



## Status of Sulphur Dioxide in B.C. (2019-2021)

British Columbia operates a network of air monitoring stations that measure sulphur dioxide and other air pollutants. This indicator reports on the concentration of sulphur dioxide from 2019-2021 and compares it to the Canadian Ambient Air Quality Standards established by the Canadian Council of Ministers of the Environment.

#### Sulphur Dioxide (SO<sub>2</sub>): Canadian Ambient Air Quality Standard

 $SO_2$  levels are calculated using **two** statistical forms called the annual and the 1-hour metrics. The Canadian Ambient Air Quality Standard value for  $SO_2$  annual is **5 parts per billion** and the standard value for  $SO_2$  1-hour is **70** parts per billion

 $SO_2$  standards are achieved when annual levels are  $\leq 5$  ppb and 1-hour levels are  $\leq 70$  ppb.

#### What is an Air Zone?

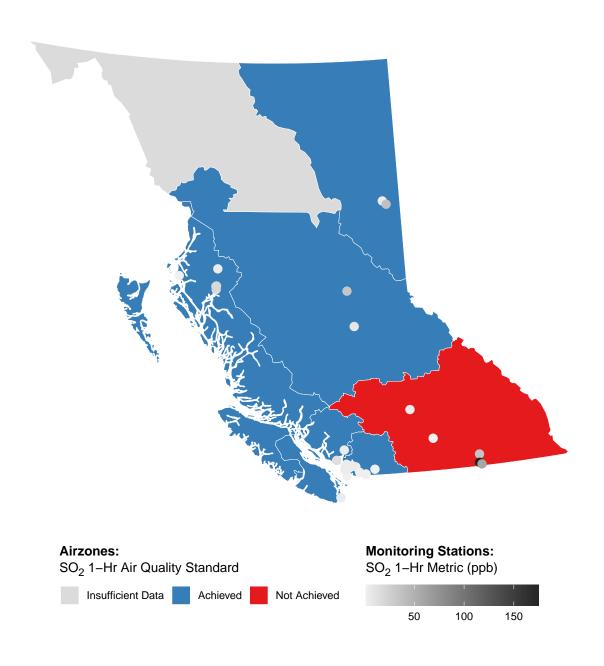
British Columbia is divided up into seven air zones, which are areas that typically exhibit similar air quality characteristics, issues, and trends.

- Sulphur dioxide is a colourless gas with a pungent odour at higher concentrations. The largest sources of SO<sub>2</sub> in B.C. include the oil and gas sector, the pulp and paper sector, and metal smelters. Marine vessels and off-road diesel vehicles are additional sources of SO<sub>2</sub>.<sup>1</sup>
- Sulphur dioxide can be harmful to humans and the environment. Short-term exposure to elevated sulphur dioxide can cause difficulties breathing for asthmatics. The long-term impacts of sulphur dioxide exposure are not well understood. Increased sulphur dioxide in the environment can affect vegetation and aquatic ecosystems through acid rain deposition <sup>1</sup>.
- Sulphur dioxide levels met the Canadian Ambient Air Quality Standards at 94 percent of assessed monitoring stations in B.C. There are two standards for SO<sub>2</sub>—an annual standard and a 1-hour standard (see sidebar). The annual standard was met at 32 of the 34 stations (94%) for which valid data was obtained, while the 1-hour standard was met at 32 of the 33 stations (97%) with sufficient data for analysis.
- Sulphur dioxide levels met both of the Canadian Ambient Air Quality Standards in five of B.C.'s seven air zones. The Coastal, Central Interior, Georgia Strait, Northeast, and Lower Fraser Valley air zones met both the annual and 1-hour standards. The Southern Interior exceeded both standards. Currently, there are no air monitoring stations in the Northwest air zone.
- Sulphur dioxide levels are used to set management levels for each air zone. Four management levels (green, yellow, orange, and red) are each associated with a suite of actions that become more rigorous as sulphur dioxide levels approach the Canadian Ambient Air Quality Standards.

The maps and chart below summarise the Canadian Ambient Air Quality Standard achievement status for sulphur dioxide in B.C. air zones, as well as both the annual and 1-hour  $SO_2$  levels at individual monitoring stations. Summaries are given for each monitoring station where sufficient data was available for the 2019-2021 reporting period.

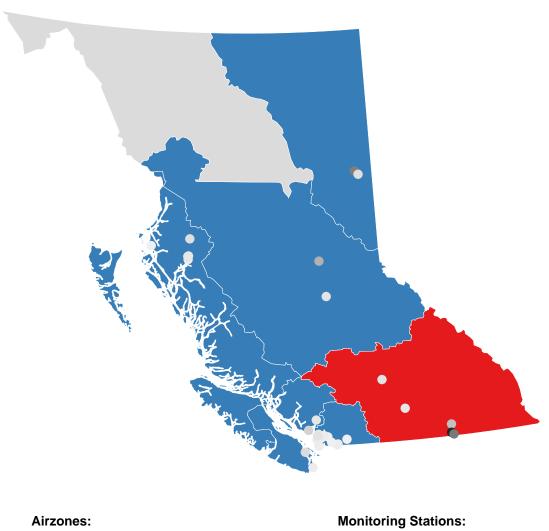


# Status of 1-hour SO₂ Levels in B.C. Air Zones (2019-2021)





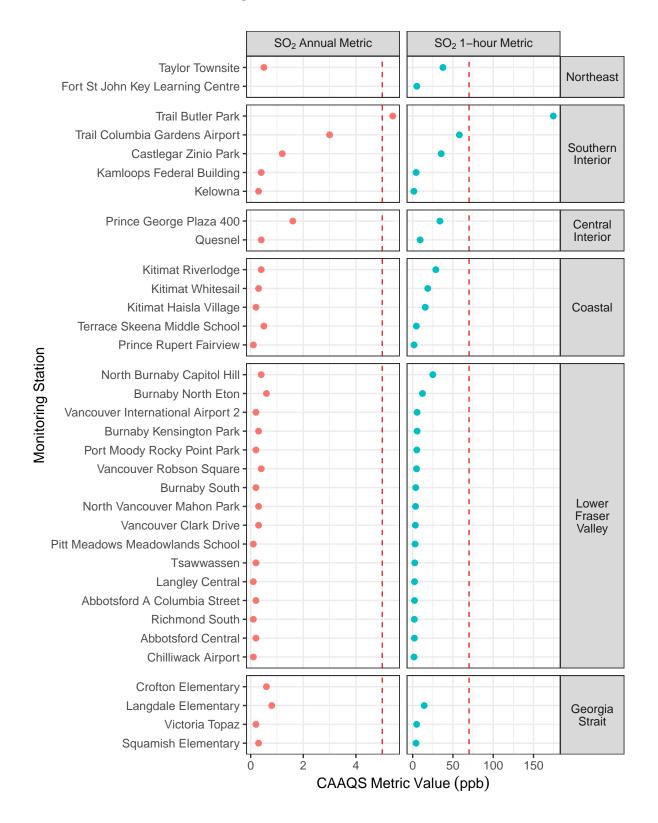
# Status of Annual SO₂ Levels in B.C. Air Zones (2019-2021)







## SO<sub>2</sub> Metrics for Air Monitoring Stations within B.C. Air Zones (2019-2021)





#### More about the Canadian Ambient Air Quality Standard sulphur dioxide metrics:

- There are two Canadian Ambient Air Quality Standards for sulphur dioxide (SO<sub>2</sub>). The statistical form of the SO<sub>2</sub> annual metric is the average over a single calendar year of all 1-hour average average concentration of SO<sub>2</sub>. The statistical form of the SO<sub>2</sub> 1-hour metric is the average of the annual 99th percentile of the daily maximum 1-hour average concentrations of SO<sub>2</sub>.
- The SO<sub>2</sub> metric for an air zone is the highest SO<sub>2</sub> metric value reported from monitoring stations within the air zone.
- Air quality monitoring stations with at least two years of valid data from 2019-2021 were included in this indicator. Visit Current Air Quality Data for a complete list of air monitoring stations across B.C.
- Criteria for data completeness and sufficiency of the two SO<sub>2</sub> metrics are described in the Guidance Document on Achievement Determination for Canadian Ambient Air Quality Standards for Sulphur Dioxide (2020).

#### **Canada-wide Air Quality Management System**

The Air Quality Management System is Canada's approach for protecting air quality. Under the Air Quality Management System, provinces and territories monitor, report and manage local air quality within air zones, with the goal of continuously improving air quality and keeping pollutants below the Canadian Ambient Air Quality Standards.

- There are seven air zones in British Columbia: Coastal, Georgia Strait, Lower Fraser Valley, Southern Interior, Central Interior, Northeast and Northwest.
- The Air Zone Management Framework defines air zone management levels for sulphur dioxide based on the higher of the annual and 1-hour sulphur dioxide levels reported from monitoring stations within the air zone.
- The four management levels are (1) green (actions for keeping clean areas clean); (2) yellow (actions for preventing air quality deterioration); (3) orange (actions for preventing Canadian Ambient Air Quality Standard exceedance); and (4) red (actions for achieving air zone Canadian Ambient Air Quality Standard). Each management level is associated with a suite of actions that become more rigorous as sulphur dioxide levels approach the standard. Actions for each management level are detailed in the Guidance Document on Air Zone Management (2019) (PDF).
- The Southern Interior was the only air zone assigned to a red management level. Central Interior and Northeast air zones were assigned to a yellow management level, and the Coastal, Georgia Strait and Lower Fraser Valley air zones were assigned to a green management level. There are currently no air monitoring stations in the Northwest air zone.

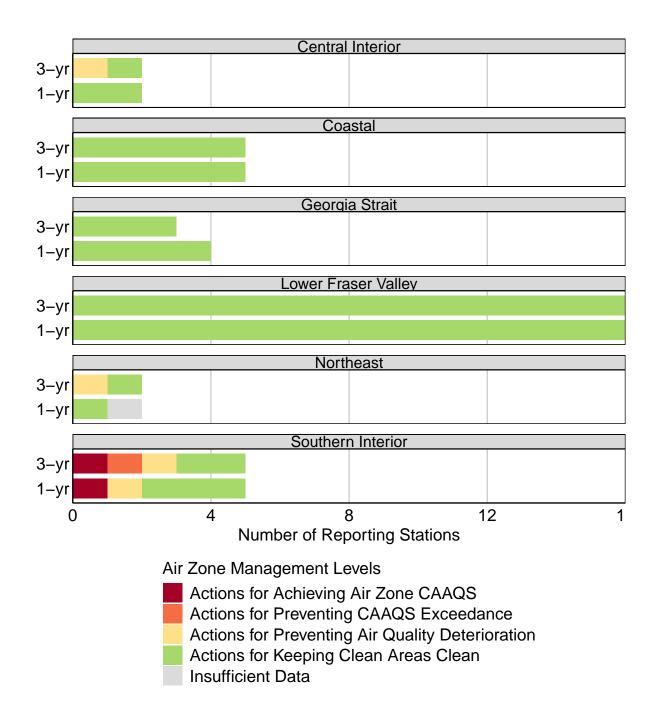


# Air Quality Management Levels in B.C. Air Zones





### Station-Level Air Quality Management Levels Within Air Zones



#### Methods

The methods used to develop this indicator—including procedures, data requirements, and calculation of the Canadian Ambient Air Quality Standard sulphur dioxide metrics—are detailed in the Guidance Document on Achievement Determination for Canadian Ambient Air Quality Standards for Sulphur Dioxide (2020) published by the Canadian Council of Ministers of the Environment.

R package and code: We have developed an R package to facilitate the calculation of air quality metrics according



to the Canadian Ambient Air Quality Standards. Download the 'rcaaqs' package from GitHub. The source code for repeating the analysis presented on this page is also available on GitHub.

#### **References and Other Useful Links**

- Read individual Air Zone reports on the achievement of the Canadian Ambient Air Quality Standards for various parameters in B.C.
- Learn more about the implementation of the Air Quality Management System in British Columbia
- Access B.C.'s real-time data on air pollutants and find locations of all provincial air monitoring stations in B.C.
- BC Lung Association's BC State of the Air Reports
- Canadian Environmental Sustainability Indicators: Air Indicators
- ¹Canadian Smog Science Assessment: Highlights and Key Messages

#### Data

\*By accessing these datasets, you agree to the licence associated with each file, as indicated in parentheses below.

- Indicator data: BC Sulphur Dioxide Canadian Ambient Air Quality Standards 2019-2021 (Open Government Licence British Columbia)
- BC SO<sub>2</sub> Hourly Data & Air Monitoring Station locations (Open Government Licence British Columbia)
- BC Air Zones (Open Government Licence British Columbia)

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Email correspondence to: envreportbc@gov.bc.ca

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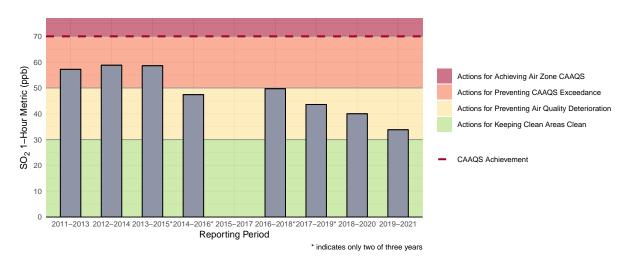


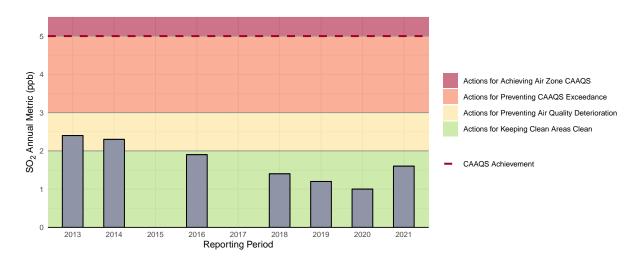
# Appendix: Detailed sulphur dioxide Canadian Ambient Air Quality Standard results for each monitoring station within air zones in B.C.

Air Zone: Central Interior

Monitoring Station: Prince George Plaza 400

SO<sub>2</sub> **1-hour Air Quality Standard:** Achieved SO<sub>2</sub> **1-hour Metric:** 33.8ppb (3 year average)

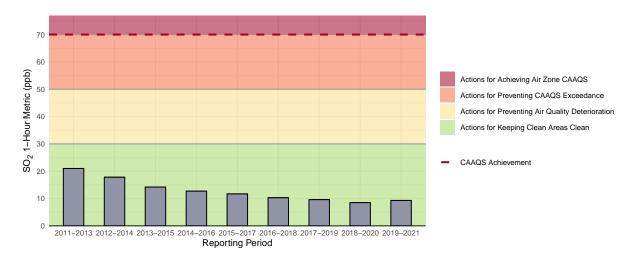


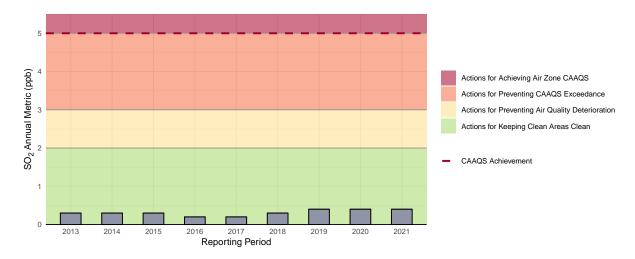




**Air Zone:** Central Interior **Monitoring Station:** Quesnel

**SO**<sub>2</sub> **1-hour Air Quality Standard:** Achieved **SO**<sub>2</sub> **1-hour Metric:** 9.3ppb (3 year average)

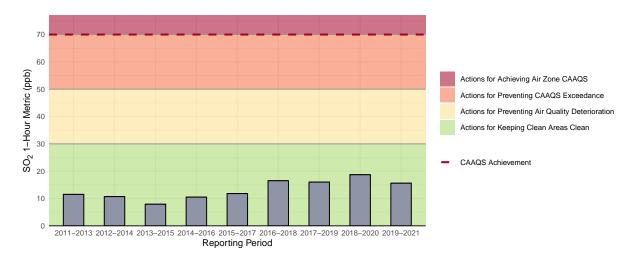


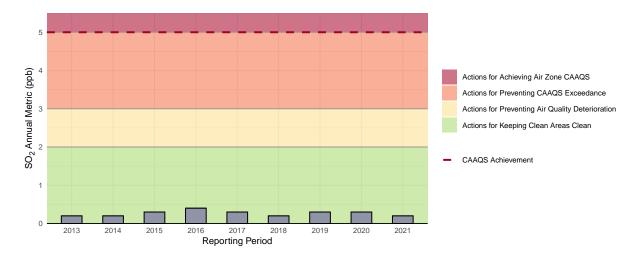




Monitoring Station: Kitimat Haisla Village

**SO**<sub>2</sub> **1-hour Air Quality Standard:** Achieved **SO**<sub>2</sub> **1-hour Metric:** 15.6ppb (3 year average)

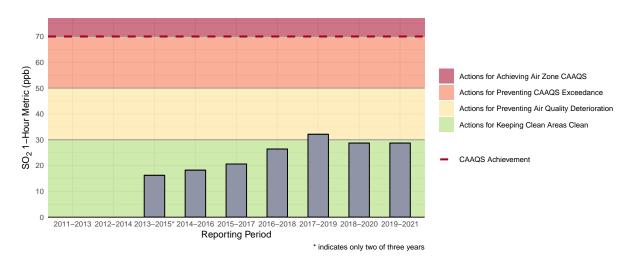


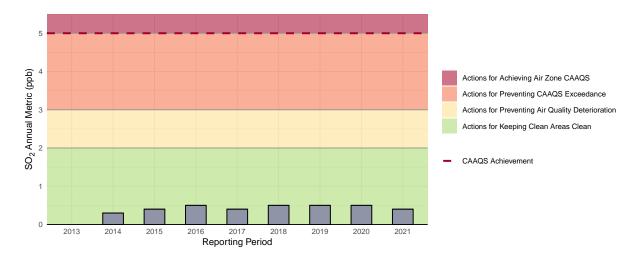




Monitoring Station: Kitimat Riverlodge

**SO**<sub>2</sub> **1-hour Air Quality Standard:** Achieved **SO**<sub>2</sub> **1-hour Metric:** 28.7ppb (3 year average)

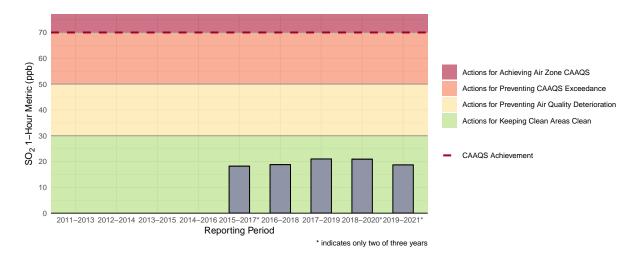


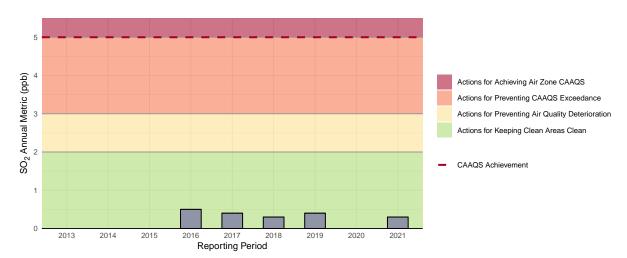




Monitoring Station: Kitimat Whitesail

**SO**<sub>2</sub> **1-hour Air Quality Standard:** Achieved **SO**<sub>2</sub> **1-hour Metric:** 18.7ppb (2 year average)

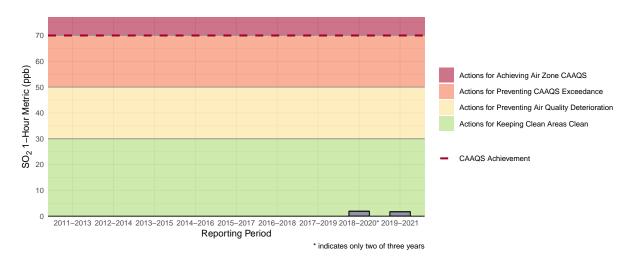


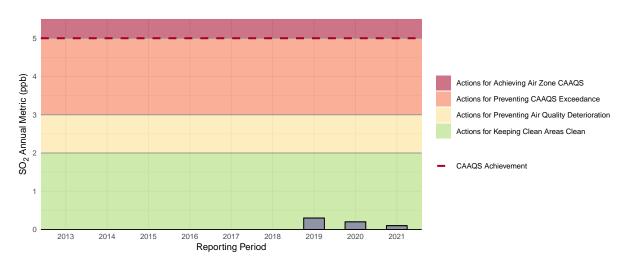




Monitoring Station: Prince Rupert Fairview

**SO**<sub>2</sub> **1-hour Air Quality Standard:** Achieved **SO**<sub>2</sub> **1-hour Metric:** 1.7ppb (3 year average)

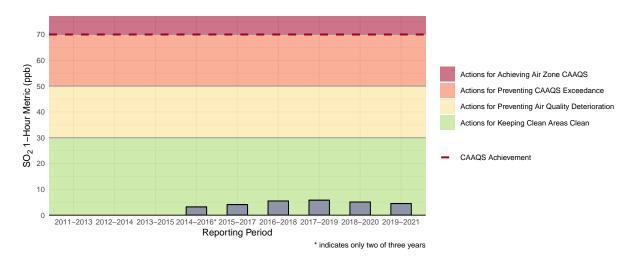


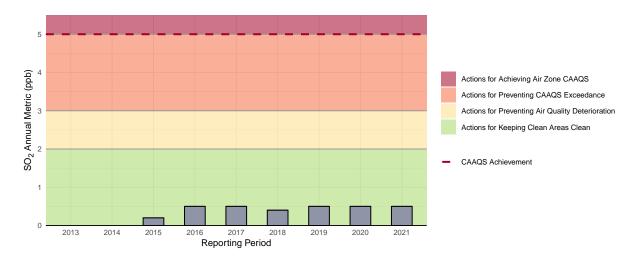




Monitoring Station: Terrace Skeena Middle School

SO<sub>2</sub> **1-hour Air Quality Standard:** Achieved SO<sub>2</sub> **1-hour Metric:** 4.5ppb (3 year average)



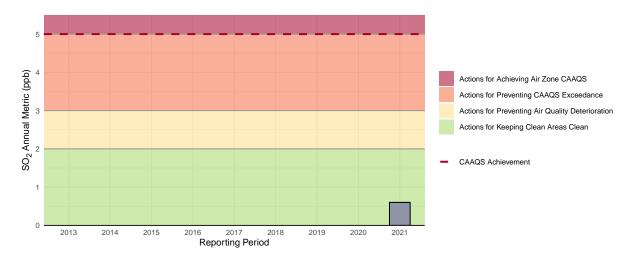




Monitoring Station: Crofton Elementary

SO<sub>2</sub> 1-hour Air Quality Standard: Insufficient Data

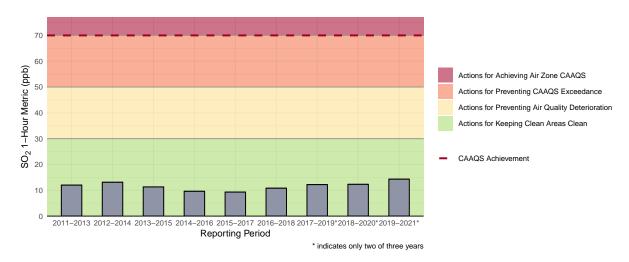
 $SO_2$  1-hour Metric: Unknown

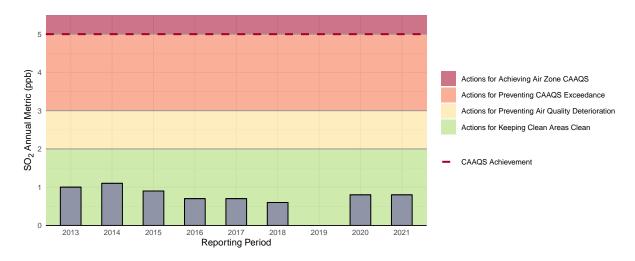




Monitoring Station: Langdale Elementary

**SO**<sub>2</sub> **1-hour Air Quality Standard:** Achieved **SO**<sub>2</sub> **1-hour Metric:** 14.3ppb (2 year average)

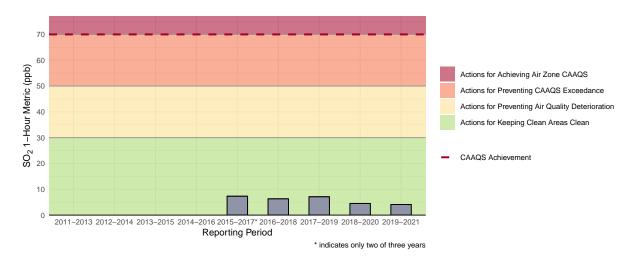


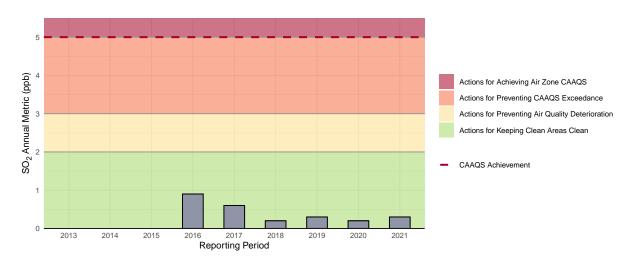




Monitoring Station: Squamish Elementary

SO<sub>2</sub> **1-hour Air Quality Standard:** Achieved SO<sub>2</sub> **1-hour Metric:** 4.1ppb (3 year average)

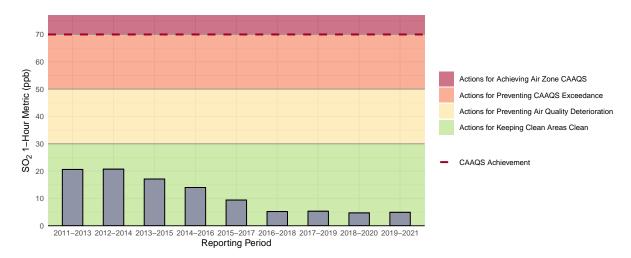


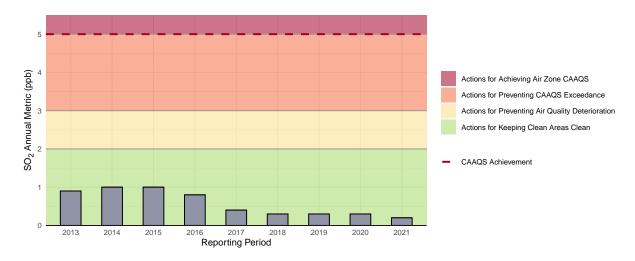




Monitoring Station: Victoria Topaz

SO<sub>2</sub> **1-hour Air Quality Standard:** Achieved SO<sub>2</sub> **1-hour Metric:** 4.9ppb (3 year average)

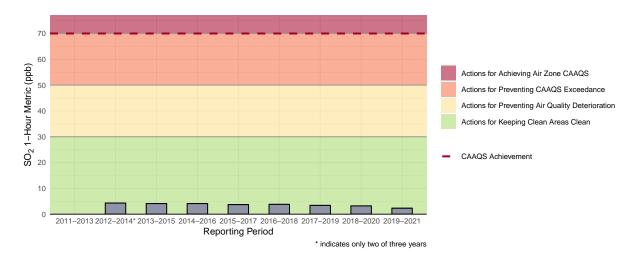


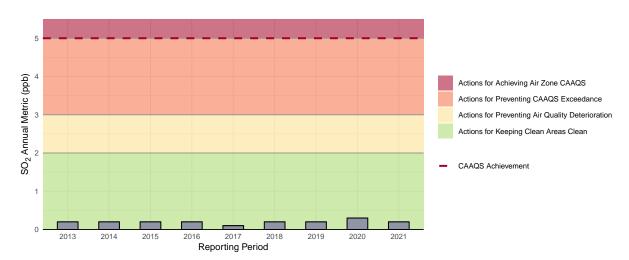




Monitoring Station: Abbotsford A Columbia Street

SO<sub>2</sub> **1-hour Air Quality Standard:** Achieved SO<sub>2</sub> **1-hour Metric:** 2.3ppb (3 year average)

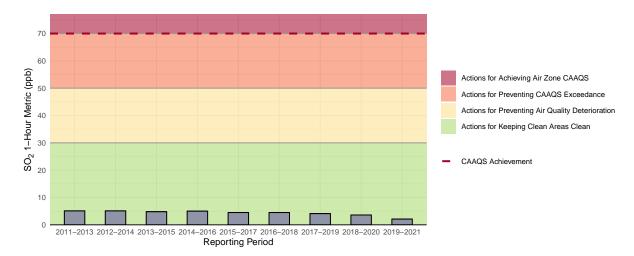


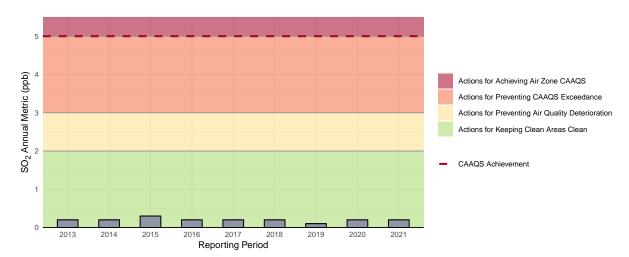




Monitoring Station: Abbotsford Central

**SO**<sub>2</sub> **1-hour Air Quality Standard:** Achieved **SO**<sub>2</sub> **1-hour Metric:** 2.1ppb (3 year average)

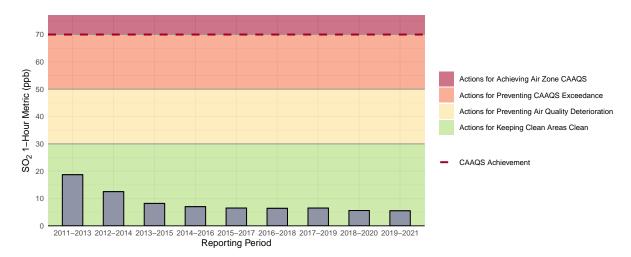


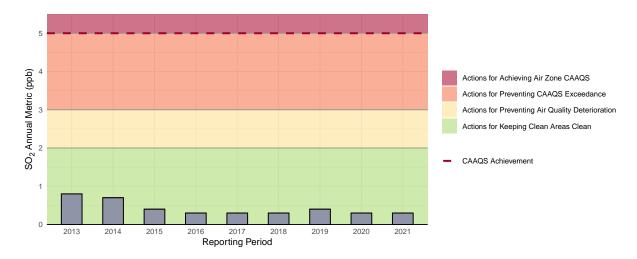




Monitoring Station: Burnaby Kensington Park

**SO**<sub>2</sub> **1-hour Air Quality Standard:** Achieved **SO**<sub>2</sub> **1-hour Metric:** 5.5ppb (3 year average)

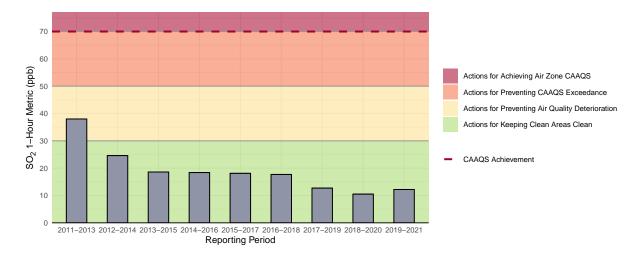


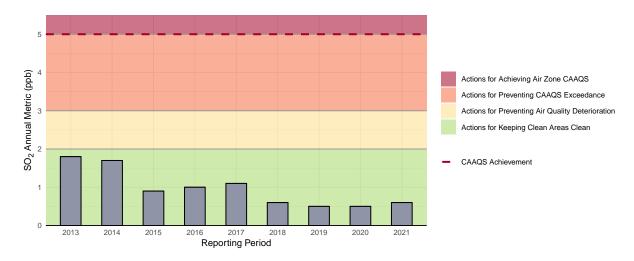




Monitoring Station: Burnaby North Eton

**SO**<sub>2</sub> **1-hour Air Quality Standard:** Achieved **SO**<sub>2</sub> **1-hour Metric:** 12.2ppb (3 year average)

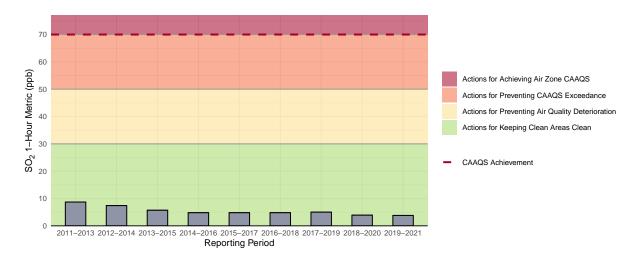


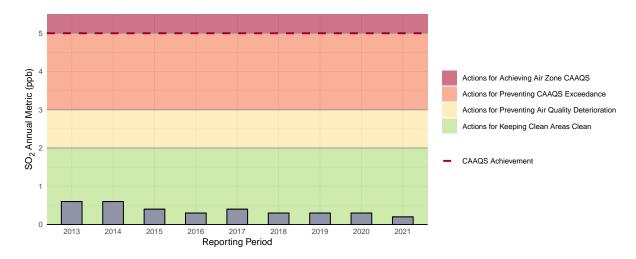




**Air Zone:** Lower Fraser Valley **Monitoring Station:** Burnaby South

SO<sub>2</sub> **1-hour Air Quality Standard:** Achieved SO<sub>2</sub> **1-hour Metric:** 3.8ppb (3 year average)

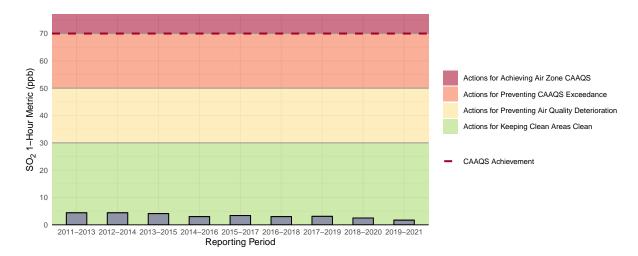


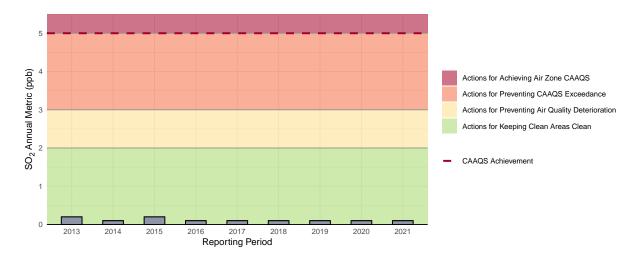




Monitoring Station: Chilliwack Airport

**SO**<sub>2</sub> **1-hour Air Quality Standard:** Achieved **SO**<sub>2</sub> **1-hour Metric:** 1.7ppb (3 year average)

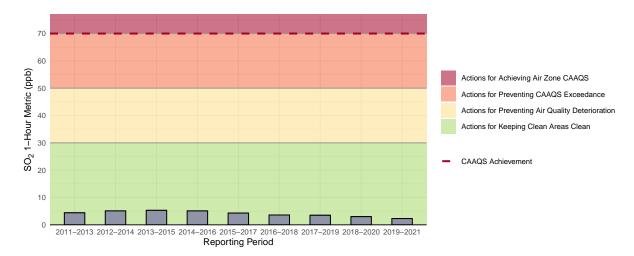


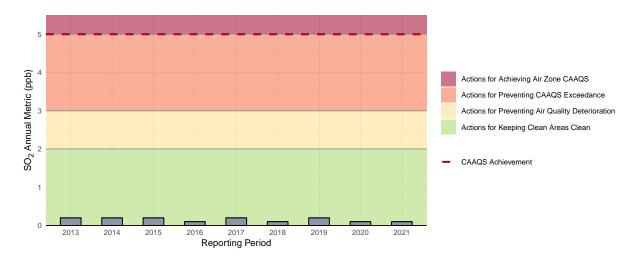




**Air Zone:** Lower Fraser Valley **Monitoring Station:** Langley Central

**SO**<sub>2</sub> **1-hour Air Quality Standard:** Achieved **SO**<sub>2</sub> **1-hour Metric:** 2.3ppb (3 year average)

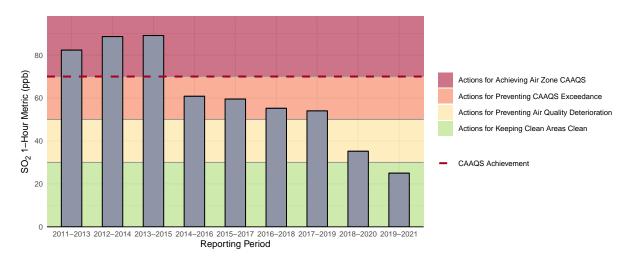


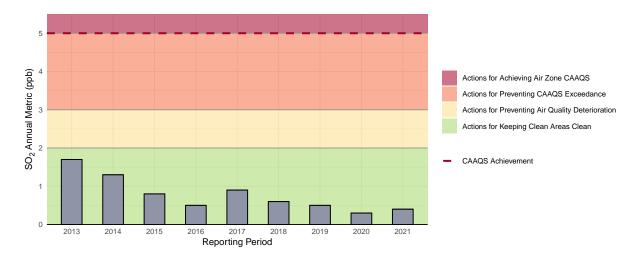




Monitoring Station: North Burnaby Capitol Hill

SO<sub>2</sub> **1-hour Air Quality Standard:** Achieved SO<sub>2</sub> **1-hour Metric:** 25ppb (3 year average)

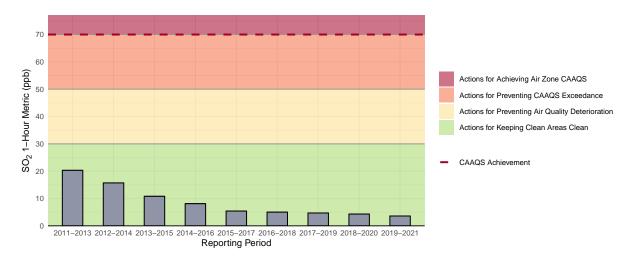


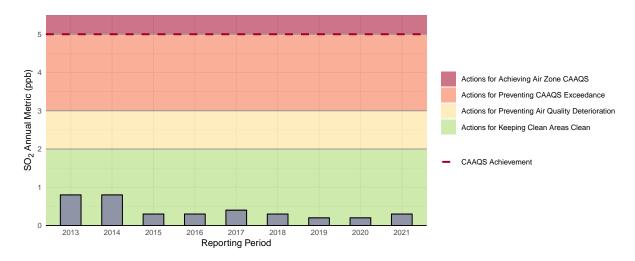




Monitoring Station: North Vancouver Mahon Park

**SO**<sub>2</sub> **1-hour Air Quality Standard:** Achieved **SO**<sub>2</sub> **1-hour Metric:** 3.6ppb (3 year average)

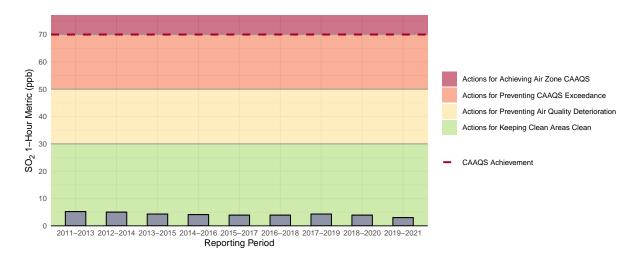


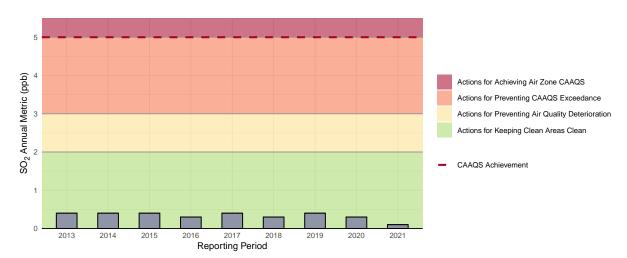




Monitoring Station: Pitt Meadows Meadowlands School

SO<sub>2</sub> **1-hour Air Quality Standard:** Achieved SO<sub>2</sub> **1-hour Metric:** 3ppb (3 year average)

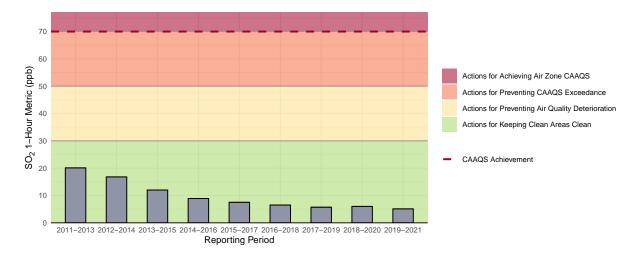


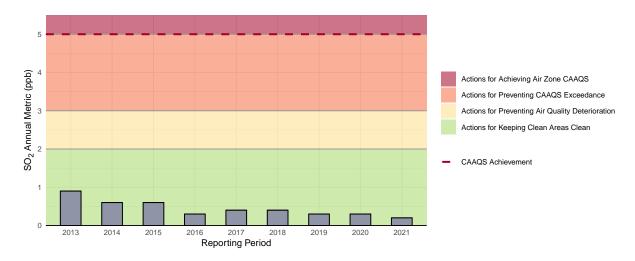




Monitoring Station: Port Moody Rocky Point Park

**SO**<sub>2</sub> **1-hour Air Quality Standard:** Achieved **SO**<sub>2</sub> **1-hour Metric:** 5.1ppb (3 year average)

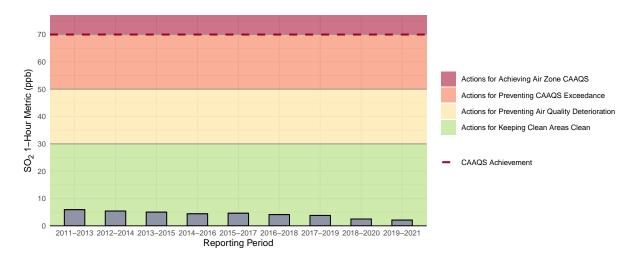


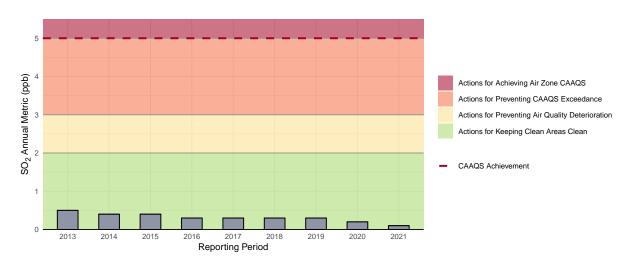




Monitoring Station: Richmond South

SO<sub>2</sub> **1-hour Air Quality Standard:** Achieved SO<sub>2</sub> **1-hour Metric:** 2.1ppb (3 year average)

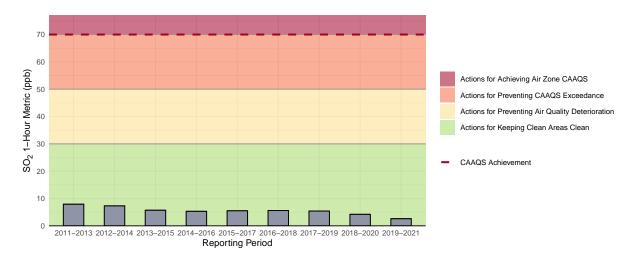


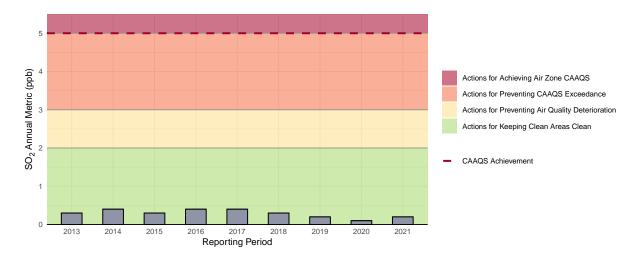




**Air Zone:** Lower Fraser Valley **Monitoring Station:** Tsawwassen

SO<sub>2</sub> **1-hour Air Quality Standard:** Achieved SO<sub>2</sub> **1-hour Metric:** 2.6ppb (3 year average)

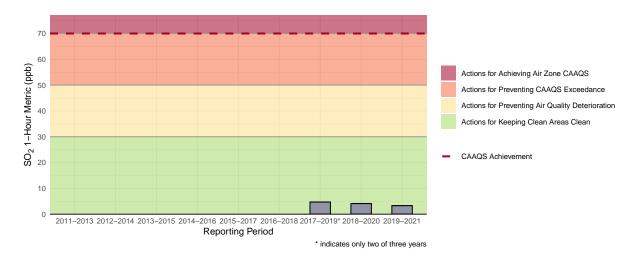


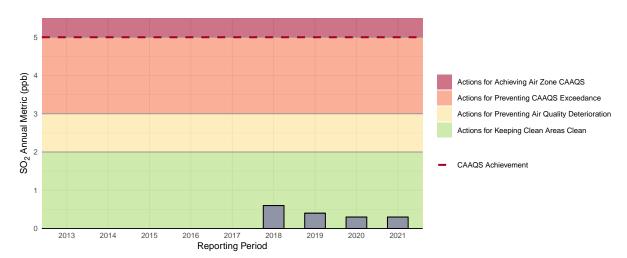




Monitoring Station: Vancouver Clark Drive

**SO**<sub>2</sub> **1-hour Air Quality Standard:** Achieved **SO**<sub>2</sub> **1-hour Metric:** 3.3ppb (3 year average)

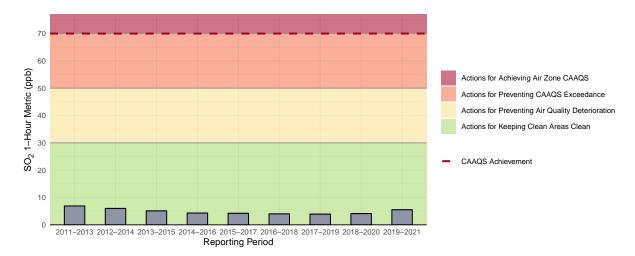


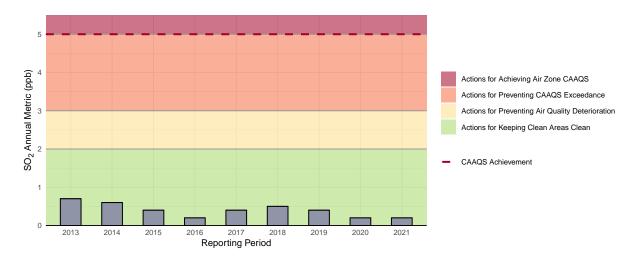




Monitoring Station: Vancouver International Airport 2

**SO**<sub>2</sub> **1-hour Air Quality Standard:** Achieved **SO**<sub>2</sub> **1-hour Metric:** 5.5ppb (3 year average)

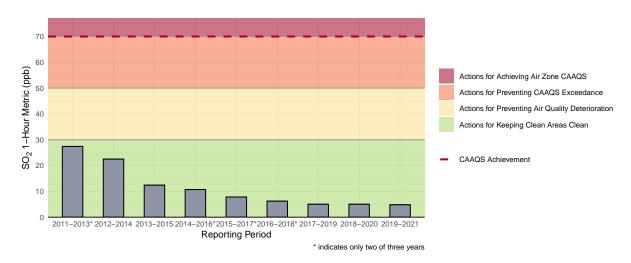


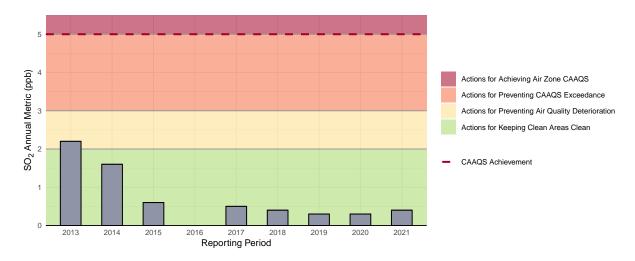




Monitoring Station: Vancouver Robson Square

SO<sub>2</sub> **1-hour Air Quality Standard:** Achieved SO<sub>2</sub> **1-hour Metric:** 4.8ppb (3 year average)



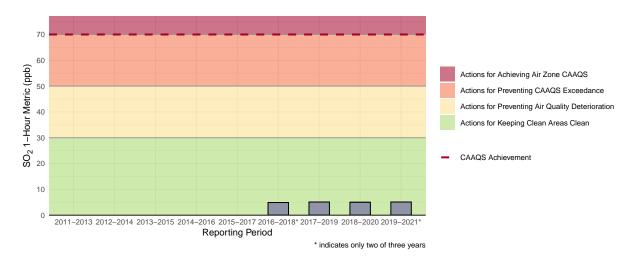




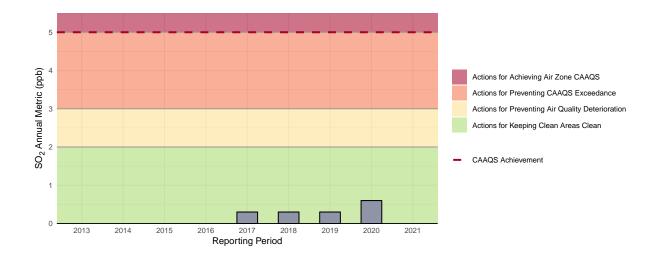
Air Zone: Northeast

Monitoring Station: Fort St John Key Learning Centre

**SO**<sub>2</sub> **1-hour Air Quality Standard:** Achieved **SO**<sub>2</sub> **1-hour Metric:** 5.1ppb (2 year average)



 ${f SO}_2$  Annual Air Quality Standard: Insufficient Data  ${f SO}_2$  Annual Metric: Unknown

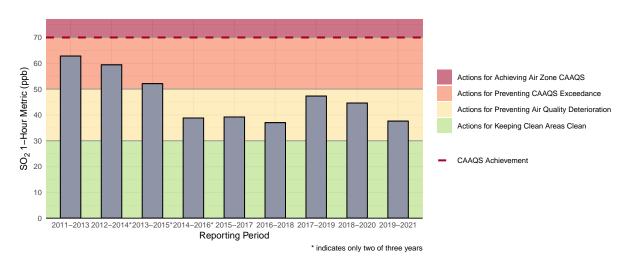


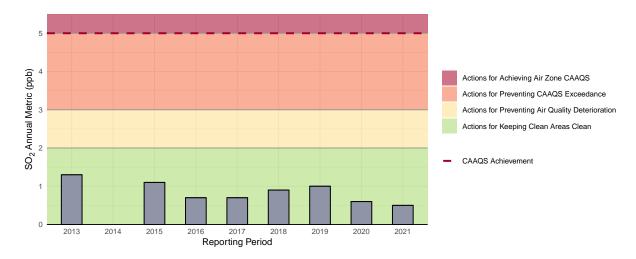


Air Zone: Northeast

Monitoring Station: Taylor Townsite

SO<sub>2</sub> **1-hour Air Quality Standard:** Achieved SO<sub>2</sub> **1-hour Metric:** 37.6ppb (3 year average)



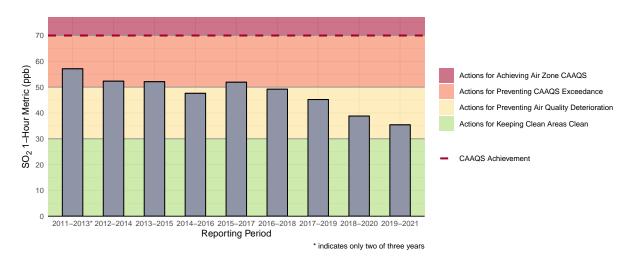


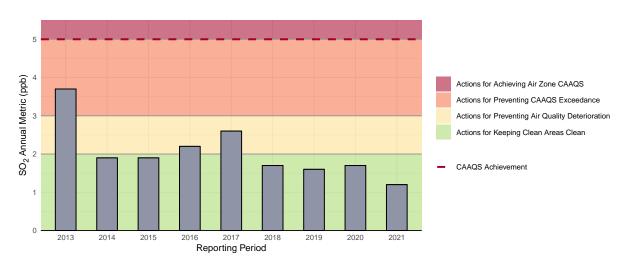


Air Zone: Southern Interior

Monitoring Station: Castlegar Zinio Park

SO<sub>2</sub> 1-hour Air Quality Standard: Achieved SO<sub>2</sub> 1-hour Metric: 35.4ppb (3 year average)



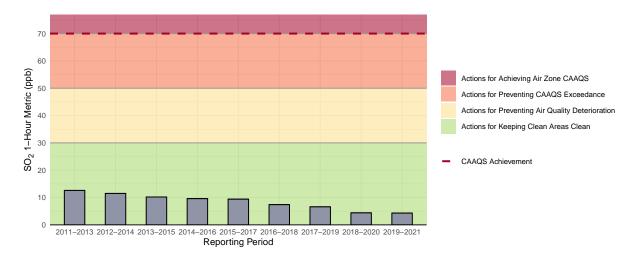


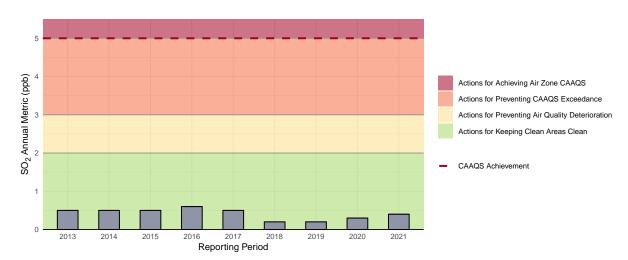


Air Zone: Southern Interior

Monitoring Station: Kamloops Federal Building

SO<sub>2</sub> **1-hour Air Quality Standard:** Achieved SO<sub>2</sub> **1-hour Metric:** 4.3ppb (3 year average)

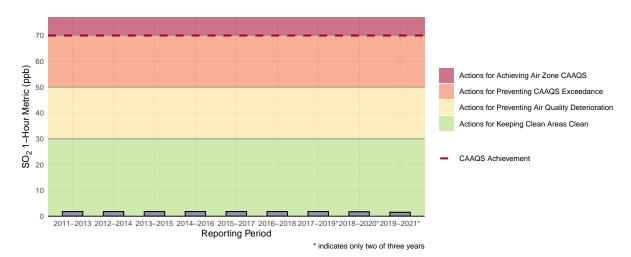


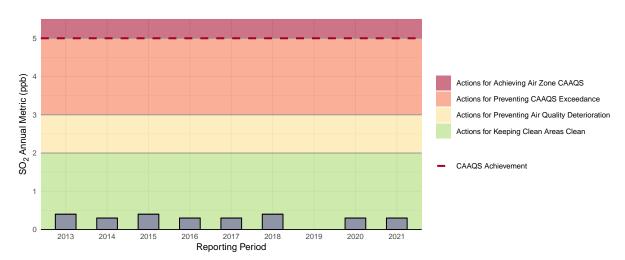




**Air Zone:** Southern Interior **Monitoring Station:** Kelowna

SO<sub>2</sub> **1-hour Air Quality Standard:** Achieved SO<sub>2</sub> **1-hour Metric:** 1.5ppb (2 year average)



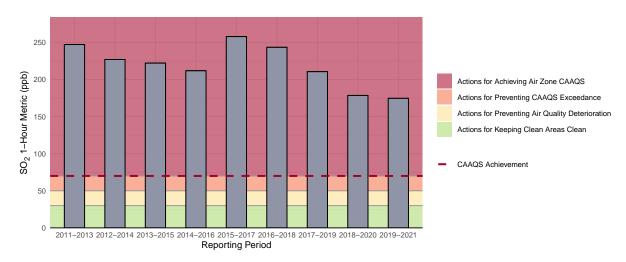


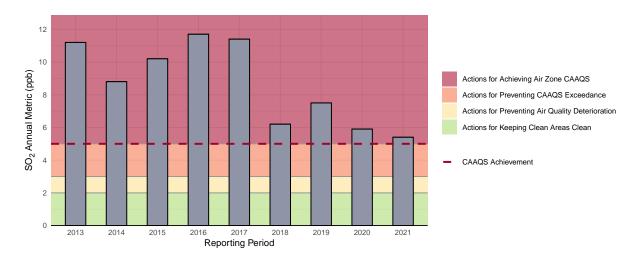


Air Zone: Southern Interior

Monitoring Station: Trail Butler Park

**SO**<sub>2</sub> **1-hour Air Quality Standard:** Not Achieved **SO**<sub>2</sub> **1-hour Metric:** 174.6ppb (3 year average)







Air Zone: Southern Interior

Monitoring Station: Trail Columbia Gardens Airport

SO<sub>2</sub> **1-hour Air Quality Standard:** Achieved SO<sub>2</sub> **1-hour Metric:** 58ppb (3 year average)

