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Northern Territory Air Monitoring Report 2011

Compliance with the National Environment Protection Measure (Ambient Air Quality)

Background

Clause 18 of the National Environment Protection (Ambient Air Quality) Measure (AAQ NEPM) requires jurisdictions to submit a report on their compliance with the AAQ NEPM for each calendar year. The content of the jurisdictional report is prescribed in clause 17 of the AAQ NEPM.

Consistent with the reporting period defined in the NEPM this report covers a calendar year ending on 31 December 2011. The report is based on Technical Paper No. 8 (Annual Reports) which details the format and data requirements of the Annual Report. It is a technical report to the National Environment Protection Council (NEPC) and supplements the annual summary report provided each year by each jurisdiction under the NEPC Act on the overall implementation process.

The report is divided into 4 sections:

Section A: Overview of the 2011 AAQ NEPM monitoring network and activities.

Section B: Assessment of compliance with the AAQ NEPM Standards and Goals.

Section C: Assessment of monitoring data against the standards.

Section D: Data analysis and trends.

This report is available on the DLPE website at: http://www.nt.gov.au/airquality and at the Australian Government Environment Protection and Heritage Council (EPHC) website at: http://www.ephc.gov.au/taxonomy/term/34

Section A – Overview of the 2011 AAQ NEPM monitoring network and activities

A.1 Monitoring Requirements

The results of air quality monitoring in 2000-2001 were used to determine the monitoring requirements for the Northern Territory over the longer term. This monitoring identified particles from landscape fires affecting the Darwin region as the primary air pollutant of concern in the Northern Territory. Analysis of the 2000-2001 against the AAQ NEPM standards indicated that nitrogen oxides, sulfur dioxide, carbon monoxide, ozone and lead aerosols were not a cause for concern in the Darwin/Palmerston region.

Since the initial monitoring in 2001 the population and industrial activity in Darwin has increased and more detailed air quality monitoring of airborne pollutants is required. In 2010 establishment and ongoing operation of a comprehensive air quality monitoring system for the Darwin region commenced. This was completed in July 2012 allowing for monitoring of particulates and other pollutants identified in the AAQ NEPM. The system consists of two monitoring stations, a performance monitoring station located near Palmerston and long term trend monitoring station located at the Bureau of Meteorology site in Winnellie. The majority of data used in this report is from the Palmerston station which has been operational since the beginning of 2011. The second station in Winnellie began operation in July 2012 and is expected to remain in operation at that site for the next ten years. Data from this station will be included in the 2012 AAQ NEPM report.

A.2 Current Monitoring Stations for the purposes of this report

During the reporting period there were two stations in operation in the Darwin /Palmerston conurbation.

Monitoring of all Air NEPM pollutants as well as collection of meteorological data was conducted at the Palmerston station. This station meets all siting and instrumentation requirements for reporting under the Air NEPM and is located in light bushland approximately 4km SW of Palmerston (Figure 1). Data from this station has been accredited by the National Association of Testing Authorities (NATA).

Monitoring for particulates was also conducted at Charles Darwin University, Casuarina, in the northern suburbs of Darwin (Figure 1). The area is entirely residential except for the University campus although the Darwin airport is located

about 4 km to the SSE. No NATA certified data is available from this station however the data has been validated to Australian Standards.

The Casuarina station comprises of a Lo-Vol Partisol Dichotomous sampler and a Tapered Element Oscillating Microbalance (TEOM). Instruments at this station do not meet a number of the siting compliance standards partly due to the location on the roof of adjacent two story buildings. The Lo-Vol Partisol Dichotomous sampler is not a designated Australian Standard instrument for particulate measurements. There is an historically good correlation with TEOM data at Casuarina suggesting the data is valuable and it is therefore provided in the current report.

It was originally intended that there would be two full Air NEPM air quality stations installed by the end of 2010 allowing for collection of comprehensive air quality data for both the Palmerston and Darwin air sheds over 2011. During 2011 and 2012 there were ongoing issues that delayed installation of the second station. This station was commissioned in mid 2012 and will supply data included the 2012 Air NEPM report.

A.3 Determination of Exposed Population for Each Performance Monitoring Station

The only areas in the Northern Territory that exceed the population threshold for ambient air quality monitoring of greater than 25,000 were the Darwin/Palmerston region 129,760 and Alice Springs 27,895 (ABS December 2011).

The major air pollutant of concern for Darwin and Palmerston is particles from bushfire smoke in the Dry season (April - October). Prevailing winds during the Dry season are South-Easterly to Easterly, causing the population of the region to be frequently exposed to particulate pollution from bushfires in surrounding areas.

Monitoring for particulates has been conducted at several sites in the Darwin / Palmerston region since 2002. There have been two periods in which particulate levels were monitored simultaneously at two sites. Results from simultaneous monitoring has shown that aside from spikes attributable to local fire events particulate levels are reasonably uniform across the region on a seasonal basis. This uniformity has also been confirmed by comparison of data across different sites in different years. As industrial development increases divergence in particulate and other pollutant levels may occur between sites.

Data from the Palmerston station used in this report is expected to provide a representative measure of air quality experienced by the general population of the Darwin/ Palmerston region.

Figure 1: Darwin/Palmerston region showing location of Casuarina, Palmerston and Winnellie monitoring station sites.

Table 1: Summary of station instrument siting compliance with AS 580.1.1.2007

Station	Location Category	Height above ground	Clear Sky Angle	Unrestricted airflow of 360º	20 m from trees	No boilers or incinerators nearby	Minimum distance from road or traffic
Palmerston DBE2	Bushland	4.5m	Yes	Yes	Yes	Yes	Yes
Casuarina TEOM	Residential / light industrial	No	Yes	Yes / Yes	No	Yes	Yes
Casuarina Dichotomous Partisol	Residential / light industrial	No	Yes	Yes / No	No	Yes	Yes

Table 2 – Ambient air quality station instrumentation

Palmerston				
Parameter	**Data available from (date)**	**Data available to (date)**	**Measurement instrument**	**Sampling frequency**
Particulate				
• PM_{10}	01/01/11	present	TEOM 1405D	continuous
• $PM_{2.5}$	01/01/11	present	TEOM 1405D	continuous
Gases				
• SO_2	01/01/11	present	Thermo Model 43i.	continuous
• NOx, NO, NO_2	01/01/11	present	Thermo Model 42i.	continuous
• O_3	01/01/11	present	Thermo Model 49i.	continuous
• CO	01/01/11	present	Thermo Model 48i.	Continuous
Meteorology (mast height: 10 m)				
• Wind direction	01/01/12	present	RM Young, model 85000.	continuous
• Wind speed	01/01/12	present	RM Young, model 85000.	continuous
• Temperature	01/01/12	present	RM Young, model 41382LC	continuous
• Humidity	01/01/12	present	RM Young, model 41382LC	continuous
Casuarina - particulates				
• PM_{10}	03/05/06	June 2012	Dichotomous Partisol –	24 hour

			Plus Model 2025 Sequential Air Sampler	
			PM10 inlet TEOM model 1400a	Continuous
• $PM_{2.5}$	03/05/06	June 2012	Dichotomous Partisol – Plus Model 2025 Sequential Air Sampler	24 hour
			PM10 inlet TEOM model 1400a	Continuous

A.4 Monitoring during the Reporting Period

Sampling for particulates was carried out at both the Palmerston and Casuarina monitoring stations while sampling for the other Air NEPM pollutants CO, NO_2, O_3, and SO_2, was only carried out at the Palmerston station. At Casuarina Monitoring for PM_{10} was undertaken using both a TEOM sampler and Partisol Dichotomous sampler, with the latter also monitoring $PM_{2.5}$. Sampling has been maintained for Partisol PM_{10} to enable comparison and as a contingency to TEOM sampling. Meteorological data collected at the Palmerston station will assist in analysis of pollution sources and behaviour.

A.5 Changes to the Approved Monitoring Plan

Under a Memorandum of Understanding between the Department of Natural Resources, Environment, the Arts and Sport (NRETAS) and Charles Darwin University (CDU), a particulate monitoring station operated at the university campus, Casuarina until July 2012. This MoU was amended to include management of the Winnellie and Palmerston stations in 2010 and will be reviewed in again at the end of 2012.

A.6 Unresolved Issues

There are no unresolved issues in the reporting period.

A.7 Status of NATA Accreditation

All data used in this report has been externally validated under the Aurecon Quality Management System to meet NATA requirements. NATA accreditation of the CDU laboratory and processes is yet to be finalised.

A.8 Methods Other than Physical Monitoring

No other methods were used in the reporting period.

Section B – Assessment of compliance with AAQ NEPM standards and goals

The following tables summarise compliance with the standards and goals of the AAQ NEPM. For each pollutant, the data availability (quarterly and annual), the number of days when standards were exceeded, the annual mean (where an annual standard exists) and an assessment of compliance are given.

Performance is assessed as not complying with the NEPM (i.e.'NOT MET') if there is more than the number of exceedances specified in Schedule 2 of the AAQ NEPM.

Standards and goals for pollutants in accordance with the Air NEPM are shown below.

Table 3: Air NEPM Standards

Pollutant	**Averaging period**	**Maximum (ambient) concentration**	**Goal within 10 years (maximum allowable exceedences**
Carbon monoxide	8 hour	9.0 ppm	1 day a year
Nitrogen dioxide	1 hour	0.12 ppm	1 day a year
	1 year	0.03 ppm	none
Photochemical oxidants (as ozone)	1 hour	0.10ppm	1 day a year
Sulfur dioxide	1 hour	0.20 ppm	1 day a year
	1 day	0.08 ppm	1 day a year
	1 year	0.02 ppm	none
Particles as PM_{10}	1 day	50 µg/m^3	5 days a year
Particles as PM2.5	1 day	25 µg/m^3	Advisory standard
	1 year	8 µg/m3	

CARBON MONOXIDE

Table 4: 2011 compliance summary for CO in the Northern Territory

AAQ NEPM Standard
9.0 ppm (8 hour average)

Region/ Performance monitoring station	Data Availability Rates (% of Days)					Number of exceedences (days)	Performance against the standard and goal
	Q1	Q2	Q3	Q4	Annual		
Palmerston DBE2	89	94	91	95	92	0	Met

NITROGEN DIOXIDE

Table 5: 2011 compliance summary for NO_2 in the Northern Territory

AAQ NEPM Standard
0.12 ppm (1 hour average)
0.03 ppm (1 year average)

Region/ Performance monitoring station	Data Availability Rates (% of Days)					Number of exceedences (days)	Annual mean (ppm)	Performance against the standard and goal	
	Q1	Q2	Q3	Q4	Annual			1h	1y
Palmerston DBE2	50	72	88	94	76*	0	0.0023	Met	Met

*Annual data capture rate is low due to instrument failure during January part of February and again in April.

OZONE

Table 6: 2011 compliance summary for Ozone in the Northern Territory

AAQ NEPM Standard
0.10 ppm (1 hour average)
0.08 ppm (4 hour average)

Region/ Performance monitoring station	Data Availability Rates (% of Days)					Number of exceedences (days)		Performance against the standard and goal	
	Q1	Q2	Q3	Q4	Annual	1 h	4 h	1h	4h
Palmerston DBE2	89	95	91	96	92.8	0	0	Met	Met

SULFUR DIOXIDE

Table 7: 2011 compliance summary for SO_2 in the Northern Territory

AAQ NEPM Standard
0.20 ppm (1 hour average)
0.08 ppm (24 hour average)
0.02 ppm (1 year average)

Region/ Performance monitoring station	Data Availability Rates (% of Days)					Number of exceedences (days)		Annual mean (ppm)	Performance against the standard and goal		
	Q1	Q2	Q3	Q4	Annual	1h	24h		1h	24h	1y
Palmerston DBE2	89	93	94	95	92.8	0	0	0.0074	Met	Met	Met

PARTICULATES PM_{10}

Table 8: 2011 compliance summary for PM_{10} in the Northern Territory

AAQ NEPM Standard
50 µg m^{-3} (24-hour average, 5 days/year)

Region/ Performance monitoring station	Data Availability Rates (% of Days)					Number of exceedences (days)	Performance against the standard and goal
	Q1	Q2	Q3	Q4	Annual		
Palmerston DBE2	90	99	96	97	96	3	Met
Casuarina TEOM	100	97	98	75	93	3	Met

PARTICULATES $PM_{2.5}$

Table 9: 2011 compliance summary for $PM_{2.5}$ in the Northern Territory

AAQ NEPM Advisory Standard
25 µg/m^3 (24-hour average)
8 µg/m^3 (1 year average)

Region/ Performance monitoring station	Data Availability Rates (% of Days)					Number of exceedences (days)	Annual average µg/m^3 (24 hour)	Performance against the standard and goal
	Q1	Q2	Q3	Q4	Annual			
Palmerston DBE2	92	98	97	97	96	15	9.97	Not met
Casuarina Partisol	10	82	14	14	30	10	12.3	Not met

Figure 2: $PM_{2.5}$ Palmerston and Casuarina

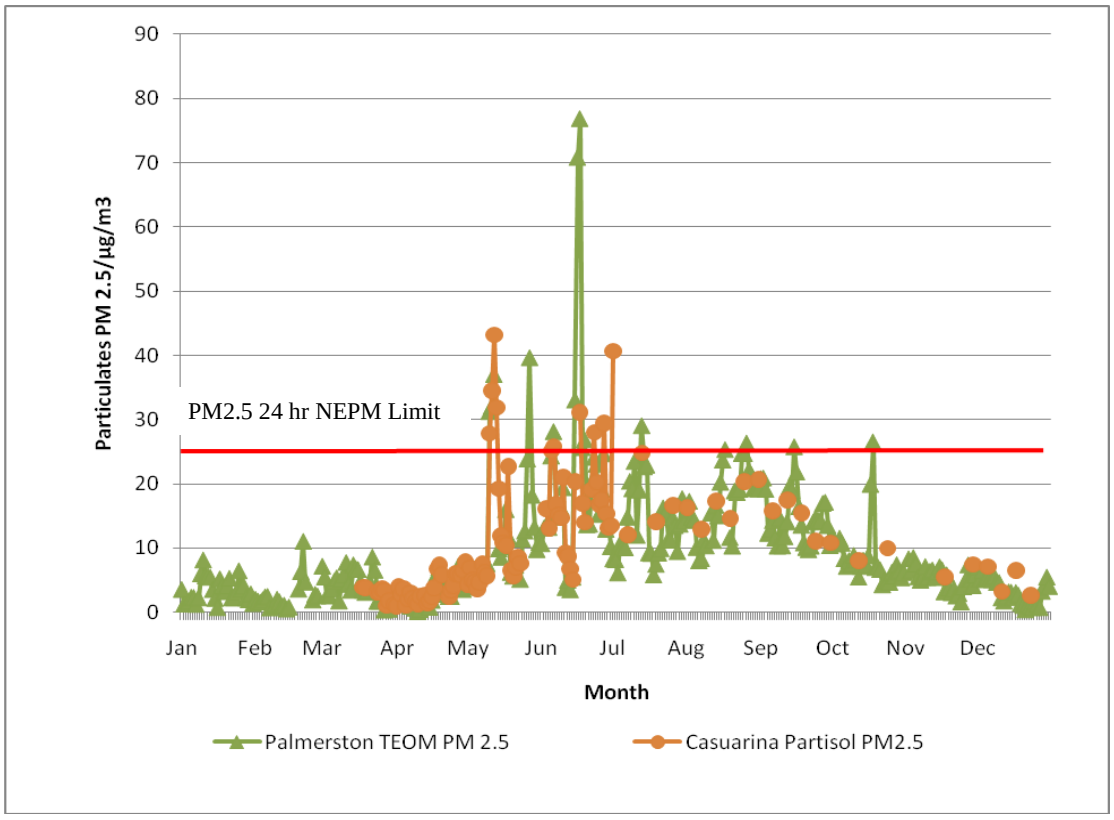

Figure 2 shows the close relationship in particulate levels across the darwin/palmerston region.

Figure 3: Palmerston Particulates

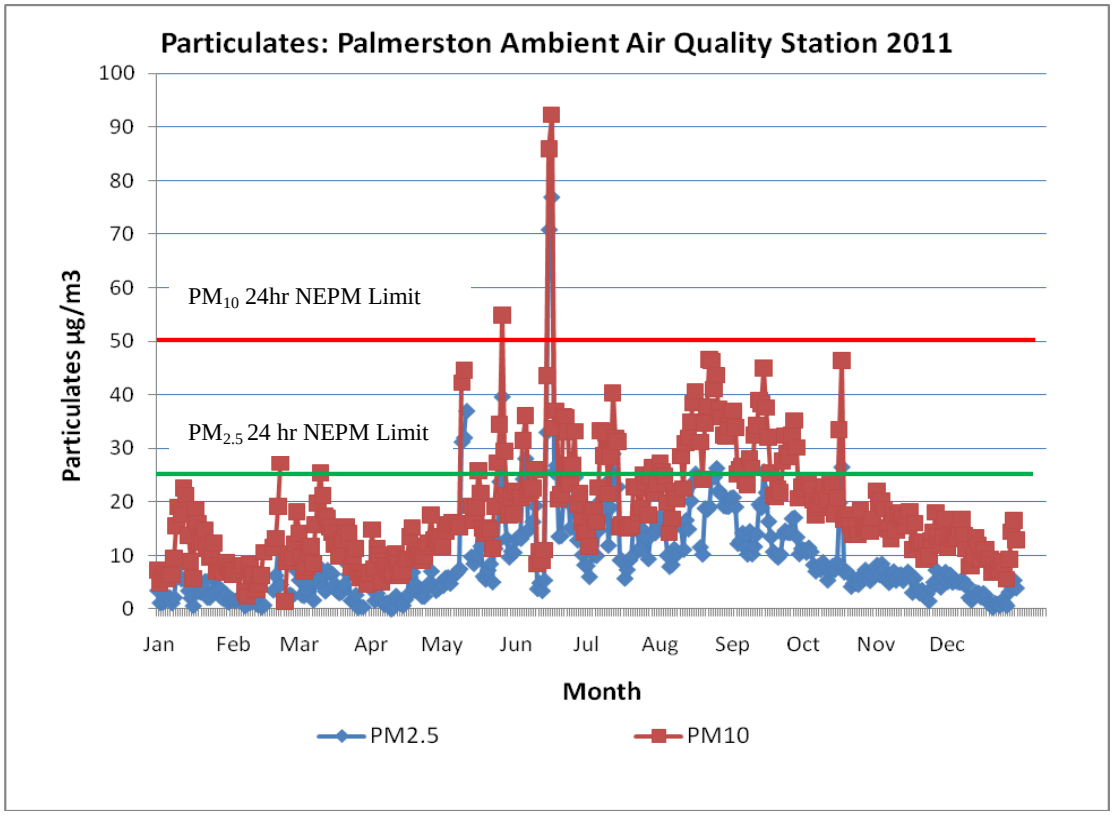

Figure 3 above demonstrates the relationship between $PM_{2.5}$ and PM_{10} both of which are associated with smoke from burning vegetation. The generally higher particulate levels during the dry season result from a combination of smoke from burning vegetation and increased dust released from the dryer landscape. Significant mid-year peaks in particulates are associated with large scale smoke plumes directed over the Darwin region by the seasonally prevailing south easterly winds.

Figure 4: PM_{10} Palmerston and Casuarina

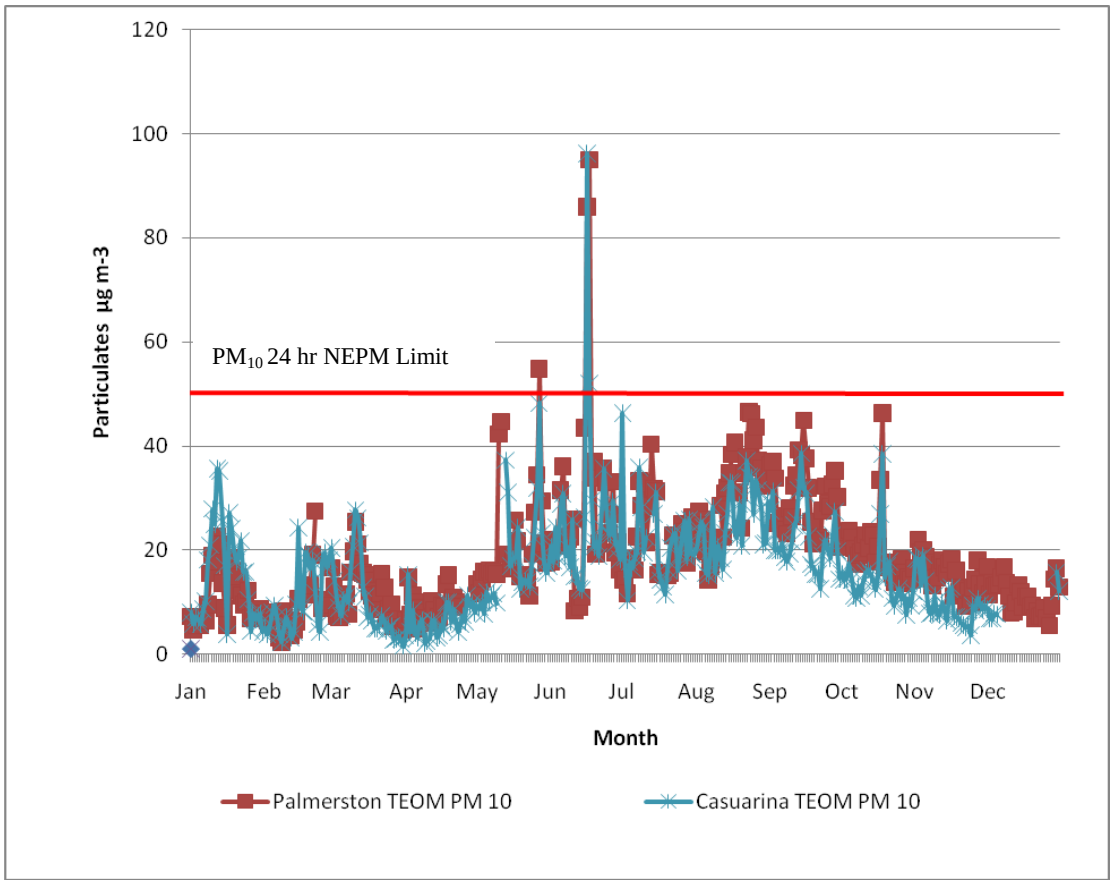

Figure 4 shows notable periods of elevated PM_{10} during the Wet season (January to March) when vegetation burning does not occur. This is consistent with periods of strong westerly winds that persist for several days and it is likely that these particulates are sea salt carried from the nearby harbour (Palmerston) and Arafura Sea (Casuarina). Literature review supports this view suggesting the particulates are associated with the coarse fraction. Typically there is not as significant and increase during the same period on the $PM_{2.5}$ chart.

Section C – Analysis of Air Quality Monitoring

Annual summary statistics are presented in this section. The AAQ NEPM states that the short-term standards should not be exceeded on more than one day for carbon monoxide, nitrogen dioxide, ozone and sulfur dioxide, or on more than five days per year for PM_{10}. In 2011 the only exceedences were for 24 hour concentrations of PM_{10}, however the advisory standard for $PM_{2.5}$ was also exceeded on both a daily and annual average. This is indicative of the high concentrations of particulates in the Darwin region during the dry season.

Table 10: 2011 summary statistics for daily peak 8 hour CO in the Northern Territory

AAQ NEPM Standard
9.0 ppm (8 hour average)

Region/ Performance monitoring station	Number of valid days	Highest (ppm)	Highest (date:hour)	2nd highest (ppm)	2nd Highest (date:hour)
Palmerston DBE2	**303**	0.0027	16/06/2011 00:00	0.01	01/02/2011 08:00

Table 11: 2011 summary statistics for daily peak 1 hour NO_2 in the Northern Territory

AAQ NEPM Standard
0.12 ppm (1 hour average)

Region/ Performance monitoring station	Number of valid days	Highest (ppm)	Highest (date:hour)	2nd highest (ppm)	2nd Highest (date:hour)
Palmerston DBE2	**278**	**42.92**	**17/06/2011 01:00**	**30.6**	17/06/2011 02:00

Table 12: 2011 summary statistics for daily peak 1 hour O_3 in the Northern Territory

AAQ NEPM Standard
0.10 ppm (1 hour average)

Region/ Performance monitoring station	Number of valid days	Highest (ppm)	Highest (date:hour)	2nd highest (ppm)	2nd Highest (date:hour)
Palmerston DBE2	**305**	**81.61**	15/08/2011 12:00	**81.59**	07/11/2011 11:00

Table 13: 2011 summary statistics for daily peak 4 hour O_3 in the Northern Territory

AAQ NEPM Standard
0.08 ppm (4 hour average)

Region/ Performance monitoring station	Number of valid days	Highest (ppm)	Highest (date:hour)	2nd highest (ppm)	2nd Highest (date:hour)
Palmerston DBE2	**305**	80.13	07/11/2011 12:00	76.61	07/11/2011 08:00

Table 14: 2011 summary statistics for 24 hour SO_2 in the Northern Territory

AAQ NEPM Standard
0.08 ppm (24 hour average)

Region/ Performance monitoring station	Number of valid days	Highest (ppm)	Highest (date)	2nd highest (ppm)	2nd Highest (date:hour)
Palmerston DBE2	**343**	0.0018	16/06/2011	0.0015	15/06/2011

Table 14: 2011 summary statistics for 24 hour PM_{10} in the Northern Territory

AAQ NEPM Standard
50 µg m^{-3} (24 hour average)

Region/ Performance monitoring station	Number of valid days	Highest (µg m^{-3})	Highest (date:hour)	2nd highest (µg m^{-3})	2nd Highest (date:hour)
Palmerston DBE2	**355**	**92.3**	**17/06/11**	**85.9**	**16/06/2011**
Casuarina TEOM	**336**	**96.2**	**16/06/11**	**52.0**	**17/06/11**

Table 15: 2011 summary statistics for 24 hour $PM_{2.5}$ in the Northern Territory

AAQ NEPM Advisory Standard
25 µg m^{-3} (24 hour average)

Region/ Performance monitoring station	Number of valid days	Highest (µg m^{-3})	Highest (date:hour)	2nd highest (µg m^{-3})	2nd Highest (date:hour)
Palmerston DBE2	**355**	**76.9**	**17/06/11**	**70.9**	**16/06/11**
Casuarina Partisol	**108**	**43.2**	**12/05/11**	**40.6**	**01/07/11**

Table 16: 2011 summary statistics for daily peak 4 hour O_3 in the Northern Territory

AAQ NEPM Standard
0.08 ppm (4 hour average)

Region/ Performance monitoring station	Number of valid days	Highest (ppm)	Highest (date:hour)	2nd highest (ppm)	2nd Highest (date:hour)
Palmerston DBE2	**305**	80.13	07/11/2011 12:00	76.61	07/11/2011 08:00

Section D - Data Analysis

Analysis of Exceedences and Progress in Achieving Air NEPM Goals

In general air quality in the Darwin region was good over 2011 with only Air NEPM parameters for PM_{10} and $PM_{2.5}$ having exceedences. There were 3 exceedences for PM_{10} which is below the NEPM standard of 5 exceednces per year. On 15 days and also on a yearly average $PM_{2.5}$ levels exceeded the advisory standard. Exceedences in both PM_{10} and $PM_{2.5}$ were primarily due to small scale localised burn offs near the stations and larger scale but more distant vegetation burn events occurring when meteorological conditions caused smoke to be pushed into the respective air sheds.

Analysis of particulate data from previous years is not available for the location of the current Palmerston station making useful comparison between this year and previous years difficult.

Particulates PM_{10}

Table 4: 2011 PM_{10} exceedences of NEPM reporting level at Palmerston TEOM

Date	TEOM PM_{10} m (µg m^{-3})	Inferred Cause
27 May	85.9	Smoke and dust
16 June	92.2	Smoke from localised fires
15 June	54.9	Smoke from localised fires

The two exceedences for PM_{10} in at both Palmerston and Casuarina are most likely related to localised vegetation burns and/or construction in the vicinity which required land clearing and potentially created elevated dust levels. The advisory standard for PM2.5 exceeded the annual averaged advisory level at both sites and there was also a high number of days above the daily advisory standard.

Daily exceedences could be attributed to localised burn off events in vegetation within fairly close proximity to the stations. A number of factors may have contributed to the higher yearly average for $PM_{2.5}$. Factors such as a higher number of fires in the region, stronger than average winds lifting dust, or coincidence between the timing of fire events and wind direction directing smoke plume across the stations.

Table 5: 2011 $PM_{2.5}$ exceedences of NEPM Advisory Standard at Palmerston TEOM

Date	TEOM $PM_{2.5}$ m (µg m^{-3})	Inferred Cause
10 May	31.24	Smoke and dust
11 May	32.03	Smoke and dust
12 May	37.02	Smoke and dust
15 May	33.03	Smoke and dust
27 May	39.65	Smoke and dust
6 June	28.12	Smoke and dust
16 June	70.87	Smoke from localised fires
17 June	76.93	Smoke from localised fires
18 June	25.59	Smoke and dust
19 June	26.85	Smoke and dust
13 July	29.03	Smoke and dust
17 August	25.31	Smoke and dust
26 August	26.33	Smoke and dust
15 September	25.74	Smoke and dust
18 October	26.53	Smoke and dust
Exceedence of NEPM Advisory Standard – Annual average $PM_{2.5}$ 8 µg m^{-3}		
Palmerston	9.2	Smoke and dust
Casuarina	*10.9	Smoke and dust

*due to low rates of data collection for PM2.5 at Casuarina this is invalid however it does correlate well with the valid Palmerston TEOM results

An advisory reporting standard has the same numerical value as a compliance standard but without an associated goal setting a timeframe for compliance. There is no timeframe set for compliance with these standards or an allowable number of exceedences. There is strong health evidence that PM2.5 poses a significant risk to human health and this remains a key driver for consideration of the need for compliance standards for this pollutant.

The elevated levels of particles in Darwin during the Dry season are predominantly due to bushfire smoke. There are no other significant source of particles affecting the region apart from localised impacts associated with land clearing and urban development. The overriding influence on levels of PM_{10} and $PM_{2.5}$ against the AAQ NEPM national standard and reporting level respectively are almost certainly from the interaction of smoke from landscape fires in the region and the prevailing wind conditions which are south-easterly and easterly during the Dry season.

Monitoring of particles will contribute towards development of NT Government air quality policy and provide the basis for the development of appropriate and effective management strategies aimed at ensuring the AAQ NEPM standards and goals are met in the future. Some preliminary work with Bushfires NT was done in .....(year) to investigate the possibility of limiting particulates impacting on population centres. Controlled burns present some opportunity for managing particulates. By timing the burn in consideration of wind direction and location it may be possible to reduce particulate levels in population centres. However control of particulates from large scale vegetation burning is difficult as vegetation fires are often started accidentally or by arson.

No monitoring has been undertaken in Alice Springs and compliance with the AAQ NEPM has not been demonstrated.

Section D – Data analysis and trends

Comparison with the previous annual reports suggests that this year the number of days with elevated particulate levels as well as the annual median were significantly higher than usual. In the case of $PM_{2.5}$ there was a very significant rise in the number of daily exceedences and the annual average particulate level.

The high number of daily exceedences and the exceedence of the annual advisory standard for $PM_{2.5}$ is most likely attributable to the higher than average incidence of landscape fires in the greater Darwin region. Data from Bushfires NT shows that during 2011 40% of the region likely to generate smoke effecting Darwin airshed burned as compared to 29% in 2010. While this increase in fire would have had some impact on $PM_{2.5}$ levels it does not completely explain the increase. In future air quality reports analysis of data on wind direction and strength will be used to assist in

further understanding the link between particulates and distant bushfires on the Darwin airshed.

It is not possible to accurately compare number of exceedences in the NT over time in accordance with AAQ NEPM technical requirements, as different sampling techniques have been used since monitoring began in 2002 (TEOM and Partisol) and instruments were located at different locations. Where possible, TEOM data is used for PM_{10} and Partisol data for $PM_{2.5}$ but anomalies include the following:

- 2004 where data collection for this project did not commence until the second quarter.
- 2004 and 2005 where the TEOM was located in Palmerston at the Charles Darwin University Palmerston campus.
- 2006 where TEOM data availability was below 75% for each quarter so Partisol data was used.
- 2009 where exceedences due to construction activity if not ignored would show PM_{10} at 9 and $PM_{2.5}$ at 5 exceedences. The dust produced from local activity and associated exceedences were not representative of the air in Casuarina and have been removed.
- 2010 where there is significant downtime especially with the Partisol and also TEOM instruments.

Table 9: Trends in percentiles of daily peak concentration (µg m^{-3}) PM_{10}, 2004-2011 (TEOM or dichotomous Partisol sampler for 2006)

AAQ NEPM standard
50 µg m^{-3} (24-hour average)

Year	Data Availability (% of days)	No. of exceedences (days)	Max. conc. µg m^{-3}
2004	*69%*	*1*	*53.7*
2005	98%	2	63.4
2006	97%	0	44.1
2007	95%	0	45.3
2008	97%	1	64.8
2009	90%	0	49.9
2010	78%	1	54.2
2011 (Palmerston)	96%	3	92.25
2011 (Casuarina)	93%	2	96.18

Note that data collection commenced in April 2004 Partisol PM_{10} data used for 2006 due to very poor data availability from TEOM PM_{10}

Table 10: Trends in percentiles of daily peak concentration (µg m^{-3}) $PM_{2.5}$, 2004-2011

AAQ NEPM reporting level

Year	Data Availability (% of days)	No. of exceedences (days)	Max. conc. µg m^{-3}
2004	*60%*	*5*	*36.5*
2005	98%	5	57.7
2006	97%	5	29.9
2007	*68%*	*4*	*47.7*
2008	*72%*	*2*	*31.5*
2009	87%	1	26.2
2010	*62%*	*2*	*29.9*
2011 (Palmerston)	96%	15	76.9

Note that data collection commenced in April 2004

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