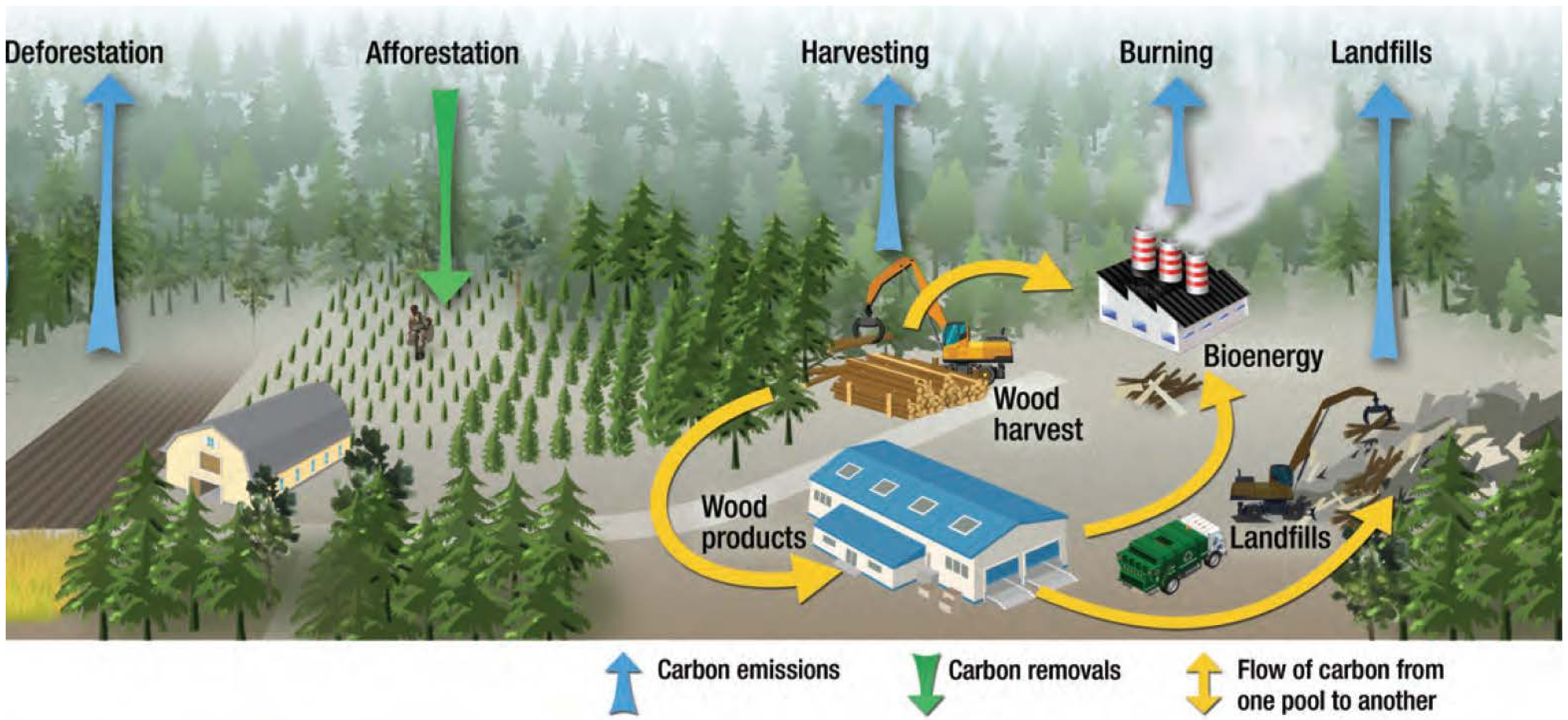
Environmental Benefits of using ALCFs

Helps reduce Greenhouse Gas Emissions in Ontario

- Long-cycle greenhouse gases, such as carbon dioxide from fossil fuels, are one of the greatest contributors to air pollution and the changing climate
- Using ALCFs in the cement production process replaces the amount of long-cycle carbon used with short-cycle carbon from plants
- Diverting organic materials from landfills also avoids the decomposition of organic material which results in methane release to the natural environment
  - Methane is an approximately 25 times more powerful greenhouse gas than carbon dioxide

Helps reduce the use of non-renewable fossil fuels

- SMC is targeting 30% thermal replacement of conventional fuels reducing the amount of coal and petroleum coke used in the production of cement
- Reducing the use of conventional fuels also reduces the transportation to get those fuels to site.
- Where possible, SMC will focus on using locally sourced ALCFs



Source: National Resources Canada, 2016

Substituting traditional fossil fuels, including coal, with lower carbon alternatives has the potential to yield significant GHG reductions across Canada. In leading jurisdictions, some cement facilities have achieved carbon intensity reductions of over 50% in the fuels they use.

Source: Concrete Council of Canada. Rediscover Concrete, Reducing our Footprint.

Environmental Benefits of using ALCFs

Helps support the Circular Economy Model

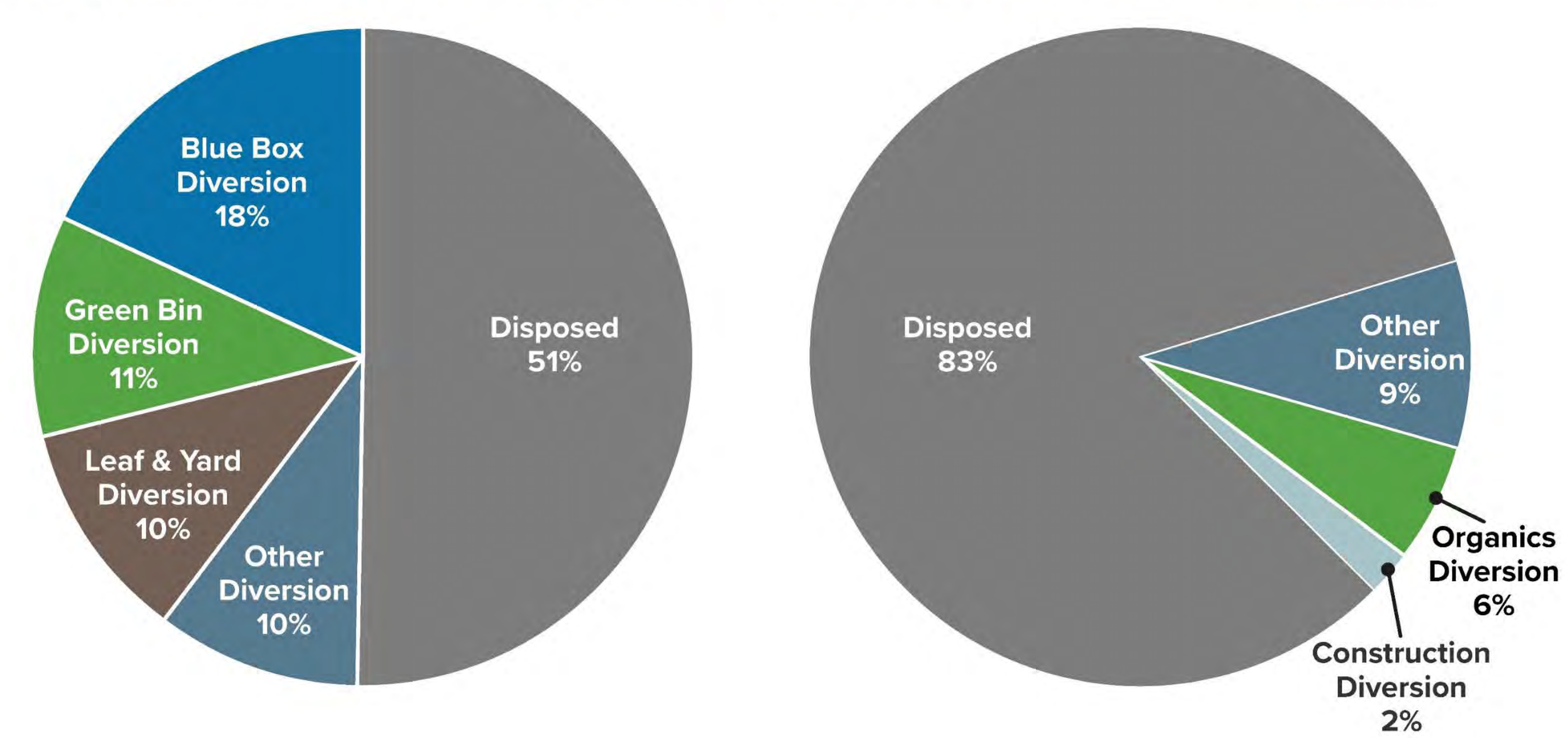
The strategy of the cement industry to use ALCFs (e.g. non-recyclable materials) in their cement production process supports the Circular Economy model

- Design to avoid resource use
- Design for longevity
- Design for reuse
- Design for material / energy recovery

Helps divert non-recyclable materials with significant heat value from distant landfills

- Ontario's Made in Ontario Environment Plan (November 2018):
  - Over 70% of our waste materials continue to end up in landfills
    - Such heavy reliance on landfills will require the province to either focus on determining new sites for landfills or look for new ways to reduce what we send to them
  - The Ontario government proposes the following actions which the introduction of ALCFs will help address
    - Reduce the amount of waste going to landfills or becoming litter
    - Increase opportunities to use technologies, such as thermal treatment, to recover valuable resources in waste

Ontario's Residential and Industrial, Commercial and Institutional Waste Management



Residential Waste: Managed by municipalities. Includes waste generated by residents in single-family homes, some apartments and some small businesses. Mix of mandatory and voluntary diversion programs.

Business Waste: Managed by the private sector. Includes food processing sites, manufacturing facilities, schools, hospitals, offices, restaurants, retail sites and some apartments. Largely voluntary diversion programs.

Source: Ministry of the Environment, Conservation and Parks, Ontario's Environment Plan (2018)

How is this project being conducted?

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O. Reg 79/15 Application Process

SMC values your input

Demonstration Project
Prior to submitting an application under O. Reg 79/15 proponents can carry out a demonstration project for the purpose of studying the effects and assisting the design of the use of ALCFs

↓

Meet with MECP to discuss path forward

- Determine ALCF materials
- Initial draft of Carbon Dioxide Emission Intensity Report
- Initiate environmental studies

Contact MECP for a list of Indigenous communities

Public Meeting #1 September 5, 2019 → Notice of Intention to Apply and Notice of Public Meeting #1

- Respond to and address public comments
- Conduct environmental studies and reports
- Finalize Carbon Dioxide Emission Intensity Report

Public Meeting #2 **WE ARE HERE December 17, 2019** → Notice of Public Meeting #2

Address public comments

Prepare Consultation Report

Public opportunity to view Consultation Report → Notice of Completion of Consultation Report

Submit Alternative Low Carbon Fuel Environmental Compliance Application to MECP

Timeline of ALCFs at the Site

- **May 2008** – Initiated discussions with the MOE, Municipality of Clarington and Durham Region regarding Alternative Fuel use at the Site
- **March 2014** – First public open house regarding Low-Carbon Alternative Fuels at the Site
- **November 2015** – Environmental Compliance Approvals (ECA) to use woody biomass as Low Carbon Alternative Fuels
  - ECA (waste) Number 7024-9XUK4C
  - Amended ECA (Air) Number 0469-9YUNSK
- **September 2018** – Public Notice of Alternative Fuel Demonstration Project
- **December 2018** – Public Notice of Alternative Fuel Demonstration Project
- **April 2019** – Initiated discussions with the MECP regarding O. Reg 79/15 Application
- **September 2019** – First public meeting providing information on Alternative Low-Carbon Fuels and the O. Reg 79/15 Application Process
- **December 2019** – Second public meeting providing information on Alternative Low-Carbon Fuels and the O. Reg 79/15 Application Process

MOE: Ministry of the Environment; MECP: Ministry of the Environment, Conservation and Parks (MECP)

Current Site Approvals

What approvals does SMCB currently have?

- In 2015, SMCB started using woody materials as Alternative Low Carbon Fuels to replace approximately 8% of their conventional fuels (by weight) under their Environmental Compliance Approvals (ECA) Number 7024-9XUK4C and Number 0469-9YUNSK
- From September 2018 to December 2018, SMCB carried out a demonstration project to use residuals derived from industrial and/or post-consumer sources including plastic polymers, paper fibres and woody materials as ALCFs at the Site under their ECA Number 1255-7QVJ2N and Number 4614-826K9W

ALCF Material Sourcing

Where is SMC getting the ALCF materials from?

- The type of fuel used in the cement production process is an important component in SMC's commitment to quality.
- There are many sources of ALCFs and the preferred source will be from manufacturing facilities with a predictable and long term supply.
- Whenever possible, St Marys Cement focuses on using locally sourced ALCFs, which is in the best interest of the community, St Marys Cement, and the environment (less transportation distance).
- Obtaining ALCFs is a dynamic process and is managed on an ongoing basis.
- St Marys Cement's Bowmanville Plant is in discussion with Durham Region to look at prioritizing the use of Durham Region materials.
- St Marys Cement has a Director of ALCFs who is always working with potential suppliers who may have the type of materials that meet the needs and approvals of each of the St Marys Cement plants.

Types of ALCF materials may include but will not be limited to a mix of:

- Paper / paper fibre materials
- Cardboard
- Cotton
- Textiles
- Construction and demolition materials
- Non-recyclable plastics
- Ragger tails from cardboard and paper recycling
- Packaging material from consumer products
- Materials derived from agricultural crop production that cannot be consumed (not including materials derived from animals or animal by-products)

What We Heard at Public Meeting #1

- SMC hosted the first Public Meeting / Open House on September 5, 2019 to provide an opportunity for members of the public to learn more about the proposed application and discuss their questions and concerns with the project team and technical experts.
- What we heard at Public Meeting #1:
  - Questions about the origin of ALCF materials;
  - Questions about current emissions monitoring at the site;
  - Questions and concerns regarding the potential air quality impact of burning of plastics;
  - Questions about what consultation is being undertaken with the region and the municipality;
  - Questions about the Durham York Energy Centre expansion project and cumulative effects;
  - Requests for transparency of the emissions monitoring results; and
  - Requests for further information about the environmental studies being prepared.
- Since the September 2019 public meeting, SMC has been working to address comments and questions raised at that meeting and incorporating feedback into the project.
- The purpose of Public Meeting #2 is to provide an overview and hear feedback on of what the Project Team has been working on with an overview of the studies that have been prepared and the results of those studies.

Potential Environmental Effects

How is SMC considering the environment?

- The potential environmental effects of the use of coal and petroleum coke as fuel sources in the cement industry is closely monitored in Ontario
- The potential environmental effects of using ALCF materials are understood through the results of the demonstration project and the environment effects assessments for other studies that have been conducted
  - Substituting coal and petroleum coke with the proposed ALCFs will help reduce GHG without increasing the impact on the environment from cement production
  - The nature of the cement making process minimizes the potential environmental impacts as extremely high temperatures are necessary to produce the clinker product
- SMC has conducted the following environmental studies to assess the potential environmental effects this increased substitution may have in the vicinity of the Site:
  - Air Quality Study and Cumulative Effects Assessment
  - Acoustic (Noise) Study
  - Traffic Impact Study
- As part of this application, SMC has prepared a Carbon Dioxide Emission Intensity Report to demonstrate the proposed ALCFs have a lesser / lower carbon dioxide emission intensity than conventional fuels (coal and petroleum coke)

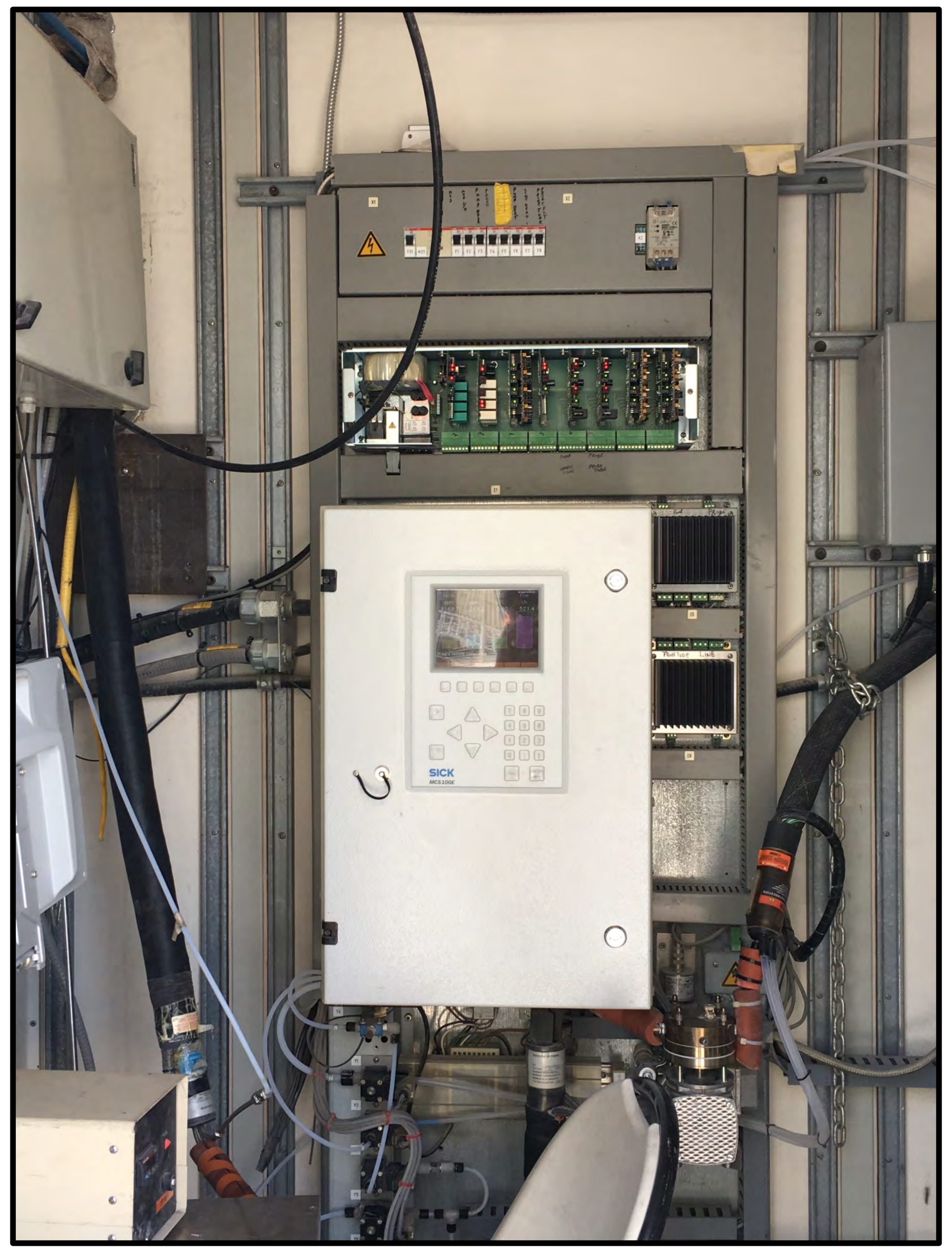
Environmental Monitoring

How is SMC considering the Environment?

As part of this project, SMC will build on their existing monitoring plan to continue to demonstrate the safe use of the ALCF material and on-going compliance with applicable environmental regulations

The Site has various monitoring practices and analytical monitoring instruments already in place. Current monitoring includes but is not limited to:

- Conventional and ALCF feed rates to track coal substitution rates
- Periodic ALCF material testing to control the feed materials
- Temperature profile of the kiln and combustion air oxygen levels to demonstrate complete combustion of the fuels and proper operating conditions to produce the clinker
- Continuous emission monitoring for nitrogen oxides, sulphur dioxides, opacity and total hydrocarbon in the kiln exhaust to demonstrate that the pollution control equipment is operating properly
- Ambient monitoring around the Site perimeter (PM10 monitors)
- Control operation system that automatically monitors air emissions and process parameters
- Interlock system that will shut down the system in the event of any abnormality or exceedance
- Alarm system is in place that emails alarms to staff when set parameters are not being met
- Vendor evaluation process for ALCF materials supplier



Environmental Monitoring

Current Monitoring

There are stations located around SMCB that monitor dust and vibration that including the following metrics:

- PM 10 BAM (Beta Attenuation Monitor) – used to measure particulate matter 10 micrometres or less in diameter
- Dust Fall Jar – used to collect large air particles for measurement
- PM 10 Hi Vol (High Volume) – used to measure ambient air
- Seismograph – used to measure ground motion or vibrations

In addition to the ambient air quality monitors around the site, the site also has a Continuous Emissions Monitoring System that monitors the main stack to provide information about air emissions.

Carbon Dioxide Emission Intensity Overview

What is Carbon Dioxide Emission Intensity?

- Carbon Dioxide Emission Intensity is a form of measurement that allows different fuel types to be compared and is an indicator of the amount of Carbon Dioxide (CO_2), which is a Greenhouse Gas (GHG), that is emitted into the atmosphere when the fuel is used
- A lower Carbon Dioxide Emission Intensity value means that the material will release less CO_2. The lower intensity fuel sources used in cement production, will have lower total carbon content, a higher biological carbon content and higher heat value.

How does this project consider and measure Carbon Dioxide Emission Intensity?

- In accordance with O. Reg 79/15, the carbon dioxide emission intensity calculations must be based on chemical analysis data of the conventional fuels and proposed ALCFs. As the carbon content of ALCFS may vary depending on the fuel supplier, St Marys Cement is developing a fuel testing program to regularly monitor the carbon dioxide intensity of the ALCFs used at the Site.
- Conventional fuel sampling:
    - Samples of the conventional fuels that are used at the St Marys Cement Bowmanville Plant were submitted for chemical analysis to estimate the total carbon content and high heat value of each fuel. In total SMC submitted six samples each of fluid petroleum coke (petcoke), petcoke, and coal fuels for chemical analysis.
- ALCF sampling:
    - Three samples of each of the following materials were submitted for chemical analysis to estimate the biological carbon content, total carbon content and high heat value of each fuel:
        - Woody materials (biomass); and
        - A mix of woody biomass, cellulosic and plastic materials.

Carbon Dioxide Emission Intensity Results

What are the results of the Carbon Dioxide Emission Intensity calculations?

- The results demonstrate that the ALCFs have significantly lower carbon dioxide emission intensity values than conventional fuels.
- Once the carbon dioxide emission intensity values were calculated for each sampling result, an average intensity value was calculated for each fuel type, summarized in the table below.
  - For ease of comparison, the table below also includes an estimate of the carbon dioxide emissions from combustion of 400 tonnes of each fuel, the amount of ALCFs that SMC has proposed to use each day as part of this application.
  - For example, combustion of biomass, cellulosic (e.g. woody materials) and plastic materials results in approximately 74% less carbon dioxide than from combustion of the same amount of coal. Combustion of woody biomass (biomass) results in approximately 99% less carbon dioxide than from combustion of the same amount of coal.

Fuel Type	Average Carbon Dioxide Emission Intensity [kg CO_2 / MJ]	Average Calorific Value [MJ/kg]	Carbon Dioxide Emissions per 400 tonnes of Fuel Combusted [tonnes CO_2]
Fluid Petcoke	0.0944	26.72	1008.8
Pet Coke	0.0909	31.13	1131.7
Coal	0.0837	29.01	971.2
Woody Materials (Biomass)	0.0003	15.63	5.8
Biomass, Cellulosic (e.g. Woody Materials) and Plastic Materials	0.0299	20.17	250.5

Why and How Did SMC Assess Air Quality Impacts from the Use of ALCF?

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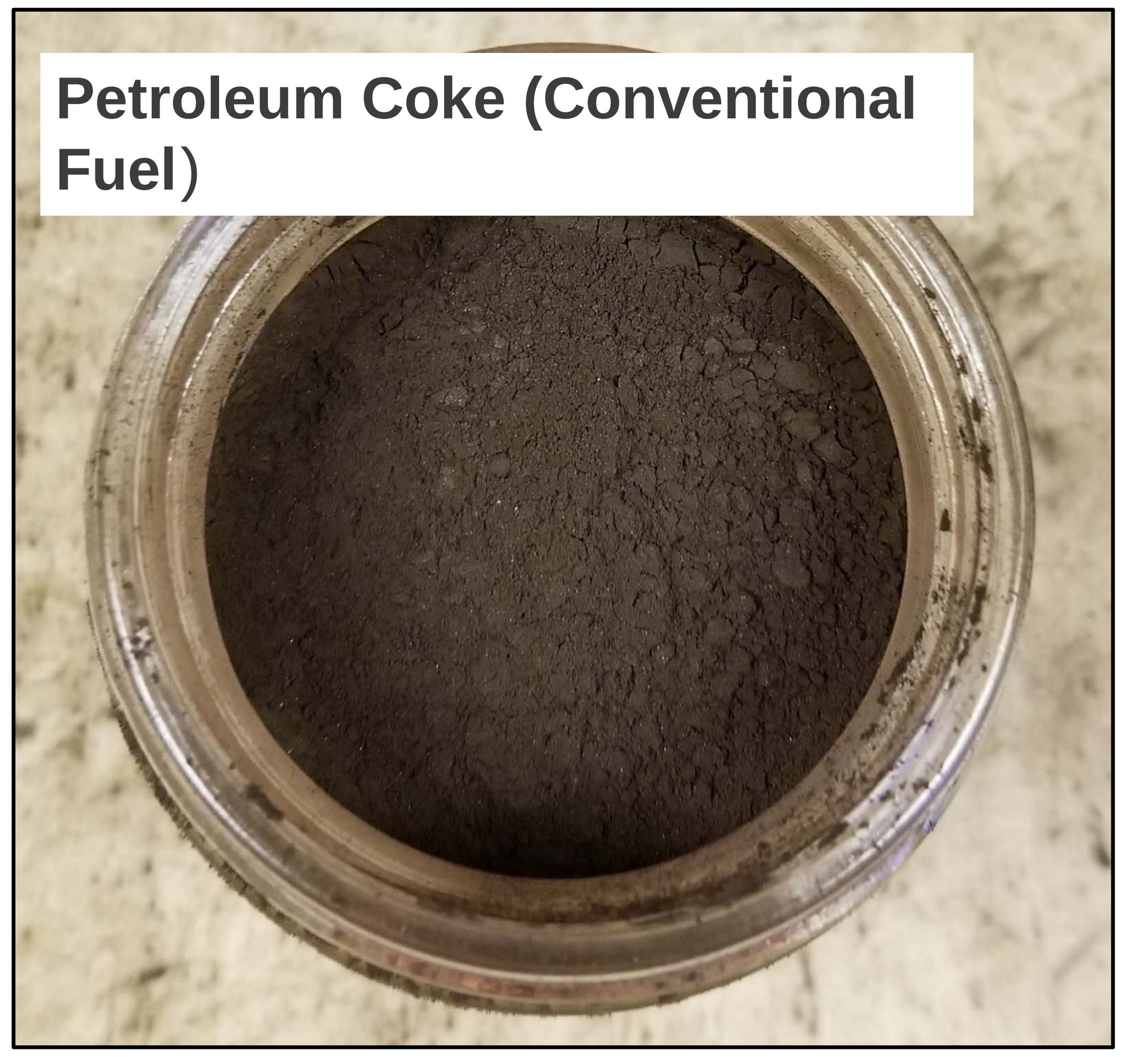
ALCF Demonstration Project

SMC presented the results of the Fall 2018 demonstration project in the first Open House.

The purpose of the demonstration project was:

- To show that SMC will remain in compliance with the Ministry's point of impingement standards under Ontario Regulation 419/05 (Reg. 419). The maximum point of impingement for SMC operations occurs on or very close to their property line;
- To show that there was no statistically significant difference in kiln stack emissions and POI concentrations of all contaminants as a result of the use of alternative fuel, relative to baseline conditions; and
- To provide an extensive Ministry validated/reviewed data set to be used in the environmental studies to support an application for regular use of ALCF.



This air quality study and the ALCF approval, if granted, does not replace the requirement for an ECA (Air) supported by a site-wide Emission Inventory and Dispersion Modelling (ESDM) Report under Ontario Regulation 419/05 (Reg. 419).

Air Quality Study & Cumulative Effects Assessment

Per the ALCF regulation (O.Reg. 79/15), an air quality study has been completed to respond to stakeholder and public comments to quantitively assess future air quality impacts, if any, in **the local community** as a result of substituting up to 30% of conventional fuel with ALCF on a thermal basis.

Differing from the ALCF demonstration project, this study specifically addresses future local ambient air quality in the community by considering SMC stationary and mobile sources, as well as **cumulative effects** from other nearby major sources.

Cumulative effects were assessed by adding future background air quality from local ambient air monitoring stations to the maximum off-site concentrations predicted by the model.

This cumulative concentration for each air quality contaminant of potential concern (CoPC) was compared to ambient air quality reference levels to assess future air quality as a result of the use of ALCF.

The study took a very conservative approach to provide the community with a high level of confidence in the study conclusions. This means that the predicted future cumulative concentrations in air quality are purposefully **over-estimated**.

What is the Air Quality Study Area?

Study Area

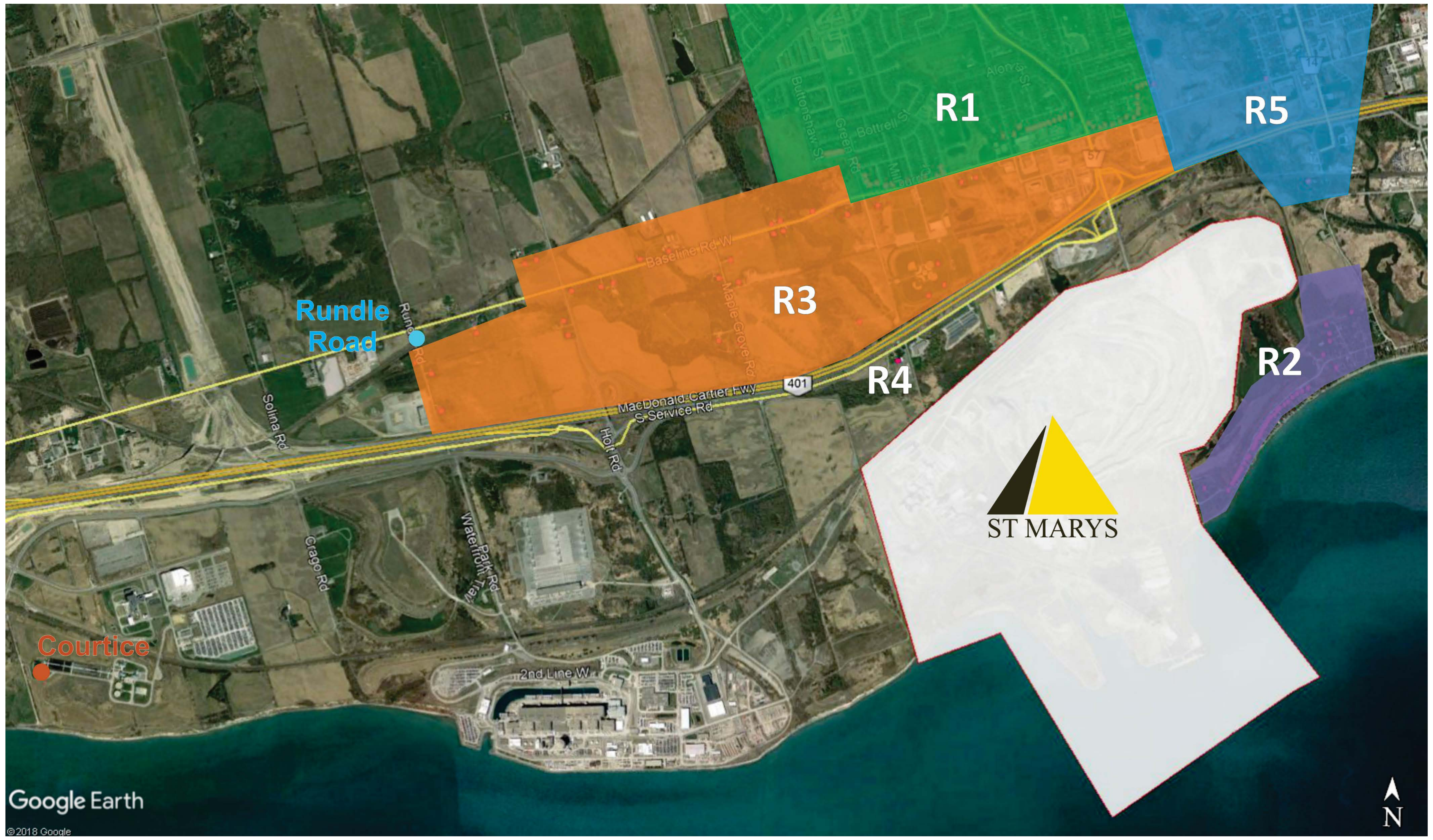
The modelling domain (study area) for this project is a 10km x 10km nested grid, centred on the cement plant.

The nested grid contains 7,864 grid points, i.e. points where the model calculates the maximum concentration for each CoPC.

Discrete Receptors

A total of 130 actual receptors (homes) were selected representing four communities:

- R1: Residential Subdivision north of Baseline Road
- R2: Residential Community along Lake Ontario
- R3: Agricultural residences north of the 401 and south of Baseline Road
- R4: Legal non-conforming home (i.e. zoned light industrial) north of the plant and south of the 401
- R5: Residential subdivision north and east of the intersection of Baseline Road and Liberty Street South



What Contaminants were Included in the Air Quality Study and Why?

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- A total of 123 CoPCs were assessed, based on Schedule B2 of SMCs demonstration ECA (no. 4614-826K9W).
- These CoPCs were identified by the MECP during the ECA application process. They are conservatively based on the MECP's experience with and requirements for a wide range of combustion/incineration activities.
- SMC's list of CoPCs is, with minor exceptions, consistent with the CoPCs assessed for the DYEC system optimization project.
- Through the public consultation process, the following contaminants were identified as being of particular concern (Key CoPCs):

Criteria Air Contaminants	Hydrochloric Acid (HCl) and Chlorinated Organics	Non-Chlorinated Organics and Metals
• Particulate Matter less than 2.5 microns • Nitrogen Dioxide • Sulphur Dioxide	• Hydrochloric Acid • Dioxins, Furans and Dioxin-Like PCBs • 1,1,2,2-Tetrachloroethane	• Benzene • Benzo(a)pyrene • Mercury • Lead

- Results for all 123 CoPCs are available in the full report. Results for the key CoPCs are provided in this presentation.

What Air Quality Criteria Were Used?

Votorantim Cimentos | St Marys Cement

Ambient Air Quality Criteria for Key CoPCs of Public Interest

Contaminant	Cas No.	Averaging Period	Criteria ($\mu g/m^3$)	Standard
Criteria Air Contaminants				
PM2.5	PM2.5	24 hr	27[2]	CAAQS
PM2.5	PM2.5	Annual	8.8[3]	CAAQS
Nitrogen Dioxide	10102-44-0	1 hr	400	AAQC
Nitrogen Dioxide	10102-44-0	24 hr	200	AAQC
Sulphur Dioxide	7446-09-5	1 hr	690	AAQC
Sulphur Dioxide	7446-09-5	24 hr	275	AAQC
Sulphur Dioxide	7446-09-5	Annual	55	AAQC
Hydrochloric Acid (HCl) & Chlorinated Organics				
Hydrochloric Acid	7647-01-0	24 hr	20	AAQC
Dioxins, Furans and Dioxin-like PCBs	CDD	24 hr	0.0000001	AAQC
1,1,2,2-Tetrachloroethane	79-34-5	24 hr	0.1	JSL
Non-Chlorinated Organics & Metals				
Benzene	71-43-2	24 hr	2.30	AAQC
Benzene	71-43-2	Annual	0.45	AAQC
Benzo(a)pyrene	50-32-8	24 hr	0.00005	AAQC
Benzo(a)pyrene	50-32-8	Annual	0.00001	AAQC
Mercury	7439-97-6	24 hr	0.50	AAQC
Lead	7439-92-1	24 hr	0.50	AAQC
Lead	7439-92-1	30 day	0.20	AAQC

1 The study results are the maximum concentrations plus background.

2 Based on a 3-year average of the annual 98th percentile of the daily 24-hour average concentrations

3 Based on a 3-year average of the annual average concentrations

Ambient Air Quality Criteria (AAQC) - desirable concentration of a contaminant in air, established to protect against adverse effects on health or the environment. AAQCs are commonly used in environmental assessments, special studies using ambient air monitoring data, assessments of general air quality in a community and annual reporting on air quality across the province.

In the absence of an AAQC:

Canadian Ambient Air Quality Standards (CAAQS) – reference level for air quality impacts. Using CAAQS for $PM_{2.5}$ in this study is conservative[1].

In the absence of an AAQC and CAAQS:

Jurisdictional Screening Level (JSL) – screening levels based on the Ministry's review of air quality values of other jurisdictions.

How Were Cumulative Effects Considered?

- As part of the public consultation, members of the Clarington community requested that cumulative effects from major sources be considered, in particular, Highway 401, OPG Darlington Station, and the proposed system optimization of the Durham York Energy Centre (DYEC).
- Cumulative effects were assessed by adding future local ambient monitoring, data to the future modelled concentrations for the SMC Bowmanville Plant and comparing the sum to the ambient air quality criteria.
- Local ambient air monitoring data, which captures all major emissions sources in the area, was obtained from the nearby DYEC facility[1,2] (Courtice and Rundle Road stations) for all contaminants except volatile organic compounds (VOCs) (for 2017 and 2018).
- Background/upwind concentrations for VOCs were obtained from the RWDI Air Inc. (RWDI)'s ambient testing program for SMC's demonstration project (October – December 2018).
- Future ambient background considered impacts from DYEC's system optimization project.

Cumulative Future Air Quality = Impacts from Future SMC Bowmanville Facility Operations + Future Ambient Background

[1] SMC's contribution was conservatively not subtracted from the background ambient data.

[2] DYEC's boilers were offline due to maintenance and repairs for approximately 40 days in 2017. This did not significantly change the ambient background levels.

What Emissions Sources Were Included in the Assessment?

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The site-wide air emission inventory includes:

- **Cement Plant emission sources**
  - Kiln Stack
  - Finish Mills
  - Clinker Cooler
  - Product Loading
  - Material Processing and Handling
  - Wind Erosion
  - Fuel Delivery and Handling
- **CBM Aggregate emission sources**
  - Material Storage and Handling
  - Wind Erosion
- **Quarry emission sources**
  - Material Extraction
  - Material Processing and Handling
  - Wind Erosion
- **Dock area emission sources**
  - Material Receiving, Storage and Handling
  - Wind Erosion
- **Road emission sources**
  - Road Dust
  - Tailpipe

How was Future Air Quality as a Result of Using the ALCFs Assessed?

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St Marys Cement

- The Air Quality Impact Study assessed a maximum future emission scenario to determine future air quality as a result of using ALCFs

Maximum Emission Scenario

- Maximum daily throughput of ALCFs: 400 tonnes per day;
- Maximum daily receiving rate of ALCFs: 1,200 tonnes per day, prior to long weekends. This assumption is very conservative since typically the daily receiving rate will equal daily throughput rate (400 tonnes per day).
- Emission factors for the kiln stack were developed using the 2018 LCF and ALCF demonstration source tests.
- Future kiln stack emission rates were calculated using these emission factors and the future fuel consumption rates for conventional fuel use only, LCF substitution and ALCF substitution.
- The highest of the three kiln stack emission rates were used to capture the worst case.
- The throughput rates of all other operations were estimated based on a realistic achievable maximum clinker production rate of 5,500 tonnes per day.

How Were Emissions Modelled?

Emissions were modelled using approved MECP air dispersion models. These models predict how air concentrations decrease with distance from the source as a result of factors such as weather, terrain and source characteristics including release height, flowrate and temperature.

As SMC is close to a large body of water, the temperature difference between water and land can result in reduced air dispersion (Shoreline Effects). This must be accounted for in the modelling.

Air Dispersion Models

CALPUFF Model: to generate “shoreline effect factors” which were then incorporated into the AERMOD model input for the kiln stack.

The CALPUFF modelling demonstrated that the impact of shoreline effects is small for SMC (a factor of less than 1.1).

AERMOD Model: To generate maximum concentrations at all grid points and discrete receptors using site-specific meteorological data.

Air Quality and Cumulative Effects - Results

How do the Assessment Results Compare to the Criteria?

- As shown in the results tables, all contaminants are below their respective criteria at all sensitive receptors in each of the five communities, without background added.
- As shown in the results tables, with the exception of two contaminants, the cumulative concentrations of all contaminants are below their respective criteria at all sensitive receptors in each of the five communities, with background added (i.e. considering cumulative effects).
- The two contaminants which are shown as above their respective criteria when background is added, are benzene (annual criterion) and benzo(a)pyrene (24-hour and annual criteria). This is because normal background concentrations are above these criteria.
- Background concentrations for benzene (annual criterion) and benzo(a)pyrene (24-hour and annual criteria) measured at the local ambient monitoring stations are similar to background concentrations measured across the province (i.e. it is not a localized phenomenon). Relative to background concentrations, the contribution from SMC is small.

How Conservative is the Study?

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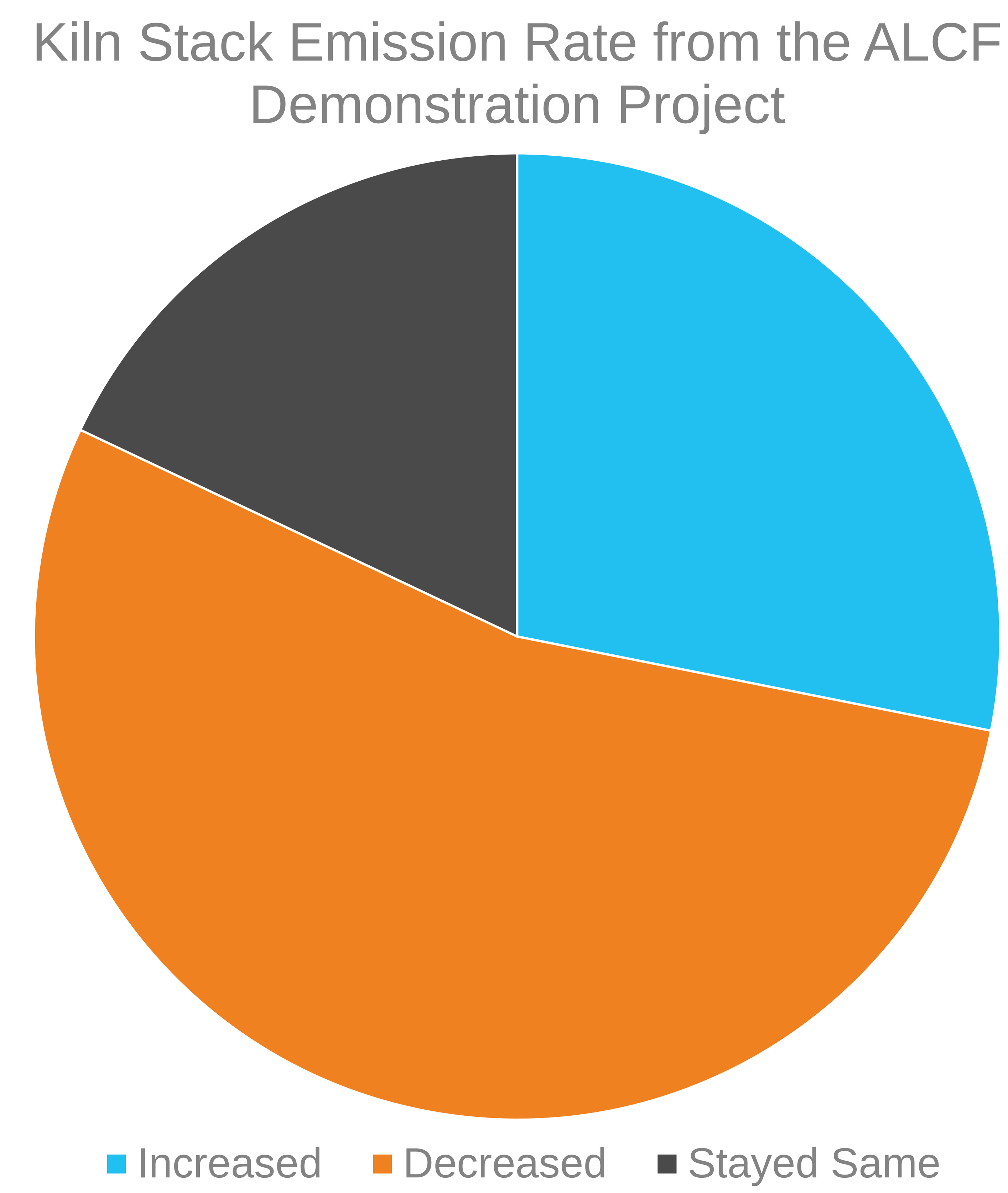
The study is very conservative to provide the community with a high level of confidence in the study conclusions. This means that the predicted cumulative concentrations from the use of ALCF are **over-estimated**.

Factors that Over-Estimate the Results

- For cumulative effects:
  - SMC's contribution was not subtracted from the background ambient data (i.e. SMC is double counted);
  - No decrease in future background concentrations was assumed (even though the recent DYEC study predicts lower impacts in the future for many CoPCs, including all of the Key CoPCs);
  - A high background concentration value was used for short-term averaging periods (90th percentile value).

- For emission estimates:
  - All emission sources were assumed to occur at their maximum achievable rates, all the time. In reality, this will not occur.
  - Even though the demonstration project showed decreases in kiln stack emissions for more than 50% of CoPCs as shown in the pie chart, no decrease was assumed.
  - Even though the demonstration project showed no statistically significant change in kiln stack emissions, the measured kiln stack emissions for all CoPCs, except for criteria air contaminants, were increased in proportion to the proposed ALCF rate.
  - The highest of conventional fuel use only, LCF substitution and ALCF substitution emission rates were used for the kiln stack emission rate.

- For modelling:
  - The absolute maximum modelled concentrations over a 5-year period were compared to the ambient air quality criteria. This is particularly conservative for $PM_{2.5}$ because the reference levels are based on a three year average.



What are the Results & What do they Mean?

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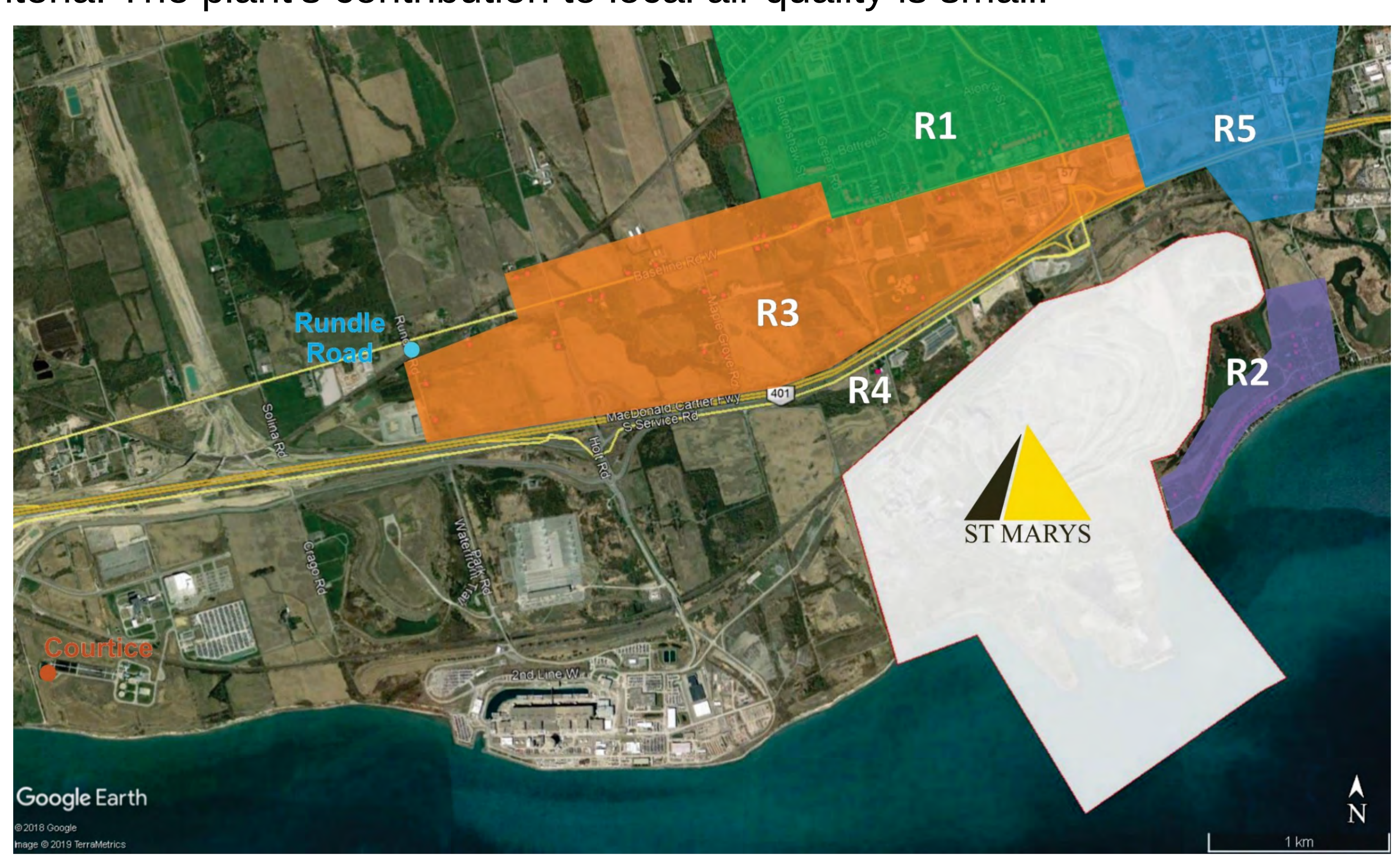
Cumulative Results (i.e. including Local Background) at Communities

Contaminant	Averaging Period	Air Quality Criteria (µg/m^3)	Background Concentration (µg/m^3)	Background % of Criteria	R1		R2		R3		R4		R5	
					Max. Concentration (µg/m^3)	% of Criteria	Max. Concentration (µg/m^3)	% of Criteria	Max. Concentration (µg/m^3)	% of Criteria	Max. Concentration (µg/m^3)	% of Criteria	Max. Concentration (µg/m^3)	% of Criteria
Criteria Air Contaminants														
$PM_{2.5}$	24 hr	27	12.3	45.5%	16.6	61.6%	19.2	70.9%	19.5	72.2%	20.8	76.9%	14.8	54.9%
$PM_{2.5}$	Annual	8.8	6.3	72.1%	6.6	74.5%	7.4	84.0%	6.9	78.2%	7.3	83.0%	6.5	73.8%
Nitrogen Dioxide	1 hr	400	21.7	5.4%	154.2	38.6%	119.6	29.9%	204.6	51.2%	205.4	51.4%	100.0	25.0%
Nitrogen Dioxide	24 hr	200	20.1	10.0%	53.7	26.8%	47.0	23.5%	76.3	38.2%	83.9	41.9%	30.5	15.2%
Sulphur Dioxide	1 hr	690	9.2	1.3%	230.7	33.4%	101.0	14.6%	295.2	42.8%	321.7	46.6%	141.8	20.5%
Sulphur Dioxide	24 hr	275	8.8	3.2%	59.2	21.5%	42.2	15.4%	92.6	33.7%	102.3	37.2%	18.7	6.8%
Sulphur Dioxide	Annual	55	3.8	6.9%	4.8	8.8%	7.5	13.7%	5.6	10.2%	5.5	10.0%	4.6	8.4%
Hydrochloric Acid (HCl) & Chloronated Organics														
Hydrochloric Acid	24 hr	20	-	-	0.7	3.4%	0.4	2.2%	1.1	5.6%	1.3	6.3%	0.1	0.7%
Dioxins, Furans and Dioxin-like PCBs	24 hr	0.0000001	0.00000003	30.6%	0.00000003	31.6%	0.00000003	31.2%	0.00000003	32.3%	0.00000003	32.5%	0.00000003	30.8%
1,1,2,2-Tetrachloroethane	24 hr	0.1	-	-	0.0001	0.09%	0.0001	0.06%	0.0001	0.14%	0.0002	0.16%	0.00002	0.02%
Non-Chloronated Organics & Metals														
Benzene	24 hr	2.30	0.6	27.3%	0.75	32.8%	0.71	30.9%	0.84	36.5%	0.86	37.5%	0.65	28.3%
Benzene*	Annual	0.45	0.5	107.5%	0.630	140.0%	0.635	141.1%	0.632	140.4%	0.631	140.2%	0.629	139.8%
Benzo(a)pyrene*	24 hr	0.00005	0.00007	134.9%	0.000077	154.2%	0.000079	158.0%	0.000084	167.6%	0.000088	176.3%	0.000072	143.5%
Benzo(a)pyrene*	Annual	0.00001	0.00003	345.5%	0.00004	350.1%	0.00004	370.0%	0.00004	359.2%	0.00004	371.8%	0.00003	348.9%
Mercury	24 hr	0.50	0.00002	0.004%	0.0003	0.06%	0.0002	0.04%	0.0005	0.09%	0.0005	0.10%	0.00007	0.01%
Lead	24 hr	0.50	0.004	0.9%	0.005	1.02%	0.005	0.97%	0.006	1.10%	0.006	1.13%	0.0046	0.91%
Lead	30 day	0.20	0.004	2.2%	0.005	2.5%	0.005	2.4%	0.006	2.8%	0.006	2.8%	0.0046	2.3%

- Members of the Clarington community specifically requested information on the contribution of $PM_{2.5}$ and dioxins, furans and dioxin-like PCBs (D&F) from SMC operations in the community.

* The ambient background exceeds the ambient air quality criteria. The plant's contribution to local air quality is small.



Why do we Anticipate Future Local Air Quality Will Be Better than Predicted?

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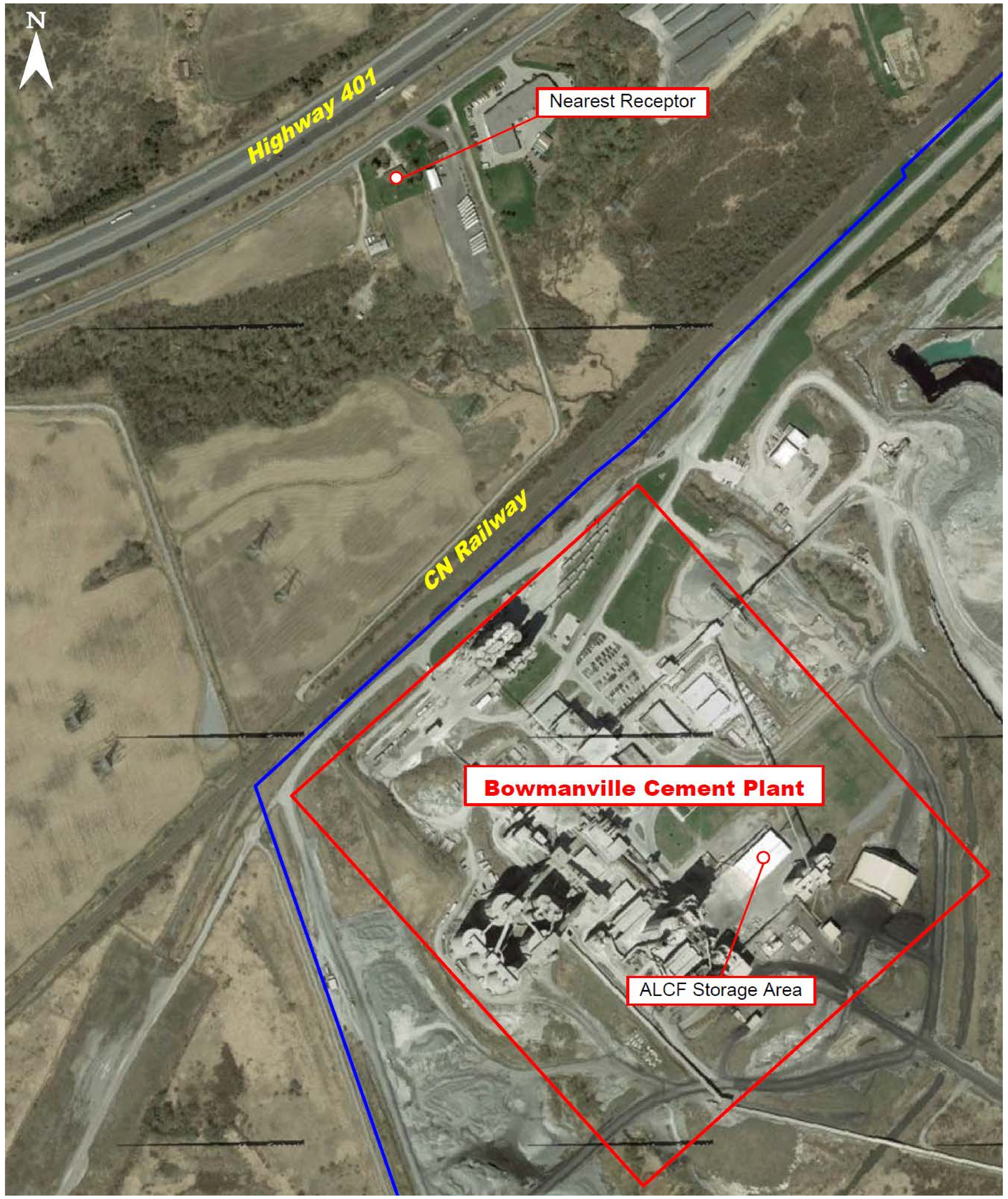
- The results of the modelled data are anticipated to be higher than the actual annual source testing results, as the assumptions of the modelled data were over-estimated.
- Local air quality will continue to improve as a result of provincial and international initiatives.
- SMC is continuing to look into initiatives to reduce emissions of CoPCs.

Alternative Low Carbon Fuels are a Viable Future Initiative from a Local Air Quality Perspective.

Acoustic (Noise) Study

Will the ALCF project change the noise emissions from the site?

- The noise emissions of the Bowmanville Cement Plant are subject to the Ontario Ministry of the Environment, Conservation and Parks (MECP) limits
- The MECP limits are applicable to the total noise levels of the facility (rather than to individual equipment or activities), evaluated at surrounding noise-sensitive points of reception
- The existing noise levels at the Bowmanville Cement Plant comply with the applicable MECP limits at all surrounding points of reception
- The point of reception that is potentially most impacted by the ALCF project is a residential property located approximately 785 metres northwest of the ALCF storage area, adjacent to Highway 401



Bowmanville Cement Plant and Nearest Noise Receptor

Acoustic (Noise) Study

Will the ALCF project change the noise emissions from the site?

- A detailed acoustical model was used to evaluate the change in noise levels of the Bowmanville Cement Plant with the increase in use of ALCFs at the plant:
    - The model is based on extensive acoustical measurements that have been conducted of all non-negligible noise sources at the facility
- The ALCF project will introduce the following new potential noise sources:
    - ALCFs will be delivered to the site by trucks; up to two additional trucks per hour may visit the site in future, relative to the operation;
    - Up to three front end loaders will operate inside either of the existing ALCF enclosed storage building (which will be expanded) or a second, new enclosed storage building;
    - Additional ALCF feed/conveyance systems will be added, which will be enclosed and emit negligible sound;
- The noise emission levels of the new potential noise sources associated with the ALCF project were input to the model, and the total noise level of the facility was predicted at the most potentially impacted point of reception
- With the addition of the new potential noise sources associated with the ALCF project, the total sound levels of the Bowmanville Cement Plant are completely unchanged from current levels at the most potentially impacted point of reception to the north (the residential property northwest of the study area described on the previous slide. They remain within the applicable MECP limits

Traffic Impact Study Results

What is the potential impact to traffic as a result of the proposed increase in use of ALCFs at the Bowmanville Plant?

- As part of the ALCF application, a Traffic Impact Study was undertaken which included an operational assessment of future total traffic conditions associated with the proposed increase in use of ALCFs at the Bowmanville Plant
- The Traffic Impact Study analyzed the following intersections:
  - Durham Road 57 (Bowmanville Avenue) / North Ramp Terminal with Highway 401;
  - Energy Drive / South Ramp Terminal with Highway 401; and,
  - Bowmanville Avenue / Energy Drive
- There is expected to be a small increase in trucks arriving at the site for deliveries of the ALCFs from the existing daily truck traffic (existing trucks per day arriving at the Site is between approximately 320 and 445 trucks)
- The study indicates that the small increase in trucks arriving at the site (on average approximately 3-5% increase) may result in incremental delays at the Bowmanville Avenue / Energy Drive intersection. These potential delays are expected to be minor in nature.

Map of Intersections included in the Traffic Impact Study

ALCF Storage and New Equipment

What are the regulation requirements for ALCF Storage?

O. Reg 79/15 indicates that the following conditions must be met for storage of ALCF materials:

- None of the fuel is stored for more than 18 months;
- The maximum amount of the fuel stored is the amount that is reasonably capable of being combusted at the site during a period of six months; and
- The fuel stored is to be combusted at the site.

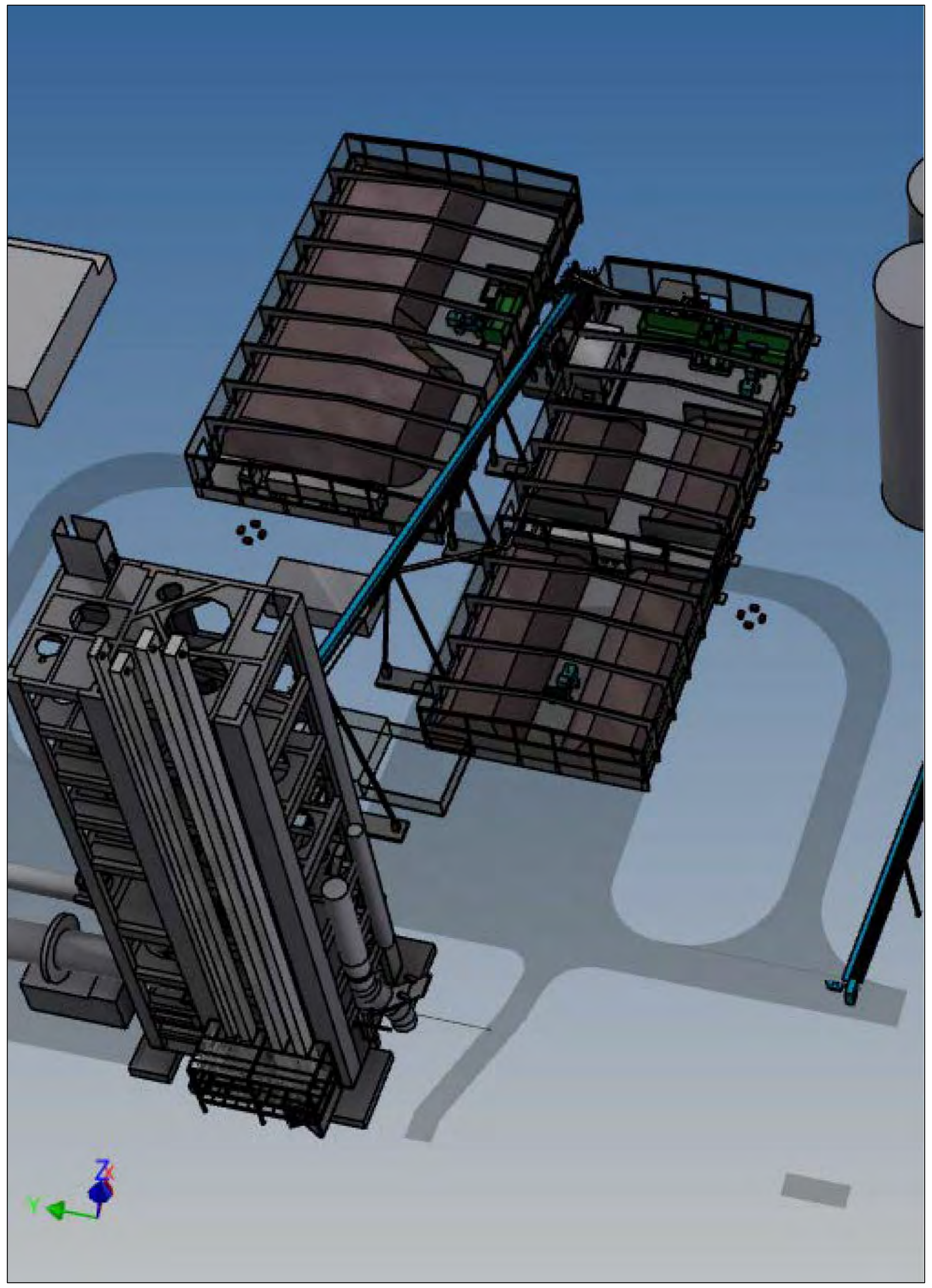
The site plans meet these conditions.

What changes will SMC be making to fuel storage and equipment at the Bowmanville Plant?

The following changes are proposed:

- SMC will be increasing the footprint of the existing ALCF building from 1,470 m² to 4,735 m² which will be sufficient to store a little more than 2 days of ALCF materials at the usage rate of 400 tonnes per day. This will include an expansion of the existing building and addition of a second building.
- The two Ecodocks will be replaced by three walking floor hoppers
- The enclosed conveyor system will be extended to the new building
- The front-end loaders will be used inside the buildings to move the material
- Another dust collector will be installed inside the building

The site currently has a permit to feed the material into the kiln and to reduce the particle size of the material.



Drawing of Potential New ALCF Storage Building at the Bowmanville Cement Plant

Next Steps, Schedule and Comments

What is the timeline for this project?

Next Steps	Anticipated Schedule
Respond to public comments and address public concerns	December 2019 / January 2020
Finalize environmental reports	December 2019 / January 2020
Prepare Consultation Report and post it for public viewing on the project website	February 2020
Submit ALCF O. Reg 79/15 Application to MECP	February / March 2020
MECP to review Application	Spring/Summer 2020

How can you participate in this project?

- Talk to our team members today or fill out a comment form and we will respond
  - We would appreciate receiving your comment forms to us by **January 20, 2020**
- Visit our website: StMarysCement.com/BowmanvilleALCF
  - All notices and presentation materials will be posted on the project website
- **Contact us by Phone or Email:**

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