Sarnia Area Environmental Health Project

AIR EXPOSURE REVIEW

COMMUNITY REPORT

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Prepared for:

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LAND ACKNOWLEDGEMENT

Intrinsik Corp., Canada North Environmental Services, and 4 Directions of Conservation Consulting Services wish to acknowledge that the research which informs this report was conducted on lands stewarded by the Chippewas and took place within Treaty 27 ½ (1825) and Treaty 29 (1827) territory. We wish to express gratitude to the Aamjiwnaang First Nation, and the Chippewas for the research that we have been able to conduct within the air which flows throughout Indigenous landscapes. We recognize the spiritual and cultural relationship that the Chippewas and all Indigenous Peoples have, to the air, the waters, the plants, and animals that grow within and around them.

We recognize the Aamjiwnaang First Nation as a holder of inherent, Aboriginal, and treaty rights, which are affirmed and protected by Section 35 of the *Constitution Act* of 1982. The AER Study Team remains committed to working collaboratively with Aamjiwnaang First Nation to ensure that their knowledge, values, culture, and rights are considered as part of the ongoing work related to the Air Exposure Review study.

Questions about the disproportionate impact of settler-made pollution and poor air quality on Indigenous Peoples, who live and harvest in the areas most impacted, was a key part of the context for this study. In Canada, First Nations and Indigenous Communities are disproportionately exposed to environmental contamination, often arising from developments in their lands, waters, and territories.

We wish to acknowledge that the research which informs this report was conducted within a Western scientific framework and shaped by colonial value systems. Approaches to evaluating, categorizing, and characterizing air quality found within this report may differ from the knowledge, values, and lived experiences of Indigenous Peoples.

1.0 INTRODUCTION

In 2020, the Ministry of Environment, Conservation and Parks (MECP) began work on the Sarnia Area Environmental Health Project (SAEHP), which aims to help address concerns that people have expressed about air pollutants and other quality of life impacts from living close to industrial operations in this area. The SAEHP was developed through discussion with provincial and federal departments, health agencies, local municipalities, the Aamjiwnaang First Nation, Walpole Island First Nation, industry, and the broader Sarnia area community.

This project is part of the work that the MECP is doing to improve air quality and health and wellbeing in the Sarnia area, and the results can help them make better rules and decisions related to air quality.

One part of the SAEHP is the Air Exposure Review study. This is a scientific study that looked at how much people in the area are exposed to chemicals in outdoor air, and how this might affect their health.

1.1 Scope

The Air Exposure Review study aims to evaluate and communicate the potential health risks to the local First Nation and other communities in the Sarnia area caused by outdoor air pollution, whether it comes from industries or other sources. The study focused on outdoor air quality impacts, as shown in Figure 1. A team of experts from Intrinsik Corp., Canada North Environmental Services, and 4 Directions of Conservation Consulting Services worked together to complete the study.

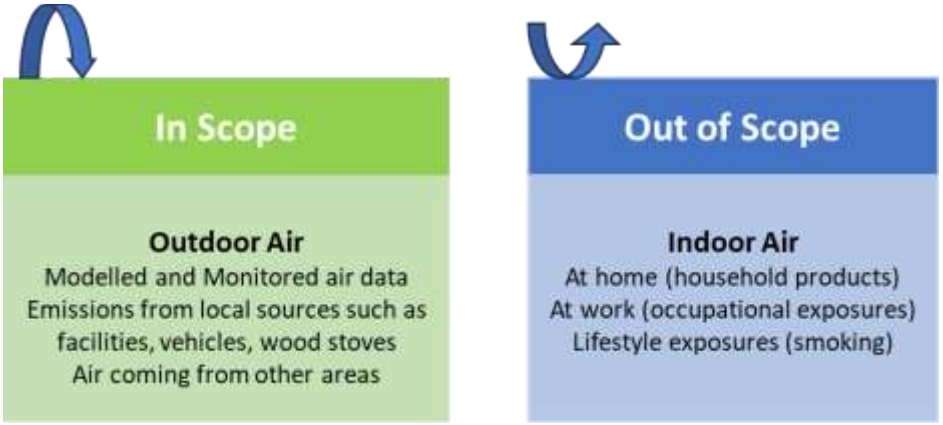

Figure 1 Scope for the Air Exposure Review

The study looked at people breathing in chemicals where they lived, worked, or played. Figure 2 shows where the chemicals come from and how they can move to areas where people could be exposed to them. The study mainly looked at sources of chemicals within Sarnia, and chemicals that travel from faraway places (transboundary contributions from the United States), including

tiny airborne particles called $PM_{2.5}$. It is also important to understand that the Air Exposure Review study only evaluated recent air quality, and not the potential effects from historic exposures when air quality was likely much worse, given improvement in air pollution controls over time. While current health status of an individual can be impacted by previous exposures, the analysis could not address historical exposures due to the lack of data available from the past.

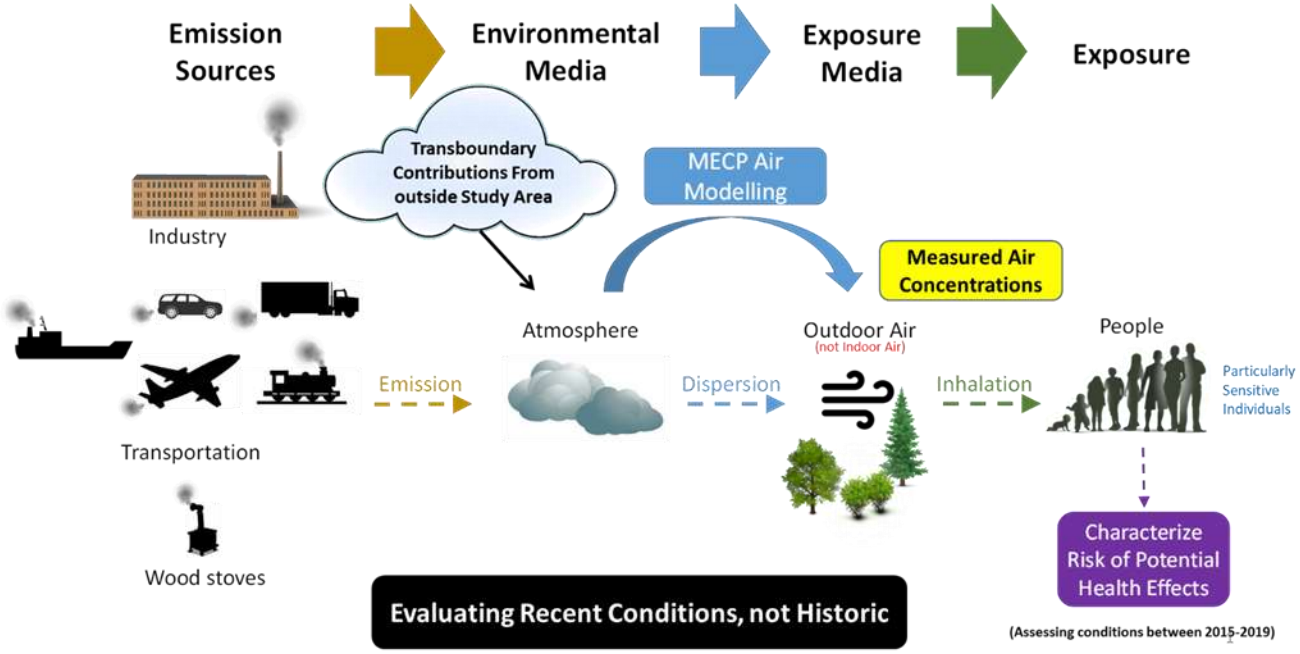

Figure 2 Pathways Considered in Air Exposure Review

1.2 Risk Assessment Framework

The Air Exposure Review study assessed the risks to human health from exposure to chemicals in the environment. Specifically, it looked at the effects of breathing in chemicals from various sources of emissions, both local and beyond. The study considered two types of exposure: 1) exposure to one chemical from multiple sources, and 2) exposure to multiple chemicals that affect the same part of the body (like the lungs). The goal was to help people understand how their environment might affect their health, and to help identify whether there are potential health risks within the Sarnia communities that require further investigations or actions in the context of broader air quality concerns (*e.g.*, disease rates of asthma, cancer rates, *etc*.).

In any risk assessment, the aim is to use best available data to identify risks, while making sure not to underestimate them. However, limitations such as a data gaps make it difficult to estimate risks with absolute certainty. While conducting the Air Exposure Review, the Study Team used conservative assumptions to fill in knowledge gaps. In other words, assumptions were made to overestimate exposure, toxicity and risk rather than underestimate them so that the conclusions would be protective of human health.

2.0 APPROACH

The Air Exposure Review Project used information from various sources. This included predicted concentrations of chemicals from air modelling conducted by the MECP multi-source modelling team, actual air concentrations measured at monitoring stations around the Sarnia area, and information on chemical releases based on permits submitted by industry to the MECP.

The Air Exposure Review involved three major steps:

- **STEP 1**: Identifying the chemicals that would be considered in the assessment.
- **STEP 2**: Identifying locations of interest within the community to be considered.
- **STEP 3**: Evaluating exposures and risks within the Study Area.

The following sections provided an overview of the different steps.

2.1 STEP 1: Identifying Chemicals

The Study Team aimed to determine if certain chemicals in the Study Area could be harmful to people. They began with a list of 600 chemicals that local facilities were allowed to release into the air, under regulatory approval. This also included 6 priority chemicals that were previously identified by MECP as greatest concerns based on monitoring concentrations: benzene, 1,3-butadiene, benzo(a)pyrene (which is from a family of chemicals called polycyclic aromatic hydrocarbons), sulphur compounds (like sulphur dioxide), ozone, and fine particulate matter ($PM_{2.5}$). After reviewing the list, they asked some questions to decide which chemicals to look at more closely. As part of the process, the Study Team considered the toxicity of the chemicals (i.e., how harmful they are), whether the chemicals were being released by many facilities or just a few, and if they could be harmful when mixed with other chemicals. Through this screening process, they identified a shorter list of 37 chemicals for closer study.

These chemicals were then grouped based on how much information was available. For some of the chemicals, a lot of information was available from both air modelling completed by the MECP multi-source modelling team and actual air concentration measurements from monitoring stations around Sarnia, so a detailed analysis could be completed (*i.e.*, 7 key “quantitative” chemicals). These included the 6 priority chemicals, with the addition of oxides of nitrogen. For others, information was only available from certain monitoring stations around Sarnia. For these (*i.e.*, 16 “semi-quantitative” chemicals), a less detailed analysis could be completed. Finally, there were chemicals which only had information provided in their industry emission permits. For these chemicals (*i.e.,* 14 “qualitative” chemicals), the study team did a simpler assessment which looked at maximum level of emissions and determined whether these chemicals can cause harmful effects. They also looked at whether emissions from different facilities are likely to overlap and cause even higher concentrations. Figure 3 shows the process followed to select the final chemical list.

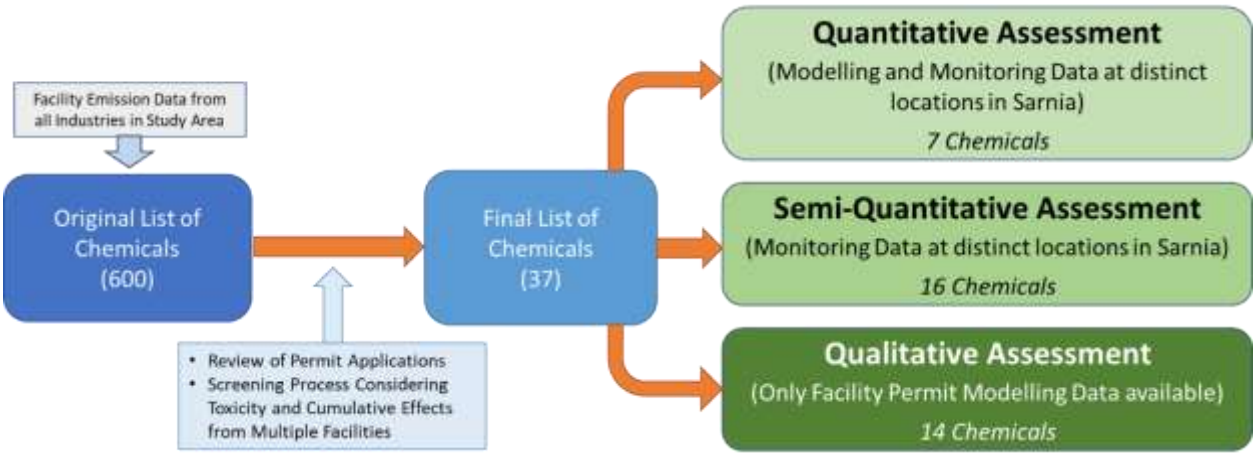

Figure 3 Screening Process for Identifying Chemicals for the Air Exposure Review

2.2 STEP 2: Identifying Receptor Locations

The Study Team, with community feedback, chose specific locations within the Study Area to evaluate potential health risks related to chemicals in the air. These areas are called "receptor locations". The MECP multi-source modelling team modelled air concentrations for the seven key chemicals throughout the study area, and provided data for each of the receptor locations. The air concentration data was used to determine the potential health risks in areas where people live, work, and play. Using specific locations provides a more accurate understanding of the total exposure that people in the Study Area may experience. In total, fifty-one specific locations were considered within the Study Area (see Figure 4) for the seven key chemicals.

To provide a more detailed understanding of where exposure may occur for each chemical, the Study Area was divided into zones that correspond with land use and specific communities. These zones (shown on Figure 4), are: **Zone 1** – North Sarnia (*i.e.*, north of Highway 402); **Zone 2** – Central Sarnia (*i.e.*, downtown Sarnia and associated residential areas); **Zone 3** – South Sarnia (*i.e.*, mixed industrial and residential area generally south of Highway 25 and north of the Aamjiwnaang First Nation Reserve); **Zone 4** – Aamjiwnaang First Nation Reserve; and **Zone 5** – Southern Mixed Residential/Industrial (*i.e.*, mixed industrial and residential lands south of the Aamjiwnaang First Nation Reserve); and, **Zone 6** – Rural region at the outskirts of Sarnia.

2.3 STEP 3: Identifying Exposures and Risks

Seven key chemicals were studied in detail for this Project, including benzene, 1,3-butadiene, benzo(a)pyrene (representing a group of chemicals called polycyclic aromatic hydrocarbons), fine particulate matter, oxides of nitrogen, ozone, and sulphur dioxide. To figure out how much of these chemicals are present in the air from pollution, the MECP multi-source modelling team used computer modelling to make predictions based on where the chemicals were released from and the range of weather conditions that can occur in the area where the chemicals were released. This allowed the MECP multi-source modelling team to calculate how much of these chemicals

are present in the air in different areas over time (see Figure 5). Monitored measurements of air concentrations for these chemicals were used to improve and confirm the accuracy of the predictions made by the modelling. Both the modelled and measured data was based on emissions between 2015 and 2019. In response to feedback from Rightsholders and stakeholders, more recent measured data from 2019 to 2023 was also looked at, to ensure that the results and recommendations of this study are still accurate and relevant.

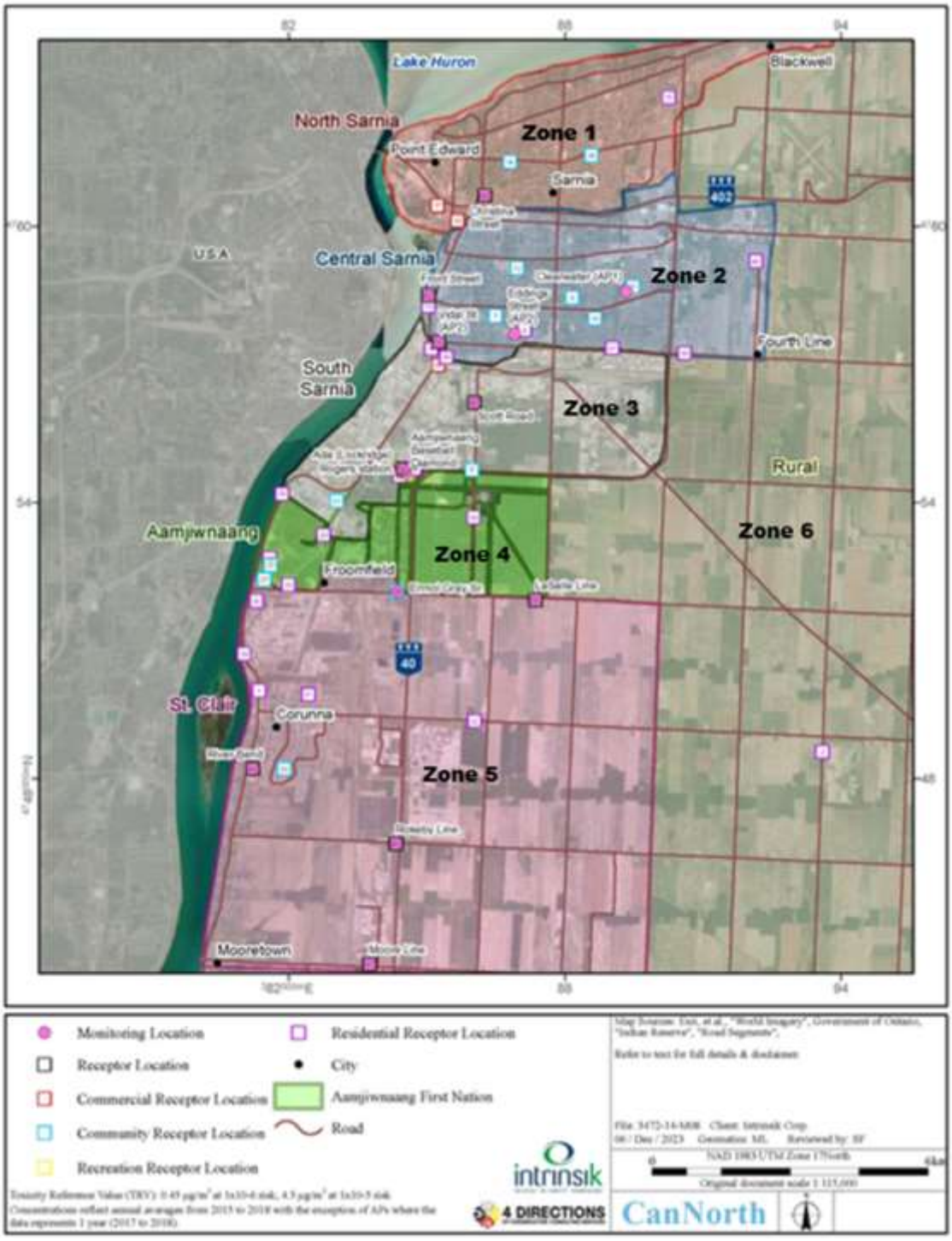

Figure 4 Air Exposure Locations with Assessment Zones

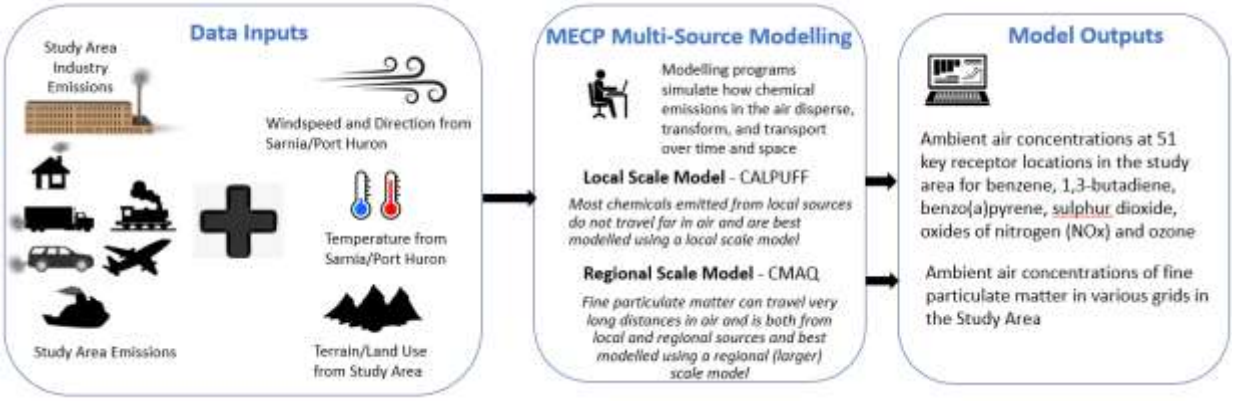

Figure 5 Simple Schematic of the Air Dispersion Modelling

The MECP multi-source modelling team did not model all the chemicals that were emitted into the environment as the modelling exercise was very complicated and time-consuming. As a result, the detailed modelling was used to predict concentrations for the "quantitative" 7 key chemicals of highest importance.

As discussed previously, different approaches were taken for the other chemicals. For the "semi-quantitative" chemicals, the Study Team used data from monitoring stations that measured chemical concentrations in the air in various locations within the Study Area. The monitoring data were used to figure out if these chemicals could cause health risks.

For the "qualitative" assessment, information on chemicals was only available from the air permits from the facilities themselves. This information only showed estimated levels that can occur at the facility perimeter, which usually represent the maximum concentrations and do not provide the Study Team information on the levels of chemicals in the air across the Study Area. Thus, the Study Team did an evaluation to see if any of the chemicals from different facilities close together could overlap to create an unsafe amount in the air. Based on this evaluation, the Study Team recommended some follow-up actions (see sections 3.3, 4.4 and 4.5).

To evaluate whether health impacts may occur, the available information on air concentrations was compared to established health-based benchmark values for each chemical. These health-based benchmark values are concentrations established by reputable regulatory agencies (*e.g.*, MECP, U.S. Environmental Protection Agency, Health Canada, World Health Organization, etc.) using studies that look at how these chemicals affect animals or humans. A safety factor is generally included when developing a benchmark to ensure that there will be no health effects in humans. Regulatory agencies typically use these health-based benchmarks to set air quality standards or as part of regulation of emissions within airsheds. These benchmarks are established to protect the most sensitive members of the population, ensuring that risks are not underestimated. They are developed to evaluate both short- and long-term exposures and their related health risks.

For the 7 key “quantitative” chemicals, and the “semi-quantitative” chemicals, risks to individuals living, working, or playing throughout the Study Area were calculated based on a comparison of air concentrations against these selected health-based benchmarks.

3.0 RESULTS

The following section provides the results of the Air Exposure Review broken down into the key groups of chemicals that were evaluated within the assessment. The Study team wishes to acknowledge that the language used includes terminology such as “potential” or “negligible” when characterizing and describing risk. It is important to note that these characterizations, while acceptable within scientific frameworks, often differ from how community members describe lived experiences, feelings, and attitudes regarding exposure risks.

3.1 Quantitative Chemicals

The results for six of the key chemicals that people are exposed to in the Study Area are summarized in Figure 6. The results indicated that some of the chemicals could potentially have health effects, while others do not. The colours gray, yellow, and red are used to show whether there is a potential health risk. Two of the chemicals, 1,3-butadiene and benzo(a)pyrene (which represents a group of chemicals called polycyclic aromatic hydrocarbons), were not found to be a health risk for people living in Sarnia. There are no further recommendations for these chemicals.

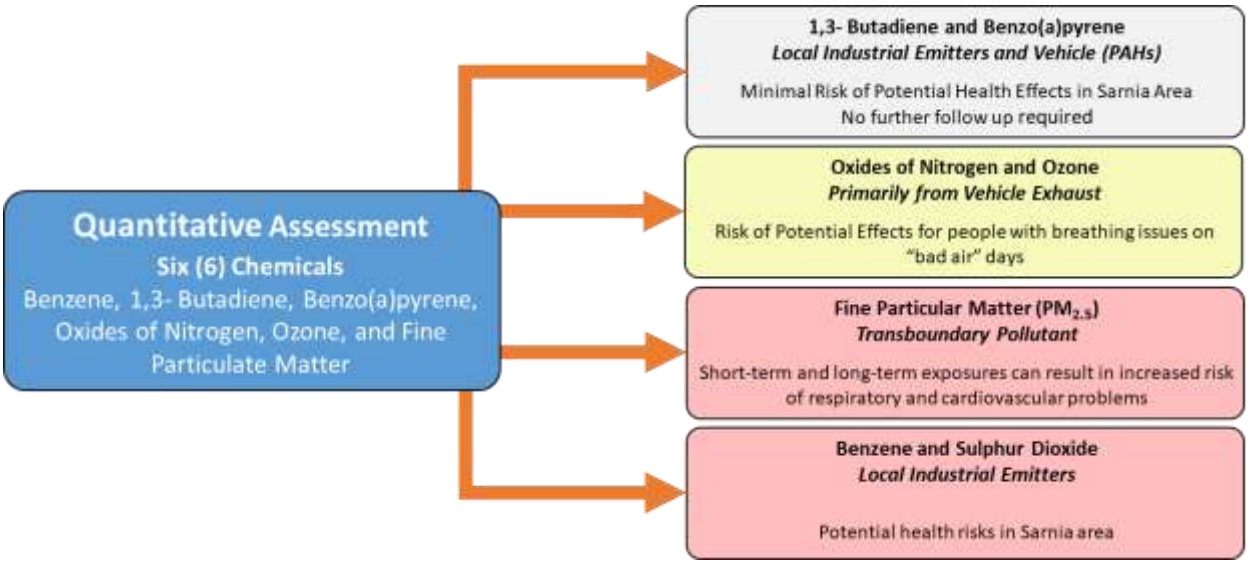

Figure 6 Results for the Quantitative Assessment

Fine Particulate Matter, Oxides of Nitrogen, and Ozone

Fine particulate matter in the air can pose a health risk to people with respiratory issues and is mostly caused by emissions from the United States (see section 5.0 for analysis of more recent $PM_{2.5}$ data). Oxides of nitrogen and ozone can also cause temporary health problems for people with respiratory issues, like asthma. These chemicals mostly come from vehicle exhaust and can sometimes drift over from the United States.

Benzene

In certain parts of the Study Area, there are elevated levels of benzene emitted from local facilities. Elevated benzene can increase the risk of adverse effects with short-term exposures, and can increase the risk of cancer if people are exposed to it over a long period of time. This is a risk in the northern parts of the Aamjiwnaang First Nation Reserve (Zone 4) and the industrial areas in Central Sarnia (Zone 3). The area of highest impact is localized and primarily focused just north of Churchill Road and the Aamjiwnaang First Nation Reserve and just south of Campbell Street, bracketed by the St. Clair River on the west and Highway 29 to the east (see the yellow area outlined in Figure 7 and then zoomed in on Figure 8). See section 5.0 for analysis of more recent benzene data.

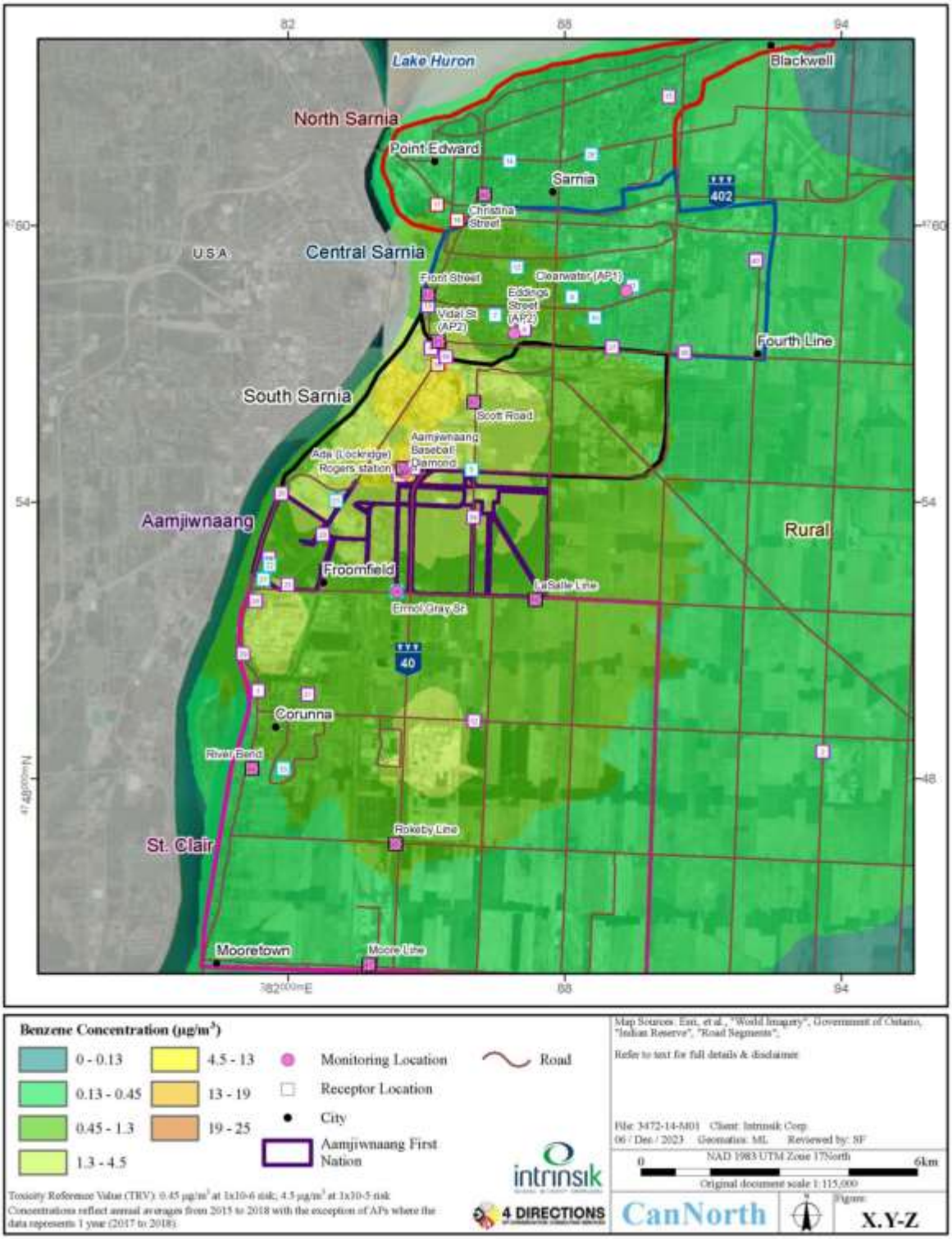

Figure 7 Predicted Benzene Annual Average Concentrations

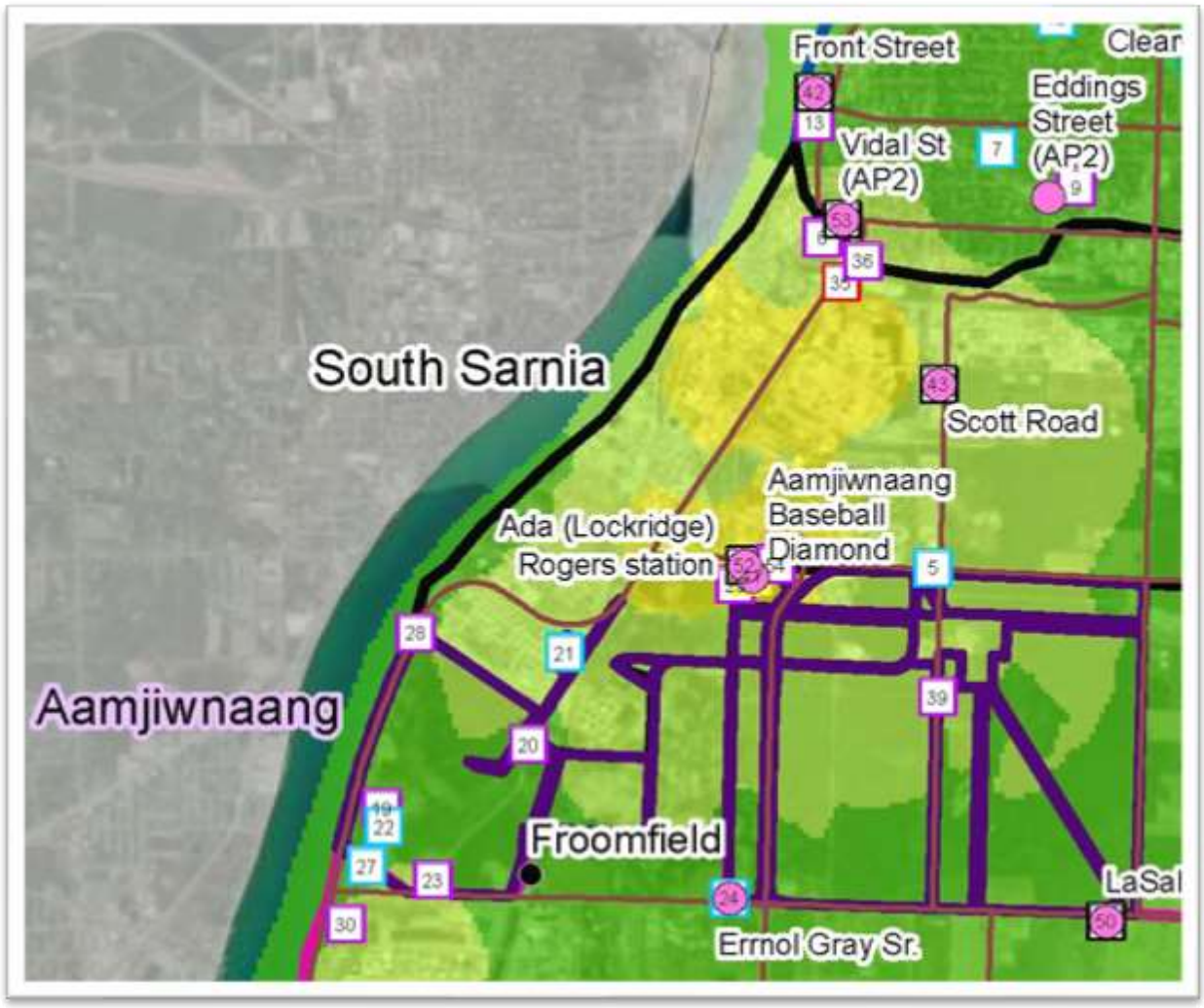

Figure 8 Heat Map of Predicted Benzene Annual Average Concentrations focused on Hotspot

Sulfur Dioxide

Exposure to sulphur dioxide can have negative effects on our health, particularly on our lungs. Experts usually assess these effects in the short term. To do this, the MECP multi-source modelling team evaluated different scenarios to simulate sulphur dioxide levels in Sarnia caused by activities at industrial facilities. The Study Team focused their analyses on the following operational scenarios: (see Figure 9):

1. **Normal Operations** – This is when facilities are running at their usual capacity and represents the daily conditions that Sarnia residents are exposed to.

2. **Combustion/Flaring Events** – This is when there are planned or unplanned events that cause flaring. These events happen a few times a month.

3. **Major Disruption** – This is a rare event that happens once every 10 years, such as a power outage at a facility.

Figure 9 Modelled Scenarios for Sulphur Dioxide in the Study Area

The results for the effects of sulphur dioxide exposure on people's health for the scenarios are shown in Figure 10. The results show that normal operations of facilities do not represent a risk for most people, including those with respiratory problems like asthma. However, if there is an acid gas flaring event, there is a chance of mild health impacts for people with respiratory problems (*i.e.*, asthmatics). If multiple facilities are flaring at the same time, the impact could be worse. In rare cases, like a complete power failure at an SO_2-emitting facility, there is a higher chance of potential health impacts on everyone in the area, especially for people with respiratory problems downwind from the emitting facilities.

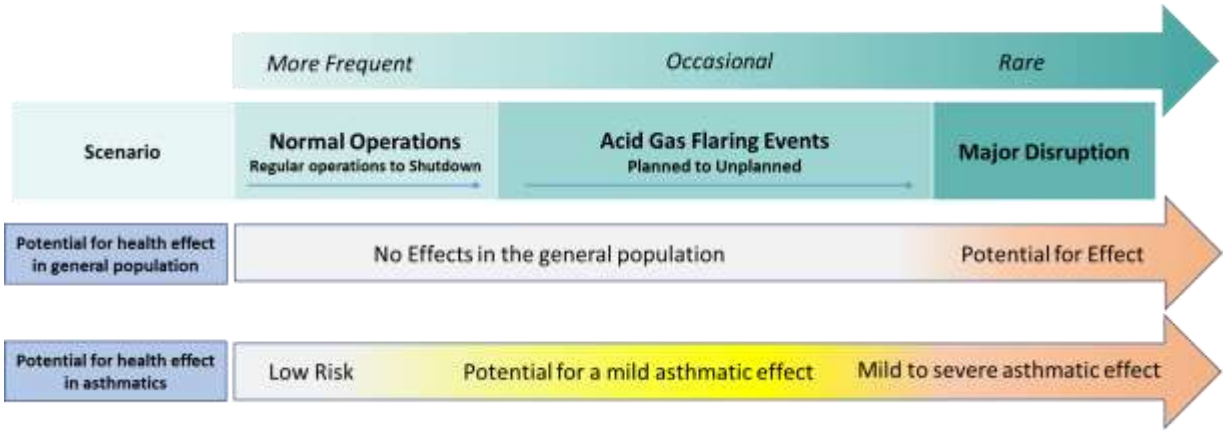

Figure 10 Results of the Modelled Scenarios for Sulphur Dioxide in the Study Area

3.2 Semi-quantitative Chemicals

A semi-quantitative assessment was completed using data from monitoring stations in the Study Area collected between 2015 and 2019. The Study Team determined that this group of chemicals does not pose a health risk to the people living in the Study Area. The information is summarized in Figure 11. The emissions of these chemicals are likely associated with emissions of the key "quantitative" chemicals released to air, at a number of the facilities. So, steps taken to reduce releases of the key chemicals will likely also reduce the emissions of these semi-quantitative chemicals.

Figure 11 Results for the Semi-Quantitative Assessment

3.3 Qualitative Chemicals

A total of 14 chemicals were evaluated qualitatively based on the maximum amount that could be present in the air at the perimeter of facilities (see Figure 12). Seven of these chemicals are not expected to be a risk to people. Emissions of cobalt and formaldehyde had amounts that could exceed safe levels, and for the remaining five chemicals the information on their permits may not be up to date.

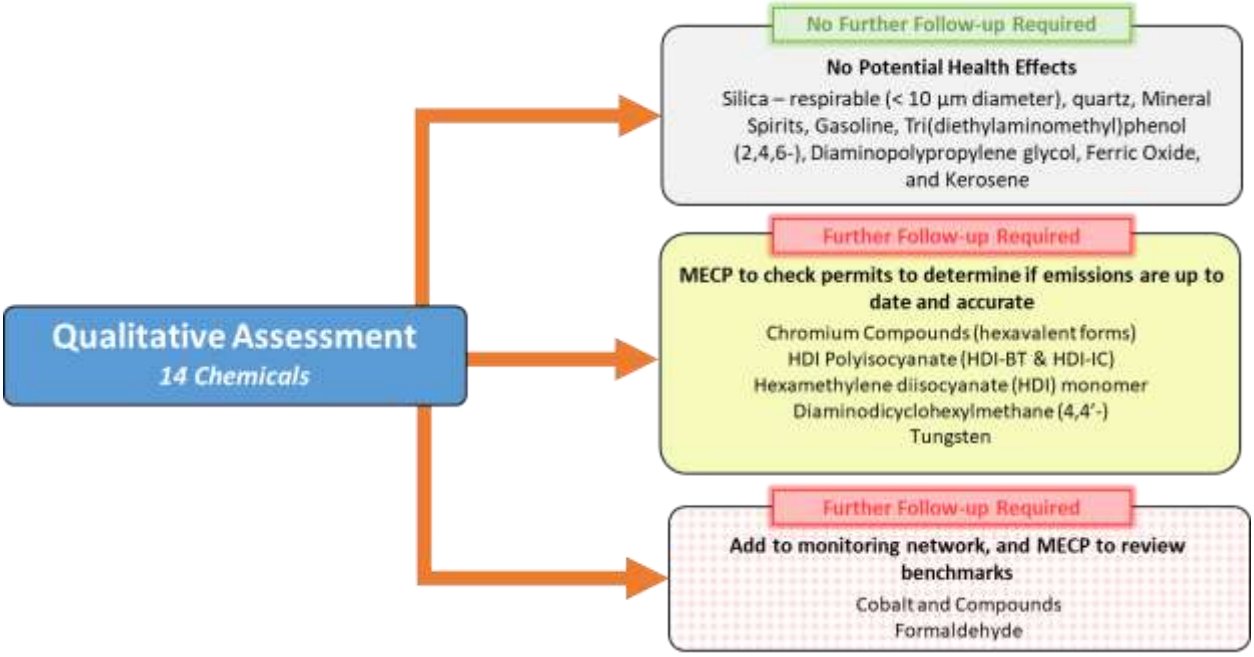

Figure 12 Results for the Qualitative Assessment

3.4 Cumulative Risks

When considering the risks of multiple chemicals being emitted from multiple facilities that are close to each other, it is important to not only look at the total amount of emissions of the chemicals from all the facilities but also at how the chemicals act within the body. People breathe in air with a mixture of chemicals, so the Study Team looked at what would happen if these chemicals could act together, also called cumulative effects (Figure 13).

To estimate the cumulative risk, the predicted risks from chemicals that act similarly in the body were added together (*e.g.*, the predicted lung cancer risks from chemicals that act similarly in the body were added together). After evaluating the risks of the mixtures, most groups of chemicals did not show any additional risks beyond the risks of the key individual chemicals within the mixtures (for example benzene and sulphur dioxide). Benzene is one of the chemicals in the mixture that can increase the risk of leukemia. The results showed that benzene poses the highest risk within this mixture of chemicals. Likewise, sulphur dioxide is the main contributor to the

mixture that can cause respiratory problems. By reducing emissions of benzene and sulphur dioxide, cumulative risks from mixtures of chemicals can be reduced.

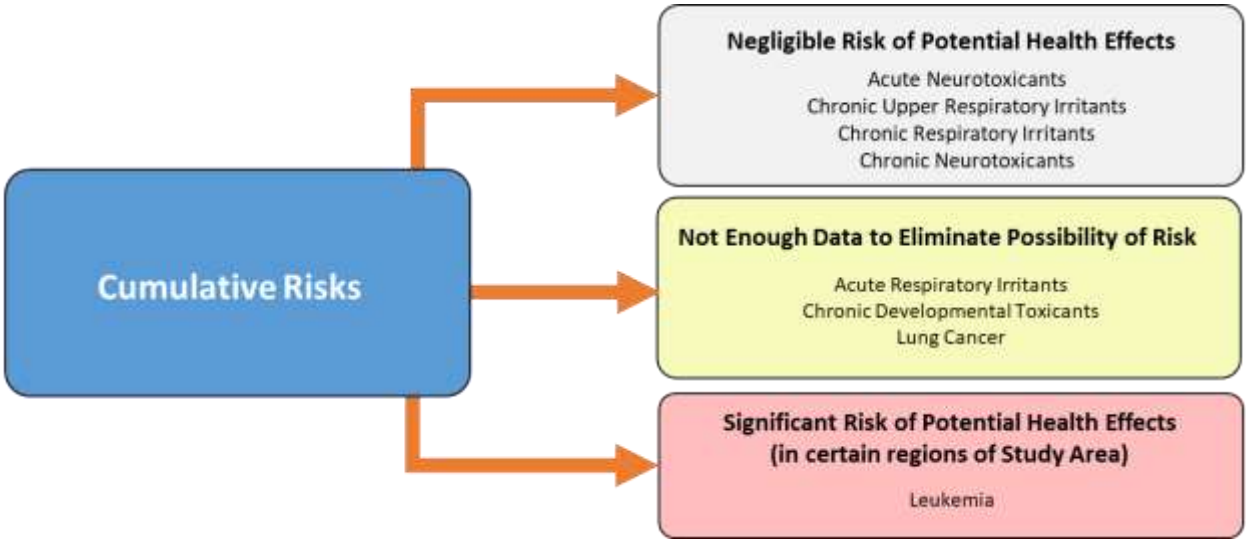

Figure 13 Results for the Cumulative Effects Assessment

4.0 RECOMMENDATIONS

After examining the chemical emissions in the Study Area and how it could affect the health of people in the Aamjiwnaang First Nation Reserve and Sarnia area in the short and long term, the Study Team provides the following recommendations for the people who make decisions and the people who are affected. These recommendations are meant to help reduce any health risks that could come from the chemical emissions in the Study Area.

4.1 Benzene

There is a concern about the level of benzene in some areas due to industrial emissions as it could potentially increase the risk of cancer (specifically leukemia). To reduce this risk, the Study Team recommends that efforts should be taken to reduce ambient benzene concentrations across the entire Study Area as much as possible. A specific focus should be made on local industrial sources that impact the air quality in the industrial areas of Zone 3 and in the north part of the Aamjiwnaang First Nation Reserve (Zone 4). It is recommended that the MECP require improved environmental performance and reduced emissions from local industry. Emitting industries should reduce their emissions of benzene. Reducing benzene emissions would also reduce overall potential long-term risks related to the leukemia cumulative effects chemical group. The MECP should also conduct a review of the most recent scientific and regulatory knowledge on benzene to develop new short-term (1-hour and 24-hour) air quality guidelines. See section 5.0 for analysis on more recent benzene data and the applicability of these recommendations.

4.2 Fine Particulate Matter ($PM_{2.5}$)

Like many similar communities across Ontario, fine particulate matter ($PM_{2.5}$) concentrations are a problem in the Study Area as it can increase the risk of health impacts to people in both the short- and long-term. The levels of $PM_{2.5}$ in Sarnia are similar to those in other areas in Ontario such as Hamilton and Windsor. Regulatory efforts to reduce the amount of fine particulate matter in the Study Area and across Ontario should continue. However, a majority of the fine particulate matter present in the air within Sarnia comes from the United States. To help reduce the air quality risks related to fine particulate matter, both countries need to continue to work together to reduce particulate emissions. In addition, efforts should be made to reduce local open (e.g., road dust, construction, *etc*.) and industrial sources. By doing this, the air quality in the Study Area can be improved. See section 5.0 for analysis on more recent $PM_{2.5}$ data and the applicability of these recommendations.

4.3 Sulphur Dioxide (SO_2)

Sulphur dioxide emissions during typical facility operations are unlikely to cause a risk to people's health, even those with breathing problems. However, when acid gas flaring events occur, people with breathing problems (such as asthmatics) may experience a mild adverse health effect. This is more likely and could become more severe if multiple facilities are flaring at the same time. To prevent this, it is recommended that additional efforts be made by the industrial community to develop flare minimization plans for individual facilities, and ensure flaring events do not overlap where multiple facilities are flaring at the same time. It is also recommended that better communication be made with the surrounding community before and during flaring events, focused specifically on those geographical areas where air quality impacts are expected to be worse. Weather reports can be used to predict where the worst sulphur dioxide concentrations will be and warn people who live there. It is important to focus these warnings on the people who are most affected, so they do not get too many messages that they may start to ignore them.

It is recommended that industry review current emergency preparedness and response plans to improve the effectiveness of existing messaging systems during the rare power outage scenario. It is also recommended that Rightsholder and multi-stakeholder planning be conducted to develop back-up plans for communication (*e.g.*, amber alert-style broadcasts) and action in coordination with the involved stakeholders and Rightsholders should such an event occur (*e.g.*, residents requested to stay indoors until given all-clear).

4.4 Cobalt and Formaldehyde

It is recommended that the MECP or other organizations such as Environment and Climate Change Canada or industrial partners consider adding cobalt and formaldehyde to the routine monitoring list for the Study Area. The MECP may also assess whether the health-based benchmarks for these chemicals require an update.

4.5 Permit Follow up and Confirmation

Many of the emission rates used in the assessment are based on old and likely out-dated air permits. As such, it is recommended that the MECP follow up with the key facilities releasing the following chemicals to confirm the information within the permits of these facilities are accurate: chromium, HDI polyisocyanate, hexamethylene diisocyanate (HDI) monomer, 4,4'-diaminodicyclohexylmethane, and tungsten. If these emissions are accurate, further investigations should be conducted to understand if these represent a risk to the health of people living in the Study Area.

5.0 APPLICABILITY OF RESULTS TO RECENT AIR QUALITY CONDITIONS

As discussed previously, both the modelling conducted by the MECP and the actual concentrations measured around the Study Area were based on data collected between 2015 and 2019. As such, the AER Study Team has received feedback from Rightsholders and stakeholders asking how ambient concentrations in 2015 to 2019 compared to more recent air quality within the Study Area, and whether the results and recommendations of the Study still hold based on current conditions.

To answer these questions, measured air concentrations for the seven *quantitative* chemicals from key monitoring stations within the Study Area for the years 2019 through 2023 were compared to the modelled concentrations for those specific locations within the Study Area. The results of this comparison showed that for most of the seven chemicals, the modelled concentrations used in the assessment are similar to the more recent measured concentrations within the Study Area. The two exceptions were short-term benzene and particulate matter exposures.

In the graphs that follow, modelled concentrations are presented in a light green colour, while recent measured concentrations are presented in a light blue colour.

Benzene

Figures 14 through 16 provide the comparison of modelled to measured benzene concentrations for the 1-hour, 24-hour, and annual average exposure periods, respectively.

With respect to long-term health risks, as shown in Figure 16, the predicted long-term concentrations of benzene are approximately equivalent to the more recent measured annual average concentrations. However, when discussing short-term health risks, there is considerable uncertainty surrounding the modelling of 1-hour worst-case benzene concentrations. The modelling used to predict short-term air concentrations of benzene is not able to account for all day-to-day variability in facility emissions. This means the modelling has difficulty capturing hourly variation in emission rates that could occur, including when an unexpected spill or leak occurs.

It is important to note that measured benzene concentrations around the Ada (Lockridge) Rogers monitoring station increased in 2022 and 2023 from the previous two years, particularly with elevated benzene concentrations over short periods of time (i.e., “spikes”). This is likely due to recent higher emissions from the nearby facilities, rather than an underestimation of modelled concentration.

In addition to comparing the maximum 1-hour benzene concentrations that are modelled and measured, Figure 14 also provides the average 1-hour concentration plus 1 standard deviation (the average is shown by the darker bar at bottom, with “whiskers” showing 1 standard deviation to indicate the range of concentrations that most hourly values fall into). This indicates that both the modelled and measured typical average 1-hour concentrations are approximately the same.

While short-term maximum benzene measurements were higher in 2022 and 2023 than the modeled maximum value at the Ada (Lockridge) Rogers location, the modelled and measured data all fall in the same risk range. As such, the AER Study conclusions and recommendations are still appropriate considering more recent air quality conditions for benzene. In addition, this analysis further reinforces the need for better monitoring to detect changes in facility emissions and reinforces the need for immediate action with respect to the recommendations to reduce the elevated benzene concentrations within the industrial area of Zone 3 and Aamjiwnaang First Nation in Zone 4.

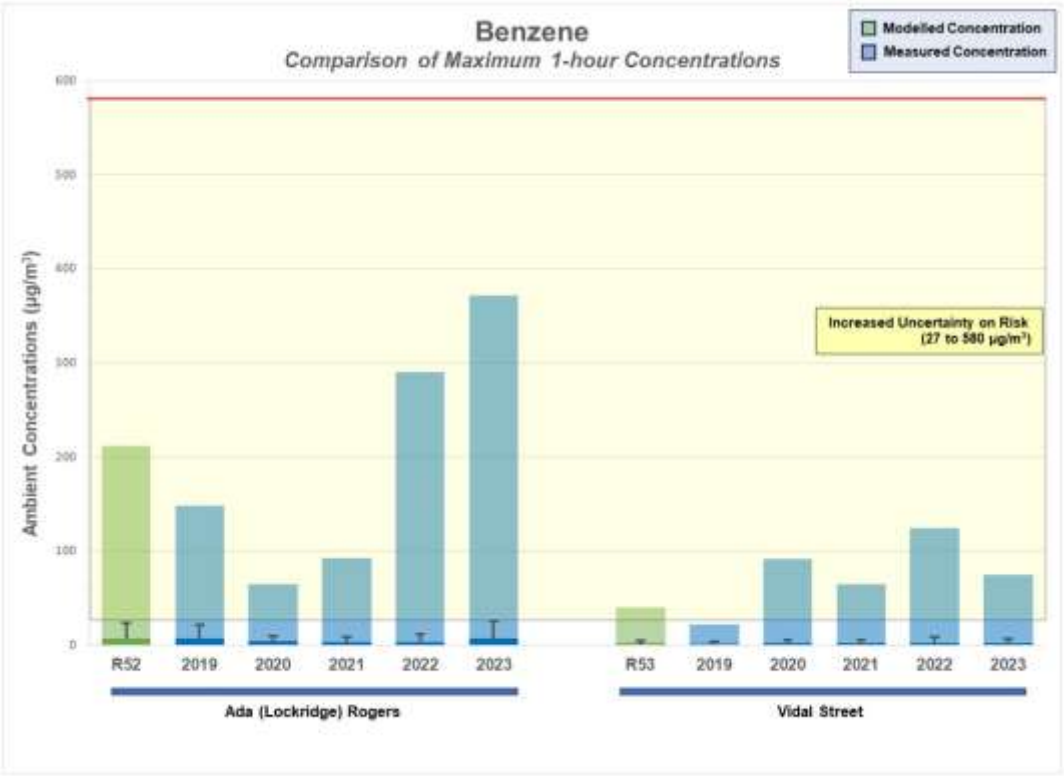

Figure 14 Comparison of Modelled versus Measured for Benzene Maximum 1-hour Concentrations

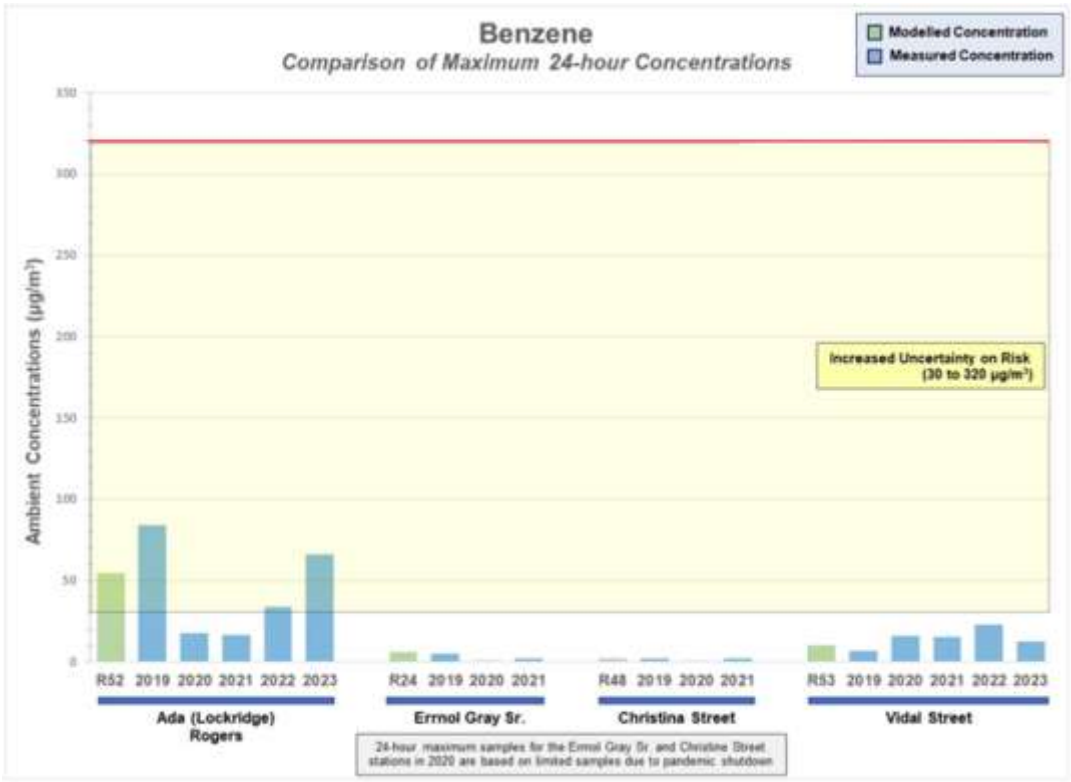

Figure 15 Comparison of Modelled versus Measured for Maximum Benzene 24-hour Concentrations

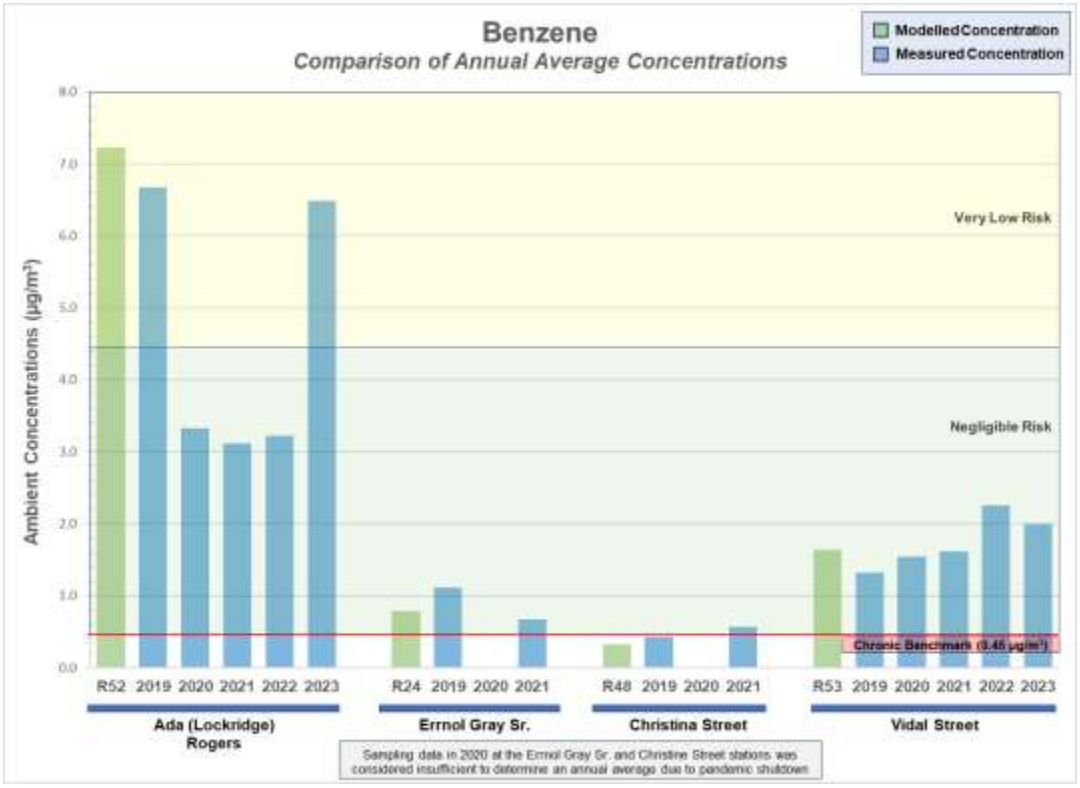

Figure 16 Comparison of Modelled versus Measured for Benzene Annual Average Concentrations

Fine Particulate Matter ($PM_{2.5}$)

Figures 17 and 18 provide the comparison of modelled to measured $PM_{2.5}$ concentrations for the 24-hour and annual average exposure periods, respectively. The models the MECP used for contaminants like $PM_{2.5}$ are less precise than those used for the other contaminants like benzene. This can result in potentially underestimating the predicted particulate concentrations, particularly for shorter exposure periods.

When one evaluates annual average exposures, the predicted $PM_{2.5}$ concentrations are in the range of ambient concentrations measured between 2019 and 2023 at the Ada (Lockridge) Rogers, Christina Street, and Vidal Street stations. However, when one evaluates 24-hour exposures, the modelling does not appear to be accurately reflecting worst-case spikes of particulate matter observed in 2023. To drill down on these observations, Figure 19 provides a graph of hourly $PM_{2.5}$ measurements from the Ada (Lockridge) Rogers monitoring location in 2023 (data available at this station up to July 26th, 2023). The 24-hour $PM_{2.5}$ concentration spikes observed in 2023, most pronounced in the 24-hour data but also impacting the annual average for $PM_{2.5}$, appear to be related to the significant impacts that northern forest fires have had on air quality throughout the province in 2023 that were not accounted for in the original modelling.

As such, the AER study conclusions are still appropriate considering more recent air quality conditions for $PM_{2.5}$, given the approximate contributions of the northern forest fires in 2023 could not have been estimated when the modelling was completed in 2020/21. In addition to further supporting the recommendations about reducing cross-border and local sources, the 2023 data also suggests that actions to prevent major forest fires in Canada could reduce health risk related to air quality in Sarnia.

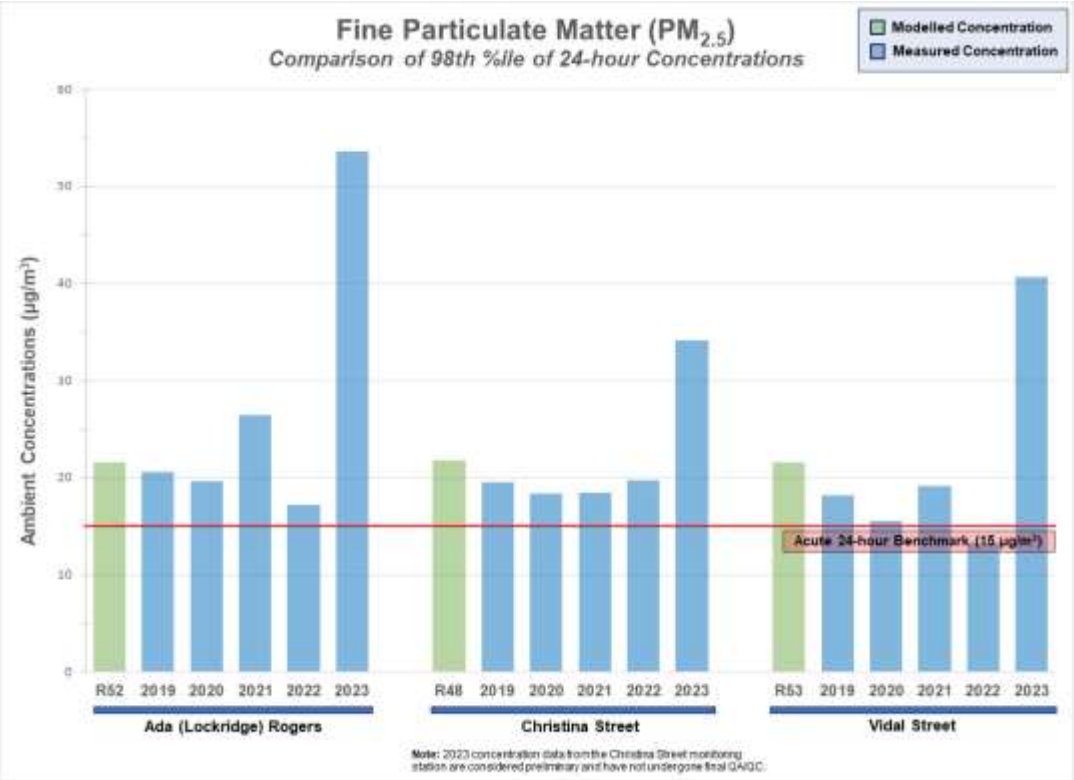

Figure 17 Comparison of Modelled versus Measured for $PM_{2.5}$ 98th Percentile 24-hour Concentrations

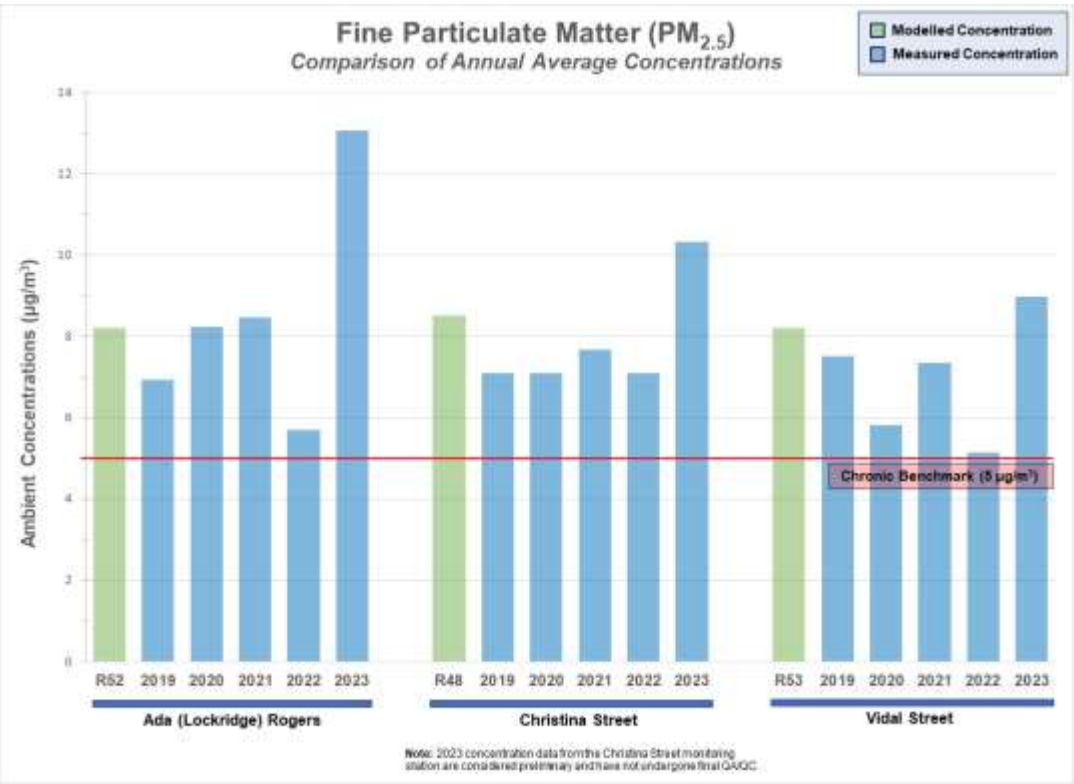

Figure 18 Comparison of Modelled versus Measured for $PM_{2.5}$ Annual Average Concentrations

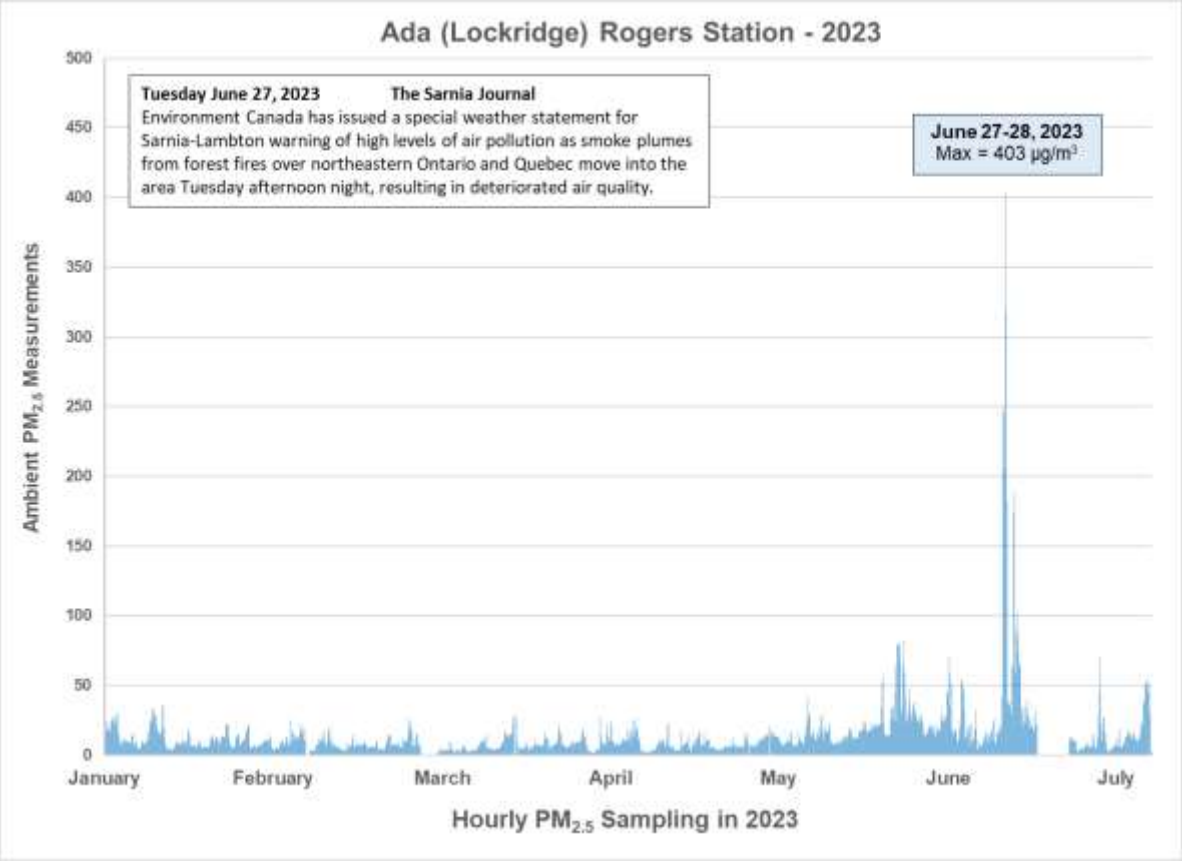

Figure 19 Hourly Measured $PM_{2.5}$ Concentrations at the Ada (Lockridge) Rogers monitoring station in 2023

6.0 CONCLUSIONS

The Air Exposure Review identifies some chemicals in air that could pose a health risk at specific locations in the Sarnia area. This community report provides a high-level overview of the analysis undertaken by the Study Team. For the detailed technical report, including a discussion on methods and limitations, please visit the CASA webpage. This webpage also includes information on other components of the Sarnia Area Environmental Health Project: the Environmental Stressors Review and Plants Study.