

Ten years after Ecojustice's report on one of Canada's most polluted communities

Return to
CHEMICAL
VALLEY 2019



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RETURN TO CHEMICAL VALLEY

Ten years after Ecojustice's report on one of Canada's most polluted communities

June 2019

An Ecojustice Report

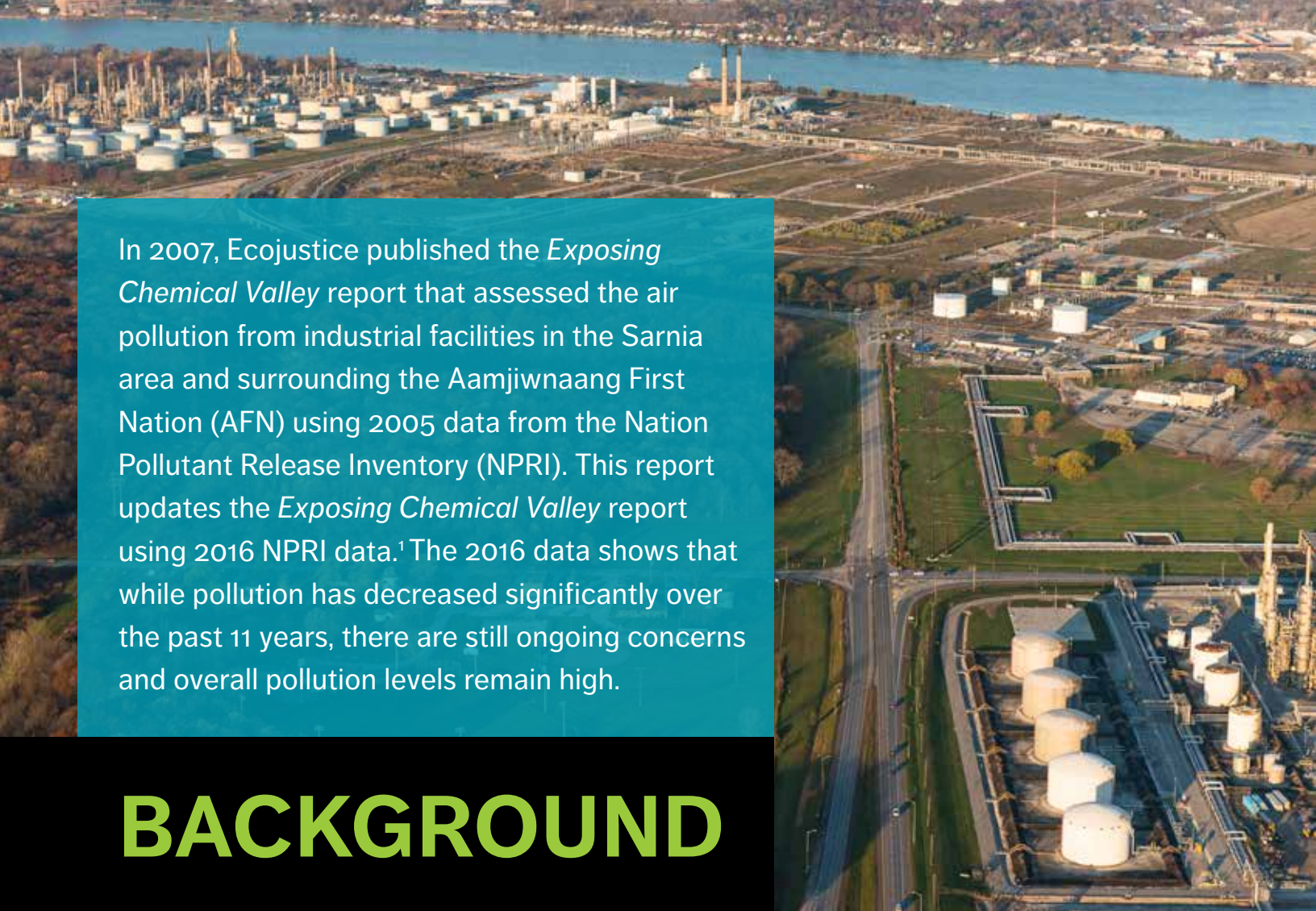
By Dr. Elaine MacDonald,
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In 2007, Ecojustice published the *Exposing Chemical Valley* report that assessed the air pollution from industrial facilities in the Sarnia area and surrounding the Aamjiwnaang First Nation (AFN) using 2005 data from the Nation Pollutant Release Inventory (NPRI). This report updates the *Exposing Chemical Valley* report using 2016 NPRI data.¹ The 2016 data shows that while pollution has decreased significantly over the past 11 years, there are still ongoing concerns and overall pollution levels remain high.

BACKGROUND

In 2007 minimal air quality monitoring data was publically available, and there was no air monitoring station within the AFN reserve. In 2008, an air monitoring station was established at AFN, and in February 2018 near real-time air quality data from the AFN station and other air monitoring stations in the Chemical Valley area were made publically available on the internet. This report reviews that data in addition to the air monitoring information available through government reports. Finally, this report discusses the outstanding challenges and recommends policy and law measures to address those challenges.

Since the 2007 report, the AFN, community members and Ecojustice have continued to advocate for stronger laws and policies to reduce air pollution and protect human health and environmental rights. While we have collectively made progress towards these goals, as demonstrated by the significant reduction in air pollution emissions, further law and policy changes are needed to secure a healthy environment for the local community.

We hope this report helps community members living in and around the Sarnia area understand more clearly the surrounding industry's air pollutant emissions and the potential impacts these emissions have on their environment and health. By providing a better understanding and contributing to the continuing dialogue at local levels, we hope to help those who are working to ensure respect for the residents' right to live in a healthy environment.

¹ The 2016 data is the most up-to-date reviewed NPRI data available to the public. <https://www.canada.ca/en/environment-climate-change/services/national-pollutant-release-inventory/tools-resources-data/access.html>

Advocating for a right to a healthy and ecologically-balanced environment in Chemical Valley

Ecojustice has worked with AFN community members for more than 10 years to advocate for their right to a healthy and ecologically-balanced environment. This right is recognized in law by more than 175 countries around the world and has driven concrete, on-the-ground improvements in health and environmental quality. Regardless, neither the Government of Ontario nor the Government of Canada legally recognize such a right.

In AFN and Sarnia, the Ontario government has not only failed to recognize residents' legal right to a healthy and ecologically-balanced environment – it has actively permitted air pollution that has seriously undermined the quality of the community's air. By permitting high levels of air pollution from the sprawling industrial complex known as Chemical Valley – pollution levels higher than almost everywhere else in Canada – the Ontario government has actively contributed to what its own watchdog described as an environmental injustice.²

For more than a decade, Ecojustice has worked with community members to safeguard their right to breathe clean air. We've advocated for better laws, more science-based decision-making, and have even taken the government to court. And we have seen a reduction in pollution emissions and some improvements in the community's overall air quality during that time. But there is still a long way to go before the community's right to a healthy and ecologically-balanced environment is fully protected.



² Environmental Commissioner of Ontario. Good Choices, Bad Choices. Environmental Rights and Environmental Protection in Ontario. 2017. Available at: <http://docs.assets.eco.on.ca/reports/environmental-protection/2017/Good-Choices-Bad-Choices.pdf>



THE LAND AND PEOPLE

Sarnia is located in southwestern Ontario where Lake Huron meets the St. Clair River. Sarnia's population is approximately 71,500 people. Across the river from Sarnia is the State of Michigan in the United States.

Situated on the south side of Sarnia is the AFN, a First Nations community of about 2,300 people, of which about 850 live on reserve lands. In the mid-18th century, AFN territory covered a vast expanse of land on both sides of the river between Lakes Huron and Erie, including nine villages supporting a population of 15,000.

Aamjiwnaang is an Ojibwa word meaning "an important gathering place" that had been used by First Nations for millennia. This gathering place was located at the foot of Lake Huron. The people who lived in this vibrant and prosperous community called Aamjiwnaang were members of the Anishinabek First Nation.

The city of Sarnia is unique relative to other metropolitan areas across the country in that it has a high concentration of industry in the south end and beyond into the neighbouring township. The area is commonly known as Chemical Valley, because of its cluster of petroleum refineries, petrochemical plants, and energy facilities. A significant proportion of this industry surrounds the AFN. Some of the facilities share a property line with AFN.

Since the 2007 report, the composition of industry in the region has changed in important ways; however, much of it remains the same. The phase-out of coal power in Ontario resulted in the closure of a significant source of pollution about 15 km south of AFN, the Lambton coal-fired power station. Until its closure in 2013, the Lambton coal-fired power station was the top emitter of pollutants in the region. Other facilities have also closed down or have reduced air emissions, while a few other new facilities have opened up.

INDUSTRIAL AIR POLLUTION EMISSIONS

Source of the data: The National Pollutant Release Inventory (NPRI)

The NPRI is a federal database that tracks the annual releases of pollutants into the air, water, and land by industry. Industries that must report their pollutant releases are identified through a set of rules that are updated and released biennially by the federal government.

Generally, a facility must report air pollution emissions to the NPRI if it manufactures, processes or otherwise uses 10 tonnes or more of a substance on the NPRI list. In 2016-2017, there were approximately 343 substances on the NPRI list. Since the 2007 report, the most significant substance added to the NPRI list, related to this report, is Total Reduced Sulphur (TRS).³

There are three things to keep in mind when looking at the NPRI data. First, data reported to the NPRI is self-reported. Therefore, the onus is on each facility to make sure that it accurately reports the data. Second, a facility can use several different methods⁴ to report how much air pollution it emits in a reporting year and some methods may be more accurate than others. Third, the NPRI does not measure every industrial/commercial source of pollution. Smaller facilities that do not meet the reporting requirements do not report to the NPRI, and mobile transportation sources such as trucks, trains, ships, and cars are omitted.

Figure 1 - Location of Table 1 facilities by rank



³ The reporting mass threshold for TRS is 10 tonnes.

⁴ A facility may use the following estimation methods: 1) Continuous emission monitoring systems, 2) predictive emissions monitoring, 3) source testing, 4) mass balance, 5) site-specific and published emission factors, 6) and engineering estimates. Guide for Reporting to the National Pollutant Release Inventory (NPRI) 2016 and 2017. Available online <http://www.ec.gc.ca/INRP-NPRI/28C24172-53CB-4307-8720-CB91EE2A6069/2016-17%20Guide%20for%20Reporting%20-%20EN.pdf>

2016 air pollution emissions data

Thirty-eight facilities within a 25 km-radius of the Aamjiwnaang First Nation reported air emission releases to the NPRI for the 2016 reporting year. However, only 23 of those facilities reported more than 50 tonnes of air pollutant emissions, as shown in Table 1 below:

Table 1 – Total air emissions⁵ by facilities emitting more than 50 tonnes within a 25 km-radius of Aamjiwnaang First Nation

| Rank (highest emitter) | Company name | Facility name | City/town | Distance from AFN (km) | 2016 total reported air pollution (tonnes) | 2005 total reported air pollution (tonnes) |
|--------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|---------------------------------------|----------------|------------------------|--------------------------------------------|--------------------------------------------|
| 1 | Imperial Oil | Sarnia Refinery Plant | Sarnia | 3 | 13,164 | 31,818 |
| 2 | Cabot Canada Limited | Cabot Canada Limited | Sarnia | 2 | 7,262 | 7,260 |
| 3 | Shell Canada Products | Sarnia Manufacturing Centre | Corunna | 4 | 4,880 | 14,079 |
| 4 | Suncor Energy Products Partnership | Sarnia Refinery | Sarnia | 3 | 4,754 | 10,214 |
| 5 | NOVA Chemicals (Canada) Ltd. | Corunna Site | Corunna | 4 | 4,079 | 7,259 |
| 6 | Greenfield Energy Centre, LP (2008) | Greenfield Energy Centre | Courtright | 18 | 2,501 | N/A |
| 7 | Imperial Oil | Sarnia Chemical Plant | Sarnia | 2 | 1,246 | 809 |
| 8 | Terra International (Canada) Inc. | CF Industries Courtright | Courtright | 22 | 1,083 | 1,568 |
| 9 | TransAlta Generation Partnership | Sarnia Regional Cogeneration Facility | Sarnia | 5 | 999 | 1947 |
| 10 | Arlanxeo (was Lanxess) | Arlanxeo East | Sarnia | 7 | 868 | 1065 |
| 11 | Clean Harbors Canada, Inc. | Clean Harbors Corunna | Corunna | 10 | 725 | 749 |
| 12 | Suncor Energy Products Inc. (2011) | St. Clair Ethanol Plant | St. Clair | 2 | 577 | N/A |
| 13 | Plains Midstream Canada (was BP) | Sarnia Fractionation Plant | Sarnia | 6 | 560 | 503 |
| 14 | NOVA Chemicals (Canada) Ltd. | Moore Site | Moore Township | 8 | 447 | 600 |
| 15 | NOVA Chemicals Corporation | St. Clair River Site | Corunna | 5 | 446 | 430 |
| 16 | INEOS Styrolution Canada Ltd. (was Nova Chemicals Sarnia) | Sarnia Site | Sarnia | 0.5 | 371 | 359 |
| 17 | Imperial Oil | Sarnia Cogen Plant | Sarnia | 7 | 350 | 83 |
| 18 | Air Products Canada Ltd. (2006) | Corunna Hydrogen Facility | Corunna | 4 | 325 | N/A |
| 19 | St. Clair Power, LP (2009) | St. Clair Energy Center | Corunna | 8 | 293 | N/A |
| 20 | Enbridge Pipelines Inc. | Sarnia Terminal | Sarnia | 5 | 150 | 18 |
| 21 | Enbridge Gas Distribution Inc. | Tecumseh (Corunna) Gas Storage | Moore Township | 10 | 124 | 681 |
| 22 | Union Gas (2010) | Airport Pool | St. Clair | 13 | 102 | N/A |
| 23 | Arlanxeo (was Lanxess) | West | Sarnia | 2 | 51 | 68 |
| Total Air Pollution emitted in Canada in a 25-km radius of AFN with over 50 tonnes of emission to air | | | | | 45,357 | |
| Amount of Air Pollution Emitted in Ontario | | | | | 455,439 | |
| Percentage of Sarnia Pollution as part of Ontario's emissions | | | | | 10% | |

⁵ In determining total air emissions efforts were made to avoid double counting of pollutants reported more than once to the NPRI.



Sarnia-area facilities released about 45,357 tonnes of air pollution in 2016. To put these numbers in context, in 2016, all Ontario facilities that report to the NPRI emitted approximately 455,439 tonnes of pollution⁶ into the air. Emissions from Sarnia account for approximately 10 per cent of the total emissions across the province. That proportion is lower than in 2005 when 44 Sarnia facilities emitted 131,992 tonnes of air pollutants, approximately 16 per cent of total Ontario emissions. About half of that decrease is due to the 2013 closure of the Lambton Generating Station.

The rest of the decrease in emissions may be linked to other facility closures (such as the closures of the Dow Chemical, Royal Polymers, and Fibrex Insulation facilities), as well as decreased production at existing facilities, improvements in pollution control, changes to cleaner feedstocks, and facilities that no longer need to report to the NPRI.

Among the 38 facilities that reported to the NPRI in 2016, Imperial Oil, Cabot Canada, Shell and Suncor emit the most pollution into the Sarnia area. All of these facilities are situated adjacent to or within a few kilometers from the AFN and have significantly reduced their emissions over the last ten years, except for Cabot.

Analysis of Criteria Air Contaminants emissions

Criteria air contaminants (CACs) are a group of pollutants that can contribute to smog and general poor air quality. The CACs that facilities must report to the NPRI are volatile organic compounds (VOC), total particulate matter (TPM), nitrogen oxides (NO_x, expressed as NO₂), sulphur dioxide (SO₂) and carbon monoxide (CO).

Table 2 - Total 2016 CAC emissions from facilities in the Sarnia area compared to all of Ontario

| 2016 | SO ₂ (tonnes) | NO ₂ (tonnes) | TPM (tonnes) | PM ₁₀ (tonnes) | PM _{2.5} (tonnes) | VOCs (tonnes) | CO (tonnes) | TRS (tonnes) |
|--------------------------------|-----------------------------|-----------------------------|-----------------|------------------------------|-------------------------------|------------------|----------------|-----------------|
| Sarnia area | 19839 | 9607 | 1471 | 1170 | 678 | 4366 | 11381 | 107 |
| Ontario total | 241914 | 625932 | 33289 | 18505 | 9423 | 42249 | 63267 | 719 |
| Sarnia area as % of Ontario | 8% | 15.5% | 4.4% | 6.3% | 7.2% | 10.3% | 18% | 15% |

⁶ Note: It is difficult to attribute overall health burdens to the aggregate pollutant release total do to the varying toxicities of substances.

The top five emitters of CACs in the Sarnia area are Imperial Oil Refinery, Cabot Canada, Shell Canada, Suncor Energy and Nova Chemicals Corunna. The highest VOC emitter was the Arlanxeo East facility, which emitted 868 tonnes of VOCs.

Table 3 - 2016 CAC emissions from highest emitting facilities in the Sarnia area

| Facility | SO ₂ (tonnes) | NO ₂ (tonnes) | TPM (tonnes) | PM _{2.5} (tonnes) | VOC (tonnes) | CO (tonnes) | TRS (tonnes) | Total (tonnes) |
|------------------------------------------------------|-----------------------------|-----------------------------|-----------------|-------------------------------|-----------------|----------------|-----------------|-------------------|
| Imperial Oil - Sarnia Refinery Plant | 9,838 | 1,975 | 712 | 277 | 604 | 1,014 | 32.6 | 14,143 |
| Cabot Canada Limited - Cabot Canada Limited | 5,036 | 658 | 89 | 75 | 96 | 1955 | 58.5 | 7834 |
| Shell Canada Products - Sarnia Manufacturing Centre | 3,073 | 818 | 198 | 77 | 304 | 449 | 2.5 | 4842 |
| Suncor Energy Products Partnership - Sarnia Refinery | 347 | 792 | 142 | 26 | 377 | 3087 | 1.4 | 4745 |
| NOVA Chemicals (Canada) Ltd. - Corunna Site | 902 | 1,931 | 69 | 47 | 325 | 794 | 3.7 | 4021 |



Analysis of toxic volatile organic compounds emissions – Benzene and 1,3-Butadiene

In this report, we highlight benzene and 1,3-butadiene because the community has raised specific health concerns about exposure to these VOCs. Benzene and 1,3 butadiene are considered carcinogenic and have been specifically linked to leukaemia.⁷ According to a 2019 study, the incident rate of acute myeloid leukemia in Sarnia is three times higher than the national average.⁸ In 2016, Sarnia area facilities emitted just under one-third of the total benzene and about 87 per cent of the total 1,3-butadiene emitted by industry in Ontario.

Table 4 - Total 2016 Benzene and 1,3-Butadiene emissions from facilities in the Sarnia area compared to all of Ontario

| 2016 | Benzene (tonnes) | 1,3 - Butadiene (tonnes) |
|---------------------------------------|------------------|--------------------------|
| Sarnia area | 47.5 | 15.7 |
| Ontario total | 162 | 18 |
| Sarnia area emissions as % of Ontario | 29.3% | 87.4% |

The table below shows the top benzene and 1,3-butadiene emitters in the Sarnia area for 2016. The top three emitters – INEOS Styrolution Canada Ltd, Nova Chemicals (Canada) Ltd Corunna Site and Imperial Oil – contribute significantly to the total amounts released in the Sarnia area.

Table 5 - Top 2016 Benzene and 1,3 Butadiene emitters

| Facility | Benzene (tonnes) | 1,3-Butadiene (tonnes) |
|------------------------------------------------------|------------------|------------------------|
| INEOS Styrolution Canada Ltd | 17 | - |
| NOVA Chemicals (Canada) Ltd. - Corunna Site | 9.2 | 8.9 |
| Imperial Oil - Sarnia Refinery Plant | 8.8 | 1.1 |
| Suncor Energy Products Partnership - Sarnia Refinery | 4.9 | - |
| Shell Canada Products - Sarnia Manufacturing Centre | 3.9 | - |
| Imperial Oil - Sarnia Chemical Plant | 3.7 | 0.236 |
| Arlanxeo Canada Inc. - West | - | 5.5 |

⁷ International Agency for Research on Cancer of the World Health Organization. List of Classifications by cancer sites with sufficient or limited evidence in humans, Volumes 1 to 123a⁷. <https://monographs.iarc.fr/wp-content/uploads/2018/07/Table4.pdf> pg 8.

⁸ Feras M. Ghazawi MD, PhD, Michelle Le BSc, Janelle Cyr MSc, Elena Netchiporouk MD, MSc, Elham Rahme PhD, Akram Alakel BSc, Andrei Zubarev MSc, Mathieu Powell MD, Linda Moreau MD, Osama Roshdy MD, Steven J. Glassman MD, Denis Sasseville MD, Gizelle Popradi MD, Ivan V. Litvinov MD, PhD. Analysis of acute myeloid leukemia incidence and geographic distribution in Canada from 1992 to 2010 reveals disease clusters in Sarnia and other industrial US border cities in Ontario. Cancer. Vol 125, Issue 11 (2019)

AMBIENT AIR MONITORING

Stationary air monitors

The concentration of air pollutants in the air in the Sarnia area is monitored at stationary monitors as well as by using mobile monitoring equipment. The 2007 report only provided NPRI data about the quantity of pollution emissions by facility because very little air monitoring data was publically available at the time.

The Ministry of the Environment, Conservation, and Parks (MECP) maintains an air monitor located in downtown Sarnia on Christina Street. There is also an air monitor located in the AFN operated by AFN in partnership by the provincial and federal governments. The Sarnia Lambton Environment Association (SLEA), a local industry association, also operates several air monitoring stations (i.e., Front Street, Scott Road, LaSalle Line, and River Bend).

Until 2017, only the MECP ambient monitor station data was publicly available online, but in February 2018 the MECP launched the Clean Air Sarnia and Area (CASA) website offering near real-time air quality data from the MECP, AFN and SLEA stations.

The air quality monitoring stations measure different pollutants, as shown in the table below adapted from the CASA web site. In addition to the pollutants shown below, all of the stations measure wind direction and wind speed.

Figure 2 - Image of monitoring stations from CASA web site

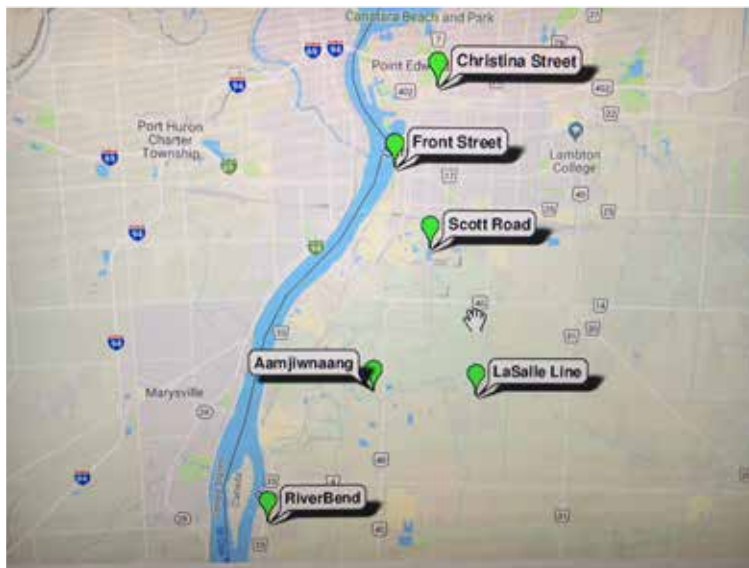


Table 6 - Parameters measured at Sarnia area air monitoring stations⁹

| Station Name | NO ₂ | O ₃ | PM _{2.5} | SO ₂ | TRS | TSP /Metals | PAH | VOC 1,3-butadiene | VOC Benzene | VOC Ethylene | VOC Other |
|------------------|-----------------|----------------|-------------------|-----------------|-----|-------------|-----|-------------------|-------------|--------------|-----------|
| Christina Street | R | R | R | R | R | | | N | N | N | N |
| Aamjiwnaang | R | | R | R | R | N | N | R and N | R and N | N | N |
| Front Street | R | R | R | R | | N | | R and N | R and N | | N |
| Lasalle Line | | | | R | | | | | | R | |
| Moore Line | | | R | | | | | | | R | |
| River Bend | R | R | | R | R | | | N | N | R | |
| Scott Road | | | | | R | | | | | R | |

Notes: NO₂ – Nitrogen Dioxide, O₃ – Ozone, SO₂ – Sulphur Dioxide, PM_{2.5} – particulate matter of less than 2.5 micrometers, TRS - Total Reduced Sulphur, TSP/ Metal - Total Suspended Particulate/Metals, PAH – Polycyclic Aromatic Hydrocarbons, VOC- Volatile Organic Hydrocarbons.

N - Non- continuous monitoring

R – Real-time continuous monitoring

⁹ Adapted from the CASA web site.



Air quality criteria and standards

The MECP sets Ontario Ambient Air Quality Criteria (AAQC) for air pollutants. An AAQC is a desirable concentration of a pollutant in the air and is used to assess general air quality resulting from all emission sources. The Ministry is supposed to set each AAQC at a concentration that protects against adverse effects on human health and the environment, although some AAQCs, such as those for NO₂ and Ozone, are outdated and some pollutants, such as PM_{2.5}, do not have an AAQC. AAQCs are not legally-binding and they do not regulate emissions from industrial facilities unless the Ministry has also created an equivalent air quality standard.

The CASA web site compares ground level concentrations at air monitoring stations to AAQCs, although at the time of publication the CASA website was still comparing ambient SO₂ concentrations to the old AAQC and not the new updated SO₂ AAQC approved in March 2018.¹⁰

There are also Canadian Ambient Air Quality Standards (CAAQS) for several pollutants (SO₂, NO₂, PM_{2.5}, and Ozone). While these are usually based on up-to-date science about a pollutant's impacts on health, they are also not legally-binding. CAAQS are part of a broader federal, provincial and territorial effort to drive air quality improvements across Canada.

Ontario has created legally-binding air quality standards under Ontario Regulation 419/05 (O. Reg. 419/05) made under the Ontario Environmental Protection Act. These standards apply to air pollutants emitted from industrial facilities and place limits on the concentration of designated pollutants that industry emits into the environment. To demonstrate compliance, facilities must produce an Emission Summary Dispersion Modelling (ESDM) report. Computer models predict the concentration of pollutants outside the facility property. Locations outside the property are called "Points of Impingement" (POI). Dispersion models take into account a variety of factors to predict the concentration at a POI, such as weather, topography, buildings, the height of stacks and other emissions sources characteristics, and emission rates.

¹⁰ EBR Decision Notice 013-0903. Regulatory amendments related to air emissions of sulphur dioxide and other items. Available here: <https://www.ebr.gov.on.ca/ERS-WEB-External/displaynoticecontent.do?noticeId=MTMyOTQ1&statusId=MjA1MjUz>



If a facility cannot meet an air standard, it can request a site-specific standard. This standard is based on the lowest concentration the facility can reach based on technical and economic considerations. These standards last for at least five years and up to a maximum of ten years. Industry sectors can also request a standard that sets out technical and operational requirements for each facility that registers under the standard. Technical standards can apply to only some parts of a facility or to only some contaminants, in which case the facility still has to comply with regular standards for the rest of its pollution sources/contaminants. But, once registered, the facility (or the parts of it covered by the standard) does not need to meet the air quality standard in O. Reg. 419/05 for any contaminant covered by the technical standard. The table below compares the Ontario AAQC, CAAQS, and O. Reg. 419/05 standards as well the values used by the CASA website to assess the ambient air quality at the monitors.

Table 7 - Comparison between Ontario and Federal air quality criteria, Industrial standards, and CASA site

| Pollutant | AAQC $\mu\text{g}/\text{m}^3$ | CAAQS $\mu\text{g}/\text{m}^3$ | | O. Reg. 419/05 standard $\mu\text{g}/\text{m}^3$ | | CASA site $\mu\text{g}/\text{m}^3$ |
|-------------------|----------------------------------------------------------------------------|--------------------------------------------|----------------------------------------------------|--------------------------------------------------|-----------------|-----------------------------------------|
| SO ₂ | 100 1-hr (38 ppb) | 183 1-hr by 2020 (70 ppb) | | 690 1-hr (250 ppb) | 100 1-hr (2023) | 690 1-hr (250 ppb) |
| NO ₂ | 400 1-hr (200 ppb) | 113 1-hr by 2020 (60 ppb) | | 400 1-hr (200 ppb) | | 400 1-hr (200 ppb) |
| PM _{2.5} | No AAQC | 28 $\mu\text{g}/\text{m}^3$ – 24 hr | 27 $\mu\text{g}/\text{m}^3$ – 24 hr by 2020 | No standard | | None |
| Benzene | 0.45 $\mu\text{g}/\text{m}^3$ annual 2.3 $\mu\text{g}/\text{m}^3$ 24-hr | None | | 0.45 $\mu\text{g}/\text{m}^3$ annual | | 2.3 $\mu\text{g}/\text{m}^3$ for 24 hrs |
| Ozone | 165 1-hr (80 ppb) | 129 $\mu\text{g}/\text{m}^3$ 8-hr (63 ppb) | 128 $\mu\text{g}/\text{m}^3$ 8-hr (62 ppb) by 2020 | No standard | | 165 1-hr (80 ppb) |



Ambient air quality

MECP provides an annual report about air quality monitoring at the AFN station. The most recent report that is publicly available¹¹ is from July 2017 and reports on the year 2015. According to that report, since monitoring began at the AFN station in 2008, MECP has observed significant reductions in some air pollutants, specifically SO₂, NO₂, TRS, and PM_{2.5}. However, during that time, MECP observed increases for suspended particulate, benzo[a]pyrene (a PAH), benzene and ozone (O₃). The report also notes that benzene was the only VOC that exceeded the AAQC, and benzo[a]pyrene also exceeded the AAQC.

MECP also publishes annual reports about air quality across Ontario. The most recent Ontario Air Quality Report is from 2016.¹² That report shows that Sarnia Christina Road station had the highest annual mean benzene concentration in Ontario at 0.7 µg/m³, which exceeds the 0.45 µg/m³ AAQC for benzene. Sarnia also had the highest toluene and ethylbenzene concentrations in Ontario. According to the Ontario report, there was insufficient data from the Sarnia Christina Road station to report an annual mean SO₂ and NO₂ in 2016, although that station measured the second highest 24-hr SO₂ level in Ontario.

The tables below provide the concentrations of air pollutants from the most recent publicly-available annual reports.¹³ The 2017 and 2018 concentrations were obtained from the CASA web site using the reporting function.

BENZENE

Benzene is known to cause cancer, and there is no level of exposure considered “safe.” Long-term exposure to benzene increases the risk of developing cancers like leukemia. According to a 2019 study, the incident rate of acute myeloid leukemia in Sarnia is three times higher than the national average. In June 2016, after several years of discussion and phase-in, Ontario updated its benzene air standard to 0.45 µg/m³ averaged over a year based on this cancer risk.

Benzene is a highly-volatile, naturally-occurring chemical in crude oil and fuel products and is used to make a wide variety of products, like plastics, nylon, latex, resin, pesticides, pharmaceuticals and detergents. Sarnia-area facilities released a total of 47 tonnes of benzene in 2016, nearly one-third of the 162 tonnes emitted by industry across Ontario.

¹¹ Available at: <http://www.aamjiwnaang.ca/air-monitoring/>

¹² Available at: <http://www.airqualityontario.com/press/publications.php>

¹³ 2015 and 2016 Air Quality in Ontario Reports Sarnia. Available here <http://www.airqualityontario.com/press/publications.php> and Aamjiwnaang First Nation Community Air Monitoring Station 2015 Report <http://www.aamjiwnaang.ca/air-monitoring/>

Sarnia petroleum refineries and petrochemical facilities requested an industry standard for benzene claiming they were unable to meet the benzene air quality standard. As mentioned above, industry standards do not generally impose numerical concentration limits but instead impose technological and process requirements. The benzene industry standards require tank upgrades and leak detection improvements to reduce benzene emissions over approximately nine years.

According to the 2016 Air Quality in Ontario Report, the Sarnia Christina Street air monitoring station measured the highest annual benzene average at 0.7 µg/m³ of the seven provincial air monitors that assess benzene.¹⁴ This report does not include the Aamjiwnaang and industry monitoring stations.

As shown in the table below, the 2018 annual mean concentration of benzene at the Aamjiwnaang community air monitoring station, based on continuous sampling data, was almost double the standard of 0.45 µg/m³ at 0.7 µg/m³. However, this is a decrease from the annual average of 1.2 µg/m³ in 2017.

The 2016 and 2017 non-continuous benzene sampling data was obtained from the National Air Pollutant Surveillance program, and was later made available through the CASA web site. The annual benzene average of the non-continuous data at the Aamjiwnaang monitor was 1.52 and 1.49 µg/m³ in 2016 and 2017, respectively. Annual averages for the years 2011 to 2016 were obtained from the MECP reports documenting air quality at the AFN monitor station.¹⁵

Table 8 - Annual benzene averages from 2011 – 2018

| | Annual Average (µg/m ³) | | | | | | | | |
|--------------------------|-------------------------------------|------|------|------|------|------|--------------------|--------------------|------|
| | Sample method | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 ¹⁶ | 2017 ¹⁷ | 2018 |
| Aamjiwnaang Station | Non- continuous (Summa canister) | 1.20 | 1.12 | 1.0 | 1.49 | 1.49 | 1.52 | 1.49 | n/a |
| | Continuous monitoring | n/a | n/a | n/a | n/a | n/a | n/a | 1.2 | 0.7 |
| Front St. Station (SLEA) | Tubes | n/a | n/a | n/a | n/a | n/a | 1.47 | 1.19 | 1.31 |

*- indicates that the AAQC was not in effect.

n/a - indicates data is not publically available or monitoring was not conducted.

Benzene fenceline monitoring data published under the Petroleum and Petrochemical Industry Standards shows that facilities are still well over the Ontario health base standard that does not apply to them.

Table 9 - Summary of 2018 annual average benzene concentrations at industry fenceline monitors

| Facility | Number of Fenceline Stations | 2018 Annual Average Range (µg/m ³) |
|--------------|------------------------------|------------------------------------------------|
| Arlanxeo | 6 | 0.19 - 3.72 |
| Imperial Oil | 19 | 1.32 - 9.21 |
| Nova Corunna | 12 | 0.66 - 7.4 |
| Shell | 12 | 1.33 - 9.77 |
| Styrolutions | 12 | 3.92 - 25.48 |
| Suncor | 12 | 1.12 - 2.39 |

¹⁴ Air Quality in Ontario 2016 report. Available at: <http://www.airqualityontario.com/downloads/AirQualityInOntarioReportAndAppendix2016.pdf>

¹⁵ Available here <http://www.aamjiwnaang.ca/air-monitoring/>

¹⁶ Based on 2016 data non-continuous results obtained from the National Air Pollutant Surveillance program and later posted on CASA site.

¹⁷ This is based on a report generated from the on the CASA web site.

SULPHUR DIOXIDE

Elevated concentrations of SO₂ are known to cause respiratory distress, particularly in vulnerable populations including children, seniors and people with asthma. Exposures for as few as ten minutes can cause coughing, wheezing, and shortness of breath. SO₂ has also been linked to cardiovascular distress and is suspected to be linked to reproductive and developmental health problems.

In 2016, 11 facilities reported releases totalling 19,839 tonnes of SO₂ into the air in the Sarnia area. SO₂ is emitted from refineries and petrochemical manufacturing plants. The processing of crude oil requires refineries to remove sulphur, resulting in the production of hydrogen sulphide gas, also called acid gas. During malfunctions, start-ups and shut-downs (also known as transitional operating conditions) a refinery may need to burn off acid gases in a flare, resulting in highly concentrated SO₂ emissions.

On March 20, 2018, the Ontario SO₂ one-hour AAQC decreased to 100 µg/m³ (38 ppb) and the annual average AAQC decreased to 10 µg/m³ (3.8 ppb). The new one-hour AAQC represents a more than six-fold reduction from old 690 µg/m³ AAQC (262 ppb), which still applies as an industry standard until 2023 during the five-year phase-in period.

The 2018 CASA reports show that the maximum measured one-hour SO₂ concentration from March 20, 2018, to the end of 2018 exceeded the new AAQC 38 times at the Aamjiwnaang monitor station and 28 times at the Sarnia monitoring station.

The SO₂ concentrations at Sarnia-area monitoring stations from the recent annual air quality reports and the CASA web site are summarized in Table 10 below. Table 10 also includes the recent SO₂ concentrations at a monitoring station across the border in Port Huron, Michigan that may be impacted by SO₂ emissions from Sarnia area facilities.

Table 10 - Summary of SO₂ ambient concentrations at monitors in the Sarnia area

| Monitoring Station | Year | Annual Average (ppb) | 24 Hour Max (ppb) | 1 Hour Max (ppb) | 1 – hour AAQC Exceedances |
|--------------------------|------|----------------------|-------------------|------------------|---------------------------|
| Aamjiwnaang | 2018 | 1.5 | 16.5 | 96 | 38 |
| | 2017 | 1.2 | 14.4 | 58 | |
| | 2015 | 2.1 | 20.6 | 119 | |
| | 2014 | 2.4 | 30.1 | 107 | |
| Sarnia (Christina St.) | 2018 | 1.9 | 27.2 | 65 | 28 |
| | 2017 | 1.7 | 26 | 72 | |
| | 2016 | INS | 22 | 71 | |
| | 2015 | 3.2 | 39.4 | 72 | |
| Front St. Station (SLEA) | 2016 | n/a | 95 ¹⁸ | n/a | |
| Port Huron, Michigan | 2017 | 2.1 | 17 | 76.1 | |
| | 2016 | 1.2 | 15.5 | 67.7 | |

¹⁸ Sarnia Lambton Environment Association. 2016 Progress Review & Technical Summary. Available at: <http://www.sarniaenvironment.com/wp-content/uploads/2013/12/SLEA-2016-Progress-Review-and-Technical-Summary.pdf>



Are Chemical Valley SO₂ emissions impacting the United States?

The State of Michigan is in the process of developing a plan to reduce SO₂ emissions from at least two coal-fired power plants in Michigan to address non-attainment with the U.S. national ambient air quality standard for sulphur dioxide¹⁹ based upon measurements at the Port Huron Michigan air quality monitor which is across the St. Clair River from Chemical Valley. According to the 2017 Air Quality Annual Report for Michigan²⁰ the highest one-hour SO₂ concentration at the Port Huron monitoring station was 76 ppb, the highest 24 hr average was 17.4ppb and the annual mean was 2.1 ppb, as shown in Table 10.

FINE PARTICULATE MATTER (PM_{2.5})

Fine particulate matter (PM_{2.5}) is a term used to describe very small particles in solid or liquid form that have a diameter of 2.5 micrometers, about 30 times smaller than the average diameter of a human hair. It includes aerosols, smoke, fumes, dust, ash, and pollen. PM can be emitted directly into the atmosphere, or it can form through chemical processes. PM is characterized according to size because health risks are greater for smaller sizes because small particles can penetrate deeper into the lungs.

Exposure to PM_{2.5} is associated with hospital admissions and worsening of cardiovascular and respiratory illnesses in people, sometimes resulting in premature deaths. Individuals that have these conditions, as well as the elderly and children, are at the highest risk of experiencing effects associated with exposure to PM_{2.5}.

Sarnia area industry released 678 tonnes of PM_{2.5} in 2016, or about seven per cent of the total industrial emissions in Ontario.

Ontario does not have an air quality standard for PM_{2.5} or PM₁₀ for that matter. Ontario follows the federal CAAQS PM_{2.5} guidelines, which are set at 28ug/m³ over 24 hours and 10 µg/m³ over one year. Under O. Reg. 419/05, there is no standard for PM_{2.5}.

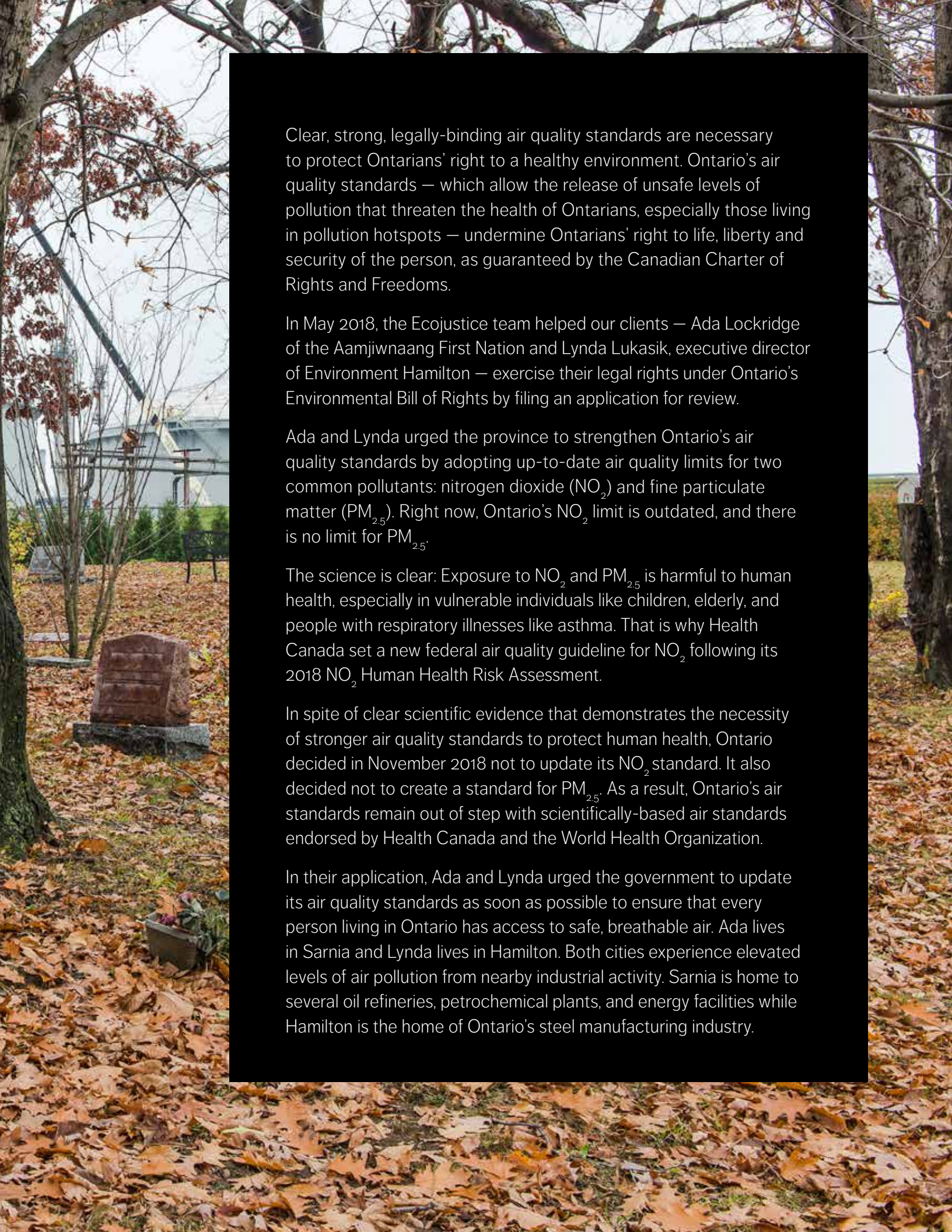
In December 2018, the Minister of Environment, Conservation, and Parks denied a request for a PM_{2.5} standard filed by Ecojustice on behalf of two Ontario residents under the province's Environmental Bill of Rights. The only particulate matter standard that currently exists is for total suspended particulate matter.²¹

¹⁹ Non-attainment means exceedance of the three year average of the 99th percentile of daily one-hour maxima of 75 ppb SO₂

²⁰ Available here https://www.michigan.gov/documents/deq/deq-aqd-amu-2017_annual_air_quality_report_632667_7.pdf

²¹ All PM that is less than 44 um in diameter.





Clear, strong, legally-binding air quality standards are necessary to protect Ontarians' right to a healthy environment. Ontario's air quality standards — which allow the release of unsafe levels of pollution that threaten the health of Ontarians, especially those living in pollution hotspots — undermine Ontarians' right to life, liberty and security of the person, as guaranteed by the Canadian Charter of Rights and Freedoms.

In May 2018, the Ecojustice team helped our clients — Ada Lockridge of the Aamjiwnaang First Nation and Lynda Lukasik, executive director of Environment Hamilton — exercise their legal rights under Ontario's Environmental Bill of Rights by filing an application for review.

Ada and Lynda urged the province to strengthen Ontario's air quality standards by adopting up-to-date air quality limits for two common pollutants: nitrogen dioxide (NO_2) and fine particulate matter ($\text{PM}_{2.5}$). Right now, Ontario's NO_2 limit is outdated, and there is no limit for $\text{PM}_{2.5}$.

The science is clear: Exposure to NO_2 and $\text{PM}_{2.5}$ is harmful to human health, especially in vulnerable individuals like children, elderly, and people with respiratory illnesses like asthma. That is why Health Canada set a new federal air quality guideline for NO_2 following its 2018 NO_2 Human Health Risk Assessment.

In spite of clear scientific evidence that demonstrates the necessity of stronger air quality standards to protect human health, Ontario decided in November 2018 not to update its NO_2 standard. It also decided not to create a standard for $\text{PM}_{2.5}$. As a result, Ontario's air standards remain out of step with scientifically-based air standards endorsed by Health Canada and the World Health Organization.

In their application, Ada and Lynda urged the government to update its air quality standards as soon as possible to ensure that every person living in Ontario has access to safe, breathable air. Ada lives in Sarnia and Lynda lives in Hamilton. Both cities experience elevated levels of air pollution from nearby industrial activity. Sarnia is home to several oil refineries, petrochemical plants, and energy facilities while Hamilton is the home of Ontario's steel manufacturing industry.

According to Ontario's annual air quality reports²², there were four exceedances of the PM_{2.5} 24-hour CAAQS at the Sarnia station in 2015 and no exceedances in 2016. Aamjiwnaang station also measured concentrations more than the CAAQS in February and March of 2015. The CASA data shows exceedances of the PM_{2.5} 24-hour CAAQS at both the Aamjiwnaang and Sarnia stations in 2017 and 2018.

Table 11 below provides the publically available PM_{2.5} concentrations from the annual reports and CASA web site.

Table 11 - Summary of PM_{2.5} ambient concentrations at monitors in the Sarnia area

| Station | Year | Annual Average (µg/m ³) | 24 Hour Max (µg/m ³) | 1 Hour Max (µg/m ³) |
|------------------------|------|-------------------------------------|----------------------------------|---------------------------------|
| Aamjiwnaang | 2018 | 7.4 | 29 | 77 |
| | 2017 | 6.9 | 29 | 65 |
| | 2015 | 9.0 | 38.8 | 106 |
| | 2014 | 8.1 | 35.5 | 53.3 |
| Sarnia (Christina St.) | 2018 | 7.4 | 31.2 | 49 |
| | 2017 | 7.1 | 41.6 | 62 |
| | 2016 | INS | 22 | 44 |
| | 2015 | 8.4 | 35.5 | 78 |

TOTAL REDUCED SULPHUR

Total Reduced Sulphur (TRS) compounds cause discomfort and irritation and may even make sensitive individuals feel ill because they smell very bad even at low concentrations. Total reduced sulphur compounds are a combination of several different sulphur compounds such as hydrogen sulphide (H₂S), methyl mercaptan (CH₄S), dimethyl sulphide (C₂H₆S) and dimethyl disulphide (C₂H₆S₂). Oil refineries are a prominent source of TRS compounds, particularly H₂S. TRS is commonly referred to as acid gas due to their acidic properties.

In 2016, refineries and petrochemical plants in Sarnia emitted about 107 tonnes of TRS, accounting for about 15 per cent of the industrial emissions in Ontario.

Ontario has 10-minute short term AAQC for TRS of 13µg/m³ (9 ppb) and a 24-hour AAQC and standard of 7µg/m³ (4.8 ppb). The former is based on odour, while the 24-hour standard is health-based. According to the data below, in recent years there have been no exceedances of the 24-hour AAQC for TRS. Data is not available for comparison to the 10-minute AAQC.

Table 12 below provides the publically available TRS concentrations from the annual reports and CASA web site.

Table 12 - Summary of TRS ambient concentrations at monitors in the Sarnia area

| Station | Year | Annual Average (ppb) | 24 Hour Max (ppb) | 1 Hour Max (ppb) |
|------------------------|------|----------------------|-------------------|------------------|
| Aamjiwnaang | 2018 | 0.3 | 0.8 | 4.8 |
| | 2017 | 0.3 | 1.1 | 3 |
| | 2015 | 0.6 | 2 | 10 |
| | 2014 | 0.2 | 1.6 | 6 |
| Sarnia (Christina St.) | 2018 | 0.2 | 0.6 | 2.1 |
| | 2017 | INS ²³ | 0.5 | 2 |
| | 2016 | INS ¹⁴ | 1 | 3 |
| | 2015 | 0.8 | 2 | 4 |

²² See footnote 12.

²³ Insufficient due to data only being available for part of the year.

NITROGEN DIOXIDE

Nitrogen Dioxide (NO₂) is a respiratory irritant and exposure to elevated NO₂ can make it easier to get sick with respiratory infections. Short-term exposure to NO₂ can trigger a range of breathing-related health impacts, including decreased lung function and airway inflammation. There is evidence that short-term exposure to NO₂ at levels commonly experienced in Sarnia increases the frequency and severity of asthma-related illnesses. Long-term exposure to NO₂ is linked to harmful health impacts like lower lung function and growth, especially in children. NO₂ is one of the primary precursors to the formation of ground-level ozone.

NO₂ is emitted from refineries, chemical plants, and power generation facilities in the Sarnia area. In 2016, 21 facilities reported NO₂ emissions totaling 9,607 tonnes or about 15 per cent of Ontario's industrial NO₂ emissions. Vehicles like cars and trucks are also a major source of NO₂ emissions but are not included in the NPRI reporting.

Currently, the one-hour Ontario AAQC and standard under O. Reg 419/05 for NO₂ is 400 µg/m³ (or 200 ppb), and the 24-hour standard is 200 µg/m³ (or 100 ppb). In response to Health Canada's assessment of the health risk of exposure to ambient NO₂ levels, the federal government established a new NO₂ CAAQS of 60 ppb for 1 hour and 17 ppb for 24-hour to be met by 2020.

The new one-hour CAAQS is more than three times lower than the Ontario AAQC, and the new 24-hour CAAQs is more than five times lower. As discussed above, in light of this disparity, in May 2018 Ecojustice requested a review of Ontario's outdated standards under Ontario's Environmental Bill of Rights on behalf of two Ontario citizens. In December 2018, several months late, the Ontario government responded to the request and refused to undertake a review.

There are no exceedances at the Aamjiwnaang or Sarnia monitors of Ontario's outdated NO₂ AAQCs. However, according to the 24-hour maximums reported at both the Sarnia and Aamjiwnaang monitors, the 24-hr CAAQS has been exceeded although the target year for meeting the CAAQS is 2020.

Table 13 below provides the publically available NO₂ concentrations from the annual reports and CASA web site.

Table 13 - Summary of NO₂ ambient concentrations at monitors in the Sarnia area

| Station | Year | Annual Average (ppb) | 24 Hour Max (ppb) | 1 Hour Max (ppb) |
|------------------------|------|----------------------|-------------------|------------------|
| Aamjiwnaang | 2018 | 5.9 | 17.8 | 42 |
| | 2017 | 5.7 | 15.7 | 31 |
| | 2015 | 10.2 | 24.6 | 43 |
| | 2014 | 9.8 | 30.3 | 48 |
| Sarnia (Christina St.) | 2018 | 7.6 | 26 | 46 |
| | 2017 | 7.3 | 23.7 | 44 |
| | 2016 | INS | 23 | 51 |
| | 2015 | 9.3 | 29.3 | 50 |

OZONE

Ozone (O₃) is a secondary pollutant formed from the mixing of NO₂, volatile organic compounds (VOCs) and sunlight. Ozone can cause chest tightness, coughing and wheezing and can be particularly problematic to individuals that have pre-existing respiratory conditions, such as asthma and cardiovascular diseases.

In Ontario, ozone currently has a one-hour AAQC of 166 µg/m³ (or 80ppb), but it is also dated compared to the federal CAAQS of 63 ppb based on an eight-hour standard, which will drop to 62ppb in 2020. Because ozone is not a primary pollutant emitted by industry, there are no NPRI reporting requirements and no air standards under O. Reg 419/05 for ozone.

Throughout 2015, there were five exceedances of the AAQC at the Aamjiwnaang monitoring station and four exceedances at the Sarnia station in both 2015 and 2016. Table 14 below provides the publicly available Ozone concentrations from the annual reports and CASA web site.

Table 14 - Summary of ozone ambient concentrations at monitors in the Sarnia area

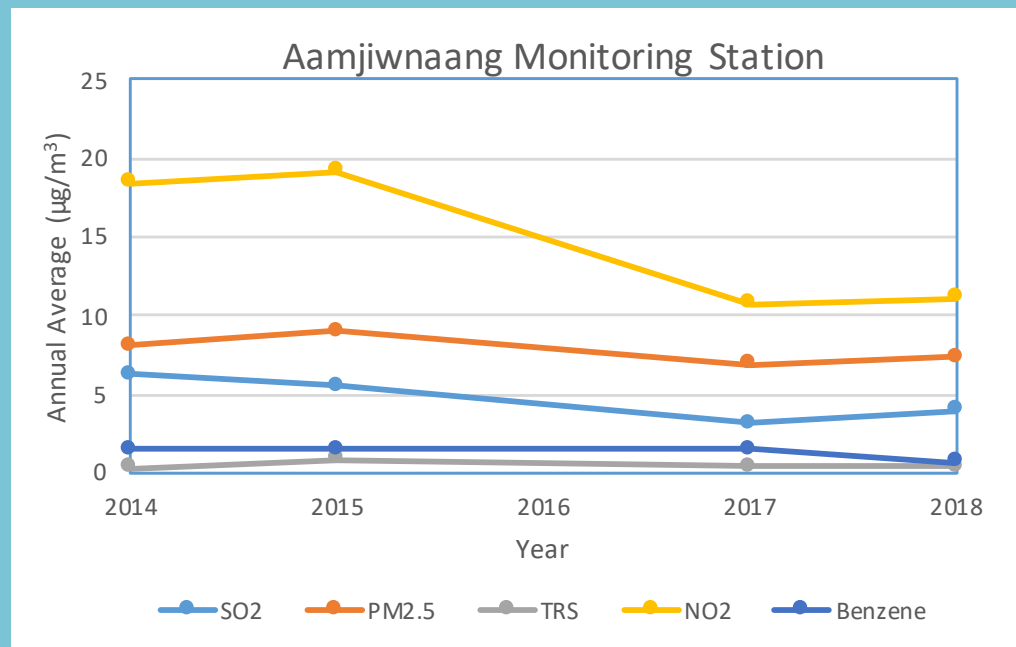
| Station | Year | Annual Average (ppb) | 24 Hour Max (ppb) | 1 Hour Max (ppb) | 1-hr AAQC Exceedances |
|------------------------|------|----------------------|-------------------|------------------|-----------------------|
| Aamjiwnaang | 2015 | 27.1 | 45.1 | 86 | 5 |
| Sarnia (Christina St.) | 2018 | 29.1 | 56.8 | 101 | 18 |
| | 2017 | 28.5 | 54.5 | 80 | 0 |
| | 2016 | 28.8 | 53 | 83 | 4 |
| | 2015 | 27.8 | 48.1 | 83 | 4 |

Summary of exceedances and annual average trends

Exceedances of Ontario's one-hour SO_2 AAQC occurred 38 and 28 times respectively, at the Aamjiwnaang and Sarnia stations in 2018. Every year since 2011 the annual benzene AAQC has been exceeded at the Aamjiwnaang station. The ozone AAQC was exceeded 18 times at the Sarnia station in 2018, no data is available for the Aamjiwnaang station after 2015. The Sarnia and Aamjiwnaang stations also exceeded the $\text{PM}_{2.5}$ CAAQS in 2017 and 2018. Ontario does not have an AAQC for $\text{PM}_{2.5}$.

Although it is difficult to compare one-hour and 24-hour maximums from year to year, the annual average air pollution level have remained relatively consistent over the least five years, with the exception of NO_2 which has decreased, as shown in Figure 3 below. The annual average is only informative for assessing benzene trends from a health risk perspective given benzene exposure impacts health over a lifetime. Annual averages are less informative for criteria air contaminants such as SO_2 , NO_2 , and $\text{PM}_{2.5}$ that have respiratory impacts because short term spikes have the greatest impact on human health.

Figure 3 – Annual average concentration of air pollutants at the Aamjiwnaang Monitoring Station





ISSUES OF SPECIAL CONCERN

Cumulative effects

The 2007 report identified a serious problem: the Ministry's failure to assess cumulative air pollution emissions from facilities near each other, as in the Sarnia area. Over the last ten years, the Ministry has not fixed that problem. Ontario continues to grant approvals to emit air pollutants without a formal, comprehensive policy on cumulative effects. The MECP continues to assess each facility as if it is the only one existing in the area.

In 2009, Ecojustice helped two members of the AFN exercise their rights under Ontario's Environmental Bill of Rights and ask the MECP to establish a cumulative effects policy for communities, like Sarnia, with a high number of industrial polluters. The MECP agreed to consider this request but did not finalize its review for nearly a decade.

In 2014 and 2017, the Environmental Commissioner of Ontario (ECO)²⁴ specifically highlighted cumulative air pollution in Sarnia and concerns about its associated health impacts on the AFN. The ECO recognized that the MECP does not consider the potential synergistic or cumulative impacts on human health in areas where there is a concentration of industry, called for the creation of legislation to deal with pollution hotspots and criticized the MECP's long delay in responding to the EBR application.²⁵

In 2018, more than ten years after the 2007 report was released, the MECP published a weak, narrow cumulative effects policy. It applies only to Hamilton and Sarnia, and only to two pollutants: benzene and benzo[a]pyrene.²⁶ In the Sarnia area, the policy will not require industry to make any changes and will not change the way Ontario approves pollution emissions. The policy will instead legitimize the existing high levels of pollution. At best, it will ensure that "business as usual" continues; at worst, it will permit further pollution. Given the number of emitting facilities near each other in the Sarnia area, the policy is wholly deficient.

RECOMMENDATION

To protect the health of local communities, Ontario must enact legislation to address the cumulative effects of air pollution emissions in areas of intense industrial activity such as Chemical Valley.

²⁴ The Environmental Commissioner of Ontario (ECO) is the province's environmental watchdog, an independent officer of the Legislature.

²⁵ Environmental Commissioner of Ontario (ECO). 2014. Managing New Challenges: 2013/2014 Annual Report. And 2017. Good Choices. Bad Choices. Available Online <https://eco.auditor.on.ca/our-reports/environmental-protection/>

²⁶ Further information available at: <https://www.ecojustice.ca/pressrelease/cumulative-effects-delay/>

Releases during flaring and transitional operating conditions

Flaring at refineries and petrochemical plants during transitional operating conditions (TOC) such as start-ups, shut-downs and malfunctions can result in significant, high concentration air pollutant emissions. Between 2014 and 2015 alone, facilities in the Sarnia area reported just under 500 pollution incidents. Of those incidents, more than a quarter involved or had the potential to involve flaring.²⁷

Generally, a flare is used to dispose of gases in a refinery or petrochemical plant when a unit starts up, shuts down for maintenance or repair, or when a malfunction occurs. Flaring may be planned to accommodate maintenance or turnover, or it may be unplanned when a malfunction requires the quick disposal of gases. Flares operating under suboptimal conditions can emit significant amounts of air pollutants into the environment²⁸ and may appear smoky. Light, noise, and vibration from flaring can lead to high-stress levels and sleeplessness in neighbouring communities.

Some community members reported experiencing trouble breathing, sleeplessness, and high stress during an extended period of high flaring in February 2017 by Imperial Oil. Ecojustice helped community members submit a formal investigation request under Ontario's Environmental Bill of Rights, and this led to an investigation of these impacts by the MECP.²⁹

When facilities flare waste gases containing hydrogen sulphide (H₂S) and other reduced sulphur compounds, there is a special reason for concern. These types of gases are referred to as acid gases. When H₂S or acid gas is burned in a flare, it is converted into SO₂. H₂S or acid gas flaring emits large quantities of SO₂.³⁰ Exposure to SO₂, even for short periods, can impact breathing and heart function and it has also been linked to preterm birth and heart malformations in babies exposed in the womb. Exposure to SO₂ can be especially harmful to susceptible and vulnerable populations like children, the elderly, fetuses, asthmatics, and people with reduced or impaired smell.³¹

In March 2018, after Ecojustice and the ECO raised concerns about flaring emissions,³² Ontario clarified the regulations to ensure that companies actually assessed acid gas flaring emissions at petroleum refineries and petrochemical facilities. Before this, some companies were not assessing whether their emissions during flaring met Ontario's SO₂ air standard.³³ However, in December 2018, the Ontario government reversed these changes. Now, existing petroleum refineries no longer have to assess SO₂ emissions from acid gas flaring before they happen, and the Ministry can only ask them to do so after an incident has already occurred. Instead, refineries may now have to pay a financial penalty if they flare more than 225 kg of SO₂ within a 24-hour period. For now, refineries will be allowed to estimate how much SO₂ they flare using a method they choose. Eventually, the Ministry will require refineries to monitor the actual amount of SO₂ they flare using stack monitors, but refineries do not have to install those monitors for three years. The Ministry will also require refineries to assess the efficiency of their sulphur recovery units and prepare plans to minimize flaring.

²⁷ Further Information available at: <https://globalnews.ca/news/3796720/sarnia-oil-industry-spills-human-impact-investigation/>

²⁸ Environmental Protection Agency (EPA). 2012. Enforcement Alert: EPA Enforcement Targets Flaring Efficiency Violations. Office of Civil Enforcement. Available Online: <https://www.epa.gov/enforcement/epa-enforcement-alert-epa-enforcement-targets-flaring-efficiency-violations-volume-10>

²⁹ Further information available here: <https://www.ecojustice.ca/update-imperial-oil-investigation/>

³⁰ Chapter 3 of ECO 2017 Annual Report. Good Choices. Bad Choices. Available online <http://docs.assets.eco.on.ca/reports/environmental-protection/2017/Good-Choices-Bad-Choices-03.pdf>

³¹ Health Canada. 2016. Human Health Risk Assessment for Sulphur Dioxide. Available for order from: <https://www.canada.ca/en/health-canada/services/publications/healthy-living/human-health-risk-assessment-sulphur-dioxide-executive-summary.html>

³² See Ecojustice blog available online <https://www.ecojustice.ca/environmental-commissioner-report/> and Chapter 3 of ECO 2017 report titled "Good Choices. Bad Choices", available online <http://docs.assets.eco.on.ca/reports/environmental-protection/2017/Good-Choices-Bad-Choices-03.pdf>

³³ EBR Registry Number: 013-0903 <http://www.ebr.gov.on.ca/ERS-WEB-External/displaynoticecontent.do?noticeId=MTMyOTQ1&statusId=MjA1MjUz&language=en>

RECOMMENDATION

Ecojustice recommends that MECP reverse its dangerous regulatory rollback and require SO₂ emissions from flares at petroleum refineries to meet Ontario's SO₂ air quality standards.

Benchmarking and gap with U.S. refineries

A 17-year joint federal-provincial initiative to reduce emissions from the petroleum refining sector in Canada compared emissions from three Sarnia refineries, as well as many other refineries throughout Canada, to the emissions from a typical refinery of the same size and type in the United States.³⁴ This initiative, called the National Framework for Petroleum Refinery Emission reductions, has revealed that Canadian refineries are emitting significantly more pollution than comparable refineries in the United States.

For example, the results show that based on 2015 data, the Imperial Oil refinery in Sarnia, Ontario would need to reduce SO₂ emissions by 98 per cent, PM_{2.5} by 82 per cent, and NOx by 75 per cent to meet U.S. benchmarks. The Suncor refinery would need to reduce carbon monoxide (CO) emissions by 96 per cent to meet U.S. benchmarks. SO₂ emissions from all Sarnia refineries were far higher than from comparable refineries in the U.S.

RECOMMENDATION

Ecojustice recommends that refineries' benchmarking data be made publically available and be used to require refineries to reduce emissions to narrow the gap between air pollution emissions from Canadian refineries and refineries in the United States.

Technical standard implementation and compliance

As discussed above, industry may request technical standards rather than comply with health-based air quality standards. As was the case with benzene, some petrochemical plants and oil refineries may require a SO₂ technical standard because they will exceed the updated SO₂ air quality standard when it comes into force in 2023. Technical standards are complex with implementation stages that stretch over many years. As the adoption of complex technical standard increases by facilities in Chemical Valley, the MECP must increase their local resources to ensure complete implementation and monitor compliance by facilities operating under technical standards.

RECOMMENDATION

Ecojustice recommends that the MECP increase local resources to ensure complete implementation and track compliance by facilities operating under technical standards.

Pollutants with outdated or non-existent standards

As discussed above, the AAQC and regulatory standard under O. Reg. 419/05 for NO₂ does not protect human health, including sensitive individuals, and lags behind federal CAAQS. The AAQC for Ozone is also outdated. Ontario does not have an AAQC or standard for PM_{2.5} or PM₁₀.

RECOMMENDATION

Ecojustice recommends that the MECP update outdated air standards, such as the standards for NO₂, and establish new air standards for pollutants that do not have standards, such as PM_{2.5}, that are protective of human health including vulnerable individuals.

³⁴ Further information available at: <https://www.ecojustice.ca/canadian-oil-refineries-lag-far-behind-us-counterparts-on-pollution-controls/>



CONCLUSION

In 2016, Sarnia area facilities released about 45,357 tonnes of air pollution. To put these numbers in context, all Ontario facilities that report to the NPRI released about 455,439 tonnes of air pollution in 2016. In 2016, pollution from Sarnia area facilities accounted for approximately ten per cent of this total. These numbers have decreased from 2005 when Sarnia area facilities emitted 131,992 tonnes of air pollution or about 16 per cent of total emissions in Ontario. The Ontario government's decision to close the coal-powered Lambton Generating Station in 2013, 15 km south of AFN, accounts for about half of the decrease. The remaining reductions may be linked to other facility closures, decreased production at existing facilities, improvements in pollution control and cleaner feedstocks. Unfortunately, despite overall decreases in emissions, Sarnia refineries continue to release far more pollution, and in particular far more SO_2 , than comparable U.S. refineries.

Ontario's AAQC and air quality standards are lagging behind current science on the health impacts of air pollutants, which may put the health of residents at risk. A new SO_2 standard will come into force in 2023. However, the NO_2 standard and AAQC and Ozone AAQC are considerably higher than the federal CAAQS, and there is no Ontario AAQC or standard in place for $\text{PM}_{2.5}$ or PM_{10} .

Benzene emissions from Ontario petrochemical facilities and refineries are exempt from the Ontario health-based air quality standard and instead regulated under an industry technical-based standard; available data shows that benzene levels continue to be far higher than the health-based standard.

The annual benzene AAQC has been exceeded at the Aamjiwnaang station every year since 2011. The new one-hour SO_2 AAQC was exceeded 38 times in 2018 at the Aamjiwnaang air monitor and 28 times at the Sarnia air monitor. Ozone was exceeded 18 times in 2018 at the Sarnia monitor. The Sarnia and Aamjiwnaang stations also exceeded the $\text{PM}_{2.5}$ CAAQS in 2017 and 2018. Ontario does not have an AAQC for $\text{PM}_{2.5}$.

Over the last five years or so, consistent decreases in air pollutant concentrations have not been observed at the Aamjiwnaang air monitoring station except for NO_2 .

This mixed record of improvement translates to the legal and policy context. For example, after a delay of more than nine years, the MECP introduced a cumulative effects policy for air pollution. However, that policy has no meaningful impact in Sarnia because of its narrow scope.

Similarly, after the MECP introduced important regulatory changes in early 2018 to address acid gas flaring emissions, it rolled them back in December 2018, replacing them with a new framework that leaves residents vulnerable to the SO_2 emissions from acid gas flaring. Consistent law and policy progress is needed to address the air pollution emissions from Chemical Valley that impact neighbouring communities such as the Aamjiwnaang First Nation and violate their right to a healthy environment, including clean air.

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