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North Queensland Bulk Ports Corporation

McEwens Beach, Mky Northern and Southern Stations

Ambient Air Quality Monitoring

Yearly Report

1st January to 31st December 2025

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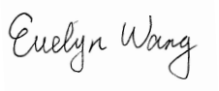
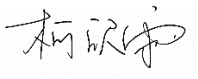
Report by: Evelyn Wang 

Signatory: Xinyu Ke 

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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 between January and December 2025.

Data capture for PM_{10} at McEwens Beach between 1st January to 31st December 2025 was 95.0%.

Data capture for PM_{10} at Mky Northern between 1st January to 31st December 2025 was 95.6%.

Data capture for PM_{10} at Mky Southern between 1st January to 31st December 2025 was 97.0%.

There was one exceedance recorded for PM_{10} during 2025.

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.

This report presents the data from the Solar BAM for the year 2025.

The data presented in this report:

- Presents the annual percentage of data captured at the monitoring station;
- Summarises exceedance events;
- Presents graphical representation of the data and comparison to regulatory limits and/or relevant guidelines;
- 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: McEwens Beach Monitoring Site Location

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

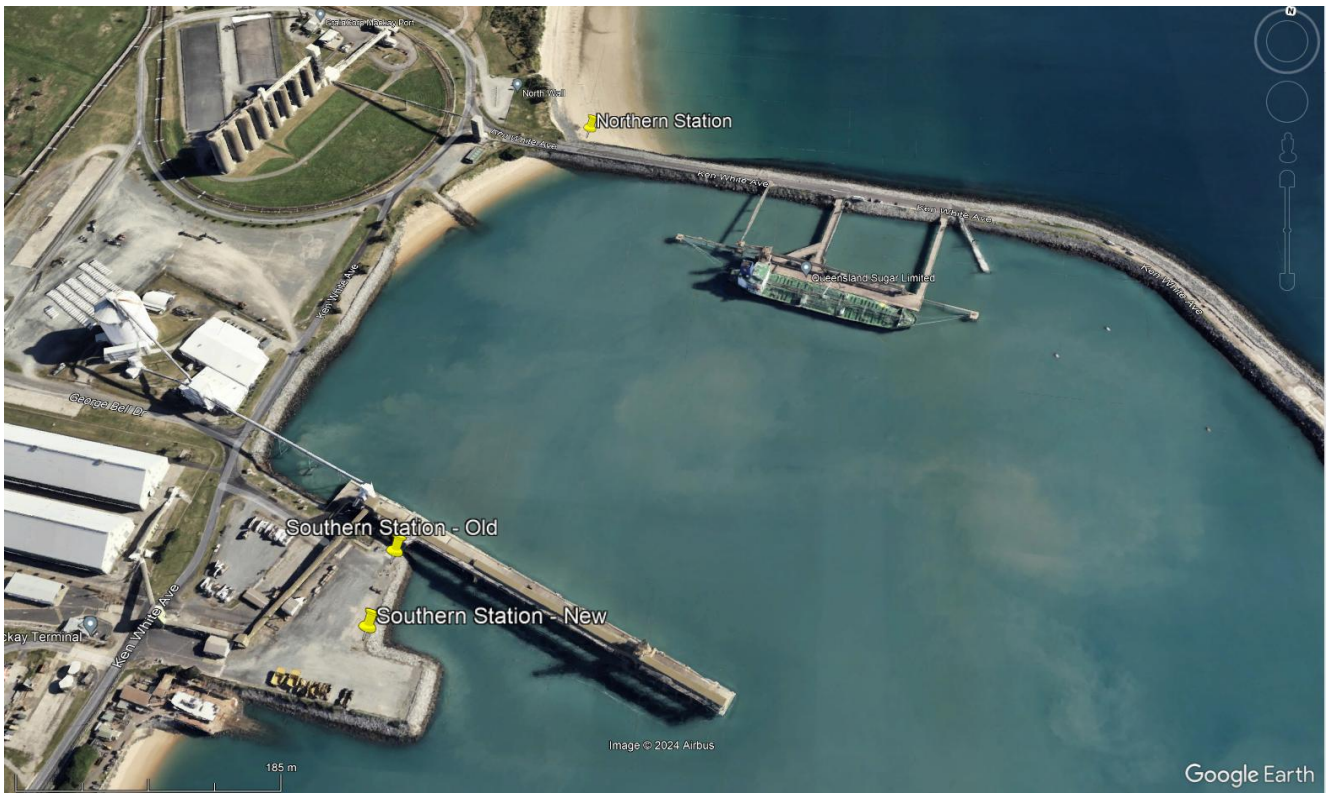

Figure 2: Mky Northern and Southern Monitoring Stations Location

Monitored ParametersTable 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 the McEwens Beach Monitoring Station

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

2.2. 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

2.2.1. 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.

2.2.2. 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.

3.0 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} (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.

4.0 Target Maximum Exceedance

The air quality goals for pollutants monitored at the McEwens Beach Station monitoring network site are based on the National Environment Protection Council (NEPC) Ambient Air Quality NEPM. The target maximum exceedances are shown in Table 5 below.

Table 5: Target Maximum Exceedance at McEwens Beach Station

Parameter	Time Period	Exceedance Level	Units	Maximum Allowable Exceedances*
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 exceedances of the Air Quality standard.

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

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 6 below displays the annual percentage of data captured by the monitoring stations. **Bold** values in the table indicate data capture below 95%.

Table 6: Overall Yearly Data Capture for NQBP Stations

Station	Parameter	Data Capture (%)
McEwens Beach	PM_{10}	**95.0**[3]
Mky Northern	PM_{10}	95.6
Mky Southern	PM_{10}	97.0

[3] The yearly data capture percentage for McEwens Beach station is 94.98%

5.2. Air Quality Summary

Table 7 below summarises any exceedances of the air quality goals of McEwens Beach recorded between 1st January and 31st December 2025

Table 7: Exceedance Recorded for McEwens Beach Station from 1st January to 31st December 2025

Parameter	Time Period	Value of Exceedance (µg/m³)	Date of Exceedance
PM_{10}	24 Hour	52	04/10/2025

5.3. Exceedance Discussion

- There was one exceedance recorded for PM_{10} between January and December 2025.

5.4. 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.[4]

Table 8: Colour-coded categories for Air Quality Categories[5]

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

The PM_{10} 1-hour average values at NQBP stations for 2025 were assessed against the Air Quality Category Rating, and the pie charts below present the percentage of the days for which a specific air quality category was identified.

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

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

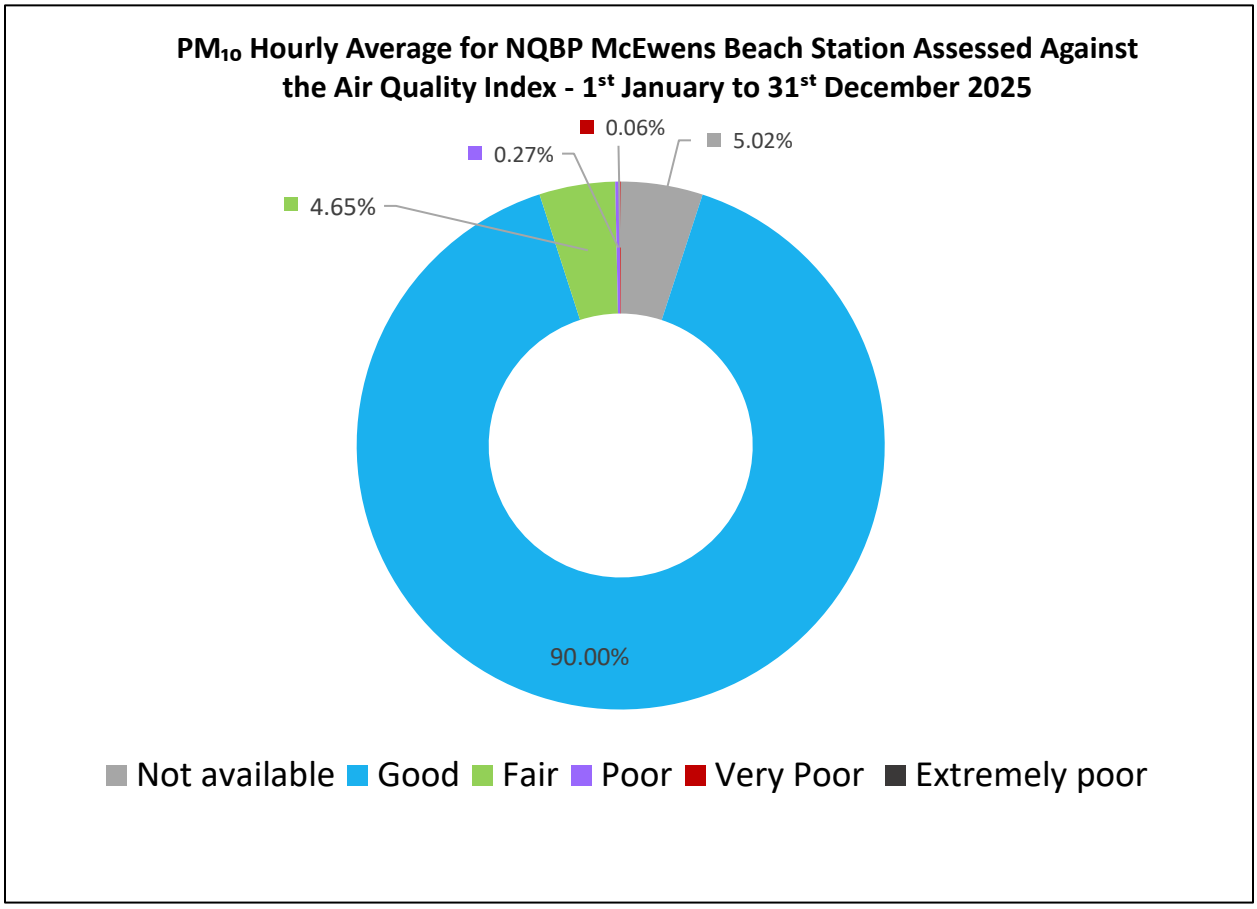

Figure 3: PM_{10} Hourly Averages for NQBP McEwens Beach Station Assessed Against the Air Quality Category – 1st January to 31st December 2025

90.00% of the time were classified as Good. 4.65% of the time were classified as Fair. 0.27% of the time were classed as poor, 0.06% of the time were classed as Very Poor. 5.02% of the time were classed as Not Available and 0.00% of the time were classified as Extremely Poor. PM_{10} data not available during the reporting period 5.02% was due to yearly maintenance- zero test performed as well as instrumental faults and communication errors occurring across the year.

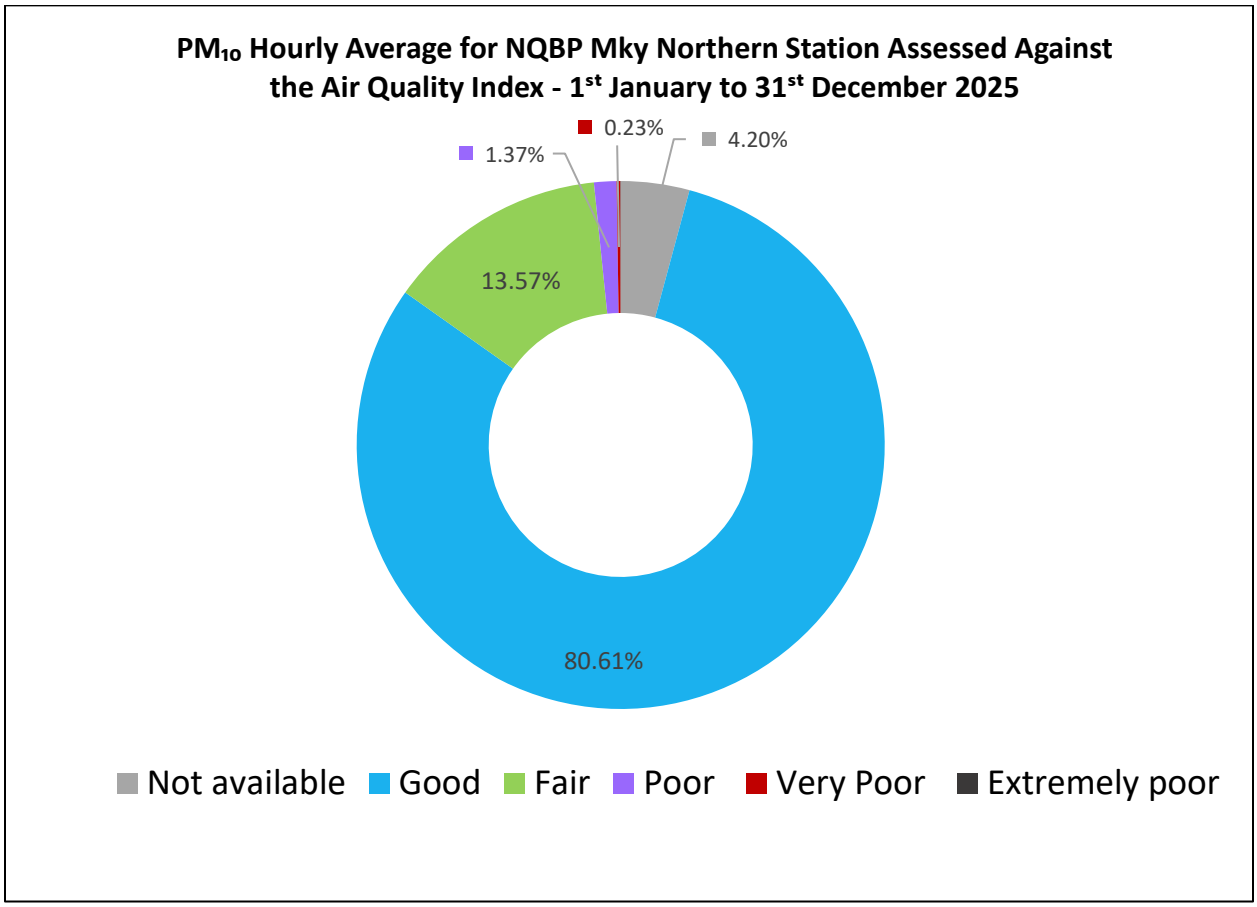

Figure 4: PM_{10} Hourly Average for NQBP Mky Northern Station Assessed Against the Air Quality Category - 1st January to 31st December 2025

80.61% of the time were classified as Good. 13.57% of the time were classified as Fair. 1.37% of the time were classed as poor, 0.23% of the time were classed as Very Poor. 4.20% of the time were classed as Not Available and 0.00% of the time were classified as Extremely Poor. PM_{10} data not available during the reporting period 4.20% was due to maintenance and power interruption occurring across the year.

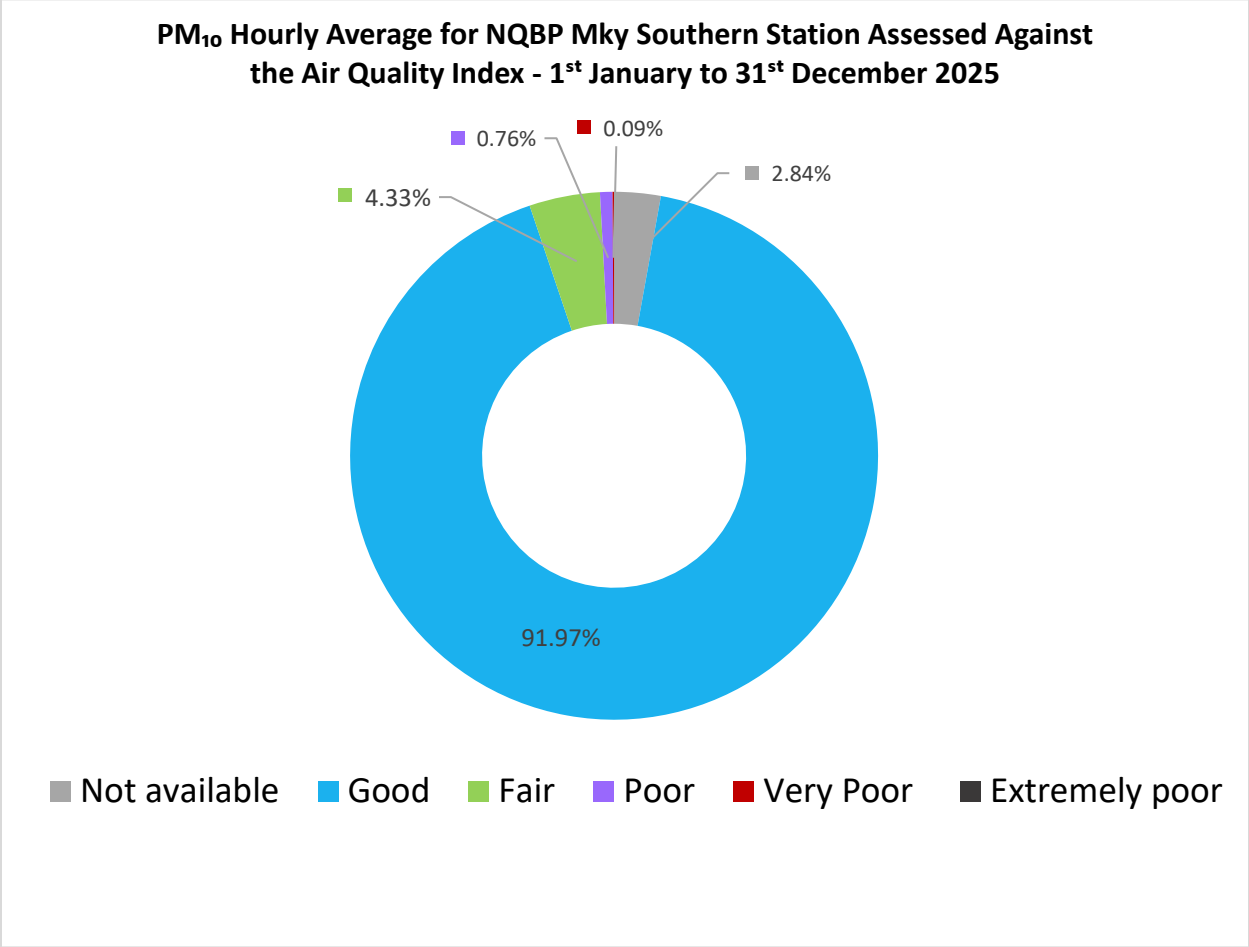

Figure 5: PM_{10} Hourly Average for NQBP Mky Southern Station Assessed Against the Air Quality Category - 1st January to 31st December 2025

91.97% of the time were classified as Good. 4.33% of the time were classified as Fair. 0.76% of the time were classed as poor, 0.09% of the time were classed as Very Poor. 2.84% of the time were classed as Not Available and 0.00% of the time were classified as Extremely Poor. PM_{10} data not available during the reporting period 2.84% was due to maintenance and power interruption occurring across the year.

5.5 Graphic Representations

Validated data for PM_{10} was used to construct the following yearly graphic representation.

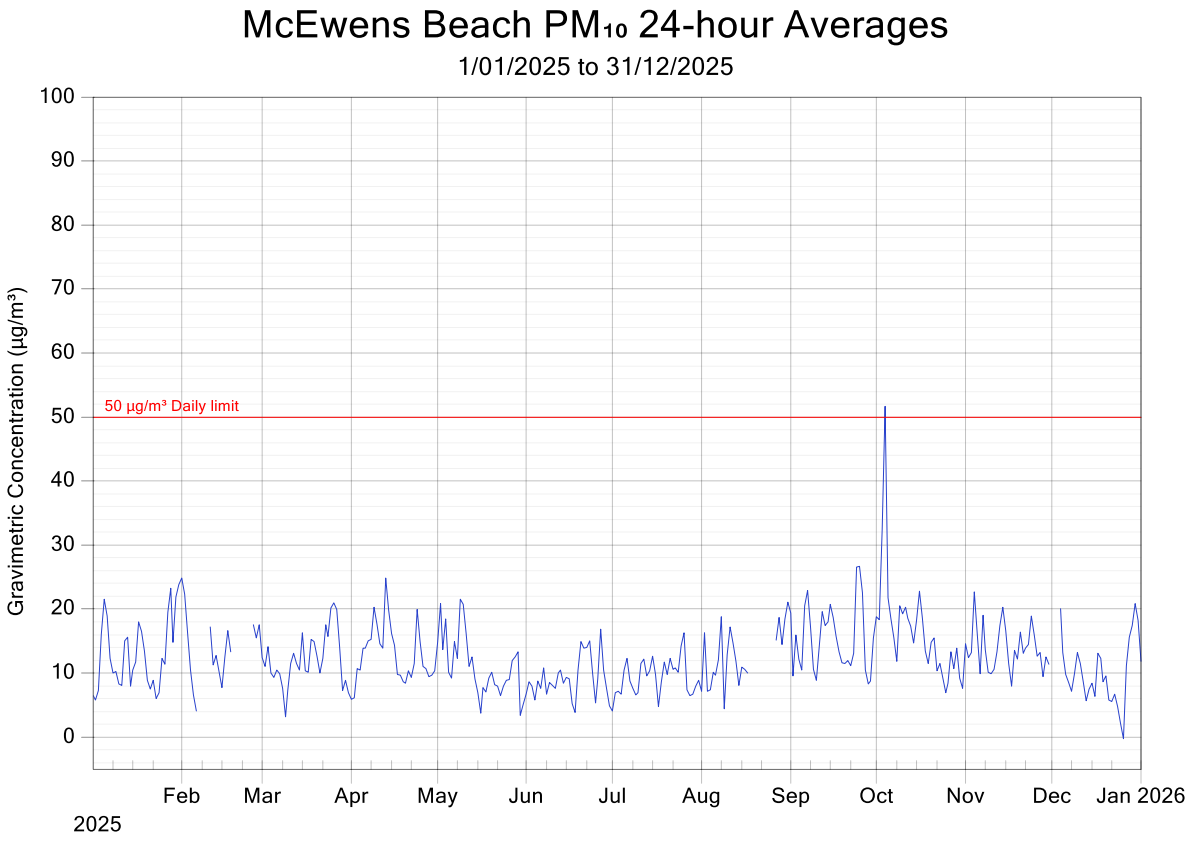

Figure 6: PM_{10} for McEwens Beach Station 24-hour Averages – 1st January to 31st December 2025

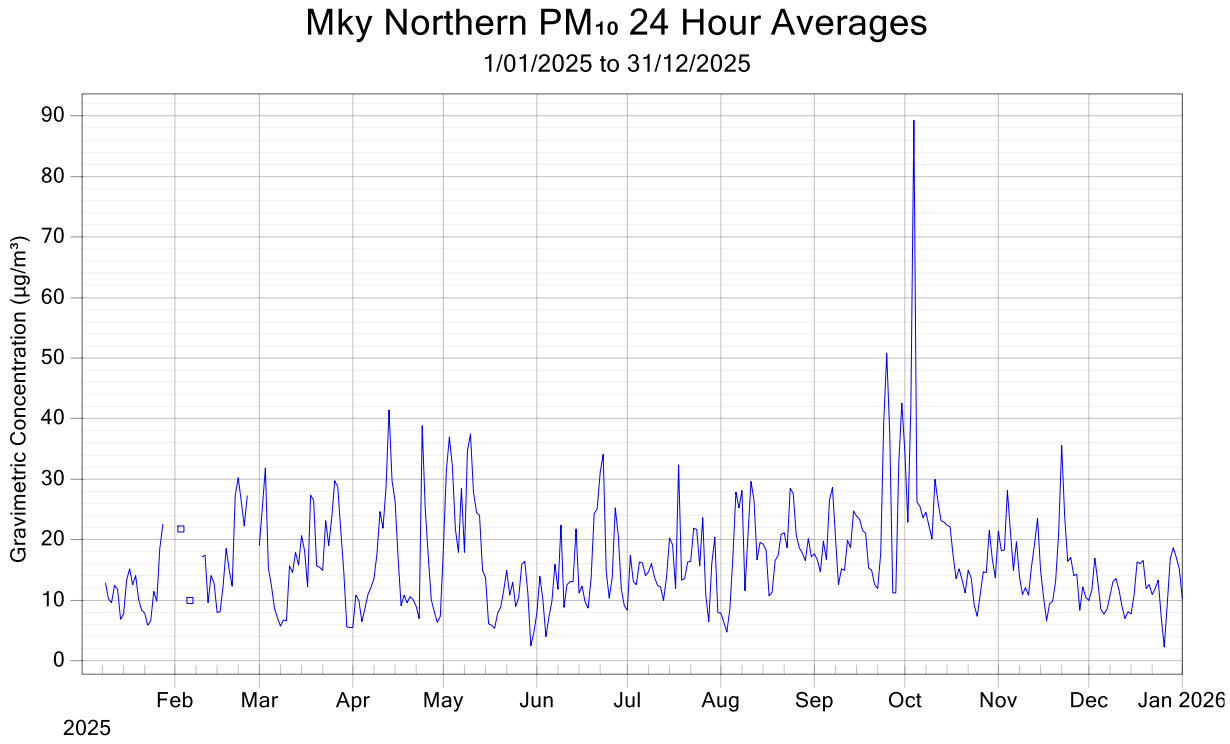

Figure 7: Mky Northern Station PM_{10} 24 Hour Averages 1st January to 31st December 2025

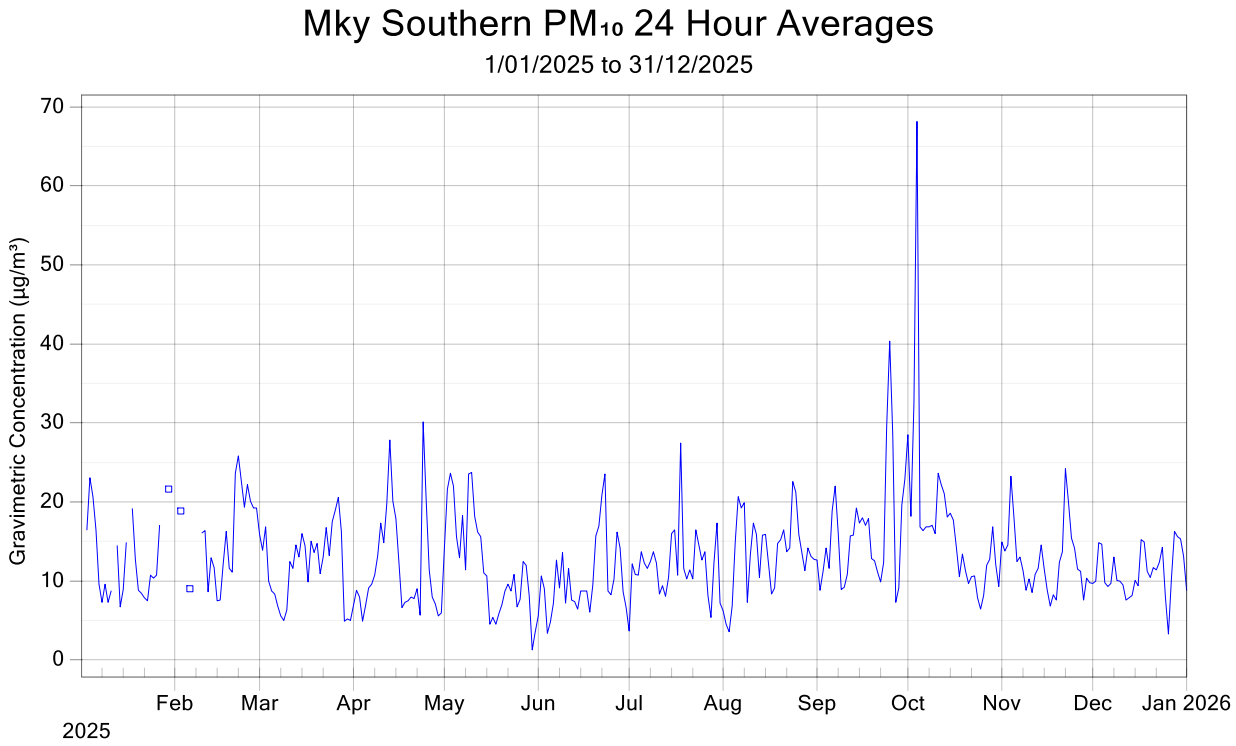

Figure 8: Mky Southern Station PM_{10} 24 Hour Averages 1st January to 31st December 2025

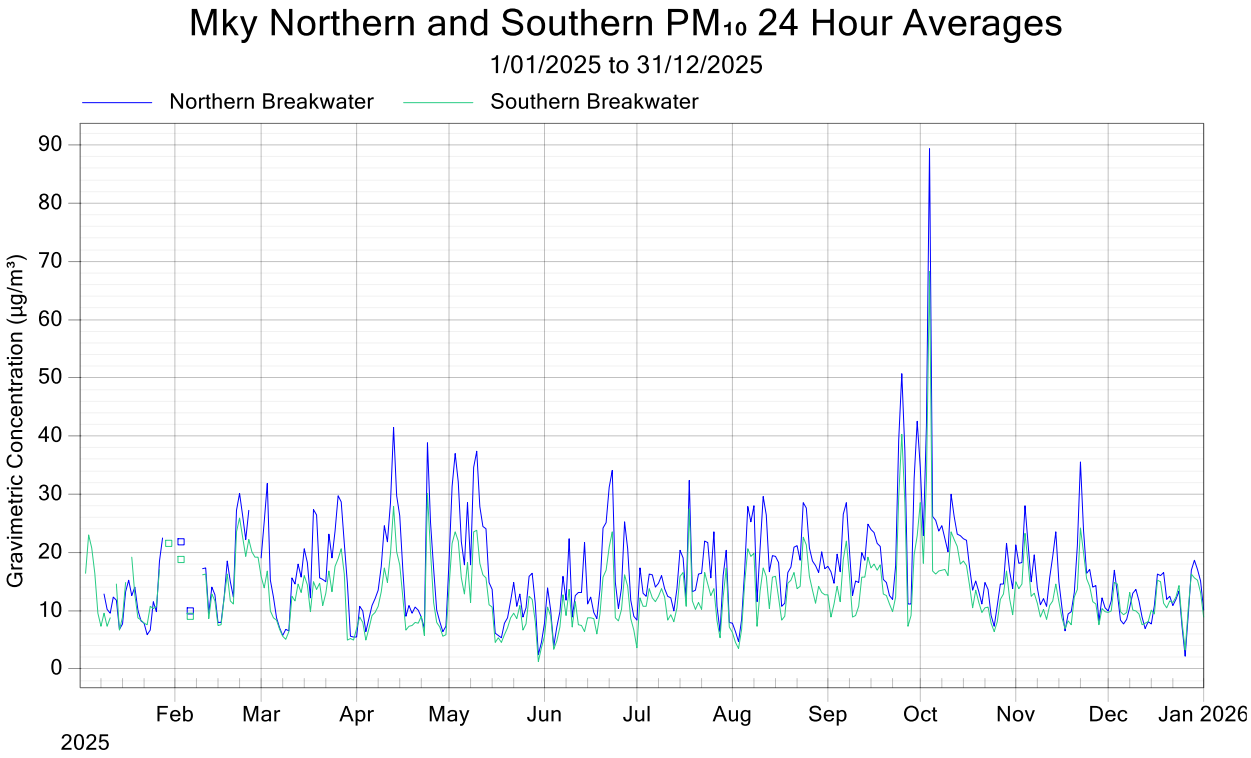

Figure 9: Mky Northern and Southern Stations PM_{10} 24 Hour Averages Comparison 1st January to 31st December 2025

6.0 Future Recommendations

- There are no recommendations for this site.

----------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)
calm	Wind conditions where the wind speed is below the operating range of the wind sensor
deg	Degrees (True North)
LDL	Lower Detectable Limit
m/s	Metres per second
PM_{10}	Particulate less than 10 microns in equivalent aerodynamic diameter
$PM_{2.5}$	Particulate less than 2.5 microns in equivalent aerodynamic diameter
WD	Vector Wind Direction
WS	Vector Wind Speed

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.