



Air Noise Environment
Environmental Monitoring and Assessment

Ambient Air Quality Monitoring Report (January 2015)

Leighton Contractors Pty Limited

43 Stafford Road,

Kedron

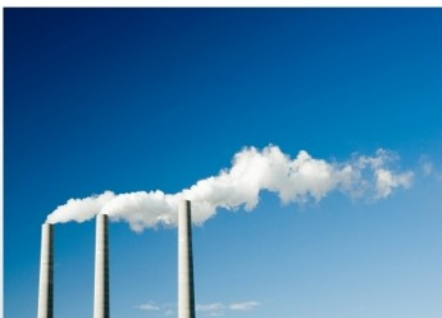
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Air Noise Environment

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The validity and comprehensiveness of supplied information has not been independently verified and, for the purposes of this report, it is assumed that the information provided to Air Noise Environment Pty Ltd for the purposes of this project is both complete and accurate.



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1 Introduction

Leighton Contractors Pty Limited commissioned Air Noise Environment Pty Ltd to undertake ambient air quality monitoring at 5 locations in proximity to the Airport Link project. The monitoring was undertaken as part of their requirements of the Conditions of Approval (“**the Conditions**”) issued by the Coordinator General in June 2007¹ for the project. Measured concentrations are compared to the criteria specified in Condition 19(k) of the Conditions.

Table 1.1 details the monitoring locations and the monitoring performed at each location. The data presented in this report is for monitoring completed during the period 1 January 2015 to 31 January 2015.

Table 1.1: Monitoring Locations and Parameters

Parameter	Monitoring Location				
	Station 1 (Aviation High School)	Station 2 (Kedron High School)	Station 3 (Lewis Street)	Station 4 (Airport Link Operations Centre)	Station 5 (Bryden Street)
Carbon Monoxide	X	X	X	X	X
Nitrogen oxide (NO) and Nitrogen Dioxide (NO ₂)	X	X	X	X	X
PM ₁₀ (Beta Attenuation Monitor)	X	X	X	X	X
PM _{2.5} (Beta Attenuation Monitor)	X	X ¹	X ²	X	X ²
Total Suspended Particulate (TSP)	X	X	X	X	X

¹ No data collected for Station 2 due to instrument fault caused by water damage.
² No data collected for Stations 3 and 5 due to instrument faults.

1 Coordinator-General's Report on the Environmental Impact Statement for the proposed Airport Link Project (July 2007)



2 Methodology

2.1 Monitoring Methodology

Table 2.1 below lists the methods used when completing the ambient air quality monitoring.

Table 2.1: Air Quality Monitoring Methodologies

Measurement Parameter	Method Equivalency
Carbon Monoxide	AS 3580.7.1-2011 Methods for sampling and analysis of ambient air - Determination of carbon monoxide - Direct-reading instrumental method AS 3580.7.1-2011/Amdt 1-2012 Methods for sampling and analysis of ambient air - Determination of carbon monoxide - Direct-reading instrumental method
Nitrogen oxide (NO) and nitrogen dioxide (NO ₂)	AS 3580.5.1-2011 Methods for sampling and analysis of ambient air - Determination of oxides of nitrogen - Direct-reading instrumental method
PM ₁₀ (Beta Attenuation Monitor)	AS/NZS 3580.9.11:2008 Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM ₁₀ beta attenuation monitors AS/NZS 3580.9.11:2008/Amdt 1:2009 Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM ₁₀ beta attenuation monitors
PM _{2.5} (Beta Attenuation Monitor)	USEPA Federal Equivalence Method for Continuous Monitoring of PM _{2.5} (EQPM 0308-170)
Total Suspended Particulate (TSP) (High Volume Air Sampler)	AS/NZS 3580.9.3:2003 Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - Total suspended particulate matter (TSP) - High volume sampler gravimetric method

2.2 Laboratory Analysis

Table 2.2 provides a list of the NATA accredited laboratory that performed the applicable analysis for the high volume sampler monitoring.

Table 2.2: Table of NATA Accredited Laboratory with NATA Accreditation Number

Measurement Parameter	NATA Accredited Laboratory
Total Suspended Particulate (TSP) (High Volume Air Sampler)	Air Noise Environment Pty Ltd - 15841



3 Results

3.1 Monitoring Locations

Table 3.1 identifies the locations of each of the five ambient air quality monitoring stations.

Table 3.1: Monitoring Station Locations

Station	Description	Latitude	Longitude
Station 1	Aviation High School Car Park	-27.412919°	153.063354°
Station 2	Kedron High School Ovals	-27.413204°	153.038291°
Station 3	Lewis Street	-27.410987°	153.055050°
Station 4	Airport Link Operations Centre	-27.412007°	153.032864°
Station 5	Bryden Street	-27.439607°	153.034940°

3.2 Nitrogen Dioxide

Table 3.2 and Figure 3.1 presents a summary of 1 hour average nitrogen dioxide concentrations measured during the period 1 January 2015 to 31 January 2015. The monitoring results presented in Table 3.2 confirm that compliance with the air quality criteria provided in Condition 19(k) of the Conditions for the Airport Link project was achieved for this period.

Table 3.2: Summary of 1 Hour Average Nitrogen Dioxide Concentration (ppb)

Station	Maximum	Average	95 th Percentile	90 th Percentile	75 th Percentile	50 th Percentile	Number of Exceedences
Station 1	14.3	2.0	8.3	7.2	4.1	1.2	0
Station 2	25.6	6.2	12.6	10.9	7.8	5.2	0
Station 3	13.3	4.3	8.7	7.9	5.9	3.8	0
Station 4	16.8	3.3	9.9	8.4	5.5	2.6	0
Station 5	19.8	5.1	10.6	8.9	6.5	4.4	0

Coordinator General's Conditions of Approval Criteria = 120 ppb (0.12 ppm)

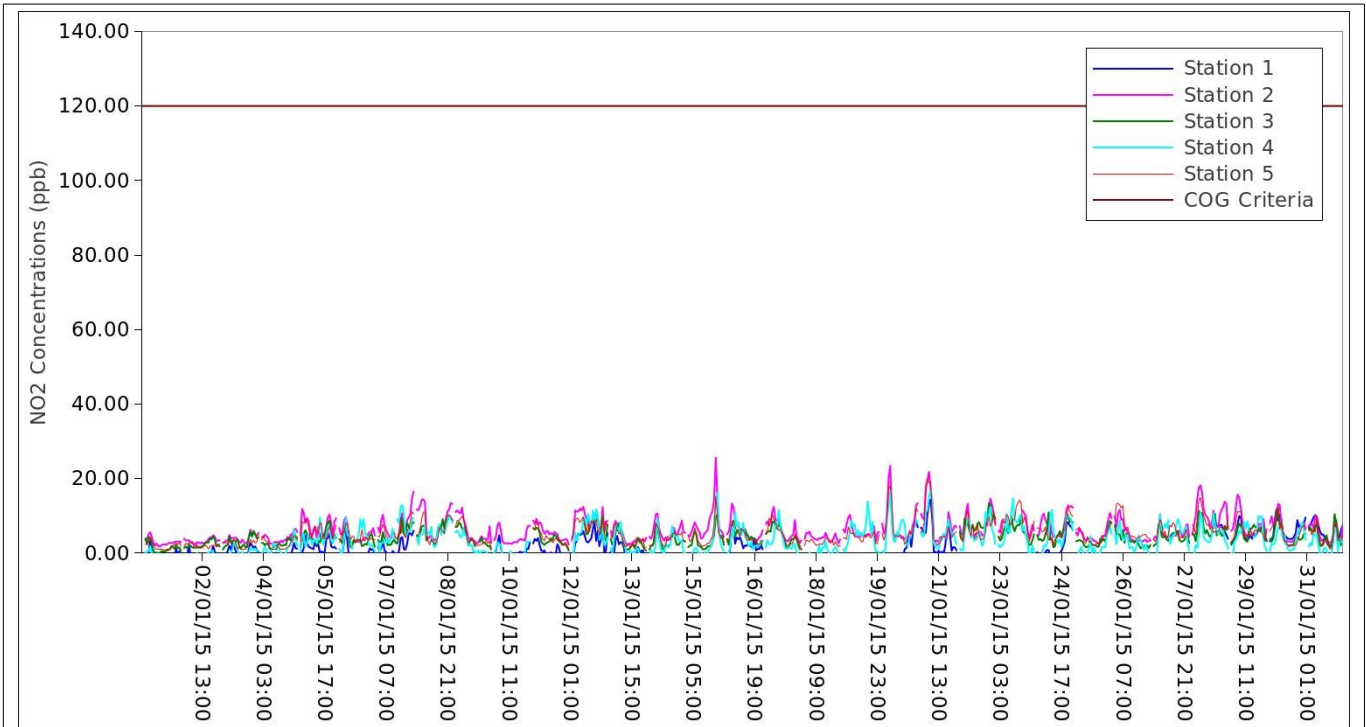


Figure 3.1: 1 hour average NO₂ concentrations (ppb)

Coordinator General's Conditions of Approval Criteria = 0.12 ppm (120 ppb)



3.3 Carbon Monoxide

Table 3.3 and Figure 3.2 presents a summary of 8 hour average carbon monoxide concentrations measured during the period 1 January 2015 to 31 January 2015. The monitoring results presented in Table 3.3 confirm that compliance with the air quality criteria provided in Condition 19(k) of the Conditions for the Airport Link project was achieved for this period.

Table 3.3: Summary of 8 Hour Average Carbon Monoxide Concentration (ppb)

Station	Maximum	Average	95 th Percentile	90 th Percentile	75 th Percentile	50 th Percentile	Number of Exceedences
Station 1	309.2	175.5	248.5	226.2	193.9	169.8	0
Station 2	788.6	379.3	558.1	516.0	458.0	397.2	0
Station 3	497.7	278.3	404.8	368.4	328.9	277.5	0
Station 4	472.6	294.9	418.5	393.0	336.3	294.1	0
Station 5	348.1	237.6	331.1	319.0	284.9	245.5	0

Coordinator General's Condition of Approval Criteria = 8000 ppb (8 ppm)

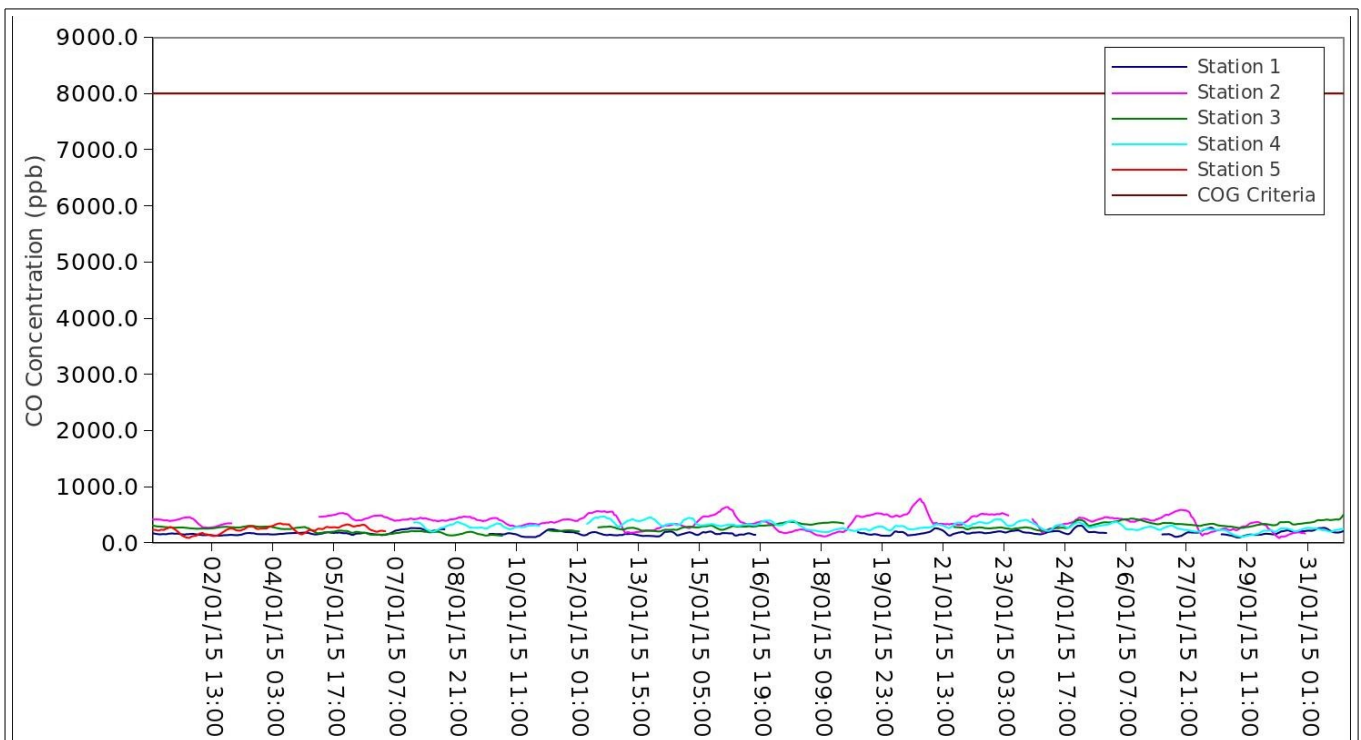


Figure 3.2: 8 hour average CO concentrations (ppb)

Coordinator General's Conditions of Approval Criteria = 8 ppm (8000 ppb)



3.4 PM_{2.5}

Table 3.4 and Figure 3.3 presents a summary of 24 hour average PM_{2.5} concentrations measured during the period 1 January 2015 to 31 January 2015. The monitoring results presented in Table 3.4 confirm that compliance with the air quality criteria provided in Condition 19(k) of the Conditions for the Airport Link project was achieved for this period.

Table 3.4: Summary of 24 Hour Average PM_{2.5} Concentration (µg/m³)

Station	Maximum	Average	95 th Percentile	90 th Percentile	75 th Percentile	50 th Percentile	Number of Exceedences
Station 1	5.0	2.0	4.6	3.7	4.5	3.4	0
Station 2 ¹	-	-	-	-	-	-	-
Station 3 ²	-	-	-	-	-	-	-
Station 4	10.4	2.4	7.7	6.3	5.1	5.9	0
Station 5 ²	-	-	-	-	-	-	-

Coordinator General Criteria = 25 µg/m³

¹No data collected for Station 2 due to instrument fault caused by water damage.

²No data collected for Stations 3 and 5 due to instrument faults.

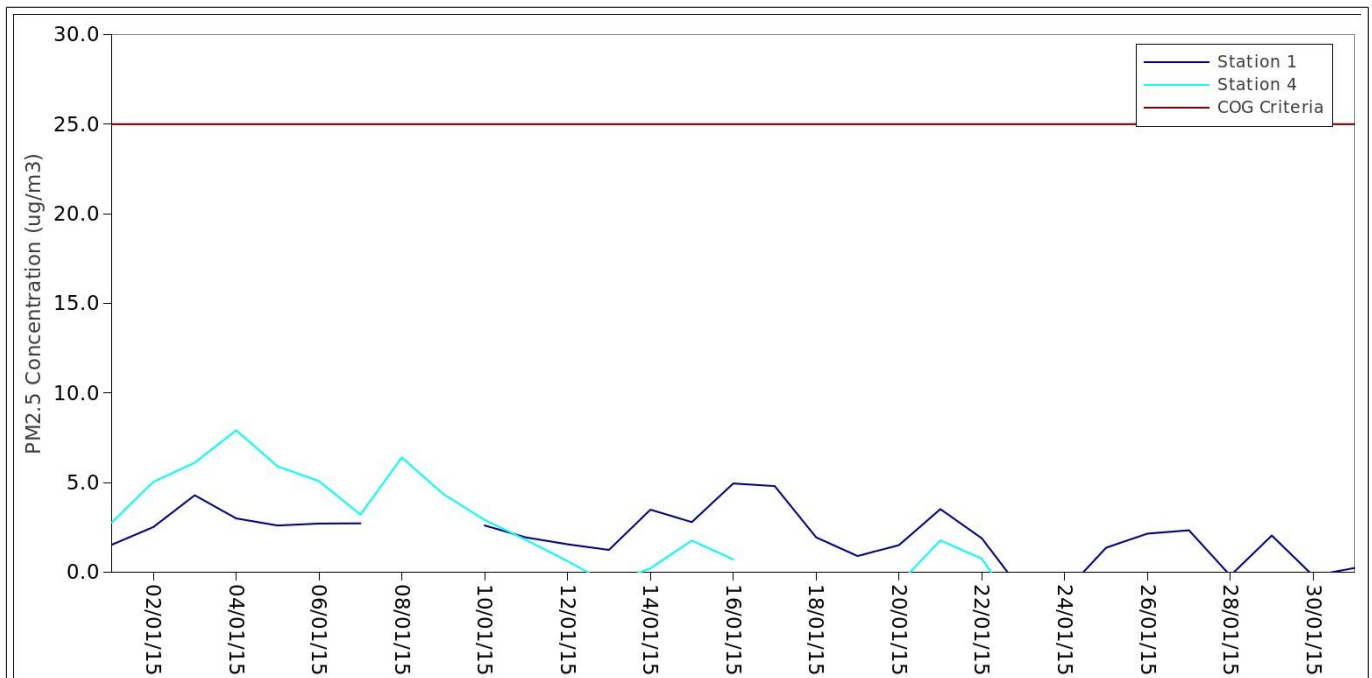


Figure 3.3: 24 hour average PM_{2.5} concentrations (µg/m³)

Coordinator General's Conditions of Approval Criteria = 25 µg/m³



3.5 PM₁₀

Table 3.5 and Figure 3.4 presents a summary of 24 hour average PM₁₀ concentrations measured during the period 1 January 2015 to 31 January 2015. The monitoring results presented in Table 3.5 confirm that compliance with the air quality criteria provided in Condition 19(k) of the Conditions for the Airport Link project was achieved for this period.

Table 3.5: Summary of 24 Hour Average PM₁₀ Concentration (µg/m³)

Station	Maximum	Average	95 th Percentile	90 th Percentile	75 th Percentile	50 th Percentile	Number of Exceedences
Station 1	16.6	10.5	15.4	13.7	11.9	10.4	0
Station 2	21.0	13.5	18.7	17.3	14.6	13.6	0
Station 3	20.2	12.3	18.5	17.5	15.1	13.3	0
Station 4	21.6	10.6	16.8	15.0	13.1	10.6	0
Station 5	25.5	15.2	22.9	21.8	18.5	15.6	0

Coordinator General's Approval Condition Criteria = 50 µg/m³

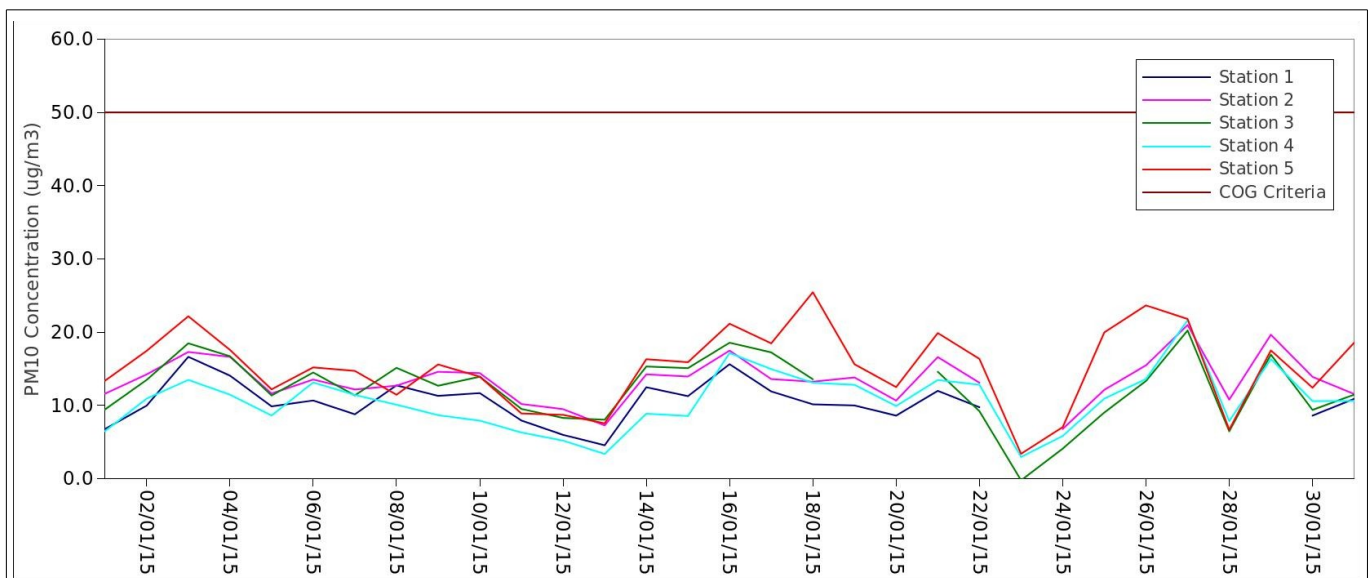


Figure 3.4: 24 hour average PM₁₀ concentrations (µg/m³)

Coordinator General's Conditions of Approval Criteria = 50 µg/m³



3.6 Total Suspended Particulate

Table 3.6 presents a summary of 24 hour average total suspended particulate concentrations measured during the period 1 January 2015 to 31 January 2015. Total suspended particulates are presented on a 1 day in 6 cycle as was required for the project.

Table 3.6: Summary of 24 Hour Average Total Suspended Particulate Concentrations ($\mu\text{g}/\text{m}^3$)

Station	Maximum	Average
Station 1	32.2	26.4
Station 2	53.2	33.9
Station 3	30.8	24.8
Station 4	35.7	28.4
Station 5	34.6	25.8

Table 3.7 presents a summary of annual average TSP concentrations for the period 31 January 2014 to 31 January 2015. The monitoring results presented in Table 3.7 confirm that compliance with the air quality criteria provided in Condition 19(k) of the Conditions for the Airport Link project was achieved for this period.

Table 3.7: Summary of Annual Average Total Suspended Particulate Concentrations ($\mu\text{g}/\text{m}^3$)

Station	Average
Station 1	28.5
Station 2	28.3
Station 3	26.0
Station 4	29.2
Station 5	26.7

Coordinator General's Conditions of Approval Annual Average Criteria = $90 \mu\text{g}/\text{m}^3$



4 Data Outages

Table 4.1 presents a summary of data outages where the data loss occurred for longer than 8 consecutive hours.

Table 4.1: Summary of Data Outages

Station	Date	Channels	Reason for Outage
1	08/01/2015 12:00 - 09/01/2015 13:00	CO	High rack temperature
	16/01/2015 16:00 - 19/01/2015 02:00	CO	Instrument fault
	25/01/2015 18:00 - 27/01/2015 00:00	CO	Instrument fault
	08/01/2015 01:00 - 10/01/2015 02:00	NO ₂	High rack temperature/Calibration drift
	14/01/2015 01:00 - 16/01/2015 02:00	NO ₂	Calibration drift
	17/01/2015 01:00 - 20/01/2015 15:00	NO ₂	Calibration drift
	22/01/2015 01:00 - 24/01/2015 02:00	NO ₂	Calibration drift
	25/01/2015 01:00 - 28/01/2015 14:00	NO ₂	Calibration drift
	08/01/2015 11:00 - 09/01/2015 14:00	PM _{2.5}	High rack temperature
	08/01/2015 13:00 - 09/01/2015 14:00	PM ₁₀	High rack temperature
	23/01/2015 08:00 - 29/01/2015 14:00	PM ₁₀	Flow sensor failure
2	03/01/2015 01:00 - 05/01/2015 02:00	CO	Calibration drift
	23/01/2015 06:00 - 23/01/2015 16:00	CO	Power failure
	23/01/2015 06:00 - 23/01/2015 17:00	NO ₂	Power failure
	01/01/2015 00:00 - 01/02/2015 00:00	PM _{2.5}	Water damage
	23/01/2015 06:00 - 23/01/2015 18:00	PM ₁₀	Power failure
3	01/01/2015 00:00 - 01/02/2015 00:00	PM _{2.5}	Instrument fault
	10/01/2015 01:00 - 11/01/2015 02:00	CO, NO ₂	Maintenance
	12/01/2015 01:00 - 12/01/2015 09:00	CO, NO ₂	Maintenance
	18/01/2015 22:00 - 21/01/2015 14:00	CO	Power failure
	18/01/2015 01:00 - 22/01/2015 02:00	NO ₂	Power failure/Calibration drift
	18/01/2015 22:00 - 20/01/2015 17:00	PM ₁₀	Power failure
4	01/01/2015 00:00 - 07/01/2015 14:00	CO	Instrument fault
	11/01/2015 01:00 - 12/01/2015 02:00	CO, NO ₂	Maintenance
	26/01/2015 01:00 - 26/01/2015 12:00	PM _{2.5}	Flow fault



Station	Date	Channels	Reason for Outage
	28/01/2015 16:00 - 01/02/2015 00:00	PM _{2.5}	Background cycle
5	07/01/2015 01:00 - 01/02/2015 00:00	CO	Instrument fault
	10/01/2015 01:00 - 11/01/2015 02:00	NO ₂	Maintenance
	01/01/2015 00:00 - 01/02/2015 00:00	PM _{2.5}	Instrument fault



5 Spreadsheet Data

Attached to this document is a spreadsheet file (.xls) containing all valid data for the period 1 January 2015 to 31 January 2015. Data that has failed Quality Assurance checks is not included in the spreadsheets.

The file(s) contains the following data:

Sheet List in File

- Sheet 1Hr - Hourly Data
 - Column A - Date / Time
 - Column B - Station 1 - CO (ppb)
 - Column C - Station 1 - NO (ppb)
 - Column D - Station 1 - NO₂ (ppb)
 - Column E - Station 1 - NO_x (ppb)
 - Column F - Station 1 - PM_{2.5} (µg/m³)
 - Column G - Station 1 - PM₁₀ (µg/m³)
 - Column H - Station 2 - CO (ppb)
 - Column I - Station 2 - NO (ppb)
 - Column J - Station 2 - NO₂ (ppb)
 - Column K - Station 2 - NO_x (ppb)
 - Column L - Station 2 - PM_{2.5} (µg/m³)
 - Column M - Station 2 - PM₁₀ (µg/m³)
 - Column N - Station 3 - CO (ppb)
 - Column O - Station 3 - NO (ppb)
 - Column P - Station 3 - NO₂ (ppb)
 - Column Q - Station 3 - NO_x (ppb)
 - Column R - Station 3 - PM_{2.5} (µg/m³)
 - Column S - Station 3 - PM₁₀ (µg/m³)
 - Column T - Station 4 - CO (ppb)
 - Column U - Station 4 - NO (ppb)
 - Column V - Station 4 - NO₂ (ppb)
 - Column W - Station 4 - NO_x (ppb)
 - Column X - Station 4 - PM_{2.5} (µg/m³)



- Column Y – Station 4 – PM₁₀ (µg/m³)
- Column Z – Station 5 - CO (ppb)
- Column AA – Station 5 – NO (ppb)
- Column AB – Station 5 - NO₂ (ppb)
- Column AC – Station 5 - NO_x (ppb)
- Column AD – Station 5 – PM_{2.5} (µg/m³)
- Column AE – Station 5 – PM₁₀ (µg/m³)

- Sheet 8Hr – Rolling 8 Hour Average Data
 - Column A – Date / Time
 - Column B – Station 1 - CO (ppb)
 - Column C – Station 2 - CO (ppb)
 - Column D – Station 3 - CO (ppb)
 - Column E – Station 4 - CO (ppb)
 - Column F – Station 5 - CO (ppb)

- Sheet 24Hr – Daily Average Data
 - Column A – Date / Time
 - Column B – Station 1 – PM_{2.5} (µg/m³)
 - Column C – Station 1 – PM₁₀ (µg/m³)
 - Column D – Station 1 – TSP (µg/m³)
 - Column E – Station 2 – PM_{2.5} (µg/m³)
 - Column F – Station 2 – PM₁₀ (µg/m³)
 - Column G – Station 2 – TSP (µg/m³)
 - Column H – Station 3 – PM_{2.5} (µg/m³)
 - Column I – Station 3 – PM₁₀ (µg/m³)
 - Column J – Station 3 – TSP (µg/m³)
 - Column K – Station 4 – PM_{2.5} (µg/m³)
 - Column L – Station 4 – PM₁₀ (µg/m³)
 - Column M – Station 4 – TSP (µg/m³)
 - Column N – Station 5 – PM_{2.5} (µg/m³)



- Column O – Station 5 – PM₁₀ (µg/m³)
- Column P – Station 5 – TSP (µg/m³)

Averaging times are reported for the start of the time period, i.e. the hourly average 04:00 is for the data collected for the five minute sample periods with start times from 04:00 am to 04:55 am. All average data has been calculated from 5 minute continuous data.

The data between 01:00 am and 02:00 am is not recorded. During this hour the daily zero and span checks are performed by the instruments.



Appendix A – Glossary of Terms



APPENDIX A: GLOSSARY OF TERMS

<	The analytes tested for were not detected; the value stated is the reportable limit of detection
µg	Micrograms (10 ⁻⁶ grams)
Am ³	Gas volume in cubic metres at measured conditions
AS	Australian Standard
g	grams
kg	kilograms
m	metres
m ³	Cubic Metres, actual gas volume in cubic metres as measured
mb	Millibars
mg	Milligrams
min	Minute
mg/m ³	Milligrams (10 ⁻³) per cubic metre
Mole	SI Unit defined as an amount of a substance that contains as many elementary entities (e.g. atoms, molecules, ions, electrons) as there are atoms in 12 grams of pure Carbon-12 (¹² C)
N/A	Not Applicable
ng	Nanograms (10 ⁻⁹ grams)
°C	Degrees Celsius
µg/m ³	Micrograms (10 ⁻⁶) per cubic metre. Conversions from µg/m ³ to parts per volume concentrations (ie, ppb) are calculated at 25 °C
ppb / ppm	Parts per billion / million
PM	Particulate Matter
PM ₁₀ , PM _{2.5} , PM ₁	Fine particulate matter with an equivalent aerodynamic diameter of



APPENDIX A: GLOSSARY OF TERMS

	less than 10, 2.5 or 1 micrometres respectively. Fine particulates are predominantly sourced from combustion processes. Vehicle emissions are a key source in urban environments
sec	Second
Sm ³	Standardised Cubic Metres - Gas volume in dry cubic metres at standard temperature and pressure (0°C and 101.3 kPa) and corrected to a standardised value (e.g. 7% O ₂)
STP	Standard Temperature and Pressure (0°C and 101.3 kPa)
TSP	Total Suspended Particulate
TVOC	Total Volatile Organic Compounds. These compounds can be both toxic and odorous