



Queensland air monitoring 2022

National Environment Protection
(Ambient Air Quality) Measure



Queensland
Government

Prepared by: Air Quality Monitoring, Department of Environment and Science

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Summary

This document fulfils annual reporting requirements for Queensland under clause 18 of the National Environment Protection (Ambient Air Quality) Measure (AAQ NEPM).

Ambient air quality monitoring at AAQ NEPM sites in Queensland from January to December 2022 recorded no exceedances of the AAQ NEPM standards for carbon monoxide, nitrogen dioxide, ozone and lead at any Queensland monitoring station. Exceedances of the AAQ NEPM standards occurred for:

- 1-hour and 1-day average sulfur dioxide concentrations at The Gap in Mount Isa due to industrial emissions;
- 1-day average PM₁₀ (particles less than 10 micrometres in diameter) concentration at Toowoomba, likely due to local dust-generating activities;
- 1-day average PM₁₀ concentration at The Gap in Mount Isa due to windblown dust during strong winds;
- 1-day average PM_{2.5} (particles less than 2.5 micrometres in diameter) concentration at Maryborough due to smoke impacts; and
- 1-day average PM_{2.5} concentration at North Ward in Townsville due to smoke from hazard-reduction birning.

The AAQ NEPM goals were met in all Queensland regions except for:

- 1-hour and 1-day average sulfur dioxide concentrations at The Gap in Mount Isa due to industrial emissions;
- 1-day average PM₁₀ concentration at Toowoomba, likely due to local dust-generating activities;
- 1-day average PM₁₀ concentration at The Gap in Mount Isa due to windblown dust during strong winds; and
- 1-day average PM_{2.5} concentration at Maryborough due to smoke impacts.

The single PM_{2.5} 1-day standard exceedance at North Ward in Townsville, was directly attributed to an exceptional event (jurisdictional authorised hazard-reduction burn) and, as such, is excluded from the determination of compliance with the 1-day goal.

The approach to population exposure evaluation and reporting adopted by Queensland using data from the entire Queensland ambient air quality monitoring network (including non-AAQ NEPM reporting stations) identified that in 2022:

- annual PM_{2.5} exposure ranged between 58 and 74 per cent of the AAQ NEPM standard in locations meeting the Australian/New Zealand Standard AS/NZS 3580.1.1 neighbourhood classification;
- annual nitrogen dioxide exposure ranged between 20 and 33 per cent of the AAQ NEPM standard in locations meeting the AS/NZS 3580.1.1 neighbourhood classification; and
- maximum 8-hour ozone exposure ranged between 55 and 88 per cent of the AAQ NEPM standard in locations meeting the AS/NZS 3580.1.1 neighbourhood classification.

Introduction

Clause 18 of the National Environment Protection (Ambient Air Quality) Measure (AAQ NEPM)¹ requires all jurisdictions to submit an annual report on their compliance with the Measure. The required content of these reports is specified in the *National Environment Protection (Ambient Air Quality) Measure Technical Paper No. 8, Annual Reports* (AAQ NEPM Technical Paper No. 8)².

The Climate, Coastal, Air and Emissions team within the Science Division of the Department of Environment and Science (DES) operates the Queensland ambient air quality monitoring network. This network includes air monitoring to assess compliance with the standards and goals of the AAQ NEPM, as detailed in the *Ambient air quality monitoring plan for Queensland*³, together with additional ambient and investigative air monitoring for other purposes.

This report documents Queensland's compliance with the standards and goals of the AAQ NEPM in 2022 in accordance with the AAQ NEPM Technical Paper No. 8.

Section A – Monitoring summary

Current AAQ NEPM monitoring stations

DES monitored ambient air quality in seven of the ten regions identified in the Queensland monitoring plan in 2022 as follows:

- South East Queensland (made up of four sub-regions: North Coast, Brisbane, Gold Coast and Ipswich)
- Toowoomba
- Maryborough – Hervey Bay
- Gladstone
- Mackay
- Townsville
- Mount Isa.

Table 1 presents summary information for all AAQ NEPM compliance monitoring stations operating in Queensland during 2022. Figure 1 shows the location of all Queensland AAQ NEPM monitoring stations operating during 2022. Each monitoring station is categorised as one of the following:

- performance monitoring station (PMS) – nominated to measure air quality to assess achievement of the AAQ NEPM goal
- trend station – nominated to measure air quality to identify long-term changes and assess achievement of the AAQ NEPM goal
- campaign station – short-term investigation station, operated for at least one calendar year, to assess the need for ongoing monitoring in the region to assess achievement of the AAQ NEPM goal.

The location category in Table 1 provides a qualitative description of the exposed population at each monitoring station.

Table 1 also describes monitoring stations using population coverage descriptors in the National Environment Protection (Ambient Air Quality) Measure Technical Paper No. 3, *Monitoring Strategy*⁴:

- generally representative upper bound (GRUB) – indicative of pollutant concentrations in the upper range occurring in populated areas in the region
- population-average – indicative of air quality experienced by most of the population.

¹ available from www.legislation.gov.au/Details/F2021C00475

² available from www.nepc.gov.au/resource/ephc-archive-ambient-air-quality-nepm

³ available from www.qld.gov.au/environment/pollution/monitoring/air-reports/

⁴ available from www.nepc.gov.au/resource/ephc-archive-ambient-air-quality-nepm

In some instances, data is reported from peak sites where the highest concentrations in the region are expected. This provides an indication of maximum exposure in the region.

Monitoring techniques used at each AAQ NEPM compliance monitoring site are listed in Table 1.

DES generally monitors air quality in compliance with the Australian Standard (AS) methods specified in the AAQ NEPM. During 2022 an exception to the use of AS methods was the measurement of PM₁₀ and PM_{2.5} by instrumentation using a backscattering of polychromatic light technique at some sites.

PM₁₀ and PM_{2.5} data was collected using tapered element oscillating balance (TEOM) instruments fitted with filter dynamics measurement system (FDMS) units at Rocklea, Southport and Springwood in South East Queensland and South Gladstone.

PM₁₀ and PM_{2.5} data at Mountain Creek and Flinders View in South East Queensland, Toowoomba, Maryborough, West Mackay, North Ward in Townsville and The Gap in Mount Isa were obtained using a Teledyne API model T640X monitor. The T640X monitor is an optical aerosol spectrometer that uses backscattering of polychromatic light to determine particle mass concentration. The T640X monitor has United States Environment Protection Agency accreditation as an equivalent method for measurement of PM₁₀ and PM_{2.5}.

The severe 2019-20 bushfire season created serious public health concerns in many parts of Queensland. To improve the safety of Queensland residents exposed to bushfire smoke, since this time DES has been expanding the geographical coverage of the Queensland ambient air quality monitoring network to include communities where previously there was no monitoring. As a result, PM₁₀ and PM_{2.5} monitoring re-commenced in Toowoomba in January 2022 and commenced in Maryborough in October 2022.

A valid assessment of compliance with the AAQ NEPM standards and goal for 2022 was not possible for:

- all parameters at the Rocklea site in South East Queensland due to the station being offline for approximately three months following flooding of the site in late February
- carbon monoxide at the Boyne Island site in Gladstone due to an extended instrument outage
- PM₁₀ and PM_{2.5} at the Springwood site in South East Queensland due to an extended instrument outage
- PM₁₀ and PM_{2.5} at the Maryborough site due to monitoring commencing part way through the year.

Table 1. Summary information for 2022 Queensland AAQ NEPM monitoring sites

Site	Station type	Date established	Pollutants measured	Monitoring technique	Location category	Non-conformance with AS3580.1.1 siting criteria	Main pollutant sources impacting station
South East Queensland							
<i>North Coast sub-region</i>							
Mountain Creek	PMS – GRUB	July 2001	O ₃ NO ₂ PM ₁₀ PM _{2.5}	AS 3580.6.1–2016 AS 3580.5.1–2011 TAPI T640X TAPI T640X	Residential	Nil	Major roads, forestry/ agricultural burning
<i>Brisbane sub-region</i>							
Deception Bay	Trend – GRUB	June 1994	O ₃ NO ₂	AS 3580.6.1–2016 AS 3580.5.1–2011	Residential	Trees within 20m west of site	Major roads
Woolloongabba	Trend – Peak	June 1998 (relocated June 2017)	CO	AS 3580.7.1–2011	Inner city roadside	Nil	Major roads
Rocklea	Trend – GRUB	January 1978 (relocated March 1994 and June 2007)	O ₃ NO ₂ PM ₁₀ PM _{2.5}	AS 3580.6.1–2016 AS 3580.5.1–2011 AS 3580.9.16:2016 (FDMS TEOM) AS 3580.9.13:2013 (FDMS TEOM)	Light industry/ residential	Nil	Major roads
Springwood	PMS – Population average	March 1999	O ₃ NO ₂ SO ₂ PM ₁₀ PM _{2.5}	AS 3580.6.1–2016 AS 3580.5.1–2011 AS 3580.4.1–2008 AS 3580.9.16:2016 (FDMS TEOM) AS 3580.9.13:2013 (FDMS TEOM)	Residential	Nil	Major roads
<i>Gold Coast sub-region</i>							
Southport	PMS – Population average	February 2018	O ₃ NO ₂ PM ₁₀ PM _{2.5}	AS 3580.6.1–2016 AS 3580.5.1–2011 AS 3580.9.16:2016 (FDMS TEOM) AS 3580.9.13:2013 (FDMS TEOM)	Residential	Buildings and trees within 20m of site	Major roads
<i>Ipswich sub-region</i>							
Flinders View	Trend – GRUB	January 1993	O ₃ NO ₂ SO ₂ PM ₁₀ PM _{2.5}	AS 3580.6.1–2016 AS 3580.5.1–2011 AS 3580.4.1–2008 TAPI T640X TAPI T640X	Industry/ residential	Trees within 20m of site	Major roads, industry (landfill, composting facilities)

Table 1 (continued). Summary information for 2022 Queensland AAQ NEPM monitoring sites

Site	Station type	Date established	Pollutants measured	Monitoring technique	Location category	Non-conformance with AS3580.1.1 siting criteria	Main pollutant sources impacting station
Toowoomba							
Toowoomba	Campaign – Population average	January 2022	PM ₁₀ PM _{2.5}	TAPI T640X TAPI T640X	Residential	Nil	Major roads
Maryborough – Hervey Bay							
Maryborough	Campaign – Population average	October 2022	PM ₁₀ PM _{2.5}	TAPI T640X TAPI T640X	Residential	Nil	Major roads
Gladstone							
Boyne Island	Trend – GRUB	October 2008	CO	AS 3580.7.1–2011	Industry/ residential	Nil	Industry (power station, metals processing)
South Gladstone	Trend – GRUB	July 1992	NO ₂ SO ₂ PM ₁₀ PM _{2.5}	AS 3580.5.1–2011 AS 3580.4.1–2008 AS 3580.9.16:2016 (FDMS TEOM) AS 3580.9.13:2013 (FDMS TEOM)	Industry/ residential	Nil	Major roads, industry (power station, metals processing)
Mackay							
West Mackay	PMS – GRUB	September 1997 (relocated June 2010)	PM ₁₀ PM _{2.5}	TAPI T640X TAPI T640X	Residential/ rural	Nil	Agricultural burning
Townsville							
Coast Guard	Campaign – Peak	March 2008	Lead	AS 3580.9.3–2003, with analysis by AS 3580.9.15:2014 (ICP)	Industry	Trees within 20m of site	Port operations handling metal concentrates
North Ward	Campaign – Population average	December 2017 (relocated August 2020)	NO ₂ SO ₂ PM ₁₀ PM _{2.5}	AS 3580.5.1–2011 AS 3580.4.1–2008 TAPI T640X TAPI T640X	Residential	Trees within 20m of site	Major roads, industry (port operations, metals processing)
Mount Isa							
The Gap	PMS – Population average	January 2009	SO ₂ PM ₁₀ PM _{2.5} Lead	AS 3580.4.1–2008 TAPI T640X TAPI T640X AS 3580.9.3–2003, with analysis by AS 3580.9.15:2014 (ICP)	Industry/ residential	Building within 20m north-east of site	Industry (metals smelting, sulfuric acid manufacture)
PMS = performance monitoring station GRUB = generally representative upper bound PM ₁₀ = particles less than 10 micrometres in diameter PM _{2.5} = particles less than 2.5 micrometres in diameter				FDMS = Filter Dynamics Measurement System TEOM = tapered element oscillating microbalance DOAS = differential optical absorption spectroscopy ICP = inductively coupled plasma TAPI T640X = Teledyne API optical particle detection			

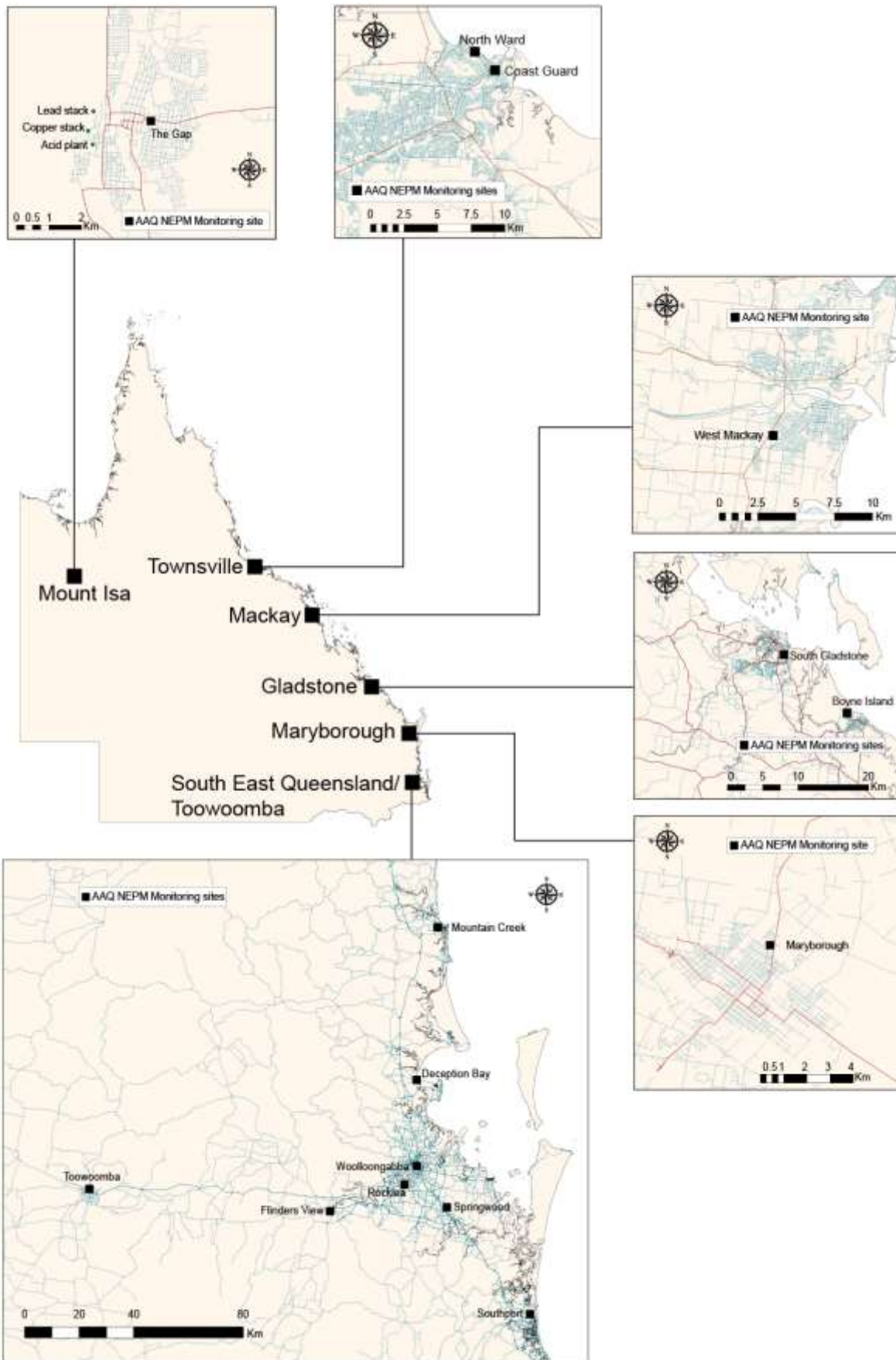


Figure 1. 2022 AAQ NEPM monitoring site locations

Variations to the approved monitoring plan for Queensland

Monitoring is not required if screening criteria specified in the *National Environment Protection (Ambient Air Quality) Measure Technical Paper No. 4 – Screening Procedures*⁵ (AAQ NEPM Technical Paper No. 4) are met.

Table 2 shows the regions and pollutants that satisfied the screening procedures.

Table 2. Regions that satisfy screening procedures and do not require campaign monitoring

Region	CO	NO ₂	Ozone	SO ₂	PM ₁₀	PM _{2.5}	Lead
South East Queensland	–	–	–	–	–	–	A
Toowoomba	A	A	A	F	A	A	F
Maryborough – Hervey Bay	F	E & F	–	F	–	–	F
Bundaberg	F	E & F	–	F	–	–	F
Gladstone	–	–	A	–	–	–	F
Rockhampton	F	E & F	–	–	–	–	F
Mackay	F	E & F	–	F	–	–	F
Townsville	F	–	A	–	–	–	–
Cairns	F	E & F	–	F	–	–	F
Mount Isa	F	E & F	–	–	–	–	–

A = Screening by campaign monitoring at a generally representative upper bound (GRUB) monitoring location (with no significant deterioration expected over 5–10 years).

E = Screening by use of generic model results based on gross emission estimates, 'worst case' meteorology estimates and other conservative assumptions.

F = Screening by comparison with a National Environment Protection (Ambient Air Quality) Measure compliant region with greater population, emissions and pollution potential.

The '–' symbol indicates that monitoring is required to assess compliance.

For further information on the screening procedures, refer to National Environment Protection (Ambient Air Quality) Measure Technical Paper No. 4, Screening Procedures, available from www.nepc.gov.au/resource/ephc-archive-ambient-air-quality-nepm.

⁵ available from www.nepc.gov.au/resource/ephc-archive-ambient-air-quality-nepm

Section B – Assessment of compliance with standards and goals

This section presents details of the 2022 compliance assessment for Queensland. Compliance criteria are applied at each performance monitoring station in the state.

Compliance is achieved if approved screening procedures are satisfied or:

- there are no exceedances of the relevant standard specified in Schedule 2 of the AAQ NEPM, and
- data availability was at least 75 per cent in each calendar quarter.

For the purposes of reporting compliance against the standards and goals for photochemical oxidants (as ozone) and PM₁₀ and PM_{2.5} (1-day standard only), monitoring data that has been determined as being directly associated with an exceptional event can be excluded. An exceptional event is defined as a fire or dust occurrence directly related to bushfire, authorised hazard-reduction burning or continental scale windblown dust. Monitoring data associated with such events are included in determination of compliance with the AAQ NEPM goals for 1-year PM₁₀ and PM_{2.5} concentrations.

AAQ NEPM Technical Paper No. 8 states that a data availability rate of at least 75 per cent in each calendar quarter is required to make a valid assessment of compliance. On this basis, compliance with the relevant standards and goals could not be demonstrated for:

- carbon monoxide at the Boyne Island site in Gladstone due to an extended instrument outage
- nitrogen dioxide, ozone, PM₁₀ and PM_{2.5} at the Rocklea site in South East Queensland due to the station being impacted by flooding
- PM₁₀ and PM_{2.5} at the Springwood site in South East Queensland due to an extended instrument outage
- PM₁₀ and PM_{2.5} at the Maryborough site due to monitoring commencing part way through the year.

Compliance summaries for AAQ NEPM pollutants in 2022 are presented in Table 3 to Table 9.

Carbon monoxide

Table 3. 2022 carbon monoxide compliance summary

Region / performance monitoring station	Data availability rates (% of hours)					Number of exceedances (days)	Performance against the standard and goal
	Q1	Q2	Q3	Q4	Annual		8-hour
South East Queensland							
<i>Brisbane sub-region</i>							
Woolloongabba	100.0	98.9	100.0	87.6	96.6	0	met
Gladstone							
Boyne Island	100.0	100.0	99.7	12.4	77.9	0	ND
ND = "not demonstrated" due to insufficient data in one or more quarters. AAQ NEPM standard for CO: 9.0 ppm (8-hour average). AAQ NEPM goal for CO: standard not to be exceeded.							

Regions which do not require monitoring on the basis of screening arguments that carbon monoxide levels are reasonably expected to be consistently below the AAQ NEPM standard are:

- Bundaberg
- Cairns
- Mackay
- Maryborough/Hervey Bay
- Mount Isa
- Rockhampton
- Toowoomba
- Townsville.

Motor vehicles are the main contributor to ambient carbon monoxide concentrations in urban areas. Combustion stoves and wood heaters can also contribute, but their use in most areas currently monitored in Queensland is minimal.

Carbon monoxide concentrations at performance monitoring stations in South East Queensland (at Brisbane CBD from 2000 to 2004 and Woolloongabba from 2007 to 2022) were consistently less than 40 per cent of the AAQ NEPM standard (see Section D – Pollutant distribution and trends). Therefore, under screening procedure F in Table 1 of the AAQ NEPM Technical Paper No. 4, carbon monoxide monitoring is not required in coastal Queensland population centres with lower traffic density and warmer winter temperatures than South East Queensland.

Carbon monoxide concentrations at North Toowoomba were consistently less than 30 per cent of the AAQ NEPM standard during campaign monitoring from July 2003 to December 2010. This satisfies the 60 per cent acceptance limit specified in screening procedure A in Table 1 of the AAQ NEPM Technical Paper No. 4.

Under screening procedure F in Table 2 of AAQ NEPM Technical Paper No. 4, carbon monoxide monitoring is not required in Mount Isa based on carbon monoxide concentrations measured in the Gladstone region meeting the 40 per cent acceptance limit and emissions of carbon monoxide being lower in Mount Isa than in the Gladstone airshed⁶.

Nitrogen dioxide

Table 4. 2022 nitrogen dioxide compliance summary

Region / performance monitoring station	Data availability rates (% of hours)					Number of exceedances (days)	Annual mean (ppm)	Performance against the standards and goals	
	Q1	Q2	Q3	Q4	Annual			1-hour	1-year
<u>South East Queensland</u>									
<i>North Coast sub-region</i>									
Mountain Creek	99.4	99.4	98.8	99.2	99.2	0	0.003	met	met
<i>Brisbane sub-region</i>									
Deception Bay	98.2	99.7	99.5	98.6	99.0	0	0.004	met	met
Rocklea	59.5	46.6	99.7	98.8	76.3	0	0.007	ND	ND
Springwood	99.5	99.5	98.9	82.1	95.0	0	0.005	met	Met
<i>Gold Coast sub-region</i>									
Southport	99.7	99.7	99.0	99.4	99.4	0	0.004	met	met
<i>Ipswich sub-region</i>									
Flinders View	97.7	92.5	99.5	99.6	97.3	0	0.006	met	met
<u>Gladstone</u>									
South Gladstone	99.1	99.7	99.5	99.4	99.4	0	0.004	met	met
<u>Townsville</u>									
North Ward	99.4	98.9	99.6	99.4	99.3	0	0.003	met	met
ND = "not demonstrated" due to insufficient data in one or more quarters. AAQ NEPM standards for NO ₂ : 0.080 ppm (1-hour average); 0.015 ppm (1-year average). AAQ NEPM goal for NO ₂ : standards not to be exceeded.									

⁶ National Pollutant Inventory reporting for 2021–22 shows that industrial facilities in Mount Isa emitted 13,000 tonnes of carbon monoxide, compared to 40,000 tonnes emitted from industrial facilities in the Gladstone region (data obtained from www.npi.gov.au).

Regions which do not require monitoring on the basis of screening arguments that nitrogen dioxide levels are reasonably expected to be consistently below the AAQ NEPM standards are:

- Bundaberg
- Cairns
- Mackay
- Maryborough/Hervey Bay
- Mount Isa
- Rockhampton
- Toowoomba.

The AAQ NEPM Technical Paper No. 4 states that nitrogen dioxide monitoring is not required if a combination of generic modelling (screening procedure E in Table 1 of the AAQ NEPM Technical Paper No. 4) and data from an AAQ NEPM compliant region with greater population, emissions and pollution potential (screening procedure F in Table 1 of the AAQ NEPM Technical Paper No. 4) show that nitrogen dioxide concentrations are below 45 per cent of the NEPM standards. Based on generic modelling conducted by CSIRO (Appendix 1 of the AAQ NEPM Technical Paper No. 4), it was determined nitrogen dioxide concentrations in coastal and inland centres with populations below 250,000 would comply with the acceptance limit for the 1-hour standard in place prior to 2022 ($45\% \times 0.12 \text{ ppm} = 0.054 \text{ ppm}$). Even with the reduction in the nitrogen dioxide 1-hour standard to 0.08 ppm in 2022, the Queensland centres listed above can still be considered to comply with the lower nitrogen dioxide acceptance limit of 0.036 ppm.

Nitrogen dioxide monitoring in Townsville (Pimlico from 2004 to 2016 and North Ward between 2018 and 2022) showed that concentrations were consistently less than 45 per cent of the AAQ NEPM standards. Across the 18 years of monitoring in Townsville, there has only been ten discrete hours in total (0.008 per cent) when the one-hour average nitrogen dioxide concentration has exceeded 0.036 ppm; and one-hour average nitrogen dioxide concentrations have never exceeded 0.042 ppm (53 per cent of the standard). The highest annual average nitrogen dioxide concentration during this period was 0.006 ppm (40 per cent of the standard). On this basis, it can be reasonably expected that nitrogen dioxide levels will comply with the AAQ NEPM standards in the Queensland centres of Bundaberg, Cairns, Mackay, Maryborough/Hervey Bay, Mount Isa and Rockhampton, and nitrogen dioxide monitoring is not required.

Campaign monitoring from 2006 to 2010 established that nitrogen dioxide concentrations at North Toowoomba were consistently less than 60 per cent of the AAQ NEPM standards adopted from 2021, satisfying the acceptance limit specified in screening procedure A in Table 1 of the AAQ NEPM Technical Paper No. 4.

Ozone

Table 5. 2022 O₃ compliance summary

Region/performance monitoring station	Data availability rates (% of hours)					Number of exceedances (days)	Performance against the standards and goals
	Q1	Q2	Q3	Q4	Annual		8-hour
<u>South East Queensland</u>							
<i>North Coast sub-region</i>							
Mountain Creek	99.7	98.8	98.1	99.0	98.9	0	met
<i>Brisbane sub-region</i>							
Deception Bay	98.3	99.7	99.0	99.6	99.2	0	met
Rocklea	61.4	48.6	99.7	100.0	77.6	0	ND
Springwood	99.7	100.0	98.8	82.0	95.1	0	met
<i>Gold Coast sub-region</i>							
Southport	99.2	100.0	98.6	100.0	99.5	0	met
<i>Ipswich sub-region</i>							
Flinders View	97.9	99.5	98.5	99.7	98.9	0	met
ND = "not demonstrated" due to insufficient data in one or more quarters. AAQ NEPM standard for O ₃ : 0.065 ppm (8-hour average). AAQ NEPM goal for O ₃ : standard not to be exceeded.							

Regions which do not require monitoring on the basis of screening arguments that ozone levels are reasonably expected to be consistently below the NEPM standards are:

- Gladstone
- Toowoomba
- Townsville.

Eight-hour average ozone concentrations monitored at Targinie in the Gladstone region from mid-2001 to mid-2006 were consistently less than 75 per cent of the new AAQ NEPM standard. The Targinie campaign GRUB monitoring station was located 20 kilometres north-west of Gladstone and downwind of the region's major industrial and transport sources. This campaign monitoring established that ozone concentrations satisfied screening procedure A in Table 2 of the AAQ NEPM Technical Paper No. 4 and, in the absence of any significant increase in ozone precursor pollutant emissions, further ozone monitoring is not required in the Gladstone region.

The maximum 8-hour average ozone concentration recorded during campaign monitoring at North Toowoomba between July 2003 and December 2010 was 0.058 ppm, or 89 per cent of the AAQ NEPM standard. During this period, ozone 8-hour average concentrations only exceeded 0.049 ppm (75 per cent of the AAQ NEPM 8-hour standard) on one to two days per year on average, with most days linked with exceptional regional events (bushfire smoke episodes during spring and summer). Emissions of ozone precursor pollutants from industrial, commercial and residential sources rarely resulted in 8-hour ozone concentrations above 0.049 ppm. While not fully satisfying screening procedure A in Table 2 of the AAQ NEPM Technical Paper No. 4, in the absence of any significant increase in ozone precursor pollutants⁷ it is considered that ozone levels in Toowoomba can be reasonably expected to remain below the AAQ NEPM standard.

No exceedances of the AAQ NEPM 8-hour ozone standard were recorded at the Pimlico campaign monitoring site in Townsville between 2004 and 2016. Ozone levels exceeded 75 per cent of the AAQ NEPM 8-hour standard on only six days during this 14-year period (one day in 2008 and five days in 2011), with the elevated ozone levels largely correlating with the presence of bushfires in the region. While not fully satisfying screening procedure A in Table 2 of the AAQ NEPM Technical Paper No. 4, given ozone precursor pollutant emissions are now significantly

⁷ National Pollutant Inventory reporting for industrial facilities in the Toowoomba region in 2021–22 compared to 2010–11 shows that while emissions of oxides of nitrogen have increased from 36 tonnes to 65 tonnes, emissions of volatile organic compounds have reduced significantly (64 tonnes compared to 23 tonnes) (data obtained from www.npi.gov.au).

less than in 2016⁸ due to decreased industrial activity in the region, it is considered that ozone levels in Townsville can be reasonably expected to remain below the AAQ NEPM standard.

As no monitoring has been carried out to date, performance against the 8-hour ozone standard adopted in 2021 is currently 'not demonstrated' for the following regions:

- Bundaberg
- Cairns
- Mackay
- Maryborough/Hervey Bay
- Mount Isa
- Rockhampton.

Previous screening exclusions for coastal centres with a population below 62,000 and inland centres with a population below 25,000 based on generic modelling conducted by CSIRO documented in Appendix 1 of the AAQ NEPM Technical Paper No. 4 do not cover the new AAQ NEPM ozone 8-hour standard adopted in 2021. Previous conclusions that ozone monitoring is not required in the coastal Queensland centres of Bundaberg, Mackay and Maryborough/Hervey Bay, and the inland centre of Mount Isa, require further generic modelling to determine their continued validity.

With maximum 8-hour average ozone concentrations in Gladstone and Townsville exceeding the 60 per cent acceptance limit specified in screening procedure F in Table 2 of AAQ NEPM Technical Paper No. 4, previous exclusions of the need for ozone monitoring in Rockhampton and Cairns on this basis are no longer valid.

⁸ Following the closure of a major metals processing facility in 2016, National Pollutant Inventory reporting for industrial facilities in the Townsville region for 2021–22 compared to 2015–16 show a marked reduction in emissions of oxides of nitrogen (310 tonnes compared to 3500 tonnes) and a small decrease in emissions of volatile organic compounds from 280 tonnes to 230 tonnes (data obtained from www.npi.gov.au).

Sulfur dioxide

Table 6. 2022 SO₂ compliance summary

Region/performance monitoring station	Data availability rates (% of hours)					Number of exceedances (days)		Performance against the standards and goals	
	Q1	Q2	Q3	Q4	Annual	1-hour	1-day	1-hour	1-day
<u>South East Queensland</u>									
<i>Brisbane sub-region</i>									
Springwood	99.4	99.5	96.1	97.0	98.0	0	0	met	met
<i>Ipswich sub-region</i>									
Flinders View	95.2	96.8	99.4	99.6	97.8	0	0	met	met
<u>Gladstone</u>									
South Gladstone	99.6	99.7	99.1	99.4	99.5	0	0	met	met
<u>Townsville</u>									
North Ward	99.2	99.5	99.5	99.2	99.4	0	0	met	met
<u>Mount Isa</u>									
The Gap	91.8	87.9	95.7	94.5	92.5	43	25	not met	not met
AAQ NEPM standards for SO ₂ : 0.10 ppm (1-hour average); 0.02 ppm (1-day average). AAQ NEPM goal for SO ₂ : standards not to be exceeded.									

Regions which do not require monitoring on the basis of screening arguments that sulfur dioxide levels are reasonably expected to be consistently below the AAQ NEPM standards are:

- Bundaberg
- Cairns
- Mackay
- Maryborough/Hervey Bay
- Toowoomba.

Ambient concentrations of sulfur dioxide are typically low unless significant industrial sources of sulfur dioxide are present (such as coal-fired power stations or metals smelting). Peak sulfur dioxide concentrations in South East Queensland and Townsville have been less than 40 per cent of the revised AAQ NEPM 1-hour and 1-day standards adopted in 2021 since 2010 and 2005 respectively (see Section D – Pollutant distribution and trends). Under screening procedure F in Table 1 of the AAQ NEPM Technical Paper No. 4, sulfur dioxide monitoring is not required in other Queensland centres with lower population and no significant sulfur dioxide point sources.

As no monitoring has been carried out to date, performance against the sulfur dioxide standards adopted in 2021 is currently 'not demonstrated' for the following region:

- Rockhampton

With maximum sulfur dioxide concentrations in Gladstone exceeding 40 per cent of the new AAQ NEPM 1-hour and 1-day standards adopted in 2021, previous exclusion of the need for sulfur dioxide monitoring in Rockhampton based on Gladstone sulfur dioxide levels meeting screening procedure F in Table 1 of AAQ NEPM Technical Paper No. 4 is no longer valid.

PM₁₀**Table 7. 2022 PM₁₀ compliance summary**

Region/performance monitoring station	Data availability rates (% of hours)					Number of exceedances (days)	Annual mean (µg/m ³)	Performance against the standards and goals	
	Q1	Q2	Q3	Q4	Annual			1-day	1-year
<u>South East Queensland</u>									
<i>North Coast sub-region</i>									
Mountain Creek	99.9	99.8	99.0	99.8	99.6	0	15.5	met	met
<i>Brisbane sub-region</i>									
Rocklea	62.1	48.7	98.6	99.4	77.4	0	12.8	ND	ND
Springwood	99.0	71.3	98.3	97.3	91.5	0	10.5	ND	ND
<i>Gold Coast sub-region</i>									
Southport	99.7	99.4	98.4	88.0	96.3	0	9.8	met	met
<i>Ipswich sub-region</i>									
Flinders View	99.9	96.6	99.9	99.9	99.1	0	14.1	met	met
<u>Toowoomba</u>									
Toowoomba	83.1	90.1	99.0	99.8	93.1	1	12.1	not met	met
<u>Maryborough – Hervey Bay</u>									
Maryborough	0.0	0.0	0.0	70.0	17.7	0	i.d.	ND	ND
<u>Gladstone</u>									
South Gladstone	95.8	76.2	95.7	99.2	91.8	0	11.0	met	met
<u>Mackay</u>									
West Mackay	100.0	99.9	100.0	99.9	99.9	0	16.7	met	met
<u>Townsville</u>									
North Ward	99.7	99.9	100.0	99.9	99.9	0	15.2	met	met
<u>Mount Isa</u>									
The Gap	100.0	99.5	95.7	99.9	98.8	1	13.4	not met	met
i.d. = insufficient data to calculate value. ND = "not demonstrated" due to insufficient data in one or more quarters. AAQ NEPM standards for PM ₁₀ : 50 µg/m ³ (1-day average); 25 µg/m ³ (1-year average). AAQ NEPM goal for PM ₁₀ : standard not to be exceeded. When reporting compliance with the PM ₁₀ 1-day goal, PM ₁₀ monitoring data determined to be directly associated with an exceptional event (e.g. bushfire smoke, dust storm) is excluded.									

PM₁₀ monitoring is required in all regions because screening procedure arguments that pollutant concentrations are reasonably expected to be consistently below the relevant AAQ NEPM standard are not satisfied.

As no monitoring has been carried out to date, performance is 'not demonstrated' for the following regions:

- Bundaberg
- Cairns
- Rockhampton.

PM_{2.5}**Table 8. 2022 PM_{2.5} compliance summary**

Region/performance monitoring station	Data availability rates (% of hours)					Number of exceedances (days)	Annual mean ($\mu\text{g}/\text{m}^3$)	Performance against the standards and goals	
	Q1	Q2	Q3	Q4	Annual			1-day	1-year
<u>South East Queensland</u>									
<i>North Coast sub-region</i>									
Mountain Creek	99.9	99.8	99.0	99.8	99.6	0	6.0	met	met
<i>Brisbane sub-region</i>									
Rocklea	62.1	48.7	98.6	99.4	77.4	0	6.1	ND	ND
Springwood	99.0	71.3	98.3	97.3	91.5	0	5.6	ND	ND
<i>Gold Coast sub-region</i>									
Southport	99.7	99.5	98.4	88.0	96.4	0	4.1	met	met
<i>Ipswich sub-region</i>									
Flinders View	99.9	96.6	99.9	99.9	99.3	0	5.6	met	met
<u>Toowoomba</u>									
Toowoomba	83.1	90.1	99.0	99.8	93.1	0	5.1	met	met
<u>Maryborough – Hervey Bay</u>									
Maryborough	0.0	0.0	0.0	70.0	17.6	1	i.d.	not met	ND
<u>Gladstone</u>									
South Gladstone	95.8	96.6	96.9	99.2	97.2	0	4.4	met	met
<u>Mackay</u>									
West Mackay	100.0	99.9	98.1	97.0	98.7	0	5.9	met	met
<u>Townsville</u>									
North Ward	99.7	99.9	100.0	99.9	99.9	1*	5.8	not met	met
<u>Mount Isa</u>									
The Gap	100.0	99.5	95.7	99.9	98.8	0	4.1	met	met
<p>* Exceedance due to bushfire smoke (exceptional event). Excluded from determination of compliance with the 1-day goal. i.d. = insufficient data to calculate value. ND = "not demonstrated" due to insufficient data in one or more quarters. AAQ NEPM standards for PM_{2.5}: 25 $\mu\text{g}/\text{m}^3$ (1-day average); 8 $\mu\text{g}/\text{m}^3$ (1-year average). AAQ NEPM goal for PM_{2.5}: standard not to be exceeded. When reporting compliance with the PM_{2.5} 1-day goal, PM_{2.5} monitoring data determined to be directly associated with an exceptional event (e.g. bushfire smoke, dust storm) is excluded.</p>									

PM_{2.5} monitoring is required in all regions because screening procedure arguments that pollutant concentrations are reasonably expected to be consistently below the relevant AAQ NEPM advisory standard are not satisfied.

As no monitoring has been carried out to date, performance is 'not demonstrated' for the following regions:

- Bundaberg
- Cairns
- Rockhampton

Lead

Table 9. 2022 Lead compliance summary

Region/performance monitoring station	Data availability rates (% of hours)					Annual mean ($\mu\text{g}/\text{m}^3$)	Performance against the standard and goal
	Q1	Q2	Q3	Q4	Annual		1-year
Townsville							
Coast Guard	93.3	93.8	100.0	93.3	95.1	0.07	met
Mount Isa							
The Gap	100.0	100.0	100.0	100.0	100.0	0.10	met
AAQ NEPM standard for lead: $0.5 \mu\text{g}/\text{m}^3$ (1-year average). AAQ NEPM goal for lead: standard not to be exceeded.							

Regions which do not require monitoring on the basis of screening arguments that lead levels are reasonably expected to be consistently below the NEPM standard are:

- Bundaberg
- Cairns
- Gladstone
- Mackay
- Maryborough/Hervey Bay
- Rockhampton
- South East Queensland
- Toowoomba.

The phase-out of leaded motor vehicle fuel from March 2001 means that no significant sources of lead now exist in most Queensland regions. The exceptions to this are non-vehicle sources of lead such as metals smelting and handling of metal ore concentrates.

Lead concentrations measured at the Woolloongabba performance monitoring station in South East Queensland were less than ten per cent of the AAQ NEPM standard for both 2001 ($0.03 \mu\text{g}/\text{m}^3$) and 2002 ($0.02 \mu\text{g}/\text{m}^3$). These measurements demonstrate that compliance with the AAQ NEPM standard and goal has been achieved in South East Queensland, in accordance with the *National Environment Protection (Ambient Air Quality) Measure Technical Paper No. 9, Lead Monitoring*⁹. Lead monitoring in South East Queensland ceased in 2002.

Peak lead concentrations in South East Queensland were less than 40 per cent of the AAQ NEPM standard between 1999 and 2002 (see Section D – Pollutant distribution and trends). This means that, under screening procedure F in Table 1 of the AAQ NEPM Technical Paper No. 4, lead monitoring is not required in other Queensland centres with lower population and traffic density (with the exception of Townsville and Mount Isa where other non-vehicle lead emission sources exist).

⁹ available from www.nepc.gov.au/resource/ephc-archive-ambient-air-quality-nepm

Section C – Analysis of monitoring data against standards

This section presents time, date and location information for the following annual summary statistics for 2022:

- exceedances of AAQ NEPM standards and circumstances under which they occurred;
- annual maximum and second-highest daily concentrations for carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide, PM₁₀ and PM_{2.5}.

Exceedance details are presented in Tables 10 to 12 and summary statistics are presented in Table 13 to 19. Concentrations exceeding AAQ NEPM standards are shown in bold text in the summary tables.

Exceedance summary

In 2022, exceedances of AAQ NEPM standards at compliance monitoring sites in Queensland included sulfur dioxide in Mount Isa, PM₁₀ in Toowoomba and Mount Isa, and PM_{2.5} in Maryborough and Townsville.

Industrial operations (metals smelting and sulfuric acid manufacture) emit sulfur dioxide into the atmosphere in Mount Isa. Prior to April 2012 smelter operations were controlled to meet *Mount Isa Mines Agreement Act 1985* (MIM Act) air quality limits. From April 2012 to December 2015, smelter operations were under a Transitional Environmental Program (TEP) that set out a staged program of works to achieve compliance with the air quality objectives contained in the then *Queensland Environmental Protection (Air) Policy 2008* (now the *Queensland Environmental Protection (Air) Policy 2019* and equivalent to the AAQ NEPM standards for sulfur dioxide in force at that time). Since January 2016 smelter operations have been operating under an Environmental Authority (EA) (further amended in 2022) which sets alternative air quality limits for some air pollutants, including sulfur dioxide, as part of the Copper Smelter Extension Project. As smelter operations were only controlled to meet EA limit values, ambient sulfur dioxide concentrations at The Gap monitoring site exceeded the more stringent AAQ NEPM 1-hour and 1-day standards on 43 and 25 days respectively during 2022. A listing of these exceedances is provided in Table 10.

PM₁₀ concentrations exceeded the AAQ NEPM 1-day standard at the Toowoomba monitoring site on 21 November 2022. While a source could not be conclusively identified, from the high ratio of PM₁₀ to PM_{2.5} and short period when PM₁₀ concentrations were elevated (two hours) it was concluded that activities producing dust in close proximity to the monitoring station were most likely responsible.

Mount Isa has a semi-arid climate where winds associated with the passage of low pressure troughs through the region can result in high levels of windblown dust during dry conditions. Windblown dust generated by fresh to strong winds accompanying the passage of a cold front was responsible for an exceedance of the AAQ NEPM 1-day PM₁₀ standard at The Gap monitoring site on 30 May 2022. With the monitoring station being downwind of industrial facilities at the time of the elevated particle levels, PM₁₀ emissions from mining and industrial operations may have also contributed to this exceedance.

Details of the 2022 PM₁₀ exceedance are summarised in Table 11.

In Maryborough, the AAQ NEPM 1-day PM_{2.5} standard was exceeded on 26 November 2022. While a source could not be conclusively identified, from the high ratio of PM_{2.5} to PM₁₀ and short period when PM_{2.5} concentrations were elevated (four hours), smoke from a local fire is seen as the most likely explanation.

Smoke haze from hazard-reduction burns on Mount Stuart, south-west of Townsville, resulted in an exceedance of the AAQ NEPM 1-day PM_{2.5} standard at the North Ward, Townsville, monitoring site on 31 May 2022.

The details of the 2022 PM_{2.5} exceedance are summarised in Table 12.

Table 10. 2022 SO₂ exceedances

Region/performance monitoring station	Standard	Concentration (µg/m ³)	Date	Time	Circumstances
Mount Isa The Gap	1-hour	0.698	Mar 22	10	All exceedances at The Gap monitoring site were due to industry emissions
		0.499	Sep 15	21	
		0.381	Jul 25	12	
		0.360	Mar 22	11	
		0.353	Jan 14	9	
		0.332	Feb 18	11	
		0.311	Oct 20	17	
		0.310	Feb 18	12	
		0.296	Jan 14	10	
		0.295	May 29	12	
		0.261	Mar 25	4	
		0.261	Oct 18	13	
		0.244	Sep 08	12	
		0.226	Apr 27	15	
		0.216	Jan 15	9	
		0.212	Aug 27	15	
		0.206	Jan 17	7	
		0.205	Jul 29	13	
		0.201	Mar 25	5	
		0.198	Feb 18	10	
		0.195	Feb 10	10	
		0.194	Mar 03	13	
		0.194	Sep 07	15	
		0.193	Jun 04	17	
		0.192	Sep 08	11	
		0.186	Sep 15	17	
		0.185	Dec 22	9	
		0.182	Jan 15	10	
		0.182	Oct 27	15	
		0.180	Sep 15	20	
		0.180	Oct 24	16	
		0.177	Dec 12	11	
		0.167	Oct 31	23	
		0.163	Jan 19	22	
		0.163	Mar 14	20	
		0.160	Mar 24	11	
		0.158	Sep 08	13	
		0.157	May 29	13	
		0.156	Jun 04	18	
		0.155	Dec 22	8	
		0.151	Oct 19	10	
		0.147	Feb 02	18	
		0.146	Jan 17	22	
		0.143	Jan 20	16	
		0.141	Jan 17	3	
		0.138	Oct 19	11	
		0.136	Jan 20	17	
		0.135	Jan 19	8	
0.134	Oct 04	10			
0.131	Jan 17	23			
0.130	Jan 19	10			
0.129	Jan 01	8			
0.129	Feb 10	9			
0.128	Mar 15	18			
0.125	Feb 10	11			
0.125	Oct 24	14			
0.125	Nov 26	12			
0.124	Jan 18	10			
0.124	Mar 15	19			

AAQ NEPM standards for SO₂: 0.10 ppm (1-hour average); 0.02 ppm (1-day average).
AAQ NEPM goal for SO₂: standards not to be exceeded.

Table 10 (continued). 2022 SO₂ exceedances

Region/performance monitoring station	Standard	Concentration (µg/m ³)	Date	Time	Circumstances
Mount Isa The Gap	1-hour	0.124	Apr 09	18	All exceedances at The Gap monitoring site were due to industry emissions
		0.121	Nov 20	17	
		0.120	Nov 20	18	
		0.119	Mar 24	10	
		0.118	Aug 10	16	
		0.118	Oct 19	8	
		0.118	Oct 24	15	
		0.117	Oct 18	14	
		0.117	Oct 19	9	
		0.116	Feb 20	15	
		0.115	Mar 03	14	
		0.114	Jan 19	23	
		0.113	Sep 21	2	
		0.113	Oct 24	5	
		0.113	Oct 24	13	
		0.112	Oct 27	12	
		0.111	Aug 27	17	
		0.111	Sep 15	22	
		0.110	Apr 27	14	
		0.109	Jan 17	6	
		0.109	Aug 29	17	
		0.109	Oct 24	17	
		0.108	Feb 02	24	
		0.108	Oct 08	8	
		0.107	Oct 15	16	
		0.106	Jan 19	7	
		0.105	Oct 20	15	
0.104	Jan 19	11			
0.103	Jan 15	11			
0.102	Jan 01	7			
0.102	May 30	13			
0.101	Nov 26	18			
Mount Isa The Gap	1-day	0.058	Jan 17	24	All exceedances at The Gap monitoring site were due to industry emissions
		0.052	Mar 22	24	
		0.051	Sep 15	24	
		0.051	Oct 19	24	
		0.050	Jan 19	24	
		0.044	Jan 14	24	
		0.043	Feb 18	24	
		0.042	Oct 24	24	
		0.041	Sep 08	24	
		0.037	Jan 15	24	
		0.032	Mar 24	24	
		0.031	Jan 01	24	
		0.030	May 29	24	
		0.030	Oct 20	24	
		0.029	Jul 25	24	
		0.029	Nov 20	24	
		0.027	Feb 02	24	
		0.027	Feb 10	24	
		0.027	Dec 12	24	
		0.025	Oct 18	24	
0.025	Dec 22	24			
0.024	Jan 16	24			
0.024	Oct 27	24			
0.022	Nov 26	24			
0.021	Mar 25	24			

AAQ NEPM standards for SO₂: 0.10 ppm (1-hour average); 0.02 ppm (1-day average).
AAQ NEPM goal for SO₂: standards not to be exceeded.

Table 11. 2022 PM₁₀ exceedances

Region/performance monitoring station	Standard	Concentration (µg/m ³)	Date	Time	Circumstances
<u>Toowoomba</u> Toowoomba	1-day	53.9	Nov 21	24	Specific source not identified. High PM ₁₀ to PM _{2.5} ratio and short period when PM ₁₀ concentrations were elevated (2 hours) suggest short-term activities producing dust close to the monitoring station were the most likely cause.
<u>Mount Isa</u> The Gap	1-day	52.1	May 30	24	Wind-blown dust generated by fresh to strong winds accompanying the passage of a cold front during dry conditions. Possible contribution from industry emissions based on wind direction during the period PM ₁₀ concentrations were elevated.

AAQ NEPM standards for PM₁₀: 50 µg/m³ (1-day average); 25 µg/m³ (1-year average).
AAQ NEPM goal for PM₁₀: standards not to be exceeded.

When reporting compliance with the PM₁₀ 1-day goal, PM₁₀ monitoring data determined to be directly associated with an exceptional event (e.g. bushfire smoke, authorised hazard-reduction burn smoke, dust storm) is excluded.

Table 12. 2022 PM_{2.5} exceedances

Region/performance monitoring station	Standard	Concentration (µg/m ³)	Date	Time	Circumstances
<u>Maryborough – Hervey Bay</u> Maryborough	1-day	28.9	Nov 26	24	Specific source not identified. High PM _{2.5} to PM ₁₀ ratio and short period when PM _{2.5} concentrations were elevated (4 hours) suggests smoke from a local fire as the most likely cause.
<u>Townsville</u> North Ward	1-day	26.3	May 31	24	Exceedance was due to smoke from hazard-reduction burning

AAQ NEPM standards for PM_{2.5}: 25 µg/m³ (1-day average); 8 µg/m³ (1-year average).
AAQ NEPM goal for PM_{2.5}: standards not to be exceeded.

When reporting compliance with the PM_{2.5} 1-day goal, PM_{2.5} monitoring data determined to be directly associated with an exceptional event (e.g. bushfire smoke, authorised hazard-reduction burn smoke, dust storm) is excluded.

Summaries of maximum and second-highest pollutant concentrations

Table 13 to 19 present daily peak and second-highest concentrations, and the time and date on which these occurred, for all AAQ NEPM pollutants and monitoring sites for 2022.

Table 13. 2022 summary statistics for daily peak 8-hour average CO concentrations

Region/performance monitoring station	Number of valid days	Highest (ppm)	Highest (date:hour)	2 nd highest (ppm)	2 nd highest (date:hour)
<u>South East Queensland</u> Woolloongabba	351	0.87	Jun 23:24	0.76	Jun 15:24
<u>Gladstone</u> Boyne Island	284	0.21	Jun 04:24	0.20	Jul 23:10
AAQ NEPM standard for CO: 9.0 ppm (8-hour average). AAQ NEPM goal for CO: standard not to be exceeded.					

Table 14. 2022 summary statistics for daily peak 1-hour average NO₂ concentrations

Region/performance monitoring station	Number of valid days	Highest (ppm)	Highest (date:hour)	2 nd highest (ppm)	2 nd highest (date:hour)
<u>South East Queensland</u> Mountain Creek	363	0.028	Jun 01:08	0.026	Jun 22:19
Deception Bay	361	0.033	Aug 17:20	0.032	Jul 29:20
Rocklea	277	0.040	Jun 16:18	0.038	Jul 29:19
Springwood	348	0.033	Aug 19:09	0.030	Jul 15:08 Jul 19:08
Southport	364	0.029	Jun 16:19	0.028	Jul 28:20 Aug 18:21 Aug 25:21
Flinders View	356	0.044	Jan 08:21	0.040	Jun 16:18
<u>Gladstone</u> South Gladstone	364	0.032	Jul 26:12	0.029	Jun 09:18 Aug 27:16
<u>Townsville</u> North Ward	364	0.024	May 31:22	0.022	Jul 12:20
AAQ NEPM standard for NO ₂ : 0.080 ppm (1-hour average). AAQ NEPM goal for NO ₂ : standards not to be exceeded.					

Table 15. 2022 summary statistics for daily peak 8-hour average O₃ concentrations

Region/performance monitoring station	Number of valid days	Highest (ppm)	Highest (date:hour)	2 nd highest (ppm)	2 nd highest (date:hour)
South East Queensland Mountain Creek	360	0.042	Aug 19:11	0.040	Sep 30:10 Oct 25:11 Nov 15:12 Nov 25:08
Deception Bay	361	0.057	Nov 25:08	0.054	Nov 26:10
Rocklea	281	0.052	Nov 25:10	0.043	Nov 26:09
Springwood	344	0.048	Mar 05:11	0.047	Nov 25:12
Southport	363	0.050	Oct 27:11	0.048	Oct 25:09
Flinders View	361	0.047	Dec 08:10	0.046	Dec 07:10
AAQ NEPM standard for O ₃ : 0.065 ppm (8-hour average). AAQ NEPM goal for O ₃ : standard not to be exceeded.					

Table 16. 2022 summary statistics for daily peak 1-hour average SO₂ concentrations

Region/performance monitoring station	Number of valid days	Highest (ppm)	Highest (date:hour)	2 nd highest (ppm)	2 nd highest (date:hour)
South East Queensland Springwood	357	0.006	Sep 30:02	0.005	Aug 04:24 Oct 31:23 Dec 06:19
Flinders View	365	0.008	Jun 05:14	0.003	Jun 08:08 Jun 09:07 Jun 13:07 Jun 23:08 Jun 24:19 Jul 28:07 Aug 25:07 Sep 12:18
Gladstone South Gladstone	365	0.078	Feb 13:15	0.058	Mar 17:13 Aug 27:15 Dec 31:16
Townsville North Ward	365	0.006	Jun 04:09 Sep 10:11		
Mount Isa The Gap	341	0.698	Mar 22:10	0.499	Sep 15:21
Bold text indicates a value greater than the AAQ NEPM standard. AAQ NEPM standard for SO ₂ : 0.100 ppm (1-hour average). AAQ NEPM goal for SO ₂ : standard not to be exceeded.					

Table 17. 2022 summary statistics for daily 1-day average SO₂ concentrations

Region/performance monitoring station	Number of valid days	Highest (ppm)	Highest (date)	2 nd highest (ppm)	2 nd highest (date)
South East Queensland Springwood	357	0.002	Sep 16 Sep 30 Oct 27 Oct 31		
Flinders View	365	0.001	153 days in total		
Gladstone South Gladstone	365	0.015	Dec 17	0.012	Aug 27 Oct 18 Dec 18
Townsville North Ward	365	0.001	14 days in total		
Mount Isa The Gap	341	0.058	Jan 17	0.052	Mar 22
Bold text indicates a value greater than the AAQ NEPM standard. AAQ NEPM standard for SO ₂ : 0.020 ppm (1-day average). AAQ NEPM goal for SO ₂ : standard not to be exceeded.					

Table 18. 2022 summary statistics for daily 1-day average PM₁₀ concentrations

Region/performance monitoring station	Number of valid days	Highest (µg/m ³)	Highest (date)	2 nd highest (µg/m ³)	2 nd highest (date)
South East Queensland Mountain Creek [‡]	364	36.9	Jan 07	34.6	Nov 19
Rocklea [†]	283	30.9	Nov 25	28.8	Jun 23
Springwood [†]	333	23.7	May 13	22.7	Aug 19
Southport [†]	352	35.4	May 13	27.2	May 12
Flinders View [‡]	361	29.2	Sep 20	26.8	Jun 26
Toowoomba Toowoomba [‡]	331	53.9	Nov 21	25.8	Nov 23
Maryborough – Hervey Bay Maryborough [‡]	64	42.9	Nov 26	37.2	Dec 29
Gladstone South Gladstone [†]	333	24.9	Jul 30	24.2	Dec 10
Mackay West Mackay [‡]	361	33.9	Feb 05	28.5	Aug 26
Townsville North Ward [‡]	365	41.1	May 31	40.1	Jun 01
Mount Isa The Gap [†]	359	52.1	May 30	43.6	Sep 21
Bold text indicates a value greater than the AAQ NEPM standard. † Monitoring by TEOM Model 1405DF instrumentation fitted with FDMS. ‡ Monitoring by TAPI T640X optical aerosol spectrometer. AAQ NEPM standard for PM ₁₀ : 50 µg/m ³ (1-day average). AAQ NEPM goal for PM ₁₀ : standard not to be exceeded (excluding exceptional events).					

Table 19. 2022 summary statistics for daily 1-day average PM_{2.5} concentrations

Region/performance monitoring station	Number of valid days	Highest (µg/m ³)	Highest (date)	2 nd highest (µg/m ³)	2 nd highest (date)
South East Queensland					
Mountain Creek [†]	364	21.0	Aug 19	14.2	Jan 07
Rocklea [†]	284	17.5	Nov 25	16.7	Jun 26
Springwood [†]	333	17.8	Aug 19	17.4	Jun 26
Southport [†]	352	13.9	May 13	12.8	Aug 19
Flinders View [‡]	361	17.0	Jun 26	15.7	Sep 20
Toowoomba					
Toowoomba [‡]	331	15.1	Nov 11	12.6	Aug 12
Maryborough – Hervey Bay					
Maryborough [‡]	64	28.9	Nov 26	11.9	Dec 31
Gladstone					
South Gladstone [†]	359	11.7	Mar 24	10.8	Jun 02
Mackay					
West Mackay [‡]	361	14.9	Aug 18	11.8	Sep 24
Townsville					
North Ward [‡]	365	26.3	May 31	24.0	Jun 01
Mount Isa					
The Gap [‡]	359	14.6	Oct 31	12.2	Nov 19
<p>Bold text indicates a value greater than the AAQ NEPM standard.</p> <p>[†] Monitoring by TEOM Model 1405DF instrumentation fitted with FDMS.</p> <p>[‡] Monitoring by TAPI T640X optical aerosol spectrometer.</p> <p>AAQ NEPM standard for PM_{2.5}: 25 µg/m³ (1-day average).</p> <p>AAQ NEPM goal for PM_{2.5}: standard not to be exceeded (excluding exceptional events).</p>					

Section D – Pollutant distribution and trends

This section presents results of further analysis of the monitoring data. Percentiles of 2022 daily peak concentrations are presented for each monitoring station and pollutant. Daily peak concentrations were only included in this analysis if at least 75 per cent of the daily data were valid. Percentiles for eight-hour average carbon monoxide and eight-hour average ozone were calculated based on daily peak concentrations. Daily peak concentrations were calculated from running hourly values, including those that overlap from one calendar day to the next. Concentrations exceeding the corresponding AAQ NEPM standard are shown in bold text.

The tables in this section also present annual statistics for all trend monitoring stations identified in the Queensland AAQ NEPM monitoring plan. For regions and sub-regions where a pollutant is not monitored at a trend station, annual statistics are presented for performance monitoring stations. Concentrations where less than 75 per cent of the annual data were valid are shown in italics.

Carbon monoxide

Table 20. 2022 percentiles of daily peak 8-hour average CO concentrations

Region/performance monitoring station	Data availability (% of days)	Maximum (ppm)	Percentiles (ppm)					
			99 th	98 th	95 th	90 th	75 th	50 th
South East Queensland Woolloongabba	96.2	0.87	0.75	0.66	0.56	0.41	0.29	0.23
Gladstone Boyne Island	77.8	0.21	0.20	0.18	0.16	0.15	0.11	0.10
AAQ NEPM standard for CO: 9.0 ppm (8-hour average). AAQ NEPM 2022 goal for CO: standard not to be exceeded.								

Table 21. Percentiles of daily peak 8-hour average CO concentrations at Woolloongabba (1998–2022)

Year	Data availability (% of days)	No. of exceedances (days)	Maximum (ppm)	Percentiles (ppm)			
				99 th	98 th	95 th	90 th
1998	<i>57.0*</i>	0	5.1	5.0	4.4	4.1	3.4
1999	<i>92.3*</i>	0	5.7	5.3	4.9	4.0	3.2
2000	92.9	0	5.0	4.7	4.2	3.4	2.9
2001	97.0	0	7.0	4.4	4.3	3.9	3.2
2002	97.0	0	4.7	4.7	4.1	3.6	3.0
2003	<i>83.3*</i>	0	5.4	4.4	4.2	3.5	2.7
2004	98.9	0	4.7	4.2	3.8	3.3	2.6
2005	95.1	0	4.0	3.5	3.3	2.6	2.1
2006	95.3	0	4.0	3.7	3.1	2.4	2.1
2007	<i>26.0*</i>	0	1.1	1.1	1.1	1.1	1.0
2008	<i>66.9*</i>	0	2.9	2.7	2.5	2.2	1.8
2009	100.0	0	2.4	2.3	2.1	1.8	1.5
2010	97.0	0	2.7	1.9	1.8	1.3	1.1
2011	99.5	0	1.9	1.7	1.6	1.3	1.0
2012	98.9	0	1.8	1.7	1.7	1.4	1.1
2013	99.7	0	1.6	1.4	1.3	1.1	0.9
2014	97.0	0	1.9	1.6	1.5	1.0	0.6
2015	98.1	0	1.6	1.4	1.3	1.0	0.8
2016	<i>45.8*</i>	0	1.2	1.2	1.2	1.0	0.8
2017	<i>55.9*</i>	0	1.1	1.0	0.9	0.8	0.7
2018	99.7	0	1.2	0.9	0.7	0.7	0.6
2019	95.3	0	1.2	1.0	0.8	0.7	0.6
2020	98.9	0	0.9	0.8	0.7	0.6	0.5
2021	97.8	0	0.9	0.8	0.7	0.6	0.5
2022	96.2	0	0.9	0.8	0.7	0.6	0.4

* Data availability less than 75% for one or more quarters.

Years shown in italics have less than 75% annual data availability.

AAQ NEPM standard for CO: 9.0 ppm (8-hour average).

AAQ NEPM goal for CO (until 2020): standard exceeded on no more than one day per year.

AAQ NEPM goal for CO (from 2021): standard not to be exceeded.

Table 22. Percentiles of daily peak 8-hour average CO concentrations at North Toowoomba (2003–2010)

Year	Data availability (% of days)	No. of exceedances (days)	Maximum (ppm)	Percentiles (ppm)			
				99 th	98 th	95 th	90 th
2003	42.4*	0	2.6	2.5	2.3	2.2	1.9
2004	97.0	0	3.4	2.8	2.5	2.0	1.5
2005	99.5	0	2.3	1.8	1.7	1.1	0.7
2006	95.3	0	1.9	1.8	1.7	1.3	1.1
2007	97.5	0	2.2	1.8	1.6	1.0	0.4
2008	98.4	0	1.9	1.7	1.5	1.1	0.8
2009	100.0	0	1.8	1.4	1.2	1.0	0.7
2010	92.6*	0	1.7	1.5	1.3	0.9	0.5

* Data availability less than 75% for one or more quarters.
Years shown in italics have less than 75% annual data availability.
AAQ NEPM standard for CO: 9.0 ppm (8-hour average).
AAQ NEPM goal for CO (until 2020): standard exceeded on no more than one day per year.
AAQ NEPM goal for CO (from 2021): standard not to be exceeded.

Table 23. Percentiles of daily peak 8-hour average CO concentrations at Boyne Island (2008–2022)

Year	Data availability (% of days)	No. of exceedances (days)	Maximum (ppm)	Percentiles (ppm)			
				99 th	98 th	95 th	90 th
2008	23.8*	0	0.3	0.3	0.3	0.2	0.2
2009	94.0	0	2.1	0.7	0.5	0.2	0.1
2010	95.1	0	1.0	0.8	0.4	0.2	0.1
2011	94.5	0	2.8	1.5	0.6	0.3	0.2
2012	99.2	0	1.3	0.5	0.4	0.3	0.3
2013	99.5	0	0.7	0.5	0.4	0.3	0.3
2014	98.9	0	0.9	0.4	0.3	0.2	0.2
2015	93.4	0	0.4	0.3	0.3	0.2	0.2
2016	99.2	0	1.4	0.4	0.3	0.2	0.2
2017	99.2	0	1.4	0.4	0.3	0.2	0.2
2018	94.2	0	0.4	0.1	0.1	0.1	0.1
2019	98.4	0	0.8	0.4	0.3	0.2	0.1
2020	100.0	0	0.3	0.3	0.3	0.2	0.2
2021	99.5	0	0.3	0.3	0.2	0.2	0.1
2022	77.8*	0	0.2	0.2	0.2	0.2	0.2

* Data availability less than 75% for one or more quarters.
Years shown in italics have less than 75% annual data availability.
AAQ NEPM standard for CO: 9.0 ppm (8-hour average).
AAQ NEPM goal for CO (until 2020): standard exceeded on no more than one day per year.
AAQ NEPM goal for CO (from 2021): standard not to be exceeded.

Nitrogen dioxide

Table 24. 2022 percentiles of daily peak 1-hour average NO₂ concentrations

Region/performance monitoring station	Data availability (% of days)	Maximum (ppm)	Percentiles (ppm)						
			99 th	98 th	95 th	90 th	75 th	50 th	
<u>South East Queensland</u>									
Mountain Creek	99.5	0.028	0.024	0.023	0.021	0.018	0.011	0.007	
Deception Bay	98.9	0.033	0.030	0.028	0.025	0.022	0.016	0.010	
Rocklea	75.9	0.040	0.037	0.034	0.031	0.028	0.022	0.015	
Springwood	95.3	0.033	0.030	0.026	0.024	0.022	0.018	0.012	
Southport	99.7	0.029	0.028	0.026	0.022	0.020	0.015	0.010	
Flinders View	97.5	0.044	0.038	0.034	0.030	0.026	0.020	0.013	
<u>Gladstone</u>									
South Gladstone	99.7	0.032	0.028	0.027	0.024	0.021	0.017	0.013	
<u>Townsville</u>									
North Ward	99.7	0.024	0.020	0.019	0.015	0.013	0.008	0.005	
AAQ NEPM standard for NO ₂ : 0.08 ppm (1-hour average). AAQ NEPM goal for NO ₂ : standard not to be exceeded.									

Table 25. Percentiles of daily peak 1-hour average NO₂ concentrations at Mountain Creek (2002–2022)

Year	Data availability (% of days)	No. of exceedances ^a (days)	Maximum (ppm)	Annual average (ppm)	Percentiles (ppm)			
					99 th	98 th	95 th	90 th
2002	91.5*	0 (0)	0.036	0.006	0.036	0.034	0.031	0.028
2003	91.4	0 (0)	0.033	0.005	0.029	0.028	0.026	0.023
2004	98.1	0 (0)	0.041	0.005	0.036	0.035	0.029	0.026
2005	100.0	0 (0)	0.032	0.005	0.031	0.028	0.025	0.022
2006	100.0	0 (0)	0.035	0.005	0.032	0.030	0.027	0.024
2007	100.0	0 (0)	0.034	0.004	0.030	0.028	0.026	0.022
2008	95.6	0 (0)	0.030	0.004	0.030	0.029	0.026	0.021
2009	99.7	0 (0)	0.030	0.004	0.029	0.027	0.024	0.021
2010	98.6	0 (0)	0.029	0.005	0.028	0.026	0.023	0.021
2011	97.8	0 (0)	0.032	0.004	0.027	0.027	0.023	0.021
2012	96.7	0 (0)	0.030	0.004	0.028	0.027	0.022	0.021
2013	99.7	0 (0)	0.031	0.004	0.029	0.026	0.023	0.020
2014	99.5	0 (0)	0.031	0.004	0.027	0.026	0.023	0.021
2015	100.0	0 (0)	0.030	0.003	0.027	0.024	0.021	0.019
2016	100.0	0 (0)	0.031	0.004	0.029	0.025	0.023	0.021
2017	99.7	0 (0)	0.044	0.004	0.032	0.032	0.027	0.023
2018	99.7	0 (0)	0.032	0.004	0.030	0.029	0.024	0.020
2019	99.7	0 (0)	0.035	0.004	0.028	0.027	0.024	0.019
2020	100.0	0 (0)	0.028	0.003	0.025	0.024	0.021	0.017
2021	99.7	0 (0)	0.026	0.003	0.022	0.022	0.020	0.019
2022	99.5	0 (0)	0.028	0.003	0.024	0.023	0.021	0.018

* Data availability less than 75% for one or more quarters.

AAQ NEPM standards for NO₂ (until 2020): 0.12 ppm (1-hour average); 0.03 ppm (1-year average).

AAQ NEPM standards for NO₂ (from 2021): 0.08 ppm (1-hour average); 0.015 ppm (1-year average).

AAQ NEPM goal for NO₂ (until 2020): 1-hour standard exceeded on no more than one day per year.

AAQ NEPM goal for NO₂ (from 2021): standards not to be exceeded.

^a First value shows number of exceedances of the 1-hour standard adopted in 2021. Value in brackets shows number of exceedances of the previous 1-hour standard in place until 2020.

Table 26. Percentiles of daily peak 1-hour average NO₂ concentrations at Deception Bay (1995–2022)

Year	Data availability (% of days)	No. of exceedances ^a (days)	Maximum (ppm)	Annual average (ppm)	Percentiles (ppm)			
					99 th	98 th	95 th	90 th
1995	93.4	0 (0)	0.058	0.007	0.054	0.046	0.038	0.033
1996	68.6*	0 (0)	0.048	<i>i.d.</i>	0.043	0.042	0.034	0.030
1997	95.6	0 (0)	0.043	0.007	0.038	0.036	0.032	0.028
1998	97.5	0 (0)	0.066	0.006	0.050	0.039	0.031	0.026
1999	96.4	0 (0)	0.058	0.006	0.039	0.030	0.028	0.024
2000	99.5	0 (0)	0.053	0.005	0.038	0.034	0.029	0.025
2001	95.1	0 (0)	0.047	0.006	0.040	0.039	0.034	0.030
2002	87.4*	0 (0)	0.065	0.006	0.044	0.042	0.036	0.030
2003	94.5	0 (0)	0.053	0.006	0.036	0.033	0.030	0.028
2004	97.8	0 (0)	0.045	0.006	0.036	0.036	0.030	0.027
2005	95.3	0 (0)	0.034	0.006	0.033	0.030	0.028	0.026
2006	99.5	0 (0)	0.044	0.008	0.035	0.033	0.028	0.027
2007	94.2*	0 (0)	0.063	0.006	0.035	0.033	0.030	0.027
2008	84.7*	0 (0)	0.037	0.008	0.034	0.031	0.029	0.027
2009	100.0	0 (0)	0.036	0.005	0.030	0.028	0.026	0.024
2010	98.9	0 (0)	0.037	0.005	0.033	0.033	0.028	0.024
2011	99.5	0 (0)	0.035	0.006	0.033	0.030	0.029	0.027
2012	97.8	0 (0)	0.040	0.006	0.034	0.033	0.030	0.027
2013	67.9*	0 (0)	0.033	<i>i.d.</i>	0.033	0.031	0.029	0.025
2014	98.9	0 (0)	0.041	0.005	0.035	0.034	0.030	0.026
2015	100.0	0 (0)	0.048	0.005	0.033	0.032	0.029	0.025
2016	100.0	0 (0)	0.037	0.005	0.035	0.034	0.030	0.026
2017	100.0	0 (0)	0.038	0.005	0.036	0.033	0.030	0.027
2018	99.7	0 (0)	0.041	0.005	0.034	0.031	0.029	0.026
2019	97.0	0 (0)	0.038	0.005	0.035	0.034	0.028	0.024
2020	99.5	0 (0)	0.037	0.004	0.032	0.029	0.028	0.023
2021	99.7	0 (0)	0.034	0.005	0.032	0.030	0.027	0.023
2022	98.9	0 (0)	0.033	0.004	0.030	0.028	0.025	0.022

* Data availability less than 75% for one or more quarters.

Years shown in italics have less than 75% annual data availability.

i.d. = insufficient data to calculate value.

AAQ NEPM standards for NO₂ (until 2020): 0.12 ppm (1-hour average); 0.03 ppm (1-year average).

AAQ NEPM standards for NO₂ (from 2021): 0.08 ppm (1-hour average); 0.015 ppm (1-year average).

AAQ NEPM goal for NO₂ (until 2020): 1-hour standard exceeded on no more than one day per year.

AAQ NEPM goal for NO₂ (from 2021): standards not to be exceeded.

^a First value shows number of exceedances of the 1-hour standard adopted in 2021. Value in brackets shows number of exceedances of the previous 1-hour standard in place until 2020.

Table 27. Percentiles of daily peak 1-hour average NO₂ concentrations at Rocklea (1990–2022)

Year	Data availability (% of days)	No. of exceedances ^a (days)	Maximum (ppm)	Annual average (ppm)	Percentiles (ppm)			
					99 th	98 th	95 th	90 th
1991	89.0	4 (0)	0.113	0.015	0.085	0.071	0.061	0.052
1992	77.9*	2 (2)	0.157	0.013	0.072	0.065	0.052	0.042
1993	89.6	2 (0)	0.086	0.013	0.066	0.058	0.047	0.040
1994	91.8	1 (0)	0.096	0.012	0.062	0.057	0.051	0.045
1995	79.5*	0 (0)	0.066	0.010	0.050	0.048	0.040	0.036
1996	90.4*	0 (0)	0.058	0.010	0.055	0.044	0.040	0.036
1997	95.6	0 (0)	0.061	0.010	0.043	0.042	0.039	0.033
1998	96.2	0 (0)	0.056	0.009	0.046	0.041	0.038	0.033
1999	91.2*	0 (0)	0.054	0.009	0.044	0.042	0.034	0.029
2000	96.7	0 (0)	0.059	0.009	0.046	0.043	0.037	0.032
2001	98.4	0 (0)	0.049	0.009	0.042	0.041	0.035	0.032
2002	98.4	0 (0)	0.051	0.009	0.046	0.041	0.037	0.033
2003	97.0	0 (0)	0.050	0.009	0.039	0.038	0.033	0.030
2004	95.6	0 (0)	0.049	0.009	0.047	0.043	0.037	0.033
2005	98.6	0 (0)	0.046	0.009	0.042	0.041	0.036	0.031
2006	96.4	0 (0)	0.046	0.011	0.039	0.035	0.031	0.027
2007	100.0	0 (0)	0.044	0.008	0.041	0.040	0.035	0.031
2008	79.3*	0 (0)	0.047	0.008	0.041	0.034	0.030	0.027
2009	98.4	0 (0)	0.039	0.007	0.035	0.034	0.031	0.027
2010	98.4	0 (0)	0.039	0.007	0.037	0.033	0.028	0.023
2011	2.7*	0 (0)	0.020	<i>i.d.</i>	0.020	0.020	0.020	0.020
2012	63.9*	0 (0)	0.039	<i>i.d.</i>	0.035	0.032	0.030	0.027
2013	98.6	0 (0)	0.037	0.007	0.034	0.032	0.030	0.025
2014	99.5	0 (0)	0.047	0.007	0.040	0.037	0.032	0.027
2015	100.0	0 (0)	0.041	0.006	0.036	0.033	0.027	0.024
2016	99.5	0 (0)	0.057	0.007	0.037	0.034	0.028	0.025
2017	99.5	0 (0)	0.042	0.006	0.036	0.033	0.027	0.025
2018	100.0	0 (0)	0.045	0.007	0.042	0.040	0.034	0.029
2019	98.6	0 (0)	0.041	0.007	0.038	0.036	0.031	0.025
2020	99.7	0 (0)	0.033	0.006	0.031	0.029	0.025	0.022
2021	99.2	0 (0)	0.034	0.006	0.031	0.026	0.025	0.022
2022	75.9*	0 (0)	0.040	0.007	0.037	0.034	0.031	0.028

Bold text indicates a value greater than the AAQ NEPM standard.

* Data availability less than 75% for one or more quarters.

Years shown in italics have less than 75% annual data availability.

i.d. = insufficient data to calculate value.

AAQ NEPM standards for NO₂ (until 2020): 0.12 ppm (1-hour average); 0.03 ppm (1-year average).

AAQ NEPM standards for NO₂ (from 2021): 0.08 ppm (1-hour average); 0.015 ppm (1-year average).

AAQ NEPM goal for NO₂ (until 2020): 1-hour standard exceeded on no more than one day per year.

AAQ NEPM goal for NO₂ (from 2021): standards not to be exceeded.

^a First value shows number of exceedances of the 1-hour standard adopted in 2021. Value in brackets shows number of exceedances of the previous 1-hour standard in place until 2020.

Table 28. Percentiles of daily peak 1-hour average NO₂ concentrations at Flinders View (1995–2022)

Year	Data availability (% of days)	No. of exceedances ^a (days)	Maximum (ppm)	Annual average (ppm)	Percentiles (ppm)			
					99 th	98 th	95 th	90 th
1995	91.2*	0 (0)	0.038	0.009	0.037	0.035	0.031	0.028
1996	98.4	0 (0)	0.055	0.009	0.050	0.044	0.037	0.033
1997	96.4	0 (0)	0.046	0.009	0.042	0.040	0.036	0.030
1998	96.4	0 (0)	0.048	0.009	0.041	0.039	0.034	0.030
1999	98.4	0 (0)	0.046	0.008	0.039	0.038	0.032	0.029
2000	99.2	0 (0)	0.042	0.008	0.040	0.038	0.034	0.031
2001	100.0	0 (0)	0.045	0.009	0.037	0.036	0.034	0.031
2002	88.8*	0 (0)	0.062	0.010	0.057	0.043	0.036	0.033
2003	94.0	0 (0)	0.046	0.009	0.039	0.037	0.033	0.029
2004	100.0	0 (0)	0.054	0.009	0.047	0.038	0.034	0.030
2005	100.0	0 (0)	0.055	0.008	0.046	0.038	0.032	0.028
2006	100.0	0 (0)	0.050	0.012	0.043	0.041	0.035	0.032
2007	96.2	0 (0)	0.039	0.008	0.036	0.035	0.031	0.029
2008	96.7	0 (0)	0.040	0.010	0.039	0.038	0.031	0.028
2009	99.5	0 (0)	0.042	0.008	0.038	0.036	0.034	0.030
2010	99.5	0 (0)	0.039	0.008	0.037	0.034	0.028	0.025
2011	99.5	0 (0)	0.040	0.008	0.036	0.034	0.031	0.028
2012	99.7	0 (0)	0.039	0.007	0.037	0.035	0.028	0.025
2013	100.0	0 (0)	0.043	0.008	0.038	0.037	0.032	0.029
2014	95.9	0 (0)	0.050	0.008	0.046	0.043	0.036	0.030
2015	100.0	0 (0)	0.041	0.006	0.038	0.036	0.031	0.026
2016	98.6	0 (0)	0.046	0.008	0.040	0.038	0.033	0.029
2017	98.9	0 (0)	0.044	0.007	0.040	0.040	0.032	0.030
2018	99.7	0 (0)	0.051	0.008	0.045	0.041	0.035	0.032
2019	99.2	0 (0)	0.043	0.007	0.038	0.038	0.033	0.028
2020	99.7	0 (0)	0.038	0.007	0.036	0.035	0.031	0.026
2021	100.0	0 (0)	0.040	0.006	0.034	0.033	0.030	0.027
2022	97.5	0 (0)	0.044	0.006	0.038	0.034	0.030	0.026

* Data availability less than 75% for one or more quarters.

AAQ NEPM standards for NO₂ (until 2020): 0.12 ppm (1-hour average); 0.03 ppm (1-year average).

AAQ NEPM standards for NO₂ (from 2021): 0.08 ppm (1-hour average); 0.015 ppm (1-year average).

AAQ NEPM goal for NO₂ (until 2020): 1-hour standard exceeded on no more than one day per year.

AAQ NEPM goal for NO₂ (from 2021): standards not to be exceeded.

^a First value shows number of exceedances of the 1-hour standard adopted in 2021. Value in brackets shows number of exceedances of the previous 1-hour standard in place until 2020.

Table 29. Percentiles of daily peak 1-hour average NO₂ concentrations at North Toowoomba (2003–2010)

Year	Data availability (% of days)	No. of exceedances ^a (days)	Maximum (ppm)	Annual average (ppm)	Percentiles (ppm)			
					99 th	98 th	95 th	90 th
2003	43.7*	0 (0)	0.057	<i>i.d.</i>	0.042	0.038	0.032	0.029
2004	98.4	0 (0)	0.054	0.007	0.041	0.039	0.035	0.031
2005	99.2	0 (0)	0.057	0.006	0.038	0.036	0.033	0.030
2006	94.8	0 (0)	0.042	0.005	0.037	0.033	0.031	0.027
2007	96.4	0 (0)	0.043	0.005	0.039	0.038	0.034	0.029
2008	98.1	0 (0)	0.041	0.007	0.035	0.033	0.031	0.029
2009	100.0	0 (0)	0.044	0.006	0.040	0.038	0.033	0.029
2010	93.2*	0 (0)	0.042	0.005	0.036	0.033	0.030	0.026

* Data availability less than 75% for one or more quarters.

Years shown in italics have less than 75% annual data availability.

i.d. = insufficient data to calculate value.

AAQ NEPM standards for NO₂ (until 2020): 0.12 ppm (1-hour average); 0.03 ppm (1-year average).

AAQ NEPM standards for NO₂ (from 2021): 0.08 ppm (1-hour average); 0.015 ppm (1-year average).

AAQ NEPM goal for NO₂ (until 2020): 1-hour standard exceeded on no more than one day per year.

AAQ NEPM goal for NO₂ (from 2021): standards not to be exceeded.

^a First value shows number of exceedances of the 1-hour standard adopted in 2021. Value in brackets shows number of exceedances of the previous 1-hour standard in place until 2020.

Table 30. Percentiles of daily peak 1-hour average NO₂ concentrations at South Gladstone (1994–2022)

Year	Data availability (% of days)	No. of exceedances ^a (days)	Maximum (ppm)	Annual average (ppm)	Percentiles (ppm)			
					99 th	98 th	95 th	90 th
1994	81.6*	0 (0)	0.049	0.005	0.047	0.044	0.038	0.028
1995	91.8	0 (0)	0.038	0.005	0.030	0.028	0.025	0.022
1996	84.2*	0 (0)	0.045	0.006	0.039	0.035	0.032	0.029
1997	65.8*	0 (0)	0.031	<i>i.d.</i>	0.030	0.029	0.022	0.017
1998	72.9*	0 (0)	0.022	<i>i.d.</i>	0.020	0.018	0.015	0.012
1999	88.8*	0 (0)	0.034	0.003	0.029	0.029	0.025	0.021
2000	97.8	0 (0)	0.031	0.003	0.025	0.024	0.022	0.019
2001	96.4	0 (0)	0.048	0.004	0.033	0.031	0.026	0.023
2002	98.4	0 (0)	0.036	0.004	0.031	0.029	0.026	0.021
2003	95.3	0 (0)	0.035	0.004	0.030	0.027	0.024	0.022
2004	100.0	0 (0)	0.042	0.004	0.030	0.029	0.026	0.023
2005	99.7	0 (0)	0.035	0.004	0.030	0.028	0.024	0.022
2006	100.0	0 (0)	0.034	0.003	0.027	0.027	0.024	0.021
2007	98.4	0 (0)	0.035	0.005	0.030	0.029	0.027	0.024
2008	98.6	0 (0)	0.033	0.003	0.030	0.026	0.023	0.020
2009	97.5	0 (0)	0.033	0.006	0.029	0.028	0.025	0.022
2010	98.4	0 (0)	0.033	0.006	0.031	0.029	0.026	0.023
2011	96.7	0 (0)	0.035	0.006	0.034	0.032	0.029	0.026
2012	94.0*	0 (0)	0.042	0.007	0.037	0.035	0.032	0.029
2013	95.3	0 (0)	0.042	0.007	0.037	0.035	0.032	0.027
2014	99.7	0 (0)	0.046	0.005	0.033	0.032	0.029	0.025
2015	99.7	0 (0)	0.043	0.005	0.036	0.032	0.028	0.025
2016	100.0	0 (0)	0.037	0.005	0.035	0.032	0.029	0.026
2017	99.2	0 (0)	0.074	0.005	0.033	0.030	0.027	0.025
2018	95.3	0 (0)	0.034	0.005	0.033	0.031	0.027	0.025
2019	97.3	0 (0)	0.036	0.005	0.031	0.030	0.026	0.023
2020	98.9	0 (0)	0.032	0.005	0.030	0.029	0.027	0.022
2021	90.7*	0 (0)	0.032	0.005	0.028	0.027	0.024	0.022
2022	99.7	0 (0)	0.032	0.004	0.028	0.027	0.024	0.021

* Data availability less than 75% for one or more quarters.

Years shown in italics have less than 75% annual data availability.

i.d. = insufficient data to calculate value.

AAQ NEPM standards for NO₂ (until 2020): 0.12 ppm (1-hour average); 0.03 ppm (1-year average).

AAQ NEPM standards for NO₂ (from 2021): 0.08 ppm (1-hour average); 0.015 ppm (1-year average).

AAQ NEPM goal for NO₂ (until 2020): 1-hour standard exceeded on no more than one day per year.

AAQ NEPM goal for NO₂ (from 2021): standards not to be exceeded.

^a First value shows number of exceedances of the 1-hour standard adopted in 2021. Value in brackets shows number of exceedances of the previous 1-hour standard in place until 2020.

Table 31. Percentiles of daily peak 1-hour average NO₂ concentrations at Pimlico (2004–2016)

Year	Data availability (% of days)	No. of exceedances ^a (days)	Maximum (ppm)	Annual average (ppm)	Percentiles (ppm)			
					99 th	98 th	95 th	90 th
2004	59.0*	0 (0)	0.034	<i>i.d.</i>	0.032	0.031	0.030	0.027
2005	100.0	0 (0)	0.034	0.005	0.032	0.031	0.028	0.024
2006	98.6	0 (0)	0.034	0.006	0.032	0.029	0.025	0.022
2007	99.2	0 (0)	0.035	0.004	0.027	0.024	0.023	0.020
2008	100.0	0 (0)	0.030	0.006	0.028	0.027	0.025	0.023
2009	97.0	0 (0)	0.035	0.005	0.030	0.028	0.025	0.023
2010	99.5	0 (0)	0.032	0.005	0.028	0.026	0.023	0.020
2011	98.9	0 (0)	0.042	0.006	0.038	0.036	0.031	0.027
2012	99.5	0 (0)	0.034	0.005	0.031	0.028	0.026	0.022
2013	98.9	0 (0)	0.033	0.004	0.029	0.027	0.023	0.018
2014	99.7	0 (0)	0.031	0.004	0.030	0.029	0.026	0.020
2015	97.8	0 (0)	0.039	0.004	0.030	0.028	0.025	0.021
2016	8.5*	0 (0)	0.022	<i>i.d.</i>	0.022	0.022	0.020	0.015

* Data availability less than 75% for one or more quarters.

Years shown in italics have less than 75% annual data availability.

i.d. = insufficient data to calculate value.

AAQ NEPM standards for NO₂ (until 2020): 0.12 ppm (1-hour average); 0.03 ppm (1-year average).

AAQ NEPM standards for NO₂ (from 2021): 0.08 ppm (1-hour average); 0.015 ppm (1-year average).

AAQ NEPM goal for NO₂ (until 2020): 1-hour standard exceeded on no more than one day per year.

AAQ NEPM goal for NO₂ (from 2021): standards not to be exceeded.

^a First value shows number of exceedances of the 1-hour standard adopted in 2021. Value in brackets shows number of exceedances of the previous 1-hour standard in place until 2020.

Table 32. Percentiles of daily peak 1-hour average NO₂ concentrations at North Ward (2018–2022)

Year	Data availability (% of days)	No. of exceedances ^a (days)	Maximum (ppm)	Annual average (ppm)	Percentiles (ppm)			
					99 th	98 th	95 th	90 th
2018	92.1*	0 (0)	0.023	0.002	0.022	0.021	0.018	0.014
2019	95.6	0 (0)	0.041	0.003	0.024	0.023	0.018	0.015
2020	96.2	0 (0)	0.024	0.002	0.020	0.018	0.014	0.011
2021	96.7	0 (0)	0.026	0.003	0.020	0.019	0.014	0.011
2022	99.7	0 (0)	0.024	0.003	0.020	0.019	0.015	0.013

* Data availability less than 75% for one or more quarters.

AAQ NEPM standards for NO₂ (until 2020): 0.12 ppm (1-hour average); 0.03 ppm (1-year average).

AAQ NEPM standards for NO₂ (from 2021): 0.08 ppm (1-hour average); 0.015 ppm (1-year average).

AAQ NEPM goal for NO₂ (until 2020): 1-hour standard exceeded on no more than one day per year.

AAQ NEPM goal for NO₂ (from 2021): standards not to be exceeded.

^a First value shows number of exceedances of the 1-hour standard adopted in 2021. Value in brackets shows number of exceedances of the previous 1-hour standard in place until 2020.

Ozone

Table 33. 2022 percentiles of daily peak 8-hour average O₃ concentrations

Region/performance monitoring station	Data availability (% of days)	Maximum (ppm)	Percentiles (ppm)					
			99 th	98 th	95 th	90 th	75 th	50 th
South East Queensland								
Mountain Creek	98.6	0.042	0.040	0.038	0.034	0.032	0.029	0.024
Deception Bay	98.9	0.057	0.050	0.047	0.039	0.037	0.033	0.027
Rocklea	77.0	0.052	0.042	0.040	0.038	0.034	0.030	0.026
Springwood	94.2	0.048	0.046	0.043	0.038	0.034	0.031	0.025
Southport	99.5	0.050	0.043	0.039	0.036	0.033	0.030	0.026
Flinders View	98.9	0.047	0.043	0.041	0.039	0.035	0.030	0.025

AAQ NEPM standard for O₃: 0.065 ppm (8-hour average).
AAQ NEPM goal for O₃: standard not to be exceeded.

Table 34. Percentiles of daily peak 8-hour average O₃ concentrations at Mountain Creek (2002–2022)

Year	Data availability (% of days)	No. of exceedances (days)	Maximum (ppm)	Percentiles (ppm)			
				99 th	98 th	95 th	90 th
2002	89.6*	0	0.048	0.043	0.041	0.037	0.034
2003	96.7	0	0.049	0.040	0.037	0.034	0.031
2004	98.6	0	0.045	0.040	0.039	0.034	0.032
2005	98.1	0	0.056	0.051	0.046	0.042	0.039
2006	98.6	0	0.056	0.045	0.042	0.039	0.037
2007	95.6	0	0.045	0.036	0.035	0.031	0.030
2008	93.7	0	0.048	0.040	0.038	0.034	0.032
2009	97.3	0	0.045	0.041	0.039	0.037	0.034
2010	96.7	0	0.050	0.037	0.036	0.034	0.032
2011	81.1*	0	0.059	0.050	0.044	0.037	0.033
2012	96.4	0	0.053	0.042	0.040	0.037	0.035
2013	97.0	0	0.045	0.041	0.040	0.038	0.035
2014	99.2	0	0.043	0.040	0.038	0.036	0.034
2015	94.8	0	0.047	0.039	0.037	0.035	0.033
2016	97.5	0	0.042	0.039	0.037	0.036	0.032
2017	98.4	0	0.053	0.045	0.043	0.040	0.037
2018	98.4	0	0.045	0.041	0.040	0.037	0.035
2019	99.2	0	0.054	0.048	0.045	0.040	0.036
2020	99.7	0	0.049	0.040	0.038	0.036	0.034
2021	97.0	0	0.049	0.038	0.037	0.034	0.032
2022	98.6	0	0.042	0.040	0.038	0.034	0.032

* Data availability less than 75% for one or more quarters.
AAQ NEPM standard for O₃ (from 2021): 0.065 ppm (8-hour average).
AAQ NEPM goal for O₃: standard not to be exceeded.

Table 35. Percentiles of daily peak 8-hour average O₃ concentrations at Deception Bay (1995–2022)

Year	Data availability (% of days)	No. of exceedances (days)	Maximum (ppm)	Percentiles (ppm)			
				99 th	98 th	95 th	90 th
1995	95.9	1	0.066	0.056	0.049	0.044	0.040
1996	96.2	1	0.068	0.055	0.052	0.045	0.041
1997	99.7	0	0.057	0.050	0.045	0.040	0.037
1998	94.0	0	0.051	0.046	0.042	0.041	0.037
1999	98.6	0	0.062	0.047	0.044	0.040	0.037
2000	98.7	0	0.056	0.044	0.043	0.039	0.036
2001	84.7*	1	0.070	0.051	0.045	0.040	0.038
2002	88.2*	0	0.062	0.051	0.048	0.042	0.038
2003	95.6	0	0.065	0.053	0.048	0.041	0.037
2004	96.4	0	0.054	0.049	0.045	0.040	0.038
2005	96.4	0	0.056	0.053	0.046	0.042	0.039
2006	97.5	0	0.056	0.046	0.043	0.040	0.037
2007	97.3	0	0.058	0.049	0.046	0.041	0.038
2008	98.4	0	0.061	0.053	0.049	0.040	0.037
2009	98.4	0	0.055	0.047	0.045	0.042	0.038
2010	97.3	0	0.044	0.042	0.040	0.037	0.035
2011	98.6	2	0.073	0.058	0.044	0.041	0.037
2012	98.9	0	0.053	0.048	0.046	0.041	0.039
2013	67.7*	0	0.052	0.052	0.046	0.044	0.041
2014	97.8	0	0.047	0.044	0.042	0.039	0.037
2015	99.7	0	0.053	0.043	0.042	0.038	0.035
2016	99.5	0	0.050	0.045	0.044	0.040	0.036
2017	99.2	0	0.054	0.050	0.048	0.043	0.040
2018	98.9	0	0.049	0.044	0.041	0.038	0.036
2019	97.0	1	0.069	0.055	0.052	0.044	0.038
2020	99.2	0	0.054	0.045	0.043	0.040	0.036
2021	99.5	0	0.052	0.043	0.042	0.040	0.037
2022	98.9	0	0.057	0.050	0.047	0.039	0.037

Bold text indicates a value greater than the AAQ NEPM standard.

* Data availability less than 75% for one or more quarters.

Years shown in italics have less than 75% annual data availability.

AAQ NEPM standard for O₃ (from 2021): 0.065 ppm (8-hour average).

AAQ NEPM goal for O₃: standard not to be exceeded.

Table 36. Percentiles of daily peak 8-hour average O₃ concentrations at Rocklea (1990–2022)

Year	Data availability (% of days)	No. of exceedances (days)	Maximum (ppm)	Percentiles (ppm)			
				99 th	98 th	95 th	90 th
1990	76.4*	0	0.043	0.033	0.030	0.028	0.025
1991	90.7	0	0.041	0.038	0.030	0.027	0.023
1992	94.8	0	0.049	0.044	0.035	0.031	0.026
1993	94.8	0	0.062	0.050	0.048	0.042	0.037
1994	94.2	1	0.075	0.063	0.052	0.044	0.039
1995	78.1*	0	0.061	0.054	0.049	0.045	0.040
1996	97.5	2	0.087	0.061	0.056	0.049	0.043
1997	96.4	0	0.059	0.057	0.052	0.046	0.039
1998	96.4	1	0.066	0.055	0.050	0.047	0.041
1999	93.4	1	0.073	0.057	0.049	0.042	0.038
2000	96.4	0	0.063	0.054	0.046	0.043	0.039
2001	97.0	0	0.056	0.050	0.046	0.043	0.038
2002	97.8	1	0.079	0.055	0.052	0.045	0.041
2003	97.3	0	0.054	0.045	0.043	0.040	0.037
2004	95.9	1	0.066	0.057	0.053	0.048	0.043
2005	97.0	0	0.057	0.051	0.049	0.045	0.042
2006	95.6	0	0.053	0.046	0.045	0.043	0.039
2007	93.2	0	0.053	0.050	0.045	0.042	0.039
2008	81.6*	0	0.053	0.047	0.045	0.042	0.036
2009	96.4	0	0.053	0.050	0.048	0.043	0.038
2010	97.3	0	0.062	0.049	0.044	0.039	0.035
2011	2.7*	0	<i>0.027</i>	<i>0.027</i>	<i>0.027</i>	<i>0.027</i>	<i>0.024</i>
2012	62.7*	0	<i>0.056</i>	<i>0.055</i>	<i>0.047</i>	<i>0.045</i>	<i>0.041</i>
2013	99.5	0	0.052	0.049	0.048	0.043	0.040
2014	99.5	0	0.060	0.054	0.048	0.044	0.041
2015	97.8	0	0.061	0.053	0.051	0.043	0.038
2016	97.8	0	0.048	0.046	0.045	0.041	0.037
2017	97.8	0	0.054	0.046	0.044	0.042	0.039
2018	98.9	0	0.058	0.053	0.050	0.043	0.038
2019	97.3	2	0.079	0.060	0.056	0.051	0.043
2020	99.5	0	0.050	0.047	0.045	0.043	0.039
2021	98.6	0	0.054	0.049	0.045	0.041	0.037
2022	77.0*	0	0.052	0.042	0.040	0.038	0.034

Bold text indicates a value greater than the AAQ NEPM standard.

* Data availability less than 75% for one or more quarters.

Years shown in italics have less than 75% annual data availability.

AAQ NEPM standard for O₃ (from 2021): 0.065 ppm (8-hour average).

AAQ NEPM goal for O₃: standard not to be exceeded.

Table 37. Percentiles of daily peak 8-hour average O₃ concentrations at Flinders View (1994–2022)

Year	Data availability (% of days)	No. of exceedances (days)	Maximum (ppm)	Percentiles (ppm)			
				99 th	98 th	95 th	90 th
1994	96.7	0	0.061	0.050	0.048	0.042	0.037
1995	92.6	0	0.056	0.052	0.049	0.044	0.040
1996	98.6	2	0.082	0.060	0.057	0.052	0.044
1997	97.3	1	0.072	0.061	0.056	0.048	0.042
1998	95.1	0	0.059	0.054	0.050	0.047	0.043
1999	98.1	1	0.083	0.054	0.052	0.044	0.038
2000	97.5	1	0.079	0.053	0.051	0.046	0.042
2001	95.9	0	0.065	0.057	0.051	0.044	0.040
2002	95.1	2	0.067	0.064	0.056	0.053	0.049
2003	94.8	0	0.056	0.051	0.046	0.042	0.038
2004	98.6	1	0.083	0.060	0.058	0.051	0.046
2005	98.4	0	0.057	0.055	0.052	0.048	0.044
2006	98.6	0	0.062	0.049	0.048	0.044	0.039
2007	98.9	0	0.056	0.051	0.049	0.044	0.040
2008	97.3	0	0.054	0.048	0.046	0.041	0.038
2009	96.7	0	0.054	0.049	0.048	0.044	0.040
2010	97.3	0	0.057	0.047	0.043	0.039	0.035
2011	95.6	1	0.076	0.059	0.052	0.043	0.040
2012	94.0	1	0.071	0.065	0.057	0.046	0.043
2013	98.1	0	0.057	0.050	0.050	0.045	0.043
2014	95.9	0	0.060	0.054	0.052	0.049	0.044
2015	99.2	0	0.062	0.059	0.051	0.046	0.040
2016	98.9	0	0.054	0.049	0.047	0.044	0.040
2017	98.9	0	0.057	0.053	0.052	0.046	0.043
2018	98.9	1	0.071	0.054	0.051	0.044	0.040
2019	99.5	3	0.088	0.060	0.054	0.051	0.046
2020	99.7	0	0.055	0.050	0.049	0.045	0.041
2021	98.6	0	0.050	0.047	0.045	0.041	0.037
2022	98.9	0	0.047	0.043	0.041	0.039	0.035

Bold text indicates a value greater than the AAQ NEPM standard.

AAQ NEPM standard for O₃ (from 2021): 0.065 ppm (8-hour average).

AAQ NEPM goal for O₃: standard not to be exceeded.

Table 38. Percentiles of daily peak 8-hour average O₃ concentrations at North Toowoomba (2003–2010)

Year	Data availability (% of days)	No. of exceedances (days)	Maximum (ppm)	Percentiles (ppm)			
				99 th	98 th	95 th	90 th
2003	45.2*	0	0.057	0.050	0.046	0.046	0.041
2004	98.4	0	0.058	0.054	0.050	0.044	0.042
2005	97.0	0	0.051	0.049	0.047	0.044	0.040
2006	94.0	0	0.051	0.049	0.049	0.045	0.041
2007	97.3	0	0.054	0.051	0.048	0.043	0.041
2008	96.2	0	0.047	0.043	0.041	0.038	0.035
2009	97.0	0	0.052	0.051	0.049	0.045	0.042
2010	92.3*	0	0.052	0.045	0.041	0.037	0.034

* Data availability less than 75% for one or more quarters.
Years shown in italics have less than 75% annual data availability.
AAQ NEPM standard for O₃ (from 2021): 0.065 ppm (8-hour average).
AAQ NEPM goal for O₃: standard not to be exceeded.

Table 39. Percentiles of daily peak 8-hour average O₃ concentrations at Targinie (2001–2006)

Year	Data availability (% of days)	No. of exceedances (days)	Maximum (ppm)	Percentiles (ppm)			
				99 th	98 th	95 th	90 th
2001	71.2*	0	0.042	0.037	0.036	0.030	0.029
2002	89.0	0	0.043	0.039	0.035	0.033	0.029
2003	95.1	0	0.036	0.032	0.029	0.029	0.027
2004	78.1*	0	0.027	0.026	0.025	0.024	0.023
2005	93.4	0	0.029	0.028	0.026	0.025	0.024
2006	33.4*	0	0.028	0.028	0.024	0.023	0.019

* Data availability less than 75% for one or more quarters.
Years shown in italics have less than 75% annual data availability.
AAQ NEPM standard for O₃ (from 2021): 0.065 ppm (8-hour average).
AAQ NEPM goal for O₃: standard not to be exceeded.

Table 40. Percentiles of daily peak 8-hour average O₃ concentrations at Pimlico (2004–2016)

Year	Data availability (% of days)	No. of exceedances (days)	Maximum (ppm)	Percentiles (ppm)			
				99 th	98 th	95 th	90 th
2004	58.4*	0	0.042	0.042	0.040	0.038	0.037
2005	98.4	0	0.042	0.039	0.038	0.035	0.033
2006	97.5	0	0.042	0.038	0.037	0.034	0.032
2007	98.6	0	0.043	0.038	0.036	0.035	0.033
2008	99.2	0	0.050	0.043	0.038	0.035	0.033
2009	90.1	0	0.047	0.046	0.046	0.040	0.036
2010	93.7	0	0.040	0.039	0.037	0.035	0.033
2011	94.5	0	0.061	0.057	0.046	0.042	0.037
2012	98.1	0	0.042	0.040	0.038	0.036	0.035
2013	84.7*	0	0.044	0.039	0.038	0.037	0.034
2014	98.9	0	0.045	0.042	0.039	0.037	0.035
2015	99.2	0	0.046	0.039	0.038	0.036	0.034
2016	16.2*	0	0.045	0.045	0.045	0.044	0.037

* Data availability less than 75% for one or more quarters.
 Years shown in italics have less than 75% annual data availability.
 AAQ NEPM standard for O₃ (from 2021): 0.065 ppm (8-hour average).
 AAQ NEPM goal for O₃: standard not to be exceeded.

Sulfur dioxide

Table 41. 2022 percentiles of daily peak 1-hour average SO₂ concentrations

Region/performance monitoring station	Data availability (% of days)	Maximum (ppm)	Percentiles (ppm)					
			99 th	98 th	95 th	90 th	75 th	50 th
South East Queensland								
Springwood	97.8	0.006	0.005	0.004	0.002	0.002	0.001	0.001
Flinders View	100.0	0.008	0.003	0.003	0.002	0.002	0.001	0.001
Gladstone								
South Gladstone	100.0	0.078	0.058	0.055	0.044	0.035	0.020	0.008
Townsville								
North Ward	100.0	0.006	0.004	0.003	0.002	0.001	0.001	0.001
Mount Isa								
The Gap	93.4	0.698	0.381	0.295	0.194	0.125	0.038	0.001

Bold text indicates a value greater than the AAQ NEPM standard.
 AAQ NEPM standard for SO₂: 0.10 ppm (1-hour average).
 AAQ NEPM goal for SO₂: standard not to be exceeded.

Table 42. 2022 percentiles of daily 1-day average SO₂ concentrations

Region/performance monitoring station	Data availability (% of days)	Maximum (ppm)	Percentiles (ppm)						
			99 th	98 th	95 th	90 th	75 th	50 th	
<u>South East Queensland</u>									
Springwood	97.8	0.002	0.002	0.001	0.001	0.001	0.001	0.000	0.000
Flinders View	100.0	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000
<u>Gladstone</u>									
South Gladstone	100.0	0.015	0.012	0.010	0.007	0.005	0.003	0.001	0.001
<u>Townsville</u>									
North Ward	100.0	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000
<u>Mount Isa</u>									
The Gap	93.4	0.058	0.051	0.043	0.027	0.015	0.004	0.000	0.000
Bold text indicates a value greater than the AAQ NEPM standard. AAQ NEPM standard for SO ₂ : 0.02 ppm (1-day average). AAQ NEPM goal for SO ₂ : standard not to be exceeded.									

Table 43. Percentiles of daily peak 1-hour average SO₂ concentrations at Flinders View (1993–2022)

Year	Data availability (% of days)	No. of exceedances ^a (days)	Maximum (ppm)	Annual average (ppm)	Percentiles (ppm)			
					99 th	98 th	95 th	90 th
1993	88.2*	0 (0)	0.049	0.002	0.030	0.024	0.018	0.014
1994	98.9	0 (0)	0.033	0.003	0.027	0.025	0.021	0.017
1995	59.5*	0 (0)	<i>0.041</i>	<i>i.d.</i>	<i>0.029</i>	<i>0.027</i>	<i>0.020</i>	<i>0.014</i>
1996	88.3*	0 (0)	0.047	0.002	0.037	0.027	0.023	0.017
1997	97.0	0 (0)	0.047	0.002	0.040	0.035	0.023	0.019
1998	95.9	0 (0)	0.090	0.002	0.037	0.033	0.024	0.019
1999	96.4	0 (0)	0.070	0.002	0.035	0.033	0.028	0.021
2000	89.9	0 (0)	0.081	0.002	0.049	0.036	0.027	0.022
2001	99.5	0 (0)	0.053	0.001	0.048	0.043	0.029	0.023
2002	97.0	0 (0)	0.057	0.001	0.035	0.033	0.025	0.018
2003	96.4	0 (0)	0.046	0.001	0.031	0.030	0.023	0.017
2004	99.5	0 (0)	0.063	0.001	0.036	0.031	0.021	0.016
2005	100.0	0 (0)	0.034	0.001	0.028	0.024	0.020	0.014
2006	100.0	0 (0)	0.040	0.001	0.037	0.027	0.023	0.018
2007	100.0	0 (0)	0.026	0.001	0.024	0.022	0.018	0.014
2008	100.0	0 (0)	0.042	0.001	0.030	0.028	0.019	0.016
2009	99.5	0 (0)	0.046	0.001	0.030	0.027	0.018	0.014
2010	99.4	0 (0)	0.034	0.001	0.022	0.018	0.015	0.012
2011	95.6	0 (0)	0.028	0.001	0.022	0.017	0.014	0.009
2012	100.0	0 (0)	0.015	0.001	0.014	0.012	0.009	0.007
2013	100.0	0 (0)	0.013	0.001	0.005	0.005	0.004	0.004
2014	96.4	0 (0)	0.008	0.000	0.005	0.004	0.003	0.003
2015	100.0	0 (0)	0.010	0.000	0.005	0.004	0.003	0.003
2016	99.7	0 (0)	0.007	0.001	0.005	0.004	0.003	0.003
2017	98.6	0 (0)	0.006	0.001	0.004	0.004	0.004	0.003
2018	98.9	0 (0)	0.005	0.001	0.005	0.004	0.003	0.003
2019	99.7	0 (0)	0.005	0.000	0.004	0.004	0.003	0.002
2020	99.7	0 (0)	0.004	0.000	0.003	0.003	0.002	0.002
2021	99.7	0 (0)	0.004	0.000	0.003	0.003	0.002	0.002
2022	100.0	0 (0)	0.008	0.000	0.003	0.003	0.002	0.002

* Data availability less than 75% for one or more quarters.

Years shown in italics have less than 75% annual data availability.

i.d. = insufficient data to calculate value.

AAQ NEPM standards for SO₂ (until 2020): 0.20 ppm (1-hour average); 0.02 ppm (1-year average).

AAQ NEPM standard for SO₂ (from 2021): 0.10 ppm (1-hour average).

AAQ NEPM goal for SO₂ (until 2020): 1-hour standard exceeded on no more than one day per year.

AAQ NEPM goal for SO₂ (from 2021): standard not to be exceeded.

^a First value shows number of exceedances of the 1-hour standard adopted in 2021. Value in brackets shows number of exceedances of the previous 1-hour standard in place until 2020.

Table 44. Percentiles of daily peak 1-hour average SO₂ concentrations at South Gladstone (1991–2022)

Year	Data availability (% of days)	No. of exceedances ^a (days)	Maximum (ppm)	Annual average (ppm)	Percentiles (ppm)			
					99 th	98 th	95 th	90 th
1991	92.6	0 (0)	0.011	0.002	0.011	0.009	0.008	0.006
1992	94.3	0 (0)	0.052	0.003	0.039	0.029	0.020	0.015
1993	98.3	0 (0)	0.075	0.004	0.059	0.050	0.039	0.032
1994	97.0	0 (0)	0.070	0.003	0.042	0.040	0.031	0.024
1995	96.7	1 (0)	0.168	0.004	0.083	0.065	0.047	0.035
1996	99.2	0 (0)	0.083	0.002	0.053	0.042	0.026	0.018
1997	98.9	0 (0)	0.049	0.001	0.029	0.023	0.014	0.010
1998	97.5	0 (0)	0.076	0.001	0.050	0.042	0.027	0.020
1999	94.2	0 (0)	0.051	0.002	0.042	0.039	0.027	0.022
2000	84.7*	0 (0)	0.092	0.001	0.071	0.045	0.034	0.024
2001	98.1	0 (0)	0.068	0.001	0.046	0.035	0.023	0.018
2002	94.5	1 (0)	0.123	0.001	0.040	0.031	0.025	0.020
2003	93.2	1 (0)	0.112	0.001	0.058	0.041	0.025	0.019
2004	96.4	0 (0)	0.064	0.001	0.040	0.032	0.022	0.017
2005	99.7	0 (0)	0.084	0.002	0.063	0.053	0.032	0.027
2006	100.0	0 (0)	0.093	0.002	0.071	0.064	0.049	0.034
2007	98.4	0 (0)	0.075	0.002	0.069	0.061	0.044	0.035
2008	98.6	1 (0)	0.140	0.002	0.065	0.056	0.042	0.026
2009	97.5	0 (0)	0.053	0.002	0.040	0.035	0.028	0.021
2010	98.4	0 (0)	0.052	0.002	0.038	0.035	0.028	0.022
2011	97.3	0 (0)	0.091	0.003	0.049	0.045	0.033	0.026
2012	99.5	0 (0)	0.059	0.002	0.050	0.045	0.030	0.024
2013	95.3	0 (0)	0.067	0.002	0.053	0.042	0.033	0.028
2014	99.7	0 (0)	0.068	0.002	0.060	0.059	0.040	0.033
2015	95.1	0 (0)	0.077	0.002	0.057	0.052	0.039	0.025
2016	97.8	0 (0)	0.061	0.002	0.053	0.051	0.038	0.030
2017	99.2	0 (0)	0.073	0.002	0.038	0.036	0.030	0.021
2018	97.3	0 (0)	0.058	0.002	0.048	0.045	0.034	0.026
2019	97.3	0 (0)	0.071	0.002	0.058	0.054	0.041	0.029
2020	98.6	0 (0)	0.076	0.002	0.045	0.043	0.037	0.028
2021	100.0	0 (0)	0.062	0.002	0.043	0.041	0.033	0.026
2022	100.0	0 (0)	0.078	0.002	0.058	0.055	0.044	0.035

Bold text indicates a value greater than the AAQ NEPM standard.

* Data availability less than 75% for one or more quarters.

AAQ NEPM standards for SO₂ (until 2020): 0.20 ppm (1-hour average); 0.02 ppm (1-year average).

AAQ NEPM standard for SO₂ (from 2021): 0.10 ppm (1-hour average).

AAQ NEPM goal for SO₂ (until 2020): 1-hour standard exceeded on no more than one day per year.

AAQ NEPM goal for SO₂ (from 2021): standard not to be exceeded.

^a First value shows number of exceedances of the 1-hour standard adopted in 2021. Value in brackets shows number of exceedances of the previous 1-hour standard in place until 2020.

Table 45. Percentiles of daily peak 1-hour average SO₂ concentrations at Pimlico (2005–2016)

Year	Data availability (% of days)	No. of exceedances ^a (days)	Maximum (ppm)	Annual average (ppm)	Percentiles (ppm)			
					99 th	98 th	95 th	90 th
2005	18.6*	0 (0)	0.003	<i>i.d.</i>	0.003	0.003	0.002	0.002
2006	98.6	0 (0)	0.006	0.000	0.005	0.004	0.003	0.002
2007	98.1	0 (0)	0.005	0.001	0.005	0.004	0.003	0.003
2008	100.0	0 (0)	0.006	0.000	0.005	0.003	0.002	0.002
2009	97.0	0 (0)	0.006	0.000	0.005	0.004	0.003	0.002
2010	90.1*	0 (0)	0.007	0.000	0.006	0.004	0.003	0.002
2011	94.2	0 (0)	0.009	0.001	0.007	0.006	0.005	0.005
2012	99.5	0 (0)	0.006	0.001	0.004	0.004	0.003	0.003
2013	94.8	0 (0)	0.004	0.000	0.003	0.003	0.002	0.002
2014	99.7	0 (0)	0.005	0.001	0.004	0.003	0.003	0.002
2015	99.5	0 (0)	0.004	0.001	0.004	0.004	0.003	0.003
2016	16.1*	0 (0)	0.007	<i>i.d.</i>	0.007	0.007	0.005	0.004

* Data availability less than 75% for one or more quarters.
Years shown in italics have less than 75% annual data availability.

i.d. = insufficient data to calculate value.

AAQ NEPM standards for SO₂ (until 2020): 0.20 ppm (1-hour average); 0.02 ppm (1-year average).

AAQ NEPM standard for SO₂ (from 2021): 0.10 ppm (1-hour average).

AAQ NEPM goal for SO₂ (until 2020): 1-hour standard exceeded on no more than one day per year.

AAQ NEPM goal for SO₂ (from 2021): standard not to be exceeded.

^a First value shows number of exceedances of the 1-hour standard adopted in 2021. Value in brackets shows number of exceedances of the previous 1-hour standard in place until 2020.

Table 46. Percentiles of daily peak 1-hour average SO₂ concentrations at North Ward (2018–2022)

Year	Data availability (% of days)	No. of exceedances ^a (days)	Maximum (ppm)	Annual average (ppm)	Percentiles (ppm)			
					99 th	98 th	95 th	90 th
2018	95.3	0 (0)	0.009	0.001	0.005	0.005	0.004	0.003
2019	86.3*	0 (0)	0.010	0.000	0.007	0.005	0.003	0.003
2020	96.2	0 (0)	0.003	0.000	0.002	0.002	0.001	0.001
2021	97.0	0 (0)	0.009	0.000	0.005	0.004	0.002	0.002
2022	100.0	0 (0)	0.006	0.000	0.004	0.003	0.002	0.001

* Data availability less than 75% for one or more quarters.

AAQ NEPM standards for SO₂ (until 2020): 0.20 ppm (1-hour average); 0.02 ppm (1-year average).

AAQ NEPM standard for SO₂ (from 2021): 0.10 ppm (1-hour average).

AAQ NEPM goal for SO₂ (until 2020): 1-hour standard exceeded on no more than one day per year.

AAQ NEPM goal for SO₂ (from 2021): standard not to be exceeded.

^a First value shows number of exceedances of the 1-hour standard adopted in 2021. Value in brackets shows number of exceedances of the previous 1-hour standard in place until 2020.

Table 47. Percentiles of daily peak 1-hour average SO₂ concentrations at The Gap (2009–2022)

Year	Data availability (% of days)	No. of exceedances ^a (days)	Maximum (ppm)	Annual average (ppm)	Percentiles (ppm)			
					99 th	98 th	95 th	90 th
2009	81.1*	30 (10)	0.591	0.004	0.389	0.264	0.155	0.103
2010	98.6	41 (19)	0.608	0.003	0.421	0.267	0.206	0.114
2011	97.3	56 (19)	0.580	0.005	0.524	0.347	0.213	0.146
2012	93.2	41 (19)	0.627	0.004	0.426	0.341	0.227	0.145
2013	89.9	43 (21)	0.636	0.005	0.477	0.316	0.235	0.161
2014	94.2	37 (13)	0.613	0.004	0.376	0.284	0.176	0.102
2015	99.7	45 (21)	0.494	0.004	0.378	0.340	0.215	0.127
2016	94.8	47 (24)	0.504	0.005	0.328	0.278	0.228	0.138
2017	97.0	51 (13)	0.579	0.005	0.397	0.310	0.188	0.131
2018	96.2	38 (13)	0.366	0.004	0.317	0.240	0.167	0.109
2019	98.1	25 (10)	0.433	0.002	0.327	0.309	0.141	0.068
2020	91.3	46 (14)	0.401	0.004	0.309	0.254	0.174	0.122
2021	96.2	48 (17)	0.848	0.006	0.514	0.372	0.199	0.139
2022	93.4	43 (15)	0.698	0.004	0.381	0.295	0.194	0.125

Bold text indicates a value greater than the AAQ NEPM standard.

* Data availability less than 75% for one or more quarters.

AAQ NEPM standards for SO₂ (until 2020): 0.20 ppm (1-hour average); 0.02 ppm (1-year average).

AAQ NEPM standard for SO₂ (from 2021): 0.10 ppm (1-hour average).

AAQ NEPM goal for SO₂ (until 2020): 1-hour standard exceeded on no more than one day per year.

AAQ NEPM goal for SO₂ (from 2021): standard not to be exceeded.

^a First value shows number of exceedances of the 1-hour standard adopted in 2021. Value in brackets shows number of exceedances of the previous 1-hour standard in place until 2020.

Table 48. Percentiles of daily peak 1-hour average SO₂ concentrations at Menzies (1990–2020)

Year	Data availability (% of days)	No. of exceedances ^a (days)	Maximum (ppm)	Annual average (ppm)	Percentiles (ppm)			
					99 th	98 th	95 th	90 th
1990	44.7*	16 (6)	0.577	<i>i.d.</i>	0.493	0.222	0.145	0.091
1991	54.8*	48 (28)	0.673	<i>i.d.</i>	0.638	0.440	0.294	0.215
1992	88.5*	53 (25)	0.540	0.012	0.457	0.406	0.286	0.170
1993	95.6	49 (24)	0.718	0.015	0.434	0.403	0.282	0.134
1994	91.5	49 (20)	0.688	0.019	0.483	0.343	0.250	0.135
1995	98.9	39 (11)	0.443	0.005	0.254	0.239	0.184	0.109
1996	98.6	49 (16)	0.598	0.005	0.409	0.285	0.198	0.131
1997	98.9	29 (7)	0.300	0.003	0.256	0.216	0.128	0.083
1998	48.8*	29 (16)	0.693	<i>i.d.</i>	0.548	0.368	0.265	0.190
1999	90.4*	52 (17)	0.675	0.004	0.366	0.269	0.202	0.141
2000	96.4	61 (31)	0.584	0.006	0.373	0.357	0.250	0.191
2001	98.9	62 (41)	0.581	0.006	0.438	0.422	0.295	0.222
2002	91.2	82 (49)	1.254	0.009	0.551	0.526	0.385	0.272
2003	98.9	69 (42)	0.658	0.007	0.503	0.493	0.312	0.217
2004	97.5	61 (36)	0.888	0.007	0.665	0.444	0.302	0.207
2005	93.7*	78 (49)	0.964	0.009	0.663	0.512	0.395	0.271
2006	97.0	49 (25)	0.567	0.005	0.398	0.356	0.246	0.176
2007	96.7	60 (31)	0.608	0.007	0.408	0.375	0.282	0.185
2008	97.0	67 (38)	0.751	0.007	0.528	0.482	0.289	0.203
2009	96.7	42 (25)	1.013	0.006	0.582	0.481	0.286	0.126
2010	97.0	47 (19)	0.669	0.005	0.413	0.392	0.248	0.146
2011	84.1*	48 (22)	0.502	0.006	0.426	0.348	0.236	0.173
2012	99.5	57 (30)	0.670	0.005	0.434	0.410	0.274	0.165
2013	96.7	57 (34)	0.594	0.006	0.398	0.375	0.311	0.191
2014	97.0	48 (20)	0.622	0.005	0.429	0.352	0.206	0.131
2015	100.0	69 (30)	0.577	0.006	0.466	0.371	0.260	0.164
2016	100.0	67 (32)	0.717	0.007	0.478	0.438	0.286	0.180
2017	99.7	50 (24)	0.958	0.005	0.384	0.319	0.254	0.136
2018	98.6	66 (26)	0.527	0.006	0.359	0.266	0.227	0.171
2019	99.5	37 (15)	0.508	0.004	0.350	0.256	0.196	0.116
2020	41.8*	23 (8)	0.341	<i>i.d.</i>	0.277	0.235	0.153	0.040

Bold text indicates a value greater than the AAQ NEPM standard.

* Data availability less than 75% for one or more quarters.

Years shown in italics have less than 75% annual data availability.

i.d. = insufficient data to calculate value.

AAQ NEPM standards for SO₂ (until 2020): 0.20 ppm (1-hour average); 0.02 ppm (1-year average).

AAQ NEPM standard for SO₂ (from 2021): 0.10 ppm (1-hour average).

AAQ NEPM goal for SO₂ (until 2020): 1-hour standard exceeded on no more than one day per year.

AAQ NEPM goal for SO₂ (from 2021): standard not to be exceeded.

^a First value shows number of exceedances of the 1-hour standard adopted in 2021. Value in brackets shows number of exceedances of the previous 1-hour standard in place until 2020.

Table 49. Percentiles of daily 1-day average SO₂ concentrations at Flinders View (1993–2022)

Year	Data availability (% of days)	No. of exceedances ^a (days)	Maximum (ppm)	Annual average (ppm)	Percentiles (ppm)			
					99 th	98 th	95 th	90 th
1993	88.2*	0 (0)	0.006	0.002	0.005	0.005	0.004	0.003
1994	98.9	0 (0)	0.008	0.003	0.007	0.006	0.006	0.005
1995	59.5*	0 (0)	0.009	<i>i.d.</i>	0.008	0.006	0.005	0.004
1996	88.3*	0 (0)	0.010	0.002	0.005	0.005	0.004	0.004
1997	97.0	0 (0)	0.009	0.002	0.006	0.005	0.004	0.003
1998	95.9	0 (0)	0.011	0.002	0.007	0.006	0.004	0.004
1999	96.4	0 (0)	0.009	0.002	0.007	0.007	0.005	0.004
2000	89.9	0 (0)	0.013	0.002	0.012	0.008	0.006	0.005
2001	99.5	0 (0)	0.014	0.001	0.007	0.006	0.004	0.003
2002	97.0	0 (0)	0.006	0.001	0.006	0.005	0.003	0.003
2003	96.4	0 (0)	0.006	0.001	0.005	0.004	0.003	0.002
2004	99.5	0 (0)	0.007	0.001	0.006	0.005	0.003	0.003
2005	100.0	0 (0)	0.006	0.001	0.004	0.004	0.002	0.002
2006	99.7	0 (0)	0.007	0.001	0.006	0.004	0.004	0.003
2007	99.5	0 (0)	0.006	0.001	0.004	0.004	0.003	0.002
2008	98.6	0 (0)	0.006	0.001	0.005	0.004	0.003	0.002
2009	97.5	0 (0)	0.007	0.001	0.005	0.004	0.003	0.002
2010	99.5	0 (0)	0.008	0.001	0.004	0.003	0.003	0.002
2011	95.6	0 (0)	0.005	0.001	0.004	0.003	0.002	0.002
2012	100.0	0 (0)	0.004	0.001	0.003	0.003	0.002	0.002
2013	100.0	0 (0)	0.003	0.001	0.002	0.002	0.002	0.002
2014	96.4	0 (0)	0.002	0.000	0.001	0.001	0.001	0.001
2015	100.0	0 (0)	0.002	0.000	0.001	0.001	0.001	0.001
2016	99.7	0 (0)	0.002	0.001	0.002	0.002	0.001	0.001
2017	98.6	0 (0)	0.002	0.001	0.002	0.002	0.002	0.002
2018	98.9	0 (0)	0.003	0.001	0.002	0.002	0.002	0.002
2019	99.7	0 (0)	0.002	0.000	0.001	0.001	0.001	0.001
2020	99.7	0 (0)	0.001	0.000	0.001	0.001	0.001	0.001
2021	99.7	0 (0)	0.001	0.000	0.001	0.001	0.001	0.001
2022	100.0	0 (0)	0.001	0.000	0.001	0.001	0.001	0.001

* Data availability less than 75% for one or more quarters.

Years shown in italics have less than 75% annual data availability.

i.d. = insufficient data to calculate value.

AAQ NEPM standards for SO₂ (until 2020): 0.08 ppm (1-day average); 0.02 ppm (1-year average).

AAQ NEPM standard for SO₂ (from 2021): 0.02 ppm (1-day average).

AAQ NEPM goal for SO₂ (until 2020): 1-day standard exceeded on no more than one day per year.

AAQ NEPM goal for SO₂ (from 2021): standard not to be exceeded.

^a First value shows number of exceedances of the 1-hour standard adopted in 2021. Value in brackets shows number of exceedances of the previous 1-hour standard in place until 2020.

Table 50. Percentiles of daily 1-day average SO₂ concentrations at South Gladstone (1991–2022)

Year	Data availability (% of days)	No. of exceedances ^a (days)	Maximum (ppm)	Annual average (ppm)	Percentiles (ppm)			
					99 th	98 th	95 th	90 th
1991	92.6	0 (0)	0.007	0.002	0.006	0.006	0.004	0.004
1992	94.3	0 (0)	0.012	0.003	0.011	0.010	0.009	0.008
1993	98.3	0 (0)	0.014	0.004	0.010	0.010	0.008	0.007
1994	97.0	0 (0)	0.013	0.003	0.007	0.007	0.006	0.005
1995	96.7	0 (0)	0.017	0.004	0.014	0.012	0.008	0.007
1996	99.2	0 (0)	0.010	0.002	0.007	0.006	0.005	0.004
1997	98.9	0 (0)	0.007	0.001	0.004	0.003	0.002	0.002
1998	97.5	0 (0)	0.012	0.001	0.010	0.007	0.005	0.003
1999	94.2	0 (0)	0.009	0.002	0.008	0.006	0.005	0.004
2000	84.7*	1 (0)	0.022	0.001	0.008	0.006	0.004	0.003
2001	98.1	0 (0)	0.006	0.001	0.005	0.004	0.003	0.002
2002	94.5	1 (0)	0.029	0.001	0.006	0.005	0.004	0.003
2003	93.2	0 (0)	0.013	0.001	0.011	0.007	0.005	0.003
2004	96.4	0 (0)	0.007	0.001	0.006	0.006	0.004	0.003
2005	98.9	0 (0)	0.011	0.002	0.009	0.006	0.004	0.004
2006	97.5	0 (0)	0.019	0.003	0.014	0.011	0.008	0.006
2007	97.5	1 (0)	0.021	0.002	0.012	0.010	0.007	0.005
2008	97.0	0 (0)	0.018	0.002	0.010	0.009	0.006	0.005
2009	93.7	0 (0)	0.009	0.002	0.008	0.007	0.006	0.004
2010	98.4	0 (0)	0.010	0.002	0.009	0.007	0.005	0.004
2011	97.3	0 (0)	0.011	0.003	0.011	0.009	0.008	0.005
2012	99.5	0 (0)	0.010	0.002	0.009	0.008	0.006	0.005
2013	95.3	0 (0)	0.013	0.002	0.010	0.008	0.006	0.004
2014	99.7	0 (0)	0.014	0.002	0.013	0.011	0.008	0.005
2015	95.1	0 (0)	0.013	0.002	0.012	0.010	0.008	0.005
2016	97.8	0 (0)	0.012	0.002	0.011	0.010	0.007	0.005
2017	99.2	0 (0)	0.011	0.002	0.009	0.008	0.005	0.004
2018	97.3	0 (0)	0.010	0.002	0.009	0.008	0.006	0.005
2019	97.3	0 (0)	0.013	0.002	0.010	0.010	0.007	0.006
2020	98.6	0 (0)	0.017	0.002	0.010	0.009	0.008	0.005
2021	100.0	0 (0)	0.012	0.002	0.009	0.009	0.006	0.004
2022	100.0	0 (0)	0.015	0.002	0.012	0.010	0.007	0.005

Bold text indicates a value greater than the AAQ NEPM standard.

* Data availability less than 75% for one or more quarters.

AAQ NEPM standards for SO₂ (until 2020): 0.08 ppm (1-day average); 0.02 ppm (1-year average).

AAQ NEPM standard for SO₂ (from 2021): 0.02 ppm (1-day average).

AAQ NEPM goal for SO₂ (until 2020): 1-day standard exceeded on no more than one day per year.

AAQ NEPM goal for SO₂ (from 2021): standard not to be exceeded.

^a First value shows number of exceedances of the 1-hour standard adopted in 2021. Value in brackets shows number of exceedances of the previous 1-hour standard in place until 2020.

Table 51. Percentiles of daily 1-day average SO₂ concentrations at Pimlico (2005–2016)

Year	Data availability (% of days)	No. of exceedances ^a (days)	Maximum (ppm)	Annual average (ppm)	Percentiles (ppm)			
					99 th	98 th	95 th	90 th
2005	18.1*	0 (0)	0.001	<i>i.d.</i>	0.001	0.001	0.001	0.000
2006	96.2	0 (0)	0.003	0.000	0.002	0.002	0.002	0.001
2007	97.0	0 (0)	0.003	0.001	0.003	0.002	0.002	0.001
2008	98.9	0 (0)	0.001	0.000	0.001	0.001	0.001	0.000
2009	95.1	0 (0)	0.003	0.000	0.002	0.001	0.001	0.001
2010	90.1*	0 (0)	0.003	0.000	0.003	0.003	0.002	0.001
2011	94.2	0 (0)	0.006	0.001	0.006	0.005	0.004	0.003
2012	99.5	0 (0)	0.003	0.001	0.002	0.002	0.002	0.001
2013	94.8	0 (0)	0.002	0.000	0.001	0.001	0.001	0.001
2014	99.7	0 (0)	0.002	0.001	0.002	0.002	0.001	0.001
2015	99.5	0 (0)	0.003	0.001	0.003	0.002	0.001	0.001
2016	16.1	0 (0)	0.001	<i>i.d.</i>	0.001	0.001	0.001	0.001

* Data availability less than 75% for one or more quarters.
Years shown in italics have less than 75% annual data availability.
i.d. = insufficient data to calculate value.
AAQ NEPM standards for SO₂ (until 2020): 0.08 ppm (1-day average); 0.02 ppm (1-year average).
AAQ NEPM standard for SO₂ (from 2021): 0.02 ppm (1-day average).
AAQ NEPM goal for SO₂ (until 2020): 1-day standard exceeded on no more than one day per year.
AAQ NEPM goal for SO₂ (from 2021): standard not to be exceeded.
^a First value shows number of exceedances of the 1-hour standard adopted in 2021. Value in brackets shows number of exceedances of the previous 1-hour standard in place until 2020.

Table 52. Percentiles of daily 1-day average SO₂ concentrations at North Ward (2018–2022)

Year	Data availability (% of days)	No. of exceedances ^a (days)	Maximum (ppm)	Annual average (ppm)	Percentiles (ppm)			
					99 th	98 th	95 th	90 th
2018	95.3	0 (0)	0.002	0.001	0.002	0.001	0.001	0.001
2019	86.3*	0 (0)	0.001	0.000	0.001	0.001	0.001	0.001
2020	96.2	0 (0)	0.001	0.000	0.001	0.001	0.001	0.001
2021	97.0	0 (0)	0.001	0.000	0.001	0.001	0.001	0.000
2022	100.0	0 (0)	0.001	0.000	0.001	0.001	0.000	0.000

* Data availability less than 75% for one or more quarters.
AAQ NEPM standards for SO₂ (until 2020): 0.08 ppm (1-day average); 0.02 ppm (1-year average).
AAQ NEPM standard for SO₂ (from 2021): 0.02 ppm (1-day average).
AAQ NEPM goal for SO₂ (until 2020): 1-day standard exceeded on no more than one day per year.
AAQ NEPM goal for SO₂ (from 2021): standard not to be exceeded.
^a First value shows number of exceedances of the 1-hour standard adopted in 2021. Value in brackets shows number of exceedances of the previous 1-hour standard in place until 2020.

Table 53. Percentiles of daily 1-day average SO₂ concentrations at The Gap (2009–2022)

Year	Data availability (% of days)	No. of exceedances ^a (days)	Maximum (ppm)	Annual average (ppm)	Percentiles (ppm)			
					99 th	98 th	95 th	90 th
2009	80.3*	13 (0)	0.073	0.004	0.047	0.027	0.018	0.011
2010	98.6	24 (0)	0.060	0.003	0.043	0.035	0.024	0.014
2011	97.3	28 (0)	0.060	0.005	0.044	0.042	0.028	0.017
2012	93.2	23 (0)	0.075	0.004	0.052	0.042	0.027	0.014
2013	89.9	25 (0)	0.071	0.005	0.060	0.042	0.032	0.017
2014	94.2	16 (0)	0.059	0.004	0.041	0.031	0.020	0.012
2015	99.7	30 (0)	0.056	0.004	0.039	0.035	0.027	0.015
2016	94.8	25 (0)	0.058	0.005	0.046	0.036	0.027	0.015
2017	97.0	21 (0)	0.053	0.005	0.051	0.046	0.024	0.014
2018	96.2	22 (0)	0.054	0.004	0.044	0.035	0.023	0.015
2019	98.1	10 (0)	0.044	0.002	0.034	0.030	0.015	0.008
2020	91.3	23 (0)	0.055	0.004	0.044	0.035	0.026	0.013
2021	96.2	33 (0)	0.071	0.006	0.060	0.047	0.030	0.020
2022	93.4	25 (0)	0.058	0.004	0.051	0.043	0.027	0.015

Bold text indicates a value greater than the AAQ NEPM standard.

* Data availability less than 75% for one or more quarters.

AAQ NEPM standards for SO₂ (until 2020): 0.08 ppm (1-day average); 0.02 ppm (1-year average).

AAQ NEPM standard for SO₂ (from 2021): 0.02 ppm (1-day average).

AAQ NEPM goal for SO₂ (until 2020): 1-day standard exceeded on no more than one day per year.

AAQ NEPM goal for SO₂ (from 2021): standard not to be exceeded.

^a First value shows number of exceedances of the 1-hour standard adopted in 2021. Value in brackets shows number of exceedances of the previous 1-hour standard in place until 2020.

Table 54. Percentiles of daily 1-day average SO₂ concentrations at Menzies (1990–2020)

Year	Data availability (% of days)	No. of exceedances ^a (days)	Maximum (ppm)	Annual average (ppm)	Percentiles (ppm)			
					99 th	98 th	95 th	90 th
1990	44.7*	129 (1)	0.088	<i>i.d.</i>	0.078	0.072	0.052	0.046
1991	54.8*	54 (3)	0.117	<i>i.d.</i>	0.100	0.073	0.053	0.038
1992	88.5*	43 (0)	0.064	0.012	0.056	0.052	0.033	0.025
1993	95.6	66 (0)	0.064	0.015	0.052	0.046	0.040	0.027
1994	91.5	136 (2)	0.085	0.019	0.059	0.054	0.045	0.040
1995	98.9	15 (0)	0.049	0.005	0.036	0.028	0.018	0.012
1996	98.6	26 (0)	0.049	0.005	0.043	0.040	0.024	0.015
1997	98.9	7 (0)	0.034	0.003	0.028	0.022	0.016	0.010
1998	48.8*	16 (0)	0.055	<i>i.d.</i>	0.041	0.037	0.029	0.019
1999	90.4*	20 (0)	0.049	0.004	0.036	0.032	0.024	0.015
2000	96.4	31 (0)	0.078	0.006	0.070	0.055	0.032	0.019
2001	98.9	37 (0)	0.075	0.006	0.052	0.045	0.033	0.021
2002	91.2	55 (1)	0.081	0.009	0.057	0.055	0.043	0.033
2003	98.9	53 (2)	0.093	0.007	0.067	0.057	0.036	0.022
2004	97.5	30 (1)	0.100	0.007	0.069	0.050	0.034	0.017
2005	91.8*	53 (2)	0.091	0.009	0.069	0.060	0.044	0.032
2006	93.7	32 (0)	0.065	0.005	0.054	0.045	0.032	0.018
2007	94.5	42 (1)	0.199	0.007	0.060	0.046	0.036	0.023
2008	96.2	42 (1)	0.089	0.007	0.064	0.056	0.037	0.025
2009	95.1	25 (2)	0.088	0.006	0.056	0.051	0.032	0.015
2010	97.0	30 (1)	0.094	0.005	0.058	0.043	0.028	0.015
2011	84.1*	23 (0)	0.060	0.006	0.053	0.047	0.029	0.016
2012	99.5	27 (0)	0.063	0.005	0.056	0.055	0.031	0.016
2013	96.7	37 (1)	0.091	0.006	0.063	0.057	0.037	0.021
2014	97.0	31 (1)	0.096	0.005	0.048	0.039	0.030	0.017
2015	100.0	32 (2)	0.106	0.006	0.047	0.044	0.034	0.019
2016	100.0	46 (1)	0.111	0.007	0.062	0.056	0.038	0.025
2017	99.7	31 (0)	0.080	0.005	0.058	0.040	0.029	0.017
2018	98.6	37 (0)	0.066	0.006	0.051	0.041	0.033	0.021
2019	99.5	21 (0)	0.053	0.004	0.037	0.035	0.022	0.014
2020	41.8*	18 (0)	0.065	<i>i.d.</i>	0.047	0.044	0.021	0.005

Bold text indicates a value greater than the AAQ NEPM standard.

* Data availability less than 75% for one or more quarters.

Years shown in italics have less than 75% annual data availability.

i.d. = insufficient data to calculate value.

AAQ NEPM standards for SO₂ (until 2020): 0.08 ppm (1-day average); 0.02 ppm (1-year average).

AAQ NEPM standard for SO₂ (from 2021): 0.02 ppm (1-day average).

AAQ NEPM goal for SO₂ (until 2020): 1-day standard exceeded on no more than one day per year.

AAQ NEPM goal for SO₂ (from 2021): standard not to be exceeded.

^a First value shows number of exceedances of the 1-hour standard adopted in 2021. Value in brackets shows number of exceedances of the previous 1-hour standard in place until 2020.

PM₁₀**Table 55. 2022 percentiles of daily 1-day average PM₁₀ concentrations**

Region/performance monitoring station	Data availability (% of days)	Maximum (µg/m ³)	Percentiles (µg/m ³)						
			99 th	98 th	95 th	90 th	75 th	50 th	
South East Queensland									
Mountain Creek [‡]	99.7	36.9	33.9	30.7	25.7	21.9	18.3	15.2	
Rocklea [†]	77.5*	30.9	27.5	25.3	22.9	20.2	16.7	12.6	
Springwood [†]	91.2*	23.7	22.4	19.6	17.5	15.2	13.0	10.1	
Southport [†]	96.4	35.4	23.3	20.9	17.3	14.8	11.9	9.4	
Flinders View [‡]	98.9	29.2	26.7	25.3	22.9	19.8	16.8	14.0	
Toowoomba									
Toowoomba [‡]	90.7	53.9	24.8	23.9	19.4	17.6	14.4	11.7	
Maryborough - Hervey Bay									
Maryborough [‡]	17.5*	42.9	42.9	42.9	32.7	27.1	18.7	16.2	
Gladstone									
South Gladstone [†]	91.2	24.9	24.0	20.1	18.6	16.2	13.6	11.3	
Mackay									
West Mackay [‡]	98.9	33.9	28.2	27.3	23.4	22.3	19.7	16.8	
Townsville									
North Ward [‡]	100.0	41.1	28.7	26.8	24.2	21.4	18.5	14.9	
Mount Isa									
The Gap [‡]	98.4	52.1	37.4	31.3	24.1	20.5	15.9	12.5	
<p>Bold text indicates a value greater than the AAQ NEPM standard.</p> <p>* Data availability less than 75% for one or more quarters.</p> <p>† Monitoring by TEOM Model 1405DF instrumentation fitted with FDMS.</p> <p>‡ Monitoring by TAPI T640X optical aerosol spectrometer.</p> <p>AAQ NEPM standard for PM₁₀: 50 µg/m³ (1-day average).</p> <p>AAQ NEPM goal for PM₁₀: standard not to be exceeded (excluding exceptional events).</p>									

Table 56. Percentiles of daily 1-day average PM₁₀ concentrations at Mountain Creek (2001–2022)

Year	Data availability (% of days)	No. of exceedances (days)	Maximum (µg/m ³)	Annual average (µg/m ³)	Percentiles (µg/m ³)			
					99 th	98 th	95 th	90 th
2001	47.9*	1	50.8	<i>i.d.</i>	39.9	38.1	27.2	23.8
2002	88.2*	8	146.9	19.1	76.0	56.3	36.6	28.1
2003	99.5	1	69.0	15.1	37.0	32.4	27.4	22.4
2004	96.7	1	66.6	15.4	39.2	34.6	29.1	23.3
2005	95.9	2	62.9	14.5	37.6	29.7	24.4	20.3
2006	98.9	0	39.8	14.6	33.3	28.4	23.9	20.9
2007	98.9	0	41.9	14.6	34.4	31.1	24.0	21.1
2008	93.4	1	53.3	15.8	42.4	35.3	27.6	23.4
2009	97.5	8	863.8	20.2	116.25	63.0	35.6	24.7
2010	97.0	0	33.7	13.1	25.2	23.8	21.3	18.9
2011	97.0	0	49.5	13.2	29.5	28.3	21.7	19.3
2012	95.1	1	57.1	13.7	37.8	31.1	24.7	20.9
2013	98.6	1	78.1	15.8	38.7	30.6	26.6	24.0
2014	97.8	1	59.5	14.5	32.8	28.4	25.1	21.2
2015	98.4	0	44.8	13.8	29.6	26.6	21.8	19.5
2016	97.5	0	38.8	16.0	31.7	28.3	25.6	23.0
2017	96.7	0	37.5	17.5	34.7	31.0	28.8	25.2
2018	98.4	5	94.6	19.6	65.5	39.7	32.7	29.2
2019	98.9	15	259.1	22.9	80.9	66.0	47.1	36.0
2020	98.6	3	77.6	16.0	49.2	33.0	27.1	23.4
2021	99.7	0	27.8	14.9	26.5	25.6	22.7	20.0
2022	99.7	0	36.9	15.5	33.9	30.7	25.7	21.9

Bold text indicates a value greater than the AAQ NEPM standard.

* Data availability less than 75% for one or more quarters.

Years shown in italics have less than 75% annual data availability.

i.d. = insufficient data to calculate value.

AAQ NEPM standards for PM₁₀: 50 µg/m³ (1-day average); 25 µg/m³ (1-year average).

AAQ NEPM goal for PM₁₀ (prior to 2016): 1-year standard not to be exceeded; 1-day standard exceeded on no more than five days per year.

AAQ NEPM goal for PM₁₀ (from 2016): standards not to be exceeded (excluding exceptional events for 1-day standard).

Table 57. Percentiles of daily 1-day average PM₁₀ concentrations at Rocklea (1996–2022)

Year	Data availability (% of days)	No. of exceedances (days)	Maximum (µg/m ³)	Annual average (µg/m ³)	Percentiles (µg/m ³)			
					99 th	98 th	95 th	90 th
1996	62.0*	2	59.5	<i>i.d.</i>	44.8	42.0	35.7	31.2
1997	92.1	0	41.3	18.1	37.4	31.3	27.6	25.9
1998	91.2	0	32.8	17.0	30.6	28.1	25.4	23.3
1999	96.4	1	56.7	15.7	31.4	27.9	25.4	22.2
2000	92.6	0	47.5	17.8	40.5	37.1	31.4	26.5
2001	97.3	1	70.8	16.8	34.8	32.1	26.5	24.2
2002	99.2	8	177.3	20.2	82.2	49.0	32.9	29.6
2003	98.1	2	119.9	16.4	40.4	33.4	28.3	24.2
2004	92.6	0	47.3	19.1	40.8	38.1	33.3	28.2
2005	89.9	2	52.6	16.9	39.8	36.2	27.0	23.3
2006	96.2	0	39.5	16.1	31.5	29.4	26.8	23.8
2007	99.2	1	53.4	17.5	39.1	36.6	31.7	26.3
2008	95.1	1	86.8	16.7	39.6	36.4	28.9	24.8
2009	97.3	9	1033.4	25.2	109.2	64.6	40.3	35.1
2010	96.7	0	38.0	16.7	30.5	27.8	25.3	22.6
2011	2.7*	0	20.4	<i>i.d.</i>	20.3	20.2	19.9	19.3
2012	56.3*	0	41.0	<i>i.d.</i>	34.8	34.6	26.7	22.8
2013	85.8	0	32.2	14.2	29.8	27.3	24.0	21.0
2014	94.8	0	31.6	14.0	30.4	29.7	23.4	21.1
2015	96.2	0	44.0	14.9	31.1	27.4	24.2	21.5
2016	90.7	0	31.2	15.1	29.5	27.1	24.4	21.7
2017	99.7	0	43.2	14.3	30.2	27.7	25.1	21.0
2018	96.2	5	137.2	15.0	55.2	34.9	27.1	22.7
2019	98.1	16	225.7	19.8	130.1	68.3	49.1	34.7
2020	94.0	2	72.4	13.1	32.0	28.3	21.7	18.6
2021	98.9	0	26.5	10.1	21.1	19.1	17.4	15.2
2022	77.5*	0	30.9	12.8	27.5	25.3	22.9	20.2

Bold text indicates a value greater than the AAQ NEPM standard.

* Data availability less than 75% for one or more quarters.

Years shown in italics have less than 75% annual data availability.

i.d. = insufficient data to calculate value.

AAQ NEPM standards for PM₁₀: 50 µg/m³ (1-day average); 25 µg/m³ (1-year average).

AAQ NEPM goal for PM₁₀ (prior to 2016): 1-year standard not to be exceeded; 1-day standard exceeded on no more than five days per year.

AAQ NEPM goal for PM₁₀ (from 2016): standards not to be exceeded (excluding exceptional events for 1-day standard).

Table 58. Percentiles of daily 1-day average PM₁₀ concentrations at Flinders View (1998–2022)

Year	Data availability (% of days)	No. of exceedances (days)	Maximum (µg/m ³)	Annual average (µg/m ³)	Percentiles (µg/m ³)			
					99 th	98 th	95 th	90 th
1998	68.2*	0	26.6	<i>i.d.</i>	24.6	22.2	20.8	19.0
1999	95.3	0	44.2	12.3	27.4	25.1	19.7	17.5
2000	97.3	1	62.8	16.6	39.2	36.2	31.3	26.0
2001	99.7	0	42.5	15.1	36.5	32.9	25.4	22.4
2002	97.3	7	197.2	19.8	92.1	47.0	36.2	30.3
2003	94.8	1	119.1	15.7	35.3	30.6	26.1	23.1
2004	99.2	3	64.1	18.5	39.1	37.4	32.2	28.5
2005	97.0	3	64.3	16.1	43.5	40.1	26.8	23.6
2006	100.0	0	35.7	14.7	29.4	28.5	25.3	22.4
2007	99.2	0	44.6	15.7	38.4	34.3	27.5	23.3
2008	99.2	2	68.5	14.6	44.7	36.0	26.3	21.1
2009	98.6	8	1001.8	21.2	100.7	54.0	32.1	26.9
2010	99.2	0	33.9	12.2	25.5	24.2	20.2	18.3
2011	99.2	2	67.0	14.1	32.8	29.7	22.2	19.9
2012	98.4	2	73.8	15.0	42.2	35.3	27.2	23.1
2013	99.2	0	42.2	15.0	32.3	29.8	24.9	22.0
2014	94.8	0	38.8	15.9	35.7	33.3	28.9	24.6
2015	99.7	0	44.5	14.6	34.5	31.4	24.5	21.8
2016	98.6	0	34.0	13.1	31.4	28.1	24.2	20.2
2017	99.5	0	41.2	16.2	33.1	31.2	27.2	24.0
2018	97.3	6	189.7	20.0	76.8	50.0	37.7	29.1
2019	100.0	21	271.2	24.3	141.8	84.6	57.1	40.8
2020	98.9	4	96.2	17.6	53.6	39.1	28.9	25.6
2021	99.2	1	59.3	14.5	29.3	26.4	22.6	19.9
2022	98.9	0	29.2	14.1	26.7	25.3	22.9	19.8

Bold text indicates a value greater than the AAQ NEPM standard.

* Data availability less than 75% for one or more quarters.

Years shown in italics have less than 75% annual data availability.

i.d. = insufficient data to calculate value.

AAQ NEPM standards for PM₁₀: 50 µg/m³ (1-day average); 25 µg/m³ (1-year average).

AAQ NEPM goal for PM₁₀ (prior to 2016): 1-year standard not to be exceeded; 1-day standard exceeded on no more than five days per year.

AAQ NEPM goal for PM₁₀ (from 2016): standards not to be exceeded (excluding exceptional events for 1-day standard).

Table 59. Percentiles of daily 1-day average PM₁₀ concentrations at North Toowoomba (2003–2010)

Year	Data availability (% of days)	No. of exceedances (days)	Maximum (µg/m ³)	Annual average (µg/m ³)	Percentiles (µg/m ³)			
					99 th	98 th	95 th	90 th
2003	41.1*	1	139.8	<i>i.d.</i>	42.0	35.2	33.2	30.1
2004	98.9	1	54.5	17.0	47.8	42.1	35.4	29.7
2005	95.9	3	111.7	15.3	43.1	34.6	28.5	24.6
2006	92.9	1	55.6	15.8	39.3	33.2	30.0	25.9
2007	97.5	1	51.5	13.8	43.0	36.6	27.2	24.0
2008	95.9	4	105.2	14.7	51.9	46.5	30.2	25.8
2009	97.5	11	1131.0	23.3	127.8	87.8	41.7	32.2
2010	90.7*	0	35.1	12.6	31.8	27.1	23.1	20.9

Bold text indicates a value greater than the AAQ NEPM standard.

* Data availability less than 75% for one or more quarters.

Years shown in italics have less than 75% annual data availability.

i.d. = insufficient data to calculate value.

AAQ NEPM standards for PM₁₀: 50 µg/m³ (1-day average); 25 µg/m³ (1-year average).

AAQ NEPM goal for PM₁₀ (prior to 2016): 1-year standard not to be exceeded; 1-day standard exceeded on no more than five days per year.

AAQ NEPM goal for PM₁₀ (from 2016): standards not to be exceeded (excluding exceptional events for 1-day standard).

Table 60. Percentiles of daily 1-day average PM₁₀ concentrations at South Gladstone (2000–2022)

Year	Data availability (% of days)	No. of exceedances (days)	Maximum (µg/m ³)	Annual average (µg/m ³)	Percentiles (µg/m ³)			
					99 th	98 th	95 th	90 th
2000	63.1*	4	65.2	<i>i.d.</i>	54.8	44.5	32.0	28.2
2001	95.6	4	66.7	17.7	47.4	35.9	30.4	25.8
2002	98.1	5	197.1	18.2	75.1	46.0	33.6	25.8
2003	96.4	0	41.3	15.5	36.1	33.4	26.2	23.6
2004	99.7	0	42.7	16.3	34.5	29.1	25.3	22.4
2005	97.8	4	196.7	16.9	48.5	32.7	26.4	22.8
2006	98.4	1	54.6	16.7	37.0	34.1	27.9	23.1
2007	96.7	0	38.8	15.7	29.5	28.3	25.1	22.7
2008	93.7	2	65.6	17.0	42.3	36.8	29.5	25.5
2009	83.0*	7	252.3	23.2	80.8	54.1	38.1	29.9
2010	78.4*	0	35.6	16.5	32.1	30.3	26.5	23.5
2011	76.7*	3	136.7	14.0	40.7	32.1	27.6	23.2
2012	88.5*	1	63.0	14.6	31.8	28.4	25.1	21.9
2013	95.3	0	37.6	16.8	30.3	28.8	25.5	23.0
2014	95.1	0	49.3	16.2	34.4	30.3	27.9	23.5
2015	93.4	0	31.5	12.9	26.6	25.9	22.0	19.8
2016	97.8	0	32.1	14.5	27.6	25.8	23.3	21.9
2017	92.1	0	40.2	13.9	27.3	25.3	21.6	19.5
2018	94.2	5	80.3	13.9	70.0	42.6	25.4	22.0
2019	97.3	10	130.4	15.9	70.8	56.9	36.9	26.6
2020	97.5	0	32.3	13.0	31.0	29.5	25.0	19.5
2021	97.0	0	27.5	12.1	25.0	23.2	19.4	17.9
2022	91.2	0	24.9	11.0	24.0	20.1	18.6	16.2

Bold text indicates a value greater than the AAQ NEPM standard.

* Data availability less than 75% for one or more quarters.

Years shown in italics have less than 75% annual data availability.

i.d. = insufficient data to calculate value.

AAQ NEPM standards for PM₁₀: 50 µg/m³ (1-day average); 25 µg/m³ (1-year average).

AAQ NEPM goal for PM₁₀ (prior to 2016): 1-year standard not to be exceeded; 1-day standard exceeded on no more than five days per year.

AAQ NEPM goal for PM₁₀ (from 2016): standards not to be exceeded (excluding exceptional events for 1-day standard).

Table 61. Percentiles of daily 1-day average PM₁₀ concentrations at West Mackay (1998–2022)

Year	Data availability (% of days)	No. of exceedances (days)	Maximum (µg/m ³)	Annual average (µg/m ³)	Percentiles (µg/m ³)			
					99 th	98 th	95 th	90 th
1998	39.5*	0	28.9	<i>i.d.</i>	28.8	28.7	22.3	20.7
1999	93.2	1	50.4	17.3	37.6	32.2	27.7	25.6
2000	98.9	2	51.6	18.9	48.4	43.0	34.0	29.9
2001	98.6	2	52.6	22.0	48.5	42.8	37.9	33.5
2002	98.6	5	475.4	24.6	51.2	46.4	37.4	33.1
2003	92.3	7	85.0	21.5	53.2	49.1	38.9	32.2
2004	97.3	0	45.3	20.7	39.6	37.7	33.6	29.6
2005	97.0	7	146.0	22.0	105.1	52.6	36.3	31.1
2006	95.6	1	106.0	19.8	41.5	36.2	31.7	28.4
2007	95.6	2	61.1	21.6	49.1	46.1	38.5	33.1
2008	98.4	9	94.0	23.6	61.4	53.1	43.9	36.4
2009	97.5	18	514.8	28.6	202.6	89.8	50.9	40.8
2010	83.0*	0	44.0	18.5	41.4	35.8	30.7	27.1
2011	92.9	1	65.8	19.9	41.8	39.4	36.2	30.2
2012	98.9	1	64.9	17.8	40.0	37.4	27.6	24.3
2013	96.4	0	42.4	18.5	36.4	30.1	26.4	24.5
2014	91.2	0	34.3	18.2	29.0	27.9	25.2	24.0
2015	91.8	0	46.5	22.0	41.9	37.8	34.1	29.5
2016	97.5	0	44.5	19.8	34.4	33.1	28.4	27.0
2017	90.4	3	69.0	21.6	45.4	42.4	37.0	32.7
2018	94.5	5	127.3	22.4	54.9	44.2	35.9	29.7
2019	98.1	10	238.5	24.1	85.3	75.6	36.3	31.0
2020	100.0	0	39.4	17.0	31.8	30.0	25.4	23.7
2021	100.0	0	43.5	16.8	34.5	28.1	25.2	22.8
2022	98.9	0	33.9	16.7	28.2	27.3	23.4	22.3

Bold text indicates a value greater than the AAQ NEPM standard.

* Data availability less than 75% for one or more quarters.

Years shown in italics have less than 75% annual data availability.

i.d. = insufficient data to calculate value.

AAQ NEPM standards for PM₁₀: 50 µg/m³ (1-day average); 25 µg/m³ (1-year average).

AAQ NEPM goal for PM₁₀ (prior to 2016): 1-year standard not to be exceeded; 1-day standard exceeded on no more than five days per year.

AAQ NEPM goal for PM₁₀ (from 2016): standards not to be exceeded (excluding exceptional events for 1-day standard).

Table 62. Percentiles of daily 1-day average PM₁₀ concentrations at Pimlico (2004–2016)

Year	Data availability (% of days)	No. of exceedances (days)	Maximum (µg/m ³)	Annual average (µg/m ³)	Percentiles (µg/m ³)			
					99 th	98 th	95 th	90 th
2004	52.2*	0	28.1	<i>i.d.</i>	27.0	25.9	23.2	21.4
2005	91.8	5	141.9	16.1	113.0	31.7	23.4	20.5
2006	89.6*	2	61.5	14.6	28.3	24.0	22.2	20.1
2007	94.0	0	29.1	12.9	26.9	24.2	20.5	18.3
2008	97.0	1	50.6	16.4	36.1	32.6	29.3	23.9
2009	93.4	9	460.4	21.2	302.2	121.5	33.9	23.6
2010	80.3*	0	31.5	13.9	29.3	25.6	22.8	19.4
2011	93.7	1	64.9	15.4	33.9	31.8	27.7	22.3
2012	92.1	0	30.0	12.9	26.3	23.6	21.5	18.8
2013	95.1	0	27.6	15.1	27.0	26.1	24.4	22.5
2014	98.4	0	29.4	15.1	27.7	26.2	23.1	20.6
2015	91.2	0	42.0	17.6	36.6	32.6	26.7	24.1
2016	11.7*	0	33.4	<i>i.d.</i>	33.4	33.4	32.5	24.5

Bold text indicates a value greater than the AAQ NEPM standard.

* Data availability less than 75% for one or more quarters.

Years shown in italics have less than 75% annual data availability.

i.d. = insufficient data to calculate value.

AAQ NEPM standards for PM₁₀: 50 µg/m³ (1-day average); 25 µg/m³ (1-year average).

AAQ NEPM goal for PM₁₀ (prior to 2016): 1-year standard not to be exceeded; 1-day standard exceeded on no more than five days per year.

AAQ NEPM goal for PM₁₀ (from 2016): standards not to be exceeded (excluding exceptional events for 1-day standard).

Table 63. Percentiles of daily 1-day average PM₁₀ concentrations at North Ward (2018–2022)

Year	Data availability (% of days)	No. of exceedances (days)	Maximum (µg/m ³)	Annual average (µg/m ³)	Percentiles (µg/m ³)			
					99 th	98 th	95 th	90 th
2018	94.5	0	42.3	15.0	37.6	26.8	23.5	20.4
2019	94.0	8	277.4	20.2	79.9	56.1	34.7	26.6
2020	92.3	0	35.6	16.2	32.7	30.6	26.7	23.7
2021	100.0	1	60.0	16.3	31.1	30.1	25.9	23.4
2022	100.0	0	41.1	15.2	28.7	26.8	24.2	21.4

Bold text indicates a value greater than the AAQ NEPM standard.

AAQ NEPM standards for PM₁₀: 50 µg/m³ (1-day average); 25 µg/m³ (1-year average).

AAQ NEPM goal for PM₁₀ (prior to 2016): 1-year standard not to be exceeded; 1-day standard exceeded on no more than five days per year.

AAQ NEPM goal for PM₁₀ (from 2016): standards not to be exceeded (excluding exceptional events for 1-day standard).

Table 64. Percentiles of daily 1-day average PM₁₀ concentrations at The Gap (2009–2022)

Year	Data availability (% of days)	No. of exceedances (days)	Maximum (µg/m ³)	Annual average (µg/m ³)	Percentiles (µg/m ³)			
					99 th	98 th	95 th	90 th
2009	63.3*	19	508.5	<i>i.d.</i>	283.6	135.6	67.8	45.8
2010	75.1*	0	32.1	8.9	25.7	23.9	18.8	15.8
2011	87.4*	13	124.0	17.3	91.2	71.5	42.6	32.4
2012	99.2	16	74.5	19.5	59.3	56.7	49.2	38.8
2013	79.7*	13	154.1	23.1	137.0	67.7	45.9	37.5
2014	96.7	12	153.7	20.4	80.0	57.7	43.4	33.6
2015	98.1	6	153.3	19.5	56.9	50.0	39.5	31.5
2016	95.6	1	350.8	16.8	43.3	41.1	31.5	26.5
2017	98.1	3	89.7	18.2	43.3	37.9	32.3	27.6
2018	96.7	15	389.9	23.9	124.2	84.7	47.3	38.4
2019	96.2	33	390.5	29.5	79.9	56.1	34.7	26.6
2020	98.6	14	184.2	20.2	70.3	58.1	48.5	32.7
2021	98.9	6	153.5	18.4	75.1	48.3	35.2	28.5
2022	98.4	1	52.1	13.4	37.4	31.3	24.1	20.5

Bold text indicates a value greater than the AAQ NEPM standard.

* Data availability less than 75% for one or more quarters.

Years shown in italics have less than 75% annual data availability.

i.d. = insufficient data to calculate value.

AAQ NEPM standards for PM₁₀: 50 µg/m³ (1-day average); 25 µg/m³ (1-year average).

AAQ NEPM goal for PM₁₀ (prior to 2016): 1-year standard not to be exceeded; 1-day standard exceeded on no more than five days per year.

AAQ NEPM goal for PM₁₀ (from 2016): standards not to be exceeded (excluding exceptional events for 1-day standard).

PM_{2.5}**Table 65. 2022 percentiles of daily 1-day average PM_{2.5} concentrations**

Region/performance monitoring station	Data availability (% of days)	Maximum (µg/m ³)	Percentiles (µg/m ³)						
			99 th	98 th	95 th	90 th	75 th	50 th	
South East Queensland									
Mountain Creek [†]	99.7	21.0	12.0	11.6	10.3	8.7	7.0	5.7	
Rocklea [†]	77.8*	17.5	16.0	14.9	13.2	10.7	7.7	5.8	
Springwood [†]	91.2*	17.8	16.0	12.2	10.5	8.5	6.6	5.1	
Southport [†]	96.4	13.9	9.8	8.6	7.2	6.2	5.2	3.8	
Flinders View [‡]	98.9	17.0	13.7	11.7	9.2	8.4	6.8	5.3	
Toowoomba									
Toowoomba [‡]	90.7	15.1	12.4	11.5	9.1	7.7	6.0	4.8	
Maryborough - Hervey Bay									
Maryborough [‡]	17.5*	28.9	28.9	28.9	10.9	8.3	6.8	5.7	
Gladstone									
South Gladstone [†]	98.4	11.7	10.7	8.5	7.4	6.4	5.2	4.3	
Mackay									
West Mackay [‡]	98.9	14.9	10.4	10.0	9.0	8.4	7.1	5.8	
Townsville									
North Ward [†]	100.0	26.3	11.0	9.8	8.9	7.9	6.9	5.8	
The Gap									
Mount Isa [‡]	98.4	14.6	10.8	9.8	7.8	6.8	5.1	3.7	

Bold text indicates a value greater than the AAQ NEPM standard.

* Data availability less than 75% for one or more quarters.

† Monitoring by TEOM Model 1405DF instrumentation fitted with FDMS.

‡ Monitoring by TAPI T640X optical aerosol spectrometer.

AAQ NEPM standard for PM_{2.5}: 25 µg/m³ (1-day average).

AAQ NEPM goal for PM_{2.5}: 1-day standard not to be exceeded (excluding exceptional events).

Table 66. Percentiles of daily 1-day average PM_{2.5} concentrations at Rocklea (1998–2022)

Year	Data availability (% of days)	No. of exceedances (days)	Maximum (µg/m ³)	Annual average (µg/m ³)	Percentiles (µg/m ³)			
					99 th	98 th	95 th	90 th
1998	80.8*	0	16.1	3.5	11.1	9.2	7.7	6.0
1999	88.8*	0	14.5	5.0	13.3	12.4	10.3	8.3
2000	95.6	3	37.4	5.8	20.2	17.7	13.3	10.9
2001	98.6	3	95.4	5.5	18.4	17.1	12.3	9.2
2002	96.4	3	45.3	6.1	22.0	17.1	12.8	10.9
2003	87.7*	1	34.7	5.1	23.3	13.9	10.6	8.6
2004	93.7	5	32.9	6.5	28.7	24.4	17.9	11.6
2005	90.1*	0	15.3	4.6	13.0	12.2	9.6	8.1
2006	95.3	0	14.2	4.1	13.7	11.1	8.6	7.1
2007	99.7	0	20.5	4.4	17.6	13.5	10.6	8.5
2008	95.3	0	11.6	3.8	9.8	9.5	7.8	6.9
2009	92.6	7	163.6	10.9	34.3	25.7	21.5	18.0
2010	96.7	0	23.2	8.2	17.4	15.3	13.6	12.0
2011	2.7*	0	8.8	<i>i.d.</i>	8.8	8.8	8.8	8.8
2012	56.3*	0	23.7	<i>i.d.</i>	22.8	16.7	13.9	11.3
2013	85.8	0	17.2	6.6	16.4	14.7	12.0	10.3
2014	94.8	0	21.9	5.8	19.1	15.5	13.0	9.6
2015	96.2	0	20.3	7.3	16.6	15.8	13.5	11.5
2016	90.7	0	19.9	6.5	16.7	15.2	13.4	10.7
2017	99.7	1	28.9	7.3	19.5	17.3	13.8	11.9
2018	96.2	2	34.7	6.4	23.5	16.0	14.0	11.1
2019	98.1	17	108.6	8.7	43.0	37.3	24.7	15.6
2020	94.0	0	22.6	6.0	18.5	16.4	11.4	9.3
2021	98.4	0	17.9	4.6	11.8	10.4	9.2	7.6
2022	77.8*	0	17.5	6.1	16.0	14.9	13.2	10.7

Bold text indicates a value greater than the AAQ NEPM standard.

* Data availability less than 75% for one or more quarters.

Years shown in italics have less than 75% annual data availability.

i.d. = insufficient data to calculate value.

Monitoring by TEOM Model 1400 instrumentation in accordance with Technical Paper on Monitoring for Particles as PM_{2.5} from 1998 to 2008. Monitoring by TEOM Model 1405 instrumentation fitted with FDMS since 2009.

AAQ NEPM standards for PM_{2.5}: 25 µg/m³ (1-day average); 8 µg/m³ (1-year average).

AAQ NEPM goal for PM_{2.5}: standards not to be exceeded (excluding exceptional events for 1-day standard).

Table 67. Percentiles of daily 1-day average PM_{2.5} concentrations at Springwood (1999–2022)

Year	Data availability (% of days)	No. of exceedances (days)	Maximum (µg/m ³)	Annual average (µg/m ³)	Percentiles (µg/m ³)			
					99 th	98 th	95 th	90 th
1999	82.7*	0	22.3	4.3	12.9	11.8	8.7	7.1
2000	96.7	6	35.4	6.4	28.9	23.6	17.3	13.2
2001	97.0	0	19.4	5.3	18.0	16.2	11.8	9.1
2002	95.9	5	38.9	6.2	28.4	20.1	14.9	11.7
2003	96.2	0	20.5	5.5	16.6	15.4	10.9	9.2
2004	98.4	0	21.7	5.5	16.9	15.4	11.7	9.5
2005	96.4	0	15.2	4.7	14.9	13.3	10.3	8.6
2006	94.0	1	25.5	4.8	20.1	15.3	9.3	7.9
2007	98.4	0	17.8	4.3	14.0	12.0	9.4	7.8
2008	96.7	0	10.9	4.1	9.9	8.8	7.9	6.7
2009	91.5	3	150.6	5.5	25.3	18.0	11.4	9.0
2010	83.3	0	19.4	4.4	12.8	10.7	8.4	7.4
2011	92.9	3	51.2	4.6	29.3	11.5	8.7	6.8
2012	98.1	0	23.7	4.4	15.6	13.3	10.2	7.5
2013	96.7	0	14.2	4.5	11.9	11.6	10.1	8.6
2014	97.3	0	17.6	4.9	14.8	13.1	10.0	8.0
2015	71.0*	0	12.6	<i>i.d.</i>	10.9	9.8	7.5	6.5
2016	95.6	0	20.1	5.7	16.0	13.6	10.9	9.3
2017	100.0	0	23.9	5.4	15.0	13.8	11.6	9.8
2018	96.4	0	24.7	5.9	20.1	17.6	13.5	11.1
2019	96.4	13	101.1	6.7	44.8	31.4	19.3	13.0
2020	91.0	1	28.1	4.7	13.7	12.9	9.9	8.2
2021	98.1	0	15.6	4.8	11.5	10.7	9.8	8.0
2022	91.2	0	17.8	5.6	16.0	12.2	10.5	8.5

Bold text indicates a value greater than the AAQ NEPM standard.

* Data availability less than 75% for one or more quarters.

Years shown in italics have less than 75% annual data availability.

i.d. = insufficient data to calculate value.

Monitoring by TEOM Model 1400 instrumentation in accordance with Technical Paper on Monitoring for Particles as PM_{2.5} until 25 February 2016. From 25 February 2016, monitoring by TEOM Model 1405 instrumentation fitted with FDMS.

AAQ NEPM standards for PM_{2.5}: 25 µg/m³ (1-day average); 8 µg/m³ (1-year average).

AAQ NEPM goal for PM_{2.5}: standards not to be exceeded (excluding exceptional events for 1-day standard).

Table 68. Percentiles of daily 1-day average PM_{2.5} concentrations at North Toowoomba (2003–2007)

Year	Data availability (% of days)	No. of exceedances (days)	Maximum (µg/m ³)	Annual average (µg/m ³)	Percentiles (µg/m ³)			
					99 th	98 th	95 th	90 th
2003	34.8*	1	28.1	<i>i.d.</i>	19.0	17.1	15.3	12.1
2004	98.6	1	33.2	5.1	19.1	17.3	14.6	11.7
2005	97.3	0	24.8	4.7	14.7	13.6	10.9	8.6
2006	93.2	0	16.0	4.1	15.3	12.0	9.6	7.9
2007	92.9	0	17.8	3.6	11.9	10.8	8.7	6.8

Bold text indicates a value greater than the AAQ NEPM standard.
 * Data availability less than 75% for one or more quarters.
 Years shown in italics have less than 75% annual data availability.
i.d. = insufficient data to calculate value.
 Monitoring by TEOM Model 1400 instrumentation in accordance with Technical Paper on Monitoring for Particles as PM_{2.5}.
 AAQ NEPM standards for PM_{2.5}: 25 µg/m³ (1-day average); 8 µg/m³ (1-year average).
 AAQ NEPM goal for PM_{2.5}: standards not to be exceeded (excluding exceptional events for 1-day standard).

Table 69. Percentiles of daily 1-day average PM_{2.5} concentrations at South Gladstone (2008–2022)

Year	Data availability (% of days)	No. of exceedances (days)	Maximum (µg/m ³)	Annual average (µg/m ³)	Percentiles (µg/m ³)			
					99 th	98 th	95 th	90 th
2008	13.9*	0	15.2	<i>i.d.</i>	12.6	12.6	12.3	11.1
2009	83.0*	7	50.8	9.2	29.8	26.9	17.7	13.8
2010	78.4*	0	17.5	6.2	16.3	14.8	12.9	9.9
2011	90.4*	9	126.7	7.6	62.2	33.5	16.4	12.0
2012	88.5*	1	49.6	5.2	21.4	12.1	9.5	7.5
2013	95.3	0	18.3	5.6	16.9	12.1	10.3	8.6
2014	95.1	1	44.0	6.0	14.6	12.8	10.9	9.4
2015	93.4	0	13.8	4.3	10.1	9.4	8.0	6.7
2016	97.8	0	15.9	5.7	14.8	13.2	10.3	8.4
2017	92.1	1	28.6	5.6	13.4	10.6	9.3	8.4
2018	94.2	7	55.0	5.5	37.7	28.2	9.8	8.4
2019	97.3	5	40.2	6.4	31.8	22.9	17.8	12.5
2020	97.5	0	18.1	5.6	16.0	14.4	11.2	9.0
2021	97.0	0	17.1	5.0	12.0	10.8	8.3	7.6
2022	98.4	0	11.7	4.4	10.7	8.5	7.4	6.4

Bold text indicates a value greater than the AAQ NEPM standard.
 * Data availability less than 75% for one or more quarters.
 Years shown in italics have less than 75% annual data availability.
i.d. = insufficient data to calculate value.
 Monitoring by TEOM Model 1405 instrumentation fitted with FDMS.
 AAQ NEPM standards for PM_{2.5}: 25 µg/m³ (1-day average); 8 µg/m³ (1-year average).
 AAQ NEPM goal for PM_{2.5}: standards not to be exceeded (excluding exceptional events for 1-day standard).

Table 70. Percentiles of daily 1-day average PM_{2.5} concentrations at North Ward (2018–2022)

Year	Data availability (% of days)	No. of exceedances (days)	Maximum (µg/m ³)	Annual average (µg/m ³)	Percentiles (µg/m ³)			
					99 th	98 th	95 th	90 th
2018	94.5	2	30.7	5.6	17.6	13.5	9.3	7.6
2019	94.0	4	51.5	7.0	28.3	19.6	13.8	10.3
2020	92.3	0	17.4	5.8	12.8	11.8	9.4	8.1
2021	100.0	0	15.3	5.8	13.7	10.9	9.2	8.1
2022	100.0	1	26.3	5.8	11.0	9.8	8.9	7.9

Bold text indicates a value greater than the AAQ NEPM standard.
Monitoring by TAPI T640X optical aerosol spectrometer.
AAQ NEPM standards for PM_{2.5}: 25 µg/m³ (1-day average); 8 µg/m³ (1-year average).
AAQ NEPM goal for PM_{2.5}: standards not to be exceeded (excluding exceptional events for 1-day standard).

Lead

Table 71. Annual average lead concentrations at Woolloongabba (1980–2002)

Year	Data availability (% of days)	Annual average ($\mu\text{g}/\text{m}^3$)
1980	91.8	2.21
1981	85.2*	2.69
1982	96.7	2.34
1983	96.7	2.21
1984	93.4	2.56
1985	86.9*	2.40
1986	100.0	1.90
1987	96.7	1.91
1988	98.4	2.13
1989	98.4	1.64
1990	98.4	1.47
1991	100.0	0.97
1992	90.2	0.63
1993	93.4	0.57
1994	96.7	0.48
1995	100.0	0.38
1996	98.4	0.25
1997	100.0	0.27
1998	65.6*	<i>i.d.</i>
1999	98.3	0.19
2000	88.5	0.14
2001	93.4	0.03
2002	96.7	0.02

Bold text indicates a value greater than the AAQ NEPM standard.

* Data availability less than 75% for one or more quarters.

Years shown in italics have less than 75% annual data availability.

i.d. = insufficient data to calculate value.

AAQ NEPM standard for lead: $0.5 \mu\text{g}/\text{m}^3$ (1-year average).

AAQ NEPM goal for lead: standard not to be exceeded.

Table 72. Annual average lead concentrations at Townsville Coast Guard (2011–2022)

Year	Data availability (% of days)	Annual average ($\mu\text{g}/\text{m}^3$)
2011	85.0*	0.14
2012	96.7	0.12
2013	88.5	0.24
2014	96.7	0.29
2015	91.8	0.16
2016	100.0	0.05
2017	91.8	0.09
2018	98.4	0.10
2019	100.0	0.18
2020	96.7	0.13
2021	95.0	0.17
2022	95.1	0.07

* Data availability less than 75% for one or more quarters.
AAQ NEPM standard for lead: $0.5 \mu\text{g}/\text{m}^3$ (1-year average).
AAQ NEPM goal for lead: standard not to be exceeded.

Table 73. Annual average lead concentrations at The Gap (2009–2022)

Year	Data availability (% of days)	Annual average ($\mu\text{g}/\text{m}^3$)
2009	77.0*	0.13
2010	95.0	0.13
2011	96.7	0.14
2012	91.8	0.10
2013	73.8*	<i>i.d.</i>
2014	91.8*	0.11
2015	100.0	0.09
2016	80.3*	0.06
2017	91.8	0.08
2018	98.3	0.10
2019	98.4	0.10
2020	100.0	0.09
2021	95.1	0.12
2022	100.0	0.10

* Data availability less than 75% for one or more quarters.
Years shown in italics have less than 75% annual data availability.
i.d. = insufficient data to calculate value.
AAQ NEPM standard for lead: $0.5 \mu\text{g}/\text{m}^3$ (1-year average).
AAQ NEPM goal for lead: standard not to be exceeded.

Section E – Population exposure

Clause 17 of the AAQ NEPM¹⁰ requires jurisdictions to evaluate and report population exposures to particles as PM_{2.5} from June 2018, and nitrogen dioxide and photochemical oxidants (as ozone) from June 2021.

Pending the development of a nationally consistent methodology for reporting annual population exposure, DES has adopted the following approach to determining population exposure:

- Within a region individual sites where the pollutant is monitored (including non-AAQ NEPM reporting sites) are assigned a classification based on Australian/New Zealand Standard 3580.1.1:2016, being:
 - peak (e.g. industry, roadside);
 - neighbourhood (e.g. residential); or
 - background (e.g. rural).
- For PM_{2.5} and nitrogen dioxide, the annual average concentrations from individual sites having the same classification are averaged to provide an indicative measure of annual population exposure for locations of this type within the region.
- For ozone, the maximum 8-hour average ozone concentration measured across individual sites having the same classification for each day of the year is first determined. These values are then averaged to provide an indicative measure of annual population exposure for locations of this type within the region. The maximum 8-hour average ozone concentration measured during the year at sites of the same classification is also reported.
- In some regions, DES's current monitoring network locations do not cover all three site classifications.

Queensland had a population of 5.327 million at 30 June 2022¹¹. In 2022 PM_{2.5} monitoring was undertaken in the following regions: South East Queensland (3.556 million residents), Gladstone (65,431 residents), Central Highlands (19,353 residents), Mackay (73,429 residents), Moranbah (9,804 residents) and Townsville (198,577 residents)¹².

PM_{2.5}

During 2022 DES undertook continuous PM_{2.5} monitoring at 25 locations in Queensland where annual data availability was greater than 75 per cent. Monitoring was conducted using either a Thermo Scientific TEOM® 1405DF oscillating microbalance or a Teledyne API T640X optical aerosol spectrometer instrument. Both instruments have US EPA equivalent method designation for measurement of PM_{2.5}.

The indicative annual exposure to PM_{2.5} particles for residents in the different location classifications in the seven regions where PM_{2.5} monitoring was conducted during 2022 is summarised in Table 74.

¹⁰ available from www.legislation.gov.au/Details/F2021C00475.

¹¹ Queensland Government Statistician's Office, Population growth, Queensland, December quarter 2021. Accessed from www.qgso.qld.gov.au/issues/3091/population-growth-ql-202112.pdf.

¹² Queensland Government Statistician's Office, Population estimates - Regions - Estimated resident population (ERP). Accessed from www.qgso.qld.gov.au/statistics/theme/population/population-estimates/regions.

Table 74. Indicative annual population exposure to PM_{2.5} for Queensland regions in 2022.

Region / Classification	Annual average population exposure		Number of monitoring stations	Air monitoring station locations
	µg/m ³	% of standard		
<u>South East Queensland</u>				
Peak	6.1	76.3	4	Brisbane CBD [†] , Cannon Hill [‡] , South Brisbane [‡] , Woolloongabba [‡]
Neighbourhood	5.6	70.0	7	Deagon [‡] , Deception Bay [‡] , Flinders View [†] , Mountain Creek [†] , Rocklea [†] , Southport [†] , Springwood [†]
Background	5.3	66.3	2	Mutdapilly [‡] , North Maclean [‡]
<u>Toowoomba</u>				
Neighbourhood	5.1	63.8	1	Toowoomba [†]
<u>Gladstone</u>				
Peak	5.2	65.0	2	Boat Creek [‡] , Clinton [‡]
Neighbourhood	4.7	58.8	2	Boyne Island [‡] , South Gladstone [†]
Background	4.8	60.0	1	Targinie [‡]
<u>Central Highlands</u>				
Neighbourhood	4.7	58.8	2	Blackwater [‡] , Emerald [‡]
<u>Mackay</u>				
Neighbourhood	5.9	73.8	1	West Mackay [†]
<u>Moranbah</u>				
Neighbourhood	5.5	68.8	2	Moranbah (Cunningham Way) [‡] , Moranbah (Utah Drive) [‡]
<u>Townsville</u>				
Neighbourhood	5.8	72.5	1	North Ward [†]
<u>Mount Isa</u>				
Neighbourhood	4.1	51.3	1	The Gap [†]
[†] AAQ NEPM performance monitoring site [‡] Non-AAQ NEPM performance monitoring site				

Nitrogen dioxide

During 2022 DES undertook nitrogen dioxide monitoring at 19 locations in Queensland where annual data availability was greater than 75 per cent. At all locations except Memorial Park in Gladstone, monitoring was conducted using a chemiluminescence analyser operated in accordance with Australian Standard AS 3580.5.1. At Memorial Park, monitoring was conducted using a differential optical absorption spectroscopy (DOAS) instrument operated in accordance with Australian/New Zealand Standard AS/NZS 3580.15.

The indicative annual exposure to nitrogen dioxide for residents in the different location classifications in the three regions where nitrogen dioxide monitoring was conducted during 2022 is summarised in Table 75.

Table 75. Indicative annual population exposure to nitrogen dioxide for Queensland regions in 2022.

Region / Classification	Annual average population exposure		Number of monitoring stations	Air monitoring station locations
	ppm	% of standard		
<u>South East Queensland</u>				
Peak	0.011	73.3	3	Cannon Hill [‡] , South Brisbane [‡] , Woolloongabba [‡]
Neighbourhood	0.005	33.3	7	Deagon [‡] , Deception Bay [†] , Flinders View [†] , Mountain Creek [†] , Rocklea [†] , Southport [†] , Springwood [†]
Background	0.003	20.0	2	Mutdapilly [‡] , North Maclean [‡]
<u>Gladstone</u>				
Peak	0.004	26.7	2	Boat Creek [‡] , Clinton [‡]
Neighbourhood	0.003	20.0	3	Boyne Island [‡] , Memorial Park [†] , South Gladstone [†]
Background	0.003	20.0	1	Targinie [‡]
<u>Townsville</u>				
Neighbourhood	0.003	20.0	1	North Ward [†]
† AAQ NEPM performance monitoring site ‡ Non-AAQ NEPM performance monitoring site				

Photochemical oxidants (as ozone)

During 2022 DES undertook ozone monitoring at 11 locations in Queensland where annual data availability was greater than 75 per cent. At all locations except Memorial Park in Gladstone, monitoring was conducted using a UV-absorption analyser operated in accordance with Australian Standard AS 3580.6.1. At Memorial Park, monitoring was conducted using a differential optical absorption spectroscopy (DOAS) instrument operated in accordance with Australian/New Zealand Standard AS/NZS 3580.15.

The indicative annual and maximum 8-hour exposure to ozone for residents in the different location classifications in the two regions where ozone monitoring was conducted during 2022 is summarised in Table 76.

Table 76. Indicative annual population exposure to ozone for Queensland regions in 2022.

Region / Classification	Average 8-hour population exposure		Maximum 8-hour population exposure		Number of monitoring stations	Air monitoring station locations
	ppm	% of standard	ppm	% of standard		
<u>South East Queensland</u>						
Peak	0.026	40.0	0.053	81.5	1	Cannon Hill [‡]
Neighbourhood	0.030	46.2	0.057	87.7	7	Deagon [‡] , Deception Bay [†] , Flinders View [†] , Mountain Creek [†] , Rocklea [†] , Southport [†] , Springwood [†]
Background	0.028	43.1	0.051	78.5	2	Mutdapilly [‡] , North Maclean [‡]
<u>Gladstone</u>						
Neighbourhood	0.019	29.2	0.036	55.4	1	Memorial Park [†]
† AAQ NEPM performance monitoring site ‡ Non-AAQ NEPM performance monitoring site						