



White Bay Cruise Terminal

Air Quality and Meteorological Monitoring
Report – July 2020

15 October 2020

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White Bay Cruise Terminal

Air Quality and Meteorological Monitoring Report – July 2020



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1. INTRODUCTION

The Port Authority of New South Wales (NSW) has committed to undertaking air quality monitoring in the residential area adjacent to the White Bay Cruise Terminal (WBCT). This report presents a summary of monitoring data collected during July 2020.

For additional detail regarding the history of the monitoring program, the methodology, monitoring station equipment and technology, please refer to any of the monthly reports prior to February 2018.

2. AIR QUALITY DATA

The monitoring results are presented below with comparison to the ambient air quality criteria for SO₂ and PM_{2.5} provided in The Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (EPA, 2017). The relevant averaging periods are 10 minutes, 1 hour and 24 hours for SO₂, and 24 hours for PM_{2.5}.

The 24-hour average SO₂ and PM_{2.5} concentrations are also compared with the data from several NSW Department of Planning, Industry and Environment (DPIE) monitoring sites, formerly known as Office of Environment and Heritage (OEH).

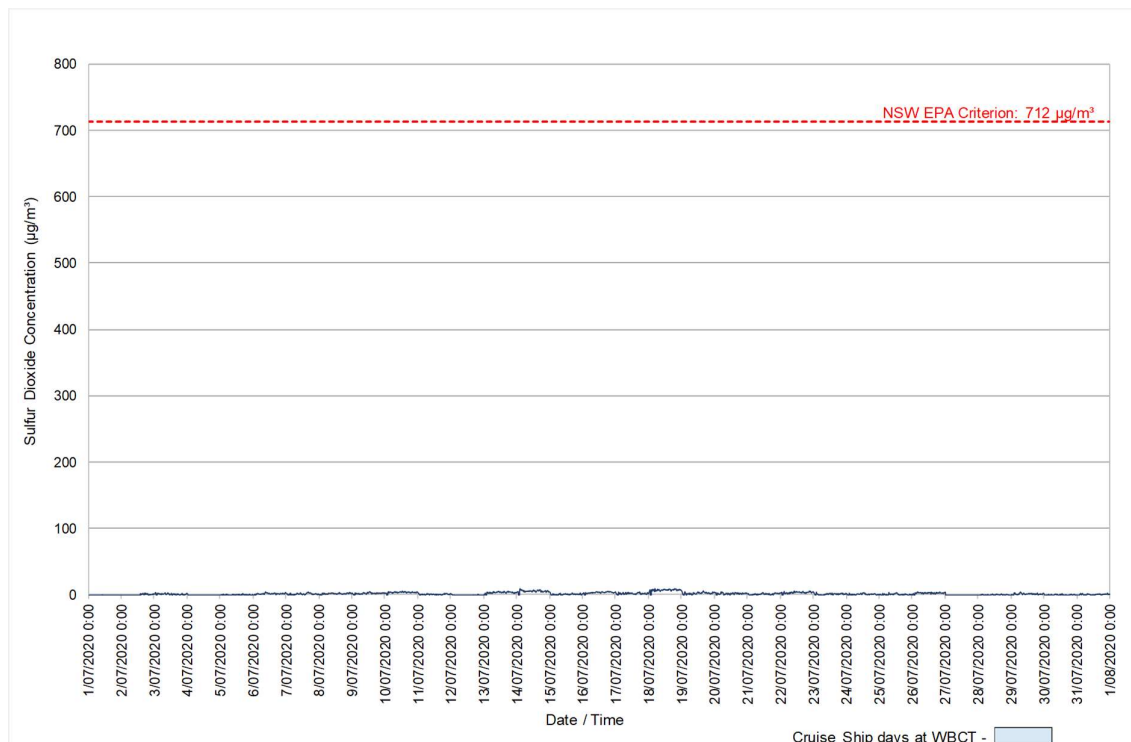
2.1 Cruise Ship Days

There were no cruise ships berthed during the month of July 2020 due to COVID-19 restrictions.

2.2 10-minute Average Sulfur Dioxide Concentrations

A time-series plot of 10-minute average SO₂ concentrations for July is provided in Figure 2-1. No exceedances of the 10-minute average air quality criterion for SO₂ were recorded during the reporting period.

The highest 10-minute average SO₂ concentration (9 µg/m³) was recorded on 14 July at 2:20 am. This concentration is approximately 1% of the NSW Environmental Protection Authority (EPA) criterion.

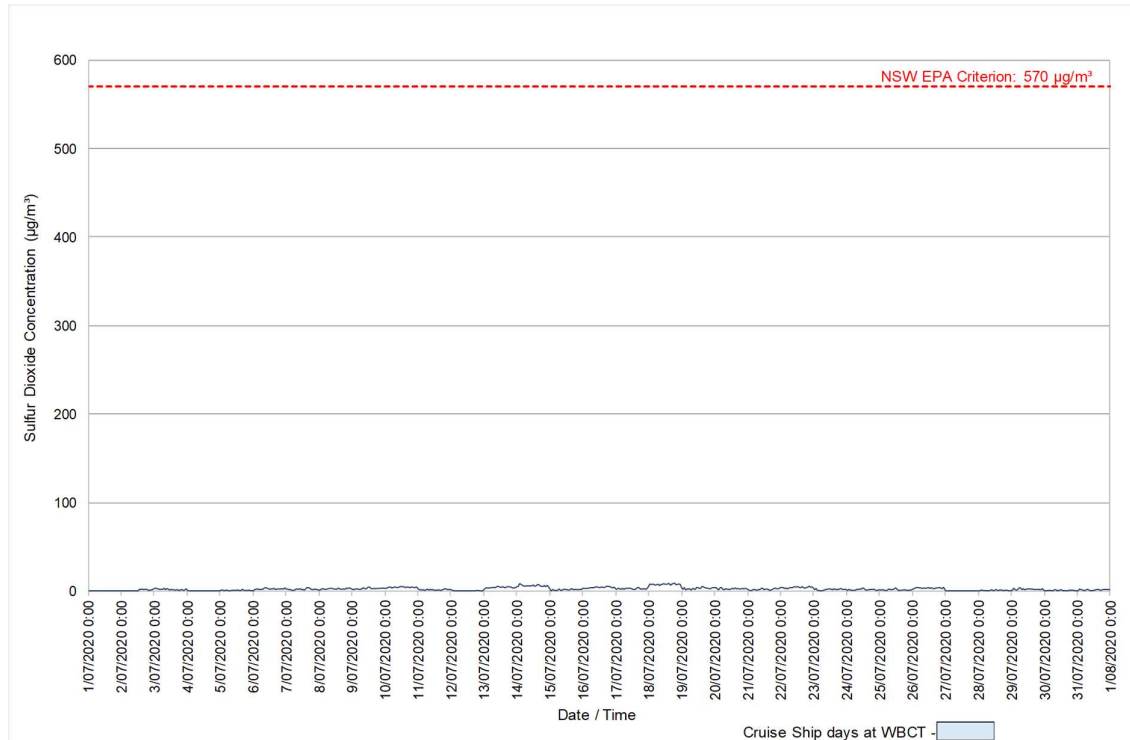


Note: Blue shading indicates cruise ship days, not arrival and departure times. Arrival and departure times are provided in Table 2.1.

Figure 2-1: 10-minute average SO₂ concentrations

2.3 1-hour Average Sulfur Dioxide Concentrations

A time series plot of the 1-hour average SO₂ concentration for July is shown in Figure 2-2. No exceedances of the 1-hour air quality criterion for SO₂ were recorded during the reporting period. The highest 1-hour average SO₂ concentration (9 µg/m³) was recorded on 18 July at 19 pm. This concentration is approximately 2% of the NSW EPA criterion.



Note: Blue shading indicates cruise ship days, not arrival and departure times. Arrival and departure times are provided in Table 2.1.

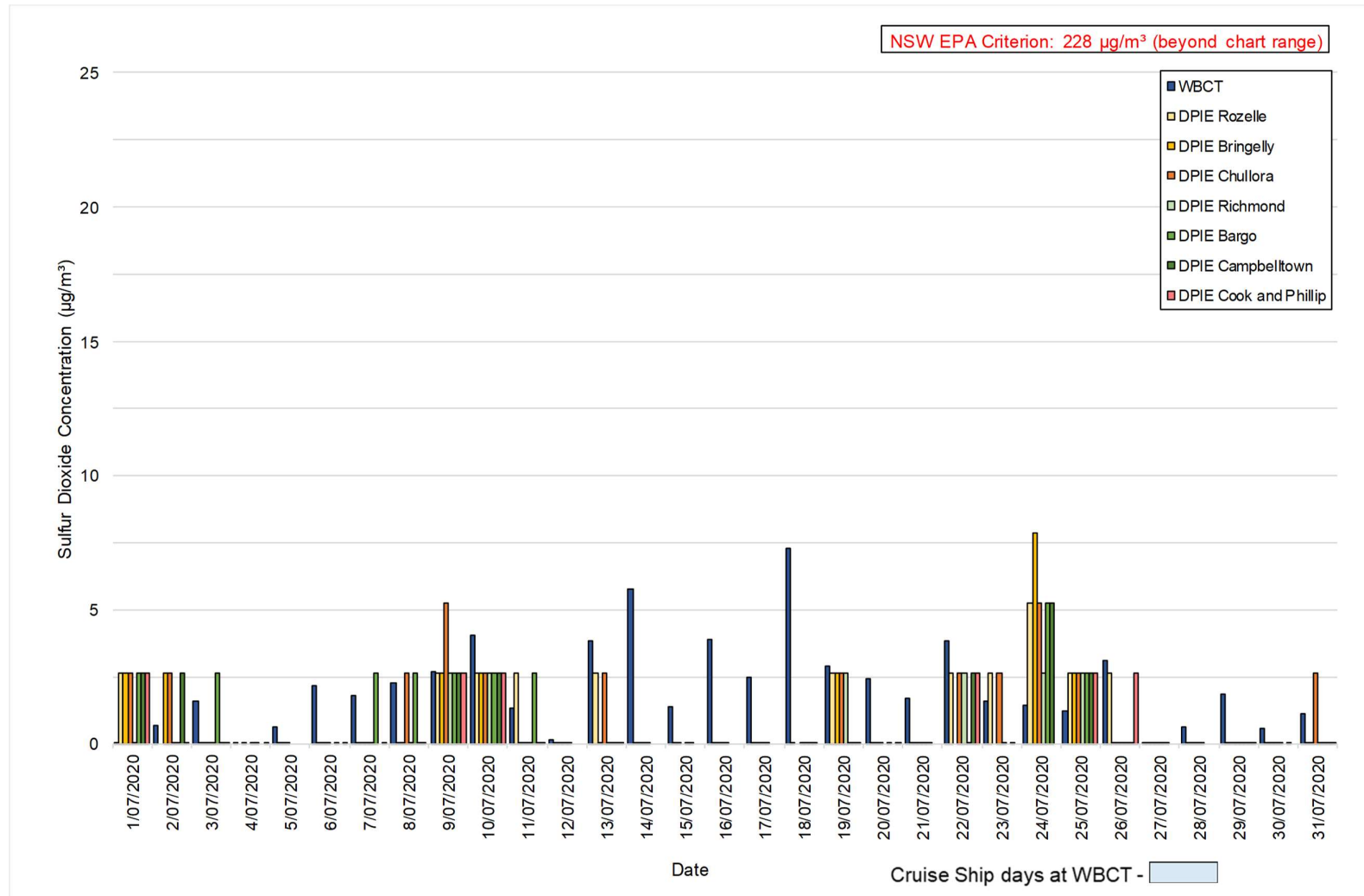
Figure 2-2: 1-hour average SO₂ concentrations

2.4 24-hour Average Sulfur Dioxide Concentrations

Time-series plots of 24-hour average SO₂ concentrations at WBCT and selected NSW DPIE urban background sites in Sydney are shown in Figure 2-3.

The selected DPIE monitoring sites that measure SO₂ include Rozelle, Bringelly, Chullora, Richmond, Bargo, Campbelltown and Cook and Phillip Park (Sydney CBD). 24-hour average SO₂ concentrations measured at White Bay are within the EPA criterion and are shown against those measured by DPIE stations in the region.

The highest 24-hour average SO₂ concentration (7 µg/m³) was recorded on 18 July, and is suspected to be an artefact of the daily automated sensor background check that is conducted by the instrument.

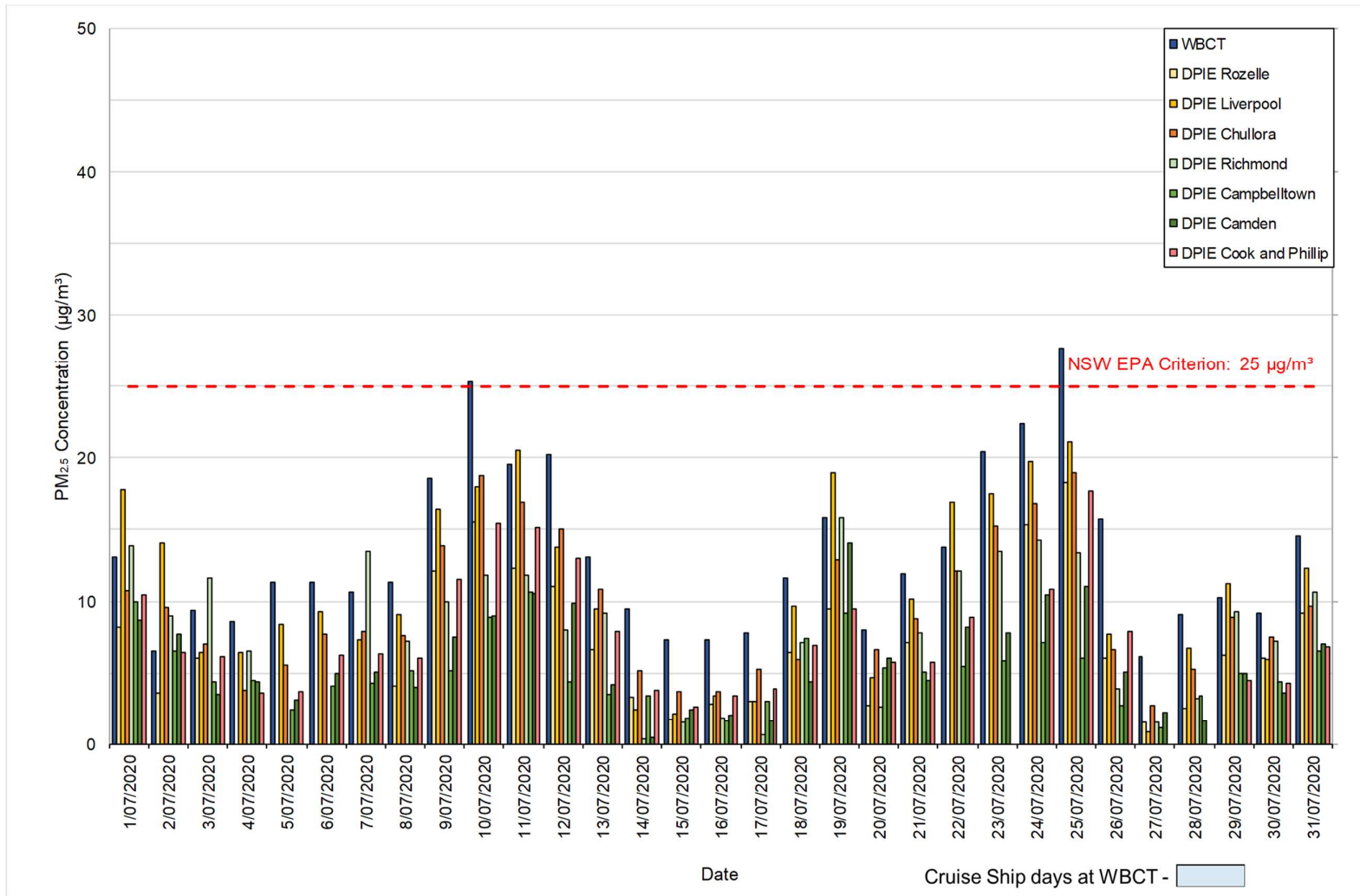


Note: Blue shading indicates cruise ship days, not arrival and departure times. Arrival and departure times are provided in Table 2.1. Zero data are graphed with a minor accentuation for visual purposes.

Figure 2-3: 24-hour average SO₂ concentrations at WBCT and DPIE monitoring sites

2.5 24-hour Average PM_{2.5} Concentrations

Time-series plots of 24-hour average PM_{2.5} concentrations at WBCT and selected DPIE monitoring sites are shown in Figure 2-4. Of the DPIE sites in Sydney, PM_{2.5} is measured at a range of locations, including Rozelle, Liverpool, Chullora, Richmond, Campbelltown, Camden and Cook and Phillip.



Note: Blue shading indicates cruise ship days, not arrival and departure times. Arrival and departure times are provided in Table 2.1.

Figure 2-4: 24-hour average PM_{2.5} concentration at WBCT and DPIE monitoring sites

Figure 2-5 presents a polar bivariate of the 1-hour average $PM_{2.5}$ records from WBCT. This plot shows $PM_{2.5}$ as a function of wind speed and wind direction, with highest concentrations shown to be present during low wind speeds to the north of the monitoring station.

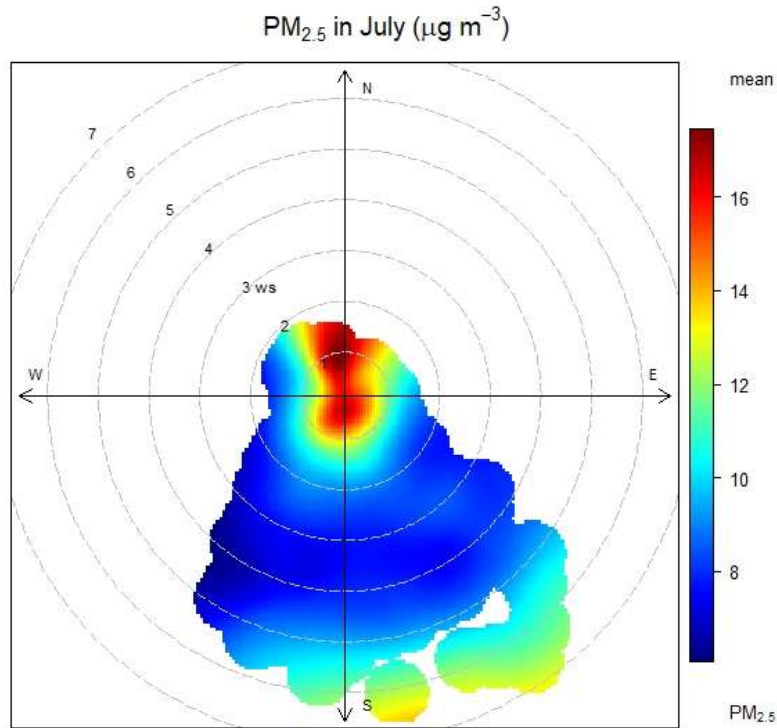


Figure 2-5: Polar bivariate plot for 1-hour average $PM_{2.5}$ concentrations as a function of wind speed (in m/s) and direction

There were two recorded exceedances of the NSW EPA 24-hour $PM_{2.5}$ criterion ($25 \mu\text{g}/\text{m}^3$) at WBCT in the month of July. These exceedances occurred on the following days:

- 10th July 2020 ($25.3 \mu\text{g}/\text{m}^3$)
- 25th July 2020 ($27.7 \mu\text{g}/\text{m}^3$).

Exceedances were not reported at the nearby DPIE Rozelle monitoring station during this time, however as shown in Figure 2-4, noting the consistency of differences against DPIE stations, these data may be carrying an offset bias, sd associated with seasonal fluctuations in the beta attenuation monitor background factor. Given the absence of WBCT shipping sources during the month of July, these exceedances are not considered to be associated with operation of the WBCT, and have not been investigated further.

2.6 Summary Statistics

Summary statistics for the SO₂ and PM_{2.5} concentrations at WBCT are shown in Table 2-1.

Table 2-1: Summary statistics for SO₂ and PM_{2.5} concentrations at WBCT (µg/m³)

Pollutant:	SO ₂			PM _{2.5}
Averaging period:	10 minute	1 hour	24 hour	24 hour
Criterion:	712	570	228	25
Mean	2	2	2	13
Median	2	2	2	11
Standard deviation	2	2	2	6
Sample variance	3	3	3	31
Range	9	9	7	22
Minimum	0	0	0	6
Maximum	9	9	7	28
Maximum (cruise ship day)	N/A	N/A	N/A	N/A

Note: N/A – Not Applicable due to the absence of cruise ships during the month of July.

3. METEOROLOGICAL DATA

A wind rose showing the frequency of counts by wind direction for the reporting period is shown in Figure 3-1. Guidance on the interpretation of wind roses is provided in the monthly reports prior to March 2018.

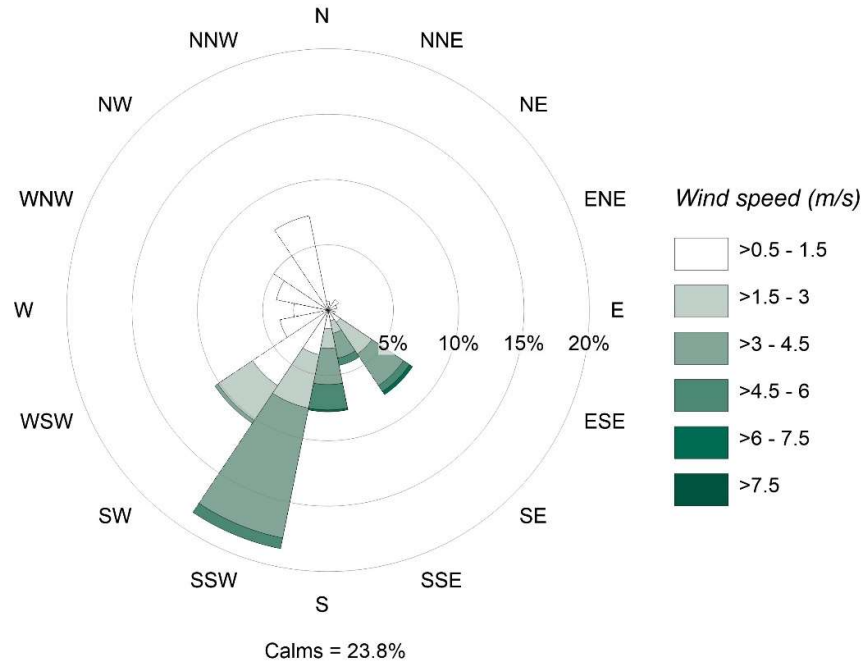


Figure 3-1: Wind rose for the reporting period

4. DATA AVAILABILITY

Data availability for SO₂ and PM_{2.5} during the reporting period, based on the 5-minute average values, is shown in Table 4-1. An output summary and data distribution for 5-minute values of wind speed (m/s), wind direction, SO₂ (µg/m³) and PM_{2.5} (µg/m³) concentrations are shown in Figure 4-1. Blue bars below each parameter represent captured data and the red bars represent missing data.

Table 4-1: Data availability and summary statistics for SO₂ and PM_{2.5}

Statistic	SO ₂ (5-minute)	PM _{2.5} (1-hour)
Possible values	8,556	744
Missing values	416	27
Availability (%)	95.3	99.7
95 th percentile (µg/m ³)	5.8	31

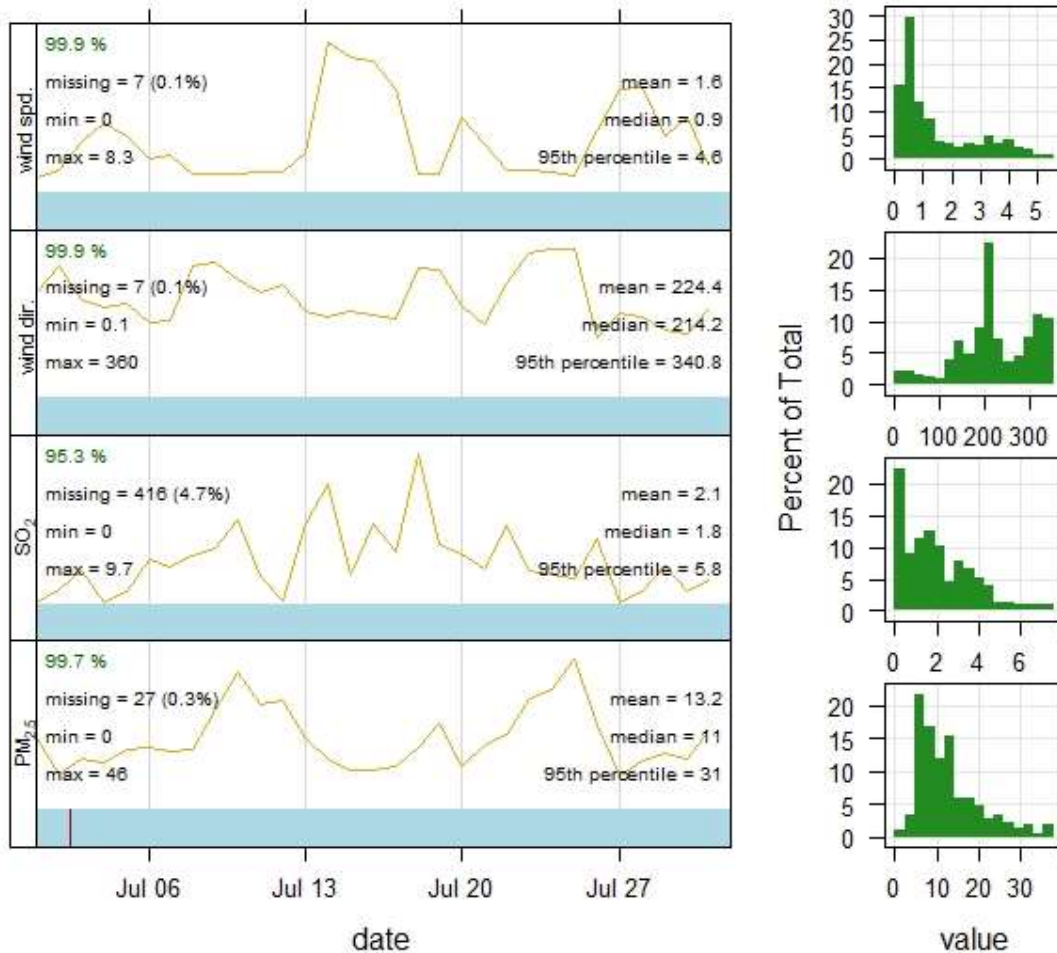


Figure 4-1: Output summary and data distribution

5. REFERENCES

NSW Environmental Protection Authority (EPA). 2017. The Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales, New South Wales Environment Protection Authority, January 2017.