2010 Air Quality Progress Report for *West Lothian Council*

In fulfillment of Part IV of the Environment Act 1995
Local Air Quality Management

April 2010

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Executive Summary

The Progress Report process has highlighted that monitoring data from the station located at East Main Street Broxburn exceeds the 2010 annual Air Quality Objective for $PM_{10.}$

There are no other exceedences of any of the Air Quality Objectives for the pollutants monitored, which include nitrogen dioxide (NO_2) and Particulates (PM_{10}).

Monitoring at Linlithgow indicates that the annual PM_{10} 2010 Air Quality Objective is likely to be exceeded in the future with the current PM_{10} concentration equivalent to the objective level.

A Detailed Assessment will be undertaken for East Main Street Broxburn to establish the likely geographical area of the likely exceedence of the annual PM10 objective. A similar assessment will also be carried out for the High Street Linlithgow.

An AQMA is likely to be declared for East Main Street Broxburn.

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1 Introduction

1.1 Description of Local Authority Area

West Lothian is situated between Edinburgh and the Borders to the east, and Falkirk, North Lanarkshire and South Lanarkshire to the west, with the Firth of Forth to the north. The region rises from the lowlands in the north and northeast to the Pentland Hills in the southeast and moorland in the south and west. Its 428 sq. km (165 sq. miles) are mainly used for agriculture or urban development. The major source of air pollution is from road traffic with several main roads including the M8, M9, A89 and A71 passing through the district. Industrial sources of air pollution in West Lothian are relatively scarce and are mostly situated in designated industrial areas away from relevant receptors.

1.2 Purpose of Progress Report

Progress Reports are required in the intervening years between the three-yearly Updating and Screening Assessment reports. Their purpose is to maintain continuity in the Local Air Quality Management process.

They are not intended to be as detailed as Updating and Screening Assessment Reports, or to require as much effort. However, if the Progress Report identifies the risk of exceedence of an Air Quality Objective, the Local Authority (LA) should undertake a Detailed Assessment immediately, and not wait until the next round of Review and Assessment.

1.3 Air Quality Objectives

The air quality objectives applicable to LAQM in Scotland are set out in the Air Quality (Scotland) Regulations 2000 (Scottish SI 2000 No 97), the Air Quality (Scotland) (Amendment) Regulations 2002 (Scottish SI 2002 No 297), and are shown in Table 1.1. This table shows the objectives in units of micrograms per cubic metre, $\mu g/m^3$ (milligrammes per cubic metre, mg/m^3 for carbon monoxide) with the number of exceedences in each year that are permitted (where applicable).

Table 1.1 Air Quality Objectives included in Regulations for the purpose of Local Air Quality Management in Scotland.

Pollutant	Concentration	Measured as	Date to be achieved by
Benzene	16.25 $\mu g/m^3$	Running annual mean	31.12.2003
	3.25 $\mu g/m^3$	Running annual mean	31.12.2010
1,3-Butadiene	2.25 $\mu g/m^3$	Running annual mean	31.12.2003
Carbon monoxide	10.0 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.5 $\mu g/m^3$	Annual mean	31.12.2004
	0.25 $\mu g/m^3$	Annual mean	31.12.2008
Nitrogen dioxide	200 $\mu g/m^3$ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 $\mu g/m^3$	Annual mean	31.12.2005
Particles (PM_{10}) (gravimetric)	50 $\mu g/m^3$, not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	50 $\mu g/m^3$, not to be exceeded more than 7 times a year	24-hour mean	31.12.2010
	40 $\mu g/m^3$	Annual mean	31.12.2004
	18 $\mu g/m^3$	Annual mean	31.12.2010
Sulphur dioxide	350 $\mu g/m^3$, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 $\mu g/m^3$, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 $\mu g/m^3$, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

1.4 Summary of Previous Review and Assessments

The conclusions from the previous rounds of review and assessment of air quality in West Lothian are summarised in Table 1.2 below.

Table 1.2 Summary of previous Review and Assessments

Report Type	Report Date	Outcomes
Review and Assessment Stages 1 and 2	October 2000	Prescribed air quality objectives are all likely to be achieved. Recommended that current air quality monitoring work in West Lothian be continued.
Updating and Screening Assessment	June 2003	No hourly NO_2 exceedences with annual objective being achieved. To continue monitoring in worst-case situations. PM_{10} results and predictions indicate 2004 and 2010 objectives can be met. To continue monitoring near busy roads with relevant exposure. No need for detailed Benzene assessment but consideration to be given for monitoring at petrol stations at Deer Park and Lizzie Bryce roundabouts. No need for further monitoring of 1,3-Butadiene and Lead. No need for detailed assessment of CO or SO_2
Progress Report	2004	NO_2 - no exceedences with annual objective being achieved. PM_{10} - no exceedences SO_2 - no exceedences Benzene to be monitored at Lizzie Bryce petrol station. No detailed assessments required.
Progress Report	2005	Groundhog moved to Cairnie Place, Whitburn from 31/01/2005 NO_2 Analyser problems, low data capture. PM_{10} 1 exceedence due to background PM_{10} SO_2 - no exceedences Benzene - no exceedences No detailed assessments required.
Updating and Screening Assessment	July 2006	Benzene no exceedences. CO - no exceedences NO_2 - no exceedences PM_{10} - no need for detailed assessment SO_2 - no exceedences

Progress Report	April 2007	Benzene no exceedences. To cease monitoring. CO -no exceedences NO_2 - no exceedences PM_{10} very near objective in Linlithgow. Diffusion tube survey results highlighted need to assess NO_2 in Broxburn. Real time monitoring proposed for Broxburn. SO_2 - no exceedences
Progress Report	March 2008	CO - no exceedences NO_2 - no exceedences, new NO_x analyser to be installed. Real time monitoring to begin in Broxburn. PM_{10} objectives achieved. Upgrade to FDMS planned at Linlithgow. Real time FDMS monitoring to begin in Broxburn. No requirement for detailed assessments.
Updating and Screening Assessment	September 2009	No exceedences of any of the pollutants objective values. Real time monitoring to continue in Linlithgow and Broxburn. PM_{10} value at Linlithgow close to objective and Broxburn elevated. Diffusion tubes to be deployed in West Calder Main Street for Detailed Assessment. A poultry farm was identified as requiring a Detailed Assessment. Further traffic surveys required to assess identified busy roads/ junctions using DMRB. Groundhog to be relocated to Whitburn. Osiris units measuring PM_{10} to be deployed at various locations throughout West Lothian.

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

West Lothian Council possess three automatic monitoring stations, two of which, are permanent stations situated at Linlithgow and Broxburn and one mobile Groundhog unit which was located in Uphall Station. The Groundhog unit was relocated to Whitburn in December 2009 but was not commissioned until end of January 2010. A map showing the locations of all monitoring sites in 2009 is included in Appendix B. Details of the monitoring sites are shown in Table 2.1.

Linlithgow – The Romon 300 monitoring station is located on Linlithgow High Street is set back from building facades in a small stretch of open space between buildings. The analyser is 8m from the kerb with the relevant exposure, domestic flats, 2.5m from the kerbside. Linlithgow High Street at this location is relatively narrow, with a pedestrian crossing, and is subject to constant often slow moving and intermittent stationary traffic. The High Street is very busy street with an annual average daily traffic flow (AADT) of approximately 14,500 vehicles. The height of the buildings is such that canyon effects at receptor locations influence air pollution levels.

Broxburn – The CMC monitoring station is located 2m from the kerbside on East Main Street near to a traffic light controlled junction with Greendykes Road. East Main Street and Greendykes Road are busy roads with a high proportion of HGV traffic associated with Greendykes Industrial Estate to the north located off Greendykes Road.
The nearest relevant exposure consists of domestic flats, which are at a slant distance of 3.5m from the analyser at first floor level. The building heights in this area are such that there may be canyon effects associated with air pollution.

Uphall Station – The mobile Groundhog unit was situated in open space of a disused primary school at Pumpherston Road in Uphall Station, 5m from the kerbside. Relevant exposure is the same distance (5m), from the kerbside. This road is relatively wide with single or two-storey housing situated on either side. Houston Industrial Estate is 100m to the west. The purpose of this monitoring location was to establish a background estimate of PM_{10}. The reason for this was highlighted in the Updating and Screening Assessment 2009[1]. The monitoring station was relocated to Whitburn at the end of 2009.

Quality Assurance and Quality Control details for all monitoring stations are fully detailed in Appendix A

Table 2.1 Details of Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	Monitoring Technique	In AQMA?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Does this location represent worst-case exposure?
Linlithgow	Roadside	X299989	Y677090	PM_{10} NO_2	FDMS NO_x analyser	N	Y (-5.5m)	8m	Y
Broxburn	Roadside	X308314	Y672231	PM_{10} NO_2	FDMS NO_x analyser	N	Y (3.5m)	2m	Y
Uphall Station	Roadside	X306219	Y670160	PM_{10} NO_2	TEOM/FDMS NO_x analyser	N	Y (0m)	5m	Y

2.1.2 Non-Automatic Monitoring

West Lothian Council has continued monitoring NO_2 with passive diffusion tubes. The diffusion tube survey includes a total of ten sites as highlighted in Table 2.2. Site locations are highlighted on the Monitoring Site map in Appendix A.

Two tubes are located at nine of the sites and three tubes are co-located with the real-time analyser at Linlithgow High Street.

Diffusion tube data remains valuable and West Lothian Council is committed to making it publicly available. The council has therefore continued to input data on the web based data entry system provided by AEA Technology Environment (NETCEN). AEA continue to provide local authorities with a calendar of suggested exposure periods for monthly changes of the diffusion tubes.

Quality Assurance / Quality Control

- Diffusion tubes are supplied and analysed by Analytical and Scientific Services, Edinburgh City Council, 4 Marine Esplanade, Edinburgh.

- The laboratory uses 50% v/v Triethanolanine (TEA) in acetone for the absorbent in which grids are dipped then allowed to dry before being inserted into acrylic tubes.

- Harmonisation Practical Guidance procedures are followed by this laboratory.

- West Lothian has compared diffusion tube results with that of an automatic NOx analyser in a co-location study at the Linlithgow roadside site (Section 2.1.2a).

- The bias adjustment factor applied to diffusion tube annual means is 0.89. This was calculated using a local co-location study (Section 2.1.2a).

- The laboratory participates in the Workplace Analysis Scheme for Proficiency (WASP) and has exhibited ‘Good’ performance for both old and new criteria for rounds 100 – 104 (January 2008 – January 2009).

West Lothian Council deploys diffusion tubes according to the procedure detailed in guidance document AEA/ENV/R/2504[3] – Issue 1a. Diffusion tubes are exposed on the 4/5 week cycle specified in the AEA calendar and are stored in a sealed container in a refrigerator until being returned to the laboratory. Travel blank diffusion tubes are carried throughout the deployment and analysis procedure.

2.1.2a Diffusion Tube Co-location

Three diffusion tubes have been located adjacent to the inlet of the automatic monitoring station in Linlithgow High Street. The results from the diffusion tubes were compared to the results over the same periods from the co-located Thermo 42i NOx analyser.

The results were analysed using the AEA spreadsheet to determine precision, accuracy and to calculate a locally derived bias correction factor as detailed in Appendix C.

The analysis calculated a locally derived bias factor of 0.89, which was applied to all diffusion tube site data. This local bias factor was considered more representative than the nationally derived bias of 0.95 obtained from the AEA spreadsheet of Bias Adjustment Factors.

A map showing non-automatic monitoring sites is shown in Appendix B.

Table 2.2 Details of Non- Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	In AQMA ?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location?
Whitburn Cross	Roadside	X294687	Y665030	NO_2	N	Y (1m)	3m	Y
Dedridge Cedric Rise	Urban Background	X306406	Y666341	NO_2	N	Y (4m)	3m	Y
Bathgate High Street	Urban Background	X297656	Y669298	NO_2	N	Y (3m)	10m	N
Whitehill Inprint	Roadside	X298259	Y666298	NO_2	N	N	25m	N
Linlithgow ROMON	Roadside	X299989	Y677090	NO_2	N	Y (4m)	7m	Y
Armadale Cross	Roadside	X293842	Y668588	NO_2	N	Y (2m)	2m	Y
Uphall Station	Roadside	X306096	Y670497	NO_2	N	Y (5m)	5m	Y
Alderstone Road	Roadside	X304653	Y667086	NO_2	N	N	2m	Y
Bathgate King Street	Roadside	X297570	Y668583	NO_2	N	Y (5m)	4m	Y
Wilkieston	Roadside	X312070	Y668476	NO_2	N	Y (4m)	3m	Y

2.2 Comparison of Monitoring Results with Air Quality Objectives

West Lothian Council monitor the pollutants PM_{10} and NO_2.

The following section considers each of the pollutants individually and compares the monitoring results with the relevant air quality objective.

2.2.1 Nitrogen Dioxide

During 2009 the Council monitored NO_2 at 3 locations using real-time automatic analysers located within the air-quality monitoring unit (Groundhog) in Uphall Station, Broxburn East Main Street (CMC) and Linlithgow High Street (Romon 300).

Diffusion tube surveys at 10 locations have been ongoing throughout 2009.

Automatic Monitoring Data

All automatic monitoring locations are representative of relevant public exposure as described in section 2.1.1.

Table 2.3a overleaf summarises the annual mean NO_2 concentrations. Results for Linlithgow (22.5 $\mu g/m^3$) and Uphall Station (17 $\mu g/m^3$) are both below the annual objective value of 40$\mu g/m^3$. The measured annual mean concentration at Broxburn was 40 $\mu g/m^3$.

The annual mean concentration for NO_2 at Broxburn was adjusted to account for the distance from the monitoring station to the receptor location. Using the distance correction model (Appendix D) the annual mean concentration drops to 32.2$\mu g/m^3$. The relevant receptor location lies at a height of 4.5m, the façade of the building lies approximately 3.5m further away from the monitor at ground level. The slant distance from the monitor to the receptor has therefore been used in the calculation.

As highlighted in the USA 2009 there is uncertainty over the result given the monitor and receptors are at different heights and there may be canyon effects affecting pollution levels at this particular location. The validity of the model in these circumstances is not clearly understood. Broxburn continues to exhibit elevated levels of NO_2 at the monitoring location in comparison with other monitoring sites.

No correction was necessary for Uphall Station NO_2 data due to the monitor being the same distance from the road as relevant receptors.

The annual mean concentration at Linlithgow has also been adjusted for distance due to relevant exposure being closer to the road than the monitor. The corrected concentration increases the annual mean to 22.5 μg/m^3. Canyon effects occur at the relevant exposure location and therefore similar uncertainties exist with the use of the model. The concentration however is significantly lower than the annual mean objective.

There are therefore no exceedences of the NO_2 annual mean objective of 40 μg/m^3 at any monitoring location.

Comparison of the hourly mean NO_2 concentrations with the 1-hour mean objective are summarised in Table 2.3b.

There are no 1-hour results that exceed the objective of 200μg/m^3 at any monitoring location.

At Uphall Station, where data capture was less than 90% the 99.8th percentile was calculated (shown in brackets) giving values less than 200μg/m^3.

Table 2.3a Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with Annual Mean Objective

Site ID	Location	Within AQMA?	Data Capture for monitoring period [a] %	Data Capture for full calendar year 2009 [b] %	Annual mean concentrations (μg/m^3)		
					2007	2008	2009
Broxburn	East Main St X 308314 Y 672231	N	N/A	99.9	NA	40 (33.3)*	39 (32.2)*
Linlithgow	High St X 299989 Y 677090	N	N/A	99.6	23	20 (21.4)*	21 (22.5)*
Uphall Station	Pumpherston Road X 306219 Y 670160	N	N/A	61.9	NA	22	17

* Incorporating distance correction to building façade (receptor).
[a] data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

Annual monitoring data from the Linlithgow station for NO_2 is available from 2006. The trend in the annual mean concentration is highlighted in Figure 1. There is a general downward trend in NO_2 concentrations since 2006.

Figure 1 Trends in Annual Mean Nitrogen Dioxide Concentration Measured at Automatic Monitoring Sites.

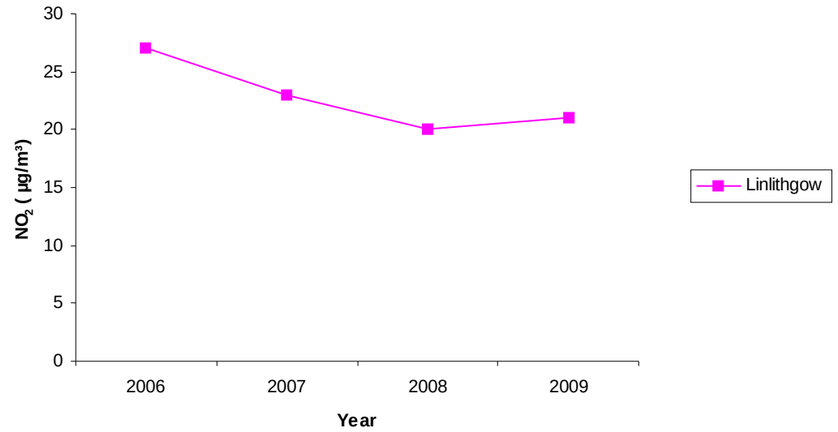


Table 2.3b Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with 1-hour Mean Objective

Site ID	Location	Within AQMA?	Data Capture for monitoring period [a] %	Data Capture for full calendar year 2009 %	Number of Exceedences of hourly mean (200 µg/m^3)		
					2007	2008	2009
Broxburn	East Main St X 308314 Y 672231	N	N/A	99.9	NA	0 (126)*	1
Linlithgow	High St X 299989 Y 677090	N	N/A	99.6	0	0	0
Uphall Station	Pumpherston Road X 306219 Y 670160	N	.N/A	61.9	NA	0 (111)*	0 (82)*

* 99.8th percentile values significantly below the hourly mean value of 200 µg/m^3

[a] data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

Diffusion Tube Monitoring Data

Diffusion tube surveys are undertaken at a number of sites as detailed in section 2.1.2 (Table 2.2) and are shown on the site location map (Appendix A). Table 2.2 highlights the sites with relevant exposure.

The annual results of diffusion tube surveys undertaken at a number of sites are detailed in Table 2.4. The data trend for sites with available historic data is illustrated in Figure 2.
The full monthly dataset for diffusion tubes is detailed in Appendix C.

Table 2.4 Results of Nitrogen Dioxide Diffusion Tubes

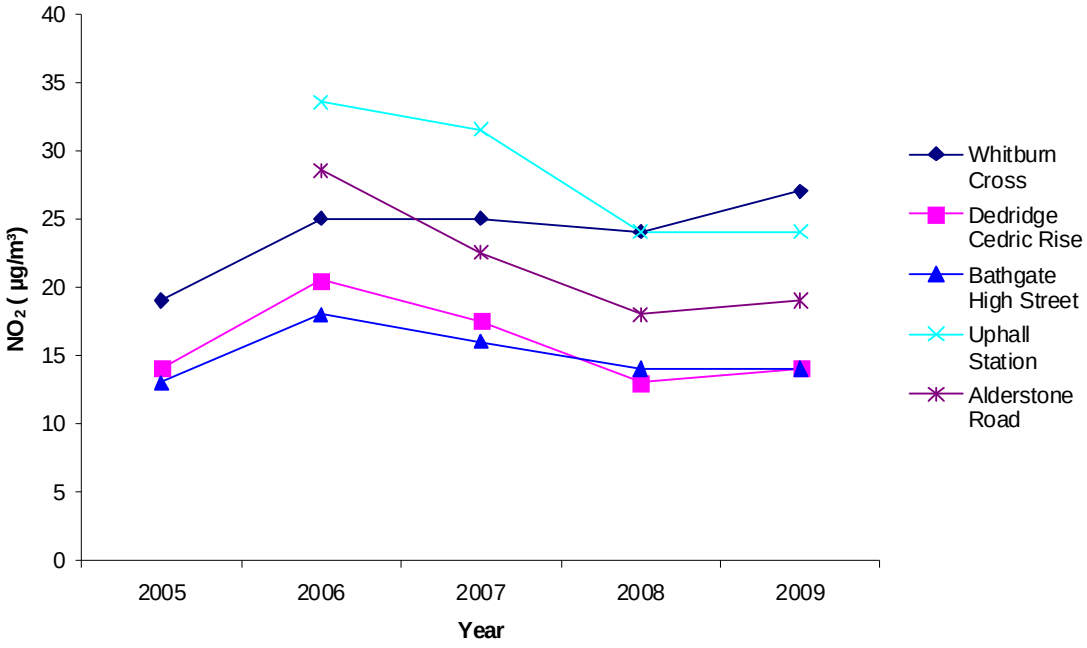
Site ID	Location	Within AQMA?	Data Capture for monitoring period[a] %	Data Capture for full calendar year 2009 %	Annual mean concentrations (µg/m^3)		
					2007	2008	2009
Whitburn Cross	X294687 Y665030	N	N/A	100	25	24	27
Dedridge Cedric Rise	X306406 Y666341	N	N/A	75	17.5	13	14
Bathgate High Street	X297656 Y669298	N	N/A	100	16	14	14
Whitehill Inprint	X298259 Y666298	N	N/A	90	NA	28	27
Linlithgow ROMON	X299989 Y677090	N	N/A	92	NA	20	23
Armadale Cross	X293842 Y668588	N	N/A	100	NA	26	29
Uphall Station	X306096 Y670497	N	N/A	92	31.5	24	24
Alderstone Road	X304653 Y667086	N	N/A	93	22.5	18	19
Bathgate King Street	X297570 Y668583	N	N/A	84	NA	31	34
Wilkieston	X312070 Y668476	N	N/A	100	NA	17	20

[a] data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

It is clear from Table 2.4 above table that the annual mean concentrations of NO_2 are relatively consistent from 2008 to 2009.

With the exception of the diffusion tubes located at Whitburn Cross, trend data in Fig 2 highlights a general downward trend in annual mean NO_2 concentration from 2006. Whitburn Cross appears to show a slight upward trend. This is not surprising since this location exhibits increasing traffic numbers coupled with a busy light controlled junction.

Figure 2 Trends in Annual Mean Nitrogen Dioxide Concentration Measured at Diffusion Tube Monitoring Sites.



2.2.2 PM_{10}

Real-time PM_{10} analysers were located within the air-quality monitoring unit (Groundhog) at Uphall Station, the CMC at East Main Street Broxburn and the Romon at Linlithgow High Street.

The analyser in the groundhog unit which was located at Uphall in 2009 was upgraded from a Tapered Element Oscillating Microbalance (TEOM) to a Filter Dynamics Measurement System (FDMS) unit in April 2009. Both the Linlithgow and Broxburn sites have FDMS units.

All monitoring locations are representative of relevant public exposure (see Section 2.1.1 Table 2.1).

Annual mean concentrations for the monitoring stations are highlighted in Table 2.5a.

Annual mean concentrations for Uphall incorporate corrections using the Volatile Correction Model (VCM) for the TEOM data from 01/01/2009 to 15/04/2009. Data from the FDMS unit was available from 17/04/2008.

Annual mean data for Uphall Station therefore incorporates corrections using the Volatile Correction Model (VCM).

There are no other corrections applied to any of the PM_{10} data.

There are no annual mean concentrations greater than the 2004 objective of 40 µg/m^3.

The annual mean concentration for Broxburn is greater than the 2010 objective of 18 µg/m^3.

Table 2.5b indicates that the number of 24-hour exceedence of 50 µg/m^3 at monitoring locations, is well below the 2004 objective (35 times per year). For the 2010 objective (7 times per year) only the Broxburn station is approaching the objective. For both objectives the 98th percentile value for the Uphall monitoring station is below 50 µg/m^3.

Linlithgow continues to be borderline and has met the annual objective level for 2010. It would appear that the annual mean concentration has increased by 2µg/m^3 from 2008 to 2009. This may be associated with a change in the monitoring equipment from a TEOM in 2008 to an FDMS in 2009.

Table 2.5a Results of PM_{10} Automatic Monitoring: Comparison with Annual Mean Objective

Site ID	Location	Within AQMA?	Data Capture for monitoring period [a] %	Data Capture for full calendar year 2009 %	Annual mean concentrations (µg/m^3)		
					2007	2008	2009
Broxburn	East Main St X 308314 Y 672231	N	N/A	99.1	NA	16.4	**19***
Linlithgow	High St X 299989 Y 677090	N	N/A	94.5	18.4	16	**18***
Uphall Station	Pumpherston Road X 306219 Y 670160	N	N/A	79.9	NA	12.1	13

[a] i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.
* exceeds the annual objective of 18µg/m^3

Table 2.5b Results of PM_{10} Automatic Monitoring: Comparison with 24-hour Mean Objective

Site ID	Location	Within AQMA?	Data Capture for monitoring period [a] %	Data Capture 2009 %	Number of Exceedences of daily mean objective (50 µg/m^3) If data capture < 90%, include the 98th percentile of daily means in brackets.		
					2007	2008	2009
Broxburn	East Main St X 308314 Y 672231	N	N/A	99.1	N/A	1(37)	5
Linlithgow	High St X 299989 Y 677090	N	N/A	94.5	5	2(41)	2
Uphall Station	Pumpherston Road X 306219 Y 670160	N	N/A	79.9	N/A	0	1(30)

[a] i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

2.2.3 Sulphur Dioxide

Monitoring of Sulphur dioxide was discontinued in 2009. There was no indicative need to continue monitoring SO_2 due to the very low levels measured.

2.2.4 Benzene

West Lothian no longer monitors for Benzene and there is no indicative need to re-introduce sampling.

2.2.5 Other pollutants monitored

There are no other pollutants monitored in West Lothian

2.2.6 Summary of Compliance with AQS Objectives

West Lothian Council has measured concentrations of PM10 above the annual mean objective at a relevant location and **will need to proceed to a Detailed Assessment**, for East Main Street in Broxburn

3 New Local Developments

Balfour Beatty Rail relocated their foundry from Bathgate to the former Motorola Facility near South Queensferry. The operation is an industrial process which is a Part B process regulated by the Scottish Environment Protection Agency (SEPA). The foundry became fully operational towards the end of 2008. An air quality dispersion model[2] was undertaken as part of their Pollution Prevention and Control (PPC) Permit Application. The model predicted PM10 concentrations to be below the annual and 24-hours PM_{10} objective at relevant receptors locations.

3.1 Road Traffic Sources

The 2009 USA highlighted a number of busy junctions and roads which were identified but for which there was no traffic data available. An assessment using current traffic flows has now been undertaken for some of these locations using the Design Manual for Roads and Bridges (DMRB)[4] namely; Newton, Whitburn Cross (East and West Main Street), Longridge, King Street Bathgate and Armadale Road, Whitburn.
The DMRB assessments are shown in Appendix E. The assessment for East Main Street Whitburn indicates annual PM_{10} level of approximately 18μg/m^3 which is at the objective level. This area will be further considered in terms of the existing monitoring programme. It may be appropriate to relocate the mobile unit to East Main Street in the future.

3.2 Other Transport Sources

West Lothian council confirms there are no new or newly identified non-road traffic sources, which may have an impact on air quality within the Local Authority area.

3.3 Industrial Sources

West Lothian Council confirms that there are no new/newly identified industrial sources which may have a significant impact on air quality within the Local Authority Area.

3.4 Commercial and Domestic Sources

West Lothian Council confirms there are no new/newly identified commercial and domestic sources which may have a significant impact on air quality within the Local Authority area.

3.5 New Developments with Fugitive or Uncontrolled Sources

West Lothian Council confirms that there are no new or newly identified local developments which may have an impact on air quality within the Local Authority area.

4 Local / Regional Air Quality Strategy

West Lothian Council do not currently have a Local or Regional Air Quality Strategy but is developing such a strategy.

5 Planning Applications

This section provides a brief outline of proposed developments in West Lothian Council area that may impact upon local air quality. All air quality assessments for the proposed developments are contained within the Environmental Statements which are available electronically using the planning application number at www.westlothian.gov.uk

Table 2.6 Significant Proposed Developments in West Lothian

Proposed Development	**Location**	AQ Assessment	Status	Application Number
Biomass Fuelled combined heat and power plant.	Deans, Livingston	Yes	Granted	0006/Ful/08
734 Residential Units, pre-school and primary school, traffic calming on existing road.	Drumshoreland, Pumpherston	Yes	Granted	0050/P/08
New motorway interchange Jn 4A (Heartlands)	Whitburn	Yes	Granted	1164/ful/07
Secondary Aggregate Recycling Centre	Philpstoun	Yes	Granted on Appeal	0345/M/07
Opencast Mining Operation	Briech, West Calder	Yes	Granted	1199/M/07
Anaerobic Digestion Facility	Bathgate	Yes	Granted	0086/Ful/09

Summary

All the above developments are likely to give rise small temporary increases in PM_{10} and NO_2 concentrations due to construction activities and site traffic during the construction phase.

There is likely to be a small increase in permanent road traffic volumes associated with most of the developments. Consequently there is likely to be a small but insignificant increase in local concentrations of PM_{10} and NO_2 associated with road traffic. All the above developments are geographically separated and therefore no cumulative impact on local air quality has been considered.

Biomass combined heat and power plant.

An air quality dispersion model submitted for the proposed Biomass development in Deans highlighted an insignificant increase in NO_2, $PM_{10,}$ $S0_2$ or CO emissions. The impact on local air quality associated with the development was considered to be negligible at any residential receptors.

Residential Development

The proposed residential and school development at Drumshoreland was likely to increase local road traffic volumes. The increase in vehicle emissions on the local road network was considered in the air quality assessment. The assessment predicted a small increase in PM10 and NO_2 emissions. Although the increase in these emissions is insignificant, the assessment highlighted that the current local air quality was likely to exceed the annual objective for PM_{10}. The background pollutant concentrations used in the assessment were obtained from the national background pollutant maps which were artificially high given a baseline concentration above the annual objective of 18 μgm^{-3}.
The local authority installed real time PM_{10} and NOx monitors for just over a year. This gave and annual PM10 average of 12.1μgm^{-3}, significantly below the 2007 baseline level used in the assessment. It was concluded that the current and future (with the development) air quality for PM_{10} was significantly below the annual objective.

New Motorway Interchange

The new motorway development in at Whitburn introduces road traffic into the locality. The predicted increase in emissions of NO_2, and PM_{10} were below the respective air quality objective values. The assessment did highlight however that with or without the development PM_{10} concentrations at existing residential premises situated approximately 25m from the M8 Motorway, was likely to exceed the annual objective. The local authority revisited this issue and re ran the model at the end of 2009 using the updated background maps. The background PM_{10} concentrations were slightly lower than those used in the original assessment. It was concluded that although concentrations of PM_{10} associated with motorway traffic were elevated, the air quality annual PM_{10} objective would be met at receptors located closest to the motorway.

Recycling Centre and Open Cast Mining developments.

The air quality assessments for the Recycling and Opencast Mining developments combined with the dust mitigation measures proposed by both developments did not give rise to any significant local air quality concerns with regards to PM_{10} or NO_2 emissions from fugitive dust emissions or vehicle traffic.

Anaerobic Digestion Facility

Modelled emissions of NO_2 and CO from the gas engines associated with this development will increase localised concentrations of these pollutants but predicted to be well below the relevant air quality objectives.

6 Air Quality Planning Policies

West Lothian Council do not currently have air quality planning policies. It is envisaged a policy will be developed in 2010

7 Local Transport Plans and Strategies

There are no specific air quality measures specifically identified in West Lothian Councils Transport Policy.

8 Climate Change Strategies

The Climate Change Strategy is currently in draft and should be finalised by the end of 2010.

9 Implementation of Action Plans

There are no action plans for West Lothian Council.

10 Conclusions and Proposed Actions

10.1 Conclusions from New Monitoring Data

Monitoring at Broxburn East Main Street has identified an exceedence (19 μgm^3) of the PM10 annual objective. A detailed assessment is being undertaken to identify the geographical extent of the exceedence. It is likely that an Air Quality Management Area (AQMA) will be required for Broxburn East Main Street.
NO_2 levels are elevated but are within the annual objective level.

Monitoring at Linlithgow High Street indicate that the PM10 levels are at the PM10 annual objective level. There is potential for the objective to be exceeded in future years. Historically monitoring data as been borderline in meeting the objective level for a number of years. A detailed assessment is proposed for 2010.

10.2 Conclusions relating to New Local Developments

There are no new local developments that will require more detailed consideration in the next Update and Screening Assessment (USA).
Since the previous 2009 USA any developments that have been granted planning permission which had the potential to have an impact on local air quality, were required to submit an air quality impact assessment. No significant impact on local air quality was identified.

10.3 Other Conclusions

There are no further conclusions to be drawn from planning applications not yet approved which have any significant potential impact on local air quality.

10.4 Proposed Actions

Monitoring data has identified the need to proceed to a Detailed Assessment for Broxburn East Main Street and Linlithgow High Street as a result of exceeding and potentially exceeding respectively the annual PM10 air quality objective.

Due to the elevated levels of NO_2 in Broxburn, sets of diffusion tubes will be located within the area of East Main Street, Broxburn with a co-located set at the monitoring station.

The mobile monitoring station, the Groundhog, was relocated to Whitburn Cross, from Uphall Station at the end of 2009.

Local Air Quality Management Tasks Outstanding

Five modified Osiris dust monitors are to be installed as a screening tool for PM10. These were to be installed in October 2009, but due to the lack of live lamppost the units underwent further design which would allow them to operate continuously with only a few hours of mains power supply to the lamppost. Installation is current and the units should be operational by end of August 2010.
The units will be deployed in Newton (due to the existing traffic levels and the potential increase associated with the Forth Road Crossing project), West Calder, Longridge, entrance to East Mains Industrial Estate, Broxburn and Bathgate.

The Detailed Assessment for East Main Street Broxburn will commence mid August 2010, which will include mapping of the geographical area of the potential exceedence of the PM10 annual objective. It is envisaged that the assessment will be completed by the end of October.
An AQMA declaration is likely to be declared by the beginning 2011 for East Main Street. Broxburn.

A detailed assessment will also be undertaken for Linlithgow which will commence by the end of 2010.

The USA 2009 highlighted thqt a detailed assessment was required for PM_{10} for a large poultry rearing unit. In lieu of further research, advice from Scottish Government however required no Local Authority to proceed to a Detailed Assessment for poultry units.

10 References

1 2009 Air Quality Updating and Screening Assessment for West Lothian Council

2. PPC Permit Number PPC/B/1030094

3 AEA/ENV/R/2504 – Issue 1a - Diffusion Tubes for Ambient NO2 Monitoring: Practical Guidance

4 Design Manual for Roads and Bridges
.

Appendices

Appendix A: **QA/QC Data**

Appendix B: **Monitoring Sites in West Lothian**

Appendix A: QA:QC Data

Diffusion Tube Bias Adjustment Factors

See section **2.1.2** and detailed results in **Appendix C**

Factor from Local Co-location Studies (if available)

The co-location study carried out at Linlithgow High Street resulted in a locally derived bias factor of 0.89. See monthly diffusion tube results for Linlithgow in **Appendix C**.

Discussion of Choice of Factor to Use

See Section **2.1.2a**

PM Monitoring Adjustment

Annual mean concentrations for Uphall Station incorporate corrections using the Volatile Correction Model from 01/01/2009 to 15/04/2009. Data from the FDMS unit was available from 17/04/2009.

Short-term to Long-term Data adjustment

No adjustments were necessary for any data from the automatic sites.

QA/QC of automatic monitoring

The three automatic monitoring stations at Uphall Station, Broxburn and Linlithgow were subject to site audits including calibration checks every 6 months. These were carried out by AEA.

Data Validation and Ratification was carried out by AEA as summarised in the Air Pollution Reports at the end of this Appendix.

Note that the PM_{10} results reported by AEA for TEOM analyser use the Volatile Correction Model (VCM). The PM_{10} monitoring data from the Uphall Station Site to 15/04/09 has been corrected using the VCM. An FDMS unit replaced the TEOM at Uphall Station from 17/04/09.

Analyser Maintenance and calibration

During 2009 Air Monitors Ltd took over responsibility for servicing at all three sites. Weekly quality control/quality assurance procedures are in place to ensure data validity. This includes checking gas levels. Records are kept of new gas cylinder installations, filter changes and other site visits.

The gases zero air and Nitric oxide were used to calibrate the real-time analysers to ensure the data is valid. Following the installation of the FDMS at Uphall Station in April 2009 zero air cylinders were replaced by scrubbed air. Gas cylinders are supplied by Air Liquide.

West Lothian Council performs a manual calibration of the Groundhog. This is completed once a fortnight and these results are recorded to establish if there is any kind of drift. A sudden drift between the span measured and span reference would indicate that there might be a fault with the analyser which is then reported to Air Monitors Ltd.

The filter in the TEOM is changed before the lifetime of the filter reaches 90%. Before the filter is changed, a pre-calibration checklist is completed. Once the filter has been changed, a post-calibration checklist is completed one hour later. This reduces the likelihood of faults being induced or associated with the filter change. The TEOM head is also cleaned each time the filter is changed.

Since the change to FDMS the relevant filter change and head cleaning procedure supplied by AEA is followed.

Servicing of analysers at all sites is carried every six months by Air Monitors. All three automatic monitoring stations use an Air Monitors web logger. Auto calibrations are run daily at each site for all analysers except PM_{10} monitors. Calibration data is monitored using Air Monitors AQ Web Manager and AQ Web Reports software.

Data Acquisition, Security and Dissemination

Data Acquisition

All sites now incorporate a web logger allowing data to be viewed, downloaded and reviewed using the associated software, AQ Web Manager, AQ Web Archive and AQ Web Reports.

All West Lothian Council automatic monitoring site data can be accessed via the Scottish Government Air Quality website at www.scottishairquality.co.uk. AEA validated historic data is available from this website.

QA/QC of diffusion tube monitoring

See Section 2.1.2

Air Pollution Report

Produced by AEA on behalf of the Scottish Government

WEST LOTHIAN BROXBURN
1st January to 31st December 2009

These data have been fully ratified by AEA

POLLUTANT	PM_{10}*+	NO_2	NO_X
Number Very High	0	0	-
Number High	0	0	-
Number Moderate	42	0	-
Number Low	8673	8752	-
Maximum 15-minute mean	280 µg m^{-3}	239 µg m^{-3}	1238 µg m^{-3}
Maximum hourly mean	280 µg m^{-3}	218 µg m^{-3}	942 µg m^{-3}
Maximum running 8-hour mean	156 µg m^{-3}	151 µg m^{-3}	726 µg m^{-3}
Maximum running 24-hour mean	78 µg m^{-3}	97 µg m^{-3}	488 µg m^{-3}
Maximum daily mean	75 µg m^{-3}	94 µg m^{-3}	483 µg m^{-3}
Average	19 µg m^{-3}	39 µg m^{-3}	107 µg m^{-3}
Data capture	99.1 %	99.9 %	99.9 %

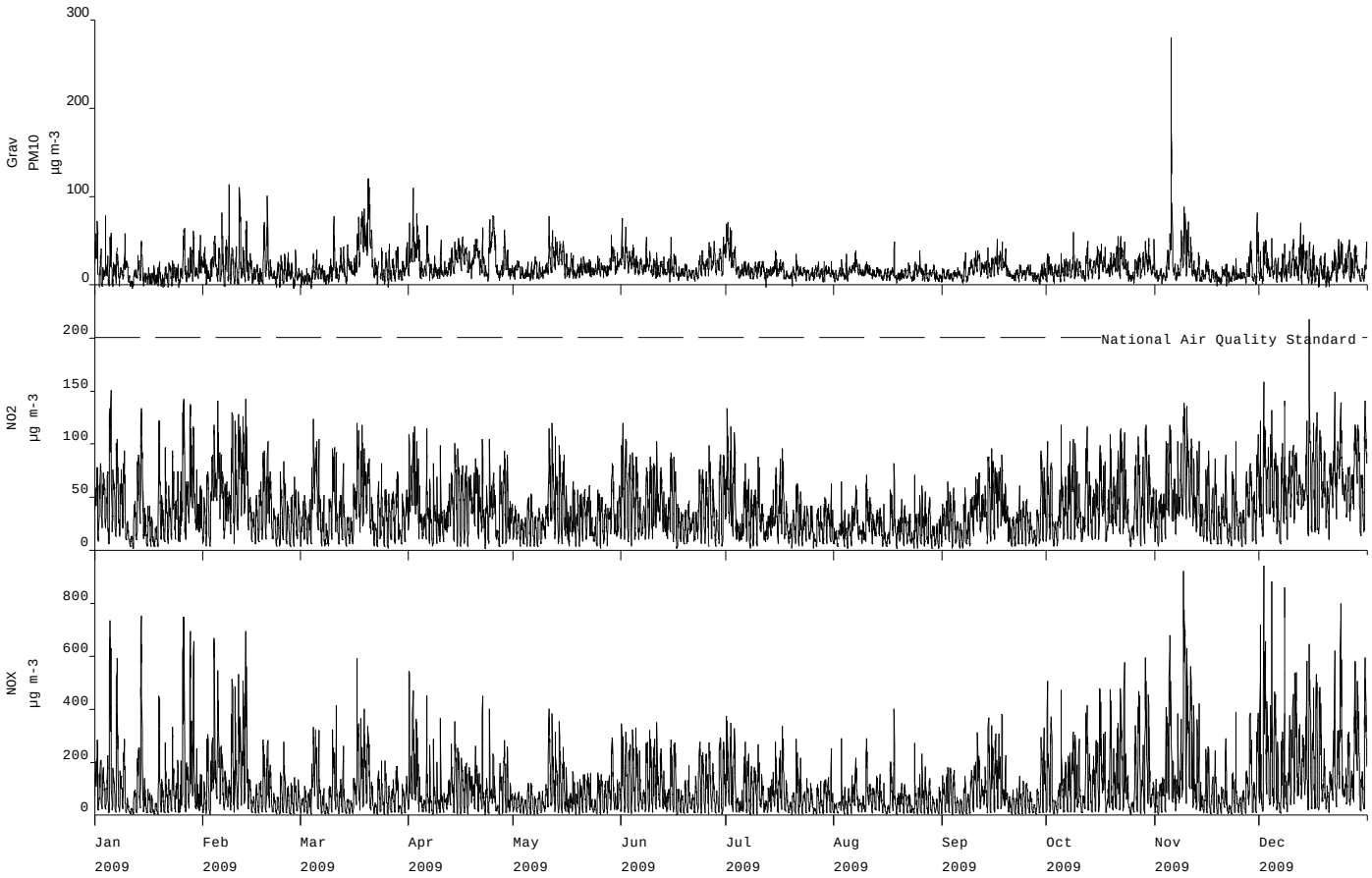
+ PM_{10} instruments:
FDMS using a gravimetric factor of 1 from 1st January 2009
All mass units are at 20℃ and 1013mb
NO_X mass units are NO_X as NO_2 µg m^{-3}

Pollutant	Air Quality Regulations (2000) and Air Quality (Scotland) Amendment Regulations 2002	Exceedences	Days
PM_{10} Particulate Matter (Gravimetric)	Daily mean > 50 µg m^{-3}	5	5
PM_{10} Particulate Matter (Gravimetric)	Annual mean > 18 µg m^{-3}	1	-
Nitrogen Dioxide	Annual mean > 40 µg m^{-3}	0	-
Nitrogen Dioxide	Hourly mean > 200 µg m^{-3}	1	1

Air Pollution Report

Produced by AEA on behalf of the Scottish Government

West Lothian Broxburn Air Monitoring
Hourly Mean Data for 1st January to 31st December 2009



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Air Pollution Report

Produced by AEA on behalf of the Scottish Government

WEST LOTHIAN LINLITHGOW HIGH STREET
1st January to 31st December 2009

These data have been fully ratified by AEA

POLLUTANT	PM_{10}*+	NO_2	NO_X
Number Very High	0	0	-
Number High	0	0	-
Number Moderate	8	0	-
Number Low	8296	8727	-
Maximum 15-minute mean	475 µg m^{-3}	244 µg m^{-3}	785 µg m^{-3}
Maximum hourly mean	475 µg m^{-3}	159 µg m^{-3}	638 µg m^{-3}
Maximum running 8-hour mean	96 µg m^{-3}	127 µg m^{-3}	424 µg m^{-3}
Maximum running 24-hour mean	67 µg m^{-3}	118 µg m^{-3}	240 µg m^{-3}
Maximum daily mean	57 µg m^{-3}	99 µg m^{-3}	232 µg m^{-3}
Average	18 µg m^{-3}	21 µg m^{-3}	41 µg m^{-3}
Data capture	94.5 %	99.6 %	99.6 %

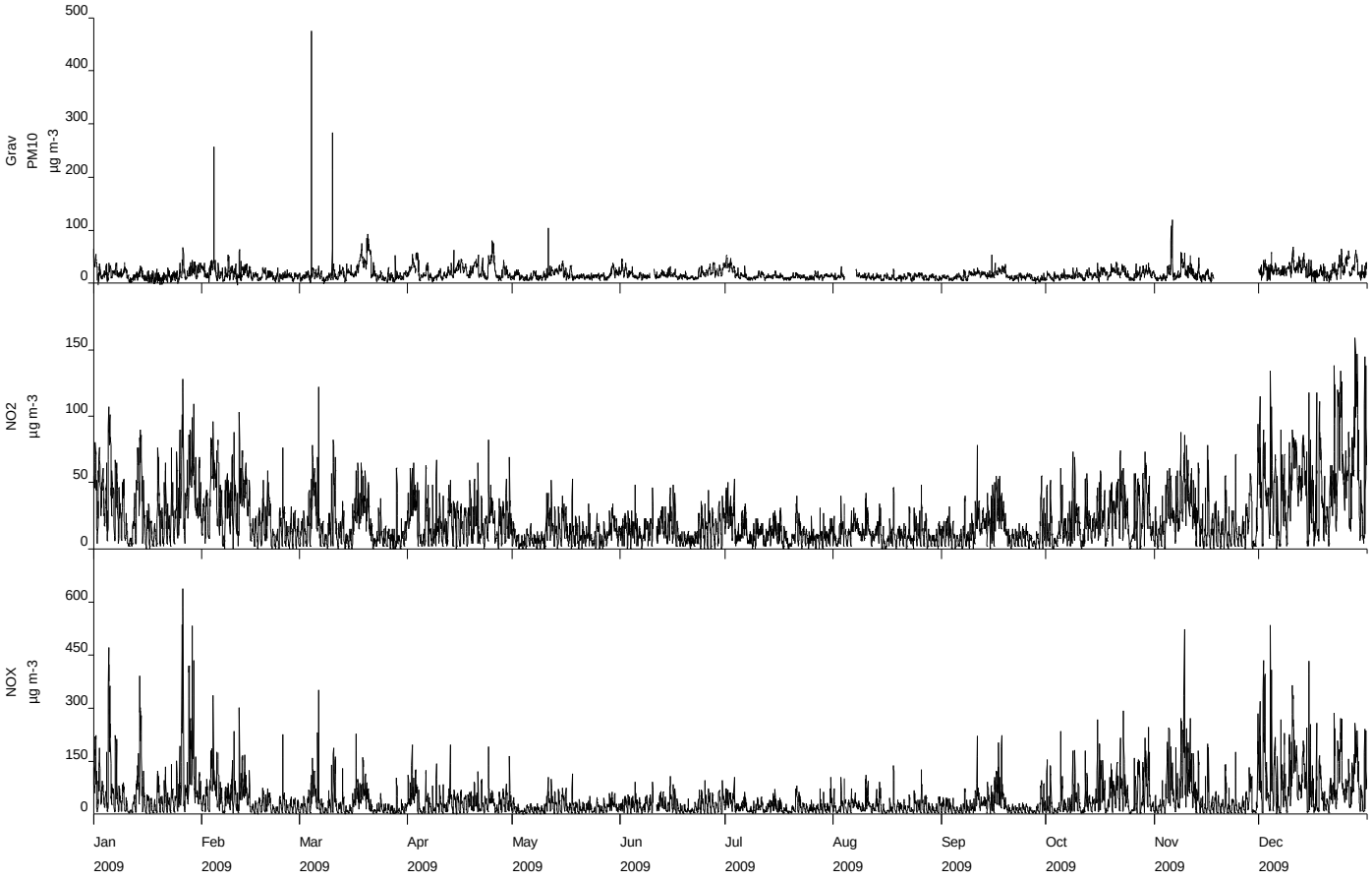
+ PM_{10} as measured by a FDMS using a gravimetric factor of 1
All mass units are at 20℃ and 1013mb
NO_X mass units are NO_X as NO_2 µg m^{-3}

Pollutant	Air Quality Regulations (2000) and Air Quality (Scotland) Amendment Regulations 2002	Exceedences	Days
PM_{10} Particulate Matter (Gravimetric)	Daily mean > 50 µg m^{-3}	2	2
PM_{10} Particulate Matter (Gravimetric)	Annual mean > 18 µg m^{-3}	0	-
Nitrogen Dioxide	Annual mean > 40 µg m^{-3}	0	-
Nitrogen Dioxide	Hourly mean > 200 µg m^{-3}	0	0

Air Pollution Report

Produced by AEA on behalf of the Scottish Government

West Lothian Linlithgow High Street Air Monitoring
Hourly Mean Data for 1st January to 31st December 2009



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Air Pollution Report

Produced by AEA on behalf of the Scottish Government

WEST LOTHIAN UPHALL
17th April to 31st December 2009

These data have been fully ratified by AEA

POLLUTANT	PM_{10}*+
Number Very High	0
Number High	0
Number Moderate	0
Number Low	4426
Maximum 15-minute mean	150 µg m^{-3}
Maximum hourly mean	150 µg m^{-3}
Maximum running 8-hour mean	88 µg m^{-3}
Maximum running 24-hour mean	54 µg m^{-3}
Maximum daily mean	53 µg m^{-3}
Average	12 µg m^{-3}
Data capture	73.9 %

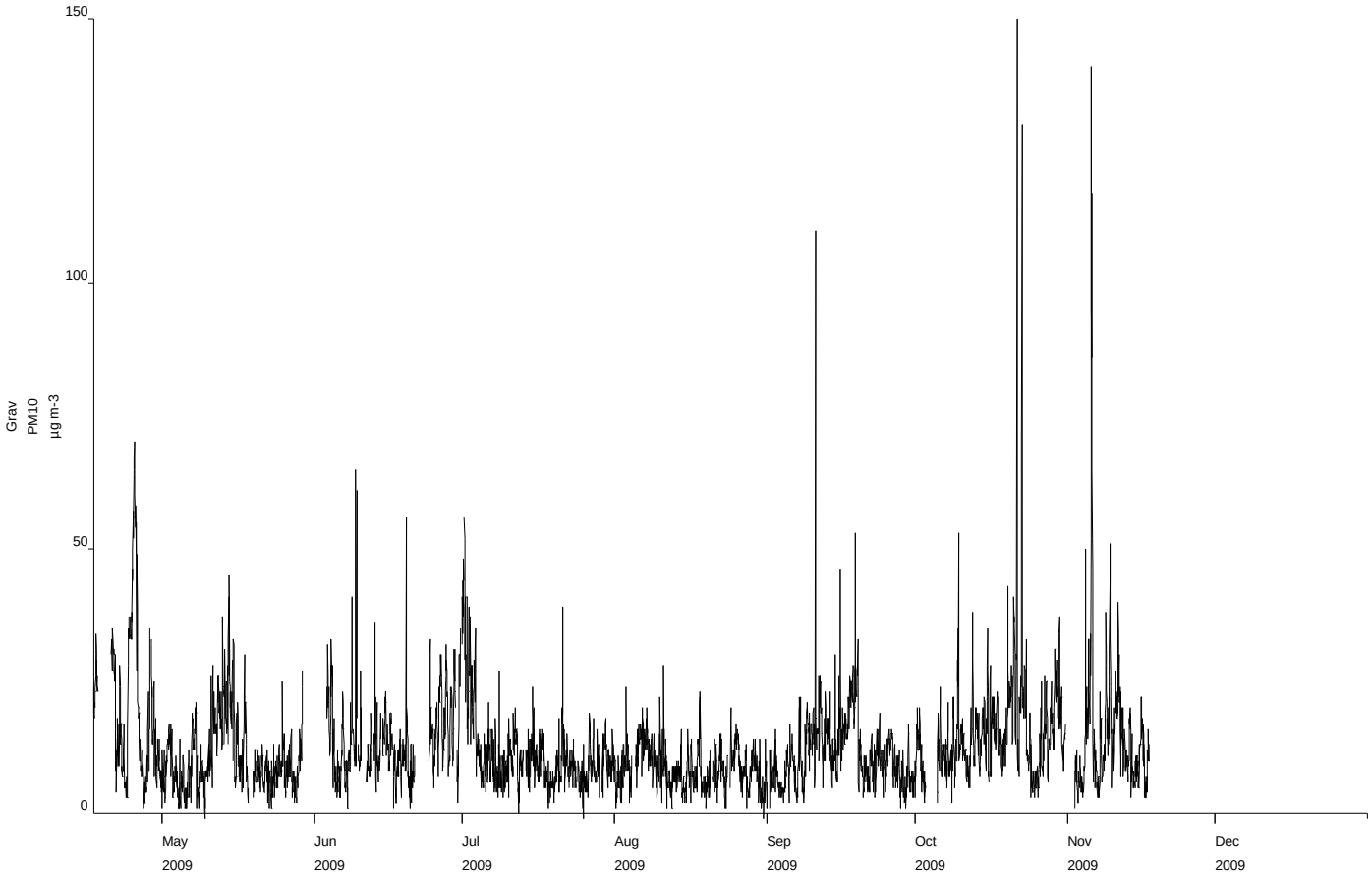
* PM_{10} Indicative Gravimetric Equivalent µg m^{-3}
+ PM_{10} instruments:
FDMS using a gravimetric factor of 1 from 16th April 2009 to 17th November 2009
All mass units are at 20℃ and 1013mb

Pollutant	Air Quality Regulations (2000) and Air Quality (Scotland) Amendment Regulations 2002	Exceedences	Days
PM_{10} Particulate Matter (Gravimetric)	Daily mean > 50 µg m^{-3}	1	1
PM_{10} Particulate Matter (Gravimetric)	Annual mean > 18 µg m^{-3}	-	-

Air Pollution Report

Produced by AEA on behalf of the Scottish Government

West Lothian Uphall Air Monitoring
Hourly Mean Data for 17th April to 31st December 2009



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Air Pollution Report

Produced by AEA on behalf of the Scottish Government

WEST LOTHIAN UPHALL
1st January to 31st December 2009

These data have been fully ratified by AEA

POLLUTANT	PM_{10}*+	NO_2	NO_X
Number Very High	0	0	-
Number High	0	0	-
Number Moderate	0	0	-
Number Low	2386	5422	-
Maximum 15-minute mean	69 µg m^{-3}	143 µg m^{-3}	701 µg m^{-3}
Maximum hourly mean	69 µg m^{-3}	126 µg m^{-3}	575 µg m^{-3}
Maximum running 8-hour mean	58 µg m^{-3}	84 µg m^{-3}	289 µg m^{-3}
Maximum running 24-hour mean	52 µg m^{-3}	61 µg m^{-3}	157 µg m^{-3}
Maximum daily mean	44 µg m^{-3}	56 µg m^{-3}	155 µg m^{-3}
Average	13 µg m^{-3}	17 µg m^{-3}	29 µg m^{-3}
Data capture	27.4 %	61.9 %	61.9 %

* PM_{10} Gravimetric Equivalent µg m^{-3}
+ PM_{10} instruments:
FDMS using a gravimetric factor of 1 from 16th April 2009 to 17th November 2009
TEOM using the VCM for Gravimetric Equivalent from 1st January 2009 to 15th April 2009
All mass units are at 20℃ and 1013mb
NO_X mass units are NO_X as NO_2 µg m^{-3}

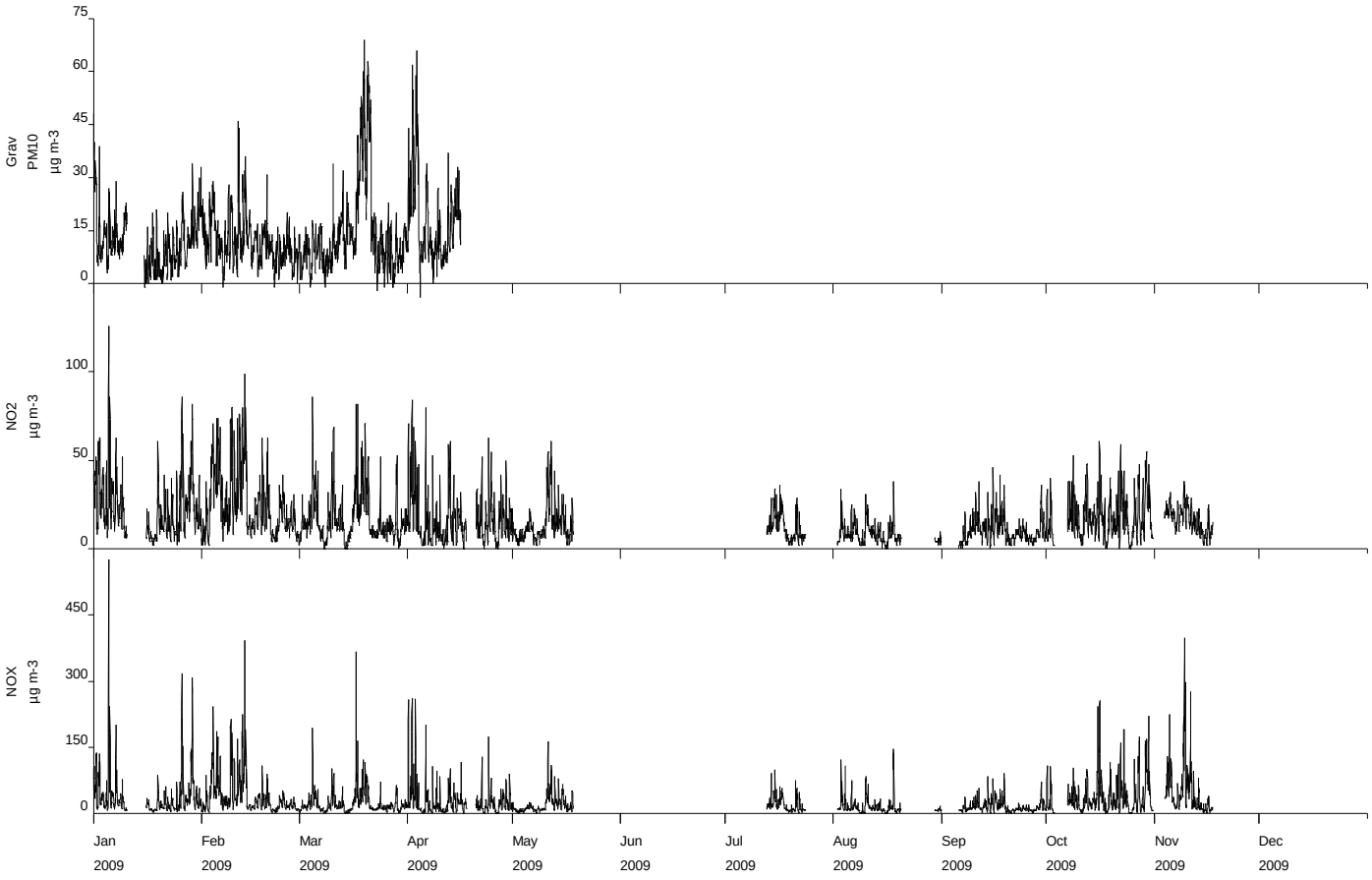
Pollutant	Air Quality Regulations (2000) and Air Quality (Scotland) Amendment Regulations 2002	Exceedences	Days
PM_{10} Particulate Matter (Gravimetric)	Daily mean > 50 µg m^{-3}	0	0
PM_{10} Particulate Matter (Gravimetric)	Annual mean > 18 µg m^{-3}	0	-
Nitrogen Dioxide	Annual mean > 40 µg m^{-3}	0	-
Nitrogen Dioxide	Hourly mean > 200 µg m^{-3}	0	0

Air Pollution Report

Produced by AEA on behalf of the Scottish Government

WEST LOTHIAN UPHALL
1st January to 31st December 2009

These data have been fully ratified by AEA



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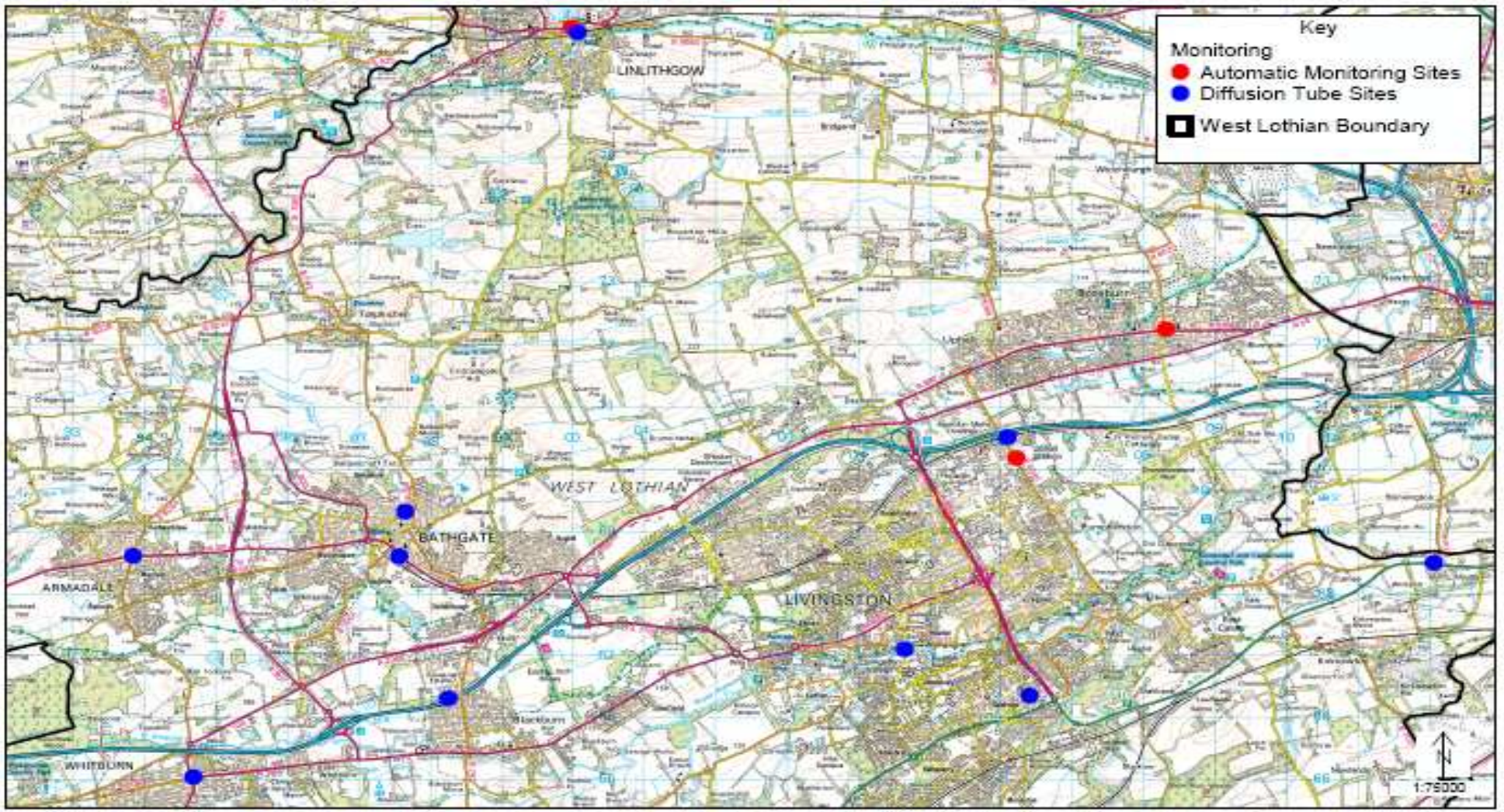
Appendix B: Monitoring Sites in West Lothian



Appendix C: Diffusion Tube Monthly Results

Linlithgow High Street diffusion tube co-location bias factor calculation

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements										Automatic Method		Data Quality Check	
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm $^{-3}$	Tube 2 µgm $^{-3}$	Tube 3 µgm $^{-3}$	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean	Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
1	09/01/2009	03/02/2009	28.0	28.0	29.0	28	0.6	2	1.4	31.1	100	Good	Good
2	03/02/2009	04/03/2009	16.0							24.8	99.9		Good
3	04/03/2009	01/04/2009	17.0	19.0	20.0	19	1.5	8	3.8	17.8	99.4	Good	Good
4	01/04/2009	30/04/2009	28.0	27.0	28.0	28	0.6	2	1.4	20	99.9	Good	Good
5	30/04/2009	05/06/2009	17.0	19.0	18.0	18	1.0	6	2.5	12	100	Good	Good
6	05/06/2009	02/07/2009	22.5	22.2	24.1	23	1.0	4	2.5	15	96.6	Good	Good
7	02/07/2009	29/07/2009	17.7	17.1	16.2	17	0.8	4	1.9	11	100	Good	Good
8	29/07/2009	04/09/2009	15.9	16.0	13.7	15	1.3	9	3.2	11	99.4	Good	Good
9	04/09/2009	01/10/2009	18.0	10.0	21.0	16	5.7	35	14.1	14	100	Poor Precision	Good
10	01/10/2009	03/11/2009	25.1	26.2	26.8	26	0.9	3	2.1	21	100	Good	Good
11	03/11/2009	01/12/2009	26.5	26.5	29.4	27	1.7	6	4.2	24.1	100	Good	Good
12	01/12/2009	08/01/2010	40.3	39.9	40.2	40	0.2	1	0.5	51.3	100	Good	Good
13													
												Good precision	Good Overall DC

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Overall survey -->

(Check average CV & DC from Accuracy calculations)

Site Name/ ID:	Linlithgow

Precision: 10 out of 11 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval) without periods with CV larger than 20%

Bias calculated using 10 periods of data

Bias factor A 0.89 (0.76 - 1.08)

Bias B 13% (-7% - 32%)

Diffusion Tubes Mean: 24 µgm^{-3}

Mean CV (Precision): 5

Automatic Mean: 21 µgm^{-3}

Data Capture for periods used: 100%

Adjusted Tubes Mean: 21 (18 - 26) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA

Bias calculated using 11 periods of data

Bias factor A 0.89 (0.77 - 1.05)

Bias B 13% (-5% - 30%)

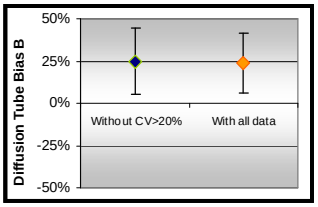
Diffusion Tubes Mean: 23 µgm^{-3}

Mean CV (Precision): 7

Automatic Mean: 21 µgm^{-3}

Data Capture for periods used: 100%

Adjusted Tubes Mean: 21 (18 - 25) µgm^{-3}



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Version 03 - November 2006

Wilkieston diffusion tube results

Adjustment of DUPLICATE or TRIPLICATE Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements										Data Quality Check
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 μgm^{-3}	Tube 2 μgm^{-3}	Tube 3 μgm^{-3}	Triplicate Average	Standard Deviation	CV	95% CI mean	Diffusion Tubes Precision Check
1	09/01/2009	03/02/2009	23.0	23.0		23.0	0.00	0.00	0.00	Good
2	03/02/2009	04/03/2009	29.0	29.0		29.0	0.00	0.00	0.00	Good
3	04/03/2009	01/04/2009	19.0	14.0		16.5	3.54	21.43	31.77	Poor Precision
4	01/04/2009	30/04/2009	28.0	25.0		26.5	2.12	8.00	19.06	Good
5	30/04/2009	05/06/2009	15.0	18.0		16.5	2.12	12.86	19.06	Good
6	05/06/2009	02/07/2009	17.2	15.7		16.5	1.06	6.45	9.53	Good
7	02/07/2009	29/07/2009	19.7	18.9		19.3	0.57	2.93	5.08	Good
8	29/07/2009	04/09/2009	16.3	14.5		15.4	1.27	8.26	11.44	Good
9	04/09/2009	01/10/2009	21.3	24.0		22.7	1.91	8.43	17.15	Good
10	01/10/2009	03/11/2009	27.2	26.9		27.1	0.21	0.78	1.91	Good
11	03/11/2009	01/12/2009	23.0	23.4		23.2	0.28	1.22	2.54	Good
12	01/12/2009	08/01/2010	42.2	33.1		37.7	6.43	17.09	57.81	Good
13										

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

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Version 03 - November 2006

Site Name/ ID:	Wilkieston

Adjusted measurement (95% confidence level)
Without periods with CV larger than 20%

Bias calculated using 10 periods of data
Tube Precision: 5 Automatic DC: 100%
Bias factor A: 0.89 (0.76 - 1.08)
Bias B: 13% (-7% - 32%)

Information about tubes to be adjusted
Diffusion Tube average: 23 μgm^{-3}
Average Precision (CV): 6
Adjusted Tube average: 21 +/- 4 μgm^{-3}

Adjusted measurement (95% confidence level)
with all data

Bias calculated using 11 periods of data
Tube Precision: 7 Automatic DC: 100%
Bias factor A: 0.89 (0.77 - 1.05)
Bias B: 13% (-5% - 30%)

Information about tubes to be adjusted
Diffusion Tube average: 23 μgm^{-3}
Average Precision (CV): 7
Adjusted Tube average: 20 +/- 3 μgm^{-3}

Whitburn Cross diffusion tube results

Adjustment of DUPLICATE or TRIPLICATE Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements										Data Quality Check
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Average	Standard Deviation	CV	95% CI mean	Diffusion Tubes Precision Check
1	09/01/2009	03/02/2009	25.0	31.0		28.0	4.24	15.15	38.12	Good
2	03/02/2009	04/03/2009	42.0	30.0		36.0	8.49	23.57	76.24	Poor Precision
3	04/03/2009	01/04/2009	26.0	25.0		25.5	0.71	2.77	6.35	Good
4	01/04/2009	30/04/2009	31.0	29.0		30.0	1.41	4.71	12.71	Good
5	30/04/2009	05/06/2009	22.0	20.0		21.0	1.41	6.73	12.71	Good
6	05/06/2009	02/07/2009	30.5	32.4		31.5	1.34	4.27	12.07	Good
7	02/07/2009	29/07/2009	27.1	24.8		26.0	1.63	6.27	14.61	Good
8	29/07/2009	04/09/2009	20.3	16.8		18.6	2.47	13.34	22.24	Good
9	04/09/2009	01/10/2009	30.7	28.3		29.5	1.70	5.75	15.25	Good
10	01/10/2009	03/11/2009	34.7	36.2		35.5	1.06	2.99	9.53	Good
11	03/11/2009	01/12/2009	33.4	31.3		32.4	1.48	4.59	13.34	Good
12	01/12/2009	08/01/2010	44.3	50.0		47.2	4.03	8.55	36.21	Good
13										

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

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Version 03 - November 2006

Site Name/ ID:	Whitburn Cross

Adjusted measurement (95% confidence level)
Without periods with CV larger than 20%

Bias calculated using 10 periods of data
Tube Precision: 5 Automatic DC: 100%
Bias factor A: 0.89 (0.76 - 1.08)
Bias B: 13% (-7% - 32%)

Information about tubes to be adjusted
Diffusion Tube average: 30 µgm^{-3}
Average Precision (CV): 7
Adjusted Tube average: 26 +/- 5 µgm^{-3}

Adjusted measurement (95% confidence level)
with all data

Bias calculated using 11 periods of data
Tube Precision: 7 Automatic DC: 100%
Bias factor A: 0.89 (0.77 - 1.05)
Bias B: 13% (-5% - 30%)

Information about tubes to be adjusted
Diffusion Tube average: 30 µgm^{-3}
Average Precision (CV): 8
Adjusted Tube average: 27 +/- 4 µgm^{-3}

Dedridge diffusion tube results

Adjustment of DUPLICATE or TRIPLICATE Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements										Data Quality Check
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 μgm^{-3}	Tube 2 μgm^{-3}	Tube 3 μgm^{-3}	Triplicate Average	Standard Deviation	CV	95% CI mean	Diffusion Tubes Precision Check
1	09/01/2009	03/02/2009	17.0	19.0		18.0	1.41	7.86	12.71	Good
2	03/02/2009	04/03/2009	19.0	19.0		19.0	0.00	0.00	0.00	Good
3	04/03/2009	01/04/2009	10.0	13.0		11.5	2.12	18.45	19.06	Good
4	01/04/2009	30/04/2009	12.0	13.0		12.5	0.71	5.66	6.35	Good
5	30/04/2009	05/06/2009	9.0							
6	05/06/2009	02/07/2009		9.6						
7	02/07/2009	29/07/2009		10.4						
8	29/07/2009	04/09/2009	7.8	7.0		7.4	0.57	7.64	5.08	Good
9	04/09/2009	01/10/2009	11.2	11.1		11.2	0.07	0.63	0.64	Good
10	01/10/2009	03/11/2009	13.3	16.5		14.9	2.26	15.19	20.33	Good
11	03/11/2009	01/12/2009	18.0	19.1		18.6	0.78	4.19	6.99	Good
12	01/12/2009	08/01/2010	33.6	29.7		31.7	2.76	8.71	24.78	Good
13										

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Jaume Targa
jaume.targa@aeat.co.uk
Version 03 - November 2006

Site Name/ ID:	Dedridge, Livingston

Adjusted measurement (95% confidence level)
Without periods with CV larger than 20%
Bias calculated using 10 periods of data
Tube Precision: 5 Automatic DC: 100%
Bias factor A: 0.89 (0.76 - 1.08)
Bias B: 13% (-7% - 32%)

Information about tubes to be adjusted
Diffusion Tube average: 16 μgm^{-3}
Average Precision (CV): 8
Adjusted Tube average: 14 +/- 3 μgm^{-3}

Adjusted measurement (95% confidence level)
with all data
Bias calculated using 11 periods of data
Tube Precision: 7 Automatic DC: 100%
Bias factor A: 0.89 (0.77 - 1.05)
Bias B: 13% (-5% - 30%)

Information about tubes to be adjusted
Diffusion Tube average: 16 μgm^{-3}
Average Precision (CV): 8
Adjusted Tube average: 14 +/- 2 μgm^{-3}

Bathgate High Street diffusion tube results

Adjustment of DUPLICATE or TRIPLICATE Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements										Data Quality Check
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 μgm^{-3}	Tube 2 μgm^{-3}	Tube 3 μgm^{-3}	Triplicate Average	Standard Deviation	CV	95% CI mean	Diffusion Tubes Precision Check
1	09/01/2009	03/02/2009	18.0	27.0		22.5	6.36	28.28	57.18	Poor Precision
2	03/02/2009	04/03/2009	46.0	15.0		30.5	21.92	71.87	196.95	Poor Precision
3	04/03/2009	01/04/2009	9.0	13.0		11.0	2.83	25.71	25.41	Poor Precision
4	01/04/2009	30/04/2009	12.0	12.0		12.0	0.00	0.00	0.00	Good
5	30/04/2009	05/06/2009	9.0	7.0		8.0	1.41	17.68	12.71	Good
6	05/06/2009	02/07/2009	8.4	8.5		8.5	0.07	0.84	0.64	Good
7	02/07/2009	29/07/2009	8.8	8.5		8.7	0.21	2.45	1.91	Good
8	29/07/2009	04/09/2009	8.4	8.3		8.4	0.07	0.85	0.64	Good
9	04/09/2009	01/10/2009	11.2	12.7		12.0	1.06	8.88	9.53	Good
10	01/10/2009	03/11/2009	18.2	17.9		18.1	0.21	1.18	1.91	Good
11	03/11/2009	01/12/2009	19.9	20.0		20.0	0.07	0.35	0.64	Good
12	01/12/2009	08/01/2010	25.7	31.0		28.4	3.75	13.22	33.67	Good
13										

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Jaume Targa
jaume.targa@aeat.co.uk
Version 03 - November 2006

Site Name/ ID:	High Street, Bathgate

Adjusted measurement (95% confidence level)
Without periods with CV larger than 20%
Bias calculated using 10 periods of data
Tube Precision: 5 Automatic DC: 100%
Bias factor A: 0.89 (0.76 - 1.08)
Bias B: 13% (-7% - 32%)

Information about tubes to be adjusted
Diffusion Tube average: 14 μgm^{-3}
Average Precision (CV): 5
Adjusted Tube average: 12 +/- 2 μgm^{-3}

Adjusted measurement (95% confidence level)
with all data
Bias calculated using 11 periods of data
Tube Precision: 7 Automatic DC: 100%
Bias factor A: 0.89 (0.77 - 1.05)
Bias B: 13% (-5% - 30%)

Information about tubes to be adjusted
Diffusion Tube average: 16 μgm^{-3}
Average Precision (CV): 14
Adjusted Tube average: 14 +/- 2 μgm^{-3}

Whitehill Inprint diffusion tube results

Adjustment of DUPLICATE or TRIPLICATE Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements										Data Quality Check
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Average	Standard Deviation	CV	95% CI mean	Diffusion Tubes Precision Check
1	09/01/2009	03/02/2009	35.0	38.0		36.5	2.12	5.81	19.06	Good
2	03/02/2009	04/03/2009	29.0	32.0		30.5	2.12	6.96	19.06	Good
3	04/03/2009	01/04/2009	25.0	24.0		24.5	0.71	2.89	6.35	Good
4	01/04/2009	30/04/2009	31.0	32.0		31.5	0.71	2.24	6.35	Good
5	30/04/2009	05/06/2009		21.0						
6	05/06/2009	02/07/2009	29.0	28.3		28.7	0.49	1.73	4.45	Good
7	02/07/2009	29/07/2009	24.7	24.8		24.8	0.07	0.29	0.64	Good
8	29/07/2009	04/09/2009	21.3	24.0		22.7	1.91	8.43	17.15	Good
9	04/09/2009	01/10/2009	27.3	26.6		27.0	0.49	1.84	4.45	Good
10	01/10/2009	03/11/2009	31.7	33.3		32.5	1.13	3.48	10.16	Good
11	03/11/2009	01/12/2009	32.0	35.7		33.9	2.62	7.73	23.51	Good
12	01/12/2009	08/01/2010	38.1	44.2		41.2	4.31	10.48	38.75	Good
13										

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Jaume Targa
jaume.targa@aeat.co.uk
Version 03 - November 2006

Site Name/ ID: Whitehill Inprint

Adjusted measurement (95% confidence level)
Without periods with CV larger than 20%
Bias calculated using 10 periods of data
Tube Precision: 5 Automatic DC: 100%
Bias factor A: 0.89 (0.76 - 1.08)
Bias B: 13% (-7% - 32%)

Information about tubes to be adjusted
Diffusion Tube average: 30 µgm^{-3}
Average Precision (CV): 5
Adjusted Tube average: 27 +/- 5 µgm^{-3}

Adjusted measurement (95% confidence level)
with all data
Bias calculated using 11 periods of data
Tube Precision: 7 Automatic DC: 100%
Bias factor A: 0.89 (0.77 - 1.05)
Bias B: 13% (-5% - 30%)

Information about tubes to be adjusted
Diffusion Tube average: 30 µgm^{-3}
Average Precision (CV): 5
Adjusted Tube average: 27 +/- 4 µgm^{-3}

Armadale Cross diffusion tube results

Adjustment of DUPLICATE or TRIPLICATE Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements										Data Quality Check
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Average	Standard Deviation	CV	95% CI mean	Diffusion Tubes Precision Check
1	09/01/2009	03/02/2009	34.0	34.0		34.0	0.00	0.00	0.00	Good
2	03/02/2009	04/03/2009	36.0	43.0		39.5	4.95	12.53	44.47	Good
3	04/03/2009	01/04/2009	28.0	29.0		28.5	0.71	2.48	6.35	Good
4	01/04/2009	30/04/2009	33.0	32.0		32.5	0.71	2.18	6.35	Good
5	30/04/2009	05/06/2009	26.0	23.0		24.5	2.12	8.66	19.06	Good
6	05/06/2009	02/07/2009	20.8	21.6		21.2	0.57	2.67	5.08	Good
7	02/07/2009	29/07/2009	27.7	28.9		28.3	0.85	3.00	7.62	Good
8	29/07/2009	04/09/2009	29.5	27.3		28.4	1.56	5.48	13.98	Good
9	04/09/2009	01/10/2009	35.0	35.9		35.5	0.64	1.80	5.72	Good
10	01/10/2009	03/11/2009	35.2	37.8		36.5	1.84	5.04	16.52	Good
11	03/11/2009	01/12/2009	36.2	40.6		38.4	3.11	8.10	27.95	Good
12	01/12/2009	08/01/2010	42.2	48.9		45.6	4.74	10.40	42.57	Good
13										

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Jaume Targa
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Version 03 - November 2006

Site Name/ ID:	Armadale Cross

Adjusted measurement (95% confidence level)
Without periods with CV larger than 20%

Bias calculated using 10 periods of data
Tube Precision: 5 Automatic DC: 100%
Bias factor A: 0.89 (0.76 - 1.08)
Bias B: 13% (-7% - 32%)

Information about tubes to be adjusted
Diffusion Tube average: 33 µgm^{-3}
Average Precision (CV): 5
Adjusted Tube average: 29 +/- 5 µgm^{-3}

Adjusted measurement (95% confidence level)
with all data

Bias calculated using 11 periods of data
Tube Precision: 7 Automatic DC: 100%
Bias factor A: 0.89 (0.77 - 1.05)
Bias B: 13% (-5% - 30%)

Information about tubes to be adjusted
Diffusion Tube average: 33 µgm^{-3}
Average Precision (CV): 5
Adjusted Tube average: 29 +/- 5 µgm^{-3}

Uphall Station diffusion tube results

Adjustment of DUPLICATE or TRIPLICATE Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements										Data Quality Check
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm $^{-3}$	Tube 2 µgm $^{-3}$	Tube 3 µgm $^{-3}$	Triplicate Average	Standard Deviation	CV	95% CI mean	Diffusion Tubes Precision Check
1	09/01/2009	03/02/2009	16.0	27.0		21.5	7.78	36.18	69.88	Poor Precision
2	03/02/2009	04/03/2009	31.0	28.0		29.5	2.12	7.19	19.06	Good
3	04/03/2009	01/04/2009	17.0							
4	01/04/2009	30/04/2009	27.0	19.0		23.0	5.66	24.60	50.82	Poor Precision
5	30/04/2009	05/06/2009	19.0	23.0		21.0	2.83	13.47	25.41	Good
6	05/06/2009	02/07/2009	25.4	25.5		25.5	0.07	0.28	0.64	Good
7	02/07/2009	29/07/2009	23.6	25.2		24.4	1.13	4.64	10.16	Good
8	29/07/2009	04/09/2009	18.5	20.1		19.3	1.13	5.86	10.16	Good
9	04/09/2009	01/10/2009	20.3	24.8		22.6	3.18	14.11	28.59	Good
10	01/10/2009	03/11/2009	31.5	28.6		30.1	2.05	6.82	18.42	Good
11	03/11/2009	01/12/2009	31.7	34.5		33.1	1.98	5.98	17.79	Good
12	01/12/2009	08/01/2010	41.8	40.5		41.2	0.92	2.23	8.26	Good
13										

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Jaume Targa
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Version 03 - November 2006

Site Name/ ID:	Uphall Station

Adjusted measurement (95% confidence level)
Without periods with CV larger than 20%
Bias calculated using 10 periods of data
Tube Precision: 5 Automatic DC: 100%
Bias factor A: 0.89 (0.76 - 1.08)
Bias B: 13% (-7% - 32%)

Information about tubes to be adjusted
Diffusion Tube average: 27 µgm^{-3}
Average Precision (CV): 7
Adjusted Tube average: 24 +/- 4 µgm^{-3}

Adjusted measurement (95% confidence level)
with all data
Bias calculated using 11 periods of data
Tube Precision: 7 Automatic DC: 100%
Bias factor A: 0.89 (0.77 - 1.05)
Bias B: 13% (-5% - 30%)

Information about tubes to be adjusted
Diffusion Tube average: 26 µgm^{-3}
Average Precision (CV): 11
Adjusted Tube average: 24 +/- 4 µgm^{-3}

Livingston Alderstone Road diffusion tube results

Adjustment of DUPLICATE or TRIPLICATE Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements										Data Quality Check
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Average	Standard Deviation	CV	95% CI mean	Diffusion Tubes Precision Check
1	09/01/2009	03/02/2009		24.0						
2	03/02/2009	04/03/2009	26.0	27.0		26.5	0.71	2.67	6.35	Good
3	04/03/2009	01/04/2009	10.0	11.0		10.5	0.71	6.73	6.35	Good
4	01/04/2009	30/04/2009	17.0	14.0		15.5	2.12	13.69	19.06	Good
5	30/04/2009	05/06/2009	16.0	15.0		15.5	0.71	4.56	6.35	Good
6	05/06/2009	02/07/2009	17.5	17.0		17.3	0.35	2.05	3.18	Good
7	02/07/2009	29/07/2009	21.1	21.0		21.1	0.07	0.34	0.64	Good
8	29/07/2009	04/09/2009	16.0	16.9		16.5	0.64	3.87	5.72	Good
9	04/09/2009	01/10/2009	19.7	20.3		20.0	0.42	2.12	3.81	Good
10	01/10/2009	03/11/2009	25.5	26.1		25.8	0.42	1.64	3.81	Good
11	03/11/2009	01/12/2009	24.9	25.3		25.1	0.28	1.13	2.54	Good
12	01/12/2009	08/01/2010	32.0	50.6		41.3	13.15	31.85	118.17	Poor Precision
13										

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Site Name/ ID:	Alderstone Road, Livingston

Jaume Targa
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Version 03 - November 2006

Adjusted measurement (95% confidence level)
Without periods with CV larger than 20%

Bias calculated using 10 periods of data
Tube Precision: 5 Automatic DC: 100%
Bias factor A: 0.89 (0.76 - 1.08)
Bias B: 13% (-7% - 32%)

Information about tubes to be adjusted
Diffusion Tube average: 19 µgm^{-3}
Average Precision (CV): 4
Adjusted Tube average: 17 +/- 3 µgm^{-3}

Adjusted measurement (95% confidence level)
with all data

Bias calculated using 11 periods of data
Tube Precision: 7 Automatic DC: 100%
Bias factor A: 0.89 (0.77 - 1.05)
Bias B: 13% (-5% - 30%)

Information about tubes to be adjusted
Diffusion Tube average: 21 µgm^{-3}
Average Precision (CV): 6
Adjusted Tube average: 19 +/- 3 µgm^{-3}

Bathgate King Street diffusion tube results

Adjustment of DUPLICATE or TRIPLICATE Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements										Data Quality Check
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm $^{-3}$	Tube 2 µgm $^{-3}$	Tube 3 µgm $^{-3}$	Triplicate Average	Standard Deviation	CV	95% CI mean	Diffusion Tubes Precision Check
1	09/01/2009	03/02/2009	35.0	40.0		37.5	3.54	9.43	31.77	Good
2	03/02/2009	04/03/2009	40.0	49.0		44.5	6.36	14.30	57.18	Good
3	04/03/2009	01/04/2009	24.0	27.0		25.5	2.12	8.32	19.06	Good
4	01/04/2009	30/04/2009	35.0	37.0		36.0	1.41	3.93	12.71	Good
5	30/04/2009	05/06/2009	32.0	24.0		28.0	5.66	20.20	50.82	Poor Precision
6	05/06/2009	02/07/2009	33.9	28.9		31.4	3.54	11.26	31.77	Good
7	02/07/2009	29/07/2009								
8	29/07/2009	04/09/2009	33.0	29.0		31.0	2.83	9.12	25.41	Good
9	04/09/2009	01/10/2009	36.9	36.9		36.9	0.00	0.00	0.00	Good
10	01/10/2009	03/11/2009	42.5							
11	03/11/2009	01/12/2009	44.9	47.5		46.2	1.84	3.98	16.52	Good
12	01/12/2009	08/01/2010	62.5	61.0		61.8	1.06	1.72	9.53	Good
13										

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Jaume Targa
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Version 03 - November 2006

Site Name/ ID:	King Street, Bathgate

Adjusted measurement (95% confidence level)
Without periods with CV larger than 20%
Bias calculated using 10 periods of data
Tube Precision: 5 Automatic DC: 100%
Bias factor A: 0.89 (0.76 - 1.08)
Bias B: 13% (-7% - 32%)

Information about tubes to be adjusted
Diffusion Tube average: 39 µgm^{-3}
Average Precision (CV): 7
Adjusted Tube average: 35 +/- 6 µgm^{-3}

Adjusted measurement (95% confidence level)
with all data
Bias calculated using 11 periods of data
Tube Precision: 7 Automatic DC: 100%
Bias factor A: 0.89 (0.77 - 1.05)
Bias B: 13% (-5% - 30%)

Information about tubes to be adjusted
Diffusion Tube average: 38 µgm^{-3}
Average Precision (CV): 8
Adjusted Tube average: 34 +/- 5 µgm^{-3}

Appendix D: Predicted Nitrogen Dioxide concentrations at different distances from roads

Broxburn

This calculator allows you to predict the annual mean NO_2 concentration for a location ("receptor") that is close to a monitoring site, but nearer or further the kerb than the monitor. The next sheet shows your results on a graph.

Enter data into the yellow cells

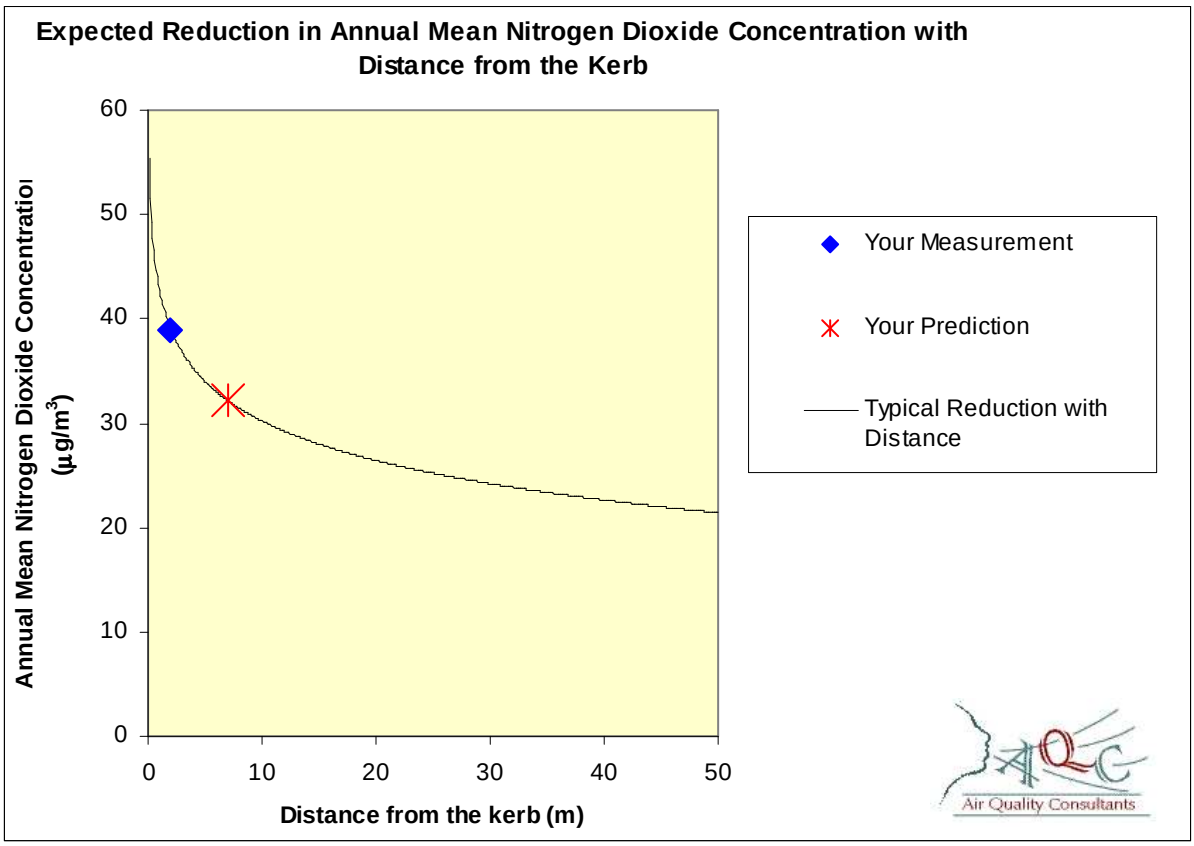
Step 1	How far from the KERB was your measurement made (in metres)?	(Note 1)	2	metres
Step 2	How far from the KERB is your receptor (in metres)?	(Note 1)	7	metres
Step 3	What is the local annual mean background NO_2 concentration (in $\mu g/m^3$)?	(Note 2)	15.7	$\mu g/m^3$
Step 4	What is your measured annual mean NO_2 concentration (in $\mu g/m^3$)?	(Note 2)	39	$\mu g/m^3$
Result	The predicted annual mean NO_2 concentration (in $\mu g/m^3$) at your receptor	(Note 3)	32.2	$\mu g/m^3$

Note 1: This should be measured horizontally from the kerb and assumes that the monitor and receptor have similar elevations. Each distance should be greater than 0.1m and less than 50m (In practice, using a value of 0.1m when the monitor is closer to the kerb than this is likely to be reasonable). The receptor is the location for which you wish to make your prediction. The monitor can either be closer to the kerb than the receptor, or further from the kerb than the receptor. The closer the monitor and the receptor are to each other, the more reliable the prediction will be. When your receptor is further from the kerb than your monitor, it is recommended that the receptor and monitor should be within 20m of each other. When your receptor is closer to the kerb than your monitor, it is recommended that the receptor and monitor should be within 10m of each other.

Note 2: The measurement and the background must be for the same year. The background concentration could come from the national maps published at www.airquality.co.uk, or alternatively from a nearby monitor in a background location.

Note 3: The calculator follows the procedure set out in Box 2.3 of LAQM TG(09). The results will have a greater uncertainty than the measured data. More confidence can be placed in results where the distance between the monitor and the receptor is small than where it is large.

Issue 2: 16/03/09. Created by Dr Ben Marner; Approved by Prof Duncan Laxen. Contact: benmarner@aqconsultants.co.uk



Linlithgow

This calculator allows you to predict the annual mean NO_2 concentration for a location ("receptor") that is close to a monitoring site, but nearer or further the kerb than the monitor. The next sheet shows your results on a graph.

Enter data into the yellow cells

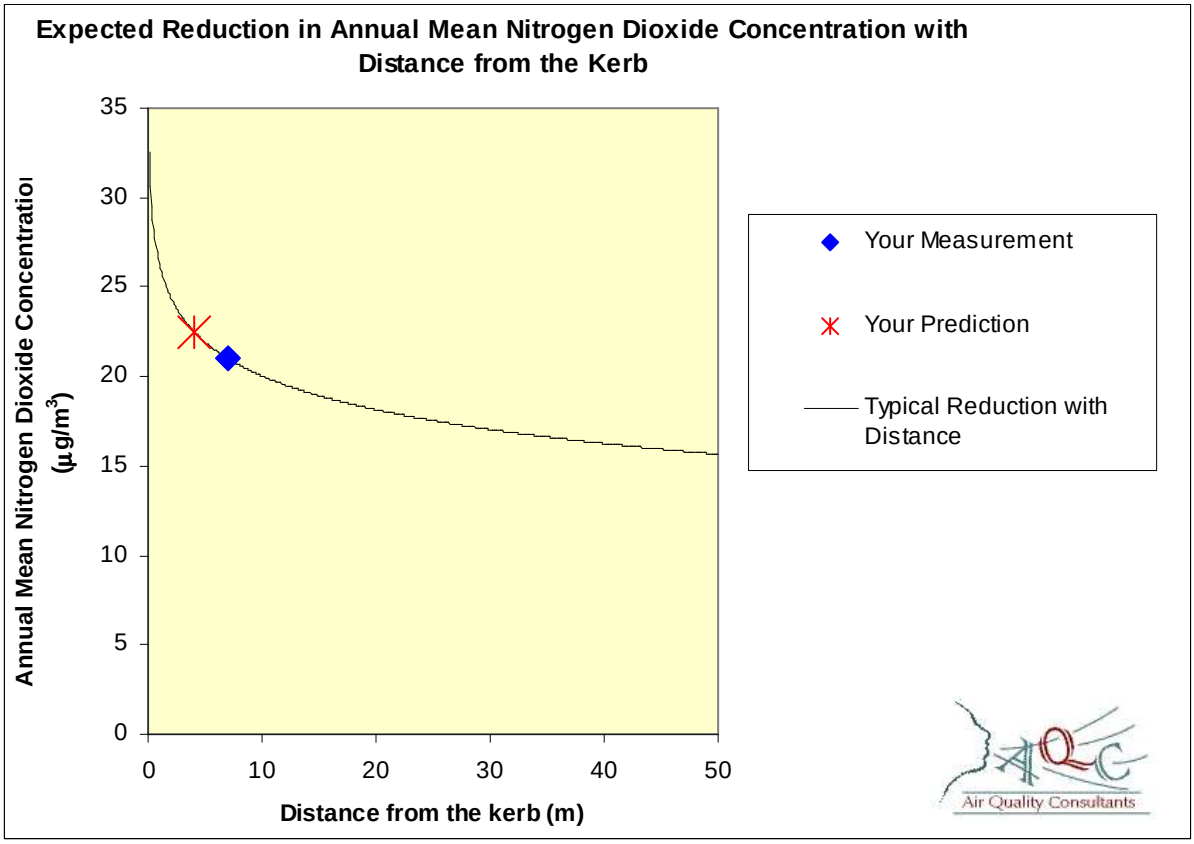
Step 1	**How far from the KERB was your measurement made (in metres)?**	(Note 1)	**7**	metres
Step 2	**How far from the KERB is your receptor (in metres)?**	(Note 1)	**4**	metres
Step 3	**What is the local annual mean background NO_2 concentration (in $\mu g/m^3$)?**	(Note 2)	**12.8**	$\mu g/m^3$
Step 4	**What is your measured annual mean NO_2 concentration (in $\mu g/m^3$)?**	(Note 2)	**21**	$\mu g/m^3$
Result	**The predicted annual mean NO_2 concentration (in $\mu g/m^3$) at your receptor**	(Note 3)	**22.5**	$\mu g/m^3$

Note 1: This should be measured horizontally from the kerb and assumes that the monitor and receptor have similar elevations. Each distance should be greater than 0.1m and less than 50m (In practice, using a value of 0.1m when the monitor is closer to the kerb than this is likely to be reasonable). The receptor is the location for which you wish to make your prediction. The monitor can either be closer to the kerb than the receptor, or further from the kerb than the receptor. The closer the monitor and the receptor are to each other, the more reliable the prediction will be. When your receptor is further from the kerb than your monitor, it is recommended that the receptor and monitor should be within 20m of each other. When your receptor is closer to the kerb than your monitor, it is recommended that the receptor and monitor should be within 10m of each other.

Note 2: The measurement and the background must be for the same year. The background concentration could come from the national maps published at www.airquality.co.uk, or alternatively from a nearby monitor in a background location.

Note 3: The calculator follows the procedure set out in Box 2.3 of LAQM TG(09). The results will have a greater uncertainty than the measured data. More confidence can be placed in results where the distance between the monitor and the receptor is small than where it is large.

Issue 2: 16/03/09. Created by Dr Ben Marner; Approved by Prof Duncan Laxen. Contact: benmarner@aqconsultants.co.uk



Appendix E
DMRB Assessments

Location	Distance from link centre to receptor (m)	Traffic flow &		Traffic composition							
		AADT (combined)	Annual average	Road type (A,B,C,D	Vehicles <3.5t GVW (LDV)			Vehicles>3.5t GVW (HDV)			
					% passen-	% light goods	Total % LDV	% buses	% rigid HGV	% articulat	Total % HDV
Newton	5	13461	30	A			85				15
Longridge	7	6900	28	A			86				14
East Main Street,Whitburn	5	13426	31	A			83				17
West Main Street, Whitburn	5	6445	22	B			85				13
Armadale Road, Whitburn	7	10151	26	A			91				9
King Street, Bathgate	5	13975	22	A			85				15

All receptors			Pollutant concentrations at receptor						
Receptor number	Name	Year	CO*	Benzene	1,3-butadiene	NO_x	NO_2*	PM_{10}	
			Annual mean mg/m^3	Annual mean $\mu g/m^3$	Annual mean $\mu g/m^3$	Annual mean $\mu g/m^3$	Annual mean $\mu g/m^3$	Annual mean $\mu g/m^3$	Days $>50\mu g/m^3$
1	Newton	2009	0.12	0.10	0.21	45.19	21.67	16.15	0.36
2	Longridge	2009	0.06	0.05	0.10	21.99	13.50	12.78	0.00
3	East Main St Whitburn	2009	0.13	0.11	0.25	52.86	27.96	17.89	1.32
4	West Main Street, Whitburn	2009	0.06	0.05	0.08	17.43	15.63	11.63	0.00
5	Armadale Road, Whitburn	2009	0.08	0.08	0.12	25.57	22.38	14.76	0.00
6	King Street, Bathgate	2009	0.13	0.11	0.23	48.19	29.06	16.19	0.38