Calgary Region Airshed Zone

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June 6, 2023

What is the Calgary Region Airshed Zone (CRAZ)?

VISION
The region's air quality supports and fosters a healthy and vibrant population, ecosystem, and economy.

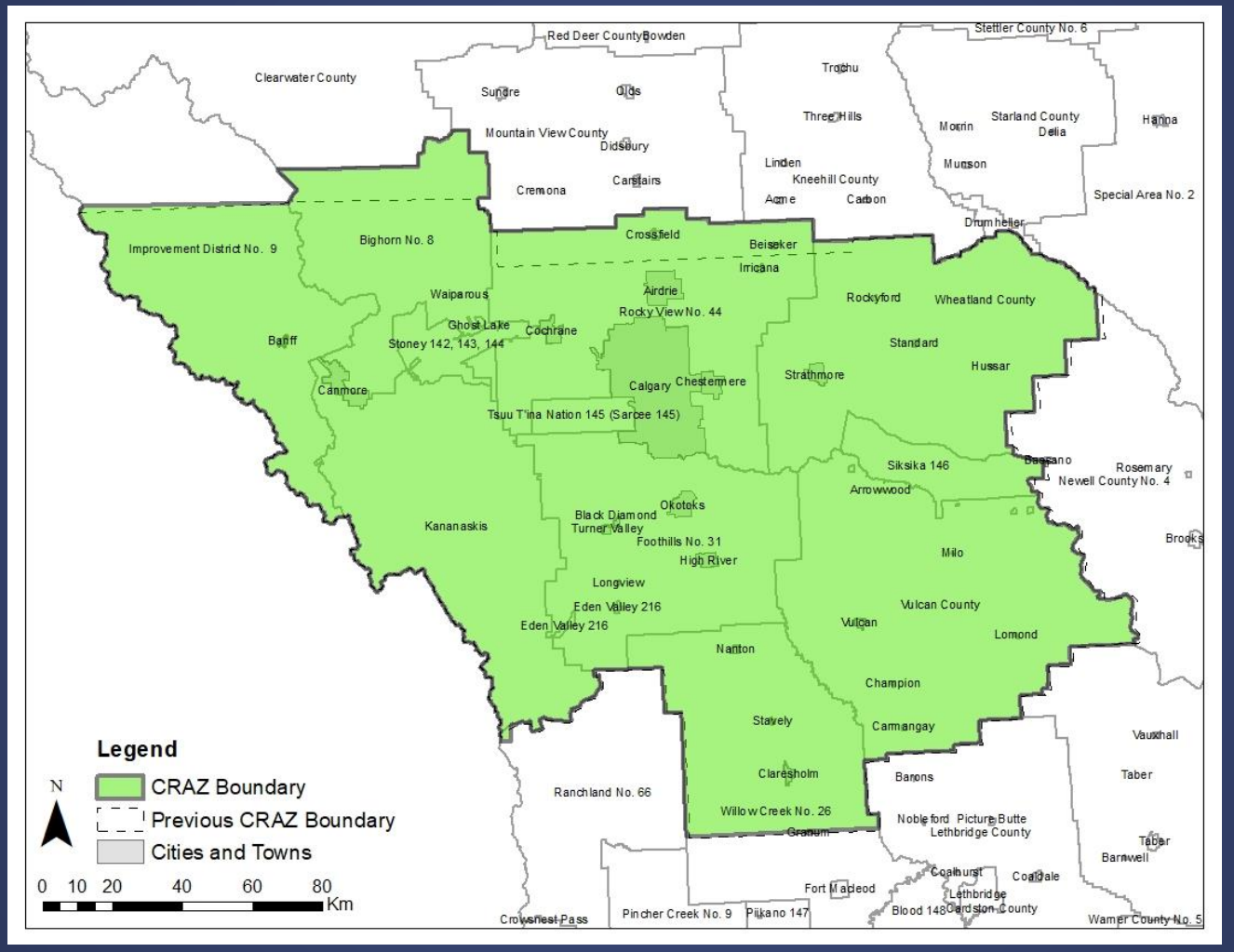
MISSION
We monitor, analyze, and engage with stakeholders to develop strategies that positively impact air quality within the region.

- An airshed is a group of stakeholders (government, industry, non-profit, public) that work towards maintaining and improving the air quality in a geographical region.
- One of 10 Airsheds in Alberta.
- Created in 2005, as a non-profit society by a broadly-based regional group representing industry, community and environmental groups, local governments, and the Province;
- CRAZ boundaries include 40 municipalities and First Nations that are home to approximately 1.8 million Albertans.
- Includes more than 100 industrial sites.

CRAZ
CALGARY REGION AIRSHED ZONE

Making the invisible visible!

CRAZ Boundaries



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Making the invisible visible!

Why do we monitor the air?

Anthropogenic (human caused) air pollution in the region contributes to:

490,855 restricted activity days per year

234 emergency room visits & ↓57 hospital admissions per year

1,359,699 respiratory and asthma symptom days per year

377 deaths per year

254 chronic bronchitis & 1,259 child acute bronchitis cases per year

$2.94 billion per year! ($2.78 billion from premature mortality and $160 million from illness, disease or lack of health.)

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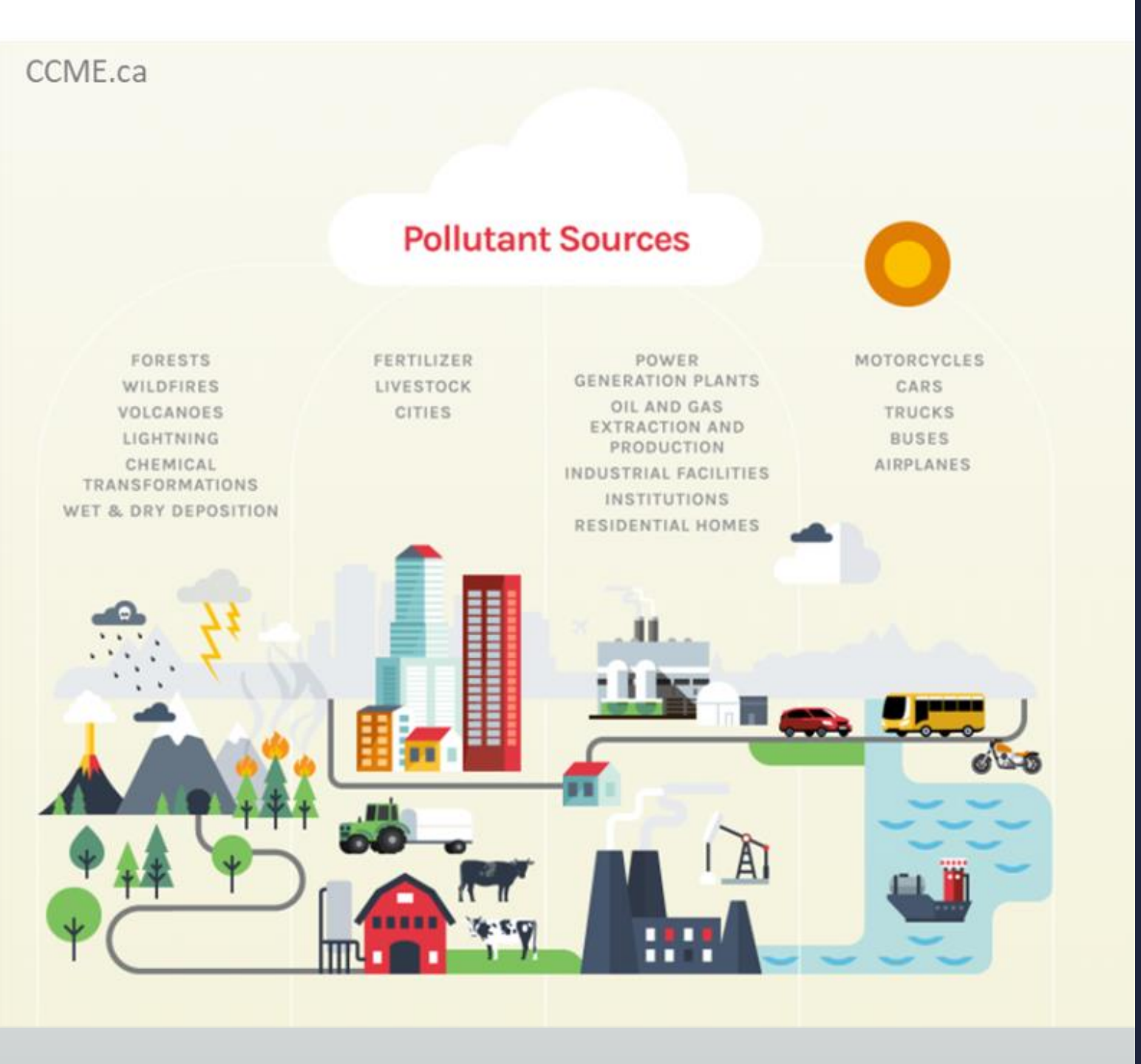
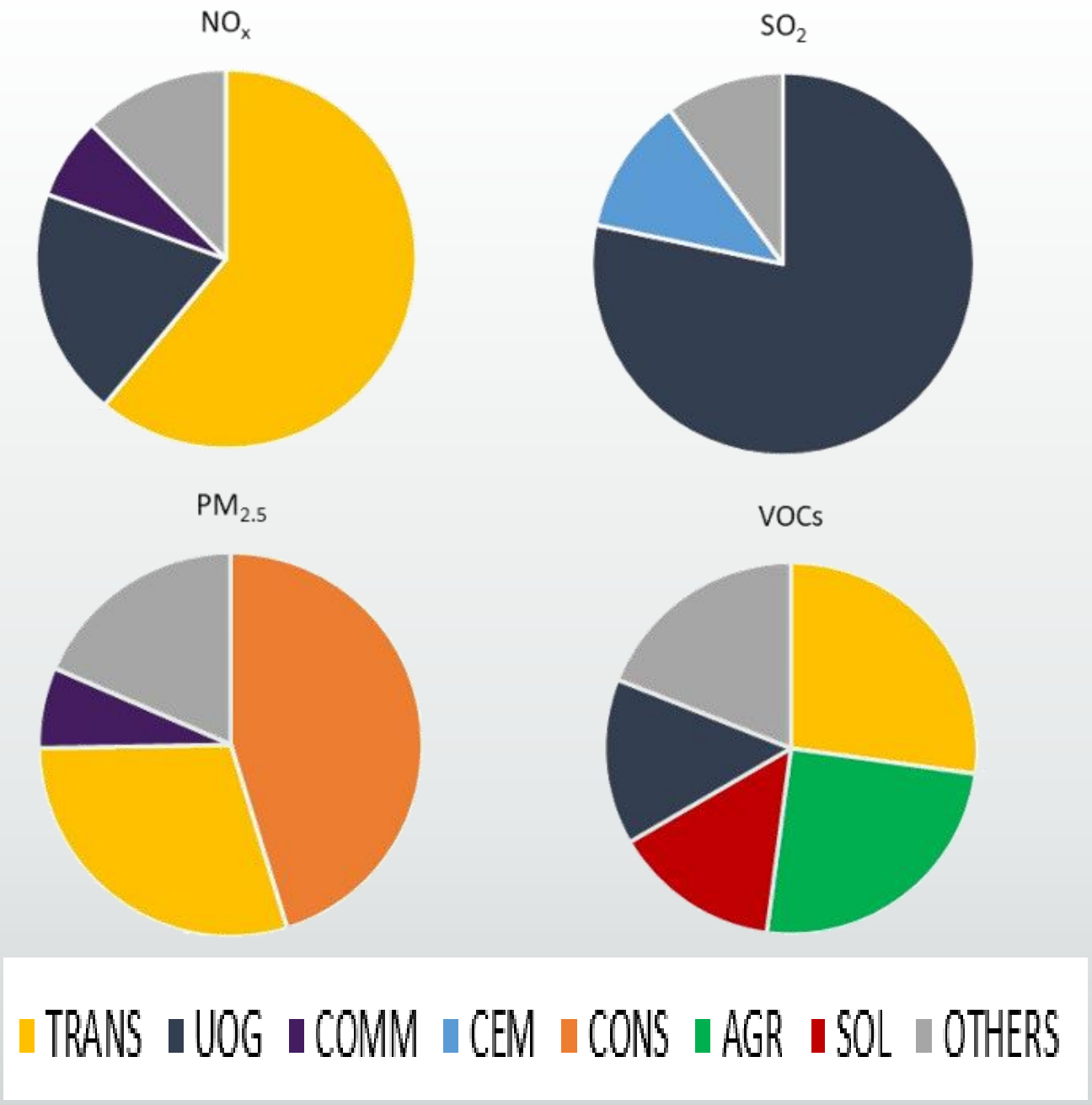


Many different types of sources contribute to air pollution:

- Natural and anthropogenic
- "Point" and "Non-point" sources
  - Point sources are often regulated, non-point sources often not regulated and difficult to manage.

Sector Definitions



TRANS (transportation
UOG (upstream oil and gas)
COMM (commercial)
CEM (rock and cement)
CONS (construction)
SOL (solvents)

Data from CRAZ Emissions Inventory (Novus, 2013)

Standards

CRAZ provides the air monitoring data that regulatory agencies use to indicate status of air quality

Longer term air quality management:

CAAQS (Canadian Ambient Air Quality Standards) long term (3+ years) impacts indicator https://www.alberta.ca/canadian-ambient-air-quality-standards.aspx

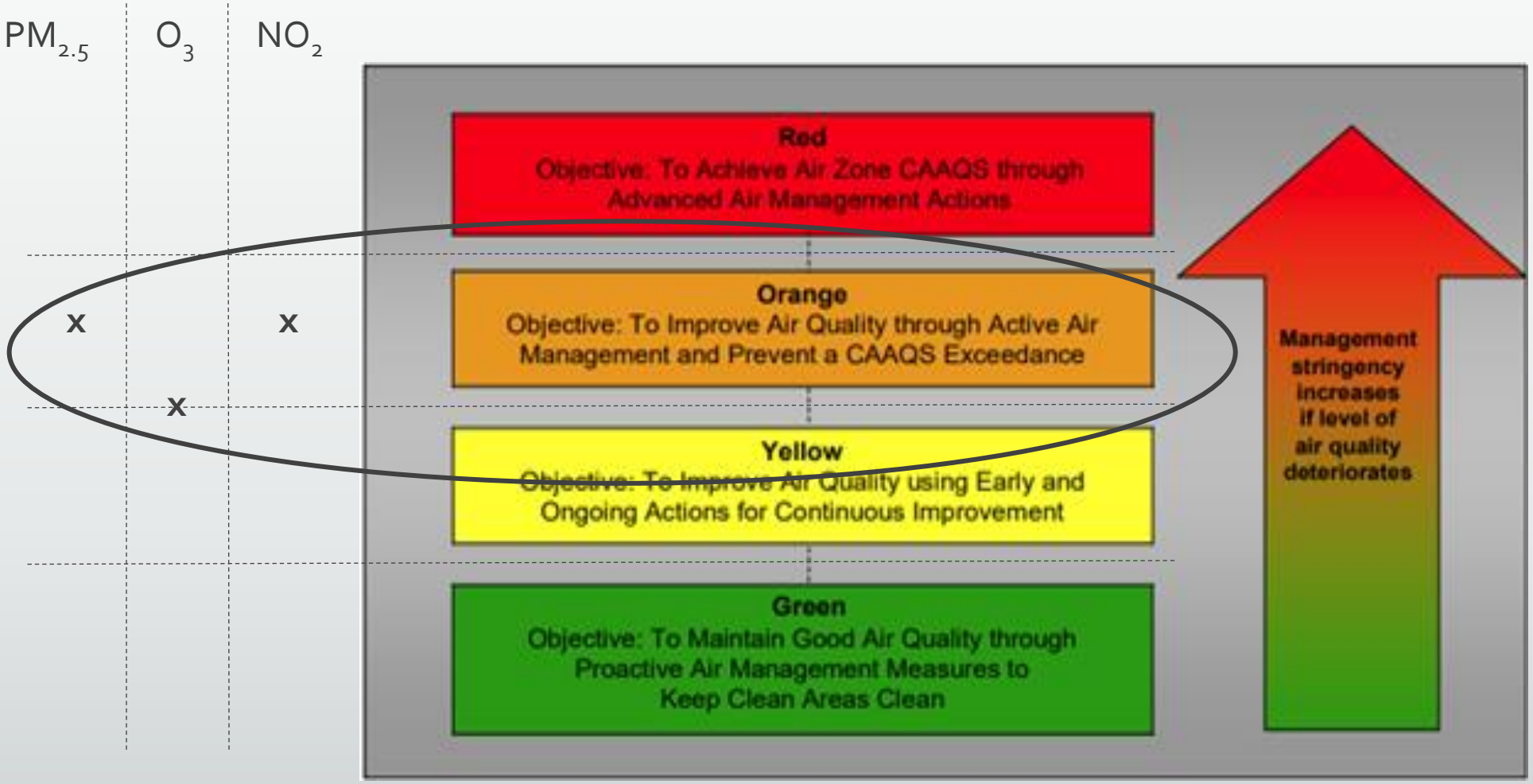
Shorter term air quality management:

AAAQOs (Alberta Ambient Air Quality Objectives) shorter term (i.e., hourly, 24hr, annual) indicator https://www.alberta.ca/ambient-air-quality-objectives.aspx

AQHI (Air Quality Health Index) a tool that relates the outside air quality to your health https://www.alberta.ca/about-the-air-quality-health-index.aspx

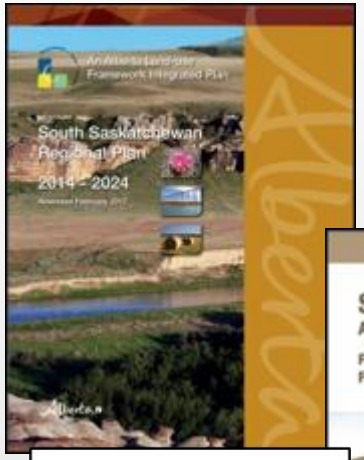
CAAQS Levels

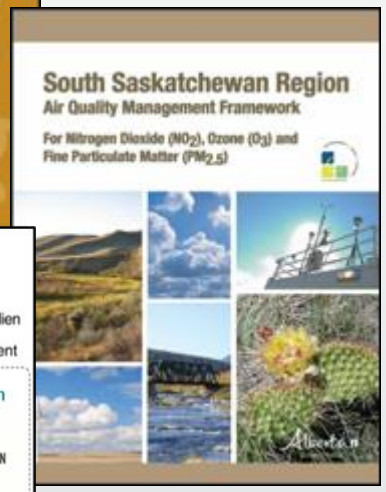
- Levels fluctuate from station to station and from year to year.
- In the past, we have triggered the need for management for $PM_{2.5}$, O_3 and NO_2.

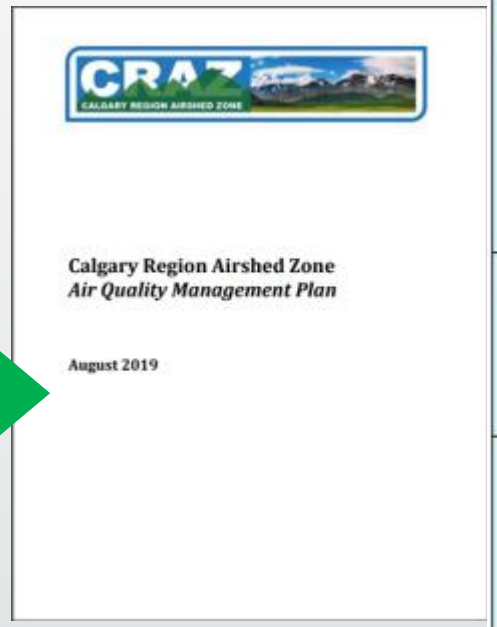


Air Quality Management Plan

CRAZ helps manage air quality though the CRAZ Air Quality Management Plan (AQMP)





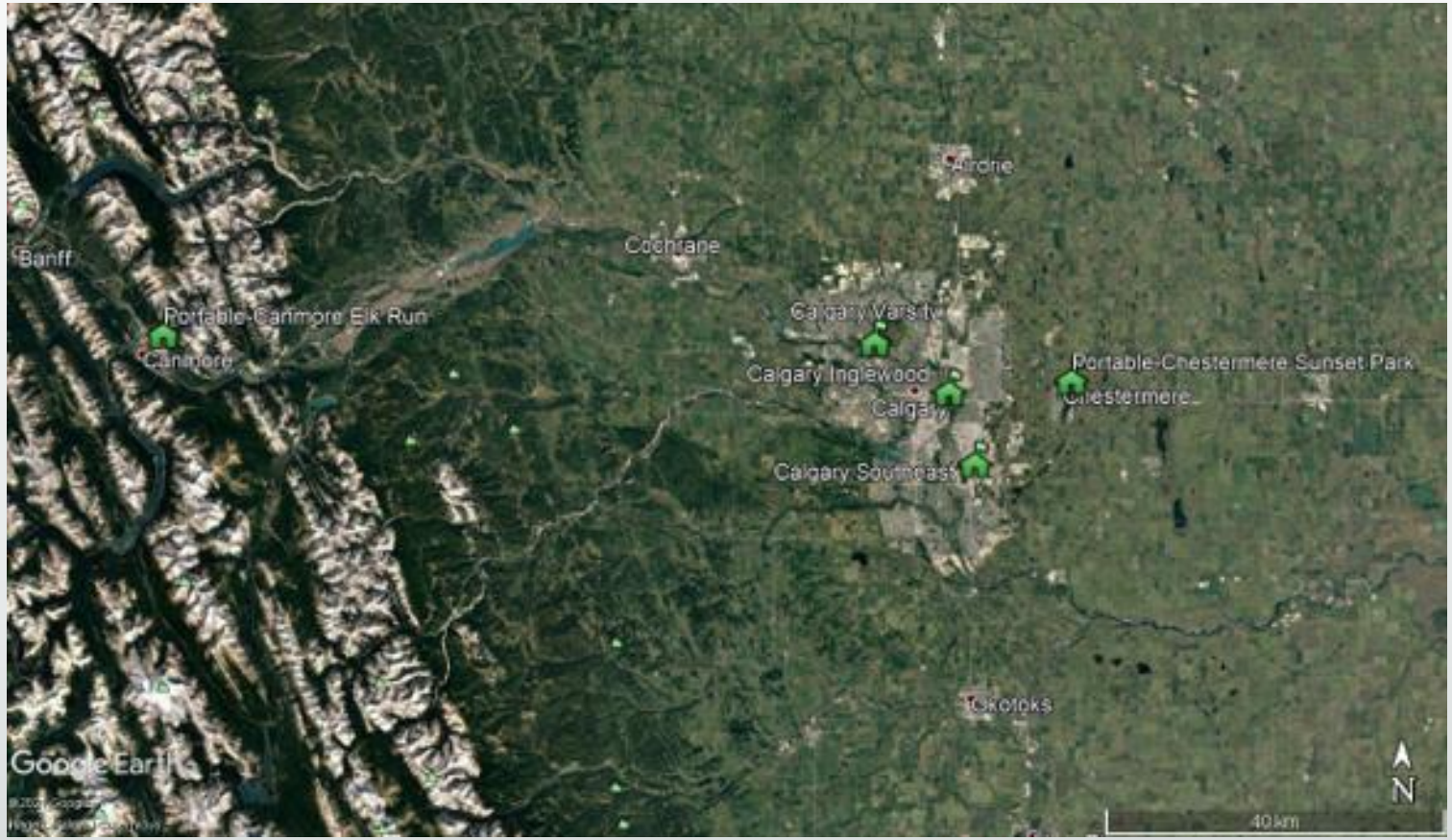


Action	Step	Performance Indicator	Time Frame	Lead Committee
1. Air quality management will be integrated into regional and municipal planning	i) Promote air qualityinitiatives within environmental management plans and municipal development plans or charters in the region (including SSRP and CMRB)	CRAZ will keep and up-to-date as possible list of municipal initiatives.	ST	**AQMP**
	ii) Develop templates for municipalities that promote/incentivize positive air qualityinitiatives for urban planning.	The relevance of the municipal toolkit is reviewed and development is continued, if required. Research opportunities to create further policy templates and tools with municipalities.	C	**Policy & Research**
2. Support multi- modal transportation systems	iii) Promote and develop programs for municipalities that promote/incentivize positive air qualityinitiatives for transportation.	Promote and develop programs/tools and/or policies to promote/incentivize positive air quality initiatives for transportation.	MT	**Engagement** Policy & Research
	iv) Evaluate the air quality impacts of transit/transportation initiatives.	Seek out and review available studies on the impacts of transit/transportation initiatives on air quality.	MT	**AQMP** Technical
3. Increase natural filters	v) Support and promote urban tree planting policies and programs for municipalities and individual residents.	Report back on results of policies and programs that increase the number of trees in the CRAZ region.	ST	**Engagement**
	vi) Encourage the implementation of green roofs policies	Report back on results of policies and programs that result in an increase in use of green roofs. Inclusion of green roof criteria in municipal building requirements/incentives.	MT	**Policy & Research** Engagement

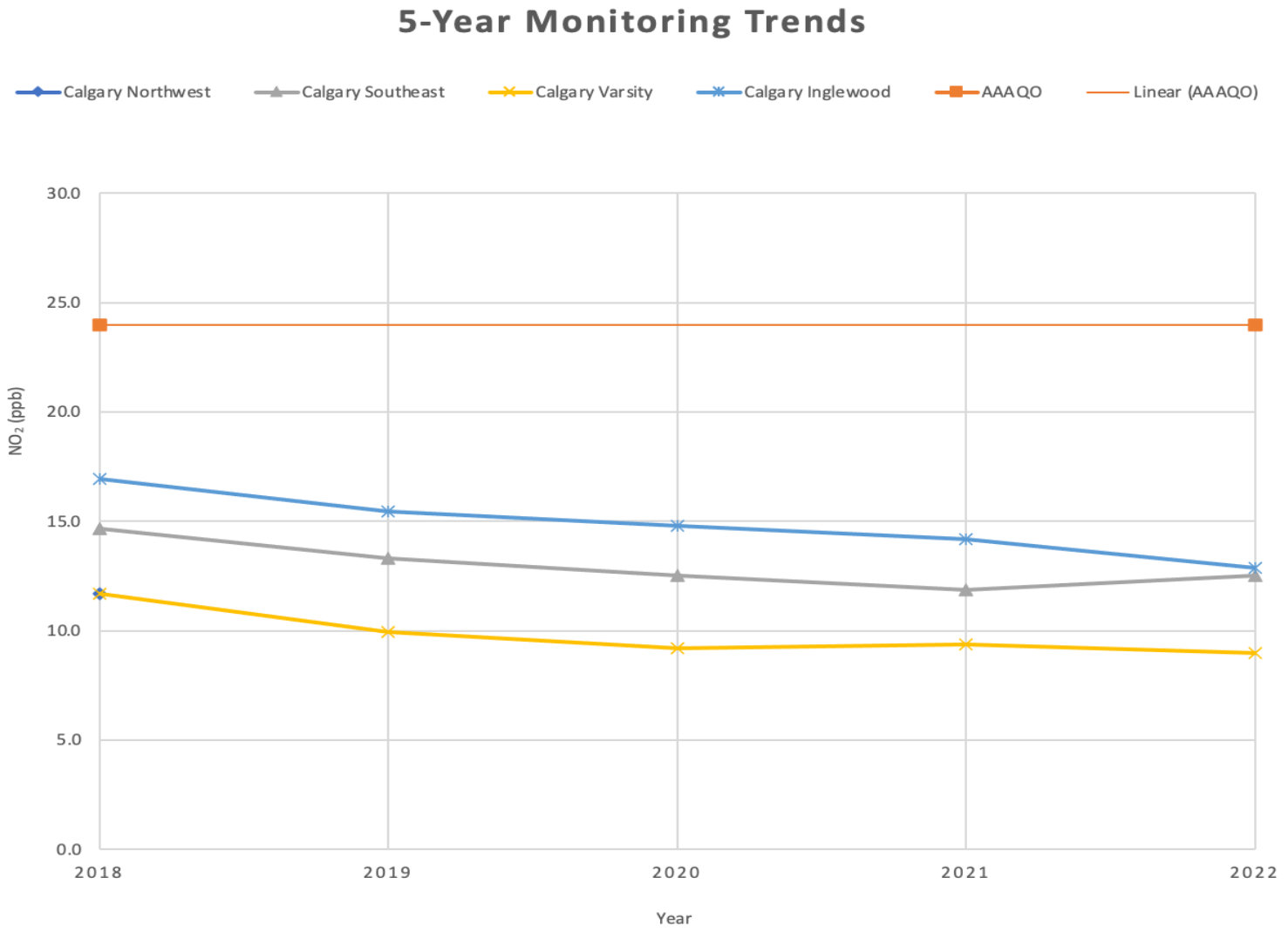
Monitoring

Monitoring Network 2021
Stations monitor different parameters based on individual monitoring objective

Parameter	Calgary Inglewood	Calgary Southeast	Calgary Varsity	PAML	Airdrie
Sulphur dioxide (SO_2)		•			
Oxides of nitrogen (NO_x)	•	•	•	•	•
Nitric oxide (NO)	•	•	•	•	•
Nitrogen dioxide (NO_2)	•	•	•	•	•
Respirable particulates ($PM_{2.5}$)	•	•	•	•	•
Ozone (O_3)	•	•	•	•	•
Non-methane hydrocarbons (NMHC)	•	•	•		
Methane (CH_4)	•	•	•		
Hydrogen sulphide (H_2S)		•			
Total hydrocarbons (THC)	•	•	•		
Carbon monoxide (CO)	•	•	•		•
Wind speed and direction	•	•	•	•	•
Air temperature	•	•	•	•	•
Relative humidity	•	•	•		•



5 – Year Monitoring Trends



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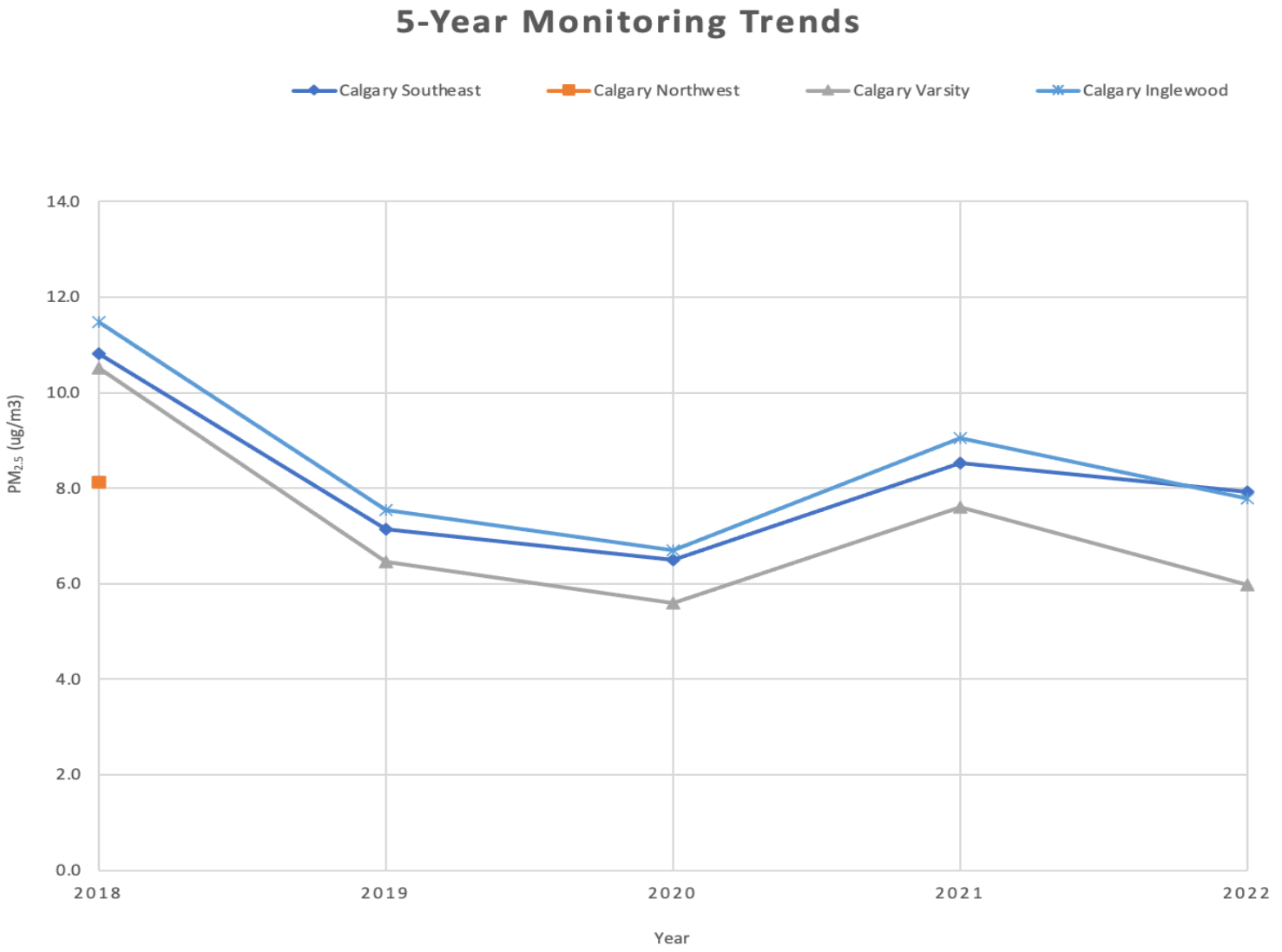

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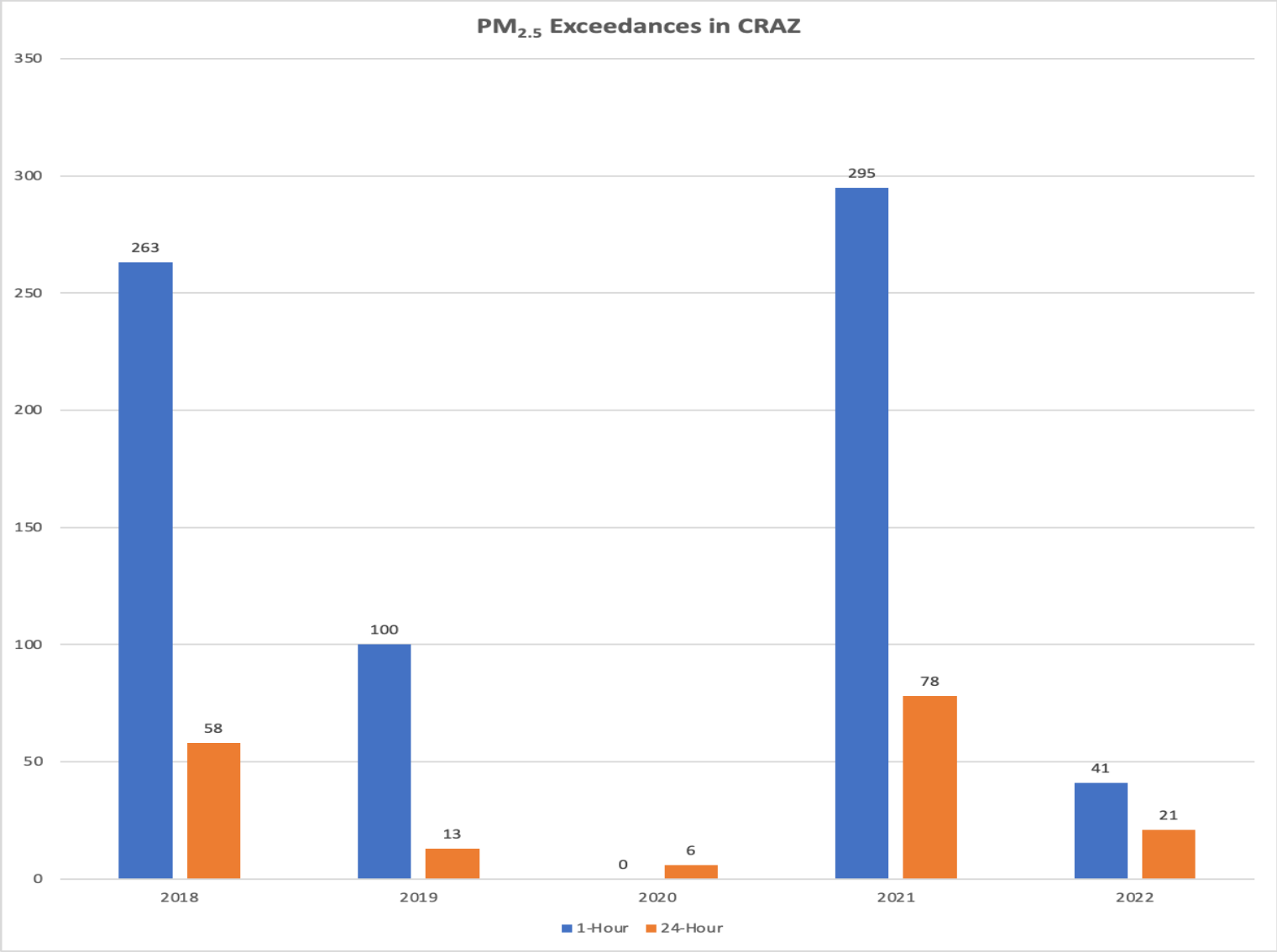

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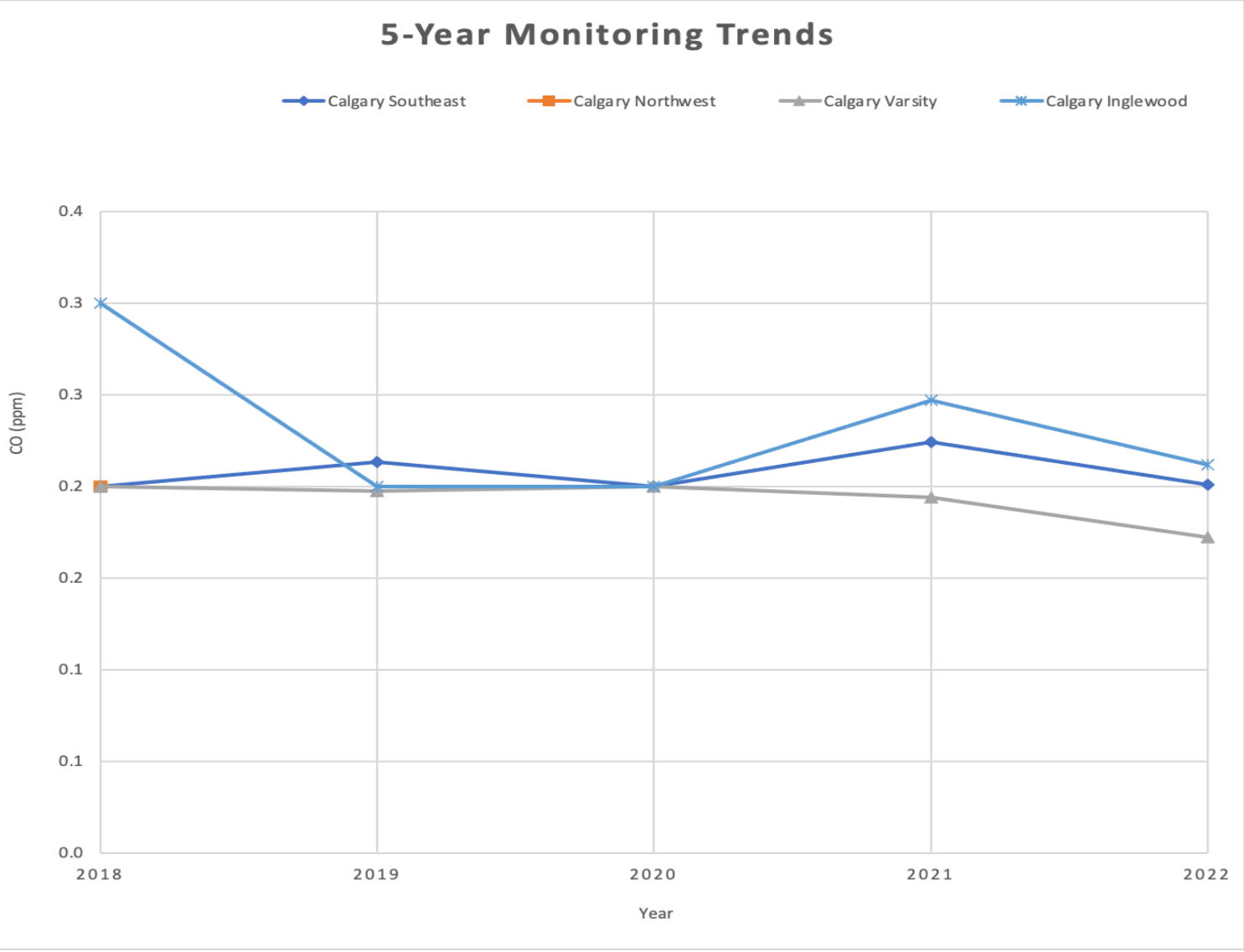

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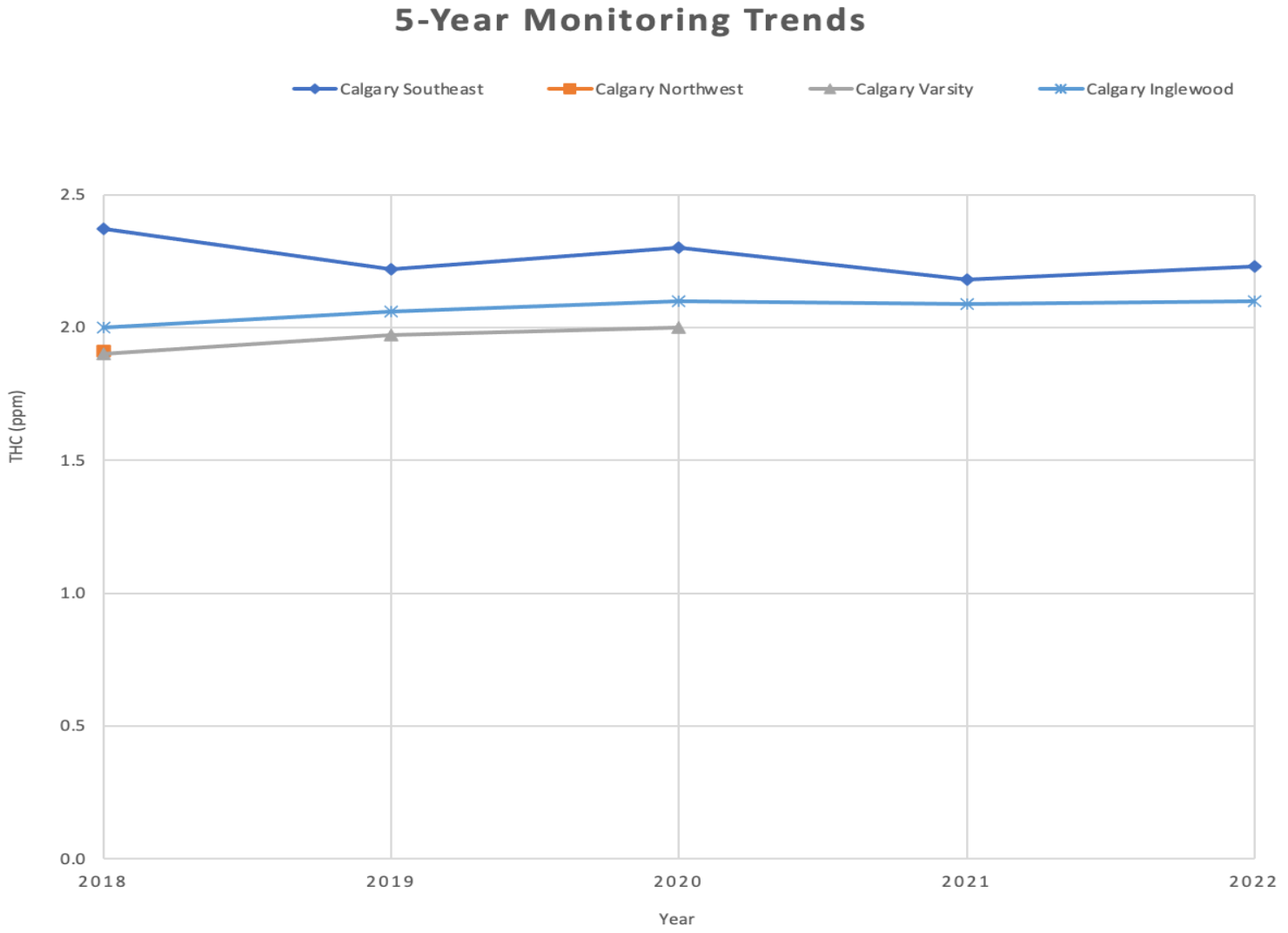

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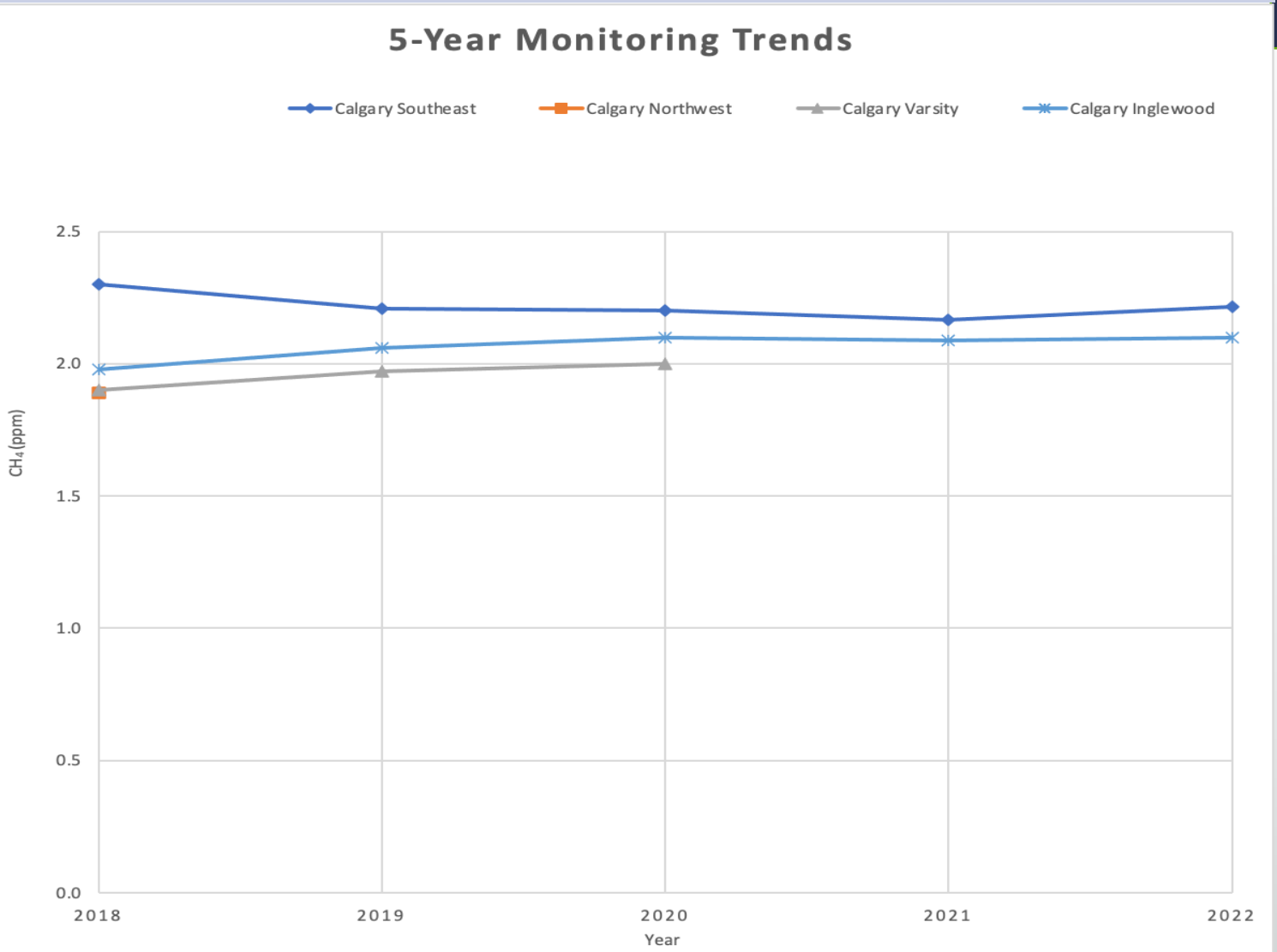

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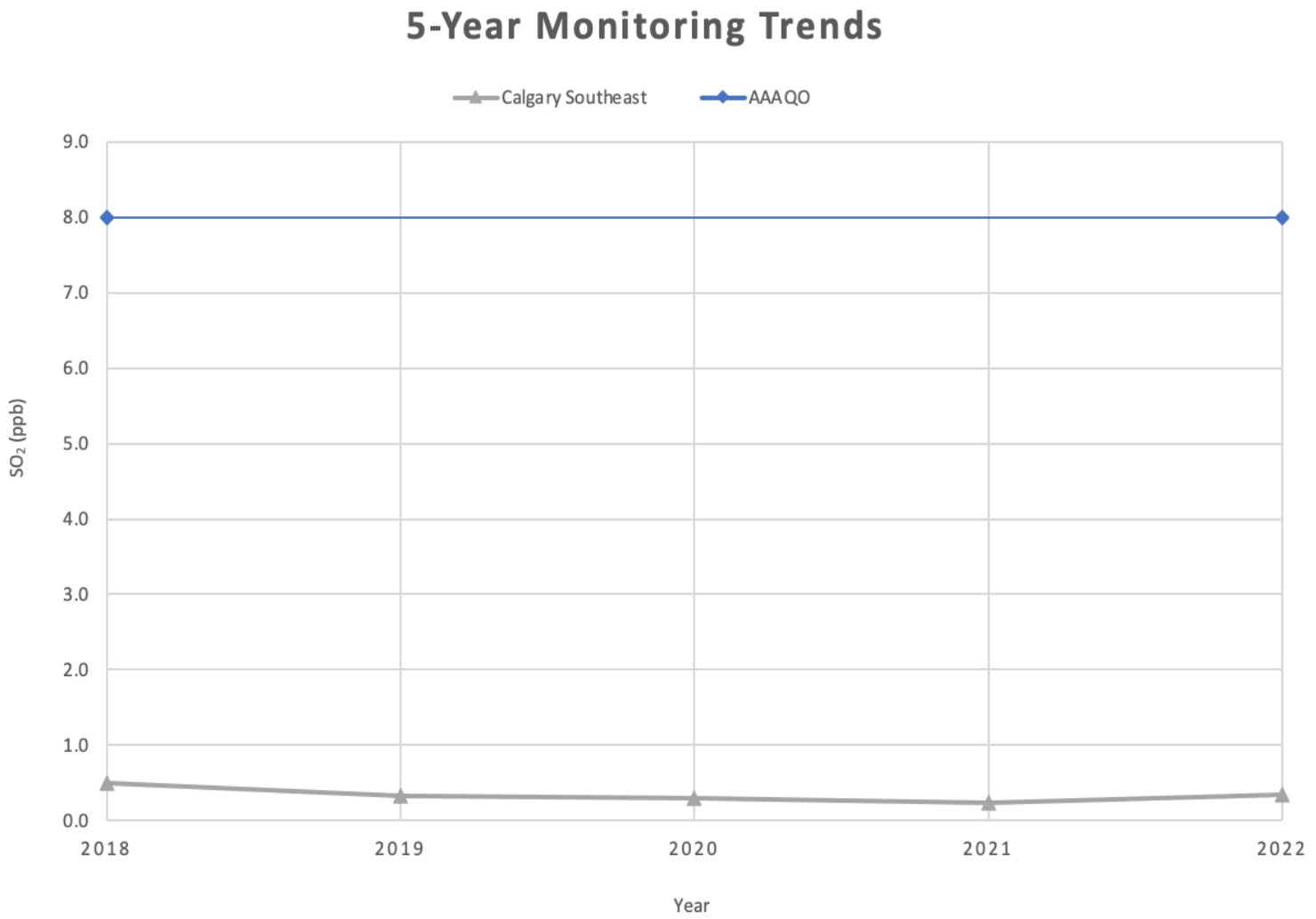

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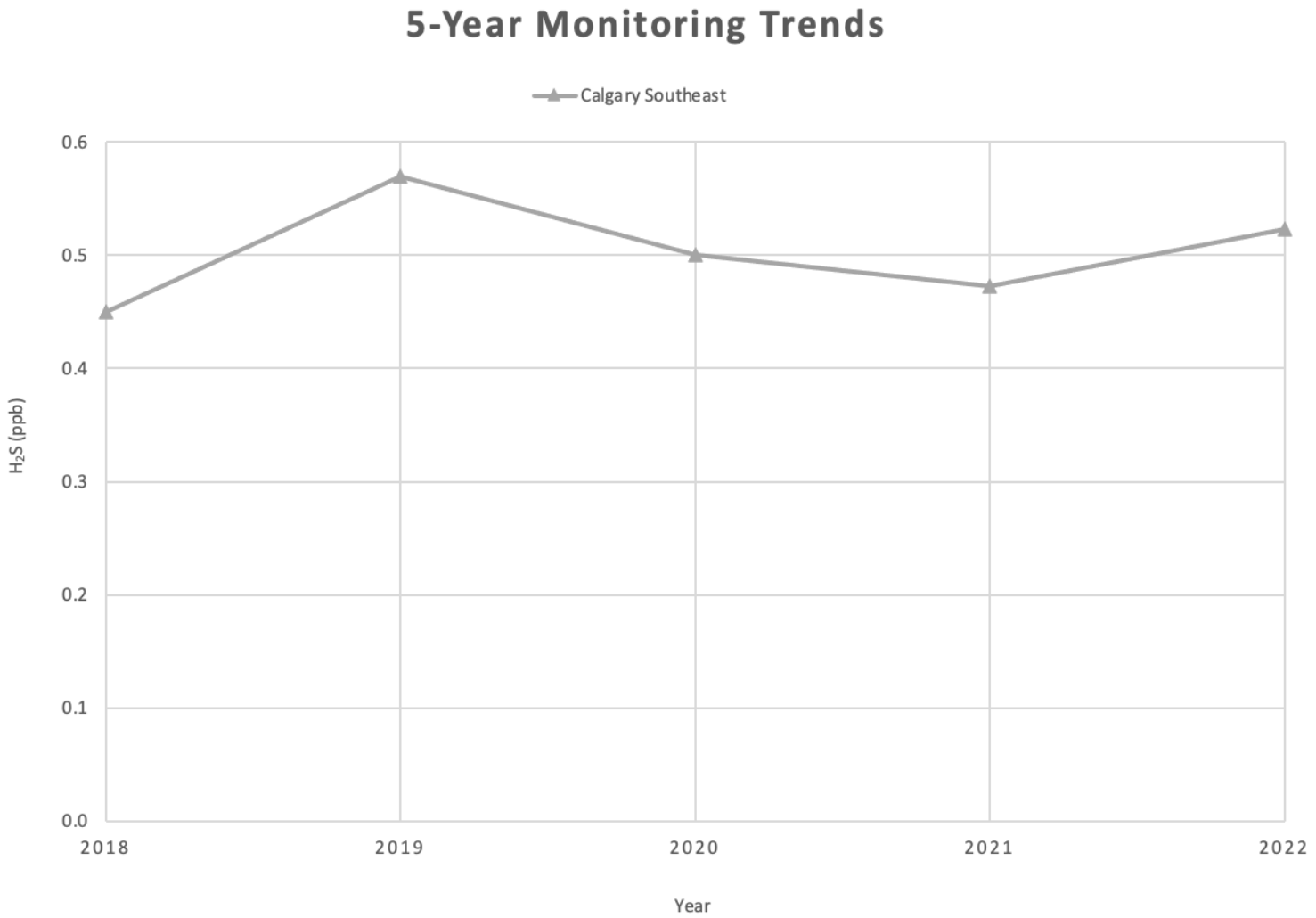
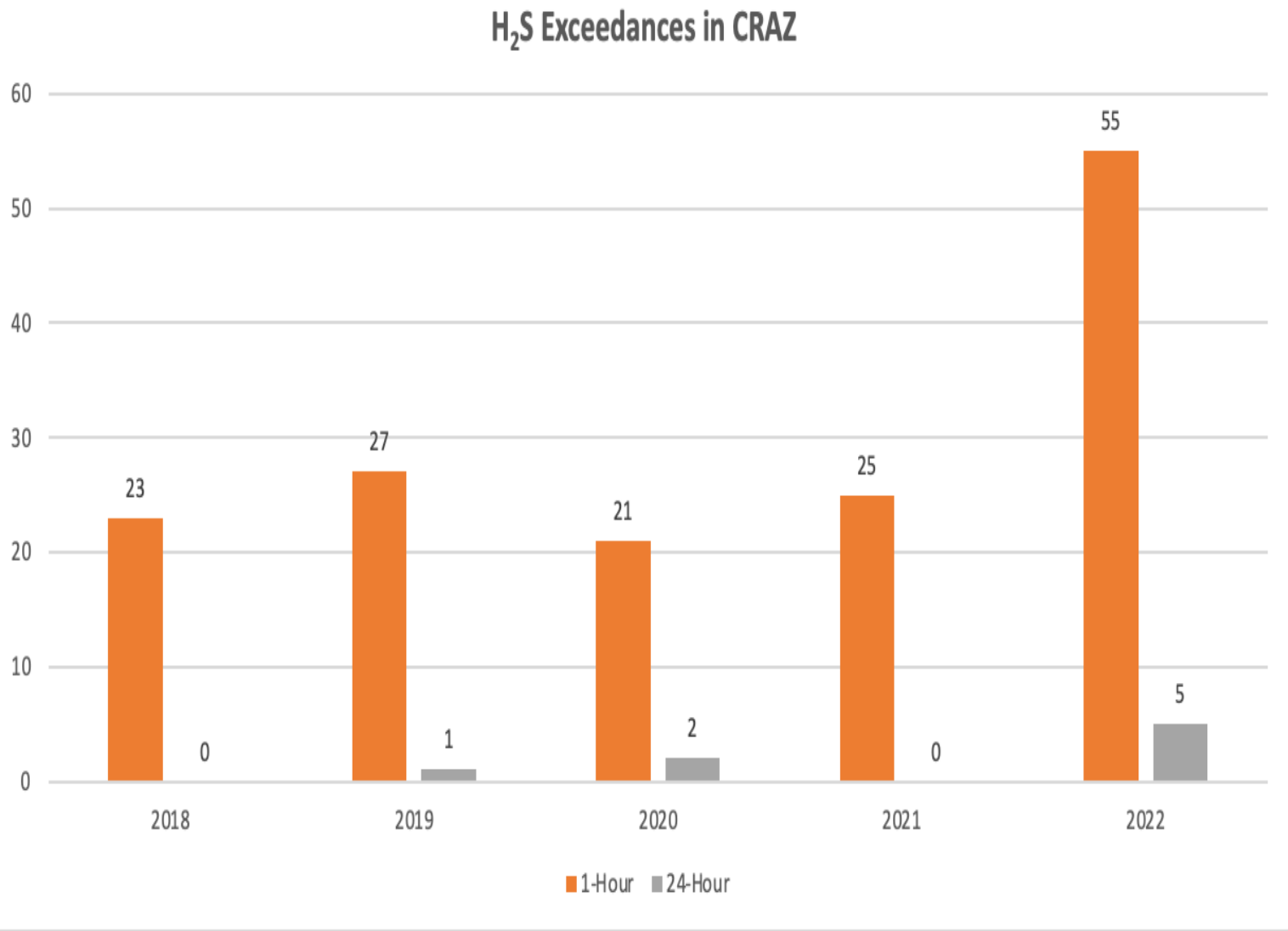


Monitoring Trends

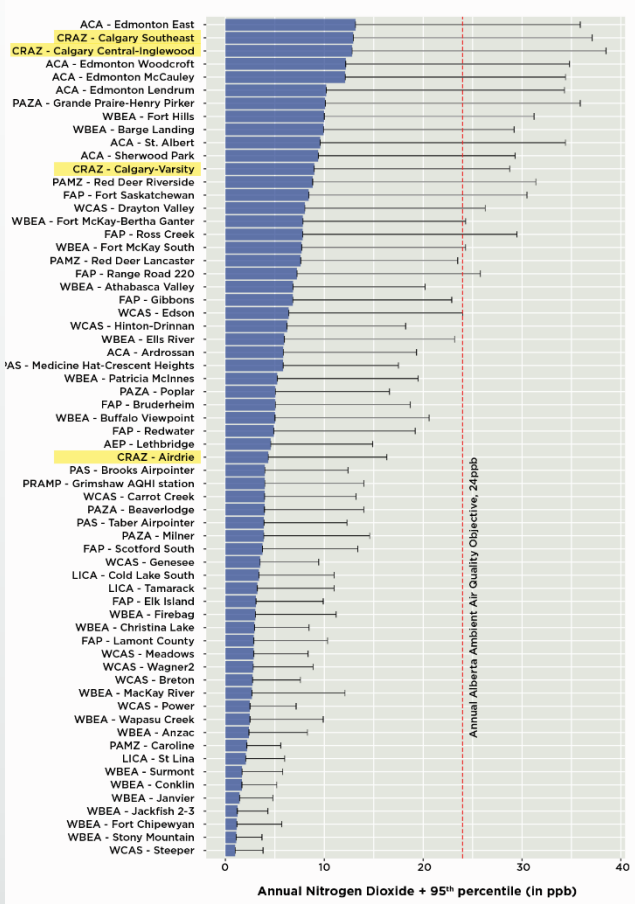
Monitoring Trends

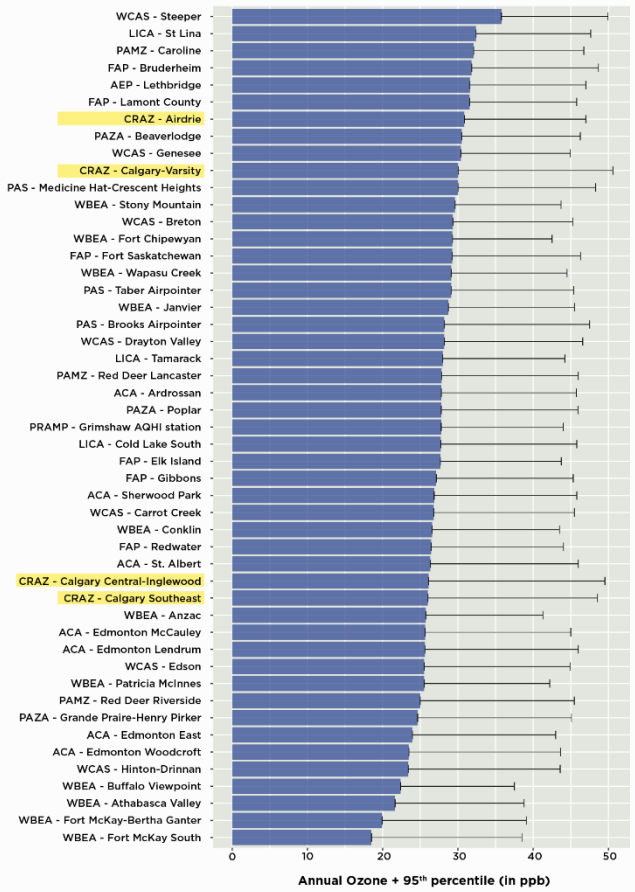
H2S Exceedances in CRAZ



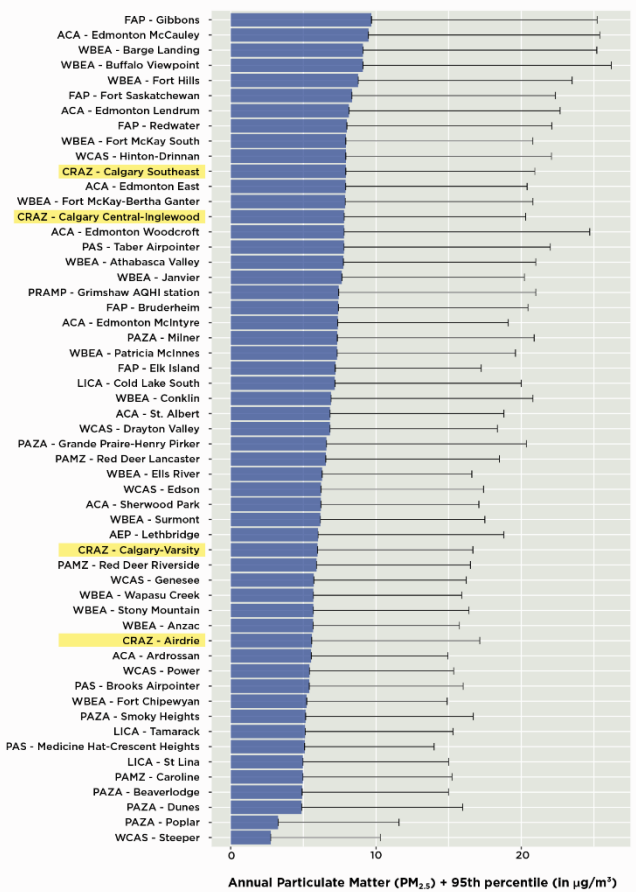
Monitoring Trends

Source: Alberta Airsheds 2022 Air Quality Report

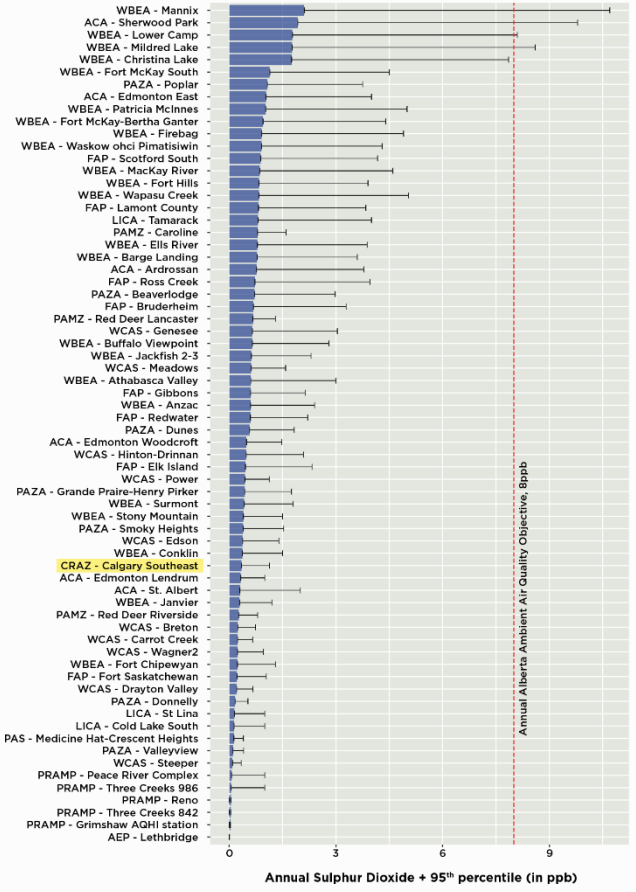


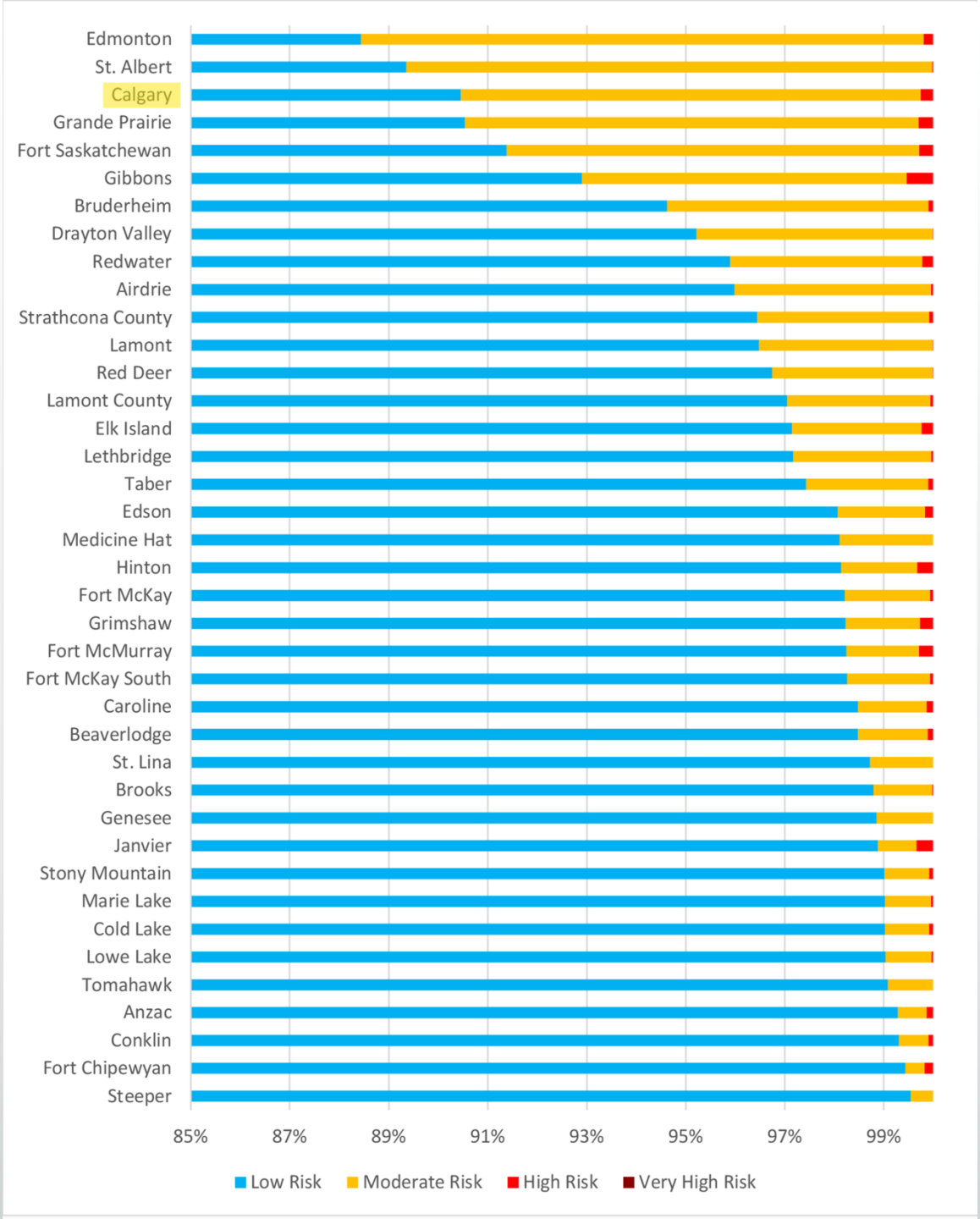


Note: There is no annual AAAQO for O_3.



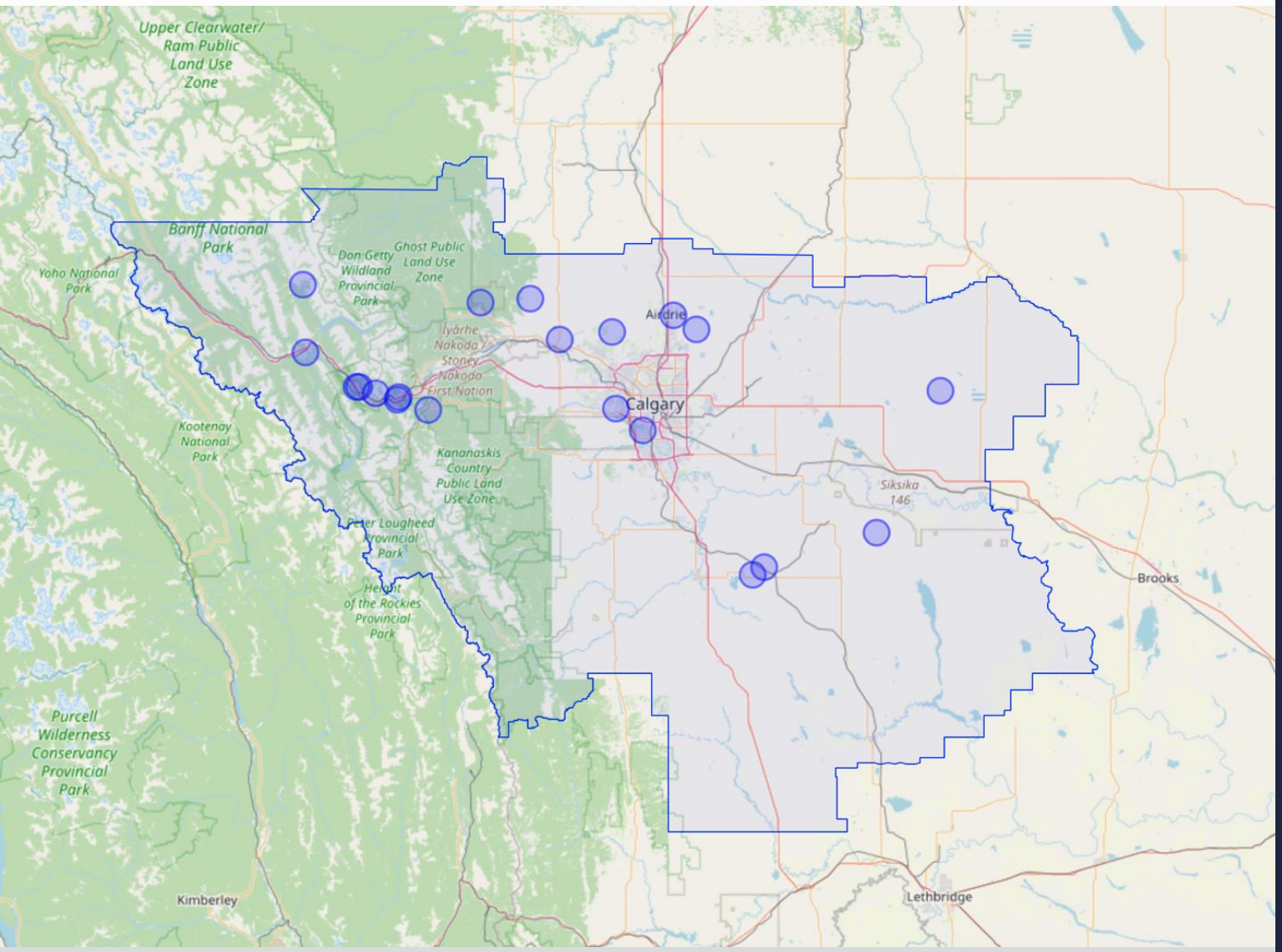
Note: There is no annual AAAQO for $PM_{2.5}$





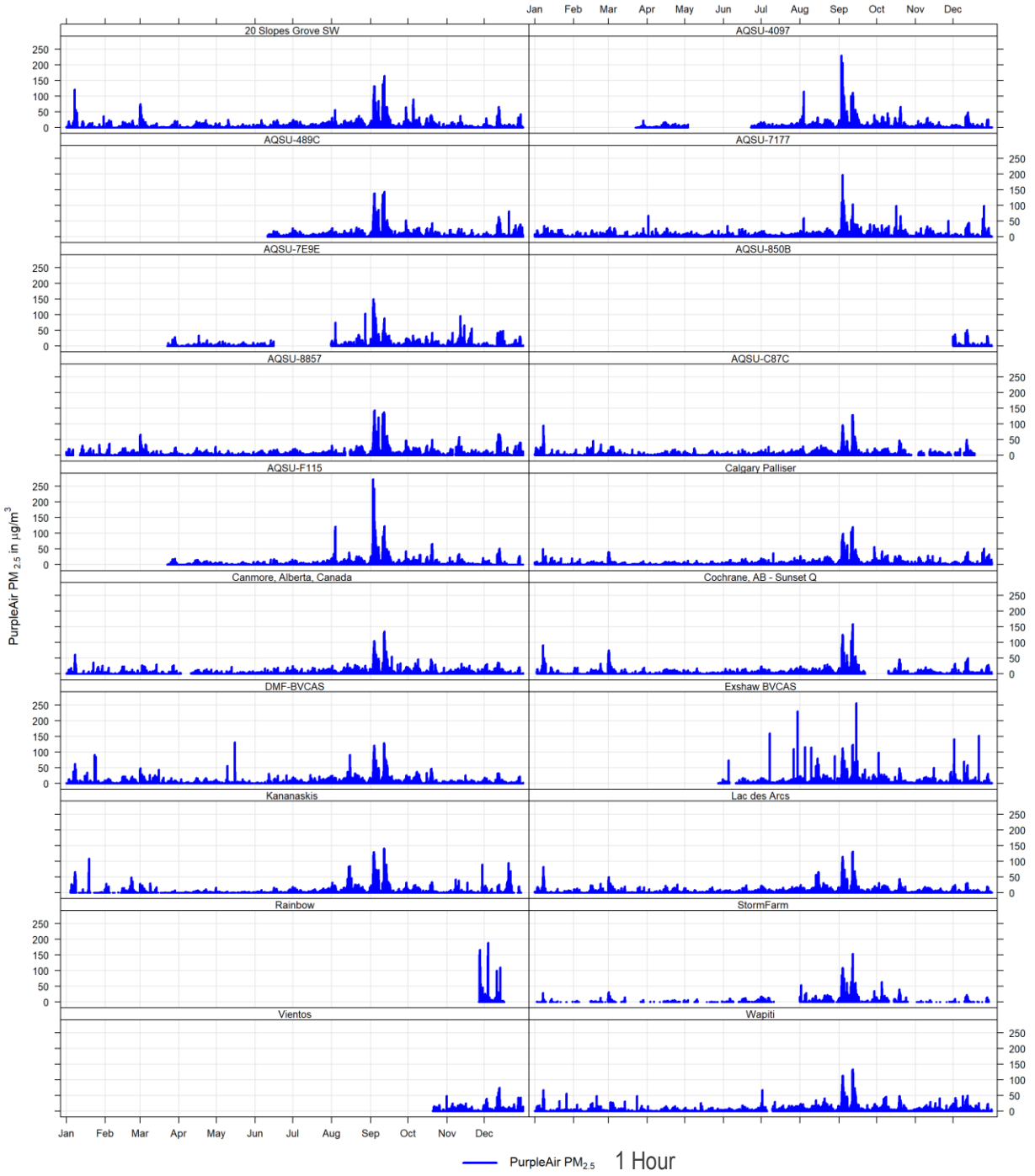
AQHI

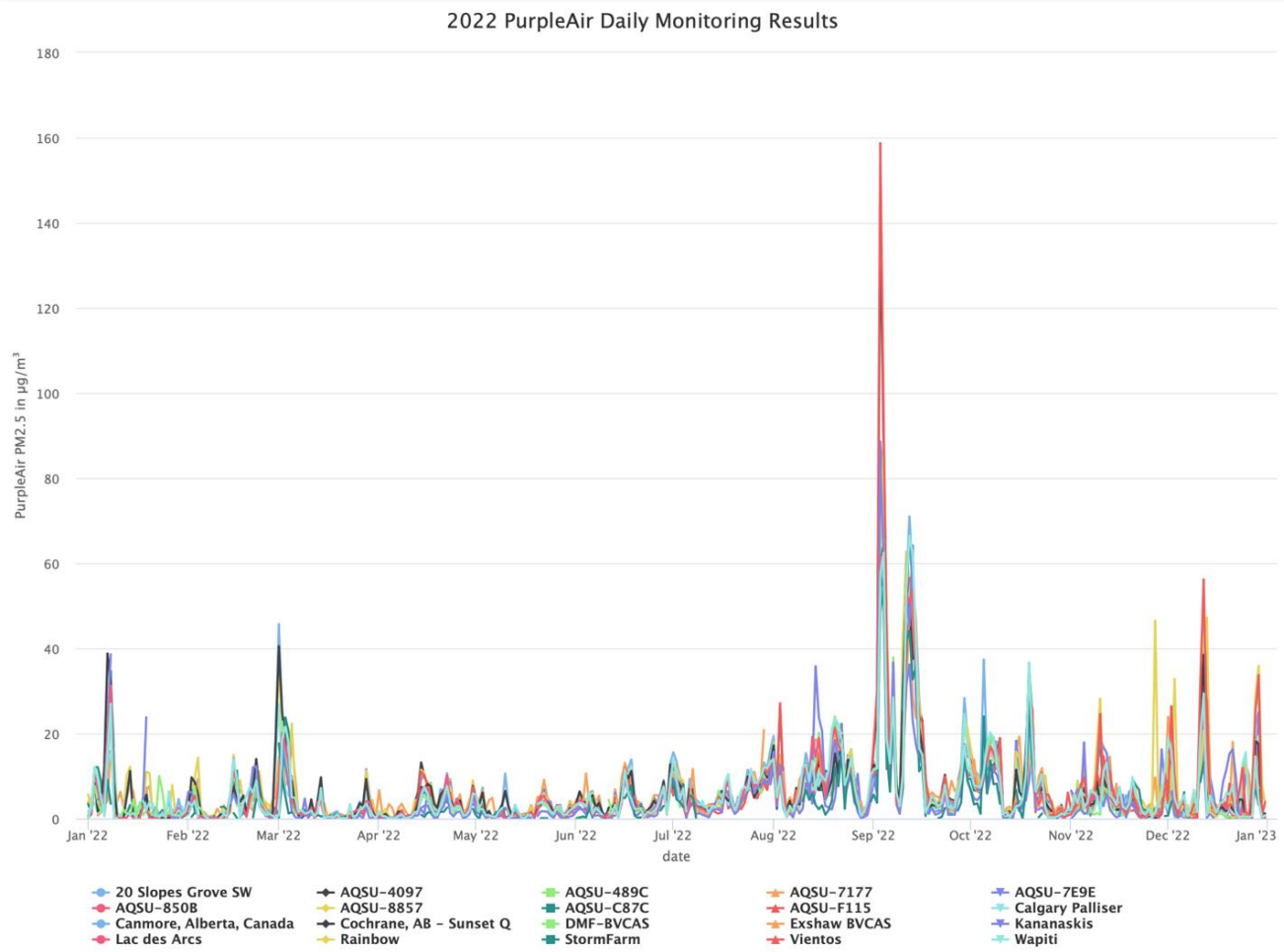
Source: Alberta Airsheds 2022 Air Quality Report



Purple Air Monitors

Purple Air Monitors

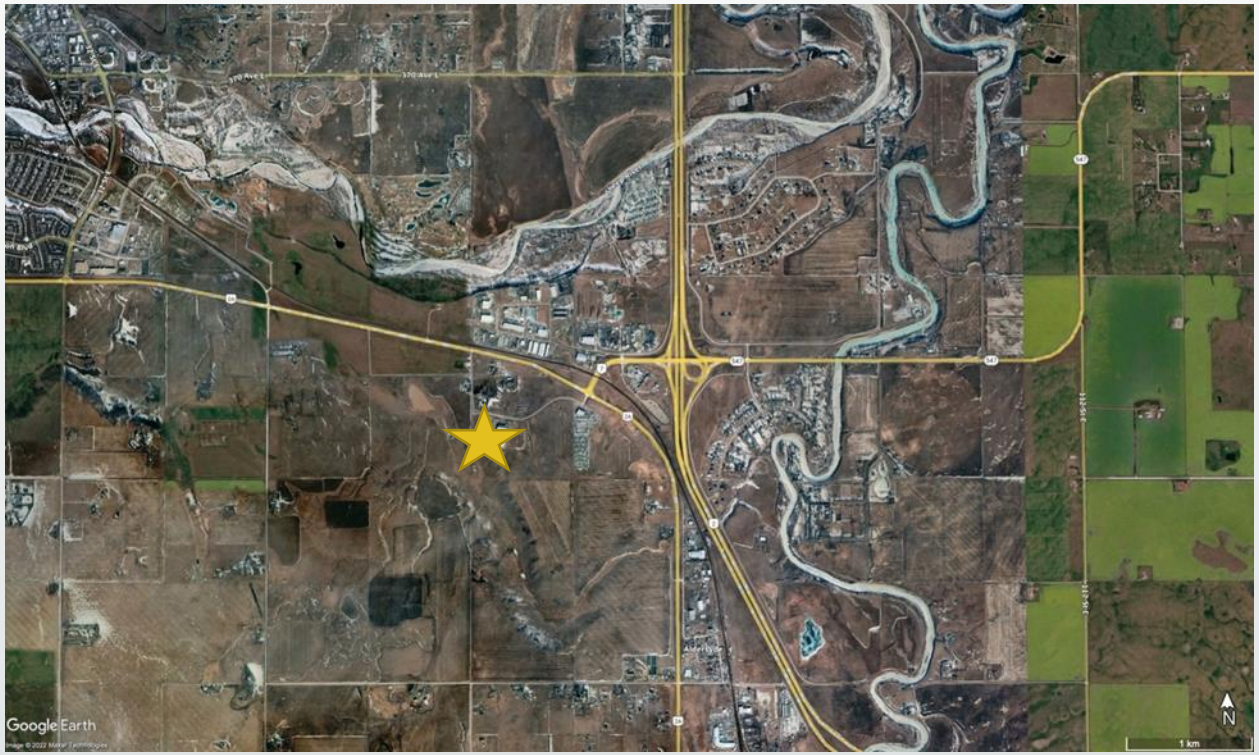




Aldersyde PAML Project

PAML

Field House, Aldersyde



Summary of Aldersyde PAML Project

The PAML has completed one years worth of data, over two 6-month periods.

Monitoring Highlights:

1. NO_2 did not exceed the air criteria set by AEP and the Government of Alberta.
   a) Monthly average NO2 levels at Field House, Aldersyde for both deployments were significantly lower than the levels observed at the three locations in Calgary where these pollutants are continuously monitored. During the first deployment, slightly different seasonal patterns for NO2 were observed when compared to the emissions at Calgary locations. However, monthly average NO2 levels at Field House, Aldersyde exhibited the same seasonal patterns during the second deployment when compared to the levels observed at the three locations in Calgary.
2. O3 emissions exceeded the 24-hour air criteria once.
   a) The O3 monthly average levels at Field House, Aldersyde were relatively similar to the levels observed at the three locations in Calgary where these pollutants are continuously monitored. However, for the October 2021 to March 2022 monitoring period, the O3 monthly average levels at Aldersyde were higher than the Calgary locations.
3. PM2.5 exceeded the 1-hour and 24-hour air criteria 49 and 14 times, respectively.
   a) For majority of the time, the PM2.5 levels at Field House, Aldersyde do not differ substantially from other locations in Calgary where PM2.5 is monitored; however, during the months of July 2019, August 2019, and September 2019, PM2.5 levels were lower than other locations in Calgary.

Overall, the air quality in Aldersyde was at low health risk (83.3%) the majority of the time.

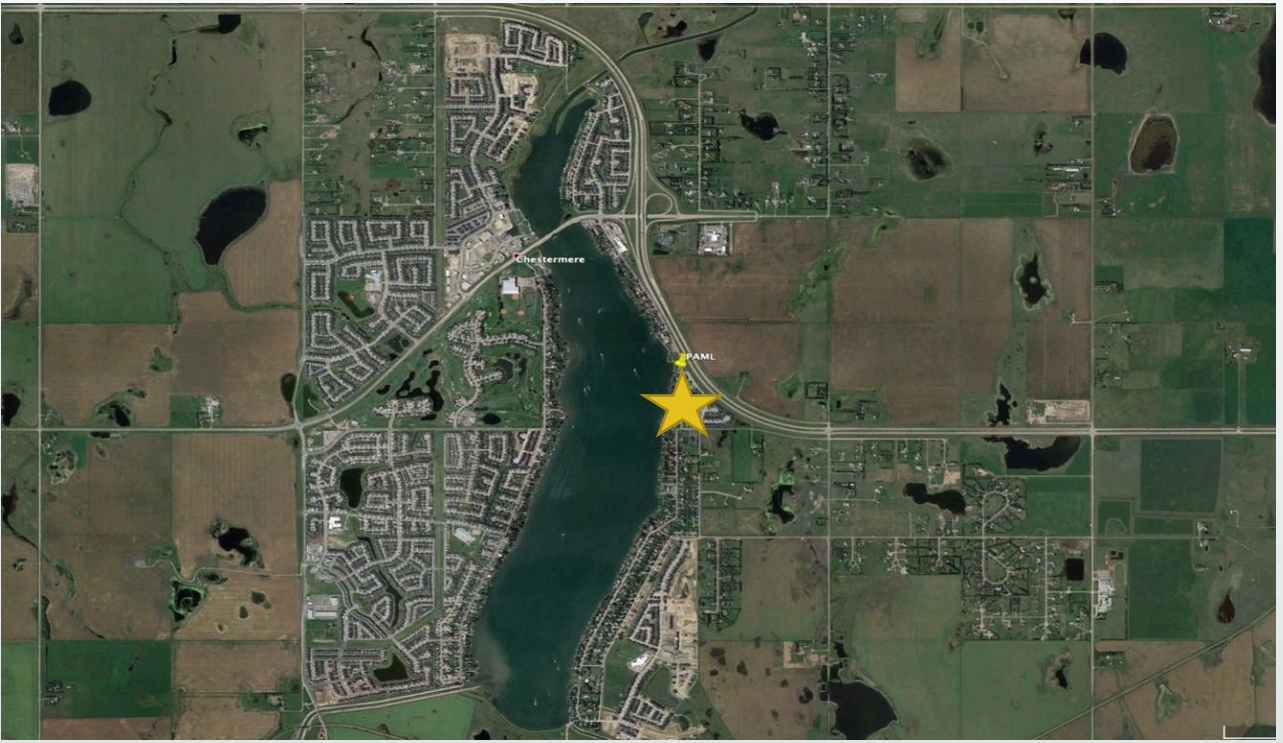
PAML

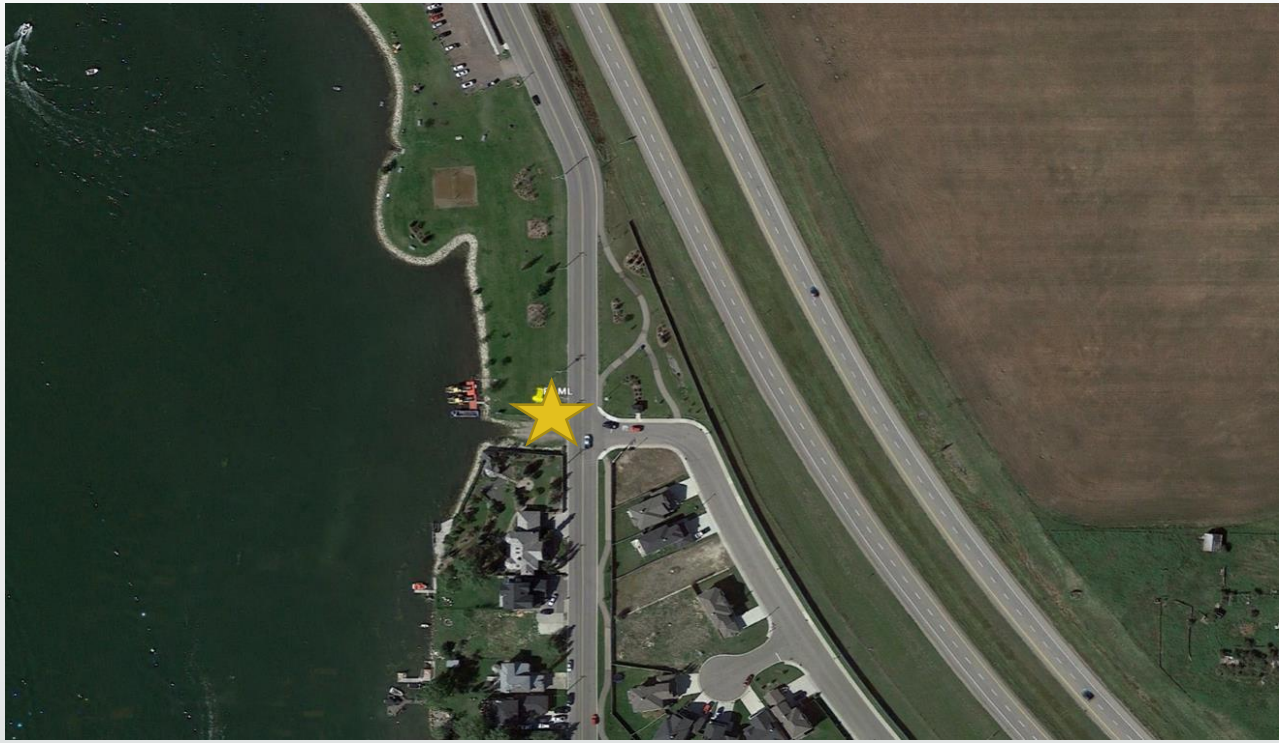
Special thanks to the Cavalry FC Regional Field House, Alberta Environment and Protected Areas (EPA) for providing funding for the deployment of PAML, and EPA for the donation of monitoring equipment.

Chestermere PAML Project

PAML

Sunset Park, Chestermere





Summary of Chestermere PAML Project

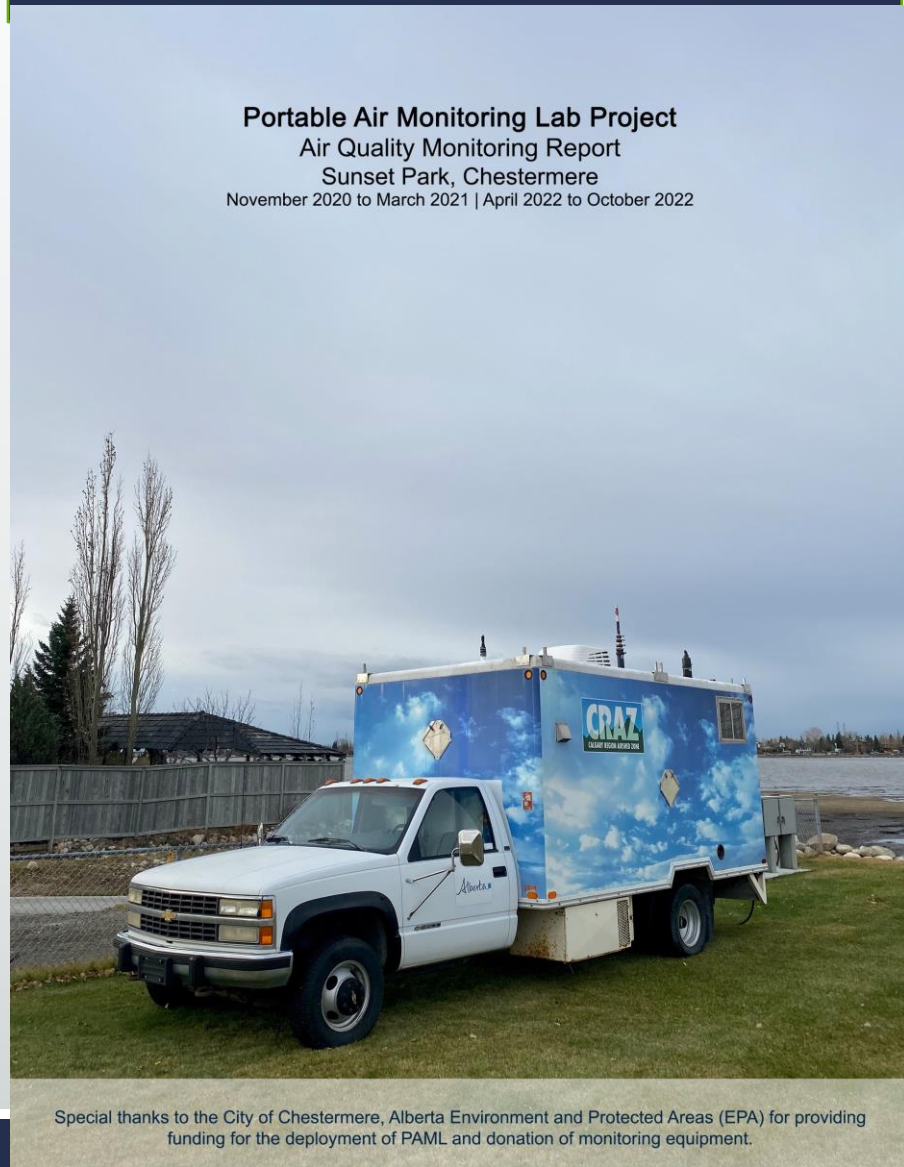
The PAML has completed one years worth of data, over two 6-month periods.

Monitoring Highlights:

1. While the region was under wildfire smoke, PM2.5 exceeded the 1-hour and 24-hour air criteria 18 and 8 times, respectively.
    1. For majority of the time, the PM2.5 levels at Sunset Park, Chestermere do not differ substantially from other locations in Calgary where PM2.5 is monitored; however, during September 2022, PM2.5 levels were significantly higher than other locations in Calgary. The PM2.5 concentrations downwind of a major city can be affected by local weather conditions. For example, if the wind direction is blowing from the city towards the downwind location, the PM2.5 emissions from the city will be transported towards the downwind location and result in higher PM2.5 concentrations.
2. Monthly average NO_2 levels at Sunset Park, Chestermere exhibited similar seasonal patterns during the two deployments and were lower than the levels observed at the three locations in Calgary most of the time. This was expected as the NO_2 is a pollutant that is mainly produced by combustion processes, such as those found in vehicle engines, and the traffic volumes in Chestermere are much lower than those in Calgary.
3. The O_3 monthly average levels at Sunset Park, Chestermere were relatively similar to the levels observed at the three locations in Calgary where these pollutants are continuously monitored.

Overall, the air quality in Chestermere was at low health risk (96.2%) the majority of the time. Forest fire smoke affected the air quality in Chestermere more than Airdrie, but less than Calgary during the second deployment resulting in significant time in moderate health risk (19.3%).

PAML



Special thanks to the City of Chestermere, Alberta Environment and Protected Areas (EPA) for providing funding for the deployment of PAML and donation of monitoring equipment.

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Questions?