North Queensland Bulk Ports Corporation

McEwens Beach PM_{10} Solar BAM1020

Ambient Air Quality Monitoring

Validated Report

1st April 2021 to 30th April 2021

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Executive Summary

North Queensland Bulk Ports Corporation has commissioned Ecotech P/L to conduct air quality monitoring for the vicinity of the Port of Hay Point at McEwens Beach. The McEwens Beach monitoring station is currently comprised of a Solar BAM1020 measuring PM_{10} particulates. The air quality station was commissioned in March 2013.

The $PM_{2.5}$ E-Sampler and wind sensor previously installed at the site were decommissioned on the 3rd September 2020.

This report presents the data collected from the McEwens Beach station during the month of April 2021.

Data capture for PM_{10} was 100 % for April 2021.

The PM_{10} monthly average was 9 µg/m^3 with a standard deviation of 6 µg/m^3.

There were no exceedences recorded for PM_{10} during April 2021.

1.0 Introduction

Ecotech Pty Ltd was commissioned by North Queensland Bulk Ports Corporation to provide monitoring and data reporting for the McEwens Beach ambient air quality monitoring station, located as detailed in Table 1. Ecotech 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.

This report presents the data from the Solar BAM for April 2021.

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 McEwens Beach site consists of one ambient air quality monitoring station. The station's 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	Lat: -21.249444° Long: 149.206389°	6

A siting audit was conducted by Ecotech Pty Ltd on 29th December 2020 to assess station siting against the guidelines in *AS/NZS 3580.1.1:2016 Methods for sampling and analysis of ambient air*. The location was found to conform to the guidelines of the standard, with the exception of a road being located within 50m of the station. Given that this road is known to only be lightly trafficked, and the airflow in the vicinity of the sampling inlet is maintained free from restrictions independent of this proximity, these factors are not likely to affect sampling results and therefore the siting of the monitoring unit is considered to be in conformity with the intent of the Standard.

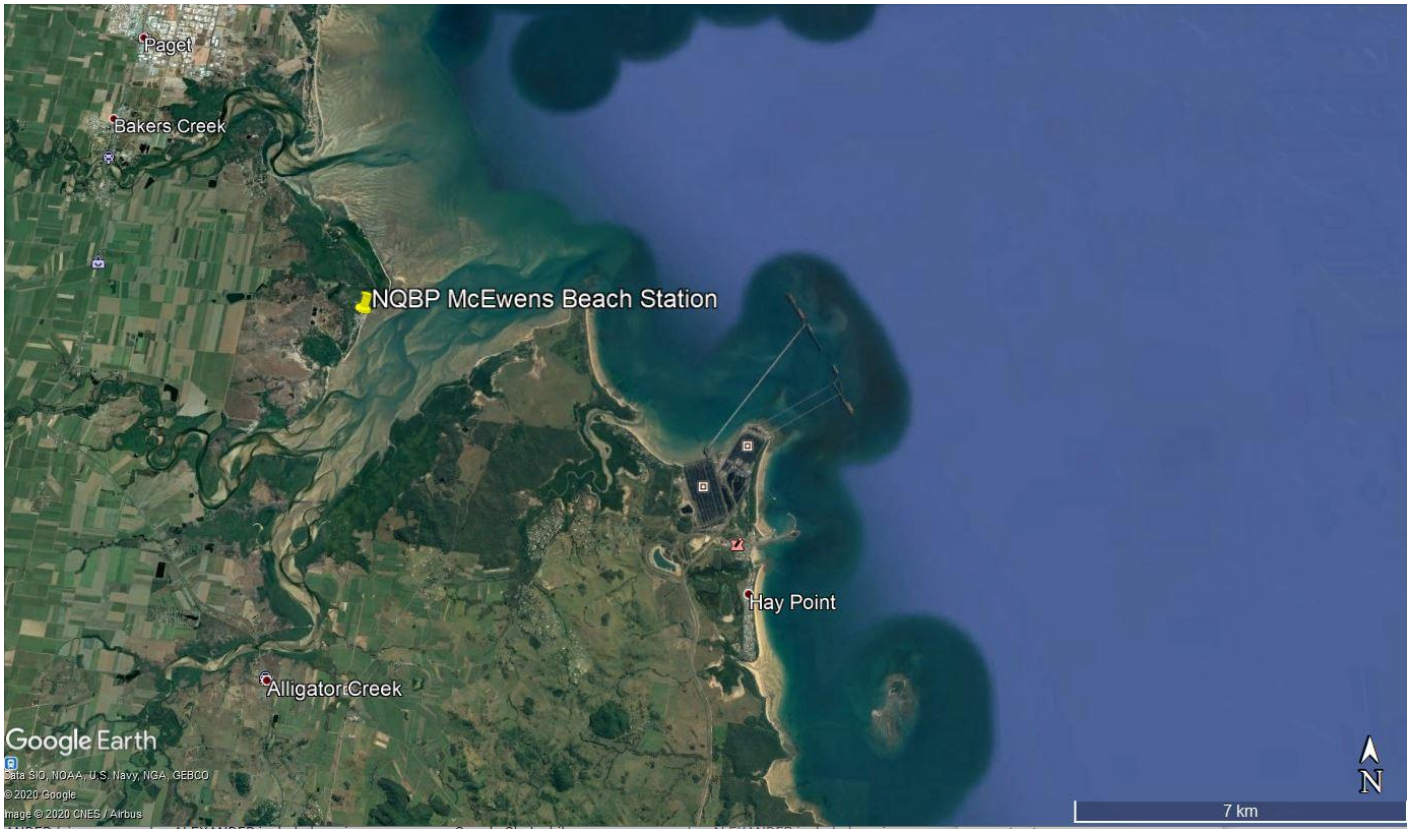

Figure 1: McEwens Beach Monitoring Station Location

2.2. Monitored Parameters

Table 2 below details the parameters monitored and the instruments used at the McEwens Beach monitoring station. Appendix 1 defines any abbreviated parameter names used throughout the report.

For meteorological sensors, the elevation given in the table below is the height above ground level at the monitoring station.

Table 2: Parameters Measured at the McEwens Beach Monitoring Station

Parameter Measured	Instrument and Measurement Technique
PM_{10}	Met One BAM 1020 – Beta ray attenuation

2.3. Data Collection Methods

Table 3 shows the methods used for data collection. Any deviations from the stated methods are detailed in section 2.3.1

Table 3: Methods

Parameter Measured	Data Collection Methods Used	Description of Method
PM_{10} (BAM 1020)	AS/NZS 3580.9.11 2016	Methods of sampling and analysis of ambient air. Method 9.11: Determination of suspended particulate matter – PM_{10} beta attenuation monitors
	Ecotech Laboratory Manual	In-house method 7.5 – Measurement of PM_{10}, $PM_{2.5}$ and TSP using Beta Attenuation Monitor.

2.3.1. NATA endorsement and Conformity with Standards

Unless stated below, parameters are monitored at the McEwens Beach station according to the methods detailed in Table 3.

2.3.2. Data Acquisition

Data acquisition is performed using a PC based WinAQMS logger (using WinAQMS® Version 2.0) situated at the monitoring site. The logger is equipped with a 4G modem for remote data collection. The recorded data is remotely collected from the WinAQMS logger on a daily basis (using Airodis™ version 5.1.5) and stored at Ecotech's Environmental Reporting Services (ERS) department in Melbourne, Australia. Data samples are logged in hourly intervals for the BAM1020.

2.4. Data Validation and Reporting

2.4.1. Validation

The Ecotech 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. Ecotech 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 Ecotech ERS operator, and the validation is reviewed. All data is checked and graphs and reports are generated based on the hourly data for the BAM1020.

2.4.2. Reporting

The reported data is in a Microsoft Excel format file named *"NQBP McEwens Beach Data Report April 2021.xlsx".*

The Excel file consists of four worksheets:

1. Cover
2. 1 Hour Averages
3. 24 Hour Averages
4. Valid Data Exception Table

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 hourly data for the BAM1020. 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 Exceedences

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

Table 4: Target Maximum Exceedences

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

*Maximum allowable exceedences 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 exceedence 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.

Ecotech 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 exceedences of the Air Quality standard.

The measurement uncertainty (as outlined in Table 5) is not considered when assessing exceedences of the air quality goals. Exceedences 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.

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	Measurement Range[1]
PM_{10} (BAM 1020)	µg/m³	1 µg/m³	24Hr: ± (5.5 % of reading + 4.0 µg/m³) (in range 0 - 100 µg/m³) Hr: ± (8 % of reading + 8.0 µg/m³) k factor of 2.0	0 to 1000 µg/m³ LDL_{24hr}=1.0µg/m³ LDL_{hr}=4.8µg/m³

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

4.2. Maintenance

Scheduled maintenance is completed quarterly by Ecotech on the BAM1020.

4.2.1. 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 6 indicates when the particulate equipment was last maintained /calibrated.

Table 6: McEwens Beach Maintenance Table April 2021

Parameter	Date of Last Maintenance	Maintenance Type	Date of Last Calibration
PM_{10}	02/03/2021	3 Monthly	29/12/2020

5.0 Results

5.1. Data Capture

BAM 1020 data capture is based on 1 hour averages 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 7 below displays data capture statistics for April 2021. **Bold** values in the table indicate data capture below 95%.

Table 7: Monthly Data Capture for McEwens Beach Station for April 2021

Parameter	Data Capture (%)
PM_{10}	100.0

5.2. Air Quality Summary

Table 8 below summarises any exceedences of the air quality goals recorded in the month of April 2021.

Table 8: Exceedences Recorded for April 2021

Parameter	Time Period	Value of Exceedence (µg/m^3)	Date of Exceedence
PM_{10}	24 Hour	-	-

5.3. Exceedences Discussion

- There were no exceedences recorded for PM_{10} during April 2021.

5.4 General Statistics

Table 9 below presents some statistical parameters for April 2021. The standard deviation is calculated based on the hourly averaged data.

Table 9: General statistics for April 2021

Parameter	Time Period	Average ($\mu g/m^3$)	Standard Deviation ($\mu g/m^3$)
PM_{10}	1 month	9	6

5.5 Tabulated Data

Table 10 details the daily averages for PM_{10} measured at McEwens Beach station during April 2021.

Table 10: McEwens Beach Station Summary Data Table April 2021

Daily Data – PM_{10}	
Date	PM_{10} (µg/m^3)
1/04/2021	16
2/04/2021	16
3/04/2021	4
4/04/2021	1
5/04/2021	2
6/04/2021	4
7/04/2021	7
8/04/2021	6
9/04/2021	8
10/04/2021	6
11/04/2021	7
12/04/2021	16
13/04/2021	18
14/04/2021	14
15/04/2021	8
16/04/2021	7
17/04/2021	12
18/04/2021	10
19/04/2021	12
20/04/2021	11
21/04/2021	7
22/04/2021	5
23/04/2021	5
24/04/2021	5
25/04/2021	12
26/04/2021	13
27/04/2021	14
28/04/2021	12
29/04/2021	5
30/04/2021	7

5.6 Graphic Representations

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

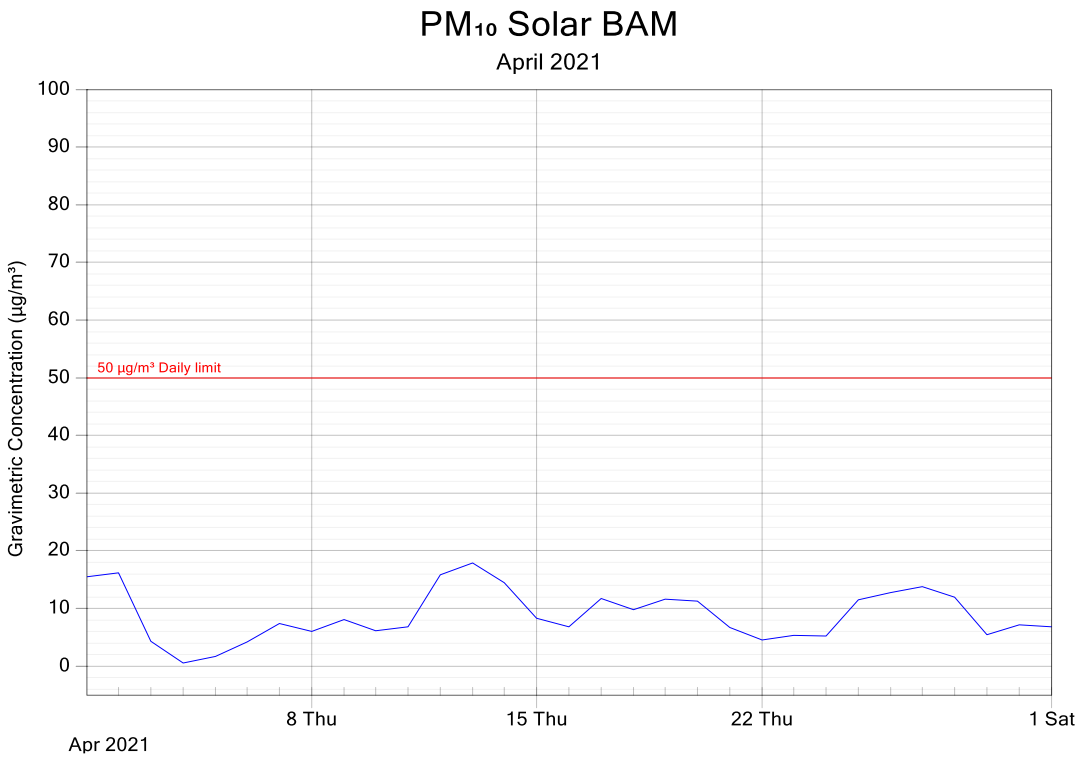

Figure 2: PM_{10} for McEwens Beach station 24-hour Averages – April 2021

6 Valid Data Exception Table

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 11: McEwens Beach Solar BAM Valid Data Exception Table

Start Date	End Date	Reason	Change Details	User Name	Change Date
01/04/21 00:00	01/05/21 00:00	No data invalidated	Nil	DP	20/05/21

7 Report Summary

- Data capture for PM_{10} was 100 % for April 2021.
- The PM_{10} monthly average was 9 µg/m^3 with a standard deviation of 6 µg/m^3.
- There were no exceedences recorded for PM_{10} during April 2021.

----------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}	Particulate less than 10 microns in equivalent 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.