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# LIST OF DEFINITIONS AND ABBREVIATIONS

| **Term** | **Definition** |
| --- | --- |
| AAQ NEPM | National Environment Protection (Ambient Air Quality) Measure |
| ACT | Australian Capital Territory |
| CO | Carbon Monoxide |
| BAM | Beta Attenuation Monitor |
| Exceptional event | Exceptional event means a fire or dust occurrence that adversely affects air quality at a particular location and causes an exceedance of one (1) day average standards in excess of normal historical fluctuations and background levels and is directly related to: bushfire; jurisdiction authorised hazard reduction burning; or continental scale windblown dust |
| NATA | National Association of Testing Authorities |
| ND | Not Demonstrated |
| NO2 | Nitrogen Dioxide |
| O3 | Ozone |
| PMS | Performance Monitoring Station |
| PM2.5 | Particles with an equivalent aerodynamic diameter less than or equal to 2.5 micrometres |
| PM10 | Particles with an equivalent aerodynamic diameter less than or equal to 10 micrometres |
| ppm | Parts per million by volume – parts of pollutant per million parts of air |
| Q | Quarter (e.g. Q1 means the first quarter of the year) |
| SO2 | Sulfur Dioxide |
| µg/m3 | micrograms per cubic metre |
|  |  |
|  |  |

# OVERVIEW

The ACT Air Quality Report 2020 (‘the Report’) presents the results of ambient air quality monitoring in the ACT for 2020 and assesses the results in accordance with the requirements of the National Environment Protection (Ambient Air Quality) Measure (AAQ NEPM) made by the National Environment Protection Council on 26 June 1998.

Air quality in this Report is assessed against the AAQ NEPM standards shown in Table 3. In accordance with its agreed policy position, the ACT assesses its compliance for the annual average for particulate matter less than 10 microns (PM10) against a lower standard of 20 μg/m3 rather than the 25 μg/m3 standard introduced in 2016.

The ACT monitors four of the six NEPM pollutants:

* carbon monoxide (CO)
* nitrogen dioxide (NO2)
* photochemical oxidants as ozone (O3)
* particulate matter (as PM10, particles less than or equal to 10 microns in diameter and PM2.5, particles less than or equal to 2.5 microns in diameter).

The ACT does not monitor sulfur dioxide (SO2) as it is primarily an industrial pollutant and the ACT does not have much heavy industry. In 2002, lead monitoring ceased with the phase out of leaded petrol.

A summary of the 2020 Report is:

* the major air quality issue in 2020 was particle pollution (both PM10 and PM2.5) between January to early February, primarily associated with the continued impact of the 2019–2020 summer bushfires
* while concentrations of carbon monoxide and nitrogen dioxide increased during the bushfire period, the associated AAQ NEPM standards were met on 99.5% of days during the year;
* ozone remained at relatively high levels in January 2020 compared with the rest of the year, meeting the AAQ NEPM standards on 99% of days throughout the year
* though more nitrogen dioxide and ozone exceedances were recorded in the ACT, the overall levels for those two pollutants in 2020 decreased compared with 2019. This is possibly due to less vehicle traffic and other human activities as a result of the COVID-19 pandemic restrictions and the cooler temperatures in the second half of 2020
* the daily PM10 standard was exceeded on 27 days at one or more monitoring stations, compared to 29 days in 2019 and 6 days in 2018. All of the PM10 exceedances occurred outside the winter season and were due to bushfires or dust storms
* the daily PM2.5 standard was exceeded on 39 days at one or more monitoring stations, compared to 32 days in 2019 and 5 days in 2018. Excluding the 26 exceedance days directly associated with bushfires, there were only 13 exceedance days related to wood heater emissions which occurred between mid-May and early August; and
* a possible cause of this increase in PM2.5 may be due to people staying at home more during the COVID-19 pandemic. As a comparison, there were only 2 days in 2019 and 1 day in 2018 that exceeded the national standard in winter months.

# MONITORING SUMMARY

## Performance Monitoring Stations

The ACT Government has been undertaking ambient air quality monitoring in Canberra since the early 1990’s. The Health Directorate is responsible for the Government’s ambient air quality monitoring network. The Environment Protection Authority (EPA) within the Chief Minister, Treasury and Economic Development Directorate is responsible for annual reporting under the AAQ NEPM.

The ACT monitoring network consists of three monitoring stations located at:

* Monash – approximately 300 metres west of Cockcroft Avenue in open urban space area
* Civic – at the northern end of the carpark on the western side of the Olympic swimming pool adjacent to Allara Street
* Florey – at the end of Neumann Place, on public land.

The compliance and non-compliance criteria for the monitoring stations against the siting standard AS/NZS 3580.1.1:2008 are listed in Table 1 below.

Table 1: Summary of stations’ siting compliance with AS 3580.1.1:2008

| **Station** | **Height above ground** | **Minimum distance to support structure** | **Clear sky angle of 120°** | **Unrestricted airflow of 270°/360°** | **20m from trees** | **No boilers or incinerators nearby** | **Minimum distance from road or traffic** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Monash | 🗹 | 🗹 | 🗹 | 🗹 | 🗹 | 🗹 | 🗹 |
| Civic | 🗹 | 🗷 | 🗷 | 🗷 | 🗷 | 🗹 | 🗹 |
| Florey | 🗹 | 🗹 | 🗹 | 🗹 | 🗹 | 🗹 | 🗹 |

Monash and Florey stations are the ACT’s two performance monitoring stations as per the requirements under Section 14 of the AAQ NEPM. In addition, the ACT Government carries out key pollutants monitoring at Civic station to better inform the community concerning ambient air quality and support formation of government policy.

The Monash and Florey stations contain instrumentation that continuously monitors carbon monoxide, nitrogen dioxide, ozone and particles as PM10 and PM2.5. Following the establishment of the Florey station on 28 February 2014, the Civic station only monitors key pollutants, including ozone and particles as PM10 and PM2.5.

## Monitoring Methods

The ACT monitoring is conducted in accordance with the relevant Australian Standards as shown in Table 2. Data not meeting the requirements of these Standards are identified as invalid and not included in this report.

Table 2: Methods used for monitoring AAQ NEPM pollutants

| **Pollutant** | **Standard** | **Title** | **Method Used** |
| --- | --- | --- | --- |
| Carbon monoxide | AS 3580.7.1-2011 | Methods for sampling and analysis of ambient air - Determination of carbon monoxide - Direct-reading instrumental method | Gas filter correlation/  Infrared |
| Nitrogen dioxide | AS 3580.5.1-2011 | Methods for sampling and analysis of ambient air - Determination of oxides of nitrogen - Direct-reading instrumental method | Gas phase  chemiluminescence |
| Photochemical  oxidant (ozone) | AS 3580.6.1-2016 | Methods for sampling and analysis of ambient air - Determination of ozone - Direct-reading instrumental method | Non-dispersive ultraviolet |
| PM10 | AS/NZS 3580.9.11-2016 | Method for sampling and analysis of ambient air Method – Determination of suspended particles matter – PM10 beta attenuation monitors | Beta Attenuation Monitor |
| PM2.5 | AS/NZS 3580.9.12:2013 | Methods for sampling and analysis of ambient air - Method 9.12: Determination of suspended particulate matter - PM2.5 beta attenuation monitors | Beta Attenuation Monitor |

## NATA Accreditation Status

The ACT Government monitoring network is accredited by NATA for the measurement of all AAQ NEPM pollutants except sulfur dioxide and lead as required under Clause 12 of the AAQ NEPM.

# ASSESSMENT OF COMPLIANCE WITH STANDARDS AND GOALS

For the purpose of this Report, air quality is assessed against the AAQ NEPM standards as specified in Schedule 2 of the AAQ NEPM and ACT policy position. The standards against which air quality is assessed are concentrations in parts per million (ppm) or micrograms per cubic metre (µg/m3) (refer to Table 3, column 3).

The goal of the AAQ NEPM is to achieve the NEPM standards as assessed in accordance with the monitoring protocol to the extent specified in Schedule 2 of the AAQ NEPM. The extent is expressed as a maximum allowable number of exceedances for each standard (shown in Table 3 column 4).

In accordance with its agreed policy position, the ACT assesses its compliance for the annual average for PM10 against a lower standard of 20 μg/m3 rather than the AAQ NEPM standard of 25 μg/m3. There is an additional goal to further reduce PM2.5 concentrations to below a daily concentration of 20 μg/m3 and an annual concentration of 7 μg/m3 by 2025.

Table 3: AAQ NEPM standards and ACT policy position

| **Pollutant** | **Averaging Period** | **Maximum concentration** | **Maximum allowable exceedances** |
| --- | --- | --- | --- |
| Carbon monoxide | 8 hours | 9.0 ppm | 1 day a year |
| Nitrogen dioxide | 1 hour  1 year | 0.12 ppm  0.03 ppm | 1 day a year  None |
| Photochemical oxidants | 1 hour  4 hours | 0.10 ppm  0.08 ppm | 1 day a year  1 day a year |
| Sulfur dioxide | 1 hour  1 day  1 year | 0.20 ppm  0.08 ppm  0.02 ppm | 1 day a year  1 day a year  None |
| Lead | 1 year | 0.50 μg/m3 | None |
| Particles as PM10 | 1 day  1 year | 50 μg/m3  20 μg/m3 | None  None |
| Particles as PM2.5 | 1 day  1 year | 25 μg/m3  8 μg/m3 | None  None |

Table 4 to Table 8 summarise compliance with the standards of the AAQ NEPM and ACT policy position. For each pollutant, the data availability (quarterly and annual), the number of days when standards were exceeded, the annual average (where an annual standard exists) and an assessment of compliance, are given for each monitoring station. Although Civic station is not a NEPM performance monitoring station, measured data from this station is included in this report to better understand ambient air quality in the ACT, especially in the city area.

Air quality is assessed as complying with the AAQ NEPM (ie ‘*MET’*) if the number of exceedances is no more than the number specified in Table 3 and data availability was at least 75 percent in each quarter of the year.

Air quality is assessed as not complying with the AAQ NEPM (ie ‘*NOT MET’*) if there is more than the number of exceedances specified in Table 3. For the purpose of reporting compliance against PM10 and PM2.5 daily average standards, monitoring data that has been determined as being directly associated with an exceptional event has been excluded.

Please refer to Appendix A for detailed information regarding pollutants exceedance in 2020.

Air quality is assessed as ‘*NOT DEMONSTRATED’* (ie *‘ND’*) if there has been insufficient data collected to demonstrate that the standards and goal have been met or not met.

These categories (ie MET, NOT MET and ND) are used in Tables 4 to 8 on the following pages.

## Carbon monoxide

During 2020, there were two exceedances of the carbon monoxide standard at Monash and Florey due to bushfire smoke. As a result, compliance was not met at both stations.

Table 4: 2020 compliance summary for CO

AAQ NEPM standard - 9.0 ppm (8-hour average)

| **Monitoring station** | **Data availability rates**  **(% of hours)** | | | | | **Number of exceedances**  **(days)** | **NEPM goal compliance** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Q1** | **Q2** | **Q3** | **Q4** | **Annual** |
| Monash  Florey | 95.8  95.8 | 95.8  94.3 | 92.4  95.0 | 95.7  93.6 | 94.9  94.7 | **2**  **2** | **NOT MET**  **NOT MET** |

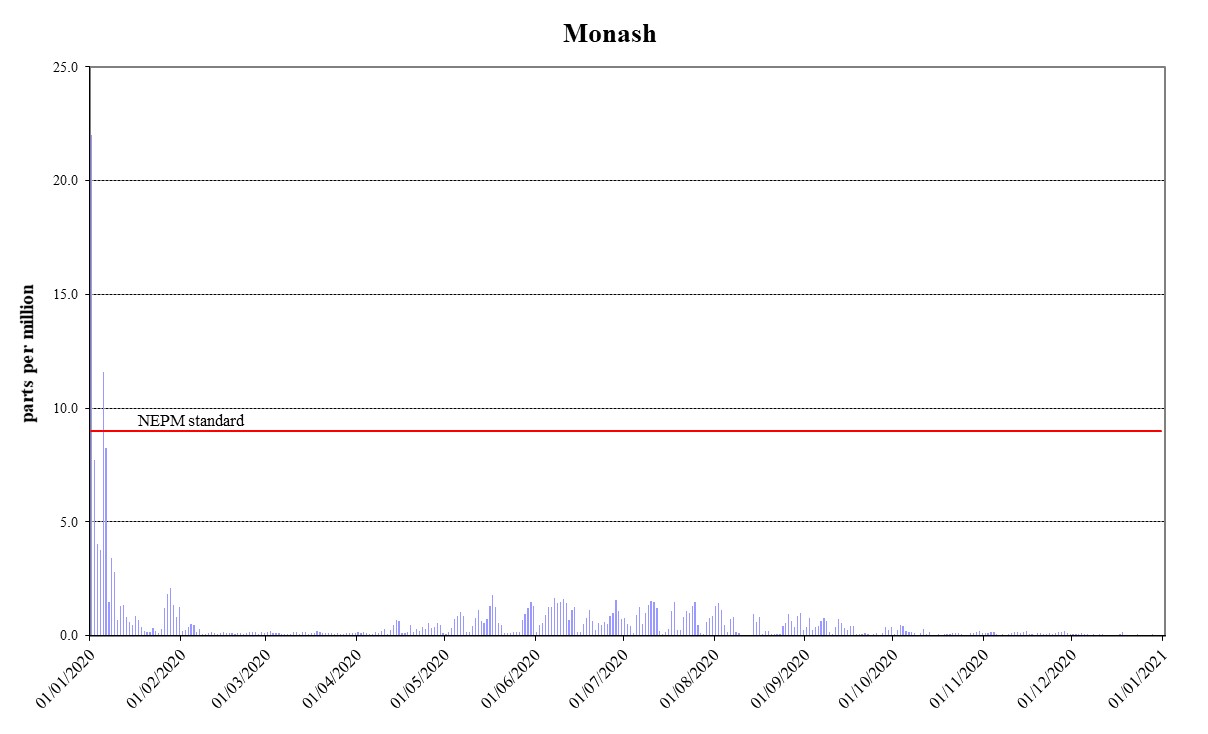


Figure 1: Daily maximum for CO 8-hour average – Monash

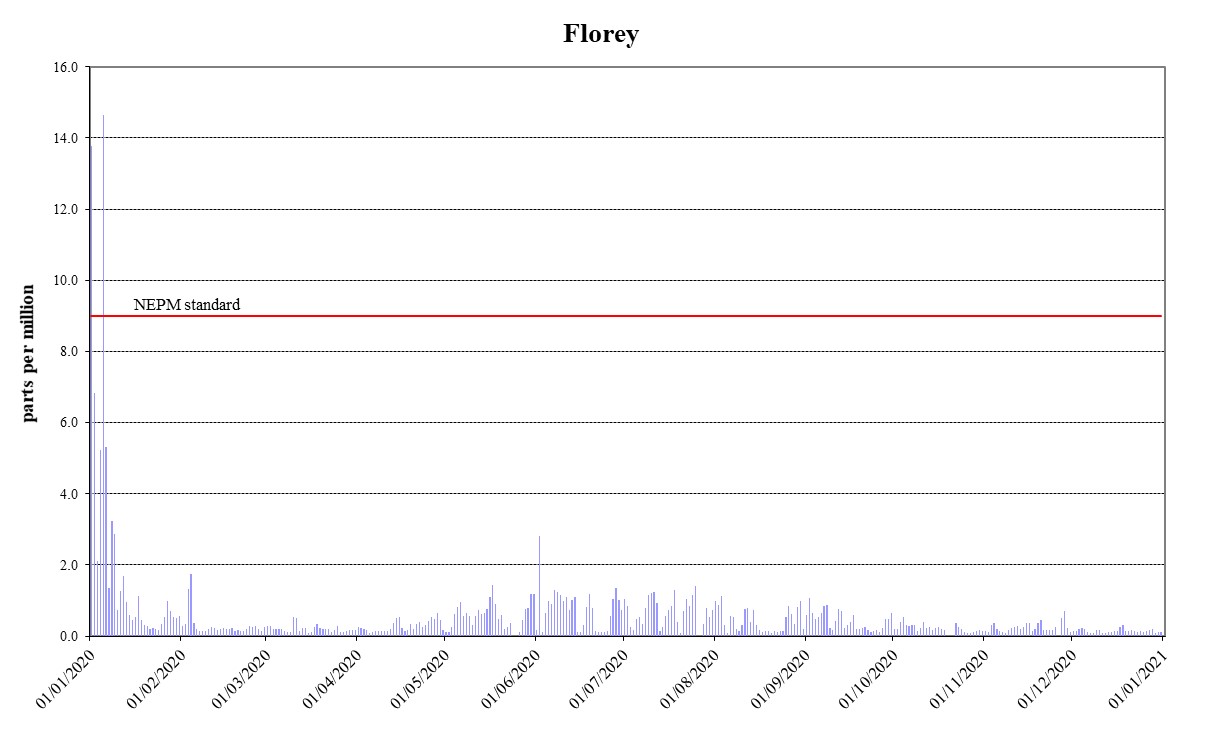
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Figure 2: Daily maximum for CO 8-hour average – Florey

## Nitrogen dioxide

During 2020, there were two exceedances of the nitrogen dioxide standard at Florey due to bushfire smoke. As a result, compliance was not met at Florey. No exceedances were recorded at Monash and compliance was demonstrated. The 1-year average levels remained low and met the standard at both stations.

Table 5: 2020 compliance summary for NO2

AAQ NEPM standard – 0.12 ppm (1-hour average), 0.03 ppm (1-year average)

| **Monitoring station** | **Data availability rates**  **(% of hours)** | | | | | **1 Hour** | | **1 Year** | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Q1** | **Q2** | **Q3** | **Q4** | **Annual** | **Number of exceedances** | **NEPM goal compliance** | **Annual average**  **(ppm)** | **NEPM goal compliance** |
| Monash  Florey | 95.8  94.3 | 95.8  94.3 | 95.7  94.2 | 95.7  93.6 | 95.7  94.1 | 0  **2** | MET  **NOT MET** | 0.004 0.004 | MET  MET |

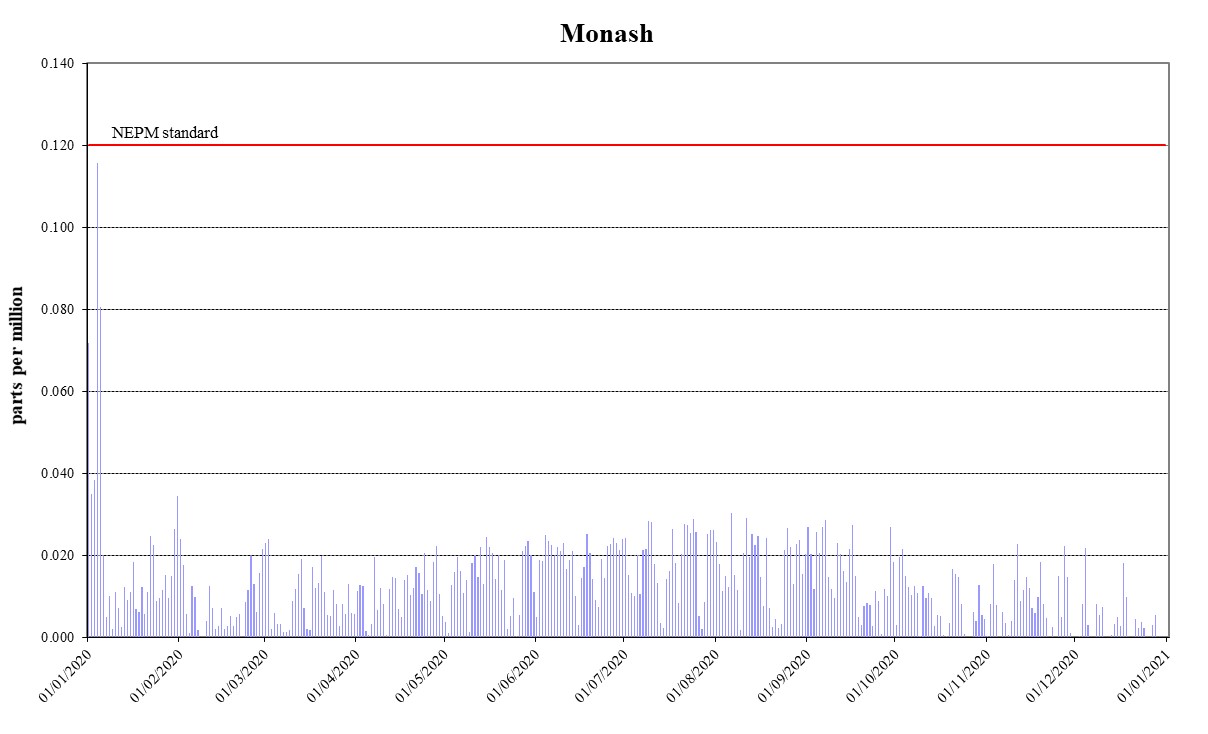


Figure 3: Daily maximum for NO2 1-hour average – Monash

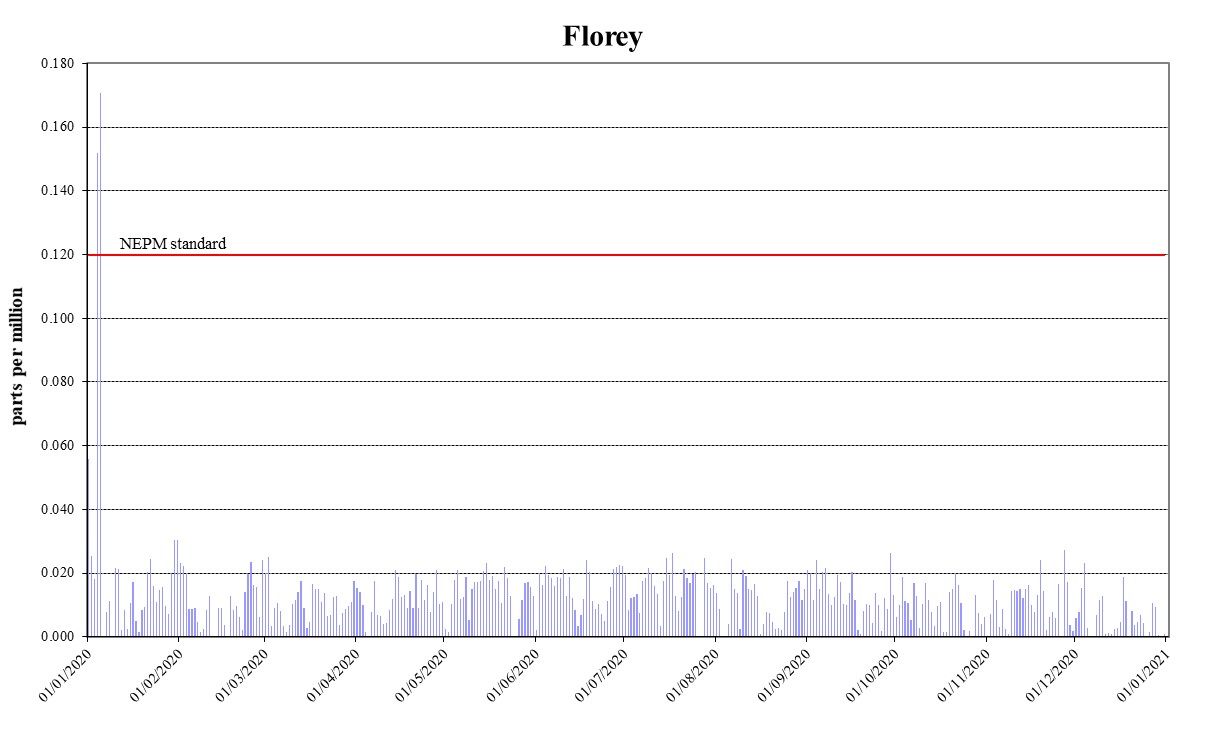


Figure 4: Daily maximum for NO2 1-hour average – Florey

## Ozone

During 2020, compliance for 1-hour ozone standard was demonstrated at Civic with no exceedances. However, compliance for 4-hour ozone standard was not met at Civic as the standard was exceeded two times due to bushfire smoke. Ozone levels above the 1-hour and 4-hour standards were recorded four times and three times at Monash and Florey respectively, due to the same reason. As a result, compliance was not met at Monash and Florey.

Table 6: 2020 compliance summary for O3

AAQ NEPM standard – 0.10 ppm (1-hour average), 0.08 ppm (4-hour average)

| **Monitoring station** | **Data availability rates**  **(% of days)** | | | | | **1 Hour** | | **4 Hour** | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Q1** | **Q2** | **Q3** | **Q4** | **Annual** | **Number of exceedances** | **NEPM goal compliance** | **Number of exceedances** | **NEPM goal compliance** |
| Monash  Civic  Florey | 95.8  95.8  95.8 | 95.8  95.8  80.7 | 95.7  95.7  95.7 | 95.8  95.8  95.7 | 95.8  95.8  92.0 | **2**  0  **2** | **NOT MET**  MET  **NOT MET** | **4**  **2**  **3** | **NOT MET**  **NOT MET**  **NOT MET** |

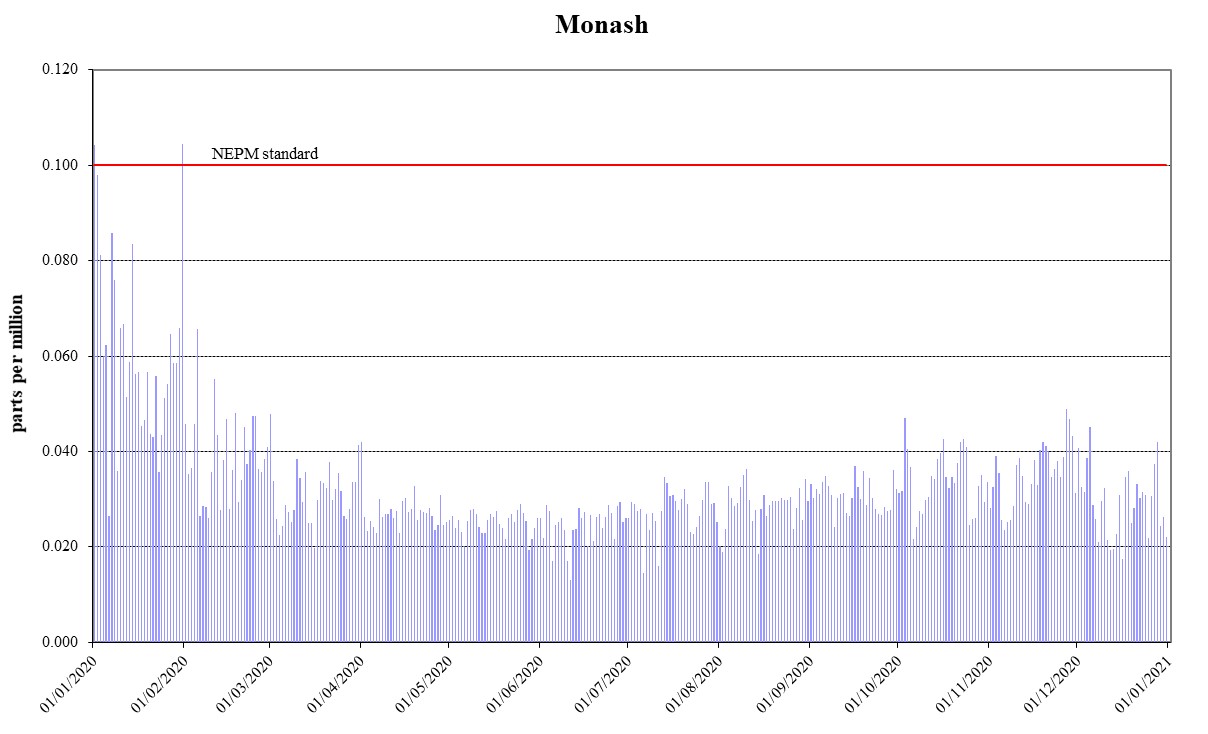


Figure 5: Daily maximum for O3 1-hour average – Monash

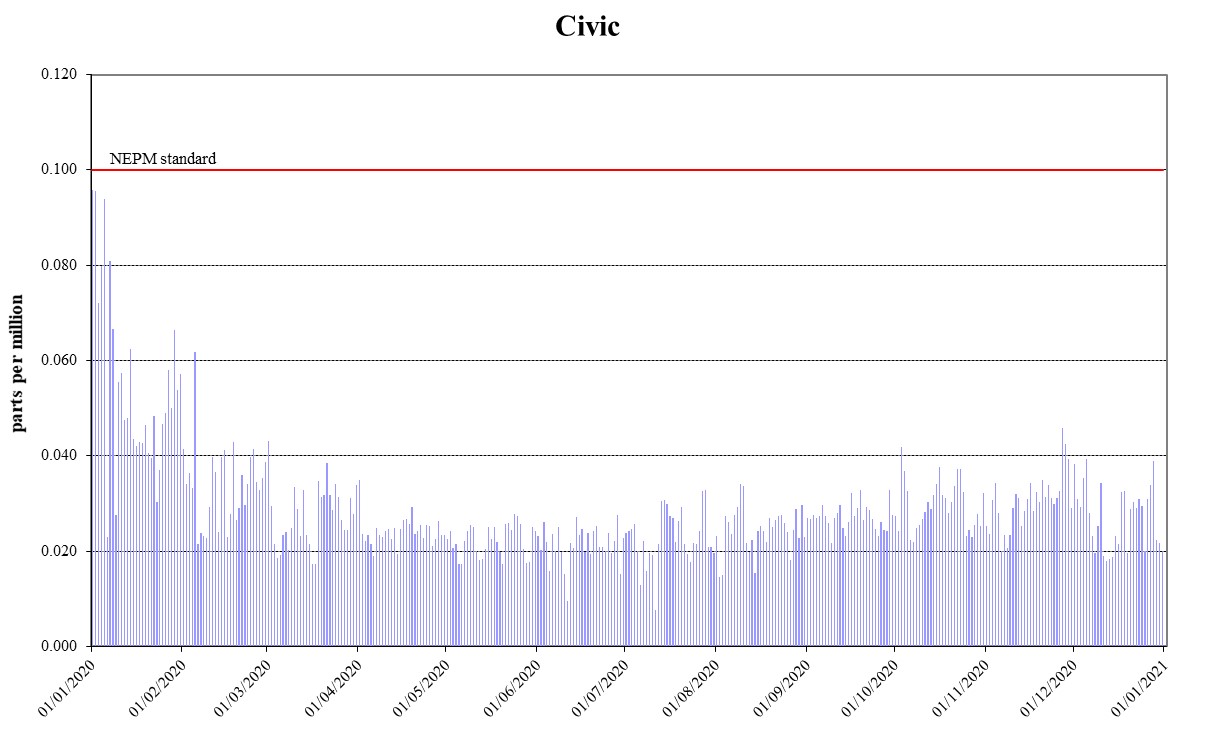


Figure 6: Daily maximum for O3 1-hour average – Civic

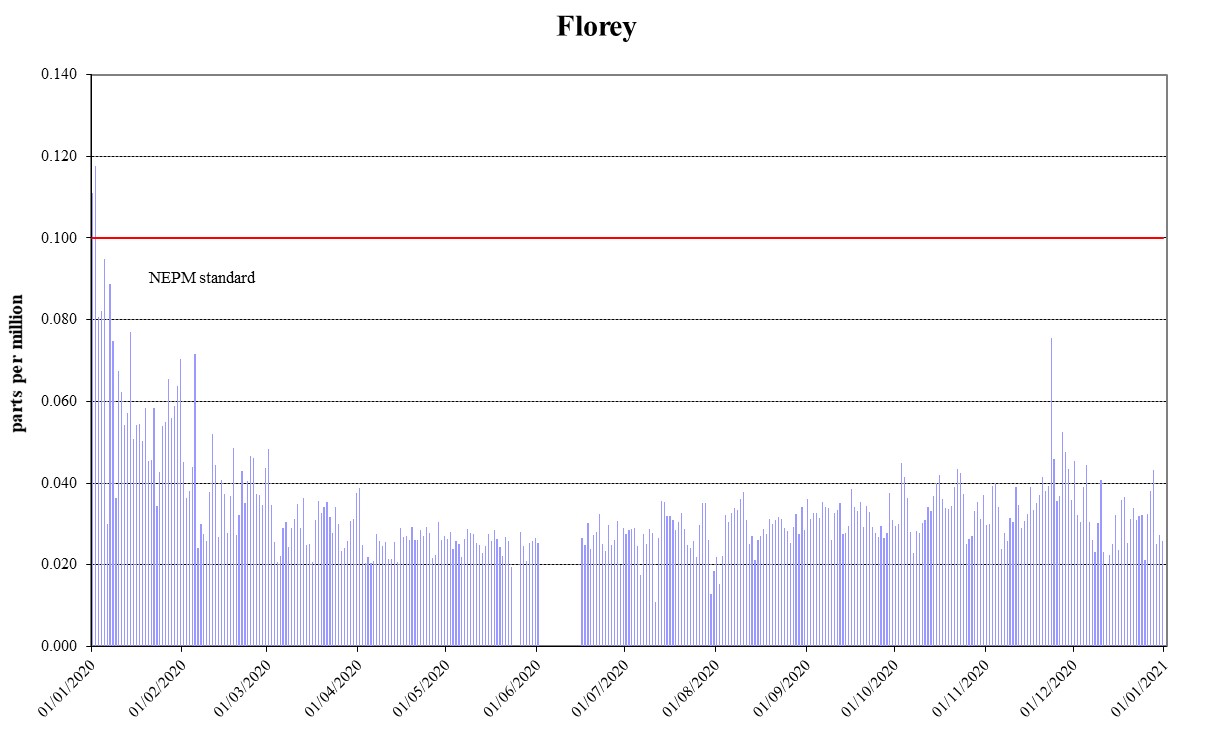


Figure 7: Daily maximum for O3 1-hour average – Florey

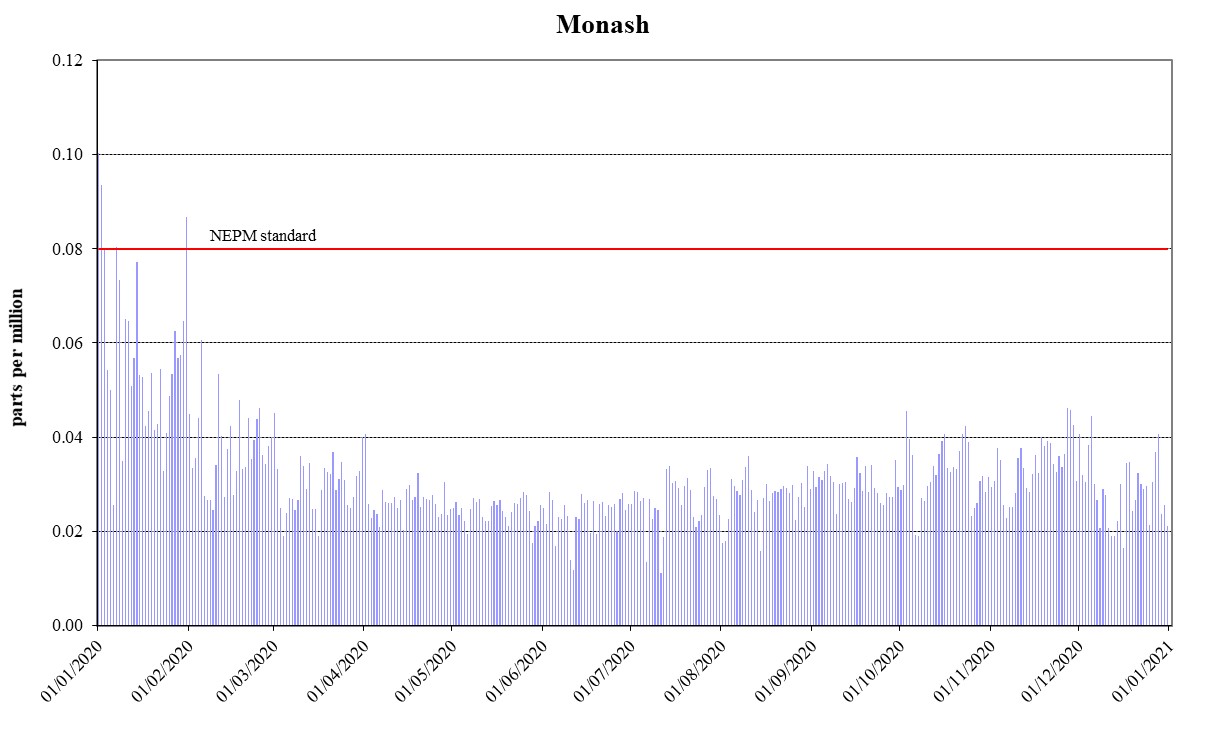


Figure 8: Daily maximum for O3 4-hour average – Monash

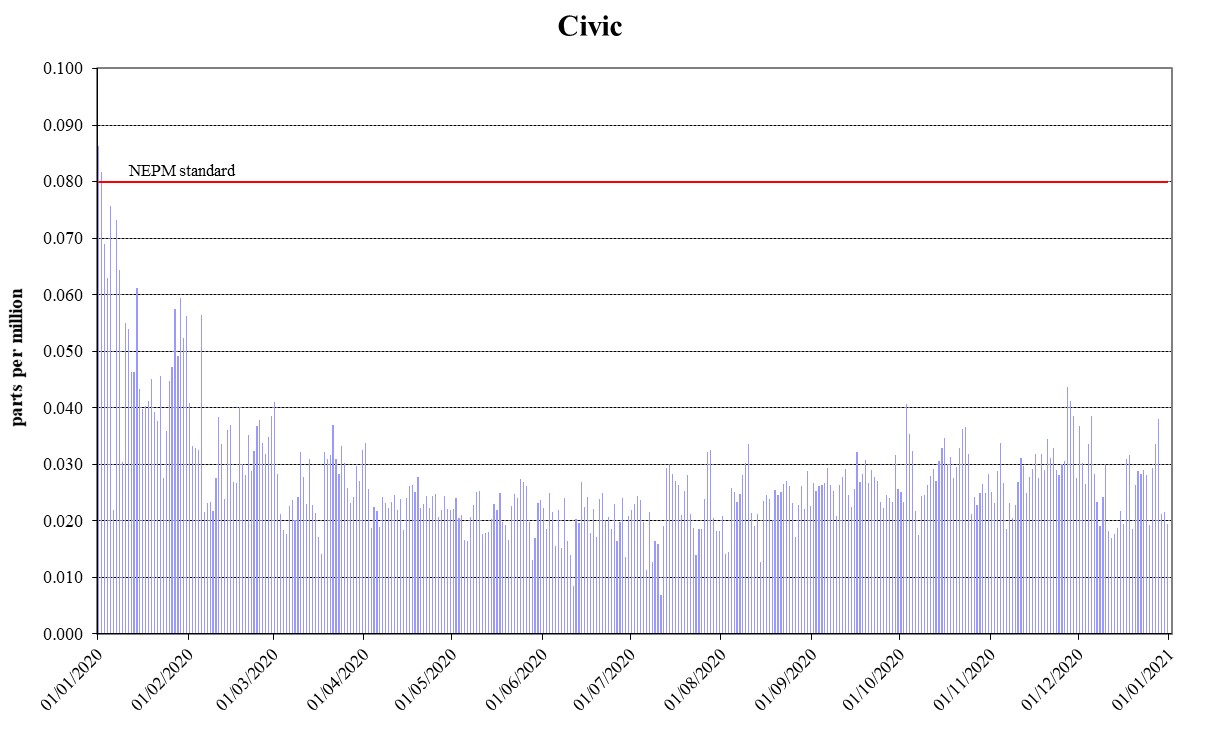
©

Figure 9: Daily maximum for O3 4-hour average – Civic

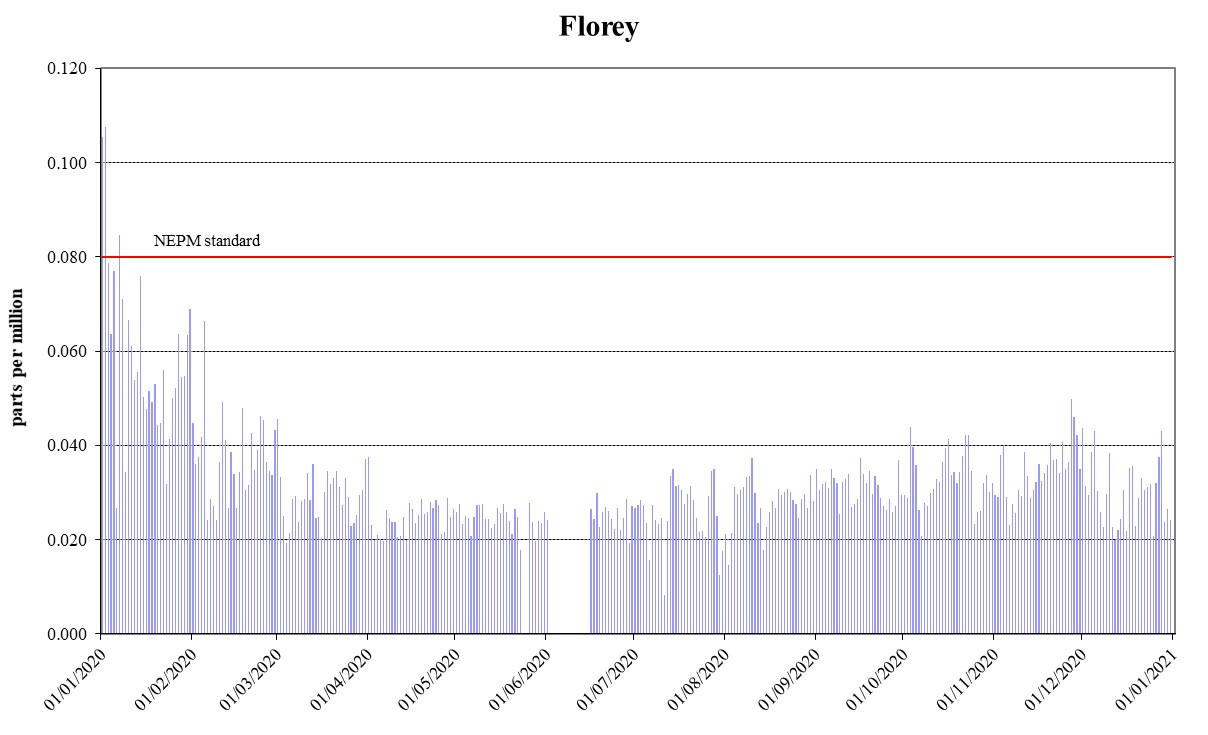


Figure 10: Daily maximum for O3 4-hour average – Florey

## PM10

During 2020, unprecedently high PM10 levels were recorded in the ACT. There were exceedances of daily PM10 standard on 27 days due to bushfires (24 days) and dust storms (3 days). Compliance against the daily PM10 standard was demonstrated at all stations as theses exceedances being exceptional events are removed. While annual average PM10 data at all stations met the 25 μg/m3 standard, annual average levels at all stations slightly exceeded the 20 μg/m3 ACT policy position.

Table 7: 2020 compliance summary for PM10

AAQ NEPM standard 50 μg/m3 1-day average, 20 μg/m3 (1-year average)\*

| **Monitoring station** | **Data availability rates**  **(% of days)** | | | | | **1 Day** | | **1 Year** | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Q1** | **Q2** | **Q3** | **Q4** | **Annual** | **Number of exceedances\*\*** | **NEPM goal compliance** | **Annual average**  **(μg/m3)** | **ACT goal compliance** |
| Monash  Civic  Florey | 100  100  100 | 100  95.6  97.8 | 95.2  98.4  100 | 100  98.4  100 | 99.2  98.4  99.5 | 0  0  0 | MET  MET  MET | **22.4**  **21.7**  **22.8** | **NOT MET**  **NOT MET**  **NOT MET** |

\* ACT policy position 20 µg/m3 not AAQ NEPM standard of 25 µg/m3 .

\*\* the number excludes exceptional events.

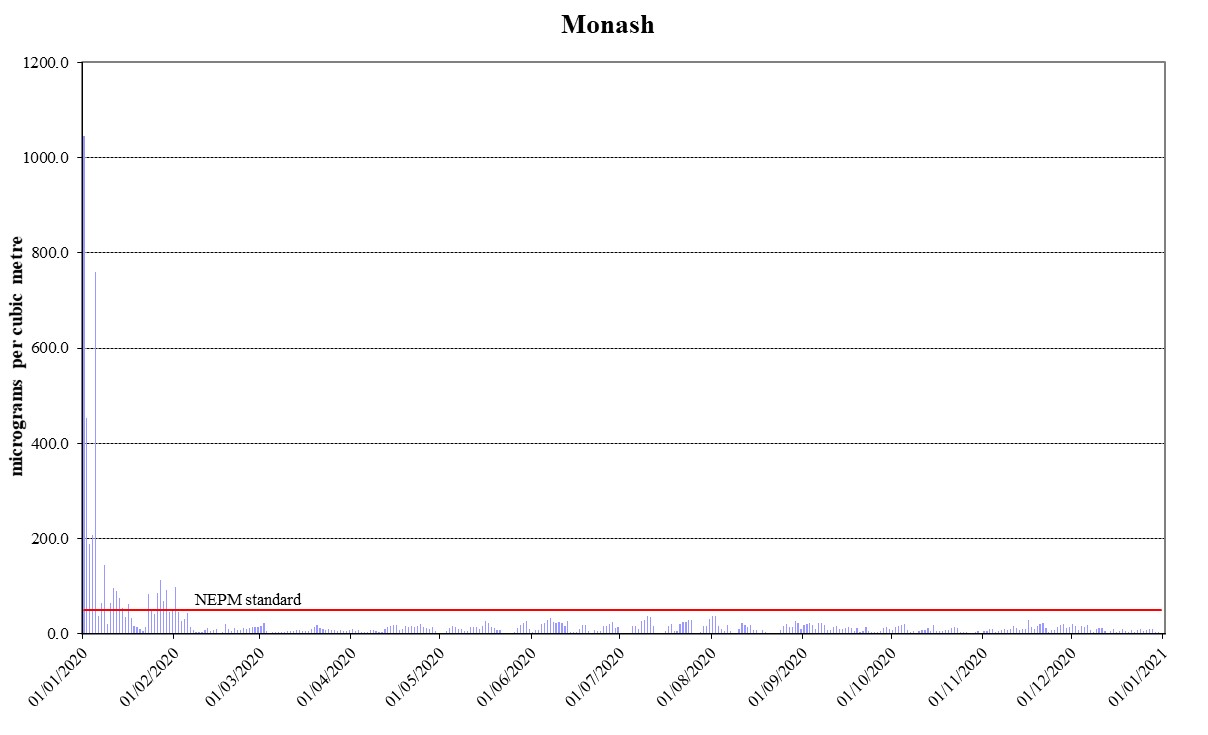


Figure 11: Daily maximum for PM10 – Monash

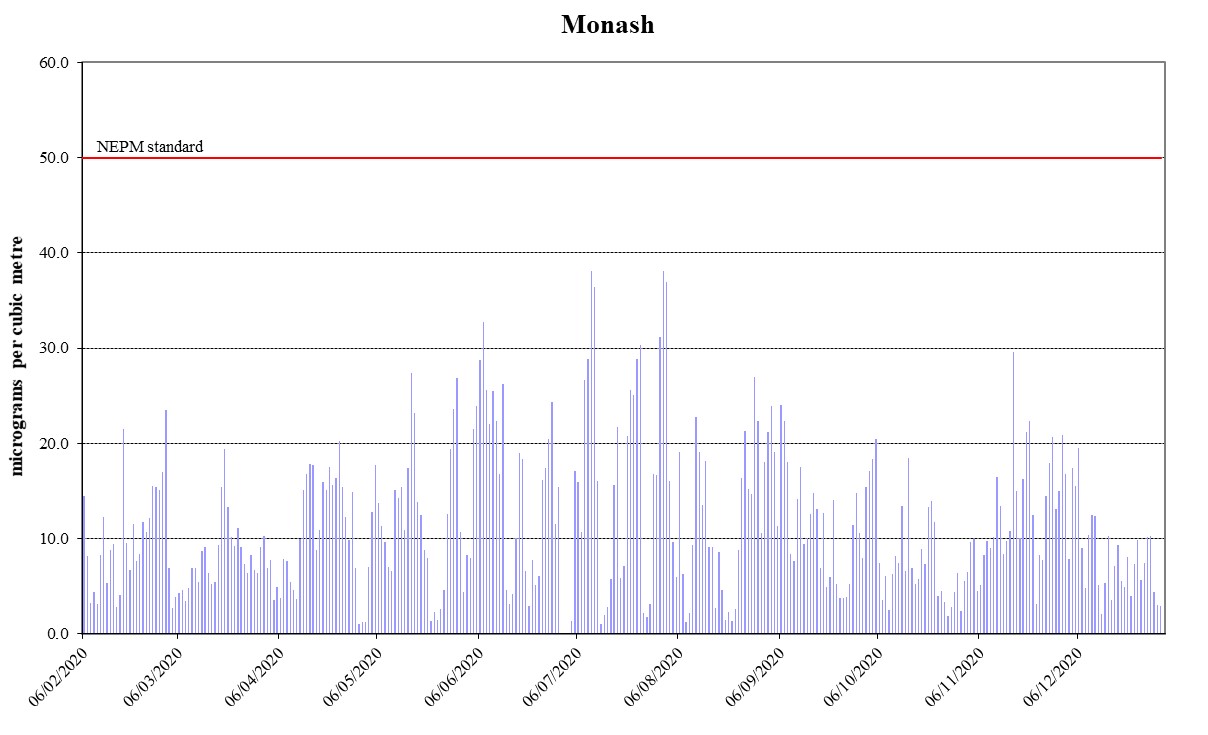


Figure 12: Daily maximum for PM10 – Monash (Excluding Bushfire Period)

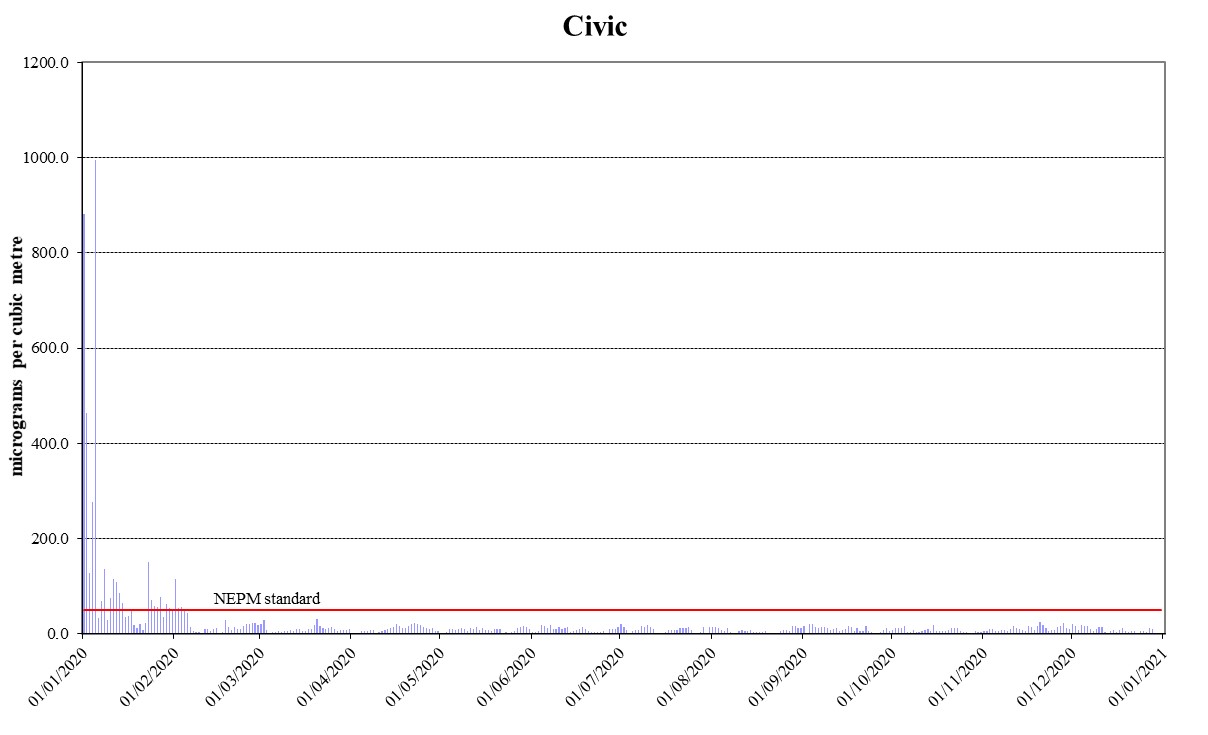


Figure 13: Daily maximum for PM10 – Civic

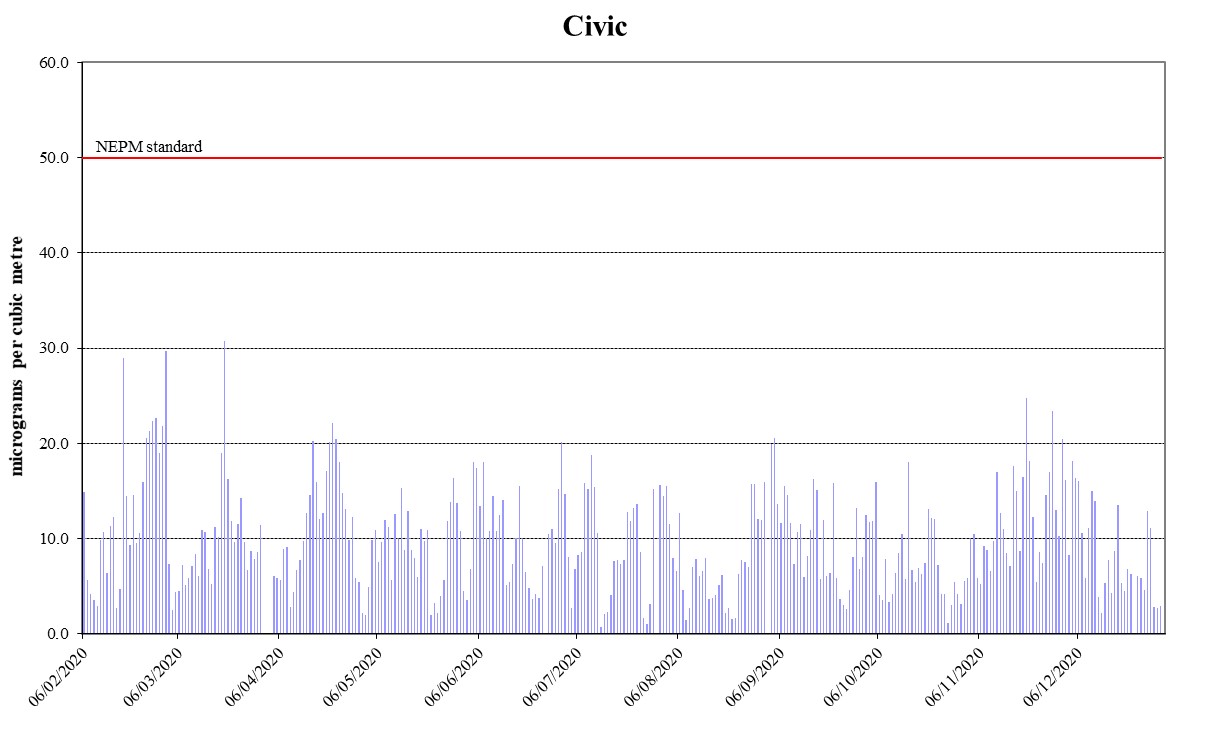


Figure 14: Daily maximum for PM10 – Civic (Excluding Bushfire Period)

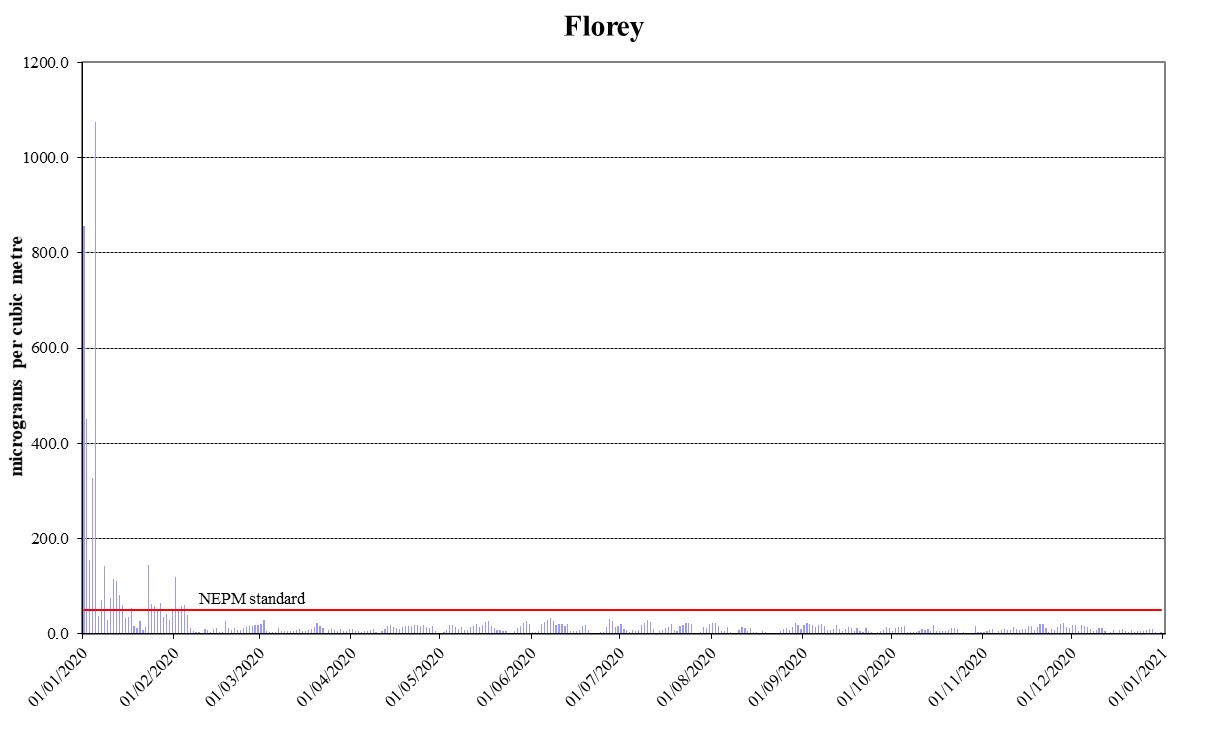


Figure 15: Daily maximum for PM10 – Florey

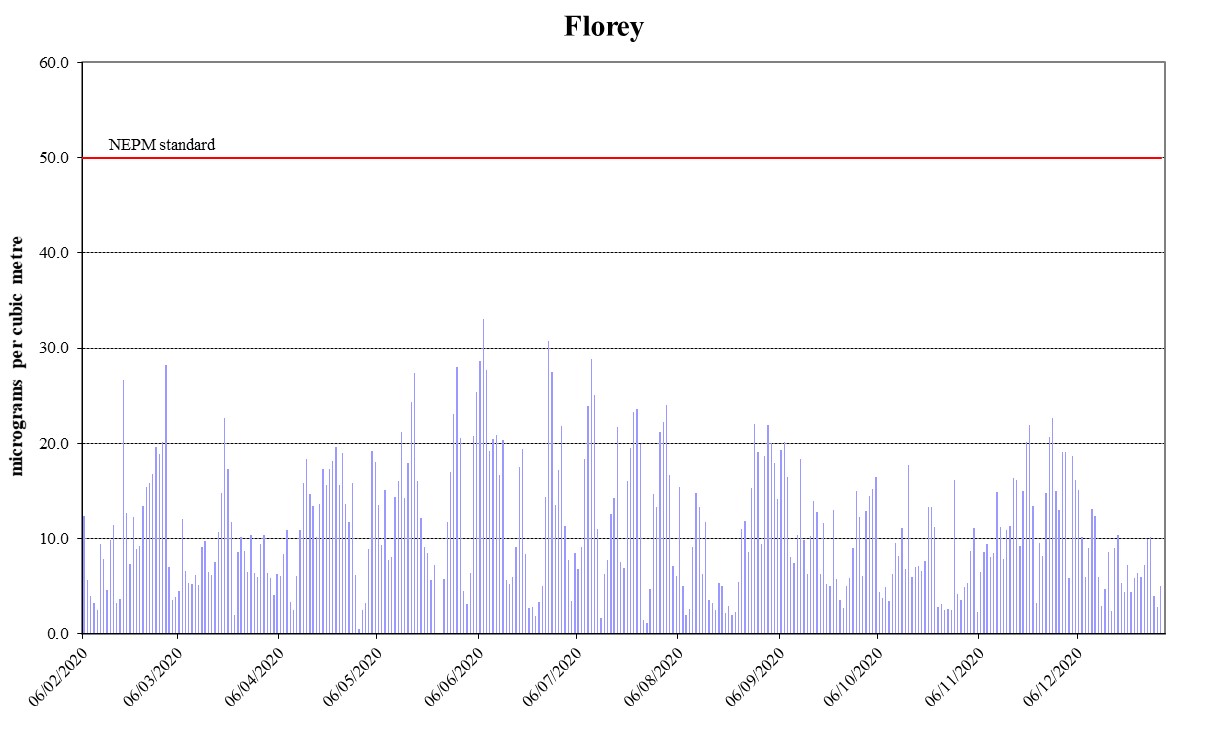


Figure 16: Daily maximum for PM10 – Florey (Excluding Bushfire Period)

## PM2.5

During 2020, there were exceedances of daily PM2.5 standard on 39 days due to bushfires and wood heater emissions. Two thirds of exceedance days (26 days) occurred outside the winter season and were due to bushfires. Compliance against the daily PM2.5 standard was demonstrated at Civic when the exceptional events were removed. There were 13 exceedance days between mid-May and early August related to wood heater emissions at Monash and Florey. As a result, compliance against the daily PM2.5 standard was not met at Monash and Florey. Annual average PM2.5 data at all stations did not meet the 8 μg/m3 AAQ NEPM standard.

Table 8: 2020 compliance summary for PM2.5

AAQ NEPM standard – 25 μg/m3 (1-day), 8 μg/m3 (1-year)

| **Monitoring station** | **Data availability rates**  **(% of days)** | | | | | **1 Day** | | **1 Year** | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Q1** | **Q2** | **Q3** | **Q4** | **Annual** | **Number of exceedances\*** | **NEPM goal compliance** | **Annual average**  **(μg/m3)** | **NEPM goal compliance** |
| Monash  Civic  Florey | 98.9  97.8  98.9 | 100  97.8  95.6 | 96.8  100  97.8 | 98.4  100  100 | 98.6  98.9  98.1 | **12**  0  **6** | **NOT MET**  MET  **NOT MET** | **17.8**  **12.8**  **16.9** | **NOT MET**  **NOT MET**  **NOT MET** |

\* the number excludes exceptional events.

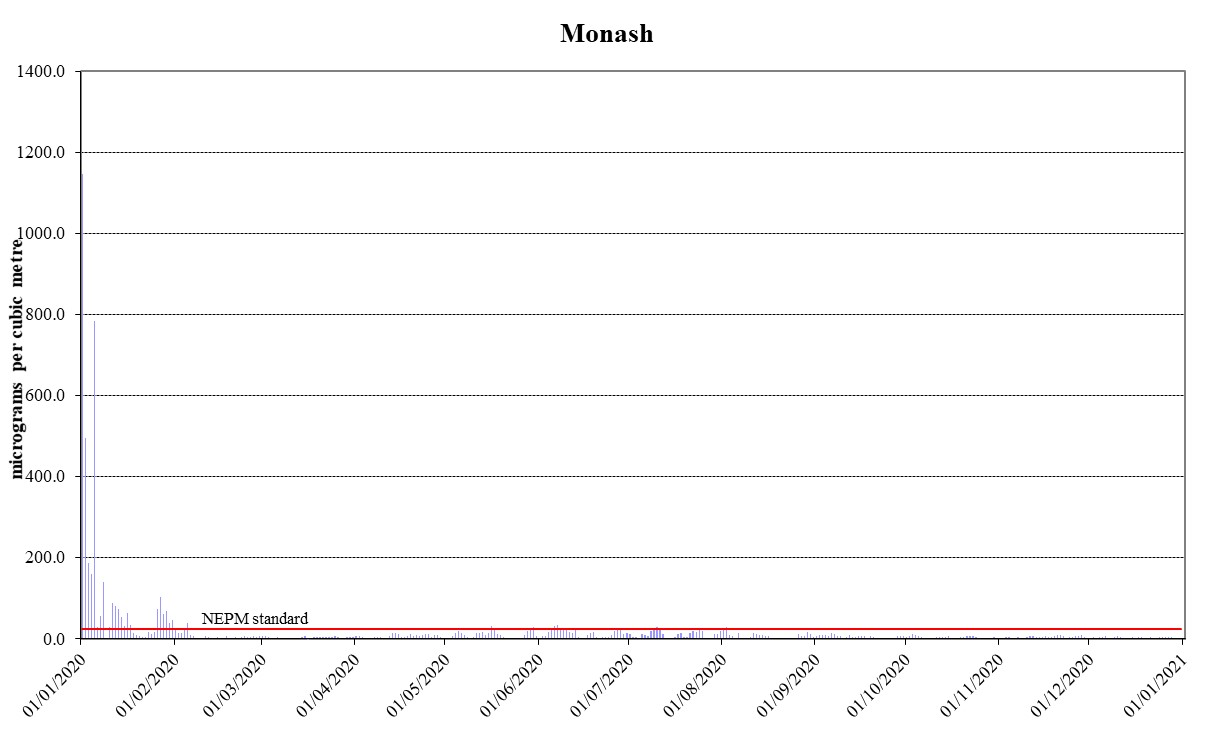


Figure 17: Daily maximum for PM2.5 – Monash

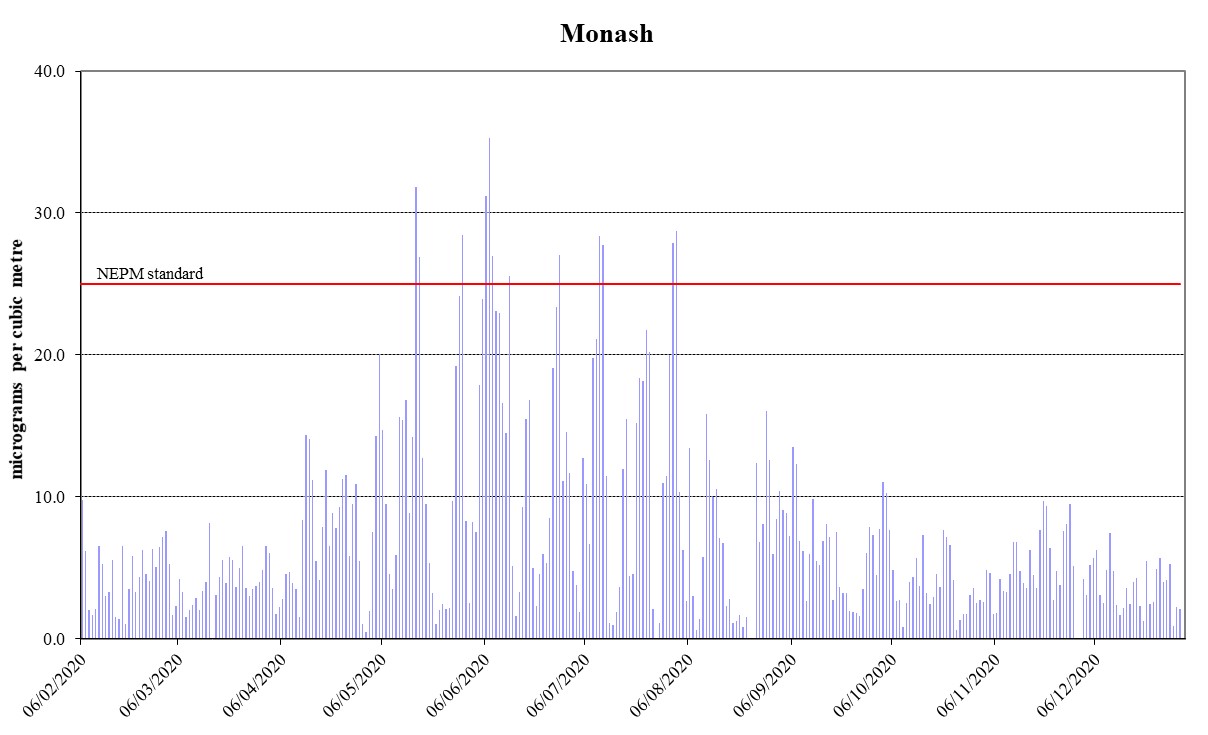


Figure 18: Daily maximum for PM2.5 – Monash (Excluding Bushfire Period)

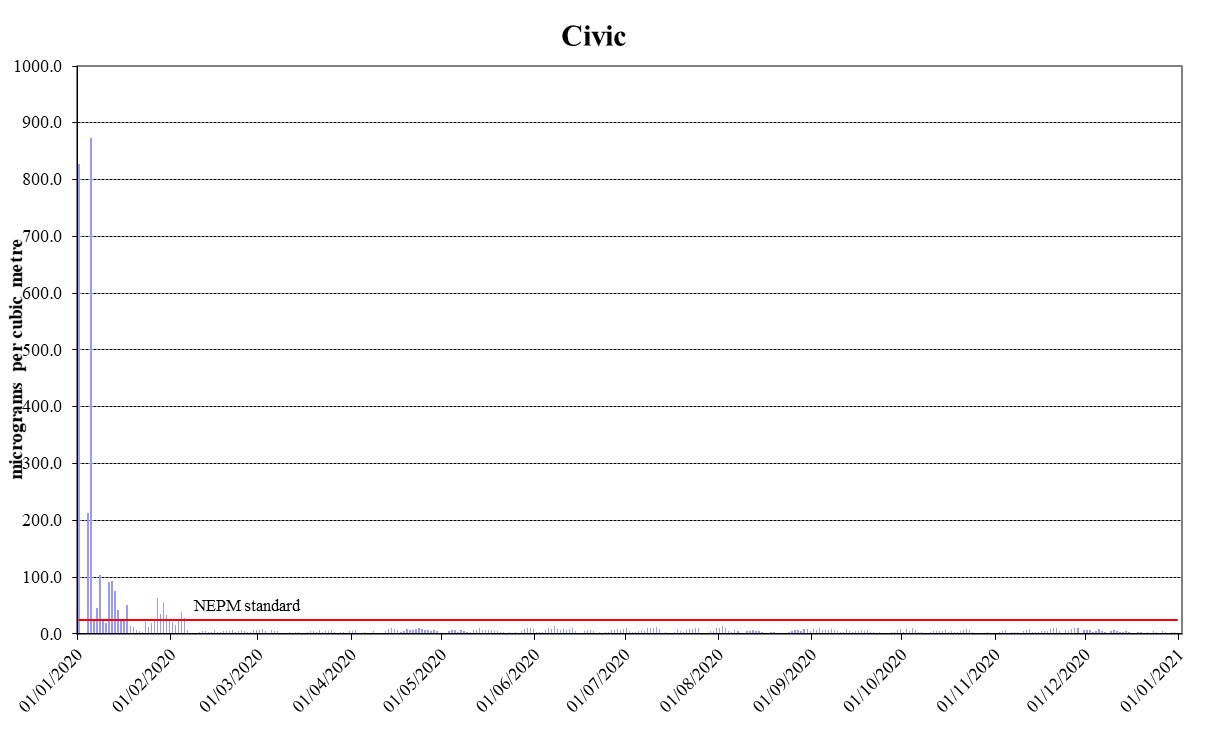


Figure 19: Daily maximum for PM2.5 – Civic

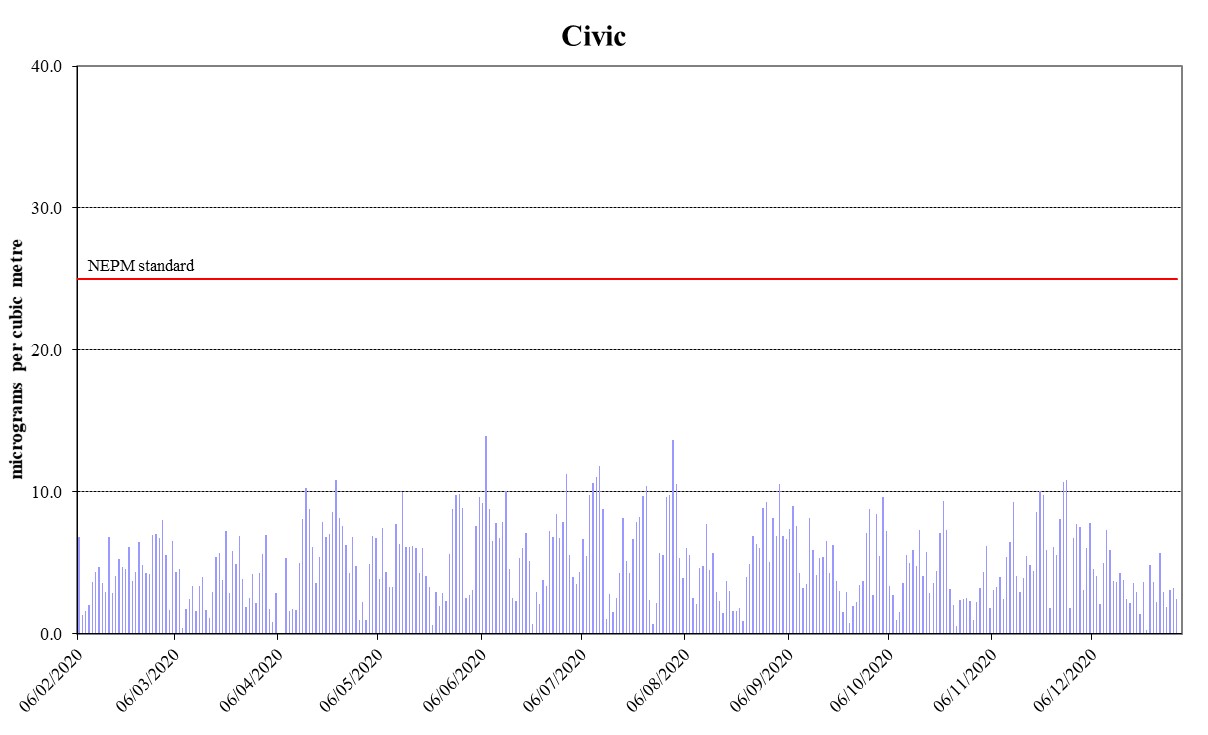


Figure 20: Daily maximum for PM2.5 – Civic (Excluding Bushfire Period)

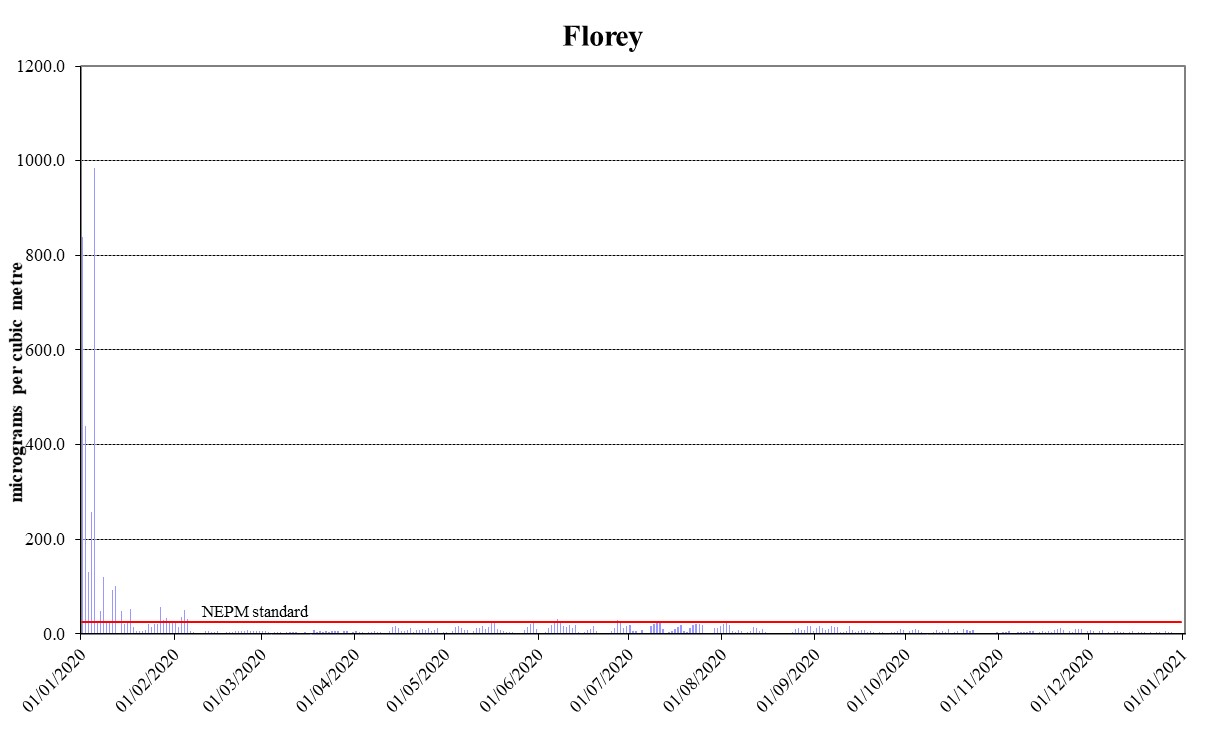


Figure 21: Daily maximum for PM2.5 – Florey

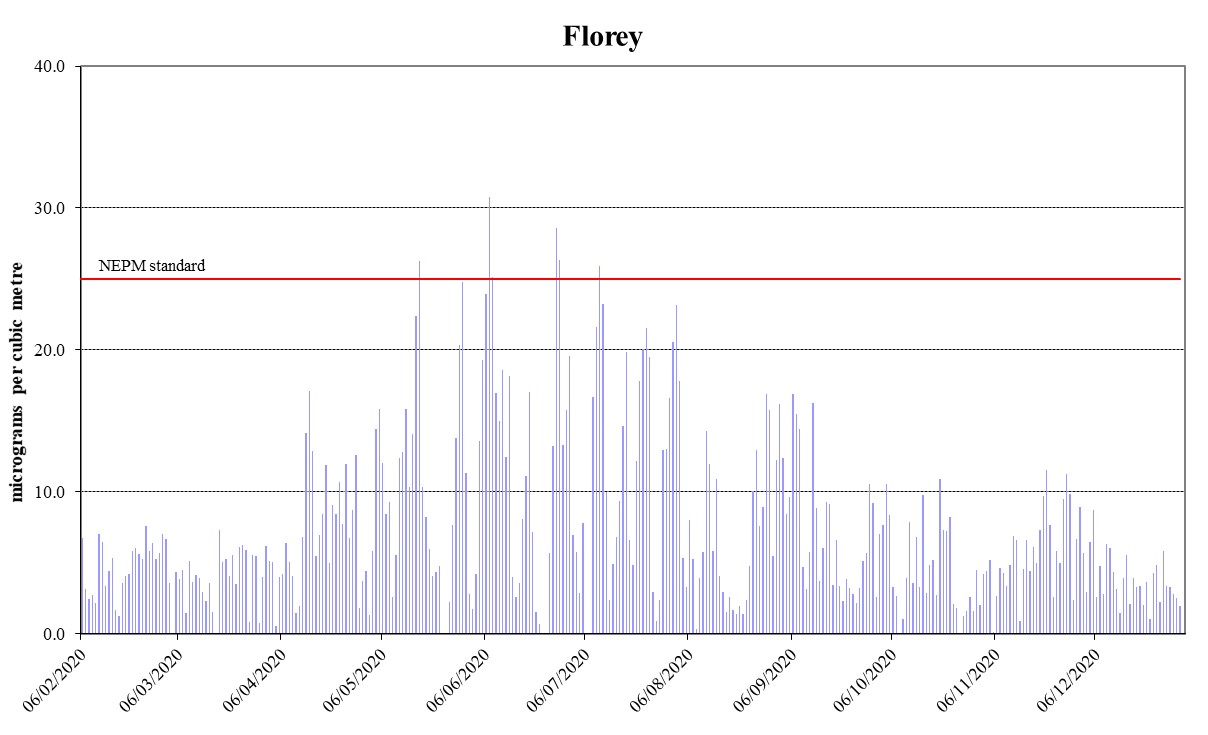


Figure 22: Daily maximum for PM2.5 – Florey (Excluding Bushfire Period)

# ANALYSIS OF AIR QUALITY MONITORING

Annual summary statistics contained in Carbon monoxide levels remained relatively high across the ACT in January 2020 due to bushfires. Two exceedances were measured in January at both Monash and Florey, with a new record of 22.0 ppm at Monash on 1 January 2020.

Table 9 to Table 14 below assess air quality against the standards and the extent of compliance with the goal. Instances where the standard has been exceeded are highlighted in bold.

## Carbon monoxide

Carbon monoxide levels remained relatively high across the ACT in January 2020 due to bushfires. Two exceedances were measured in January at both Monash and Florey, with a new record of 22.0 ppm at Monash on 1 January 2020.

Table 9: 2020 summary statistics for daily peak 8-hour CO

AAQ NEPM standard - 9.0 ppm (8-hour average)

| **Monitoring station** | **Number of valid days** | **Highest**  **(ppm)** | **Highest**  **(date/time)** | **2nd Highest**  **(ppm)** | **2nd Highest**  **(date/time)** |
| --- | --- | --- | --- | --- | --- |
| Monash  Florey | 362  359 | **22.0**  **14.6** | 01 Jan 05:00  05 Jan 06:00 | **11.6**  **13.8** | 05 Jan 22:00  01 Jan 07:00 |

## Nitrogen dioxide

The bushfire smoke adversely impacted the nitrogen dioxide levels in January 2020. Two exceedances were recorded at Florey, which was the first time since the commencement of air quality monitoring in the ACT. The highest recorded 1-hour value during 2020 was 0.171 ppm at Florey. The overall nitrogen dioxide levels decreased compared with the previous year. This may be attributed to less traffic and other human activities during the COVID-19 pandemic. Annual average remained well below the standard in 2020. The annual average in 2020 was 0.004ppm at both Monash and Florey. This is 13% of the annual standard 0.03ppm.

Table 10: 2020 summary statistics for daily peak 1-hour NO2

AAQ NEPM standard 0.12 ppm (1-hour average)

| **Monitoring station** | **Number of valid days** | **Highest**  **(ppm)** | **Highest**  **(date/time)** | **2nd Highest**  **(ppm)** | **2nd Highest**  **(date/time)** |
| --- | --- | --- | --- | --- | --- |
| Monash  Florey | 366  354 | 0.116  **0.171** | 04 Jan 22:00  05 Jan 01:00 | 0.081  **0.152** | 05 Jan 20:00  04 Jan 00:00 |

## Ozone

Due to bushfires impacts, there were four days in 2020 when ozone levels were above the standards. On 1 and 2 January 2020, the most extensive ozone event for 2020 occurred. All monitoring stations recorded ozone levels over the 4-hour standard on those two days. Ozone levels above the 4-hour standard were recorded one more time at Monash and Florey on 7 January 2020. The 1-hour standard was also exceeded at Monash and Florey on 1 and 2 January 2020. Bushfires continued impacting the Canberra region till early February, which resulted in another exceedance day for both 1-hour and 4-hour standards on 31 January 2020 at Monash.

The highest recorded 1-hour value in the ACT during 2020 was 0.118 ppm at Florey. The highest recorded 4-hour value in the ACT during 2020 was 0.108 ppm at Florey.

Table 11: 2020 summary statistics for daily peak 1-hour O3

AAQ NEPM standard 0.10 ppm (1-hour average)

| **Monitoring station** | **Number of valid days** | **Highest**  **(ppm)** | **Highest**  **(date/time)** | **2nd Highest**  **(ppm)** | **2nd Highest**  **(date/time)** |
| --- | --- | --- | --- | --- | --- |
| Monash  Civic  Florey | 366  366  350 | **0.104**  0.096  **0.118** | 31 Jan 10:00  01 Jan 15:00  02 Jan 17:00 | **0.104**  0.095  **0.111** | 01 Jan 14:00  02 Jan 17:00  01 Jan 15:00 |

Table 12: 2020 summary statistics for daily peak 4-hour O3

AAQ NEPM standard 0.08 ppm (4-hour average)

| **Monitoring station** | **Number of valid days** | **Highest**  **(ppm)** | **Highest**  **(date/time)** | **2nd Highest**  **(ppm)** | **2nd Highest**  **(date/time)** |
| --- | --- | --- | --- | --- | --- |
| Monash  Civic  Florey | 366  366  350 | **0.100**  **0.086**  **0.108** | 01 Jan 16:00  01 Jan 16:00  02 Jan 18:00 | **0.093**  **0.082**  **0.105** | 02 Jan 17:00  02 Jan 17:00  01 Jan 16:00 |

## PM10

There were 27 days when daily PM10 standard was exceeded at different stations from January till early February 2020. The daily PM10 reached unprecedented high levels across the ACT.

The high number of daily PM10 exceedances was attributed to the extensive bushfires throughout NSW (24 days) impacting the ACT and the increasing frequency of widespread dust storms (3 days). Under the exceptional event rule they have been excluded when assessing compliance against the daily standard.

Whilst monitoring data from exceptional events is excluded for reporting compliance for daily averaging standards it is still included for one-year averaging standards.

The highest recorded annual average in 2020 was 22.8μg/m3 at Florey (refer to Table 7) slightly less than the maximum annual average of 23.8μg/m3 (Florey) in 2019. This is below the national annual standard of 25μg/m3, but slightly over the ACT annual standard of 20μg/m3.

Table 13: 2020 summary statistics for daily PM10

AAQ NEPM daily standard 50 μg/m3

| **Monitoring station** | **Number of valid days** | **Highest**  **(μg/m3)** | **Highest**  **(date)** |
| --- | --- | --- | --- |
| Monash  Civic  Florey | 363  359  364 | **1046.1**  **994.9**  **1075.5** | 01 January  05 January  05 January |

## PM2.5

The daily standard for PM2.5 was exceeded on 39 days in 2020 at one or more of the monitoring stations. 13 exceedance days, which occurred between May and August 2020, were primarily a result of domestic wood heater emissions in winter. The other exceedances were attributed to bushfire smoke (26 days). The highest daily PM2.5 level was 1146.5μg/m3 which was recorded at Monash on 1 January 2020.

Whilst monitoring data from exceptional events is excluded for reporting compliance for daily averaging standards it is still included for one year averaging standards. Given the length of time the Canberra airshed was affected by bushfire smoke the annual average PM2.5 levels remained relatively high in 2020. All monitoring stations recorded annual average PM2.5 concentrations above the national standard 8μg/m3. The highest recorded annual average in 2020 was 17.8μg/m3 at Monash (refer to Table 8).

Table 14: 2020 summary statistics for daily PM2.5

AAQ NEPM daily standard 25 μg/m3

| **Monitoring station** | **Number of valid days** | **Highest**  **(μg/m3)** | **Highest**  **(date)** |
| --- | --- | --- | --- |
| Monash  Civic  Florey | 361  362  359 | **1146.5**  **872.6**  **983.4** | 01 January  05 January  05 January |

# ASSESSMENT OF PROGRESS TOWARDS ACHIEVING THE GOAL

Historical monitoring results indicate that the only AAQ NEPM pollutant of concern in the ACT air shed is particulate matter, which increases significantly during winter because of emissions from domestic wood heaters. In more recent years, especially 2018 and 2019, exceedances of the particulate matter standards have also been attributed to smoke from hazard reduction burns, bushfires and dust storms.

While carbon monoxide and nitrogen dioxide concentrations increased during bushfire period, the AAQ NEPM standards were met on 99.5% of days during the year.

Ozone levels were relatively high in January 2020 compared with other months of the year, meeting the AAQ NEPM standards on 99% of all days during the year.

Canberra experienced days with extreme air pollution in early 2020 due to smoke from bushfires, dust storms or a combination of both. In early January, the particle pollution was at levels more than 20 times (PM10) or 45 times (PM2.5) the national standards. In addition, there was an increase of PM2.5 exceedances in winter months. The COVID-19 pandemic restrictions may be a possible cause of this increase, with people staying at home more.

The ACT Government acknowledges that wood heater emissions reduce air quality during winter, and continue to implement an integrated program to address this including:

* provides public information on air quality levels in the ACT through the online Air Quality Index and AirRater App;
* the annual 'Burn Right Tonight' community education campaign which reminds ACT residents how to use wood heaters correctly to minimise air pollution;
* the regulation of firewood merchants to ensure only seasoned wood is sold;
* the regulation of wood heaters sold in the ACT to ensure they meet the current Australian Standards for emissions and efficiency;
* the prohibition of wood heaters in new developments where planning studies show that they would have an adverse impact on air quality. The ACT Government has taken this approach for the development of the Molonglo Valley (except Wright), and previously with the suburbs of Dunlop and East O'Malley;
* compliance and enforcement activities for wood heater emissions; and
* administering the Wood Heater Replacement Program to replace old inefficient wood heaters with high efficiency alternatives.

Bushfire smoke and dust storms continue to present a threat to future air quality in the ACT, particularly as climate change is set to exacerbate the frequency and intensity of bushfire events, coupled with rising temperatures and prolonged dry weather.

# APPENDIX A: STATISTICAL SUMMARY AND TRENDS

The following section provides a basic statistical summary, using percentiles, for Monash, Civic and Florey stations and for each standard in the past ten years. Daily maximum values are also presented in the following tables.

## Carbon monoxide

Table 15: Statistical summary for daily maximum 8-hour CO Monash 2011 – 2020

| Year | Data  Availability  (%) | No. of  Exceedances  (days) | Max  conc.  (ppm) | 95th  percentile  (ppm) | 75th  percentile  (ppm) | 50th  percentile  (ppm) |
| --- | --- | --- | --- | --- | --- | --- |
| 2011 | 98.6 | 0 | 2.2 | 1.5 | 0.5 | 0.2 |
| 2012 | 99.7 | 0 | 1.8 | 1.2 | 0.6 | 0.3 |
| 2013 | 95.9 | 0 | 2.1 | 1.5 | 0.6 | 0.3 |
| 2014 | 94.0 | 0 | 1.8 | 1.4 | 0.7 | 0.4 |
| 2015 | 94.8 | 0 | 1.9 | 1.4 | 0.6 | 0.3 |
| 2016 | 95.8 | 0 | 1.7 | 1.0 | 0.4 | 0.2 |
| 2017 | 95.4 | 0 | 1.6 | 1.2 | 0.6 | 0.2 |
| 2018 | 92.3 | 0 | 1.5 | 1.2 | 0.5 | 0.2 |
| 2019 | 72.1 | 1 | 12.4 | 1.1 | 0.4 | 0.1 |
| 2020 | 94.9 | 2 | 22.0 | 1.5 | 0.6 | 0.2 |

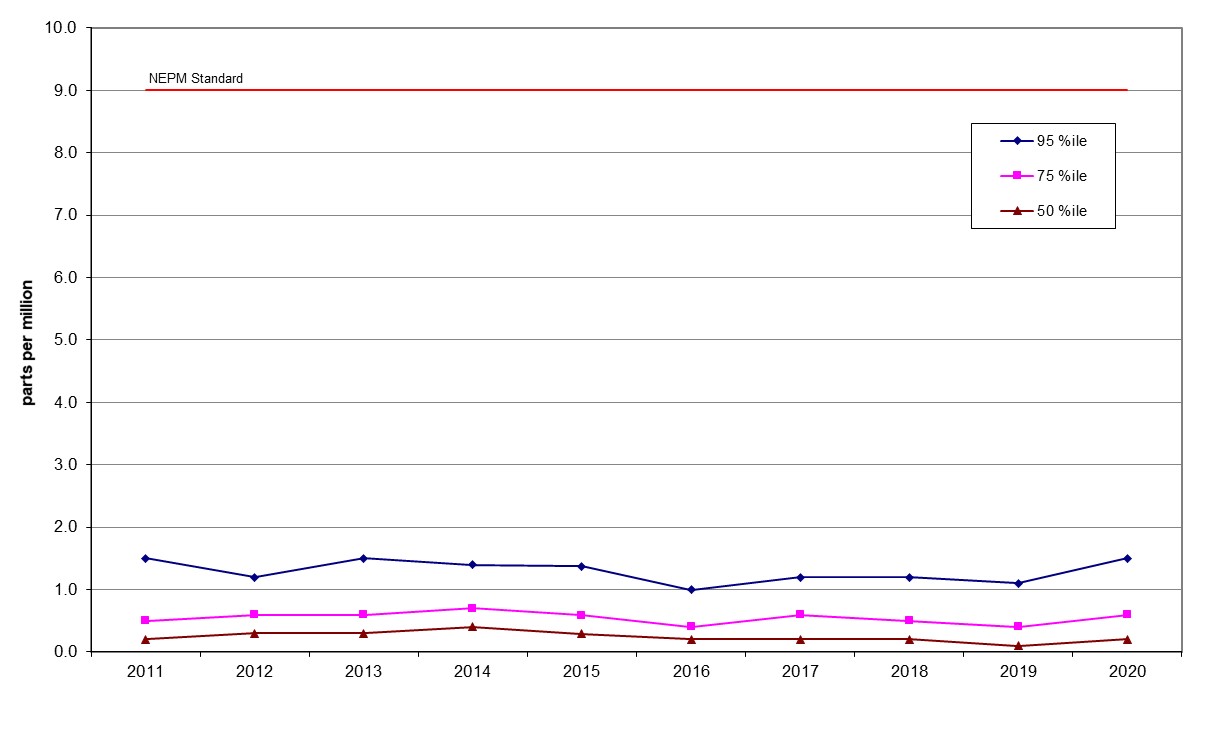


Figure 23: Statistical summary for daily maximum 8-hour CO Monash 2011 – 2020

Table 16: Statistical summary for daily maximum 8-hour CO Florey 2014 – 2020

| Year | Data  Availability  (%) | No. of  Exceedances  (days) | Max  conc.  (ppm) | 95th  percentile  (ppm) | 75th  percentile  (ppm) | 50th  percentile  (ppm) |
| --- | --- | --- | --- | --- | --- | --- |
| 2014 | 79.2 | 0 | 2.2 | 1.4 | 0.7 | 0.3 |
| 2015 | 94.9 | 0 | 2.0 | 1.5 | 0.6 | 0.3 |
| 2016 | 95.5 | 0 | 1.9 | 1.2 | 0.5 | 0.3 |
| 2017 | 94.7 | 0 | 1.8 | 1.4 | 0.5 | 0.2 |
| 2018 | 94.7 | 0 | 1.5 | 1.1 | 0.5 | 0.3 |
| 2019 | 95.3 | 0 | 8.6 | 1.2 | 0.6 | 0.3 |
| 2020 | 94.7 | 2 | 14.6 | 1.3 | 0.6 | 0.3 |

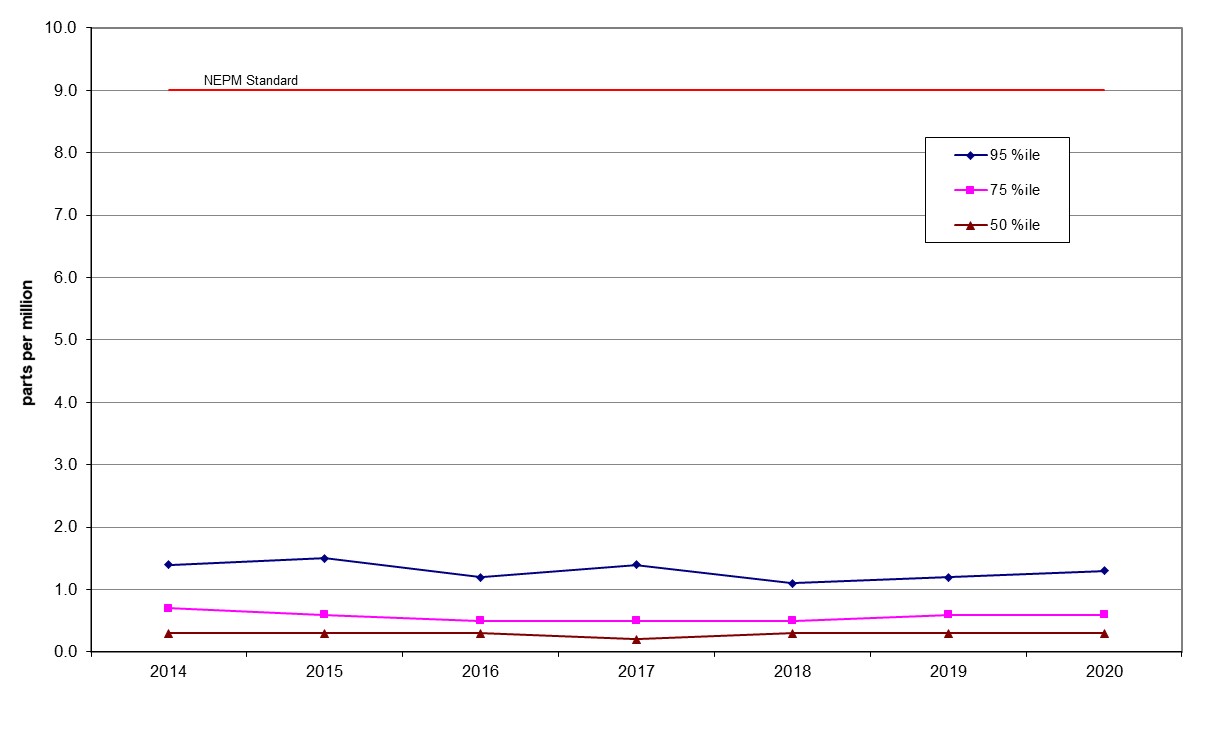


Figure 24: Statistical summary for daily maximum 8-hour CO Florey 2014 – 2020

## Nitrogen dioxide

Table 17: Statistical summary for daily maximum 1-hour NO2 Monash 2011 – 2020

| Year | Data  Availability  (%) | No. of  Exceedances  (days) | Max  conc.  (ppm) | Annual average  (ppm) | 95th  percentile  (ppm) | 75th  percentile  (ppm) | 50th  percentile  (ppm) |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 2011 | 96.7 | 0 | 0.043 | 0.005 | 0.029 | 0.022 | 0.015 |
| 2012 | 97.5 | 0 | 0.033 | 0.006 | 0.026 | 0.021 | 0.014 |
| 2013 | 97.5 | 0 | 0.037 | 0.005 | 0.027 | 0.021 | 0.014 |
| 2014 | 94.1 | 0 | 0.036 | 0.005 | 0.027 | 0.020 | 0.015 |
| 2015 | 94.8 | 0 | 0.032 | 0.004 | 0.026 | 0.020 | 0.014 |
| 2016 | 95.6 | 0 | 0.036 | 0.004 | 0.027 | 0.019 | 0.012 |
| 2017 | 95.6 | 0 | 0.031 | 0.004 | 0.027 | 0.021 | 0.013 |
| 20208 | 95.5 | 0 | 0.039 | 0.004 | 0.028 | 0.020 | 0.014 |
| 2019 | 94.9 | 0 | 0.084 | 0.005 | 0.027 | 0.021 | 0.014 |
| 2020 | 95.7 | 0 | 0.116 | 0.004 | 0.027 | 0.019 | 0.011 |

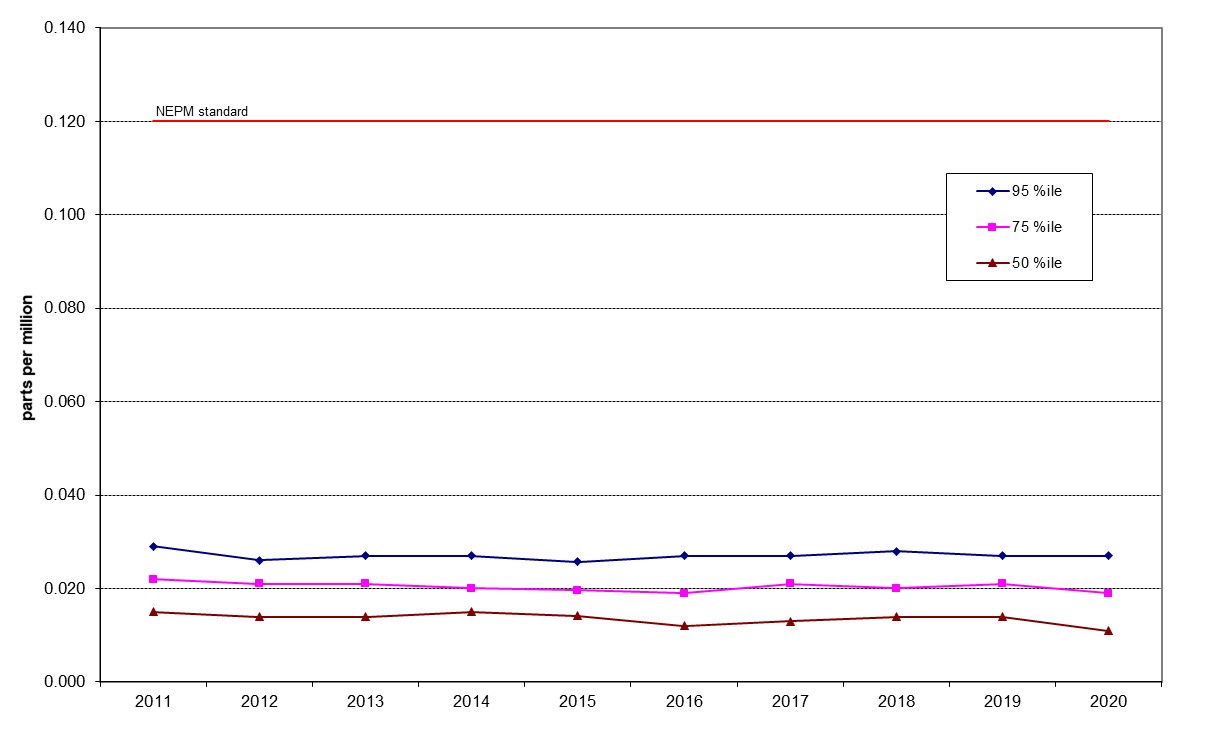


Figure 25: Statistical summary for daily maximum 1-hour NO2 Monash 2011 – 2020

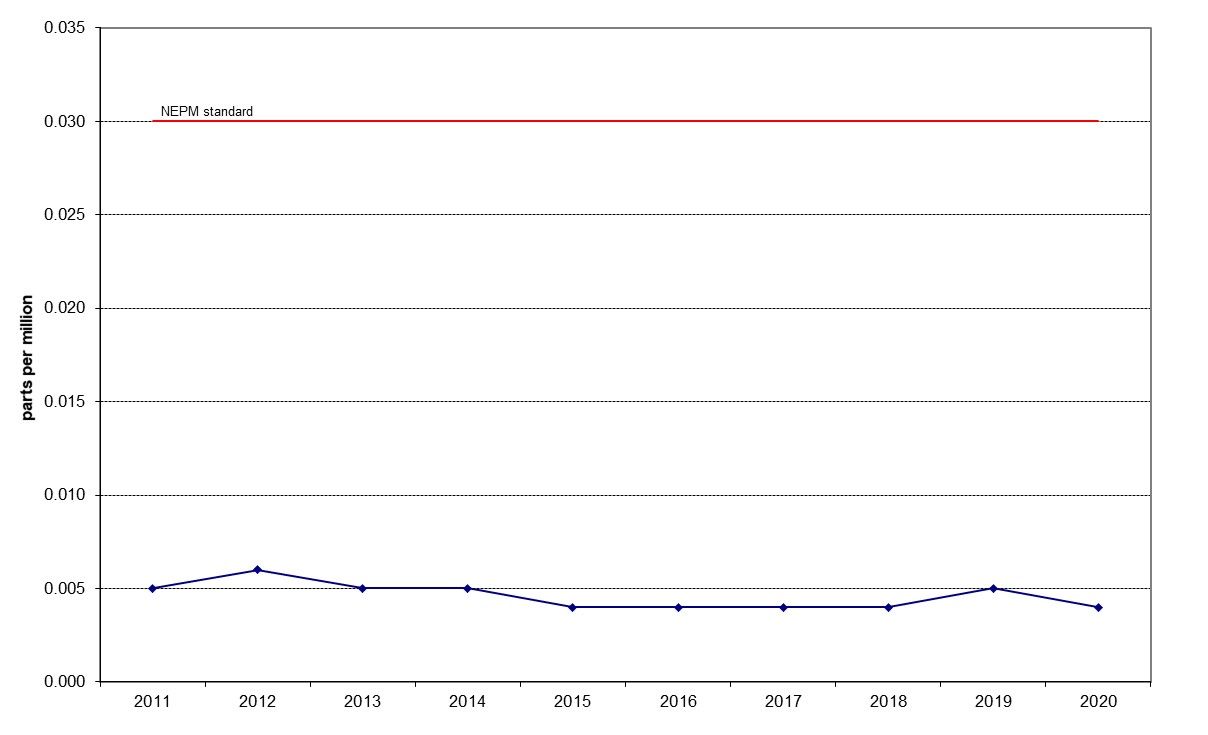


Figure 26: Annual average 1-hour NO2 Monash 2011 – 2020

Table 18: Statistical summary for daily maximum 1-hour NO2 Florey 2014 – 2020

| Year | Data  Availability  (%) | No. of  Exceedances  (days) | Max  conc.  (ppm) | Annual average  (ppm) | 95th  percentile  (ppm) | 75th  percentile  (ppm) | 50th  percentile  (ppm) |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 2014 | 78.3 | 0 | 0.045 | 0.006 | 0.027 | 0.020 | 0.015 |
| 2015 | 91.5 | 0 | 0.033 | 0.005 | 0.027 | 0.020 | 0.014 |
| 2016 | 94.7 | 0 | 0.034 | 0.004 | 0.027 | 0.019 | 0.013 |
| 2017 | 93.7 | 0 | 0.033 | 0.005 | 0.025 | 0.020 | 0.015 |
| 2018 | 93.3 | 0 | 0.039 | 0.005 | 0.028 | 0.022 | 0.015 |
| 2019 | 92.4 | 0 | 0.062 | 0.005 | 0.027 | 0.020 | 0.014 |
| 2020 | 94.1 | 2 | 0.171 | 0.004 | 0.024 | 0.017 | 0.011 |

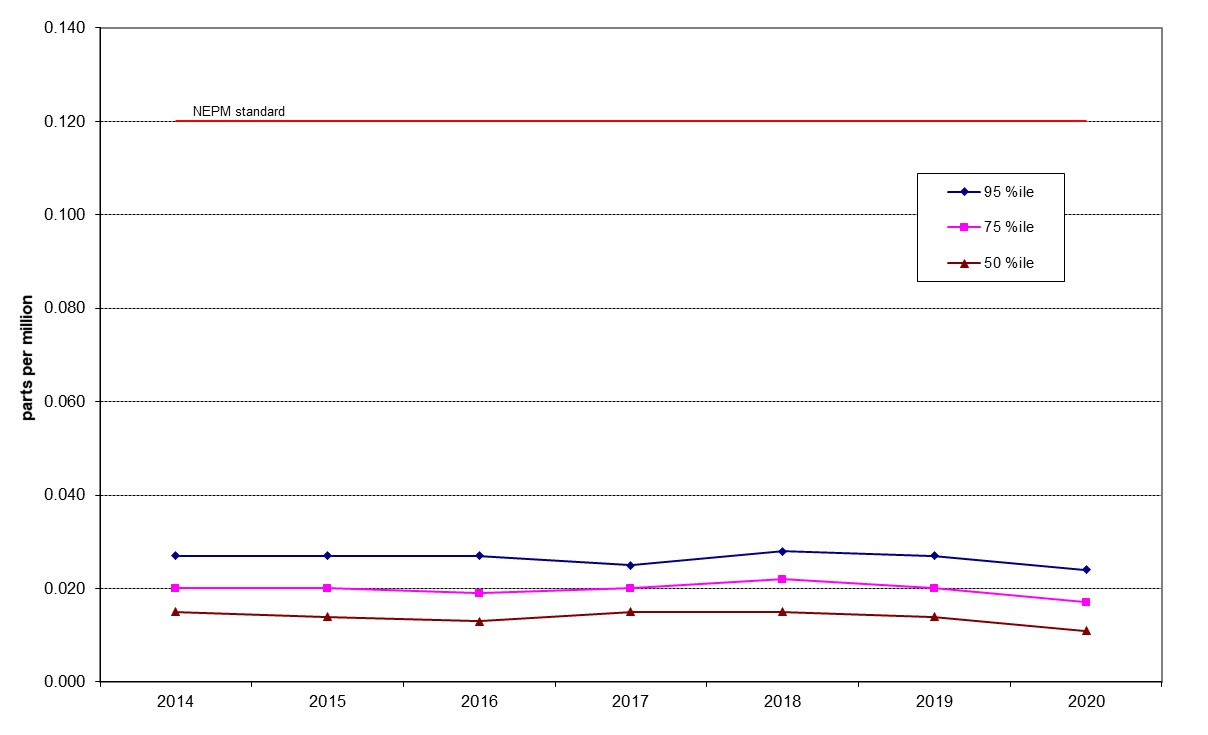


Figure 27: Statistical summary for daily maximum 1-hour NO2 Florey 2014 – 2020

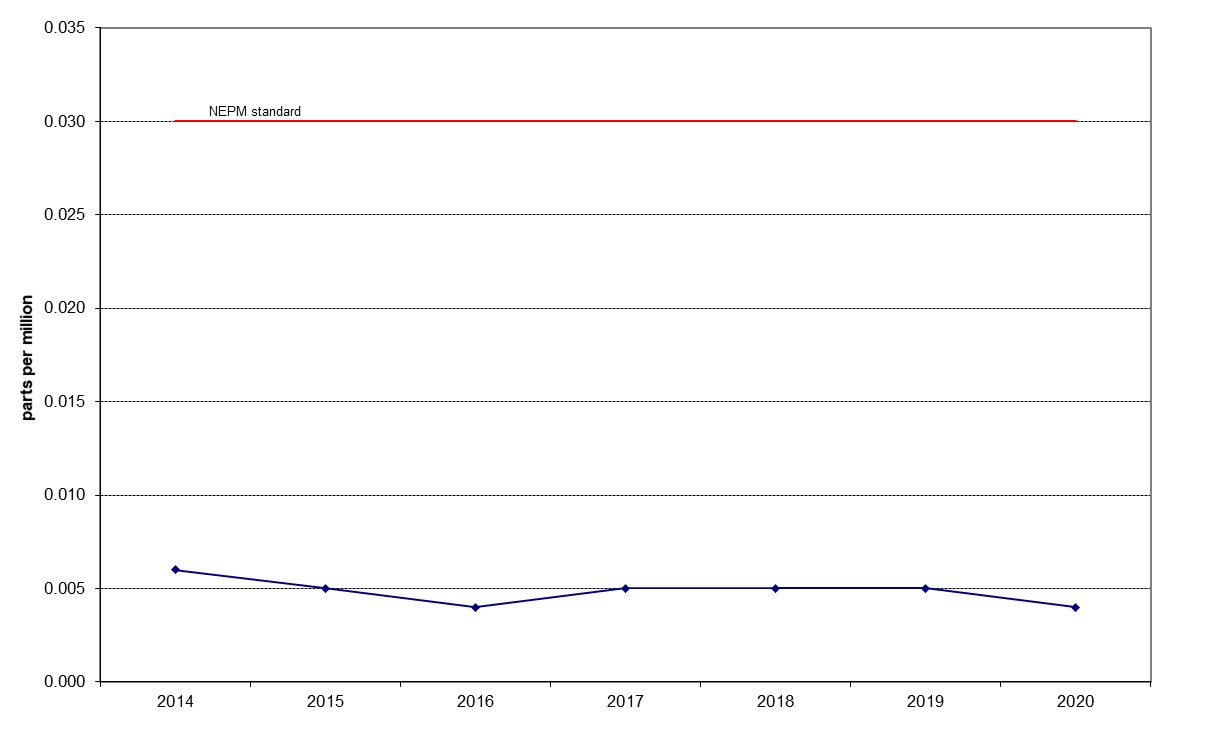


Figure 28: Annual average 1-hour NO2 Florey 2014 – 2020

## Ozone

Table 19: Statistical summary for daily maximum 1-hour O3 Monash 2011 – 2020

| Year | Data  Availability  (%) | No. of  Exceedances  (days) | Max  conc.  (ppm) | 95th  percentile  (ppm) | 75th  percentile  (ppm) | 50th  percentile  (ppm) |
| --- | --- | --- | --- | --- | --- | --- |
| 2011 | 99.2 | 0 | 0.056 | 0.044 | 0.033 | 0.028 |
| 2012 | 100 | 0 | 0.055 | 0.043 | 0.034 | 0.029 |
| 2013 | 97.8 | 0 | 0.062 | 0.045 | 0.035 | 0.029 |
| 2014 | 94.8 | 0 | 0.087 | 0.050 | 0.036 | 0.030 |
| 2015 | 92.8 | 0 | 0.065 | 0.044 | 0.034 | 0.026 |
| 2016 | 95.2 | 0 | 0.057 | 0.044 | 0.032 | 0.026 |
| 2017 | 95.5 | 0 | 0.060 | 0.049 | 0.038 | 0.032 |
| 2018 | 95.8 | 0 | 0.062 | 0.050 | 0.039 | 0.032 |
| 2019 | 95.8 | 1 | 0.127 | 0.066 | 0.040 | 0.033 |
| 2020 | 95.8 | 2 | 0.104 | 0.056 | 0.035 | 0.030 |

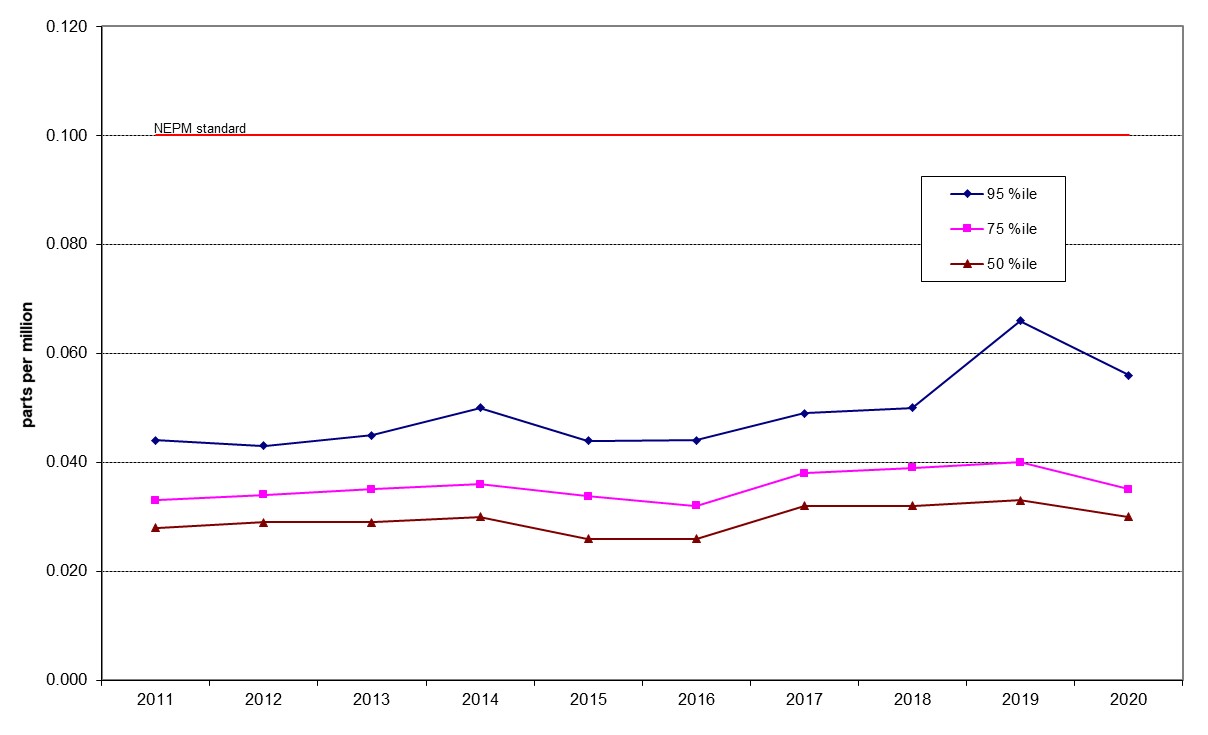


Figure 29: Statistical summary for daily maximum 1-hour O3 Monash 2011 – 2020

Table 20: Statistical summary for daily maximum 1-hour O3 Civic 2011 – 2020

| Year | Data  Availability  (%) | No. of  Exceedances  (days) | Max  conc.  (ppm) | 95th  percentile  (ppm) | 75th  percentile  (ppm) | 50th  percentile  (ppm) |
| --- | --- | --- | --- | --- | --- | --- |
| 2011 | 96.4 | 0 | 0.052 | 0.041 | 0.030 | 0.026 |
| 2012 | 100 | 0 | 0.053 | 0.034 | 0.024 | 0.020 |
| 2013 | 92.1 | 0 | 0.060 | 0.036 | 0.028 | 0.024 |
| 2014 | 94.0 | 0 | 0.060 | 0.039 | 0.028 | 0.022 |
| 2015 | 89.0 | 0 | 0.042 | 0.034 | 0.026 | 0.022 |
| 2016 | 95.8 | 0 | 0.047 | 0.036 | 0.028 | 0.024 |
| 2017 | 95.8 | 0 | 0.053 | 0.045 | 0.034 | 0.028 |
| 2018 | 95.2 | 0 | 0.056 | 0.046 | 0.032 | 0.028 |
| 2019 | 95.8 | 4 | 0.169 | 0.065 | 0.037 | 0.029 |
| 2020 | 95.8 | 0 | 0.096 | 0.048 | 0.032 | 0.026 |



Figure 30: Statistical summary for daily maximum 1-hour O3 Civic 2011 – 2020

Table 21: Statistical summary for daily maximum 1-hour O3 Florey 2014 – 2020

| Year | Data  Availability  (%) | No. of  Exceedances  (days) | Max  conc.  (ppm) | 95th  percentile  (ppm) | 75th  percentile  (ppm) | 50th  percentile  (ppm) |
| --- | --- | --- | --- | --- | --- | --- |
| 2014 | 79.4 | 0 | 0.074 | 0.034 | 0.027 | 0.023 |
| 2015 | 94.2 | 0 | 0.040 | 0.032 | 0.025 | 0.021 |
| 2016 | 95.8 | 0 | 0.050 | 0.040 | 0.031 | 0.027 |
| 2017 | 95.5 | 0 | 0.057 | 0.048 | 0.038 | 0.032 |
| 2018 | 95.2 | 0 | 0.059 | 0.050 | 0.038 | 0.032 |
| 2019 | 95.3 | 1 | 0.118 | 0.067 | 0.039 | 0.032 |
| 2020 | 92.0 | 2 | 0.118 | 0.058 | 0.036 | 0.030 |

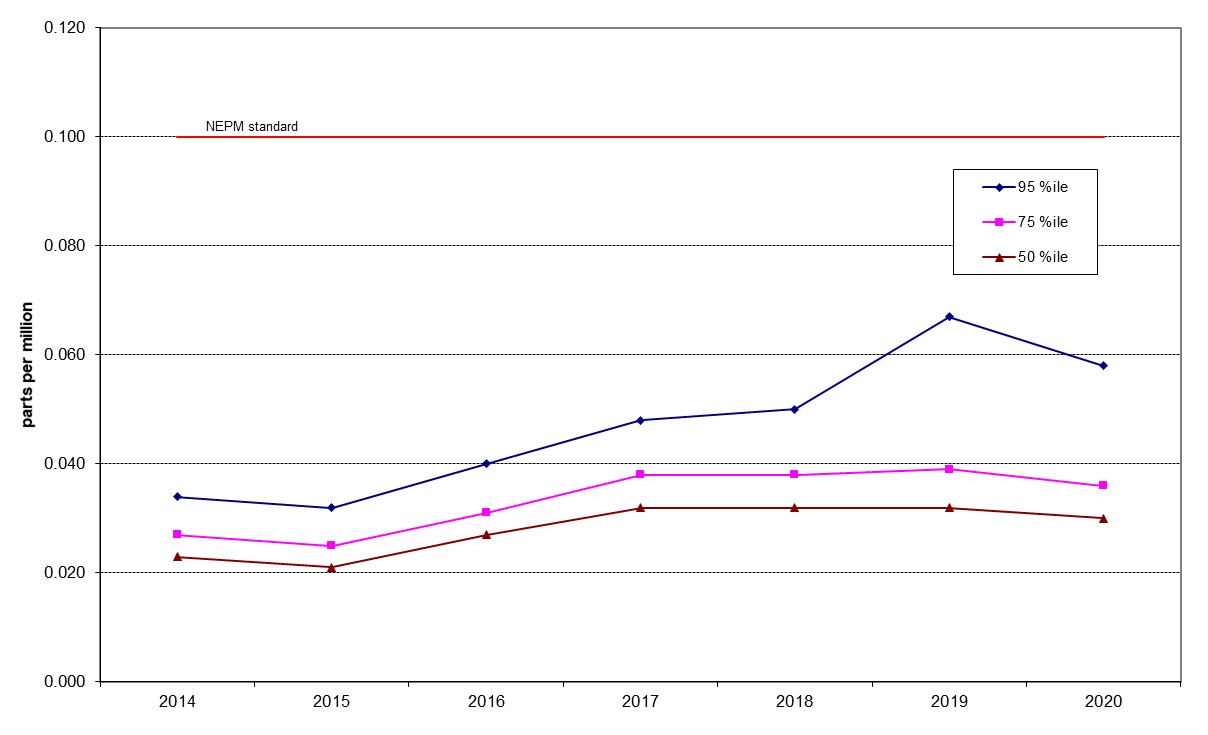


Figure 31: Statistical summary for daily maximum 1-hour O3 Florey 2014 – 2020

Table 22: Statistical summary for daily maximum 4-hour O3 Monash 2011 – 2020

| Year | Data  Availability  (%) | No. of  Exceedances  (days) | Max  conc.  (ppm) | 95th  percentile  (ppm) | 75th  percentile  (ppm) | 50th  percentile  (ppm) |
| --- | --- | --- | --- | --- | --- | --- |
| 2011 | 98.9 | 0 | 0.054 | 0.041 | 0.032 | 0.027 |
| 2012 | 99.7 | 0 | 0.052 | 0.043 | 0.034 | 0.029 |
| 2013 | 97.8 | 0 | 0.059 | 0.042 | 0.033 | 0.028 |
| 2014 | 94.8 | 0 | 0.060 | 0.046 | 0.034 | 0.029 |
| 2015 | 92.8 | 0 | 0.050 | 0.041 | 0.033 | 0.025 |
| 2016 | 95.2 | 0 | 0.055 | 0.042 | 0.030 | 0.025 |
| 2017 | 95.5 | 0 | 0.055 | 0.047 | 0.036 | 0.031 |
| 2018 | 95.8 | 0 | 0.057 | 0.049 | 0.038 | 0.032 |
| 2019 | 95.8 | 1 | 0.118 | 0.061 | 0.039 | 0.032 |
| 2020 | 95.8 | 4 | 0.100 | 0.053 | 0.034 | 0.029 |



Figure 32: Statistical summary for daily maximum 4-hour O3 Monash 2011 – 2020

Table 23: Statistical summary for daily maximum 4-hour O3 Civic 2011 – 2020

| Year | Data  Availability  (%) | No. of  Exceedances  (days) | Max  conc.  (ppm) | 95th  percentile  (ppm) | 75th  percentile  (ppm) | 50th  percentile  (ppm) |
| --- | --- | --- | --- | --- | --- | --- |
| 2011 | 96.4 | 0 | 0.050 | 0.038 | 0.029 | 0.025 |
| 2012 | 100 | 0 | 0.042 | 0.032 | 0.023 | 0.019 |
| 2013 | 91.8 | 0 | 0.057 | 0.034 | 0.027 | 0.023 |
| 2014 | 94.0 | 0 | 0.047 | 0.036 | 0.026 | 0.020 |
| 2015 | 89.0 | 0 | 0.041 | 0.031 | 0.025 | 0.021 |
| 2016 | 95.8 | 0 | 0.045 | 0.035 | 0.027 | 0.023 |
| 2017 | 95.8 | 0 | 0.049 | 0.042 | 0.033 | 0.027 |
| 2018 | 95.2 | 0 | 0.053 | 0.044 | 0.031 | 0.026 |
| 2019 | 95.8 | 1 | 0.098 | 0.060 | 0.036 | 0.029 |
| 2020 | 95.8 | 2 | 0.086 | 0.046 | 0.031 | 0.025 |

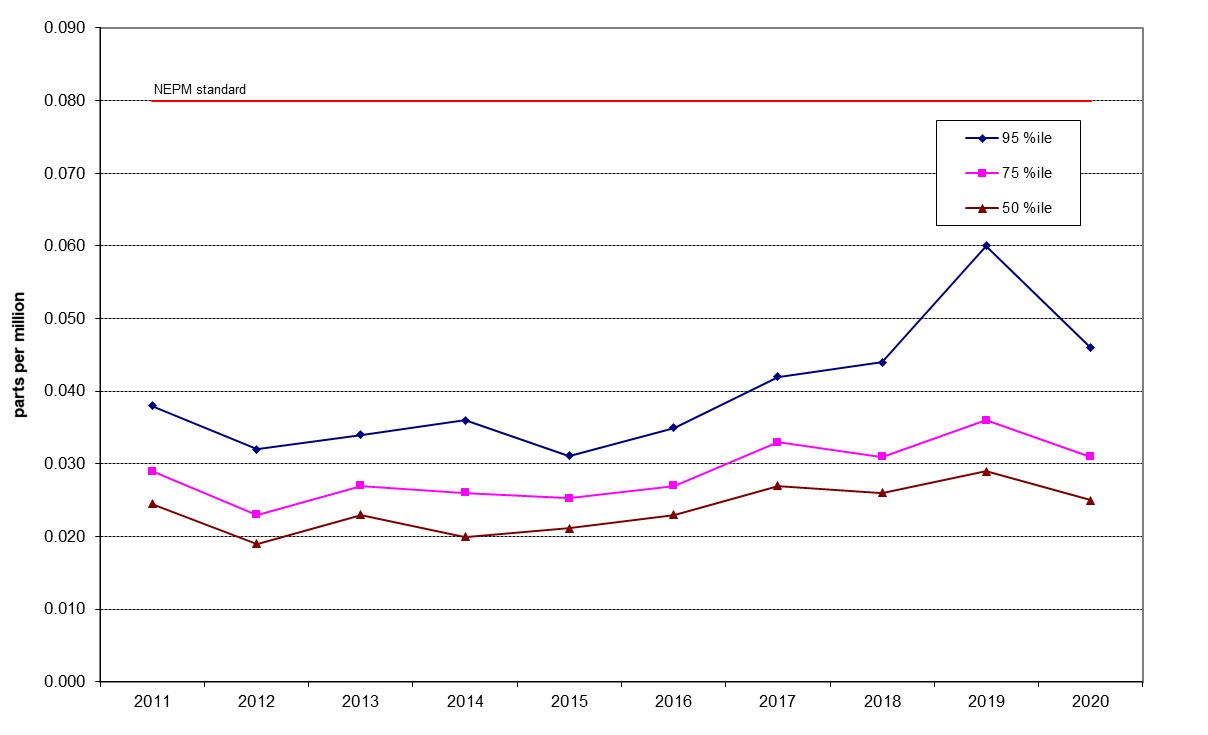


Figure 33: Statistical summary for daily maximum 4-hour O3 Civic 2011 – 2020

Table 24: Statistical summary for daily maximum 4-hour O3 Florey 2014 – 2020

| Year | Data  Availability  (%) | No. of  Exceedances  (days) | Max  conc.  (ppm) | 95th  percentile  (ppm) | 75th  percentile  (ppm) | 50th  percentile  (ppm) |
| --- | --- | --- | --- | --- | --- | --- |
| 2014 | 79.4 | 0 | 0.040 | 0.031 | 0.026 | 0.022 |
| 2015 | 94.2 | 0 | 0.037 | 0.031 | 0.025 | 0.020 |
| 2016 | 95.8 | 0 | 0.050 | 0.038 | 0.029 | 0.026 |
| 2017 | 95.5 | 0 | 0.054 | 0.046 | 0.037 | 0.031 |
| 2018 | 95.2 | 0 | 0.057 | 0.048 | 0.037 | 0.031 |
| 2019 | 95.3 | 3 | 0.109 | 0.064 | 0.038 | 0.031 |
| 2020 | 92.0 | 3 | 0.108 | 0.054 | 0.035 | 0.029 |

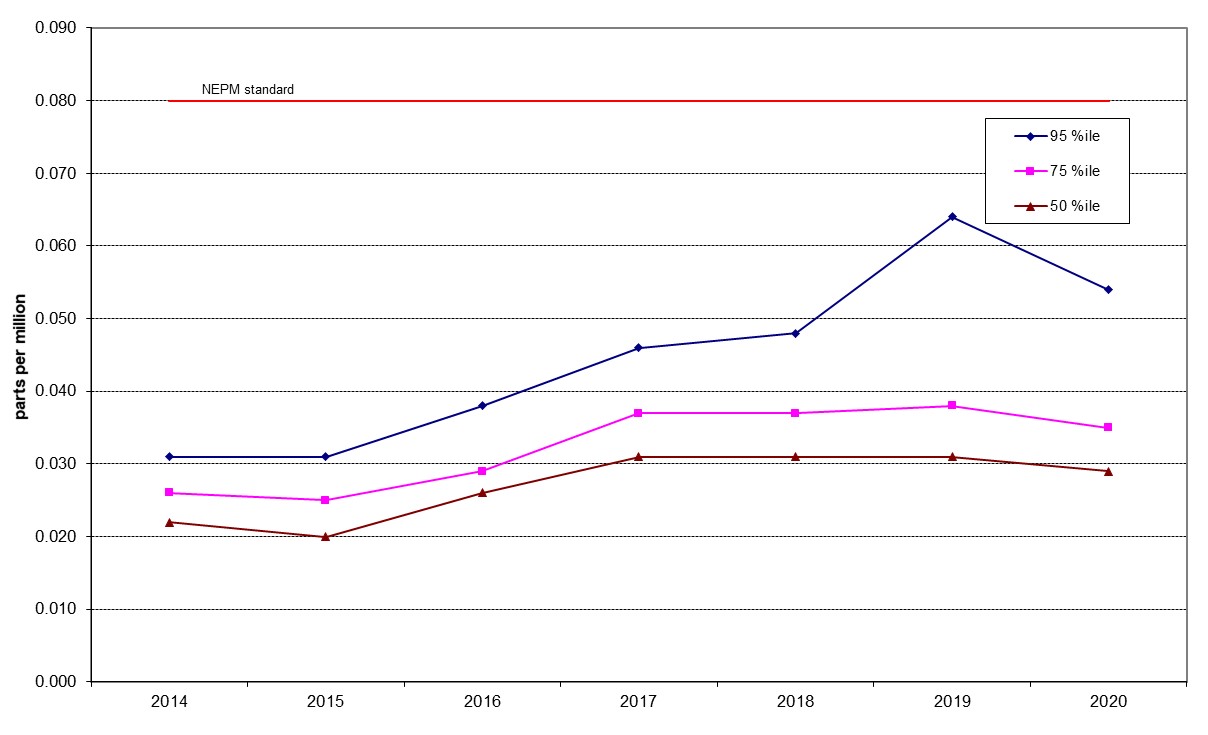


Figure 34: Statistical summary for daily maximum 4-hour O3 Florey 2014 – 2020

## PM10

Table 25: Statistical summary for daily maximum daily PM10 Monash 2011 – 2020

| Year | Data  Availability  (%) | No. of  Exceedances  (days) | Max  conc.  (μg/m3) | Annual average  (μg/m3) | 95th  percentile  (μg/m3) | 75th  percentile  (μg/m3) | 50th  percentile  (μg/m3) |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 2011 | 99.2 | 0 | 40.0 | 10.4 | 22.8 | 13.2 | 8.7 |
| 2012 | 98.6 | 0 | 41.0 | 10.4 | 19.7 | 13.7 | 9.7 |
| 2013 | 95.6 | 0 | 43.5 | 9.8 | 20.2 | 13.1 | 8.9 |
| 2014 | 97.8 | 0 | 39.3 | 10 | 19.1 | 12.9 | 9.6 |
| 2015 | 98.4 | 0 | 49.4 | 9.9 | 19.5 | 13.1 | 9.5 |
| 2016 | 99.5 | 0 | 31.9 | 9.7 | 21.5 | 12.7 | 9.0 |
| 2017 | 98.9 | 0 | 28.3 | 9.8 | 20.5 | 12.3 | 9.0 |
| 2018 | 99.2 | 4 | 139.2 | 11.8 | 23.0 | 14.8 | 10.4 |
| 2019 | 98.4 | 22 | 385.7 | 19.1 | 61.1 | 17.8 | 11.4 |
| 2020 | 99.2 | 21 | 1046.1 | 22.4 | 54.3 | 17.8 | 10.4 |

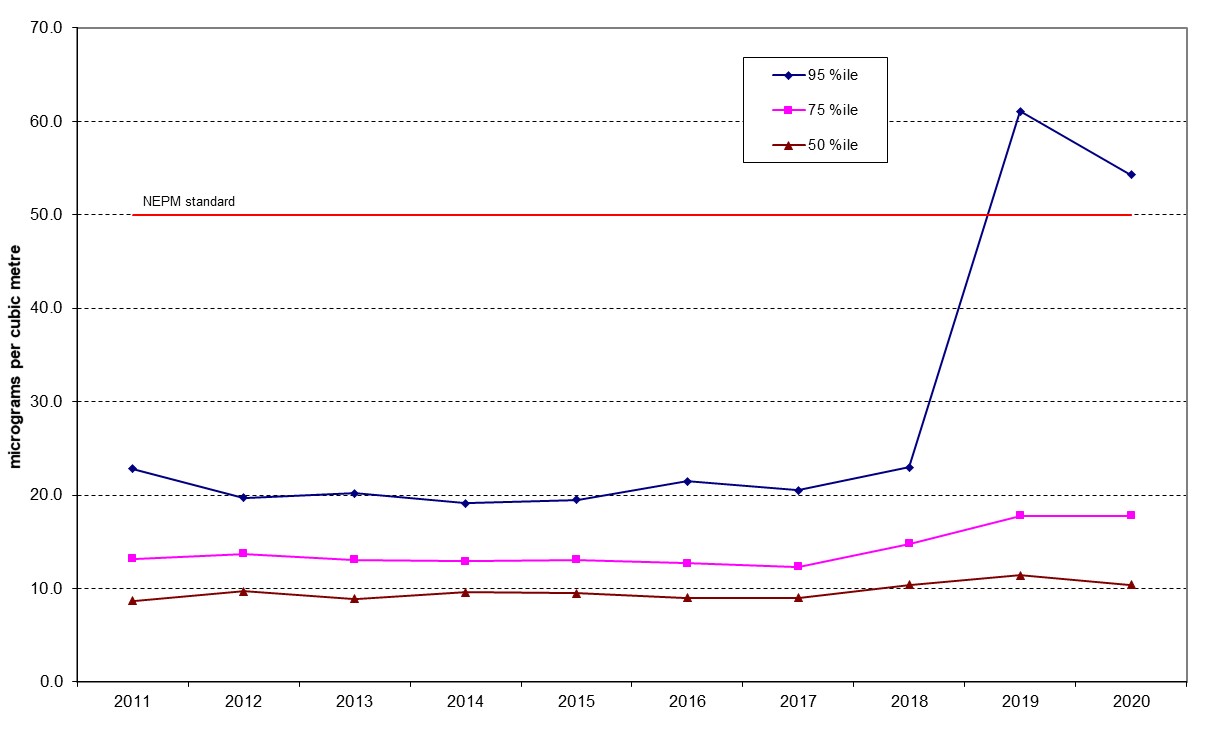


Figure 35: Statistical summary for daily PM10 Monash 2011 – 2020

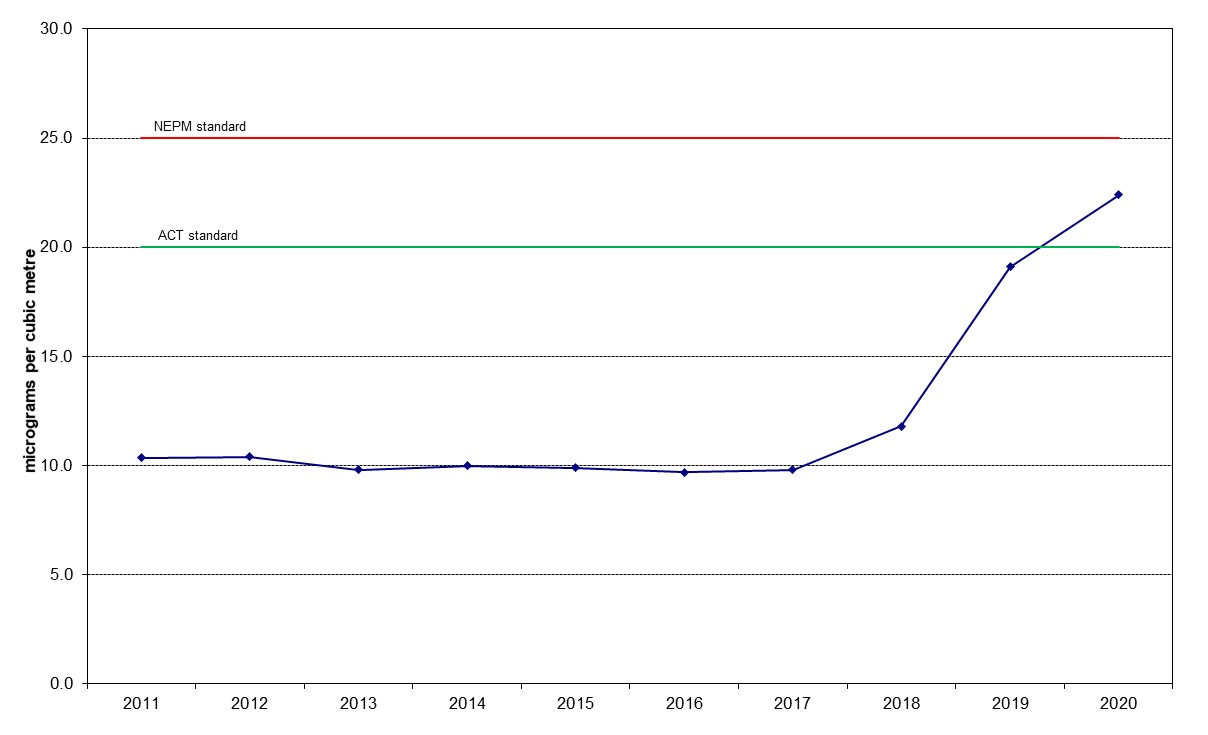


Figure 36: Annual average daily PM10 Monash 2011 – 2020

Table 26: Statistical summary for daily maximum daily PM10 Civic 2011 – 2020

| Year | Data  Availability  (%) | No. of  Exceedances  (days) | Max  conc.  (μg/m3) | Annual average  (μg/m3) | 95th  percentile  (μg/m3) | 75th  percentile  (μg/m3) | 50th  percentile  (μg/m3) |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 2011 | 97.0 | 0 | 29.2 | 8.7 | 16.9 | 11.0 | 7.9 |
| 2012 | 95.1 | 0 | 49.5 | 9.4 | 17.0 | 12.1 | 8.7 |
| 2013 | 92.9 | 1 | 57.8 | 9.7 | 19.9 | 12.0 | 8.6 |
| 2014 | 95.1 | 0 | 31.4 | 9.8 | 17.7 | 12.6 | 9.3 |
| 2015 | 97.5 | 1 | 64.3 | 11.1 | 20.9 | 14.1 | 10.4 |
| 2016 | 100 | 0 | 36.6 | 10.7 | 20.6 | 14.3 | 9.7 |
| 2017 | 83.6 | 1 | 53.0 | 9.68 | 10.8 | 7.1 | 5.2 |
| 2018 | 97.8 | 1 | 179.8 | 13.5 | 24.1 | 16.1 | 11.3 |
| 2019 | 97.3 | 29 | 390.2 | 22.9 | 82.5 | 19.5 | 12.7 |
| 2020 | 98.4 | 24 | 994.9 | 21.7 | 56.7 | 15.2 | 10.0 |

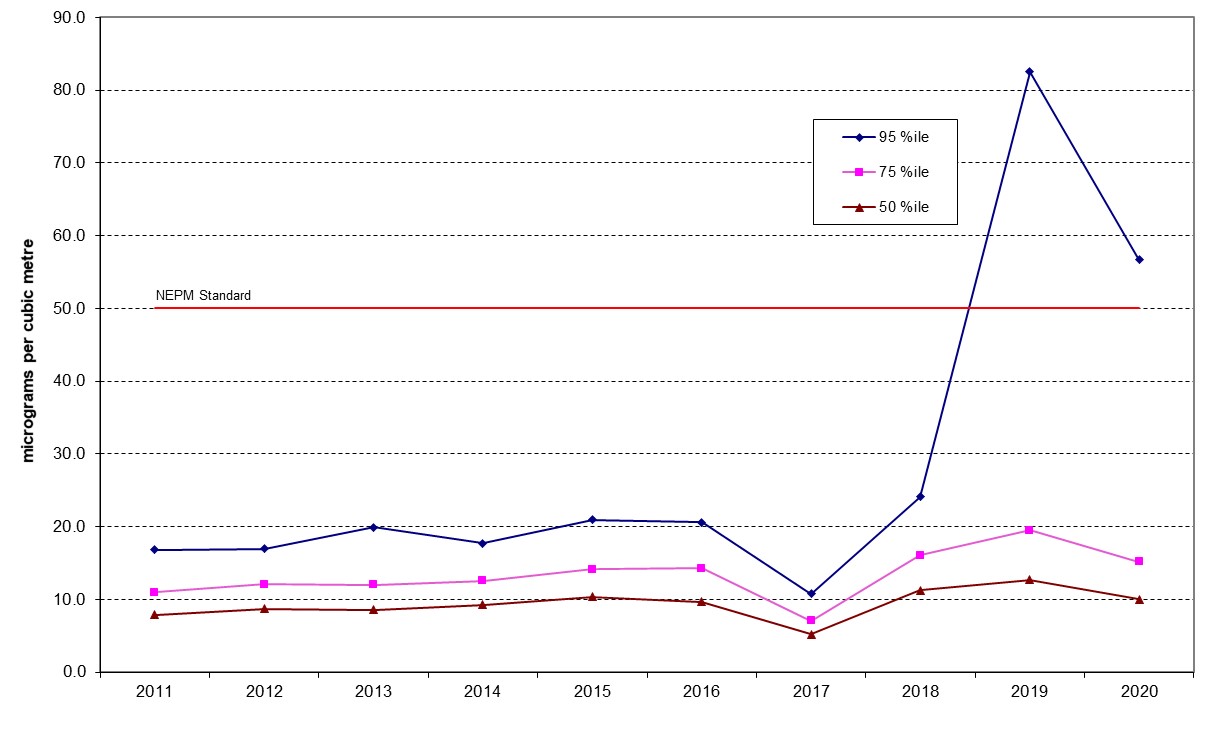


Figure 37: Statistical summary for daily PM10 Civic 2011 – 2020

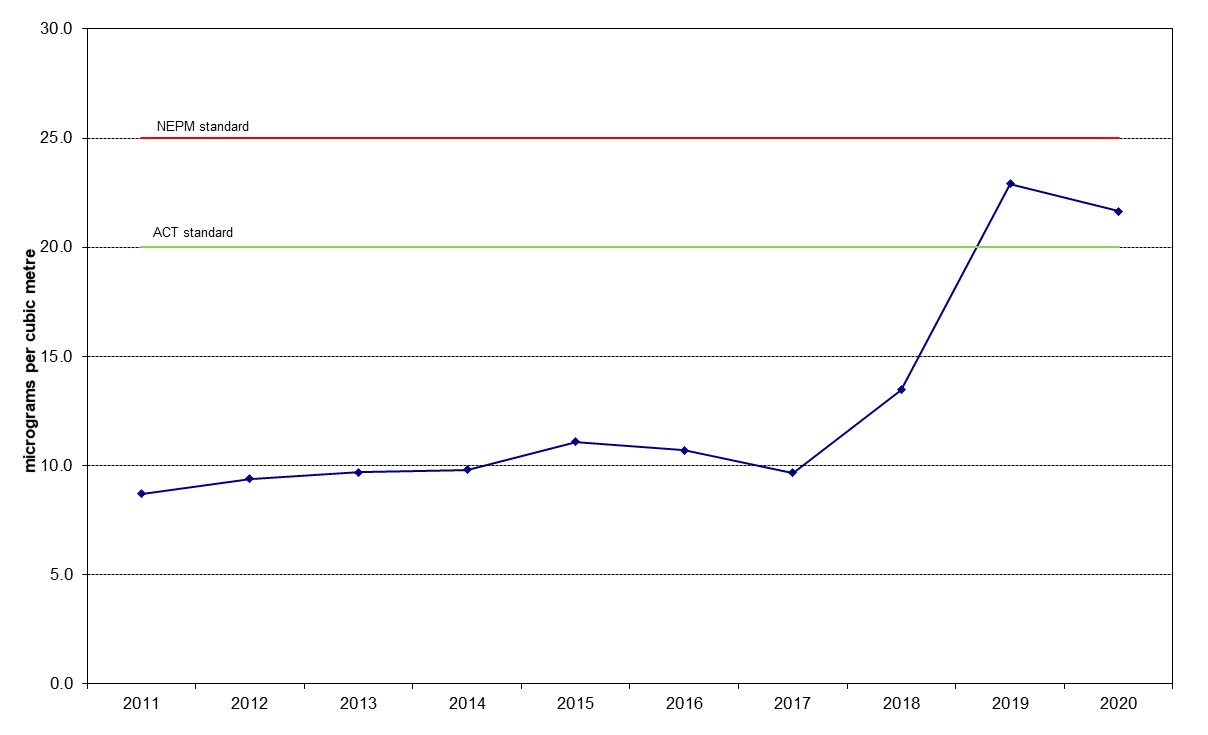


Figure 38: Annual average daily PM10 Civic 2011 – 2020

Table 27: Statistical summary for daily maximum daily PM10 Florey 2014 – 2020

| Year | Data  Availability  (%) | No. of  Exceedances  (days) | Max  conc.  (μg/m3) | Annual average  (μg/m3) | 95th  percentile  (μg/m3) | 75th  percentile  (μg/m3) | 50th  percentile  (μg/m3) |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 2014 | 83.3 | 0 | 30.2 | 10.4 | 21.5 | 13.0 | 9.4 |
| 2015 | 95.6 | 0 | 70.8 | 10.7 | 21.8 | 13.7 | 9.4 |
| 2016 | 98.9 | 0 | 28.8 | 10.1 | 20.6 | 13.1 | 9.2 |
| 2017 | 98.4 | 0 | 28.1 | 9.84 | 21.8 | 12.8 | 8.5 |
| 2018 | 89.9 | 3 | 158.6 | 12.0 | 23.8 | 15.3 | 10.1 |
| 2019 | 98.1 | 28 | 379.7 | 23.8 | 96.8 | 20.6 | 13.4 |
| 2020 | 99.5 | 21 | 1075.5 | 22.8 | 57.5 | 17.9 | 10.9 |

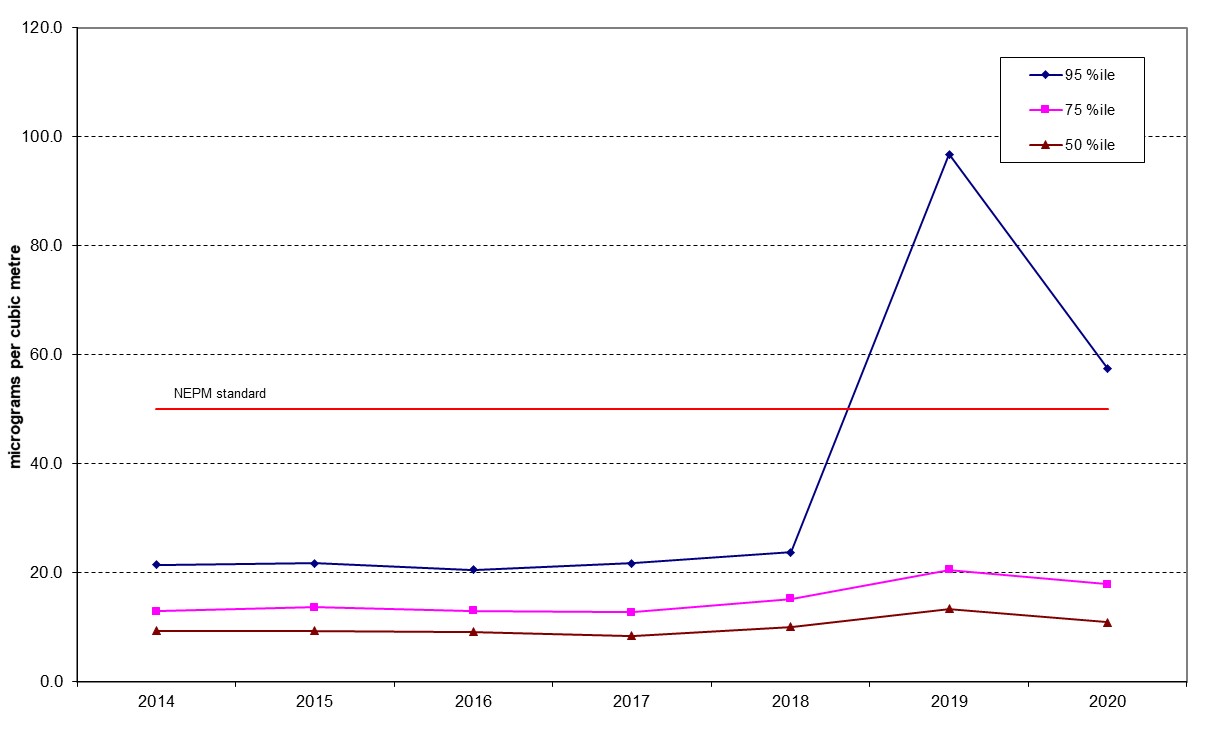


Figure 39: Statistical summary for daily PM10 Florey 2014 – 2020



Figure 40: Annual average daily PM10 Florey 2014 – 2020

## PM2.5

Table 28: Statistical summary for daily maximum daily PM2.5 Monash 2011 – 2020

| Year | Data  Availability  (%) | No. of  Exceedances  (days) | Max  conc.  (μg/m3) | Annual average  (μg/m3) | 95th  percentile  (μg/m3) | 75th  percentile  (μg/m3) | 50th  percentile  (μg/m3) |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 2011 | 92.1 | 4 | 32.8 | 6.5 | 20.0 | 7.0 | 4.5 |
| 2012 | 95.1 | 3 | 29.2 | 7.1 | 16.5 | 8.3 | 5.0 |
| 2013 | 98.6 | 6 | 38.4 | 6.9 | 19.2 | 8.1 | 5.2 |
| 2014 | 87.7 | 4 | 31.5 | 6.8 | 18.7 | 8.6 | 5.6 |
| 2015 | 96.4 | 6 | 33.8 | 7.4 | 19.0 | 8.2 | 5.6 |
| 2016 | 98.1 | 8 | 32.7 | 7.4 | 20.7 | 8.2 | 5.4 |
| 2017 | 98.6 | 12 | 35.2 | 7.7 | 22.5 | 9.3 | 5.3 |
| 2018 | 99.2 | 2 | 32.0 | 6.8 | 19.2 | 8.6 | 5.3 |
| 2019 | 98.9 | 28 | 307.9 | 14.1 | 42.7 | 12.5 | 7.2 |
| 2020 | 98.6 | 37 | 1146.5 | 17.9 | 38.4 | 11.3 | 5.7 |

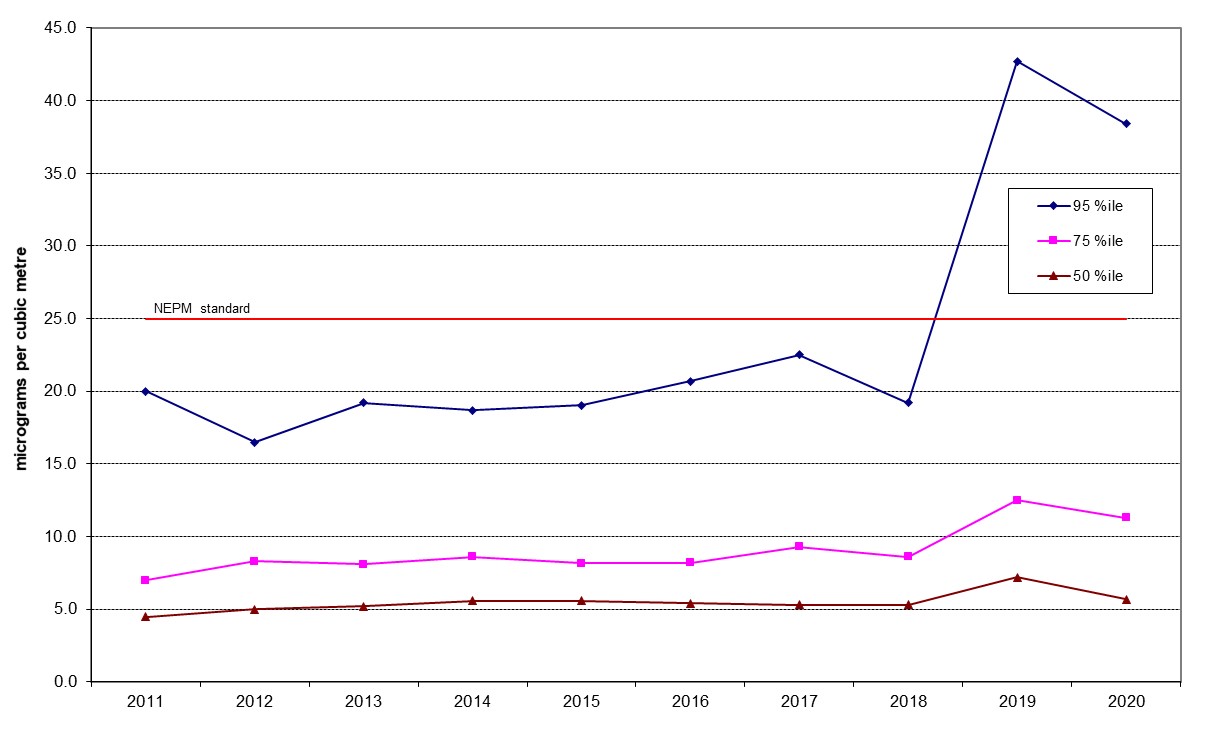


Figure 41: Statistical summary for daily PM2.5 Monash 2011 – 2020

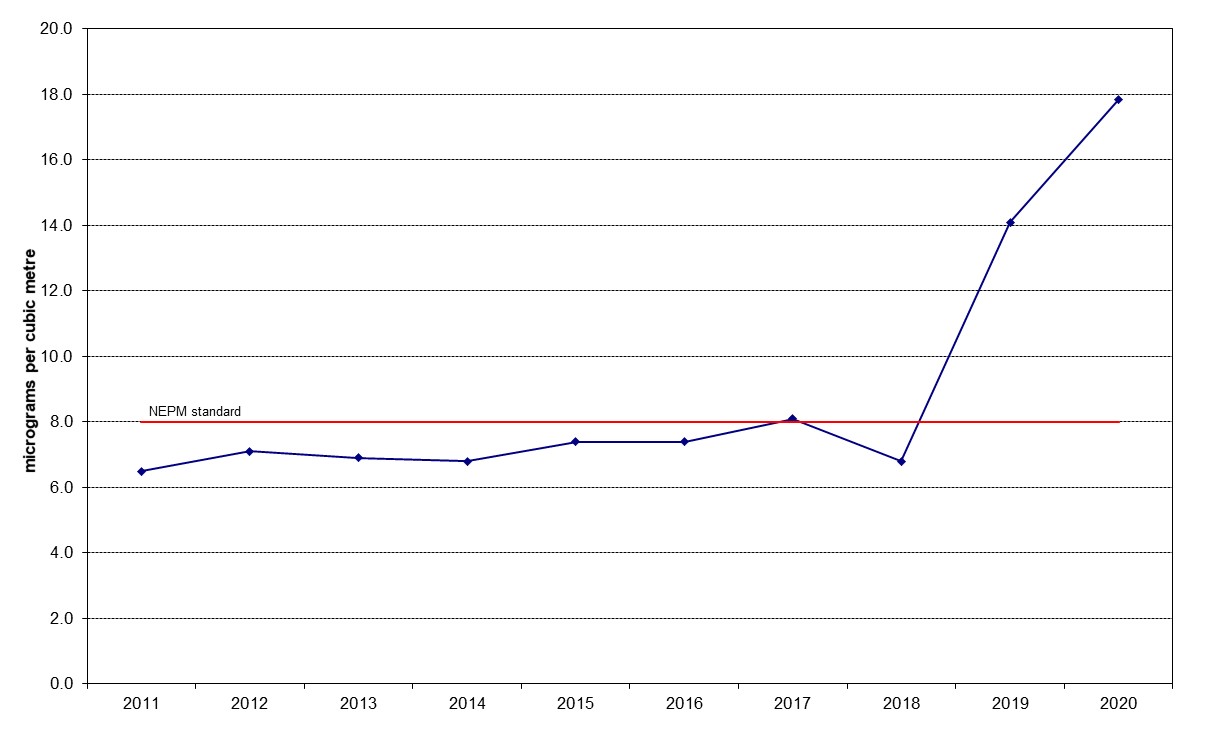


Figure 42: Annual average daily PM2.5 Monash 2011 – 2020

Table 29: Statistical summary for daily maximum daily PM2.5 Civic 2016 – 2020

| Year | Data  Availability  (%) | No. of  Exceedances  (days) | Max  conc.  (μg/m3) | Annual average  (μg/m3) | 95th  percentile  (μg/m3) | 75th  percentile  (μg/m3) | 50th  percentile  (μg/m3) |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 2016 | 98.6 | 0 | 22.1 | 5.5 | 11.0 | 7.1 | 4.8 |
| 2017 | 94.2 | 1 | 53.8 | 5.9 | 10.8 | 7.1 | 5.2 |
| 2018 | 98.6 | 1 | 36.1 | 6.5 | 12.1 | 8.1 | 6.1 |
| 2019 | 96.4 | 29 | 390.2 | 22.9 | 82.5 | 19.5 | 12.7 |
| 2020 | 99.2 | 18 | 872.6 | 12.9 | 24.8 | 7.6 | 5.1 |

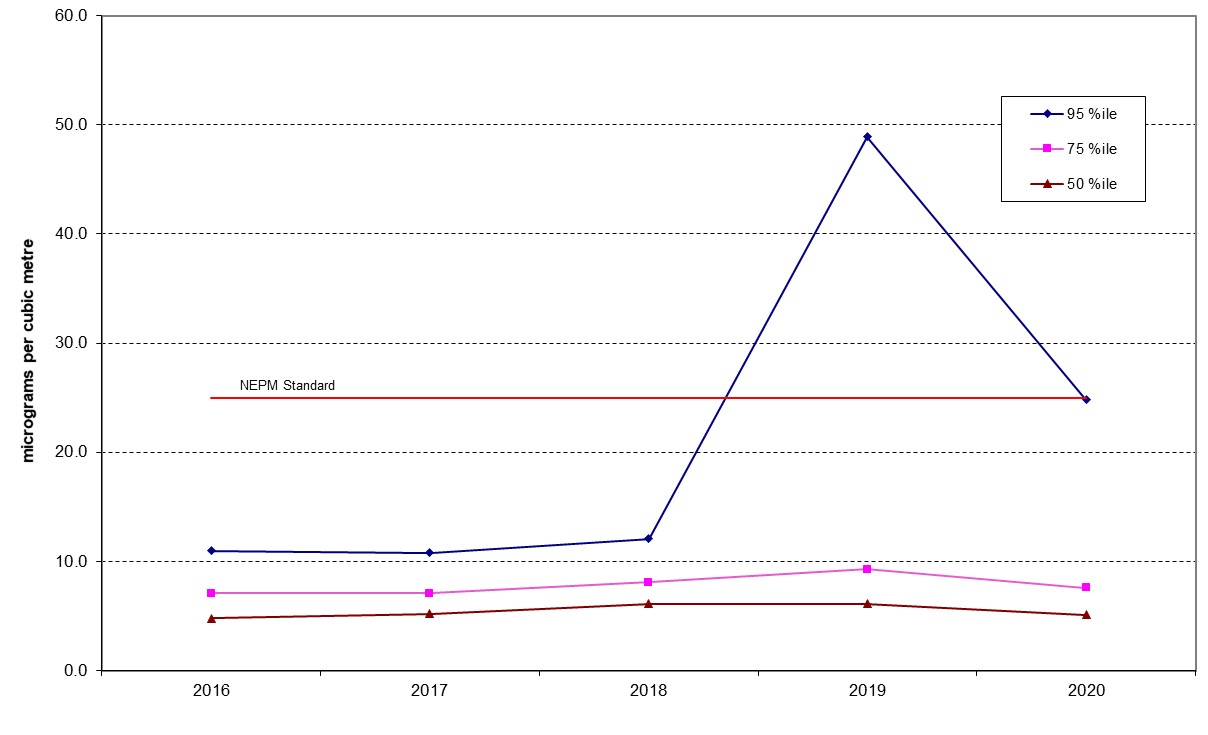


Figure 43: Statistical summary for daily PM2.5 Civic 2016 – 2020

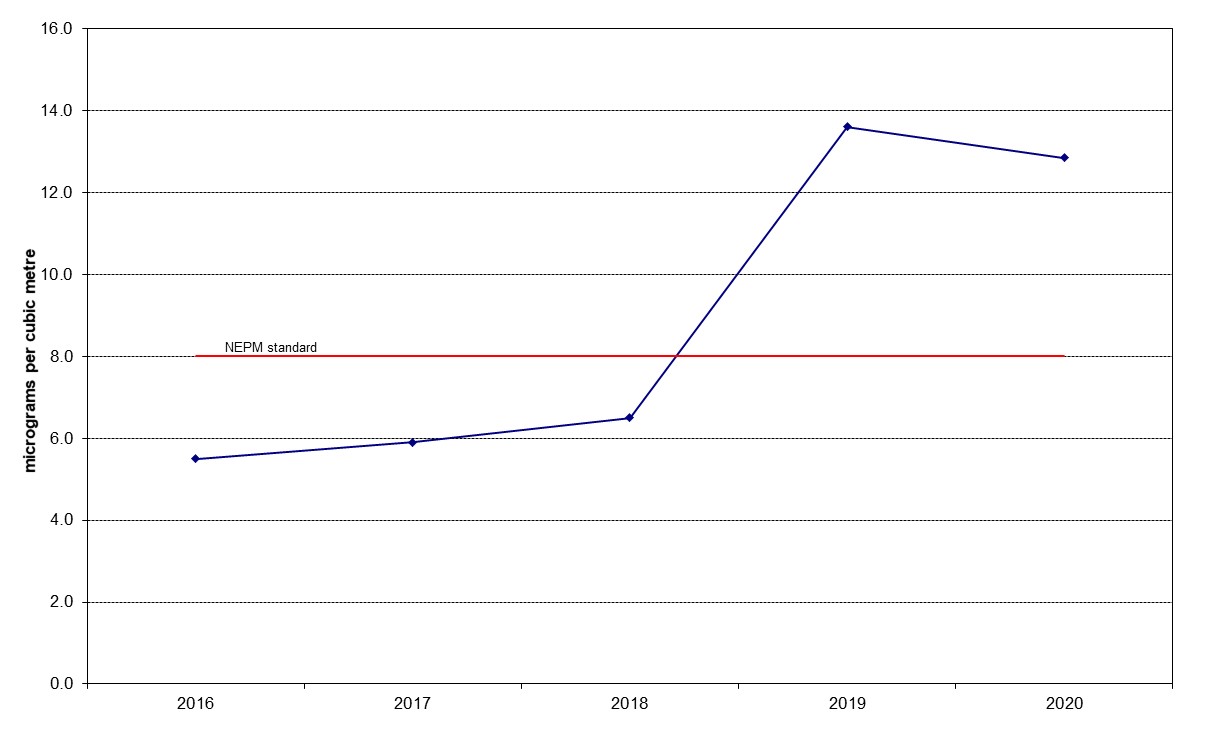


Figure 44: Annual average daily PM2.5 Civic 2016 – 2020

Table 30: Statistical summary for daily maximum daily PM2.5 Florey 2014 – 2020

| Year | Data  Availability  (%) | No. of  Exceedances  (days) | Max  conc.  (μg/m3) | Annual average  (μg/m3) | 95th  percentile  (μg/m3) | 75th  percentile  (μg/m3) | 50th  percentile  (μg/m3) |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 2014 | 74.2 | 0 | 22.8 | 5.8 | 15.0 | 7.1 | 4.9 |
| 2015 | 96.2 | 0 | 24.3 | 6.5 | 17.1 | 7.4 | 4.8 |
| 2016 | 98.6 | 1 | 27.2 | 7.3 | 17.4 | 8.6 | 5.8 |
| 2017 | 94.2 | 0 | 23.8 | 7.2 | 17.9 | 8.7 | 5.6 |
| 2018 | 97.3 | 2 | 26.4 | 7.4 | 17.0 | 8.7 | 5.9 |
| 2019 | 98.4 | 29 | 319.6 | 14.8 | 46.9 | 12.3 | 7.2 |
| 2020 | 97.3 | 25 | 983.4 | 16.9 | 28.8 | 12.2 | 5.9 |

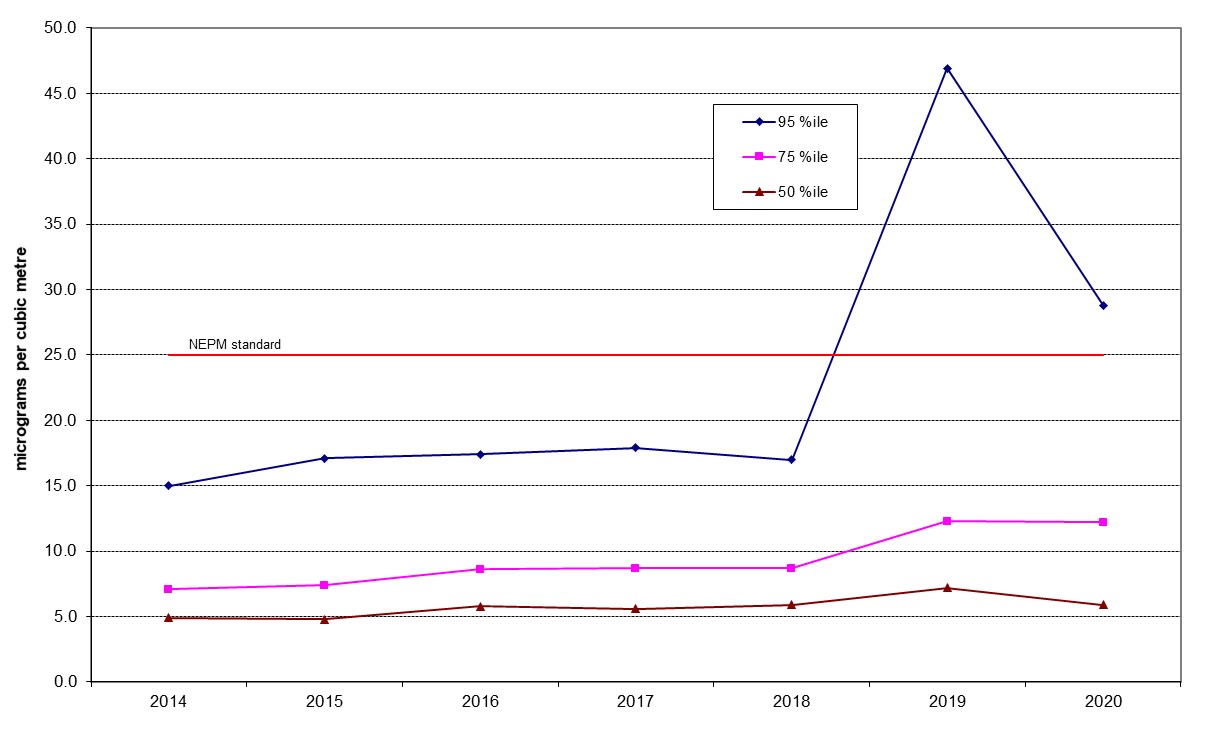


Figure 45: Statistical summary for daily PM2.5 Florey 2014 – 2020

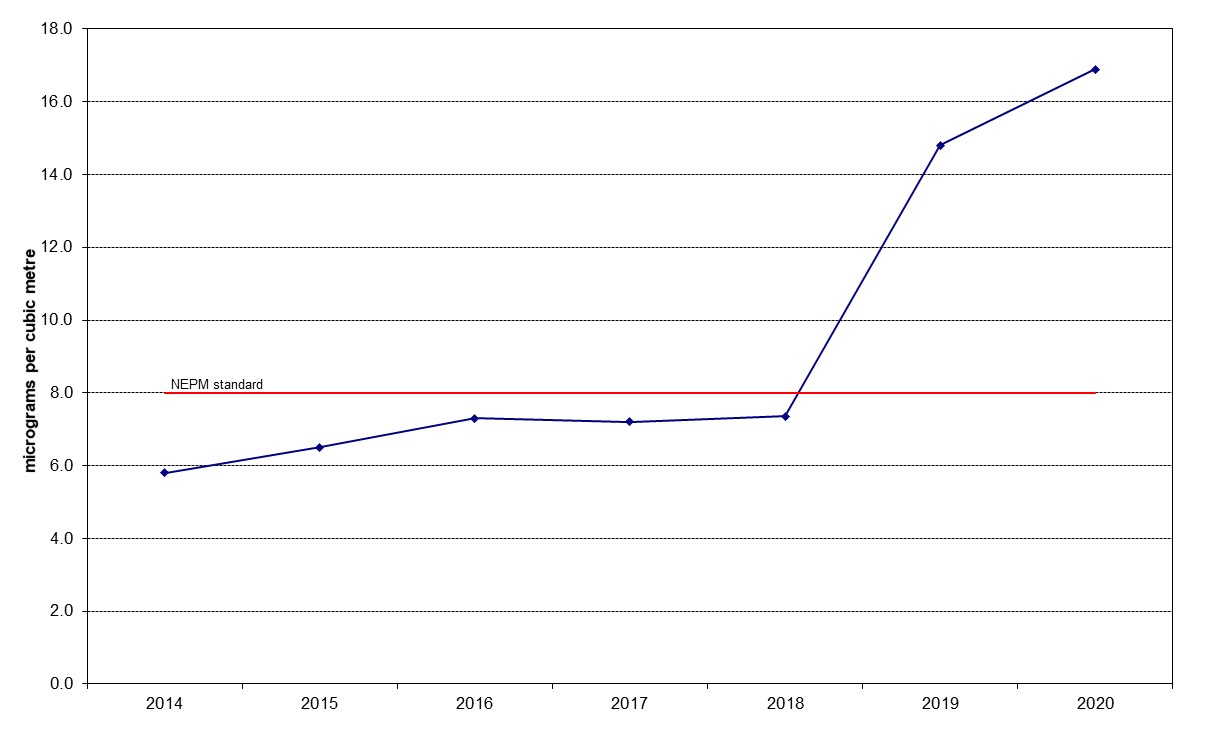


Figure 46: Annual average daily PM2.5 Florey 2014 – 2020

# APPENDIX A Exceedance Summary

Table 31: PM10 Daily Exceedances in 2020

| **Date** | **Monitoring Station** | | | **Inferred Cause** | **Exceptional Event** |
| --- | --- | --- | --- | --- | --- |
| **Monash**  **(μg/m3)** | **Civic**  **(μg/m3)** | **Florey**  **(μg/m3)** |
| **01/01/2020** | 1046.1 | 881.8 | 857.3 | Bushfire | Yes |
| **02/01/2020** | 453.6 | 462.8 | 451.9 | Bushfire | Yes |
| **03/01/2020** | 188.3 | 127.6 | 156.1 | Bushfire | Yes |
| **04/01/2020** | 206.7 | 277.5 | 328.1 | Bushfire | Yes |
| **05/01/2020** | 759.0 | 994.9 | 1075.5 | Bushfire | Yes |
| **07/01/2020** | 65.7 | 68.5 | 71.3 | Bushfire | Yes |
| **08/01/2020** | 145.2 | 137.3 | 142.7 | Bushfire | Yes |
| **10/01/2020** | 65.6 | 76.4 | 75.0 | Bushfire | Yes |
| **11/01/2020** | 96.2 | 115.7 | 115.6 | Bushfire | Yes |
| **12/01/2020** | 89.6 | 109.6 | 110.7 | Bushfire | Yes |
| **13/01/2020** | 74.8 | 85 | 82.7 | Bushfire | Yes |
| **14/01/2020** | 54.5 | 64.4 | 61.3 | Bushfire | Yes |
| **16/01/2020** | 62.6 |  |  | Bushfire | Yes |
| **17/01/2020** |  | 51.3 | 53.7 | Bushfire | Yes |
| **23/01/2020** | 84.8 | 150 | 144.4 | Dust Storm | Yes |
| **24/01/2020** | 52.6 | 70.9 | 63.5 | Dust Storm | Yes |
| **25/01/2020** |  | 59.4 | 58.2 | Dust Storm | Yes |
| **26/01/2020** | 86.5 | 56.4 |  | Bushfire | Yes |
| **27/01/2020** | 112.4 | 77.8 | 64.6 | Bushfire | Yes |
| **28/01/2020** | 69.3 |  |  | Bushfire | Yes |
| **29/01/2020** | 92.8 | 63 |  | Bushfire | Yes |
| **30/01/2020** |  | 54.4 |  | Bushfire | Yes |
| **31/01/2020** | 51.9 | 51.5 | 52.0 | Bushfire | Yes |
| **01/02/2020** | 98.7 | 114.8 | 119.5 | Bushfire | Yes |
| **02/02/2020** |  | 54 |  | Bushfire  Dust Storm | Yes |
| **03/02/2020** |  | 56 | 58.8 | Bushfire  Dust Storm | Yes |
| **04/02/2020** |  |  | 60.2 | Bushfire  Dust Storm | Yes |

Table 32: PM2.5 Daily Exceedances in 2020

| **Date** | **Monitoring Station** | | | **Inferred Cause** | **Exceptional Event** |
| --- | --- | --- | --- | --- | --- |
| **Monash**  **(μg/m3)** | **Civic**  **(μg/m3)** | **Florey**  **(μg/m3)** |
| **01/01/2020** | 1146.5 | 827.1 | 839.1 | Bushfire | Yes |
| **02/01/2020** | 495.0 |  | 439.4 | Bushfire | Yes |
| **03/01/2020** | 188.2 |  | 130.2 | Bushfire | Yes |
| **04/01/2020** | 159.3 | 213.8 | 258.5 | Bushfire | Yes |
| **05/01/2020** | 783.6 | 872.6 | 983.4 | Bushfire | Yes |
| **06/01/2020** | 29.8 |  | 27.1 | Bushfire | Yes |
| **07/01/2020** | 56.7 | 46.4 | 48.5 | Bushfire | Yes |
| **08/01/2020** | 140.5 | 103.8 | 121.0 | Bushfire | Yes |
| **10/01/2020** | 28.6 |  |  | Bushfire | Yes |
| **11/01/2020** | 88.6 | 91.3 | 92.4 | Bushfire | Yes |
| **12/01/2020** | 82.2 | 92.6 | 102.2 | Bushfire | Yes |
| **13/01/2020** | 74.5 | 76.1 |  | Bushfire | Yes |
| **14/01/2020** | 54.7 | 42.4 | 48.1 | Bushfire | Yes |
| **15/01/2020** | 31.8 |  |  | Bushfire | Yes |
| **16/01/2020** | 64.0 |  |  | Bushfire | Yes |
| **17/01/2020** | 35.2 | 50.2 | 52.4 | Bushfire | Yes |
| **26/01/2020** | 74.8 | 26.0 |  | Bushfire | Yes |
| **27/01/2020** | 104.4 | 64.0 | 57.5 | Bushfire | Yes |
| **28/01/2020** | 61.5 | 34.8 | 30.5 | Bushfire | Yes |
| **29/01/2020** | 68.9 | 54.1 | 33.7 | Bushfire | Yes |
| **30/01/2020** | 39.9 | 34.1 |  | Bushfire | Yes |
| **31/01/2020** | 46.1 |  | 26.7 | Bushfire | Yes |
| **01/02/2020** | 27.2 |  |  | Bushfire | Yes |
| **03/02/2020** |  | 26.9 | 36.5 | Bushfire | Yes |
| **04/02/2020** | 27.9 | 38.2 | 50.1 | Bushfire | Yes |
| **05/20/2020** | 38.4 | 27.4 | 31.9 | Bushfire | Yes |
| **16/05/2020** | 31.83 |  |  | Wood Heater | No |
| **17/05/2020** | 26.93 |  | 26.3 | Wood Heater | No |
| **30/05/2020** | 28.5 |  |  | Wood Heater | No |
| **06/06/2020** | 31.2 |  |  | Wood Heater | No |
| **07/06/2020** | 35.3 |  | 30.8 | Wood Heater | No |
| **08/06/2020** | 27.0 |  | 25.1 | Wood Heater | No |
| **13/06/2020** | 25.6 |  |  | Wood Heater | No |
| **27/06/2020** |  |  | 28.6 | Wood Heater | No |
| **28/06/2020** | 27.0 |  | 26.3 | Wood Heater | No |
| **10/07/2020** | 28.4 |  | 25.9 | Wood Heater | No |
| **11/07/2020** | 27.8 |  |  | Wood Heater | No |
| **01/08/2020** | 27.9 |  |  | Wood Heater | No |
| **02/08/2020** | 28.8 |  |  | Wood Heater | No |

Table 33: Carbon Monoxide 8-hour Exceedances in 2020

| **Date** | **Monitoring Station** | | **Inferred Cause** |
| --- | --- | --- | --- |
| **Monash**  **(ppm)** | **Florey**  **(ppm)** |
| **01/01/2020** | 22.00 | 13.76 | Bushfire |
| **05/01/2020** | 11.58 | 14.64 | Bushfire |

Table 34: Nitrogen Dioxide 1-hour Exceedances in 2020

| **Date** | **Monitoring Station** | **Inferred Cause** |
| --- | --- | --- |
| **Florey**  **(ppm)** |
| **04/01/2020** | 0.152 | Bushfire |
| **05/01/2020** | 0.171 | Bushfire |

Table 35: Ozone 1-hour and 4-hour Exceedances in 2020

| **Date** | **Monitoring Station** | | | | | | **Inferred Cause** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Monash**  **(ppm)** | | **Civic**  **(ppm)** | | **Florey**  **(ppm)** | |
| **1 Hour** | **4 Hour** | **1 Hour** | **4 Hour** | **1 Hour** | **4 Hour** |
| **01/01/2020** | 0.104 | 0.100 |  | 0.086 | 0.111 | 0.105 | Bushfire |
| **02/01/2020** |  | 0.093 |  | 0.082 | 0.118 | 0.108 | Bushfire |
| **07/01/2020** |  | 0.080 |  |  |  | 0.085 | Bushfire |
| **31/01/2020** | 0.104 | 0.087 |  |  |  |  | Bushfire |