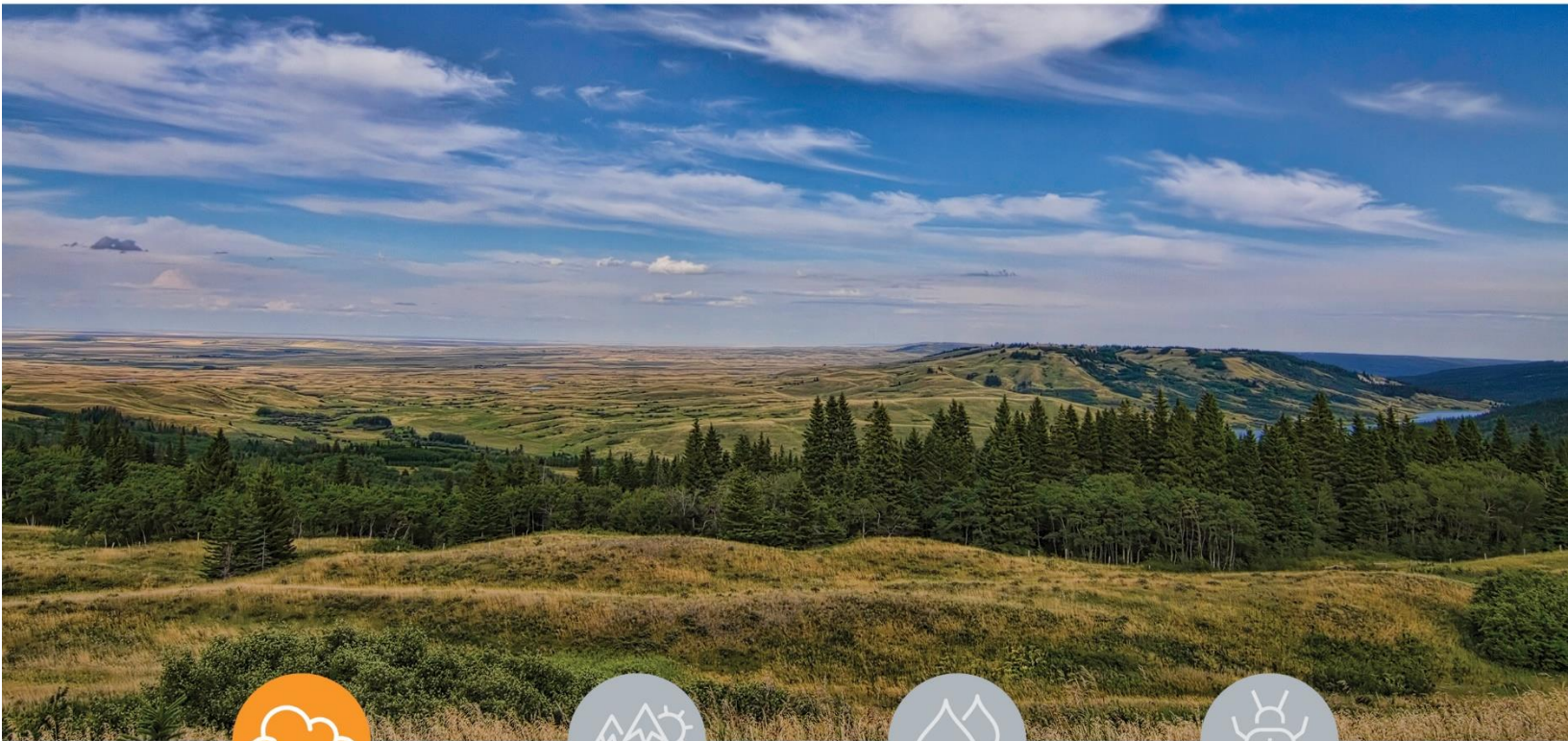


2017 Status of Air Quality

# South Saskatchewan Region



Air



Land



Water



Biodiversity

Reporting on the South Saskatchewan Air Quality Management  
Framework for January 2017 - December 2017

## 2017 Status of Air Quality, South Saskatchewan Region, Alberta

Casandra Brown

Cover photo: Alberta Parks

This publication can be found at: [open.alberta.ca/publications/9781460140932](https://open.alberta.ca/publications/9781460140932)

Comments, questions, or suggestions regarding the content of this document may be directed to:

Ministry of Environment and Parks, Environmental Monitoring and Science Division

10<sup>th</sup> Floor, 9888 Jasper Avenue NW, Edmonton, Alberta, T5J 5C6

Email: [EMSD-Info@gov.ab.ca](mailto:EMSD-Info@gov.ab.ca)

Website: [environmentalmonitoring.alberta.ca](https://environmentalmonitoring.alberta.ca)

For media inquiries please visit: [alberta.ca/news-spokesperson-contacts.aspx](https://alberta.ca/news-spokesperson-contacts.aspx)

Recommended citation:

Brown, C. 2019. 2017 Status of Air Quality South Saskatchewan Region, Alberta for January 2017 – December 2017. Government of Alberta, Environment and Parks. ISBN 978-1-4601-4093-2. Available at: [open.alberta.ca/publications/9781460140932](https://open.alberta.ca/publications/9781460140932).

© Her Majesty the Queen in Right of Alberta, as represented by the Minister of Alberta Environment and Parks, 2019.

This publication is issued under the Open Government Licence – Alberta [open.alberta.ca/licence](https://open.alberta.ca/licence).

Published August 2019

ISBN 978-1-4601-4093-2

# Alberta's Environmental Science Program

The Chief Scientist has a legislated responsibility for developing and implementing Alberta's environmental science program for monitoring, evaluation and reporting on the condition of the environment in Alberta. The program seeks to meet the environmental information needs of multiple users in order to inform policy and decision-making processes. Two independent advisory panels, the Science Advisory Panel and the Indigenous Wisdom Advisory Panel, periodically review the integrity of the program and provide strategic advice on the respectful braiding of Indigenous Knowledge with conventional scientific knowledge.

Alberta's environmental science program is grounded in the principles of:

- *Openness and Transparency.* Appropriate standards, procedures, and methodologies are employed and findings are reported in an open, honest and accountable manner.
- *Credibility.* Quality in the data and information are upheld through a comprehensive Quality Assurance and Quality Control program that invokes peer review processes when needed.
- *Scientific Integrity.* Standards, professional values, and practices of the scientific community are adopted to produce objective and reproducible investigations.
- *Accessible Monitoring Data and Science.* Scientifically-informed decision making is enabled through the public reporting of monitoring data and scientific findings in a timely, accessible, unaltered and unfettered manner.
- *Respect.* A multiple evidence-based approach is valued to generate an improved understanding of the condition of the environment, achieved through the braiding of multiple knowledge systems, including Indigenous Knowledge, together with science.

Learn more about the condition of Alberta's environment at: [environmentalmonitoring.alberta.ca](http://environmentalmonitoring.alberta.ca).

# Acknowledgments

The author thanks the following reviewers for their critical review and feedback, which has enhanced this work: Greg Wentworth, Ph.D. (Atmospheric Scientist, Alberta Environment and Parks), Emily Herdman (Resource Management and Biodiversity Specialist, Alberta Environment and Parks), and Phoenix Le (Land Use Framework Planner, Alberta Environment and Parks).

# Table of Contents

<b>Executive Summary</b> .....	<b>8</b>
Background .....	8
2017 Results.....	8
<b>South Saskatchewan Regional Plan</b> .....	<b>9</b>
<b>Monitoring Stations</b> .....	<b>10</b>
<b>Ambient Air Quality Triggers and Limits</b> .....	<b>11</b>
Triggers and Limits for Nitrogen Dioxide (NO <sub>2</sub> ).....	11
Triggers and Limits for Ozone and Particulate Matter (PM <sub>2.5</sub> ).....	12
<b>2017 Status of Air Quality</b> .....	<b>14</b>
Nitrogen Dioxide (NO <sub>2</sub> ).....	14
Annual Average of the Hourly Data for NO <sub>2</sub> .....	14
Upper Range of the Hourly Data for NO <sub>2</sub> .....	14
Ozone and Particulate Matter.....	16
Assigning Management Levels .....	16
<b>Appendix A – Summary of the 2014-2016 PM<sub>2.5</sub> and Ozone CAAQS Calculations</b> .....	<b>17</b>
PM <sub>2.5</sub> 24-hour Metric for 2014-2016.....	17
PM <sub>2.5</sub> Annual Metric for 2014-2016.....	17
Ozone Metric for 2014-2016 .....	18
2014-2016 CAAQS Management Levels for Ozone and PM <sub>2.5</sub> .....	18
<b>References</b> .....	<b>20</b>

# List of Tables

Table 1 Ambient air quality monitoring stations in the South Saskatchewan Region that measure continuous nitrogen dioxide, ozone, and fine particulate matter. ....	10
Table 2 Ambient air quality triggers and limits (in $\mu\text{g}/\text{m}^3$ and ppb) for the annual average of the hourly data. ....	11
Table 3 Ambient air quality triggers (in $\mu\text{g}/\text{m}^3$ and ppb) for the upper range of the hourly data. ....	12
Table 4 Ambient air quality triggers and limits for ozone and $\text{PM}_{2.5}$ . ....	13
Table 5 Summary statistics for $\text{NO}_2$ in the South Saskatchewan Region in 2017. ....	14
Table 6 Status of ambient air quality indicators at monitoring stations in 2017. ....	16
Table 7 CAAQS metric for $\text{PM}_{2.5}$ 24-hour in the South Saskatchewan Region. ....	17
Table 8 CAAQS metric for $\text{PM}_{2.5}$ Annual in the South Saskatchewan Region. ....	17
Table 9 CAAQS metric for ozone in the South Saskatchewan Region. ....	18
Table 10 2014-2016 CAAQS management levels for the ozone metric, $\text{PM}_{2.5}$ 24-hour metric, and $\text{PM}_{2.5}$ annual metric. ....	19

# List of Figures

Figure 1 Land Use Framework regions of Alberta. The South Saskatchewan Region is the area shaded blue on the map. ....	9
Figure 2 Locations of the five ambient air monitoring stations in the South Saskatchewan Region. .	10
Figure 3 Annual average of the hourly data for 2012-2017 from air monitoring stations in the South Saskatchewan Region for $\text{NO}_2$ . ....	15
Figure 4 Upper range of the hourly data for 2012-2017 from air monitoring stations in the South Saskatchewan Region for $\text{NO}_2$ . ....	15

# Acronyms and Abbreviations

AAAQO	Alberta Ambient Air Quality Objective
AEP	Alberta Environment and Parks
CAAQS	Canadian Ambient Air Quality Standards
CCME	Canadian Council of Ministers of the Environment
CRAZ	Calgary Region Airshed Zone
EMSD	Environmental Monitoring and Science Division
GDAD	Guidance Document on Achievement Determination: Canadian Ambient Air Quality Standards for Fine Particulate Matter and Ozone
kPa	kilopascals
$\mu\text{g}/\text{m}^3$	micrograms per cubic metre
$\text{NO}_2$	Nitrogen Dioxide
$\text{O}_3$	Ozone
PAS	Palliser Airshed Society
$\text{PM}_{2.5}$	Fine Particulate Matter with a diameter of 2.5 micrometres or less
ppb	parts per billion
SSRP	South Saskatchewan Regional Plan
TF/EE	Transboundary flow and exceptional event

# Executive Summary

## Background

Prepared by the Alberta Environment and Parks (AEP) Environmental Monitoring and Science Division, this report is on the state of the ambient environmental conditions in 2017 in relation to the Air Quality Management Framework supporting the South Saskatchewan Regional Plan (SSRP).

The 2017 report is the third annual report for the South Saskatchewan Region. Previous annual reports for the status of environmental condition in the South Saskatchewan Region are accessible at:

[www.alberta.ca/south-saskatchewan-regional-planning.aspx](http://www.alberta.ca/south-saskatchewan-regional-planning.aspx).

Reporting requirements for the SSRP are determined by the Government of Alberta as outlined in the Alberta Land Stewardship Act. The Environmental Monitoring and Science Division of AEP is responsible for monitoring, evaluation and reporting under the Environmental Management Frameworks, including the SSRP Air Quality Management Framework.

In this report, nitrogen dioxide, ozone, and fine particulate matter concentrations measured at continuous air monitoring stations in the South Saskatchewan Region are assessed against the ambient air quality triggers and limits set by the South Saskatchewan Regional Plan. Management levels are assigned to each monitoring station based on the results of this assessment.

## 2017 Results

In 2017, nitrogen dioxide (NO<sub>2</sub>), ozone (O<sub>3</sub>) and particulate matter (PM<sub>2.5</sub>) were continuously measured at air monitoring stations. The findings are summarized in Table 6 and were as follows:

- No limits were exceeded for air quality indicators.
- Three monitoring stations had annual average NO<sub>2</sub> ambient concentrations higher than the trigger for Level 2.
- Ambient levels have not yet been assigned for ozone and PM<sub>2.5</sub> for the 2015-2017 period as the analysis is still underway.
- Air quality objectives identified in the South Saskatchewan Regional Plan are being met.



# South Saskatchewan Regional Plan

The South Saskatchewan Regional Plan (SSRP) is a regional plan developed by the Government of Alberta under the Land Use Framework (Government of Alberta, 2008). The plan sets outcomes that describe what the Government of Alberta wants to accomplish at a regional level, and is given legislative authority under the Alberta Land Stewardship Act (Government of Alberta, 2009). The South Saskatchewan Regional Plan applies to the South Saskatchewan Region, an area approximately 83,764 square kilometers in size located in southern Alberta (Figure 1). For more information on the South Saskatchewan Region, see the South Saskatchewan Regional Plan (Government of Alberta, 2018).

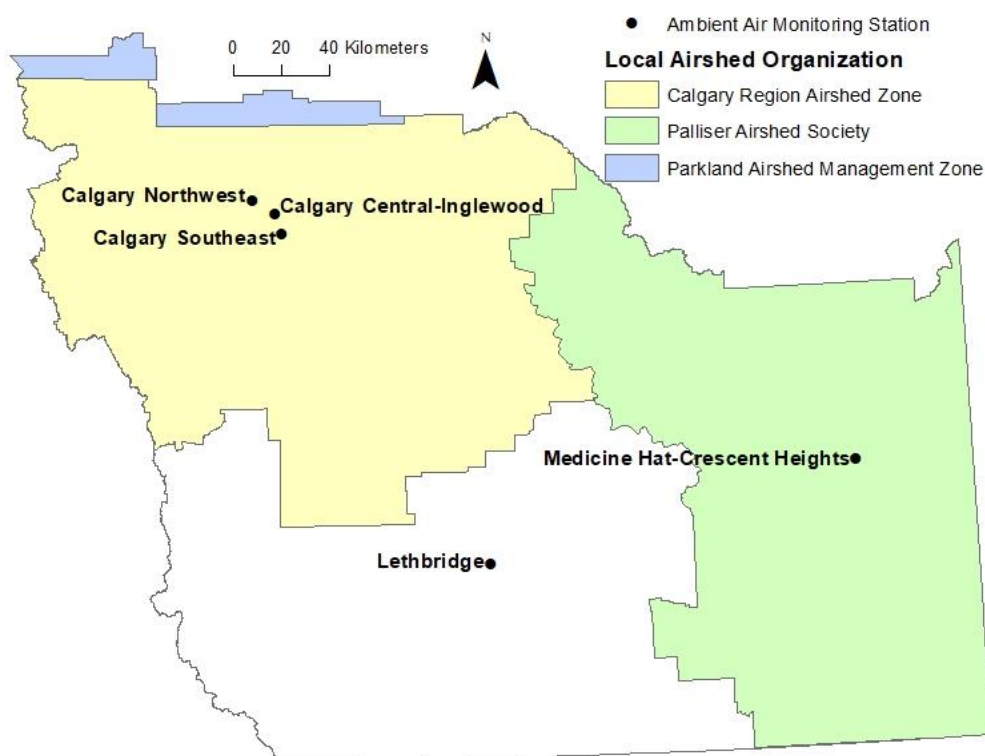
The Environmental Monitoring and Science Division of Alberta Environment and Parks is responsible for monitoring, assessing and reporting on the condition of the environment in the South Saskatchewan Region, while other sections of the Government of Alberta are responsible for management of activities and natural resources in response to environmental conditions.



**Figure 1 Land Use Framework regions of Alberta. The South Saskatchewan Region is the area shaded blue on the map.**

# Monitoring Stations

Ambient air quality is measured at five continuous air monitoring stations (Figure 2) maintained by Alberta Environment and Parks (AEP), the Calgary Region Airshed Zone (CRAZ) and the Palliser Airshed Society (PAS) on behalf of AEP. In 2017, this regional monitoring network consisted of five stations that measured nitrogen dioxide, ozone, and particulate matter (Table 1). AEP analyzed the 2017 hourly averaged data from these continuous air monitoring stations for the purposes of this annual report.



**Figure 2** Locations of the five ambient air monitoring stations in the South Saskatchewan Region.

**Table 1** Ambient air quality monitoring stations in the South Saskatchewan Region that measure continuous nitrogen dioxide, ozone, and fine particulate matter.

Station	Location
Calgary Central-Inglewood	Sanctuary Road SE and 9 <sup>th</sup> Avenue SE, Calgary
Calgary Northwest	39 <sup>th</sup> Street and 29 <sup>th</sup> Avenue NW, Calgary
Calgary Southeast	46 <sup>th</sup> Street and 110 <sup>th</sup> Avenue SE, Calgary
Medicine Hat-Crescent Heights	7 <sup>th</sup> Street and 2 <sup>nd</sup> Avenue NE, Medicine Hat
Lethbridge	2805 12 <sup>th</sup> Avenue N, Lethbridge

# Ambient Air Quality Triggers and Limits

## Triggers and Limits for Nitrogen Dioxide (NO<sub>2</sub>)

The SSRP sets the triggers and limits for nitrogen dioxide (NO<sub>2</sub>) shown in Table 2 and Table 3.

As discussed in the Air Quality Management Framework (Alberta Environment and Sustainable Resource Development, 2014) ambient air quality limits (based on annual averages of the hourly data) are determined by existing Alberta Ambient Air Quality Objectives (AAAQOs) and air quality triggers are set at 1/3 and 2/3 of the limit (Table 2). The short-term (upper range) and long-term (annual average) AAAQOs were established to protect human health and ecosystem health, respectively. Ambient air quality triggers based on the upper range of the hourly data (as represented by the 99th percentile of the hourly data) are also established as a statistical measure of the peak air quality concentrations (Table 3). The methods of derivation for triggers based on the upper range of the hourly data are found in Appendix A of the Air Quality Management Framework. By using two types of triggers, management actions can respond to undesirable air quality conditions before they exceed the limit. The first trigger (annual average) represents average air quality over the course of the year (long-term) while the second trigger (upper range) considers peak air quality conditions that occur over the short-term.

As specified in the Air Quality Management Framework, at least 75% data completeness is required in each season (i.e., 75% of the hours in each season have data available) in order to calculate a valid annual average or upper range metric value. Air monitoring stations not meeting this criterion are not included in the assessment of triggers and limits.

In the management framework, the ambient air quality triggers and limits are expressed in terms of levels of air quality conditions. These ambient air quality levels are described in the section titled “Assigning Management Levels.”

**Table 2 Ambient air quality triggers and limits (in µg/m<sup>3</sup> and ppb) for the annual average of the hourly data.**

Description	NO <sub>2</sub>
Level 4	
Limit <sup>a</sup>	45 µg/m <sup>3</sup> (24 ppb) <sup>b</sup>
Level 3	
Trigger for Level 3	30 µg/m <sup>3</sup> (16 ppb)
Level 2	
Trigger for Level 2	15 µg/m <sup>3</sup> (8 ppb)
Level 1	

<sup>a</sup> Annual air quality limits are determined by the annual Alberta Ambient Air Quality Objectives (AAAQO)

<sup>b</sup> Conversion between µg/m<sup>3</sup> and ppb assumes 25°C and 101.325 kPa.

**Table 3 Ambient air quality triggers (in  $\mu\text{g}/\text{m}^3$  and ppb) for the upper range of the hourly data.**

Description	$\text{NO}_2$
Level 4	
Trigger for Level 4 <sup>a</sup>	196 $\mu\text{g}/\text{m}^3$ (104 ppb) <sup>b</sup>
Level 3	
Trigger for Level 3	130 $\mu\text{g}/\text{m}^3$ (69 ppb)
Level 2	
Trigger for Level 2	66 $\mu\text{g}/\text{m}^3$ (35 ppb)
Level 1	

<sup>a</sup> 99<sup>th</sup> percentile triggers are calculated in relation to the hourly AAAQOs. The hourly AAAQO for  $\text{NO}_2$  is 300  $\mu\text{g}/\text{m}^3$  (159 ppb).

<sup>b</sup> Conversion between  $\mu\text{g}/\text{m}^3$  and ppb assumes 25°C and 101.325 kPa.

## Triggers and Limits for Ozone and Particulate Matter (PM<sub>2.5</sub>)

The SSRP sets the following values for the triggers and limits for ozone and particulate matter as shown in Table 4. As described in the Air Quality Management Framework, ambient air quality triggers and limits are based on the Canadian Ambient Air Quality Standards (CAAQS), which are a component of the national Air Quality Management System. The assignment of management levels under the CAAQS follows three steps:

**Step 1:** The ozone metric, PM<sub>2.5</sub> 24-hour metric, and PM<sub>2.5</sub> annual metric are calculated using all available data collected over a three-year window, using the methodology described in the Guidance Document on Achievement Determination (GDAD): Canadian Ambient Air Quality Standards for Fine Particulate Matter and Ozone (Canadian Council of Ministers of the Environment (CCME), 2012).

**Step 2:** Enhanced levels of ozone and PM<sub>2.5</sub> that are affected by “transboundary flow” and “exceptional events” (TF/EE) are identified. These events are identified through a detailed investigation of a number of possible factors such as the long-range transport of ozone and elevated PM<sub>2.5</sub> due to forest fire smoke. A more comprehensive definition of TF/EE and the process for demonstrating the influence of TF/EE can be found in the GDAD (CCME, 2012).

**Step 3:** The ozone metric, PM<sub>2.5</sub> 24-hour metric, and PM<sub>2.5</sub> annual metric are recalculated, excluding the measurements affected by transboundary flow and exceptional events. Management levels are assigned based on these calculations, as outlined in Table 4.

Annual assessments of the South Saskatchewan Region Air Quality Management Framework follow the procedures and requirements outlined in the GDAD, including data completeness requirements for metric calculation. Air monitoring stations not meeting the data completeness criteria outlined in the GDAD are not included in the assessment of triggers and limits.

**Table 4 Ambient air quality triggers and limits for ozone and PM<sub>2.5</sub>.**

Description	O <sub>3</sub> <sup>a</sup>	PM <sub>2.5</sub> 24-hour <sup>b</sup>	PM <sub>2.5</sub> Annual <sup>c</sup>
Level 4 <sup>g</sup>			
Limit <sup>d</sup>	63 ppb	28 µg/m <sup>3</sup>	10.0 µg/m <sup>3</sup>
Level 3 <sup>h</sup>			
Trigger for Level 3 <sup>e</sup>	56 ppb	19 µg/m <sup>3</sup>	6.4 µg/m <sup>3</sup>
Level 2 <sup>i</sup>			
Trigger for Level 2 <sup>f</sup>	50 ppb	10 µg/m <sup>3</sup>	4.0 µg/m <sup>3</sup>
Level 1 <sup>j</sup>			

<sup>a</sup> 8-hour averaging time, achievement to be based on 4<sup>th</sup> highest annual measurement, averaged over three consecutive years

<sup>b</sup> 24-hour averaging time, achievement to be based on 98<sup>th</sup> percentile annual value, averaged over three consecutive years

<sup>c</sup> Achievement to be based on annual average value, averaged over three consecutive years

<sup>d</sup> CAAQS refers to this as the Standard

<sup>e</sup> CAAQS refers to this as Middle Threshold

<sup>f</sup> CAAQS refers to this as Lowest Threshold

<sup>g</sup> CAAQS refers to these as Actions for Achieving CAAQS, or Red Management Level

<sup>h</sup> CAAQS refers to these as Actions for Preventing CAAQS Exceedances, or Orange Management Level

<sup>i</sup> CAAQS refers to these as Actions for Preventing Air Quality Deterioration, or Yellow Management Level

<sup>j</sup> CAAQS refers to these as Actions for Keeping Clean Areas Clean, or Green Management Level

# 2017 Status of Air Quality

## Nitrogen Dioxide (NO<sub>2</sub>)

### Annual Average of the Hourly Data for NO<sub>2</sub>

In 2017, three air monitoring stations (Calgary Central-Inglewood, Calgary Northwest, and Calgary Southeast) measured annual average ambient concentrations of NO<sub>2</sub> above the trigger for Level 2 (8 ppb) (Table 5). These stations were also above the Level 2 trigger in 2016 (Figure 3).

Two stations (Lethbridge and Medicine Hat-Crescent Heights) had ambient air quality concentrations below the trigger for Level 2. These stations were also below the trigger for Level 2 each year from 2012-2016.

In general, annual average NO<sub>2</sub> concentrations at the Calgary Northwest station have decreased over the period from 2012-2017, while at the other stations in the South Saskatchewan Region there has been minimal change in annual average NO<sub>2</sub> concentrations.

### Upper Range of the Hourly Data for NO<sub>2</sub>

In 2017, three air monitoring stations (Calgary Central-Inglewood, Calgary Northwest, and Calgary Southeast) measured ambient concentrations of NO<sub>2</sub> above the upper range trigger for Level 2 (35 ppb) (Table 5). These stations were also above the Level 2 trigger in 2016 (Figure 4).

Two stations (Lethbridge and Medicine Hat-Crescent Heights) had ambient air quality concentrations below the trigger for Level 2. These stations were also below the trigger for Level 2 each year from 2012-2016.

The upper range of NO<sub>2</sub> concentrations measured at the Calgary Northwest station has decreased over the period from 2012-2017. There has been minimal change in the upper range of the NO<sub>2</sub> concentrations measured at the other stations in the region.

**Table 5 Summary statistics for NO<sub>2</sub> in the South Saskatchewan Region in 2017**

NO <sub>2</sub>	2017 Levels						
	Annual Average		Upper Range		Hours Measured	Data Completeness	AAAQO Exceedances
Station	ppb	Management Level	ppb	Management Level	Count	%	Count
Calgary Central-Inglewood	15	2	55	2	8658	99	0
Calgary Northwest	10	2	41	2	8599	98	0
Calgary Southeast	13	2	48	2	8282	95	0
Lethbridge	5	1	30	1	8567	98	0
Medicine Hat-Crescent Heights	6	1	24	1	8123	93	0

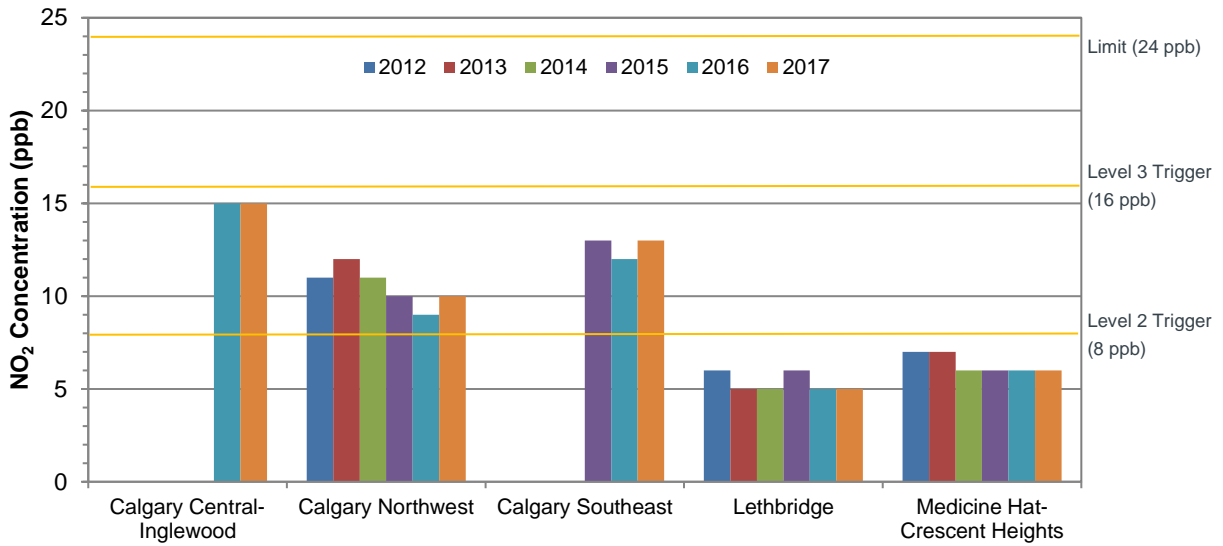


Figure 3 Annual average of the hourly data for 2012-2017 from air monitoring stations in the South Saskatchewan Region for NO<sub>2</sub>.<sup>1</sup>

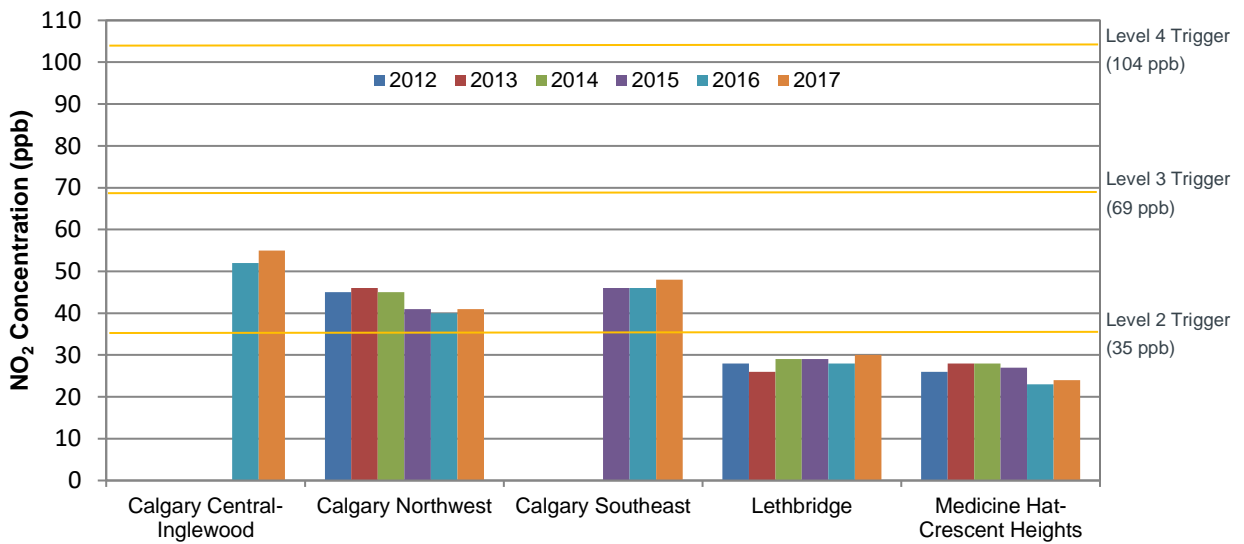


Figure 4 Upper range of the hourly data for 2012-2017 from air monitoring stations in the South Saskatchewan Region for NO<sub>2</sub>.<sup>1</sup>

<sup>1</sup> Stations with missing years did not meet completeness criteria of at least 75% data completeness.

## Ozone and Particulate Matter

The analysis of the CAAQS metrics for 2015-2017 is currently underway. Therefore, ambient levels for 2015-2017 have not yet been assigned. The expected completion date for the 2015-2017 CAAQS assessment is winter 2018.

Analysis of the 2014-2016 CAAQS assessment was not complete and levels were not assigned at the time of the 2016 Status of Air Quality reporting. The CAAQS results for 2014-2016, as reported in the Alberta: Air Zones Report 2014-2016 (Alberta Environment and Parks, 2018a), are summarized in Appendix A.

## Assigning Management Levels

**Table 6 Status of ambient air quality indicators at monitoring stations in 2017.**

Level	Description	Management Intent	Status of 2017 Indicator for NO <sub>2</sub>
4	Ambient air quality exceeding air quality limits	Improve ambient air quality to below limits or Level 4 trigger	No stations with NO <sub>2</sub> above the limit or trigger
<b>Limit for Level 4</b>			
3	Ambient air quality below but approaching air quality limits	Proactively maintain air quality below limits or Level 4 trigger for upper range	No stations with NO <sub>2</sub> above the trigger
<b>Trigger for Level 3</b>			
2	Ambient air quality below air quality limits	Improve knowledge and understanding and plan	NO <sub>2</sub> was above the annual average trigger at: <ul style="list-style-type: none"> <li>• Calgary Central-Inglewood</li> <li>• Calgary Northwest</li> <li>• Calgary Southeast</li> </ul> NO <sub>2</sub> was above the upper range trigger at: <ul style="list-style-type: none"> <li>• Calgary Central-Inglewood</li> <li>• Calgary Northwest</li> <li>• Calgary Southeast</li> </ul>
<b>Trigger for Level 2</b>			
1	Ambient air quality well below air quality limits	Apply standard regulatory and non-regulatory approaches	NO <sub>2</sub> was below the annual average trigger at: <ul style="list-style-type: none"> <li>• Medicine Hat-Crescent Heights</li> <li>• Lethbridge</li> </ul> NO <sub>2</sub> was below the upper range trigger at: <ul style="list-style-type: none"> <li>• Medicine Hat-Crescent Heights</li> <li>• Lethbridge</li> </ul>

In 2017, no air monitoring stations in the South Saskatchewan Region measured ambient NO<sub>2</sub> concentrations above the limits or triggers for Level 4 or Level 3 established in the Air Quality Management Framework. Three stations were assigned to Level 2 for NO<sub>2</sub> based on the annual average of hourly data and on the upper range of hourly data (Calgary Central-Inglewood, Calgary Northwest, and Calgary Southeast).



# Appendix A – Summary of the 2014-2016 PM<sub>2.5</sub> and Ozone CAAQS Calculations

This appendix summarizes the results of the 2014-2016 CAAQS calculations as reported in the Alberta: Air Zones Report 2014-2016 (Alberta Environment and Parks, 2018a).

## PM<sub>2.5</sub> 24-hour Metric for 2014-2016

In 2014-2016, all stations in the South Saskatchewan Region achieved the CAAQS (28 µg/m<sup>3</sup>) for the PM<sub>2.5</sub> 24-hour metric before TF/EE analysis (Table 7).

**Table 7 CAAQS metric for PM<sub>2.5</sub> 24-hour in the South Saskatchewan Region**

Annual 98 <sup>th</sup> Percentile (µg/m <sup>3</sup> )				PM <sub>2.5</sub> 24-hour Metric (µg/m <sup>3</sup> ) <sup>a,b</sup> (before TF/EE analysis)
Station	2014	2015	2016	2014-2016
Calgary Central-Inglewood	n/a <sup>c</sup>	n/a <sup>d</sup>	15.5	n/a <sup>e</sup>
Calgary Northwest	20.4	26.1	12.7	20
Calgary Southeast	n/a <sup>d</sup>	30.1	15.8	23 <sup>f</sup>
Lethbridge	20.9	42.0	14.1	26
Medicine Hat-Crescent Heights	16.0	45.5	10.7	24

## PM<sub>2.5</sub> Annual Metric for 2014-2016

In 2014-2016, all stations in the South Saskatchewan Region achieved the CAAQS (10.0 µg/m<sup>3</sup>) for the PM<sub>2.5</sub> annual metric before TF/EE analysis (Table 8).

**Table 8 CAAQS metric for PM<sub>2.5</sub> Annual in the South Saskatchewan Region**

Annual Average (µg/m <sup>3</sup> )				PM <sub>2.5</sub> Annual Metric (µg/m <sup>3</sup> ) <sup>a,b</sup> (before TF/EE analysis)
Station	2014	2015	2016	2014-2016
Calgary Central-Inglewood	n/a <sup>c</sup>	n/a <sup>d</sup>	5.8	n/a <sup>e</sup>
Calgary Northwest	7.8	8.5	4.6	7.0
Calgary Southeast	n/a <sup>d</sup>	7.6	5.3	6.5 <sup>f</sup>
Lethbridge	7.1	8.2	4.8	6.7
Medicine Hat	4.8	6.6	4.0	5.1

<sup>a</sup> These values have not been screened for transboundary flow or exceptional events. Therefore, they may include such influences.

<sup>b</sup> The metric is the 3-year average value.

<sup>c</sup> Station was not in operation this year.

<sup>d</sup> The year is not available as it did not meet data completeness criteria.

<sup>e</sup> The 3-year average cannot be calculated as only one year of data was available.

<sup>f</sup> One of the three years of the assessment period did not meet data completeness criteria and thus the 3-year average is based on two years.

## Ozone Metric for 2014-2016

In 2014-2016, all stations in the South Saskatchewan Region achieved the CAAQS (63 ppb) for the ozone metric before consideration of TF/EE (Table 9).

**Table 9 CAAQS metric for ozone in the South Saskatchewan Region**

Annual 4 <sup>th</sup> Highest (ppb)				Ozone Metric (ppb) <sup>a,b</sup> (before TF/EE analysis)
Station	2014	2015	2016	2014-2016
Calgary Central-Inglewood	n/a <sup>c</sup>	60.9	61.1	61 <sup>d</sup>
Calgary Northwest	57.6	64.4	58.4	60
Calgary Southeast	55.6	59.9	57.1	58
Lethbridge	56.0	61.3	56.6	58
Medicine Hat-Crescent Heights	55.6	62.9	56.4	58

<sup>a</sup> These values have not been screened for transboundary flow or exceptional events. Therefore, they may include such influences.

<sup>b</sup> The metric is the 3-year average value.

<sup>c</sup> Station was not in operation this year.

<sup>d</sup> One of the three years of the assessment period did not meet data completeness criteria and thus the 3-year average is based on two years.

## 2014-2016 CAAQS Management Levels for Ozone and PM<sub>2.5</sub>

CAAQS management levels for ozone and PM<sub>2.5</sub> were assigned for 2014-2016 after accounting for transboundary flow and exceptional events (Table 10). The management level for the South Saskatchewan Region was determined by comparing the station with the highest metric value after TF/EE events were removed against the threshold values for the CAAQS management levels (Table 4). Stations with metric values based on only two years of data were excluded from consideration of the region's metric value.

For the ozone metric, the South Saskatchewan Region was assigned the "Yellow: Actions for Preventing Air Quality Deterioration" management level under the CAAQS. Four stations had ambient concentrations in the Yellow management level (Calgary Northwest, Calgary Southeast, Lethbridge, and Medicine Hat-Crescent Heights). The Calgary Central-Inglewood station had ambient concentrations in the "Orange: Actions for Preventing CAAQS Exceedances" management level. The Calgary Central-Inglewood station was not in operation in 2014 and therefore the 3-year average is based on two years and is not considered for the region's ozone metric.

For the PM<sub>2.5</sub> 24-hour and annual metrics, the South Saskatchewan Region was assigned the Yellow management level under the CAAQS. Four stations had ambient concentrations in the yellow management level or lower (Calgary Northwest, Calgary Southeast, Lethbridge, and Medicine Hat-Crescent Heights). Based on the Guidance Document on Achievement Determination: Canadian Ambient Air Quality Standards for Fine Particulate Matter and Ozone (CCME, 2012), at least two years of data must be available for a station to be assigned a management level. Because only one year of data was available at Calgary Central-Inglewood, no assessment was possible.

**Table 10 2014-2016 CAAQS management levels for the ozone metric, PM<sub>2.5</sub> 24-hour metric, and PM<sub>2.5</sub> annual metric.**

CAAQS Management Levels for 2014-2016 <sup>a</sup>			
Station	Ozone	PM <sub>2.5</sub> 24-hour	PM <sub>2.5</sub> Annual
Calgary Central-Inglewood	Orange <sup>b</sup>	- <sup>c</sup>	- <sup>c</sup>
Calgary Northwest	Yellow	Yellow	Yellow
Calgary Southeast	Yellow	Yellow <sup>b</sup>	Yellow <sup>b</sup>
Medicine Hat-Crescent Heights	Yellow	Yellow	Yellow or lower <sup>d</sup>
Lethbridge	Yellow	Yellow	Yellow

a The colours in the table indicate the management level assigned under the CAAQS:

- Red: Actions for Achieving Air Zone CAAQS
- Orange: Actions for Preventing CAAQS Exceedances
- Yellow: Actions for Preventing Air Quality Deterioration
- Green: Actions for Keeping Clean Areas Clean

b One of the three years of the assessment period did not meet data completeness criteria. The 3-year average is based on two years and is not considered for the region's metric.

c The 3-year average cannot be calculated as only one year is available.

d TF/EE analysis was completed for all stations in the red and orange management levels. The 2014-2016 assessment identifies stations in the yellow management level as "Yellow or lower" if TF/EE analysis may have brought the station to the green management level.

Investigations involving the analysis of ambient concentrations and trends and the identification of potential emission sources leading to elevated ambient concentrations of PM<sub>2.5</sub> are ongoing. The Status of Management Response Report as of October 2017 (released August 2018) summarizes the findings of these investigations and provides a summary of the initiatives and actions underway that contribute to the overall management of PM<sub>2.5</sub> (AEP, 2018c). The investigation focuses on the stations assigned to the Orange management level in the 2011-2013 CAAQS assessment (Calgary Northwest, Lethbridge, and Medicine Hat-Crescent Heights) (AEP, 2015). In the 2012-2014 and 2013-2015 CAAQS assessments, an additional station (Calgary Central 2, which was decommissioned in April 2015) was assigned to the Orange management level for PM<sub>2.5</sub> (AEP, 2018b). The ongoing investigation will expand to include the Calgary Central 2 station and analysis of additional years of data for the other stations.

In response to the results of the 2011-2013 CAAQS assessment, Alberta Environment and Parks developed a management plan to improve air quality in the South Saskatchewan Region, released in September 2017. The management actions range from policy and regulatory initiatives to reduce emissions, to knowledge improvement and engagement actions to inform the public and stakeholders. For a comprehensive list of the management actions to be undertaken in the South Saskatchewan Region, please refer to the South Saskatchewan Region Air Zone Canadian Ambient Air Quality Standards Response Government of Alberta Action Plan (AEP, 2017).

# References

- Alberta Environment and Parks, 2015. Alberta: Air Zones Report 2011-2013. Government of Alberta, Department of Environment and Parks. Available at: <https://open.alberta.ca/publications/alberta-air-zones-report-2011-2013>.
- Alberta Environment and Parks, 2017. South Saskatchewan Region Air Zone Canadian Ambient Air Quality Standards Response Government of Alberta Action Plan. Government of Alberta, Department of Environment and Parks. Available at: <http://aep.alberta.ca/air/management-frameworks/canadian-ambient-air-quality-standards/documents/SouthSaskatchewanCAAQS-ActionPlan-Sep2017.pdf>.
- Alberta Environment and Parks, 2018a. Alberta: Air Zones Report 2014-2016. Government of Alberta, Department of Environment and Parks. Available at: <http://aep.alberta.ca/air/management-frameworks/canadian-ambient-air-quality-standards/default.aspx>.
- Alberta Environment and Parks, 2018b. Alberta: Air Zones Report 2012-2014, 2013-2015. Government of Alberta, Department of Environment and Parks. Available at: <https://open.alberta.ca/publications/9781460134962>.
- Alberta Environment and Parks, 2018c. South Saskatchewan Region Status of Management Response for Environmental Management Framework, as of October 2017. Government of Alberta, Department of Environment and Parks. Available at: <https://open.alberta.ca/publications/9781460136782>.
- Alberta Environment and Sustainable Resource Development. 2014. South Saskatchewan Region Air Quality Management Framework for Nitrogen Dioxide (NO<sub>2</sub>), Ozone (O<sub>3</sub>), and Fine Particulate Matter (PM<sub>2.5</sub>). Government of Alberta. ISBN: 978-1-4601-1858-0 (Print); 978-1-4601-1859-7 (PDF). Available at: <https://open.alberta.ca/publications/9781460118597>.
- Canadian Council of Ministers of the Environment (CCME). 2012. Guidance Document on Achievement Determination: Canadian Ambient Air Quality Standards for Fine Particulate Matter and Ozone. ISBN No. 978-1-896997-91-9 (PDF). Available at: [http://www.ccme.ca/files/Resources/air/aqms/pn\\_1483\\_gdad\\_eng.pdf](http://www.ccme.ca/files/Resources/air/aqms/pn_1483_gdad_eng.pdf).
- Government of Alberta. 2008. Land-Use Framework. ISBN: 978-7785-7713-3 (Print); 978-0-7785-7714-0 (PDF). Available at: <https://open.alberta.ca/publications/9780778577140>.
- Government of Alberta. 2009. Statutes of Alberta. Chapter A-26.8. Alberta Land Stewardship Act. Available at: <https://open.alberta.ca/publications/a26p8>.
- Government of Alberta. 2018. South Saskatchewan Regional Plan 2014-2023: amended May 2018. ISBN: 978-1-4601-3940-0 (Print); 978-1-4601-3941-7 (PDF). Available at: <https://open.alberta.ca/publications/9781460139417>.