![ACOEM logo]

North Queensland Bulk Ports Corporation Mky

Southern and Northern Stations

Ambient Air Quality Monitoring

Validated Report

1st June – 30th June 2022

Report No.: DAT18616

Report issue date: 28th July 2022

Maintenance contract: MC950

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Revision History			
Revision	**Report ID**	**Date**	**Analyst**
0	DAT18616	28/07/2022	Anand Shrivastava

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Executive Summary

North Queensland Bulk Ports Corporation has commissioned Acoem Australasia to conduct air quality monitoring for the Mackay Dust Monitoring Program. The monitoring stations at Southern and Northern sites are each equipped with an E-Sampler. Both E-samplers were equipped to measure TSP until 12th June 2020 when the E-Sampler heads at both stations were changed to measuring PM_{10}.

The air quality stations were commissioned in July 2016.

This report presents the data collected from the Southern and Northern stations during the month of June 2022.

Data capture for Northern station was 100.0% and Southern station was 100.0% for June 2022.

The PM_{10} monthly average for Southern station was 9 μg/m^3 with a standard deviation of 7 μg/m^3.

The PM_{10} monthly average for Northern station was 14 μg/m^3 with a standard deviation of 11 μg/m^3.

1.0   Introduction

Acoem Australasia was commissioned by North Queensland Bulk Ports Corporation to provide monitoring and data reporting for the Mackay Dust Monitoring Program at Southern and Northern monitoring stations, located in Mackay Harbour, QLD, Australia as detailed in Table 1.

Acoem Australasia commenced data collection from both stations on 20th July 2016.

This report presents the data for the 1st – 30th June 2022

The data presented in this report:

- Describes air quality measurements;

- Compares monitoring results;

- Has been quality assured.

2.0   Monitoring and Data Collection

2.1.   Siting Details

Station locations and siting details are described below.

Table 1: Southern and Northern Stations Siting

Site Name	Geographical Coordinates	Height Above Sea Level (m)
Northern	21° 06' 4.18" S 149°13'26.10" E	5m
Southern	21° 06' 22.3" S 149°13'28.4'' E	5m

Figure 1: Southern and Northern Monitoring Stations Location

2.2.   Monitored Parameters

Table 2 below details the parameters monitored and the instruments used at the Southern and Northern stations. Appendix 1 defines any abbreviated parameter names used throughout the report.

Table 2: Parameters Measured at the Southern and Northern Monitoring Stations

Parameter Measured	Instrument and Measurement Technique
PM_{10}	Met One E-Sampler – light scatter aerosol monitor

2.3.   Data Collection Methods

Table 3 shows the methods used for data collection.

Table 3: Methods

Parameter Measured	Data Collection Methods Used	Description of Method
PM_{10} (E-Sampler)	Met One E-Sampler Operation Manual	Met One E-Sampler Operation Manual

2.3.1. Data Acquisition

Data is logged by the E-sampler at each monitoring site. Each E-sampler is equipped with a 4G modem for remote data collection. The recorded data is remotely collected from the E-samplers on a daily basis (using Airodis™ version 5.2.1) and stored at Acoem Australasia's Environmental Reporting Services (ERS) department in Melbourne, Australia. Data samples are logged in 5-minute intervals.

2.4.   Data Validation and Reporting

2.4.1. Validation

The Acoem Australasia ERS department performs daily data checks to ensure maximum data capture rates are maintained. Any equipment failures are communicated to the responsible field engineers for urgent rectification. Acoem Australasia ERS maintains two distinct databases containing non-validated and validated data respectively.

The validated database is created by duplicating the non-validated database and then flagging data affected by instrument faults, calibrations and other maintenance activities. The data validation software requires the analyst to supply a valid reason (e.g., backed by maintenance notes, calibration sheets etc) in the database for flagging any data as invalid.

Validation is performed by the Acoem Australasia ERS operator, and the validation is reviewed. All data is checked and graphs and reports are generated based on the verified five-minute data.

2.4.2. Reporting

The reported data is in a Microsoft Excel format file named *"NQBP Mky Southern and Northern Stations Data Report June 2022.xlsx"*.

The Excel file consists of six worksheets:

1. Cover
2. 5 Minute Data Averages
3. 15 Minute Data Averages
4. 1 Hour Data Averages
5. 24 Hour Data Averages
6. Valid Data Exception Tables

The data contained in these reports is based on Australian Eastern Standard Time. Data is for all parameters measured continuously.

 All averages are calculated from the five-minute data. Averages are based on a minimum of 75% valid readings within the averaging period. Averaging periods of eight hours or less are reported for the end of the period, i.e., the hourly average 02:00am is for the data collected from 1:00am to 2:00am. One-hour averages are calculated based on a clock hour. One day and one-year averages are calculated based on calendar days.

2.5. Calibrations and Maintenance

2.5.1. Units and Uncertainties

The uncertainties for each parameter have been determined by the manufacturer's tolerance limits of the equipment's parameters, and by the data collection standard method.

The reported uncertainties are expanded uncertainties, calculated using coverage factors which give a level of confidence of approximately 95%.

Table 4: Units and Uncertainties

Parameter	Units	Resolution	Uncertainty[1]	Measurement Range
PM$_{10}$ (E-Sampler)	µg/m^3	1 µg/m^3	± 10% to gravimetric method[2]	0 to 65 mg/m³

2.5.2. Maintenance

Scheduled maintenance is completed every 2 months by Acoem Australasia.

2.5.2.1. Calibration & Maintenance Summary Tables

The last calibrations for the following parameters were performed on the indicated dates. Data supplied after this time is subject to verification, to be performed at the next calibration cycle.

Note: Maintenance and calibration dates may differ, as calibrations may be less frequent than scheduled maintenance visits.

Table 5 indicates when the particulate equipment was last maintained/calibrated.

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[1] Uncertainties are calculated based on the full measurement range unless stated otherwise

[2] Manufacturer's stated accuracy for nephelometer when calibrated for local particulate type.

Table 5: Southern and Northern Stations Maintenance Table June 2022

Station	Parameter	Date of Last Maintenance	Maintenance Type	Date of Last Calibration
Southern	PM_{10}	01/06/2022	3-monthly	01/06/2022
Northern	PM_{10}	01/06/2022	3-monthly	01/06/2022

3.0   Results

3.1.   Data Capture

Data capture is calculated from 5-minute data, and refers to the amount of available data collected during the report period.

The percentage of data captured is calculated using the following equation:

Data capture = (Reported air quality data / Total data) x 100%

Where:

- Reported air quality data = Number of instrument readings which have been verified through a quality assured process and excludes all data errors, zero data collection due to calibration, failures and planned and unplanned maintenance.

- Total data = Total number of samples (instrument readings) expected for the sampling period. Total data is calculated based on the same averaging period as "reported air quality data" and the duration of the corresponding report period. e.g., for 5-minute data collected over a month of 31 days, the total data would be equal to 12 (5-minute samples in an hour) x 24 (hours in a day) x 31 (days in a month) = 8928 samples.

Table 6 below displays data capture statistics for June 2022. **Bold** values in the table indicate data capture below 95%.

Table 6: Monthly Data Capture for Southern and Northern stations for June 2022

Station	Parameter	Data Capture (%)
Southern	PM_{10}	100.0
Northern	PM_{10}	100.0

3.2.   Air Quality Summary

Table 7 below presents some statistical parameters for June 2022. The standard deviation is calculated based on the 5-minute averaged data.

Table 7: General statistics for June 2022

Station	Parameter	Time Period	Average ($\mu g/m^3$)	Standard Deviation ($\mu g/m^3$)
Southern	PM_{10}	1 month	9	7
Northern	PM_{10}	1 month	14	11

3.2.1. Air Quality Categories

Air quality categories rather than an air quality index have been adopted to align with a Nationally consistent method of reporting of air quality data.

Each air quality measurement from a monitoring station is assigned an air quality category rating based on comparison of the measurement value against the relevant air quality guideline. Five colour-coded air quality categories are used, being 'Good' (green), 'Fair' (yellow), 'Poor' (orange), 'Very Poor' (red) or 'Extremely Poor' (dark red). Values greater than the air quality guideline will be appear as 'Poor', 'Very Poor' or 'Extremely Poor'.[4]

The Air Quality Categories rating is based on 1-hour averages values.

Table 8: Colour-coded Categories for Air Quality Categories

Not available	Good	Fair	Poor	Very poor	Extremely poor
	<50	50-100	100.1-200	200.1-600	>600

The PM_{10} 1-hour average values for the reporting month at the Northern and Southern stations were assessed against the air quality category rating, and the pie chart on the next pages presents the percentage of the time for which a specific air quality category was identified.
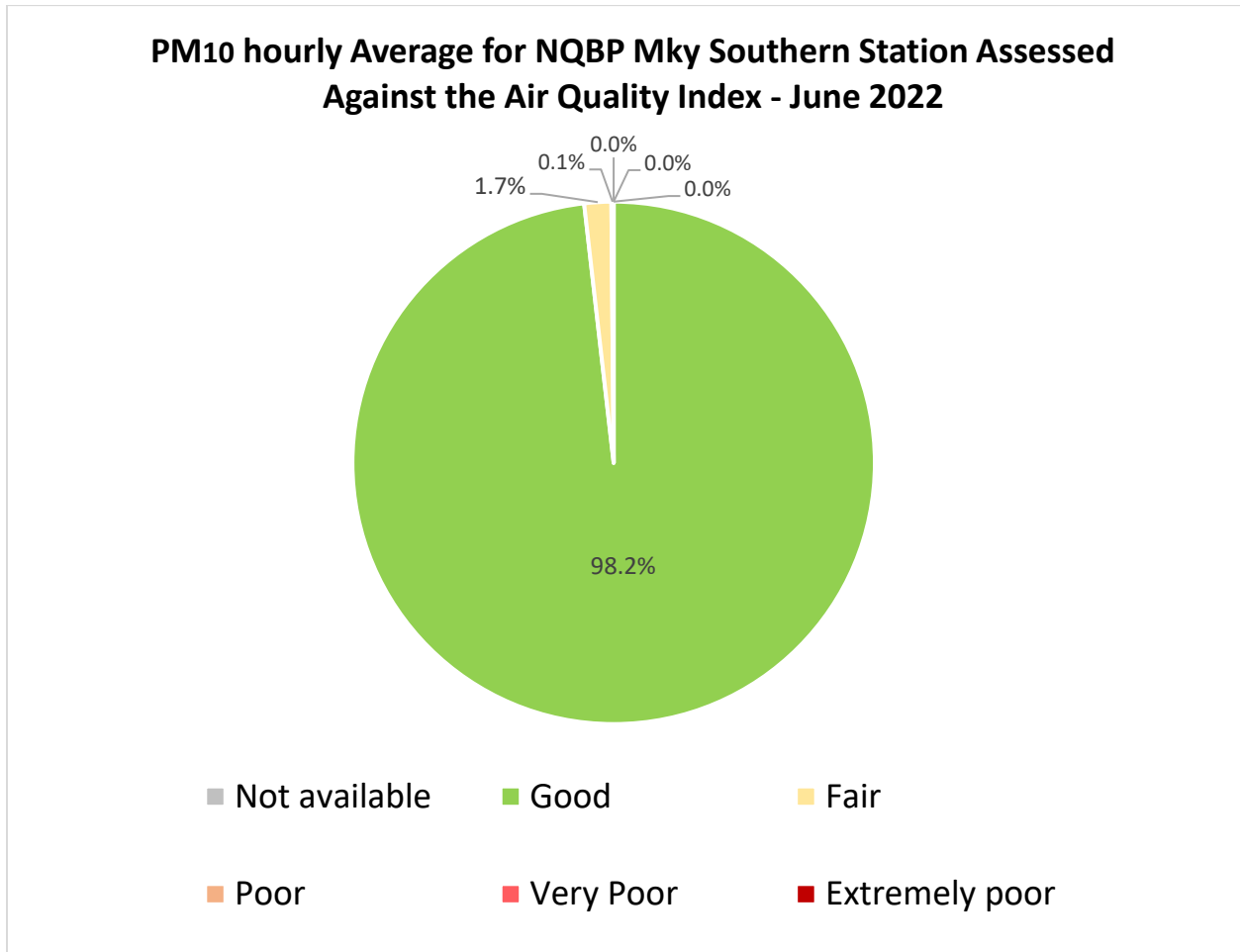
Figure 2: Hourly PM$_{10}$ Averages for NQBP Mky Southern Station Assessed Against the Air Quality Category

98.2% of time during the reporting period presented by the Air Quality Category are classified as Good, 1.7% of time are classified as Fair, 0.1% of time are classified as Poor, 0.0% of time are classified as Very Poor, Extremely Poor and Not available.

North Queensland Bulk Ports Corporation

PM10 hourly Average for NQBP Mky Northern Station Assessed Against the Air Quality Index - June 2022

- Not available
- Good
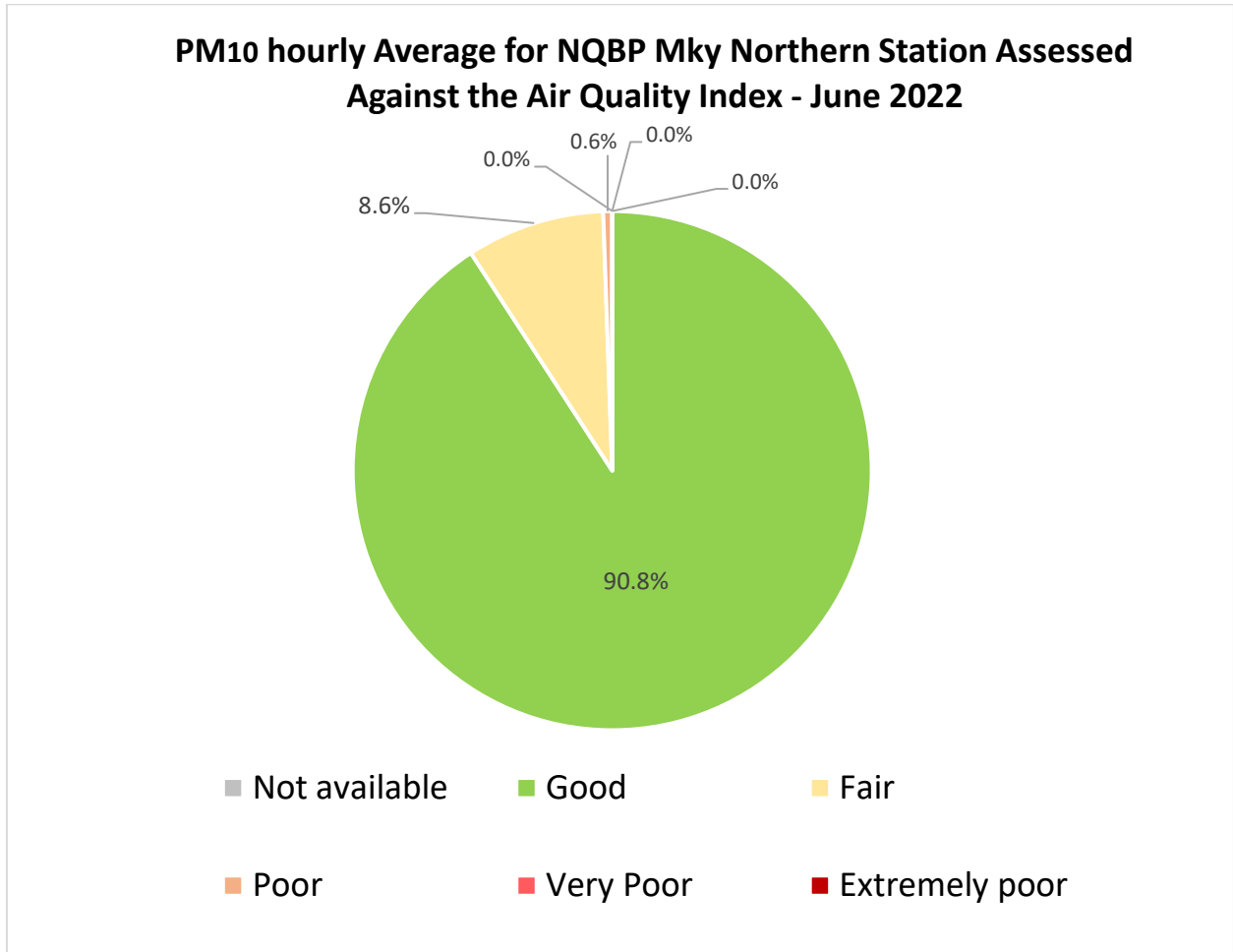- Fair
- Poor
- Very Poor
- Extremely poor

Figure 3: Hourly PM$_{10}$ averages for NQBP Mky Northern Station Assessed Against the Air Quality Category

90.8% of time during the reporting period presented by the Air Quality Category are classified as Good, 8.6% of time are classified as Fair, 0.6% of time are classified as Poor, 0.0% of time are classified as Very Poor, Extremely Poor and Not available.

3.3.   Tabulated Data

Table 9 details the daily averages for PM_{10} measured at Southern and Northern stations during June 2022.

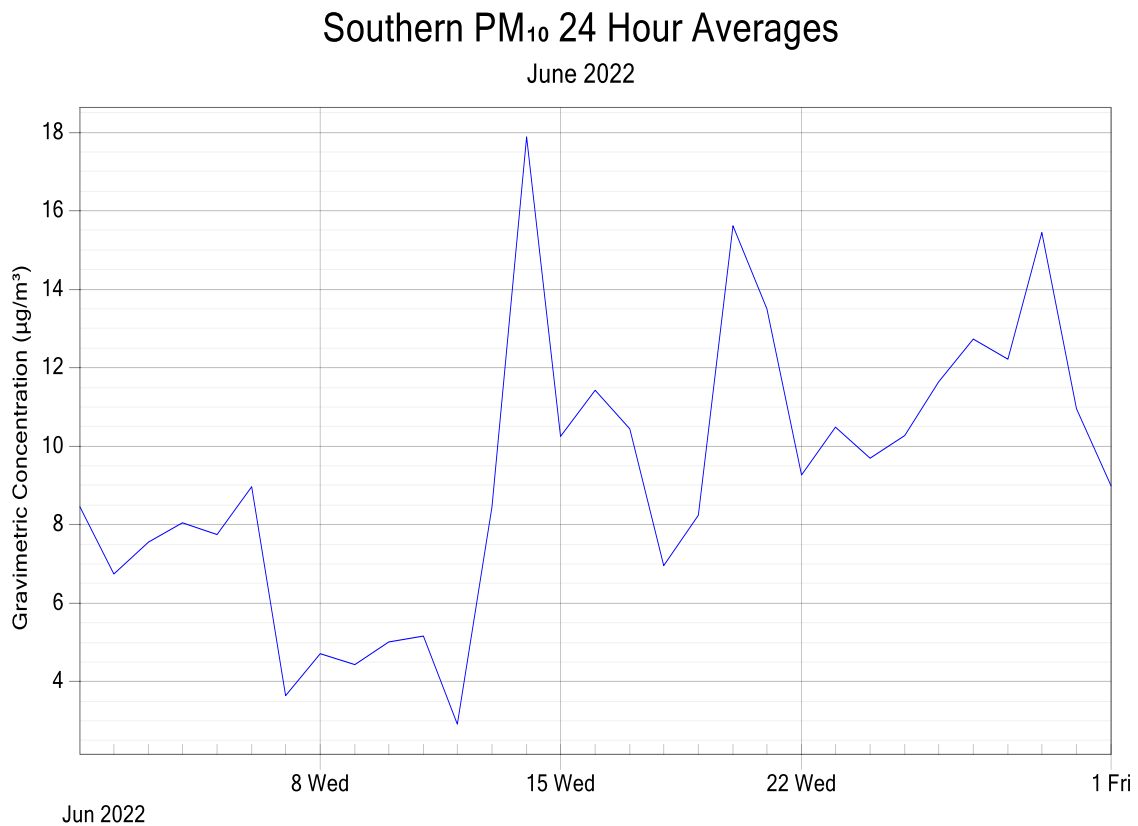**Table 9: Southern and Northern Stations Data Table June 2022**

| Date	Southern (µg/m³)	Northern (µg/m³)
1-06-2022	8	11
2-06-2022	7	8
3-06-2022	8	11
4-06-2022	8	12
5-06-2022	8	11
6-06-2022	9	11
7-06-2022	4	5
8-06-2022	5	8
9-06-2022	4	7
10-06-2022	5	7
11-06-2022	5	7
12-06-2022	3	4
13-06-2022	8	8
14-06-2022	18	24
15-06-2022	10	16
16-06-2022	11	16
17-06-2022	10	13
18-06-2022	7	10
19-06-2022	8	12
20-06-2022	16	23
21-06-2022	13	23
22-06-2022	9	22
23-06-2022	10	23
24-06-2022	10	17
25-06-2022	10	16
26-06-2022	12	17
27-06-2022	13	16
28-06-2022	12	20
29-06-2022	15	23
30-06-2022	11	16

3.4.   Graphic Representations

Validated PM_{10} data was used to construct the following monthly graphic representations.

Figure 4: Southern station PM_{10} 24 Hour Averages June 2022

Northern PM$_{10}$ 24 Hour Averages
June 2022
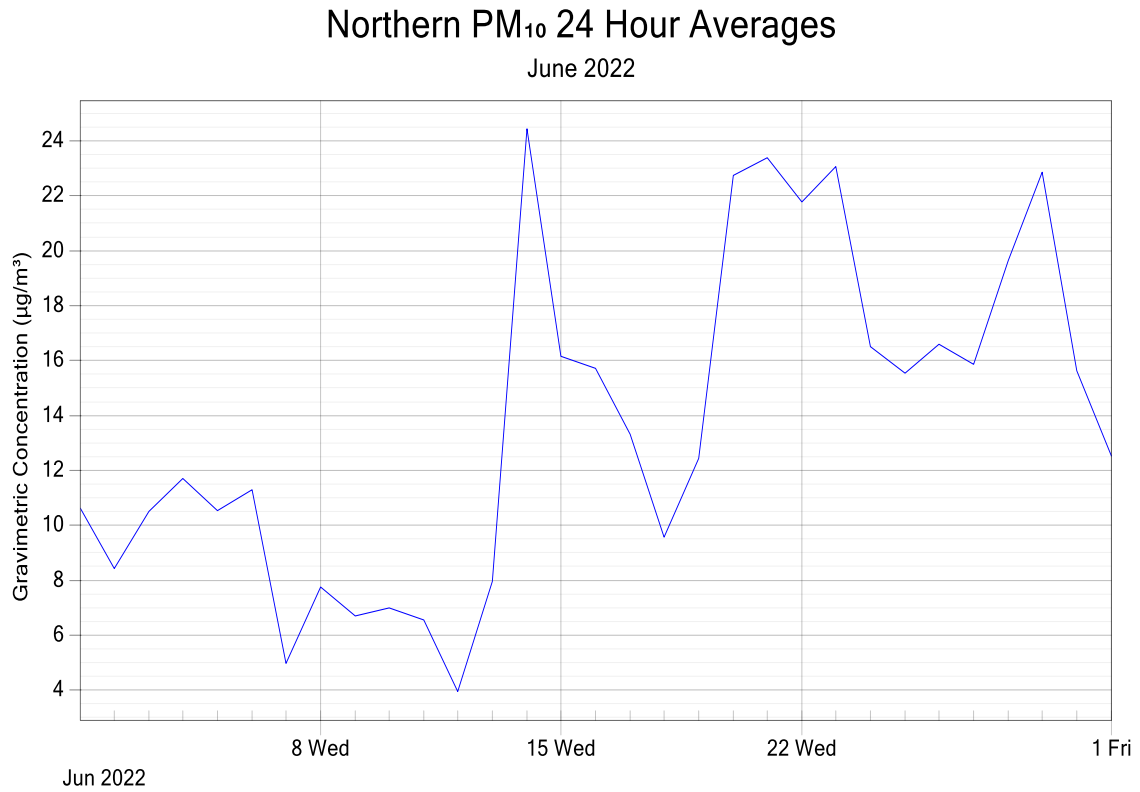
Figure 5: Northern station PM$_{10}$ 24 Hour Averages June 2022
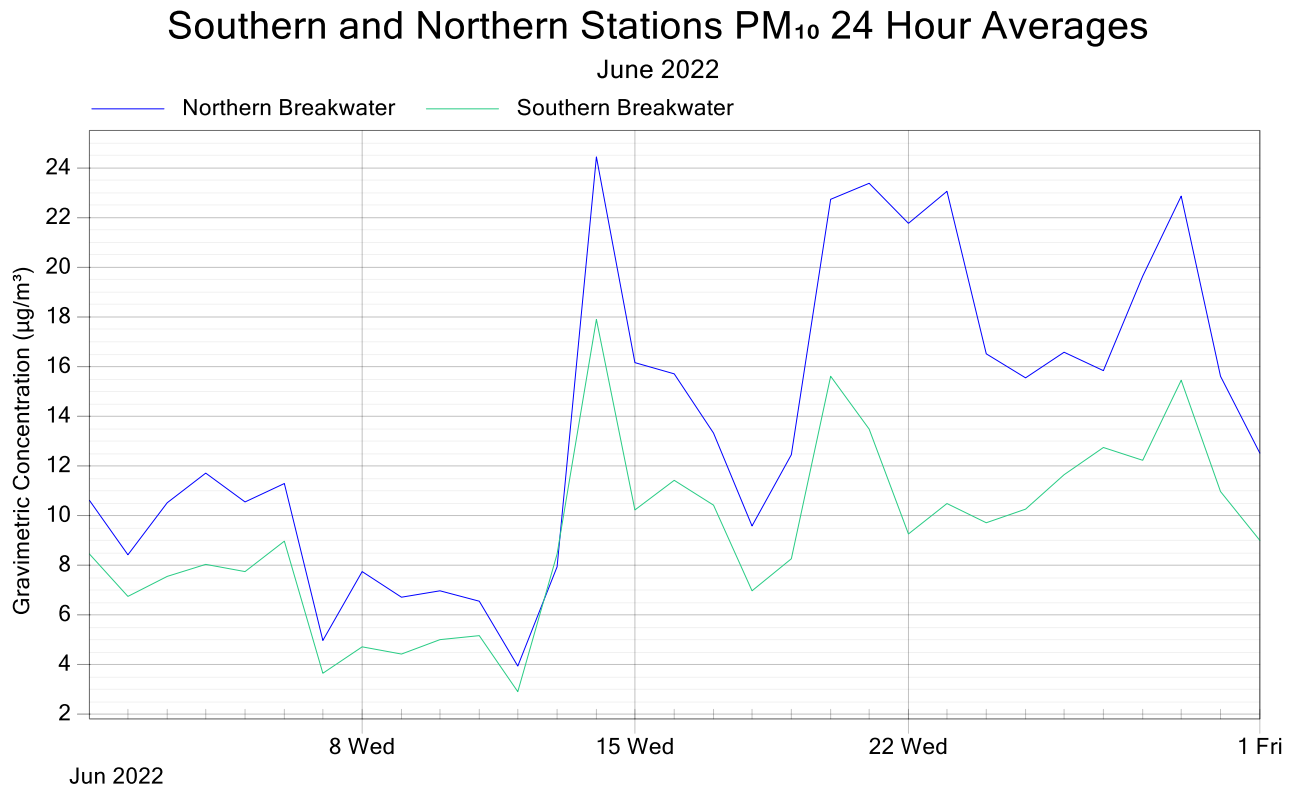
Figure 6: Southern and Northern Stations PM$_{10}$ 24 Hour Averages Comparison June 2022

4.0   Valid Data Exception Tables

The tables below detail all changes made to the raw data set during the validation process. An explanation of reasons given in the table can be found in Appendix 2.

Table 10: Southern Station PM$_{10}$ Valid Data Exception Table

Start Date	End Date	Reason	Change Details	User Name	Change Date
01-06-22 07:30	01-06-22 07:40	3-monthly maintenance - new inlet head installed	PM$_{10}$	AS	28-07-22

Table 11: Northern Station PM$_{10}$ Valid Data Exception Table

Start Date	End Date	Reason	Change Details	User Name	Change Date
01-06-22 07:00	01-06-22 07:10	3-monthly maintenance - new inlet head installed	PM$_{10}$	AS	28-07-22

5.0   Report Summary

- Data capture for Northern station was 100.0% and Southern station was 100.0% for June 2022.

- The PM_{10} monthly average for Southern station was 9 µg/m^3 with a standard deviation of 7 µg/m^3.

- The PM_{10} monthly average for Northern station was 14 µg/m^3 with a standard deviation of 11 µg/m^3.

---END OF REPORT---

Appendix 1 - Definitions & Abbreviations

$\mu g/m^3$	Micrograms per cubic metre at standard temperature and pressure (0°C and 101.3 kPa)
PM_{10}	Particulates less than 10 microns equivalent in aerodynamic diameter

Appendix 2 - Explanation of Exception Table

Commissioning refers to the initial setup and calibration of the instrument when it is first installed. For some instruments there may be a stabilisation period before normal operation commences.

Data transmission error refers to a period of time when the instrument could not transmit data. This may be due to interference, or a problem with the phone line or modem.

Equipment malfunction/instrument fault refers to a period of time when the instrument was not in the normal operating mode and did not measure a representative value of the existing conditions.

Gap in data/data not available refers to a period of time when either data has been lost or could not be collected.

Instrument Alarm refers to an alarm produced by the instrument. A range of alarms can be produced depending on how operation of the instrument is being affected.

Instrument out of service refers to a lack of data due to an instrument being shut down for repair, maintenance, or factory calibration.

Linear offset or multiplier refers to when an offset or multiplier has been applied between two points where the values of the offset or multiplier are different and the correction is interpolated between the two points.

Logger error refers to when an error occurs and instrument readings are not correctly recorded by the logger.

Maintenance refers to a period of time when the logger/instrument was switched off due to maintenance.

Power Interruption refers to no power to the station therefore no data was collected at this time.

Stabilisation following power interruption refers to the startup period of an instrument after power has been restored.