North Queensland Bulk Ports Corporation

McEwens Beach, Mky Northern and Southern Stations

Ambient Air Quality Monitoring

Validated Report

1st November – 30th November 2025

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Revision History			
Revision	**Report ID**	**Date**	**Analyst**
0	DAT23557	24/12/2025	Evelyn Wang

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Executive Summary

North Queensland Bulk Ports Corporation has commissioned Acoem Australasia to conduct air quality monitoring, including McEwens Beach, and port of Mackay (Mky) Dust Monitoring Program at the Northern and Southern stations.

The McEwens Beach monitoring station, commissioned in March 2013, is currently comprised of a Solar BAM 1020 measuring PM_{10} particulates. The Mky Northern and Southern stations, commissioned in July 2016, are equipped with E-Samplers. 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}.

This report presents the data collected from the McEwens Beach, Mky Northern and Southern stations for November 2025.

The PM_{10} monthly data capture rate of PM_{10} at McEwens Beach was 100.0%.

The PM_{10} monthly data capture rate of PM_{10} at Mky Northern was 100.0%.

The PM_{10} monthly data capture rate of PM_{10} at Mky Southern was 100.0%.

The PM_{10} monthly average for McEwens was 14 $\mu g/m^3$ with a standard deviation of 6 $\mu g/m^3$.

The PM_{10} monthly average for Mky Northern station was 16 $\mu g/m^3$ with a standard deviation of 9 $\mu g/m^3$.

The PM_{10} monthly average for Mky Southern station was 13 $\mu g/m^3$ with a standard deviation of 6 $\mu g/m^3$.

1.0 Introduction

Acoem Australasia was commissioned by North Queensland Bulk Ports Corporation to provide monitoring and data reporting for McEwens Beach ambient air quality monitoring station and Mackay Dust Monitoring Program at Northern and Southern stations, located as detailed in Table 1. Acoem Australasia commenced data collection from the McEwens Beach station on the 4th (Solar E-Sampler $PM_{2.5}$) and 5th (Solar BAM PM_{10}) April 2013. The $PM_{2.5}$ E-Sampler was decommissioned on the 3rd September 2020. Data collection from both Mky Northern and Southern stations was commenced on 20th July 2016.

The data presented in this report:

- Describes air quality measurements;
- Compares monitoring results;
- Has been quality assured;
- Conforms to NATA accreditation requirements, where applicable.

2.0 Monitoring and Data Collection

2.1 Siting Details

The NQBP air quality monitoring network consists of 3 ambient air quality monitoring stations. The stations' location and siting details are described below.

Table 1: NQBP Monitoring Site Locations

Site Name	Geographical Coordinates	Height Above Sea Level (m)
McEwens Beach	21° 14' 58.23" S, 149° 12' 23.84" E	6m
Mky Northern	21° 06' 4.18" S 149° 13' 26.10" E	5m
Mky Southern	21° 06' 24.7" S 149° 13' 28.20" E	5m

Siting audits were conducted at McEwens, Mky Northern and Mky Southern on 25th February 2025, 2nd October 2025 and 2nd October 2025, respectively. This is to assess station siting against the guidelines and mandatory requirements of AS/NZS 3580.1.1:2016 "Methods for sampling and analysis of ambient air – guide to siting air monitoring equipment". The siting of these stations does not conform with the guidelines in AS/NZS 3580.1.1:2016. Details are included in Section 2.3.1.

Figure 1: McEwens Beach Monitoring Station Location

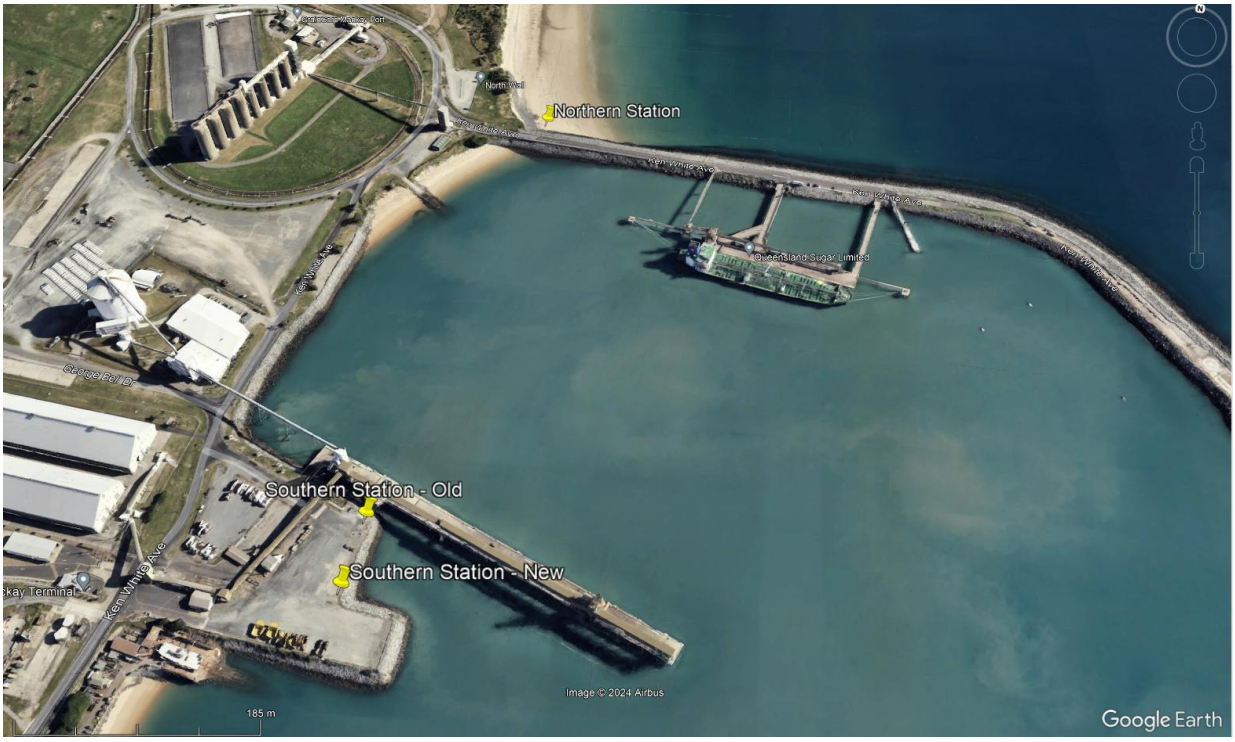

Figure 2: Mky Northern and Southern Monitoring Stations Location

2.2 Monitored Parameters

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

Table 2: Parameters Measured at NQBP Monitoring Stations

Site Name	Parameter Measured	Instrument and Measurement Technique
McEwens Beach	PM_{10}	Met One BAM 1020 – Beta ray attenuation
Mky Northern	PM_{10}	Met One E-Sampler – light scatter aerosol monitor
Mky Southern	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} (BAM 1020)	AS/NZS 3580.9.11:2022	Methods of sampling and analysis of ambient air. Method 9.11: Determination of suspended particulate matter - PM_{10} beta attenuation monitors
PM_{10} (E-Sampler)	Met One E-Sampler Operation Manual	Met One E-Sampler Operation Manual

2.3.1 Conformance with Standards

Unless stated below, parameters are monitored at NQBP stations according to the methods detailed in Table 3 above.

- The Met One E-Sampler particulate monitor used at Mky Northern and Southern is classified as a non-compliant instrument under the relevant Australian Standards (e.g. AS/NZS 3580 series) for regulatory particle monitoring.
- The siting of McEwens Beach station does no conform with all the recommendations of the guidelines AS/NZS 3580.1.1:2016 due to trees and/or buildings in the area that may restrict the airflow in the vicinity of the sample inlet or alter the pollutant concentrations via adsorption or absorption.
- The siting of Mky Northern station does not conform with the guidelines in AS/NZS 3580.1.1:2016 due to it being located 2 meters away from a fence and road located less than 5m south of E-Sampler.
- The siting of Mky Southern station does not conform with the guidelines in AS/NZS 3580.1.1:2016 due to Port Road being located 6 meters west of the monitor, although traffic volume is very low as the site is within a secure port facility.

2.3.2 Data Acquisition

At McEwens Beach station, data acquisition is conducted using a Met One BAM 1020 instrument. At Mackay Northern and Southern stations, E-Samplers are used for data acquisition. Each instrument is equipped with a 4G modem to enable remote data collection. The recorded data are collected daily via Airodis™ version 5.2.4 and stored at Acoem Australasia's Environmental Reporting Services (ERS) department in Melbourne, Australia.

- **BAM 1020:** Data are logged in hourly intervals.
- **E-Samplers:** Data are logged in 5-minute intervals.

Unless otherwise specified, raw data are retained for a minimum of four years.

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 hourly data for BAM 1020 and the verified five-minute data for E-Samplers.

2.4.2 Reporting

The reported data is in a Microsoft Excel format file named *"NQBP Monthly Data Report November 2025.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.

For BAM 1020, all averages are calculated form hourly data, while for E-Samplers, 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.

3.0 Target Maximum Exceedance

The air quality goals for pollutants monitored at McEwens Beach Station monitoring network site are based on the Australian National Environmental Council (NEPC) Ambient Air Quality NEPM. The target maximum exceedance is shown in Table 4 below.

Table 4: Target Maximum Exceedance at McEwens Beach Station

Parameter	Time Period	Exceedance Level	Units	Maximum Allowable Exceedance*
PM_{10}	1 day	50	$\mu g/m^3$	None
PM_{10}	1 year	25	$\mu g/m^3$	None

*Maximum allowable exceedance is a target. The site is not under operational control or formal compliance limits.

Note:

Exceptional events are excluded from this standard. As per the Ambient Air Quality NEPM, **Exceptional event** means a fire or dust occurrence that adversely affects air quality at a particular location, and causes an exceedance of 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.

Acoem Australasia will include any valid data identified as being associated with an exceptional event in all report tables and graphic representations. However, 1-day averages associated with exceptional events will not be counted as exceedance of the Air Quality standard.

The measurement uncertainty (as outlined in Table 5) is not considered when assessing exceedance of the air quality goals. Exceedance are only reported for above goal values based on the decimal places reported.

4.0 Calibrations and Maintenance

4.1 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. [2]

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

Table 5: Units and Uncertainties

Parameter	Units	Resolution	Uncertainty[1]	Measurement Range
PM_{10} (BAM 1020)	$\mu g/m^3$	1 $\mu g/m^3$	24Hr: ± (5.5 % of reading + 4.0 $\mu g/m^3$) (in range 0 - 100 $\mu g/m^3$) Hr: ± (8 % of reading + 8.0 $\mu g/m^3$) k factor of 2.0	0 to 1000 $\mu g/m^3$ LDL_{24hr}= 1.0$\mu g/m^3$ LDL_{hr}= 4.8$\mu g/m^3$
PM_{10} (E-Sampler)	$\mu g/m^3$	1 $\mu g/m^3$	± 10% to gravimetric method[2]	0 to 65 mg/m^3

[1] Uncertainties may not be calculated based on the full measurement range.

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

4.2 Maintenance

4.2.1 Maintenance Notes

4.2.1.1 McEwens Beach station

- There was no scheduled maintenance performed in November 2025.

4.2.1.2 Mky Northern station

- There was no scheduled maintenance performed in November 2025.

4.2.1.3 Mky Southern station

- There was no scheduled maintenance performed in November 2025.

4.2.2 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 6 to Table 8 indicate when the particulate equipment was last maintained /calibrated.

“Calibration cycle” refers to the frequency of calibrations and intermediate calibration checks. The most frequent check or calibration is listed here.

Table 6: McEwens Beach Maintenance Table

Parameter	Date of Last Maintenance	Maintenance Type	Date of Last Calibration	Calibration Cycle
PM_{10}	02/10/2025	2-Monthly	25/08/2025	Yearly

Table 7: Mky Northern Maintenance Table

Parameter	Date of Last Maintenance	Maintenance Type	Date of Last Calibration	Calibration Cycle
PM_{10}	02/10/2025	2-Monthly	02/10/2025	2-Monthly

Table 8: Mky Southern Maintenance Table

Parameter	Date of Last Maintenance	Maintenance Type	Date of Last Calibration	Calibration Cycle
PM_{10}	02/10/2025	2-Monthly	02/10/2025	2-Monthly

5.0 Results

5.1 Data Capture

Data capture refers to the amount of available data collected during the report period. BAM 1020 data capture at McEwens station is based on 1-hour averages. E-Samplers at Mky Northern and Southern stations are calculated from 5-minute data.

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 9 below displays data capture statistics for November 2025. **Bold** values in the table indicate data capture below 95%.

Table 9: Monthly Data Capture for NQBP stations

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

5.2 Air Quality Summary

Table 10 below presents some statistical parameters for McEwens Beach, Mky Northern and Southern stations. The standard deviation of McEwens Beach is calculated based on the hourly averaged data. The standard deviation of Mky Northern and Southern is calculated based on the 5-minute averaged data.

Table 10: General Statistics

Station	Parameter	Time Period	Average ($\mu g/m^3$)	Standard Deviation ($\mu g/m^3$)
McEwens Beach	PM_{10}	1 month	14	6
Mky Northern	PM_{10}	1 month	16	9
Mky Southern	PM_{10}	1 month	13	6

Table 11 below summarises any exceedance of the air quality goals of McEwens Beach detailed in Table 4.

Table 11: Exceedance Recorded for McEwens Beach Station

Parameter	Time Period	Value of Exceedance ($\mu g/m^3$)	Date of Exceedance
PM_{10}	24 Hour	-	-

5.2.1 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' (Blue), 'Fair' (Green), 'Poor' (Purple), 'Very Poor' (Red) or 'Extremely Poor' (Black). Values greater than the air quality guideline will be appear as 'Poor', 'Very Poor' or 'Extremely Poor'.

The Air Quality Categories rating is based on 1-hour averages values.[3]

Table 12: Colour-coded Categories for Air Quality Categories[4]

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 Mky 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.

[3] https://www.qld.gov.au/environment/management/monitoring/air/air-monitoring/air-quality-categories

[4] Colour scheme and pie chart type has been changed to reflect the website of North Queensland Bulk Ports Corporation.

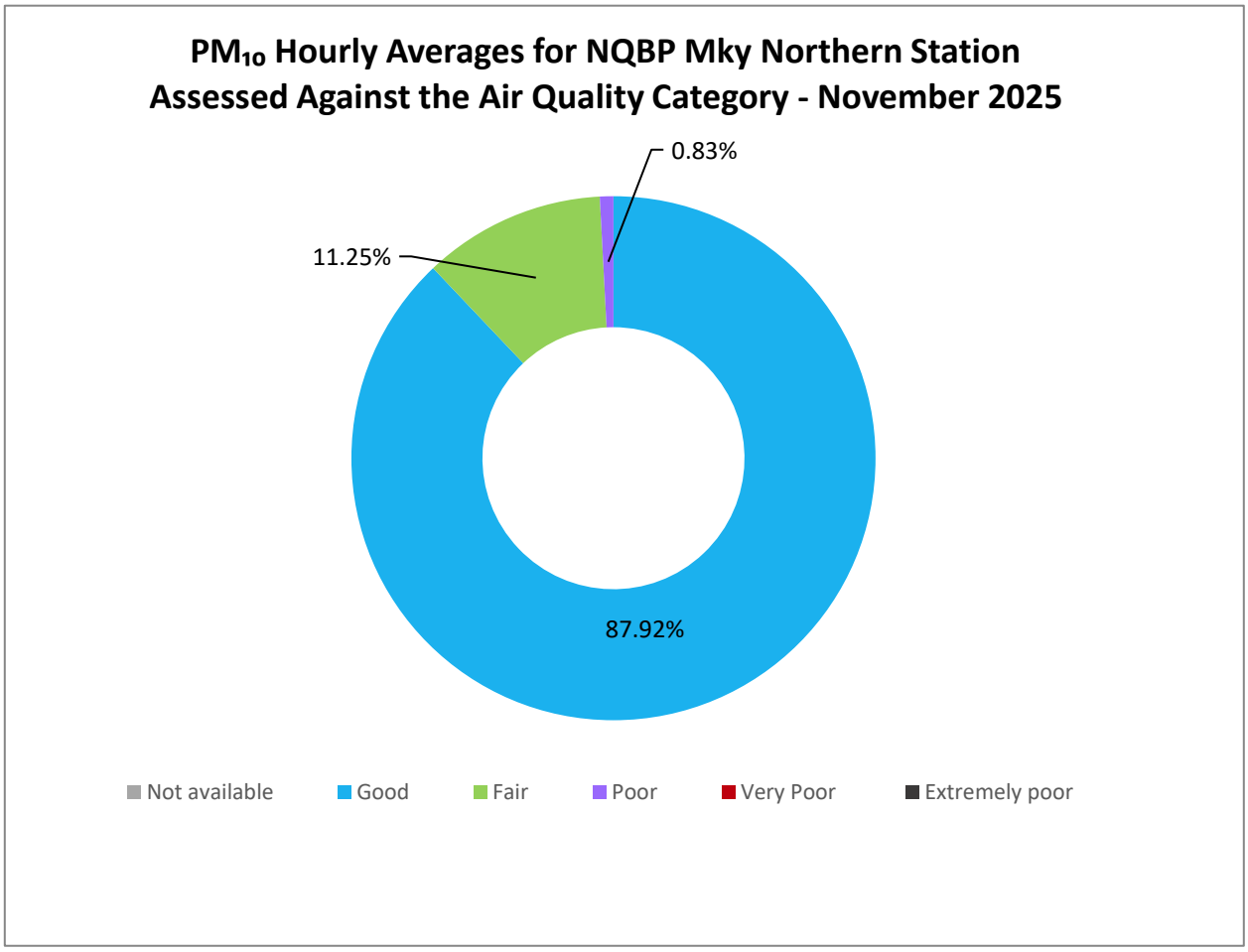

Figure 3: Hourly PM_{10} Averages for NQBP Mky Northern Station Assessed Against the Air Quality Categories

87.92% of days during the reporting period presented by the Air Quality Category are classified as Good, 11.25% days are classified as Fair, 0.00% days are classified as Not available, 0.83% of days are classified as Poor, 0.00% of days are classified as Very Poor and 0.00% are classified as Extremely Poor.

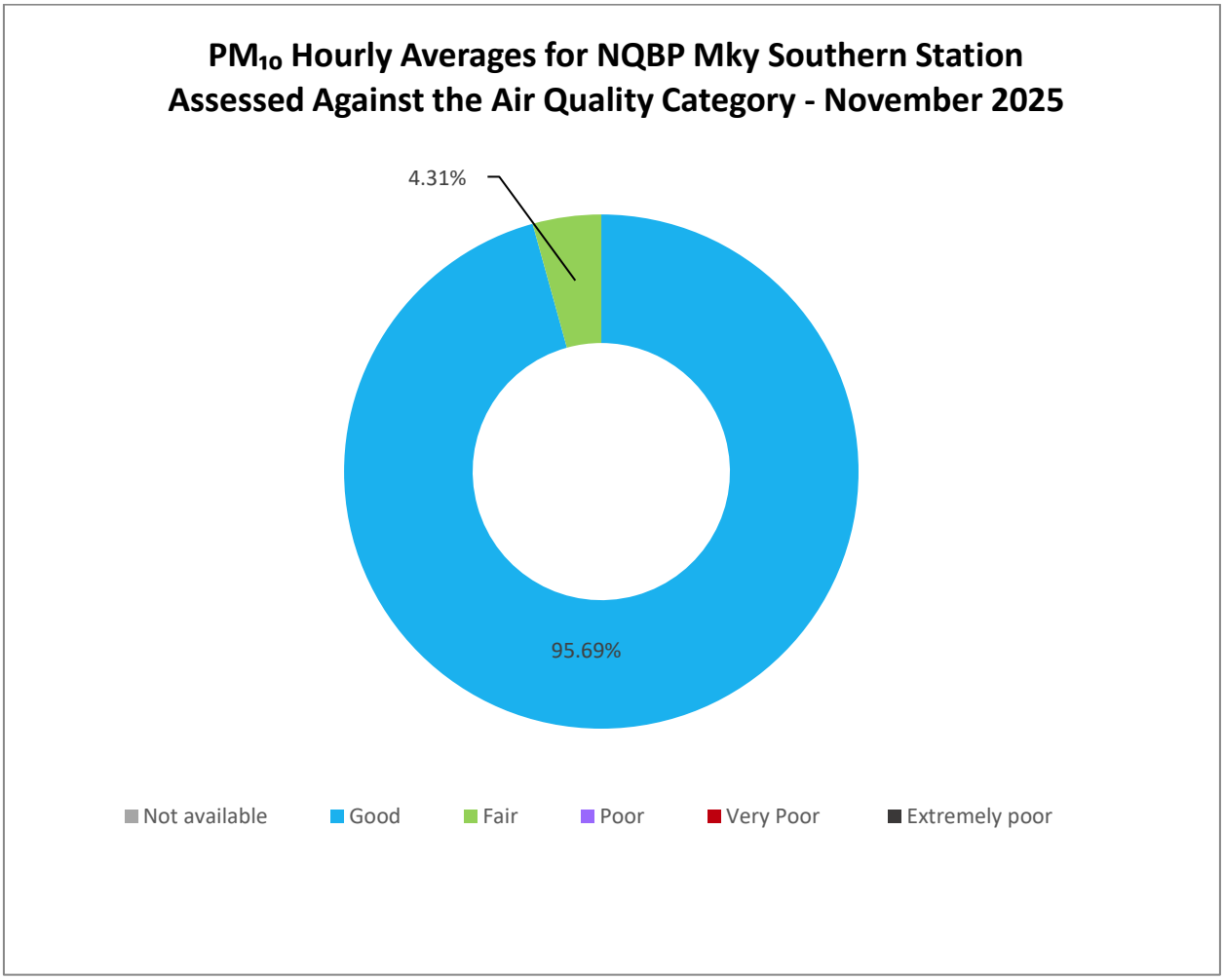

Figure 4: Hourly PM_{10} Averages for NQBP Mky Southern Station Assessed Against the Air Quality Categories

95.69% of days during the reporting period presented by the Air Quality Category are classified as Good, 0.00% of days are classified as Not available, 4.31% of days are classified as Fair, 0.00% of days are classified as Poor, 0.00% of days are classified as Very Poor and 0.00% of days are classified as Extremely Poor.

5.3 Tabulated Data

Table 13 details the daily averages for PM_{10} measured at Southern and Northern stations.

Table 13: NQBP Stations Data Table

Date	McEwens Beach PM_{10} (µg/m³)	Mky Northern PM_{10} (µg/m³)	Mky Southern PM_{10} (µg/m³)
1/11/2025	15	21	15
2/11/2025	12	18	14
3/11/2025	13	18	15
4/11/2025	23	28	23
5/11/2025	16	21	18
6/11/2025	10	15	12
7/11/2025	19	20	13
8/11/2025	14	14	11
9/11/2025	10	11	9
10/11/2025	10	12	10
11/11/2025	11	11	9
12/11/2025	13	16	11
13/11/2025	17	19	12
14/11/2025	20	23	15
15/11/2025	17	15	12
16/11/2025	11	10	9
17/11/2025	8	7	7
18/11/2025	14	9	8
19/11/2025	12	10	8
20/11/2025	16	13	12
21/11/2025	13	21	14
22/11/2025	14	36	24
23/11/2025	15	24	20
24/11/2025	19	16	15
25/11/2025	16	17	14
26/11/2025	13	14	12
27/11/2025	13	14	11
28/11/2025	9	8	8
29/11/2025	13	12	10
30/11/2025	11	10	10

5.4 Graphic Representations

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

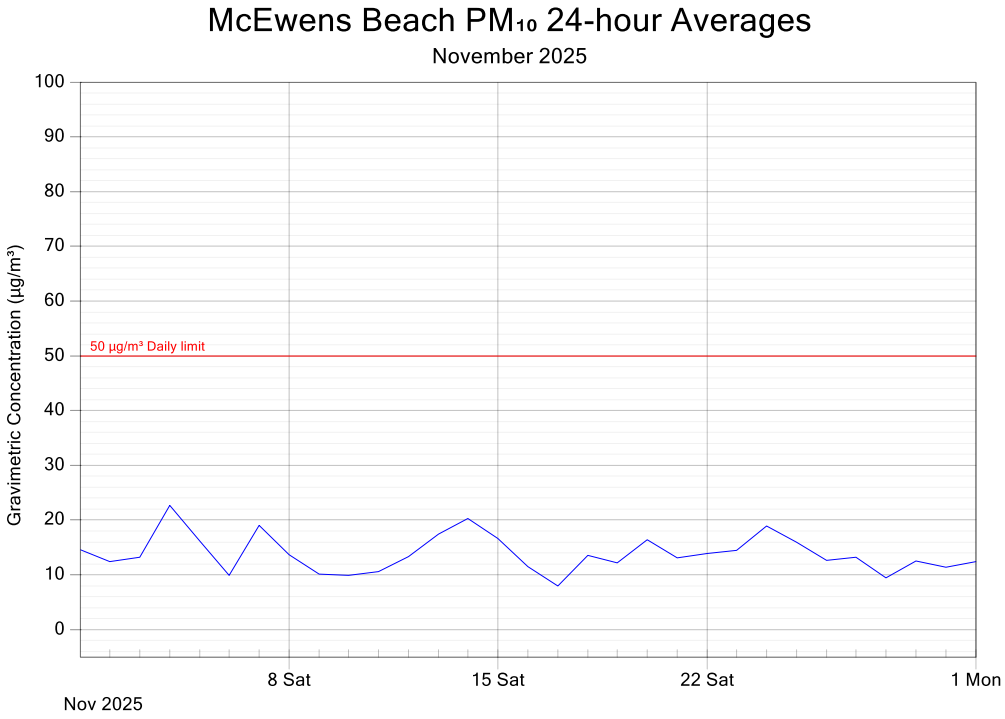

Figure 5: McEwens Beach Station PM_{10} 24-hour Averages

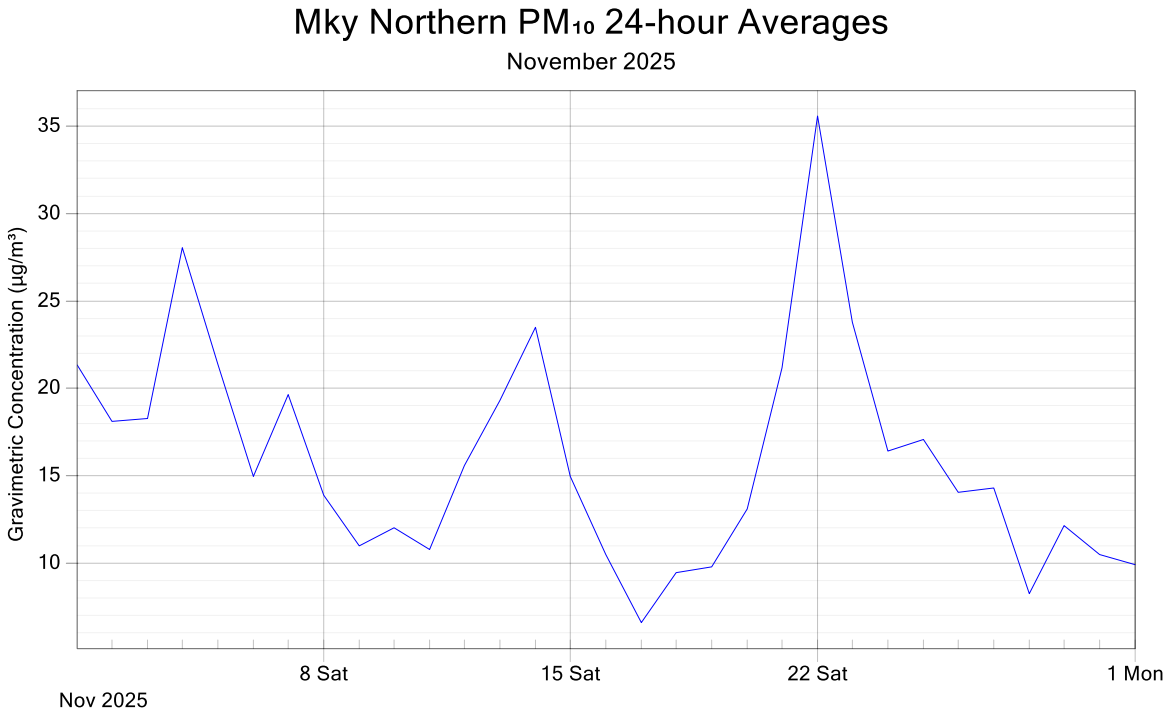

Figure 6: Mky Northern Station PM_{10} 24-hour Averages

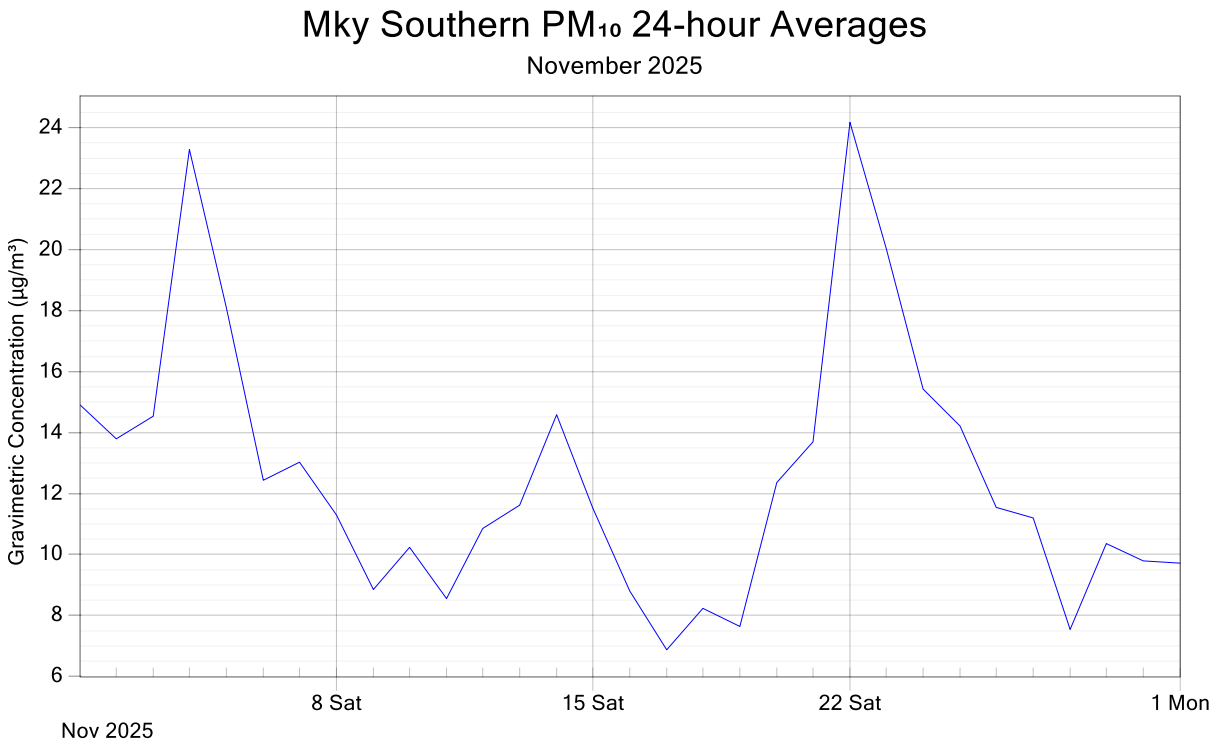

Figure 7: Mky Southern Station PM_{10} 24-hour Averages

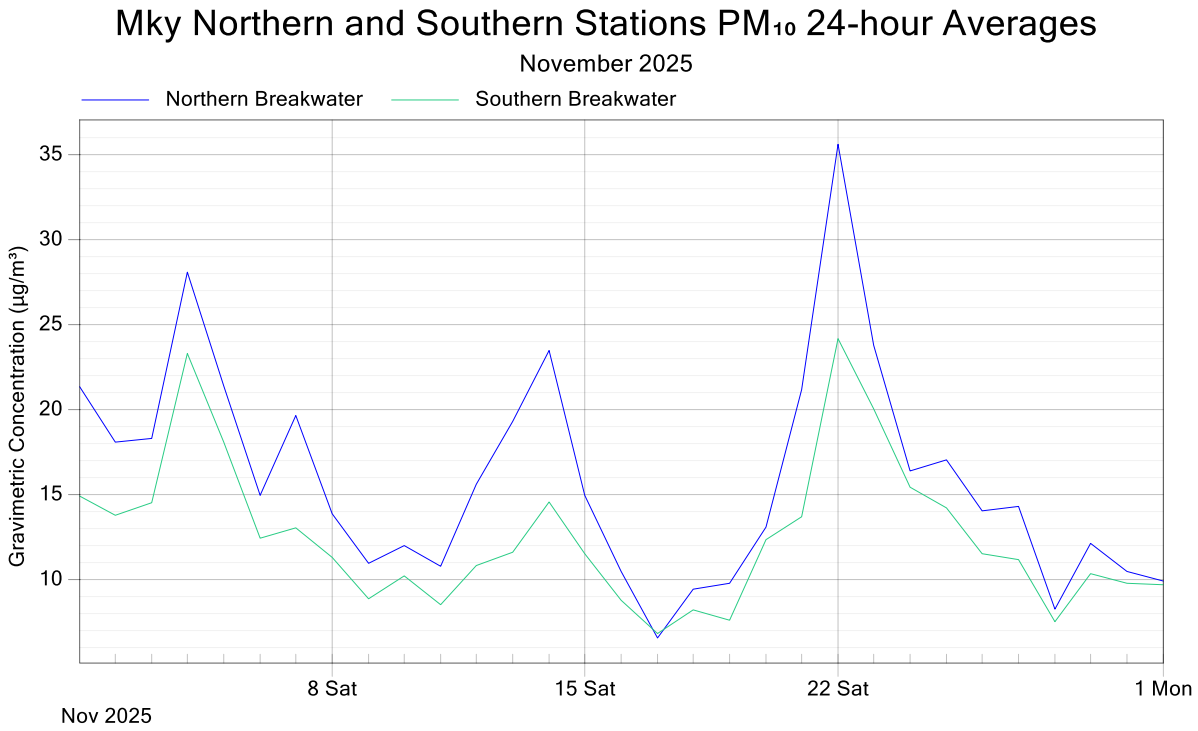

Figure 8: Mky Northern and Mky Southern Stations PM_{10} 24-hour Averages Comparison

6.0 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 14: McEwens Beach BAM 1020 Valid Data Exception Table

Start Date	End Date	Reason	Change Details	User Name	Change Date
01/11/2025 00:00	01/12/2025 00:00	No data affected during the reporting period	Nil	EW	24/12/2025

Table 15: Mky Northern E-Sampler Valid Data Exception Table

Start Date	End Date	Reason	Change Details	User Name	Change Date
01/11/2025 00:00	01/12/2025 00:00	No data affected during the reporting period	Nil	EW	24/12/2025

Table 16: Mky Southern E-Sampler Valid Data Exception Table

Start Date	End Date	Reason	Change Details	User Name	Change Date
01/11/2025 00:00	01/12/2025 00:00	No data affected during the reporting period	Nil	EW	24/12/2025

7.0 Report Summary

- The PM_{10} data capture was above 95% for McEwens Beach, Mky Northern and Southern stations in the reporting month.
- The PM_{10} monthly average for McEwens Beach station was 14 µg/m^3 with a standard deviation of 6 µg/m^3.
- The PM_{10} monthly average for Mky Northern station was 16 µg/m^3 with a standard deviation of 9 µg/m^3.
- The PM_{10} monthly average for Mky Southern station was 13 µg/m^3 with a standard deviation of 6 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)
LDL	Lower Detectable Limit
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 affected by environmental conditions – wind speed/wind speed gust spike refers to when a one-off high reading occurs due to a natural occurrence such as a bird sitting on the wind sensor, or some other event causing the readings to spike.

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 start/up period of an instrument after power has been restored.

Tape break refers to the breaking of the EBAM/BAM sample tape during operation.