Transfield Services Limited

Eastlink Ambient Air Quality Monitoring System Report

1st January 2011 – 31st March 2011

Report issue date: 14th April 2011

Maintenance contract: MC621

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Revision History

Report	Revision	Date	Analyst
DAT5011	0	14/04/11	DD

Report by David Ding (name) David Ding (signature)

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1.0 Executive Summary

EastLink is a motorway, which runs between Donvale in Melbourne's north east, to Frankston in the south-east of Melbourne. Transfield services are responsible for the operation and maintenance of the 39 kilometre road and have commissioned Ecotech P/L to monitor the ambient air quality outside the two Eastlink tunnels and provide maintenance and reporting services. CO, NOx and particulate data are monitored, along with meteorological data. Monitoring of these parameters allows any changes in the ambient air quality to be quickly identified and recorded.

The three ambient Eastlink sites are located around the north east end of the Eastlink freeway at Chaim Crt, Craig Rd and Heads Rd. Ecotech P/L commenced monitoring of these sites on June 16th 2010.

The overall percentage availability at Chaim Crt and Craig Rd was above 95% for the reporting period. At Heads Rd, the overall percentage availability fell below this threshold at 94%.

No readings over the State Environmental Planning Policy (MARP) intervention levels were recorded during the reporting period.

2.0 Introduction

Ecotech P/L was commissioned by Transfield Services to provide monitoring and data reporting for the Eastlink ambient air quality monitoring network, located as detailed in Table 1. Ecotech commenced data collection from the Eastlink network on the 16th June 2010.

This report presents the data for the period January to March 2011.

The data presented in this report:

- Describes air quality measurements
- Compares monitoring results
- Has been quality assured
- Complies with NATA accreditation requirements, where applicable

3.0 Monitoring and Data Collection

The Eastlink monitoring network consists of three ambient air quality monitoring stations. Station locations and parameters monitored are described below.

Table 1: Eastlink monitoring network sites geographical co-ordinates

Site Name	Geographical Coordinates
Chaim Crt	37°48'30.55"S, 145°12'36.59"E
Craig Rd	37°48'7.85"S, 145°12'24.14"E
Heads Rd	37°48'7.39"S, 145°11'43.50"E

A siting audit conducted on 17 June 2010 showed that the siting of the Chaim Crt and Craig Rd sites complies with *AS/NZS 3580.1.1:2007 Methods for sampling and analysis of ambient air*. The Heads Rd site does not comply with the above standard as the monitoring equipment is situated too close to trees.

These sites are classified as neighbourhood stations according to *AS/NZS 3580.1.1:2007 Methods for sampling and analysis of ambient air*.

3.1 Station Parameters

The Eastlink monitoring stations are equipped to measure the following parameters:

Table 2: Parameters measured at the Eastlink ambient monitoring sites

Station	Parameter Measured	Instrument
Chaim Crt	NO, NO_2, NO_x	Ecotech EC9841
	CO	Ecotech EC9830
	PM_{10}	Rupprecht & Patashnick TEOM
	$PM_{2.5}$	Rupprecht & Patashnick TEOM FDMS
	Wind Speed	Vaisala WS425
	Wind Direction	Vaisala WS425
	Ambient Temperature	Vaisala HMP45A
	Relative Humidity	Vaisala HMP45A
	Solar Radiation	Middleton Solar Pyranometer SK-01-D2
Craig Rd	NO, NO_2, NO_x	Ecotech EC9841
	CO	Ecotech EC9830
	PM_{10}	Rupprecht & Patashnick TEOM
	Wind Speed	Vaisala WS425
	Wind Direction	Vaisala WS425
	Ambient Temperature	Vaisala HMP45A
	Relative Humidity	Vaisala HMP45A
Heads Rd	NO, NO_2, NO_x	Ecotech EC9841
	CO	Ecotech EC9830
	PM_{10}	Rupprecht & Patashnick TEOM
	Wind Speed	Vaisala WS425
	Wind Direction	Vaisala WS425
	Ambient Temperature	Vaisala HMP45A
	Relative Humidity	Vaisala HMP45A

3.2 Data Collection Methods

The following methods are used for data collection:

Table 3: Methods

Parameter Measured	Method	Description
NO, NO_2, NO_x	AS 3580.5.1-1993	Methods for sampling and analysis of ambient air. Method 5.1: Determination of oxides of nitrogen – Chemiluminescence method
CO	AS 3580.7.1-1993	Methods for sampling and analysis of ambient air. Method 7.1: Determination of carbon monoxide – Direct-reading instrumental method
PM_{10} (TEOM)	AS 3580.9.8-2008	Methods for sampling and analysis of ambient air. Method 9.8: Determination of suspended particulate matter - PM_{10} continuous direct mass method using a tapered element oscillating microbalance analyser.
$PM_{2.5}$ (TEOM FDMS)	In-house method 7.3	In-house Method 7.3: Determination of suspended particulate matter – PM_{10} and $PM_{2.5}$ continuous direct mass method using a tapered element oscillating microbalance analyser.
Wind Speed	AS 2923-1987	Ambient Air – Guide for measurement of horizontal wind for air quality applications
Wind Direction	AS 2923-1987	Ambient Air – Guide for measurement of horizontal wind for air quality applications

Table 3: Methods (continued)

Parameter Measured	Method	Description
Sigma	AS 2923-1987	Ambient Air – Guide for measurement of horizontal wind for air quality applications
Ambient Temperature	US EPA 454/R-99-005	Meterological Monitoring Guidance for Regulatory Modeling Applications
Relative Humidity	US EPA 454/R-99-005	Meterological Monitoring Guidance for Regulatory Modeling Applications
Solar Radiation	US EPA 454/R-99-005	Meterological Monitoring Guidance for Regulatory Modeling Applications

Note: The horizontal wind sensor sitting does not meet the AS2923 requirements.

3.2.1 Data Acquisition

Data acquisition is done using a PC based WinAQMS logger (using WinCollect® Version 4.0 & WinAQMS® Version 2.0) situated at each of the three monitoring sites; Chaim Crt, Craig Rd and Heads Rd. Each logger is equipped with a 3G modem for remote data collection. The recorded data is remotely collected from the AQMS loggers on a daily basis and stored at Ecotech's Environmental Reporting Services (ERS) department in Melbourne. Data samples are logged in 5 minute intervals.

3.3 Data Validation and Reporting

3.3.1 Validation

The Ecotech ERS department perform 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 operator, and the validation is reviewed. All data is checked and graphs and reports are generated based on the verified 5 minute data.

3.3.2 Reporting

The reported data is in 3 Microsoft Excel format files named *"Chaim Crt Data Report Jan_Mar11.xls", "Craig Rd Data Report Jan_Mar11.xls"* and *"Heads Rd Data Report Jan_Mar11.xls".*

Each Excel file consists of 4 Excel spreadsheets:

1. Cover
2. 1 Hour Data
3. 24 Hour Data
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 the 5 minute data.

Averaging times 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.

4.0 Air Quality Goals

The air quality goal requirements for particulates at the Eastlink monitoring network sites are shown below.

Table 4: MARP Schedule B Intervention Levels

Parameter	Time Period	Intervention Level	Units
NO_2	1 hour	140	ppb
CO	1 hour	29	ppm
PM_{10}	24 hour	60	$\mu g/m^3$
$PM_{2.5}$	24 hour	36	$\mu g/m^3$

5.0 Calibrations and Maintenance

5.1 Units and Uncertainties

The uncertainties for each parameter have been determined by the manufacturers tolerance limits of the equipment's parameters, and by the applicable Australian Standard.

Table 5: Units and Uncertainties

Parameter	Units	Resolution	Uncertainty	Range
NO	ppb	1 ppb	± 14 ppb K factor of 2.01	0 ppb to 500 ppb
NO_2	ppb	1 ppb	± 16 ppb K factor of 2.01	0 ppb to 500 ppb
NO_x	ppb	1 ppb	± 14 ppb K factor of 2.01	0 ppb to 500 ppb
CO	ppm	0.1 ppm	± 1.1 ppm K factor of 2	0 ppm to 50 ppm

Table 5: Units and Uncertainties (continued)

Parameter	Units	Resolution	Uncertainty	Range
PM_{10} (TEOM)	$\mu g/m^3$	0.1 $\mu g/m^3$	±5.0 $\mu g/m^3$ or 3.6% of reading, whichever is the greater K factor of 1.96	0 $\mu g/m^3$ to several g/m^3
$PM_{2.5}$ (TEOM FDMS)	$\mu g/m^3$	0.1 $\mu g/m^3$	±5.0 $\mu g/m^3$ or 3.6% of reading, whichever is the greater K factor of 1.96	0 $\mu g/m^3$ to several g/m^3
Vector Wind Speed	m/s	0.1 m/s	±0.22 m/s or 3.0% of reading, whichever is greater K factor of 1.96	0 m/s to 15 m/s
Vector Wind Direction	Deg (°)	1°	±4.0° K factor 2.11	0° to 360°
Solar Radiation	W/m^2	1 W/m^2	± 5 % of reading or ±32 w/m^2 or whichever is greater K factor of 1.96	0 to 1100 W/m^2
Ambient Temperature	˚C	0.1˚C	± 0.25˚C K factor of 2.01	0˚C to 50˚C
Relative Humidity	%	1%	± 5% K factor of 2.31	0-100%

The reported uncertainties are expanded uncertainties calculated using coverage factors which give a level of confidence of approximately 95%.

5.2 Maintenance

The last calibrations for the following parameters have been performed on the indicated date. Data supplied after this time is subject to verification to be performed at the next calibration cycle.
Tables 6, 7 and 8 indicate when the particulate, gas and meteorological equipment were last calibrated.

Table 6: Chaim Court Maintenance Table January to March2011

Parameter	Scheduled Maintenance Performed	Date Scheduled Maintenance performed	Last Calibration Date
NO, NO_2, NO_x	Yes	16/03/11	16/03/11
CO	Yes	16/03/11	16/03/11
PM_{10}	No	N/A	19/01/11
$PM_{2.5}$	No	N/A	19/01/11
Wind Speed*	No	23/09/10	23/09/10
Wind Direction*	No	23/09/10	23/09/10
Ambient Temperature	Yes	17/03/11	17/03/11
Relative Humidity	Yes	17/03/11	17/03/11
Solar Radiation**	No	N/A	TBA

*Instrument covered by Ecotech's NATA scope of accreditation from the calibration date onwards
**Provision of this service not covered by NATA scope of accreditation as the instrument does not have a current calibration certificate.

Table 7: Craig Rd Maintenance Table January to March 2011

Parameter	Scheduled Maintenance Performed	Date Scheduled Maintenance performed	Last Calibration Date
NO, NO_2, NO_x	Yes	28/03/11	28/03/11
CO	Yes	28/03/11	28/03/11
PM_{10}	No	N/A	18/01/11
Wind Speed*	No	24/09/10	24/09/10
Wind Direction*	No	24/09/10	24/09/10
Ambient Temperature	Yes	28/03/11	28/03/11
Relative Humidity	Yes	28/03/11	28/03/11

*Instrument covered by Ecotech's NATA scope of accreditation from the calibration date onwards

Table 8: Heads Rd Maintenance Table January to March 2011

Parameter	Scheduled Maintenance Performed	Date Scheduled Maintenance performed	Last Calibration Date
NO, NO_2, NO_x	Yes	17/03/11	30/03/11
CO	Yes	17/03/11	30/03/11
PM_{10}	No	N/A	18/01/11
Wind Speed*	No	27/09/10	27/09/10
Wind Direction*	No	27/09/10	27/09/10
Ambient Temperature	Yes	17/03/11	17/03/11
Relative Humidity	Yes	17/03/11	17/03/11

*Instrument covered by Ecotech's NATA scope of accreditation from the calibration date onwards

6.0 Results

6.1 Percentage Availability

Percentage availability is based on 1 hour averages, calculated from 5 minute data, and refers to the amount of available data collected for January to March 2011.

The percentage of available data is calculated using the following equation:

Availability = (Reported air quality data / Total data) x 100%

- Reported air quality data = Number of instrument readings which have been verified through a NATA or quality assured process as appropriate and excludes all data errors, zero data collection due to calibration, failures and planned and unplanned maintenance.
- Total data = Total number of instrument readings since the start of the term assuming no maintenance, errors, loss of data or calibration.

Table 9: Monthly Percentage Availability for Eastlink Sites for January to March 2011

Parameter	Chaim Crt %	Craig Rd %	Heads Rd %
NO, NO_2, NO_x	**84**	**91**	**90**
CO	95	**92**	**88**
PM_{10}	100	97	**94**
$PM_{2.5}$	**94**	N/A	N/A
WS, WD, Sigma	99	97	97
AT	100	97	98
RH	100	97	98
SR	100	N/A	N/A

* Bold values indicate Overall Percentage Availability below 95%

Table 10: Exceedences Above MARP Intervention Levels for January to March 2011

Station	Parameter	Time Period	Value of Exceedence	Date of Exceedence
Chaim Crt	NO_2	1 hour	-	-
	CO	1 hour	-	-
	PM_{10}	24 hour	-	-
	$PM_{2.5}$	24 hour	-	-
Craig Rd	NO_2	1 hour	-	-
	CO	1 hour	-	-
	PM_{10}	24 hour	-	-
Heads Rd	NO_2	1 hour	-	-
	CO	1 hour	-	-
	PM_{10}	24 hour	-	-

6.2 Graphical Reports

Validated 5 minute data for NO, NO_2, NO_x, CO, PM_{10}, $PM_{2.5}$, wind speed and wind direction were used to construct the following monthly graphical representations.

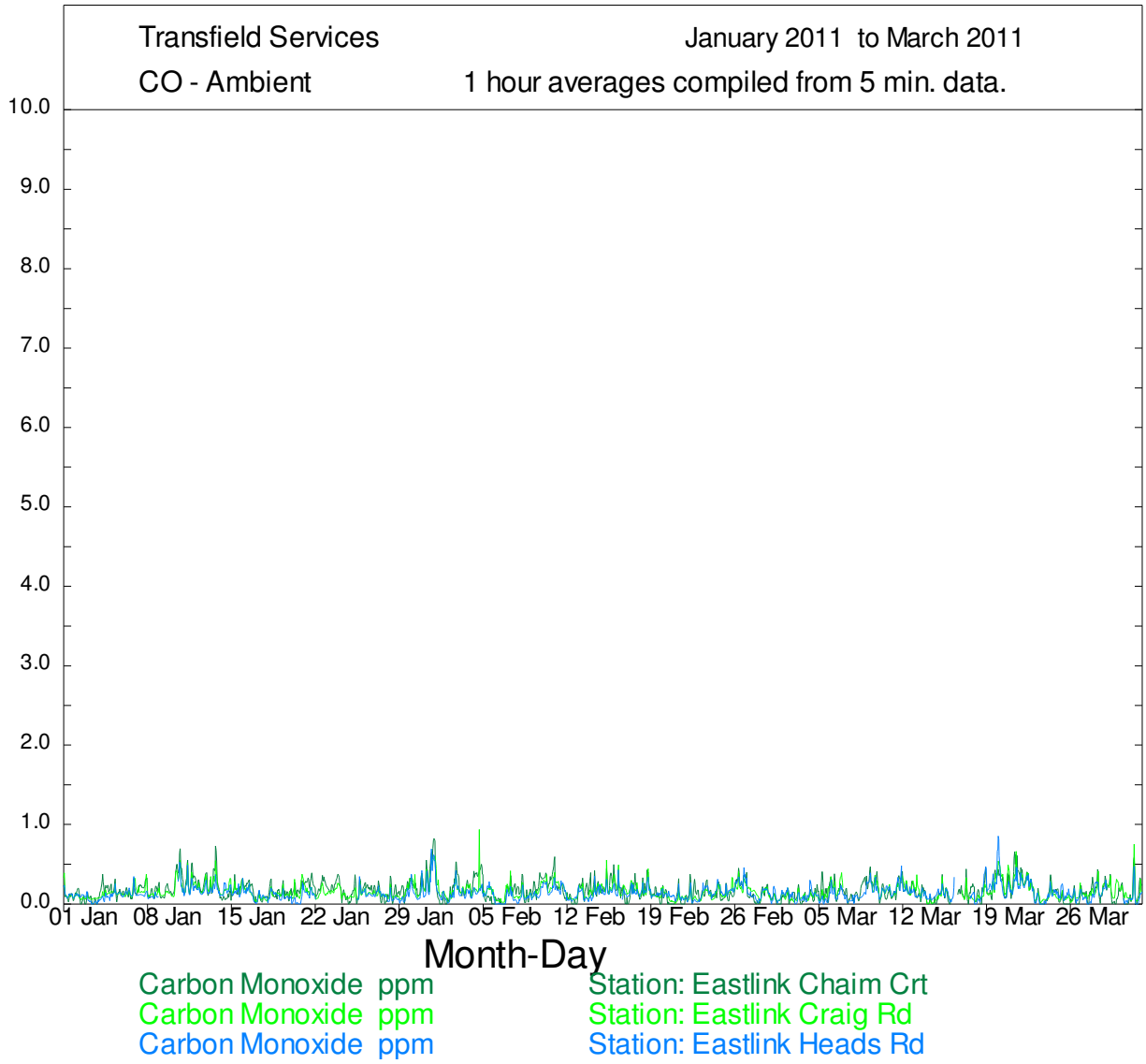

Figure 1: CO 1-hour Averages for January to March 2011

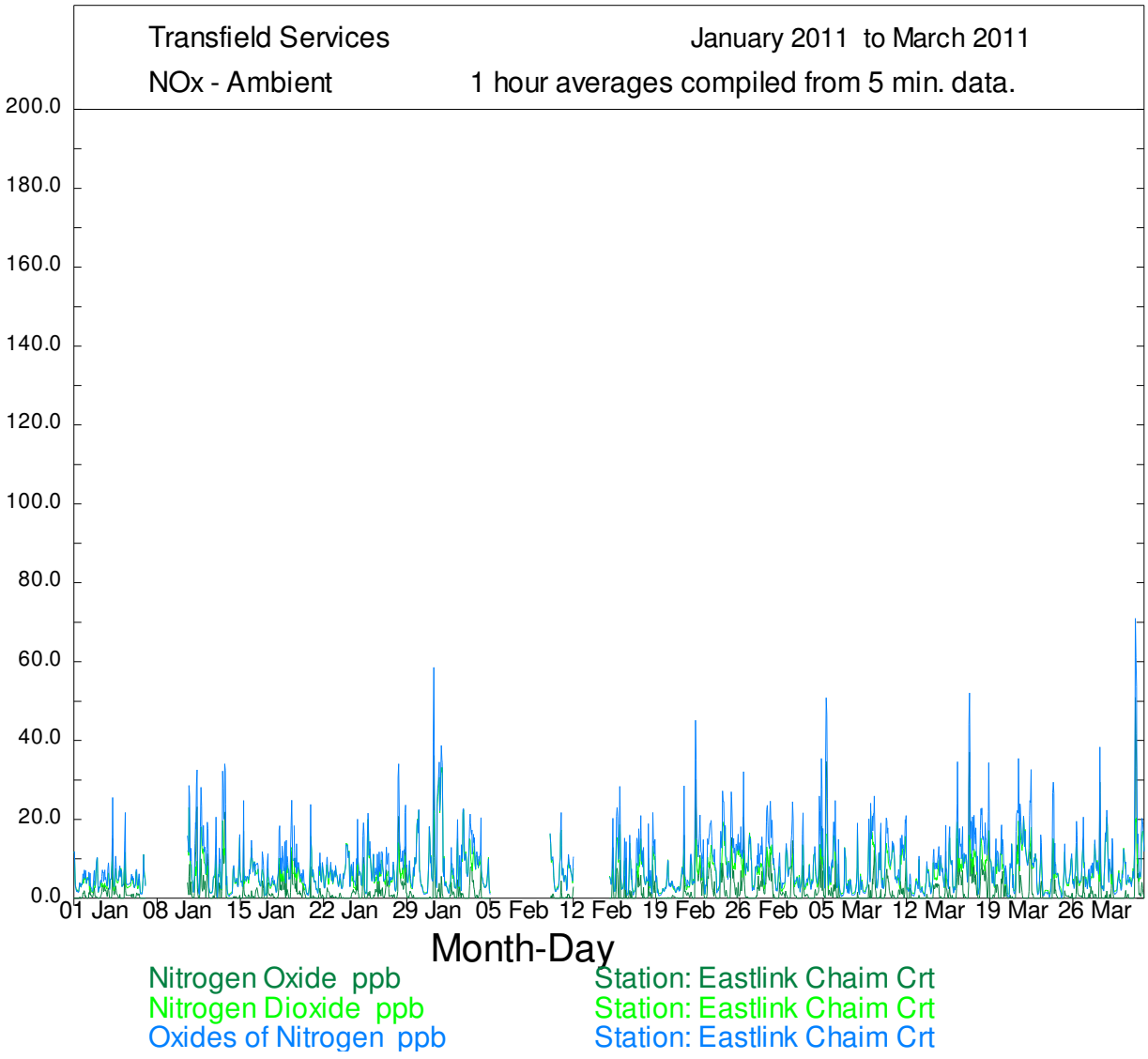

Figure 2: Chaim Crt NO, NO_2, NO_x 1-hour Averages for January to March 2011

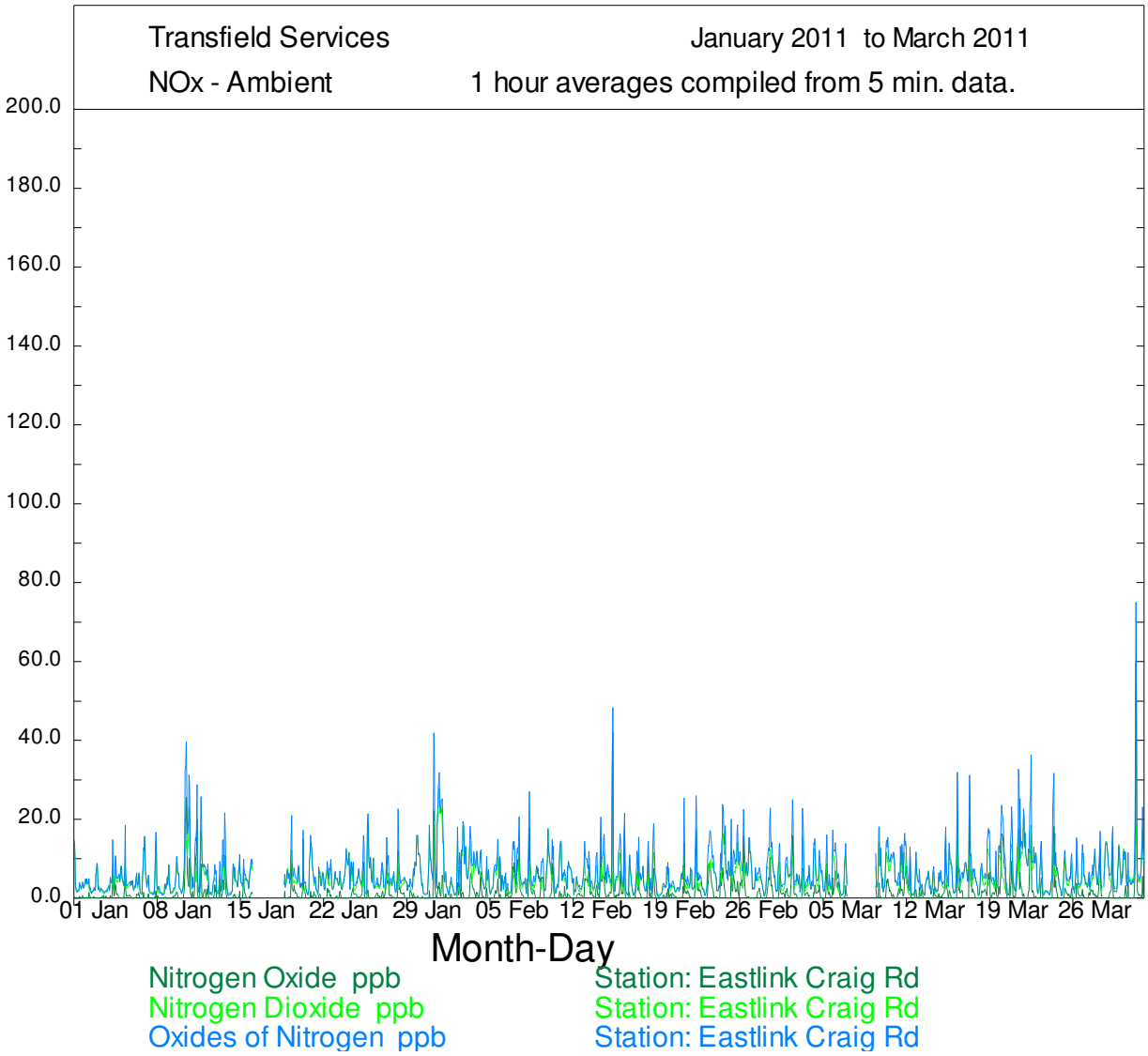

Figure 3: Craig Rd NO, NO_2, NO_x 1-hour Averages for January to March 2011

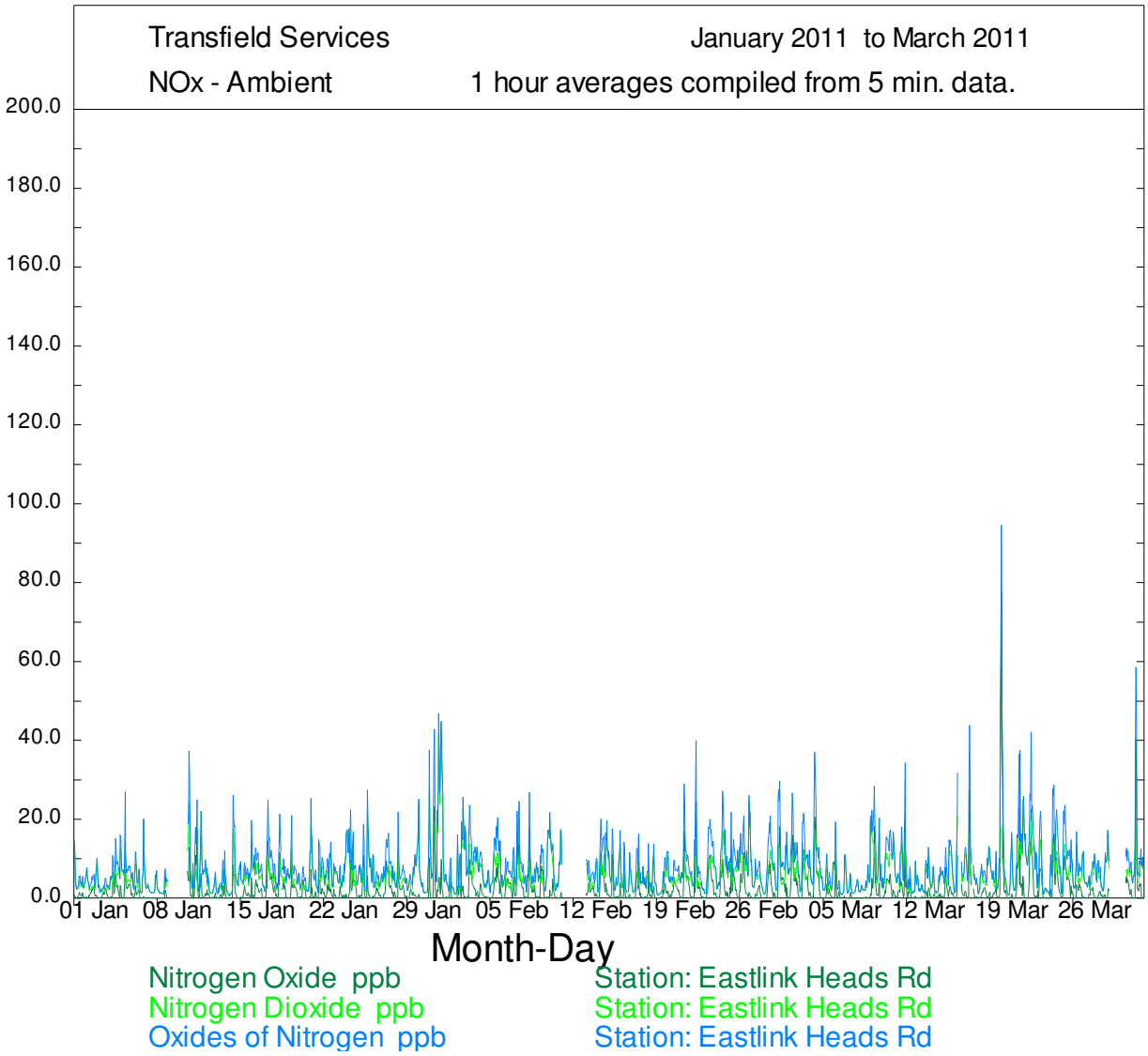

Figure 4: Heads Rd NO, NO_2, NO_x 1-hour Averages for January to March 2011

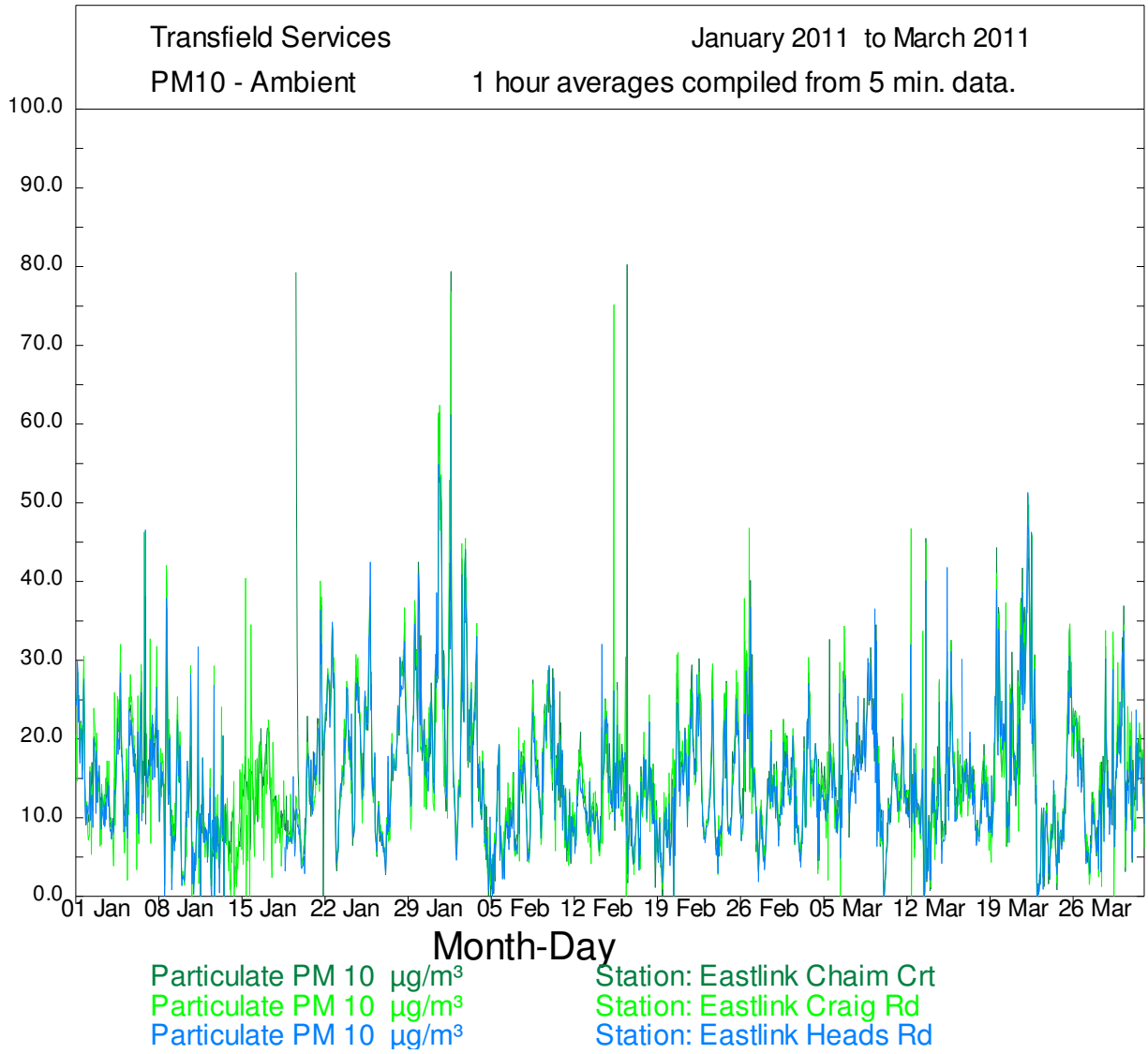

Figure 5: PM_{10} 1-hour Averages for January to March 2011

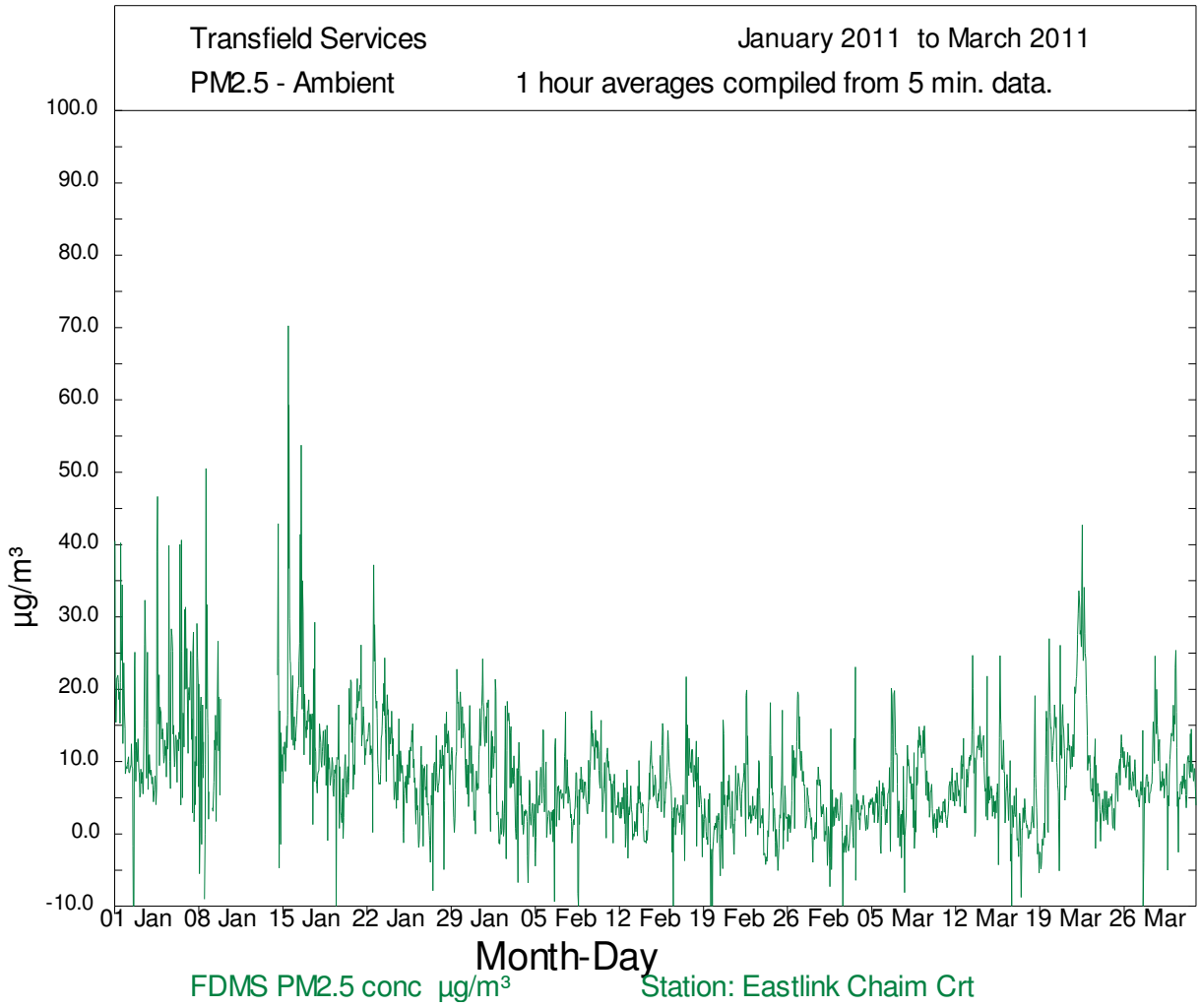

Figure 6: $PM_{2.5}$ 1-hour Averages for January to March 2011

7.0 Valid Data Exception Tables

Table 11: Chaim Crt Valid Data Exception Table

Start Date	End Date	Reason	Change Details	User Name	Change Date
4/01/11 10:05	20/01/11 12:25	Intermittent additional automatic calibration checks	CO	DD	21/02/2011
5/01/11 18:10	24/01/11 07:10	Intermittent data affected by environmental conditions - wind speed spike	WS, WD, Sigma	DD	21/02/2011
7/01/11 01:50	10/01/11 13:15	Span out of tolerance	NO, NO_2, NO_x	DD	21/02/2011
9/01/11 19:05	14/01/11 09:05	TEOM drier fault	$PM_{2.5}$	DD	21/02/2011
10/01/11 13:20	10/01/11 13:30	Maintenance - Remote calibration	NO, NO_2, NO_x	DD	21/02/2011
10/01/11 13:20	10/01/11 13:40	Maintenance - Remote calibration	CO	DD	21/02/2011
14/01/11 09:10	14/01/11 13:25	Maintenance - Replaced dryer and instrument stabilisation	$PM_{2.5}$	DD	21/02/2011
14/01/11 10:30	14/01/11 12:05	Maintenance - TEOM filter change and instrument stabilisation	PM_{10}	DD	21/02/2011
19/01/11 10:25	19/01/11 12:35	Scheduled maintenance - monthly	NO, NO_2, NO_x	DD	21/02/2011
19/01/11 11:20	19/01/11 12:35	Scheduled maintenance - monthly	CO	DD	21/02/2011
19/01/11 11:50	19/01/11 13:35	Maintenance - TEOM filter change and instrument stabilisation	PM_{10}	DD	21/02/2011
19/01/11 11:50	19/01/11 14:30	Maintenance - TEOM filter change and instrument stabilisation	$PM_{2.5}$	DD	21/02/2011
5/02/11 01:50	10/02/11 00:55	Span out of tolerance	NO, NO_2, NO_x	DD	9/03/2011

Table 11: Chaim Crt Valid Data Exception Table (continued)

5/02/11 09:45	5/02/11 18:40	Intermittent data affected by environmental conditions - wind speed spike	WS, WD, Sigma	DD	9/03/2011
7/02/11 10:20	22/02/11 13:15	Intermittent additional automatic calibration checks	CO	DD	9/03/2011
12/02/11 01:50	15/02/11 00:55	Span out of tolerance	NO, NO_2, NO_x	DD	9/03/2011
16/02/11 10:40	16/02/11 11:35	Scheduled maintenance - monthly	CO, NO, NO_2, NO_x	DD	9/03/2011
19/02/11 22:00	19/02/11 22:00	Power interruption	All channels	DD	9/03/2011
19/02/11 22:05	19/02/11 22:05	Instrument stabilisation following power interruption	CO	DD	9/03/2011
19/02/11 22:05	19/02/11 22:35	Instrument stabilisation following power interruption	PM_{10}	DD	9/03/2011
19/02/11 22:05	19/02/11 22:50	Instrument stabilisation following power interruption	$PM_{2.5}$	DD	9/03/2011
25/02/11 07:25	25/02/11 07:25	Power interruption	All channels	DD	9/03/2011
25/02/11 07:30	25/02/11 07:30	Instrument stabilisation following power interruption	CO	DD	9/03/2011
25/02/11 07:30	25/02/11 08:00	Instrument stabilisation following power interruption	$PM_{2.5}$	DD	9/03/2011
25/02/11 07:30	25/02/11 08:05	Instrument stabilisation following power interruption	$PM_{2.5}$	DD	9/03/2011
28/02/11 21:10	28/02/11 21:10	Power interruption	CO, NO, NO_2, NO_x, $PM_{2.5}$, PM_{10}	DD	9/03/2011

Table 11: Chaim Crt Valid Data Exception Table (continued)

28/02/11 21:15	28/02/11 21:15	Instrument stabilisation following power interruption	CO	DD	9/03/2011
28/02/11 21:15	28/02/11 21:45	Instrument stabilisation following power interruption	PM_{10}	DD	9/03/2011
28/02/11 21:15	28/02/11 21:55	Instrument stabilisation following power interruption	$PM_{2.5}$	DD	9/03/2011
2/03/11 14:15	31/03/11 21:45	Intermittent additional automatic calibration checks	CO	DD	10/04/2011
5/03/11 22:15	5/03/11 22:15	Power interruption	All channels	DD	10/04/2011
5/03/11 22:20	5/03/11 22:20	Instrument stabilisation following power interruption	CO	DD	10/04/2011
5/03/11 22:20	5/03/11 22:50	Instrument stabilisation following power interruption	PM_{10}	DD	10/04/2011
5/03/11 22:20	5/03/11 23:05	Instrument stabilisation following power interruption	$PM_{2.5}$	DD	10/04/2011
13/03/11 18:35	17/03/11 09:15	Intermittent data affected by environmental conditions - wind speed spike	WS, WD, Sigma	DD	10/04/2011
16/03/11 01:25	16/03/11 01:25	Power interruption	All channels	DD	10/04/2011
16/03/11 01:30	16/03/11 02:00	Instrument stabilisation following power interruption	PM_{10}	DD	10/04/2011
16/03/11 01:30	16/03/11 02:10	Instrument stabilisation following power interruption	$PM_{2.5}$	DD	10/04/2011
16/03/11 01:30	16/03/11 13:40	Instrument fault after power interruption	CO	DD	10/04/2011
17/03/11 09:10	17/03/11 09:15	Scheduled maintenance - monthly	WS, WD, Sigma	DD	10/04/2011

Table 11: Chaim Crt Valid Data Exception Table (continued)

17/03/11 10:05	17/03/11 10:45	Scheduled maintenance - monthly	AT, RH	DD	10/04/2011
17/03/11 10:20	17/03/11 10:30	Scheduled maintenance - monthly	SR	DD	10/04/2011
21/03/11 02:05	21/03/11 02:05	Power interruption	All channels	DD	10/04/2011
21/03/11 02:10	21/03/11 02:10	Instrument stabilisation following power interruption	CO	DD	10/04/2011
21/03/11 02:10	21/03/11 02:40	Instrument stabilisation following power interruption	PM_{10}	DD	10/04/2011
21/03/11 02:10	21/03/11 02:50	Instrument stabilisation following power interruption	$PM_{2.5}$	DD	10/04/2011

Table 12: Craig Rd Valid Data Exception

Start Date	End Date	Reason	Change Details	User Name	Change Date
6/01/11 05:50	30/01/11 05:45	Data affected intermittently by environmental conditions - wind speed spike	WS, WD, Sigma	DD	21/01/2011
16/01/11 01:50	18/01/11 13:35	Instrument span out of tolerance	NO, NO_2, NO_x	DD	21/01/2011
18/01/11 13:40	18/01/11 16:30	Scheduled maintenance - monthly	CO, NO, NO_2, NO_x	DD	21/01/2011
18/01/11 14:00	18/01/11 17:20	Maintenance - TEOM filter change and instrument stabilisation	PM_{10}	DD	21/01/2011
18/01/11 15:30	18/01/11 16:05	Data transmission error due to maintenance	WS, WD, Sigma, AT, RH	DD	21/01/2011
5/02/11 08:45	28/02/11 18:40	Data affected intermittently by environmental conditions - wind speed spike	WS, WD, Sigma	DD	9/03/2011
18/02/11 10:30	18/02/11 11:05	Scheduled maintenance - monthly	CO, NO, NO_2, NO_x	DD	9/03/2011
18/02/11 10:30	18/02/11 11:20	Scheduled maintenance - monthly	CO	DD	9/03/2011
19/02/11 22:00	19/02/11 22:00	Power interruption	All channels	DD	9/03/2011
19/02/11 22:05	19/02/11 22:10	Instrument stabilisation following power interruption	CO	DD	9/03/2011
19/02/11 22:05	19/02/11 22:35	Instrument stabilisation following power interruption	PM_{10}	DD	9/03/2011
25/02/11 07:25	25/02/11 07:25	Power interruption	All channels	DD	9/03/2011

Table 12: Craig Rd Valid Data Exception Table (continued)

25/02/11 07:30	25/02/11 07:35	Instrument stabilisation following power interruption	CO	DD	9/03/2011
25/02/11 07:30	25/02/11 08:00	Instrument stabilisation following power interruption	PM_{10}	DD	9/03/2011
28/02/11 21:10	28/02/11 21:10	Power interruption	All channels	DD	9/03/2011
28/02/11 21:15	28/02/11 21:45	Instrument stabilisation following power interruption	PM_{10}	DD	9/03/2011
28/02/11 21:15	28/02/11 21:55	Instrument stabilisation following power interruption	CO	DD	9/03/2011
1/03/11 05:45	31/03/11 06:10	Data affected intermittently by environmental conditions - wind speed spike	WS, WD, Sigma	DD	10/04/2011
5/03/11 22:15	5/03/11 22:15	Power interruption	All channels	DD	10/04/2011
5/03/11 22:20	5/03/11 22:25	Instrument stabilisation following power interruption	CO	DD	10/04/2011
5/03/11 22:20	5/03/11 22:50	Instrument stabilisation following power interruption	PM_{10}	DD	10/04/2011
7/03/11 01:50	9/03/11 10:35	Power interruption	All channels	DD	10/04/2011
16/03/11 01:25	16/03/11 01:25	Power interruption	All channels	DD	10/04/2011
16/03/11 01:30	16/03/11 02:00	Instrument stabilisation following power interruption	PM_{10}	DD	10/04/2011
16/03/11 01:30	16/03/11 23:45	Instrument stabilisation following power interruption	CO	DD	10/04/2011
21/03/11 02:05	21/03/11 02:05	Power interruption	All channels	DD	10/04/2011

Table 12: Craig Rd Valid Data Exception Table (continued)

21/03/11 02:10	21/03/11 02:15	Instrument stabilisation following power interruption	CO	DD	10/04/2011
21/03/11 02:10	21/03/11 02:40	Instrument stabilisation following power interruption	PM_{10}	DD	10/04/2011
28/03/11 12:00	28/03/11 14:40	Scheduled maintenance - monthly	CO, NO, NO_2, NO_x	DD	10/04/2011
28/03/11 13:35	28/03/11 13:40	Scheduled maintenance - monthly	WS, WD, Sigma	DD	10/04/2011
28/03/11 14:20	28/03/11 14:50	Scheduled maintenance - monthly	AT, RH	DD	10/04/2011

Table 13: Heads Rd Valid Data Exception Table

Start Date	End Date	Reason	Change Details	User Name	Change Date
8/01/11 21:30	10/01/11 12:50	Power conditioner off	CO, NO, NO_2, NO_x, AT, RH, WS, WD, Sigma	DD	21/01/2010
10/01/11 12:55	10/01/11 13:45	Maintenance	CO, NO, NO_2, NO_x, WS, WD, Sigma	DD	21/01/2010
13/01/11 15:10	14/01/11 14:55	Instrument flow fault	PM_{10}	DD	21/01/2010
14/01/11 15:00	18/01/11 12:20	Instrument removed for repair	PM_{10}	DD	21/01/2010
15/01/11 19:50	30/01/11 06:15	Data affected intermittently by environmental conditions - wind speed spike	WS, WD, Sigma	DD	21/01/2010
18/01/11 09:10	18/01/11 12:35	Maintenance - calibration	CO, NO, NO_2, NO_x	DD	21/01/2010
18/01/11 12:25	18/01/11 12:25	Data transmission error due to maintenance	WS, WD, Sigma, AT, RH	DD	21/01/2010
18/01/11 12:30	18/01/11 14:20	Maintenance - installed instrument and performed calibration	PM_{10}	DD	21/01/2010
22/01/11 01:50	25/01/11 10:50	Instrument span out of tolerance	CO	DD	21/01/2010
25/01/11 10:55	25/01/11 11:15	Remote calibration	CO, NO, NO_2, NO_x	DD	21/01/2010
3/02/11 12:25	26/02/11 07:00	Data affected intermittently by environmental conditions - wind speed spike	WS, WD, Sigma	DD	9/03/2011
11/02/11 01:50	13/02/11 00:55	Instrument span out of tolerance	NO, NO_2, NO_x	DD	9/03/2011

Table 13: Heads Rd Valid Data Exception Table (continued)

15/02/11 21:50	15/02/11 21:50	Power interruption	All channels	DD	9/03/2011
15/02/11 21:55	15/02/11 22:00	Instrument stabilisation following power interruption	CO, PM10	DD	9/03/2011
16/02/11 06:05	16/02/11 06:10	Power interruption	All channels	DD	9/03/2011
16/02/11 06:15	16/02/11 06:20	Instrument stabilisation following power interruption	CO, PM_{10}	DD	9/03/2011
16/02/11 12:30	16/02/11 13:55	Scheduled maintenance - monthly	CO, NO, NO_2, NO_x	DD	9/03/2011
1/03/11 06:10	30/03/11 08:00	Data affected intermittently by environmental conditions - wind speed spike	WS, WD, Sigma	DD	10/04/2011
16/03/11 07:05	16/03/11 14:30	Power interruption	All channels	DD	10/04/2011
16/03/11 14:35	16/03/11 15:00	Instrument stabilisation following power interruption	NO, NO_2, NO_x	DD	10/04/2011
16/03/11 14:35	16/03/11 15:05	Instrument stabilisation following power interruption	PM_{10}	DD	10/04/2011
16/03/11 14:35	17/03/11 11:20	Instrument fault following power interruption	CO	DD	10/04/2011
17/03/11 11:25	17/03/11 15:20	Scheduled maintenance - monthly	NO, NO_2, NO_x	DD	10/04/2011
17/03/11 11:25	17/03/11 15:25	Scheduled maintenance - monthly	CO	DD	10/04/2011
17/03/11 12:05	17/03/11 13:25	Scheduled maintenance - monthly	WS, WD, Sigma	DD	10/04/2011
17/03/11 13:10	17/03/11 13:10	Scheduled maintenance - monthly	All channels	DD	10/04/2011
17/03/11 13:50	17/03/11 14:15	Scheduled maintenance - monthly	AT, RH	DD	10/04/2011

Table 13: Heads Rd Valid Data Exception Table (continued)

29/03/11 01:50	30/03/11 10:00	Instrument span out of tolerance	CO, NO, NO_2, NO_x	DD	10/04/2011
30/03/11 10:05	30/03/11 10:25	Maintenance - calibration	CO, NO, NO_2, NO_x	DD	10/04/2011

8.0 Discussion

- Percentage availability for all parameters at Chaim Crt, except oxides of nitrogen and $PM_{2.5}$, was above 95% for the reporting period. The percentage availability for oxides of nitrogen was low, at 84%, due to a combination of power interruptions and the overnight spans being out of tolerance occasionally. The percentage availability for $PM_{2.5}$ was low, at 94%, due to a combination of instrument drier faults and power interruptions.

- Percentage availability for all parameters at the Craig Rd station, except oxides of nitrogen and CO, was above 95% for the reporting period. The percentage availability for oxides of nitrogen was low, at 91%, due to a combination of power interruptions and the overnight spans being out of tolerance occasionally. The percentage availability for CO was low, at 92%, due to frequent power interruptions.

- Percentage availability for meteorological parameters at Head Rd were above 95%, while oxides of nitrogen, CO and PM_{10} which fell below 95%. This was due to a combination of instrument faults, the overnight spans being out of tolerance and power interruption.

- There were no recorded readings over the MARP intervention levels for the reporting period.

----------END OF REPORT----------

Appendix 1

Definitions

NO: Nitric oxide

NO_2: Nitrogen dioxide

NO_x: Oxides of nitrogen

CO: Carbon monoxide

PM_{10}: Particulate less than 10 microns

$PM_{2.5}$: Particulate less than 2.5 microns

$PM_{2.5}$_B: $PM_{2.5}$ base mass (without volatiles)

$PM_{2.5}$_R: $PM_{2.5}$ with volatiles

WS: Wind Speed

WD: Wind Direction

AT: Ambient Temperature

RH: Relative Humidity

SR: Solar Radiation

ppb: Parts per billion

ppm: Parts per million

µg/m^3: micrograms per cubic metre @ standard temperature and pressure (0°C and 101.3 kPa)

m/s: metres per second

deg: degrees (True North)

W/m^2: Watts per square metre

Appendix 2

Explanation of Exception Table

Logger update and site integration refers to the initial handover and setup time of the instrument when it is first installed and the channels are stabilizing.

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.

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.

Instrument out of service refers to a lack of data due to an instrument being shut down for repair, maintenance or factory calibration.

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