



Port of Townsville Limited on behalf of
Glencore, Northern Stevedoring Services, South32, Aurizon and
Townsville Marine Logistics Pty Ltd

Boundary Air Monitoring Plan

Document Control Sheet

Revision history

Revision No.	Effective Date	Comments
0	20/12/2017	Original Document
1	29/03/2019	Updated to reflect revised plan
2	16/03/2020	Reformatting and updates to references, equipment etc.
3	11/03/2021	Reformatted and updated cover page/back page and logos, update equipment timelines (table 1), and references.

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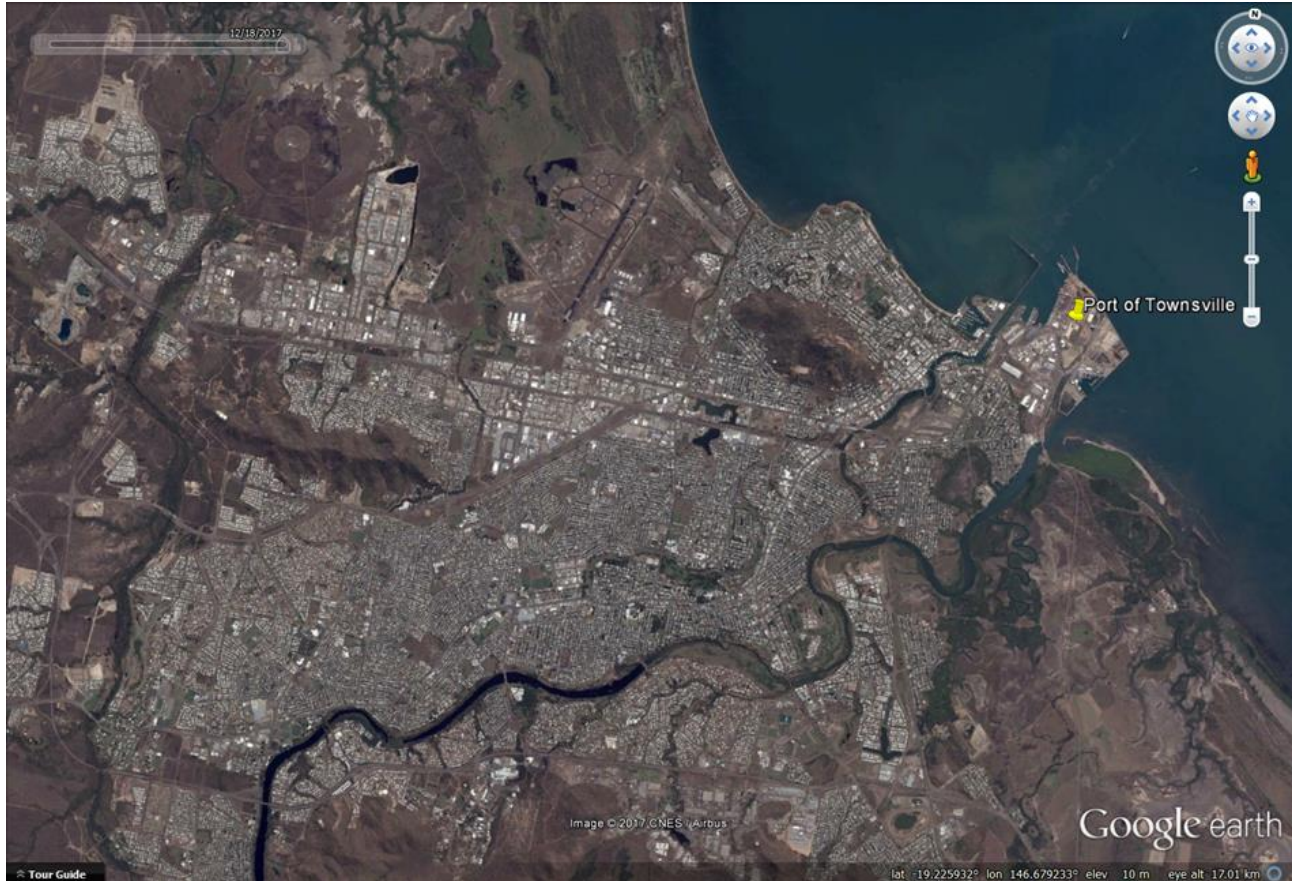
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1 INTRODUCTION

Port of Townsville Limited (the Port) administers the Ports of Townsville and Lucinda. The Port of Townsville (19°15'S, 146°50'E) is a general-purpose cargo port in tropical North Queensland. It has a land and sea jurisdiction in excess of 450 km² and the sea jurisdiction encompasses the Great Barrier Reef World Heritage Area, which is also a national heritage place. Surrounding the Port is Cleveland Bay and the community of Townsville (Figure 1). Townsville is a long-established township with a history of urbanisation and industrial activities in the Ross River and Ross Creek drainage system.

Figure 1: Location of Port of Townsville (Image from Google Earth)



The Port operates and maintains a boundary air monitoring program on behalf of bulk mineral handling customers Glencore, South32, Northern Stevedoring Services, Aurizon and Townsville Marine Logistics Pty Ltd.

Port Operations have the potential to generate dust, and a comprehensive boundary air monitoring program has been implemented to ensure that Port operations do not have an adverse impact. The long-term air monitoring program has been in place since 1994.

This program outlines the air monitoring that occurs at the boundary of the Port of Townsville.

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2 BACKGROUND

There are multiple potential emission sources contributing to the air quality within the Townsville and Port air shed including:

- Regional dust and smoke;
- Emissions from industrial activities such as refineries, manufacturing and repair facilities, rail and other transport activities; and
- Localised dust sources from construction, maintenance and landscaping works.

Townsville is in the dry tropics and climatic conditions such as low rainfall and windy conditions can also adversely impact air quality.

Port operations, conducted by or on behalf of the Port or by Port Customers, have the potential to impact on air quality through both point and diffuse sources of air pollutant emissions. Point sources include product handling operations, emissions from port facilities; and exhaust emissions from vessels, trains or trucks. Diffuse sources include fugitive emissions such as from construction activities or unsealed roads and land; remobilisation of emissions; and transport activities by vessels, trains or trucks.

Port Customers who handle bulk mineral products at the Port of Townsville are required to hold an Environmental Authority (EA) under the *Environmental Protection Act 1994*. Conditions in the EAs belonging to Port Customers require extensive monitoring of air quality to measure compliance with air quality objectives at the boundary of the Port. These objectives are outlined in Table 4.

3 PROGRAM SCOPE

3.1 Objectives

Since 1994, the Port has conducted a long-term air monitoring program at the Port of Townsville, primarily to characterise air quality in the environment within and surrounding the port and to ensure that port operations do not have an adverse impact on the surrounding environment. This program outlines the boundary air monitoring at the Port of Townsville. It is designed to:

- Characterise air quality in the environment at the boundary of the port to determine dust and air contaminant levels that could be attributed to port operations;
- Identify trends across a range of environmental parameters to monitor effectiveness of air quality management measures; and
- Provide data to Port Customers for comparison with air quality objectives for compliance monitoring purposes.

The Port also conducts an operational air monitoring program (refer POT 1571 Operational Air Monitoring Plan for further details), which monitors air quality within the port.

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In addition, the Department of Environment and Science (DES) conducts an air monitoring program in Townsville and the Port utilises the data, when available, from this program.

3.2 Equipment and Methodology

Boundary air monitoring is carried out via a number of methods using the equipment shown in Table 1 and described below.

Continuous Metals Analyser –a continuous monitor which records metal/metalloid concentrations in real time.

Particulate Matter (PM₁₀) Mass Monitor –a continuous monitor which records PM₁₀ concentrations in relation to wind directions and speeds.

Total Suspended Particulate Matter (TSP) Monitor –a continuous monitor which records TSP concentrations in relation to wind directions and speeds in real time.

High Volume Air Samplers (HVAS) –collect samples of dust on filters over a 24-hour period, which are transported to a National Association of Testing Authorities (NATA) accredited laboratory for analysis of the deposited dust and composition of metal/metalloid components. The HVAS can measure either PM₁₀ or TSP depending on the type of head unit installed on the body of the sampler. One of each head unit is installed at each boundary monitoring location.

Dust Deposition Gauges –passively collect dustfall from the surrounding air, with samples being transported to a NATA accredited laboratory for analysis of the composition of the deposited dust and its metal/metalloid composition. Two dust deposition gauges are installed at each boundary monitoring location. This enables metal/metalloid analysis to be conducted every month.

Meteorological Equipment –collects data such as wind direction, wind speed and rainfall in real time.

All equipment is installed, calibrated and maintained in accordance with the requirements specified in the relevant Australian Standards (AS/NZS 3580 and AS/NZS 3580.1.1), where possible taking into consideration the constraints posed by some locations, i.e. distance to roads etc.

All sampling is conducted in accordance with the operating practices specified in the relevant Australian Standards (AS/NZS 3580.9.3, AS/NZS 3580.9.6, AS/NZS 3580.9.8, AS/NZS 3580.10.1, AS/NZS 3580.14 and AS/NZS 3580.15).

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Table 1: Equipment Located at Each Monitoring Location

Location	Equipment & Location ID	Implementation Date	
		Installed	To be Installed
Coast Guard	T640 (PM ₁₀) Mass Monitor	June 2017	
	Xact continuous metals analyser [operated by DES]*	September 2015	
	TEOM TSP Monitor [operated by DES]^	August 2007	
	Continuous metals analyser		By end May 2021
	Total Suspended Particulate Matter (TSP) Monitor	August 2020	
	TSP HVAS	December 2011	
	PM ₁₀ HVAS	June 2013	
	Dust deposition gauge BD05 & BD06	January 2012	
	Meteorological equipment	June 2017	
Lennon Drive	T640 (PM ₁₀) Mass Monitor	January 2018	
	Continuous Metal Monitor	June 2020	
	Real time TSP monitor	November 2019	
	TSP HVAS	June 2014	
	PM ₁₀ HVAS	June 2014	
	Dust deposition gauge BD03 & BD04	May 2014	
	Meteorological equipment	June 2017	
Enviro Park	T640 (PM ₁₀) Continuous Monitor	August 2019	
	TSP HVAS	June 2012	
	PM ₁₀ HVAS	June 2012	
	Dust deposition gauge BD01 & BD02	September 2011	
	Meteorological equipment	June 2017	

NOTE: * This instrument will be replaced by a Port Metals analyser

^ This instrument was replaced by a Port TSP analyser

3.3 Monitoring Locations

Boundary air monitoring is conducted at 3 locations (Figure 2); Coast Guard, Lennon Drive and Enviro Park. These locations have been chosen primarily to define the boundary of the port operations with the community of Townsville. Global Positioning System (GPS) coordinates for all monitoring locations are included in Table 2.

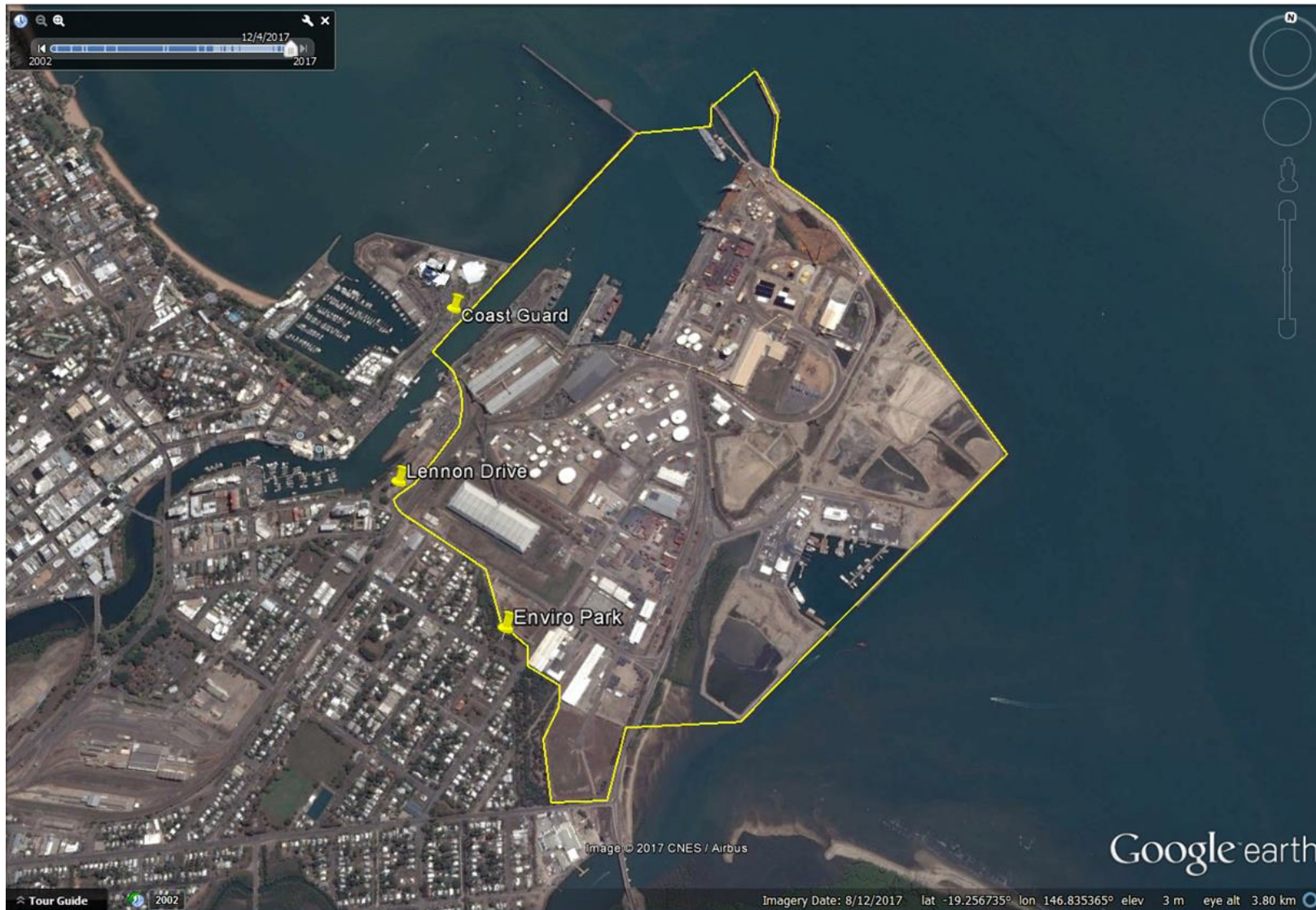
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Table 2: Boundary Air Monitoring Locations

Location	Location Coordinates	
	Easting	Northing
Coast Guard	481841	7871218
Lennon Drive	481779	7870523
Enviro Park	482223	7869995

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Figure 2: Boundary Air Monitoring Locations (Image from Google Earth)



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3.4 Frequency and Timing

Boundary air monitoring is conducted throughout the year. The PM₁₀, TSP and metal monitors run continuously and provide real time data on an hourly and daily basis. The HVAS collect samples of dust on filters over a 24-hour period every six days and the filters are collected and replaced every six days. The dust deposition gauges are collected and replaced at the end of each month to attain the standard sampling time period of 28 ± 2 days.

3.5 Parameters

Table 3 lists the parameters monitored in this program.

Table 3: Boundary Air Parameters

Parameter	Relevance	Monitoring Equipment	Method
PM ₁₀	Indicates the mass of that portion of the air particles that are less than 10 microns in diameter, i.e. inhalable particles	PM ₁₀ continuous monitor and PM ₁₀ HVAS	Real-time Analysis and Laboratory Analysis
TSP	Indicates the mass of that portion of the air particles that are less than 100 microns in diameter suspended in the air	TSP continuous monitor and TSP HVAS	Real-time Analysis and Laboratory Analysis
Trace metal/metalloids (Arsenic, Cadmium, Copper, Lead, Nickel and Zinc)	Indicates total concentration and amount of metals/metalloids in the TSP fraction of the air column	Continuous metals analyser and TSP HVAS	Real-time Analysis and Laboratory Analysis
Trace metal/metalloids (Arsenic, Cadmium, Copper, Lead, Nickel and Zinc)	Indicates total concentration and amount of metals/metalloids in the PM ₁₀ fraction of the air column	PM ₁₀ HVAS	Laboratory Analysis
Ash content	Indicates the mass of that portion of the insoluble matter remaining after combustion	Dust deposition gauge	Laboratory Analysis
Combustible matter	Indicates the mass of that portion of the insoluble matter lost during combustion	Dust deposition gauge	Laboratory Analysis
Total soluble matter	Indicates the mass of the soluble portion of the deposited matter	Dust deposition gauge	Laboratory Analysis
Total insoluble matter	Indicates the mass of the insoluble portion of the deposited matter	Dust deposition gauge	Laboratory Analysis
Total solids	Indicates the mass of the particulate matter deposited in a deposit gauge	Dust deposition gauge	Laboratory Analysis
Total metals/metalloids (Arsenic, Cadmium, Copper, Lead, Nickel and Zinc)	Indicates total concentration and amount of metals/metalloids in the air column	Dust deposition gauge	Laboratory Analysis

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4 AIR QUALITY OBJECTIVES

Results from the boundary air monitoring program are compared against the air quality objectives listed in Table 4.

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Table 4: Boundary Air Quality Objectives

Parameter	Investigation Trigger Level*	Air Quality Limit	Limit Type/Measurement Period	Monitoring Equipment
PM ₁₀	N/A	50 µg/m ³	Rolling 24 hour average based on 1 hour averages	Continuous PM ₁₀ monitor
	N/A	25 µg/m ³	Calendar year average	Continuous PM ₁₀ monitor
TSP	100 µg/m ³	N/A	Rolling 24 hour average based on 1 hour averages	Continuous TSP monitor
	N/A	90 µg/m ³	Calendar year average	HVAS TSP
Arsenic and compounds	N/A	0.006 µg/m ³	Calendar year average	HVAS PM ₁₀
Cadmium and compounds	N/A	0.005 µg/m ³	Calendar year average	HVAS PM ₁₀
Copper and compounds	5 µg/m ³	N/A	Rolling 24 hour average based on 1 hour averages	Continuous metals analyser
Lead and compounds	0.65 µg/m ³	N/A	Rolling 24 hour average based on 1 hour averages	Continuous metals analyser
	0.3 µg/m ³	0.5 µg/m ³	Rolling 3 month average based on 1 month averages	HVAS TSP
	0.25 µg/m ³	0.5 µg/m ³	Rolling 12 month average based on 1 month averages	HVAS TSP
	N/A	0.5 µg/m ³	Calendar year average	HVAS TSP
Nickel and compounds	0.2 µg/m ³	N/A	Rolling 24 hour average based on 1 hour averages	Continuous metals analyser
	N/A	0.02 µg/m ³	Calendar year average	HVAS PM ₁₀
Zinc and compounds	12 µg/m ³	N/A	Rolling 24 hour average based on 1 hour averages	Continuous metals analyser
Dust – total insoluble matter	120 mg/m ² /day	N/A	Monthly average	Dust Deposition Gauge
Dust – Arsenic and compounds	4 µg/m ² /day	N/A	Calendar year average	Dust Deposition Gauge
Dust – Cadmium and compounds	2 µg/m ² /day	N/A	Calendar year average	Dust Deposition Gauge
Dust – Lead and compounds	100 µg/m ² /day	N/A	Calendar year average	Dust Deposition Gauge

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5 REPORTING

Data validation protocols have been developed with DES and align with Australian Standard (AS 3580.19).

Monthly graphs of the boundary air monitoring results are provided on the Port website as part of the Air Quality Dashboard, with calendar year graphs provided in February of each year. Continuous data is provided on the DES Live Air Quality website.

Data is also provided to designated Port Customers as per the Port of Townsville Boundary Air Monitoring Agreement.

6 REVIEW

This program is subject to regular review and refinement to ensure it remains fit for purpose. As a minimum, this review occurs annually.

7 REFERENCES

AS/NZS 3580.1.1: 2016. *Methods for sampling and analysis of ambient air – Part 1.1: Guide to siting air monitoring equipment*. Standards Australia, 2016.

AS/NZS 3580.9.3:2015. *Methods for sampling and analysis of ambient air – Method 9.3: Determination of suspended particulate matter – Total suspended particulate matter (TSP) – High volume sampler gravimetric method*. Standards Australia, 2015.

AS/NZS 3580.9.6:2015. *Methods for sampling and analysis of ambient air Part 9.6: Determination of suspended particulate matter – PM₁₀ high volume sampler with size selective inlet – Gravimetric method*. Standards Australia, 2015.

AS/NZS 3580.9.8:2008 (R2018). *Methods for sampling and analysis of ambient air – Part 9.8: Determination of suspended particulate matter – PM₁₀ continuous direct mass method using a tapered element oscillating microbalance analyser*. Standards Australia, 2008.

AS/NZS 3580.10.1: 2016. *Methods for sampling and analysis of ambient air – Method 10.1: Determination of particulate matter – Deposited matter – Gravimetric method*. Standards Australia, 2016.

AS/NZS 3580.14: 2014. *Methods for sampling and analysis of ambient air – Part 14: Meteorological monitoring for ambient air quality monitoring applications*. Standards Australia, 2014.

AS/NZS 3580.15: 2014. *Methods for sampling and analysis of ambient air – Part 15: Determination of gaseous pollutants in ambient air using differential optical absorption spectrometry (DOAS) – Direct-reading instrumental method.* Standards Australia, 2014.

AS 3580.19: 2020. *Methods for sampling and analysis of ambient air – Ambient air quality data validation and reporting.* Standards Australia, 2020.

EPP (Air) 2019. *Environmental Protection (Air) Policy 2019.* Department of Environment and Science, 2019.

8 DEFINITIONS AND ACRONYMS

AS/NZS	Australian Standard / New Zealand Standard
DES	Department of Environment and Science
EA	Environmental Authority
EPP (Air)	Environmental Protection (Air) Policy 2019
GPS	Global Positioning System
ID	Identification Number
HVAS	High Volume Air Sampler
NATA	National Association of Testing Authorities
NEPM	National Environment Protection (Ambient Air Quality) Measure
PM	Particulate Matter
the Port	Port of Townsville Limited
TSP	Total Suspended Particulate Matter