West Lothian Council

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

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

September 2009

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Executive Summary

The Review and Assessment process has highlighted that there are no exceedences of any of the Air Quality Objectives for the pollutants monitored, which include nitrogen dioxide (NO_2), Particulates (PM_{10}), carbon monoxide (CO) or sulphur dioxide (SO_2).

Automatic monitoring will continue at Linlithgow and Broxburn due to the annual mean concentration for PM_{10} and NO_2 respectively, being close to the annual air quality objective for these pollutants.

Diffusion tube surveys for NO_2 will continue although some may be relocated.

The Review and Assessment Process has indicated two Detailed Assessments will be required. One for NO_2 at West Calder associated with road traffic and one for PM_{10} at Drumshoreland Road associated with a large poultry farm.

A programme of road traffic surveys will be undertaken at various busy roads and junctions to allow a DMRB assessment to be undertaken for relevent pollutants.

Currently there are no Air Quality Management Areas (AQMA) in West Lothian.

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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, A8 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 Report

This report fulfils the requirements of the Local Air Quality Management process as set out in Part IV of the Environment Act (1995), the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 and the relevant Policy and Technical Guidance documents[1]. The Local Air Quality Management (LAQM) process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where exceedences are considered likely, the local authority must then declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives.

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 microgrammes 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	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
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
	40 $\mu g/m^3$	Annual 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
	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. To date there have been no exceedences of the air quality objectives for any pollutant.

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 of 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 to 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.

The Review and Assessment process in West Lothian to date has not resulted in any requirement for detailed assessments or AQMA declarations.

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 which are permanently, situated at Linlithgow and Broxburn and one mobile unit currently located at Uphall Station. A map showing the locations of all monitoring sites is included in Appendix A. Details of the monitoring sites are shown in Table 2.1

The permanent roadside monitoring station (Romon300) located at Linlithgow High Street has real-time analysers for NO_X and PM_{10} and monitoring has been ongoing for a number of years.

The mobile air quality unit (Groundhog) was relocated from Cairnie Place in Whitburn (due to the completion of the Polkemmet bing removal) to Uphall Station adjacent to Pumpherston Road in June 2008. The unit was relocated to Uphall Station to verify the pollution levels in the vicinity of a proposed large residential development. It had been predicted that the existing air quality for PM_{10} would exceed the 2010 objective. The prediction however was based on an unusually high background concentration obtained from the national background maps. The Groundhog has real-time analysers monitoring Carbon monoxide (CO), Oxides of Nitrogen (NO_X), Particulate Matter (PM_{10}) and Sulphur dioxide (SO_2).

A new monitoring (CMC) station has been located in East Main Street, Broxburn since June 2008 monitoring NOx and PM_{10}. The requirement to undertake monitoring at this location was highlighted in the progress report of March 2007 as a result elevated NO_2 levels identified from a diffusion tube survey.

All three automatic monitoring sites in West Lothian are included in the Scottish Government, Scottish Air Quality database for Scotland and the Scottish Air Quality Website. Data and information on the monitoring sites can be obtained from www.scottishairquality.co.uk

Table 2.1 Details of 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?
Linlithgow	Roadside	X 299989 Y 677090	NO_2 PM_{10}	N	Y (-5.5m)	8m	Y
Broxburn	Roadside	X 308314 Y 672231	NO_2 PM_{10}	N	Y (3.5m)	2m	Y
Uphall Station	Roadside	X 306219 Y 670160	NO_2 PM_{10} SO_2 CO	N	Y (0m)	5m	Y

Linlithgow – The Romon 300 monitoring station is located on Linlithgow High Street 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, which is subject to constant often slow moving traffic. The High Street is very busy street with an annual average daily traffic flow (AADT) of approximately 16,500 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 is currently 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 lies 100m to the west.

Quality Assurance and Quality Control details for these monitoring stations are fully detailed in Appendix B

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 (after Broxburn ceasing) 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.

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?
Broxburn West Main Street (to 30/09/08)	Roadside	X 308192 Y 672223	NO_2	N	Y (2m)	2m	Y
Whitburn Cross	Roadside	X 294687 Y 665030	NO_2	N	Y (1m)	3m	Y
Dedridge Cedric Rise	Urban background	X 306403 Y 666341	NO_2	N	Y (4m)	3m	N
Bathgate High Street	Urban background	X 297656 Y 669298	NO_2	N	Y (3m)	10m	N
Whitehill Inprint	Roadside	X 298259 Y 666298	NO_2	N	N	25m	Y
Linlithgow ROMON	Roadside	X 299989 Y 677090	NO_2	N	Y (4m)	7m	Y
Armadale Cross	Roadside	X 293842 Y 668588	NO_2	N	Y (2m)	2m	Y
Uphall Station	Roadside	X 306096 Y 670497	NO_2	N	Y (5m)	5m	Y
Alderston Road	Roadside	X 304653 Y 667086	NO_2	N	N	2m	Y
Bathgate King Street	Roadside	X 297570 Y 668583	NO_2	N	Y (5m)	4m	Y
Wilkieston	Roadside	X 312070 Y 668476	NO_2	N	Y (4m)	3m	Y

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 absorbant 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 have 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 0.88. 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[2] – 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 0.88, which was applied to all diffusion tube site data. This local bias factor was considered more representative than the nationally derived bias of 0.92 obtained from the AEA spreadsheet of Bias Adjustment Factors. The locally derived bias factor calculates values around 4% less than if using the national factor. This would be insignificant with regard to measured diffusion tube concentrations.

2.2 Comparison of Monitoring Results with AQ Objectives

West Lothian Council monitor predominantly the pollutants PM_{10} and NO_2. Monitoring of CO and SO_2 was continued in 2008 in the mobile monitoring station (groundhog).
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

Real-time NOx analysers are located within the air-quality monitoring unit (Groundhog) in Uphall Station, Broxburn East Main Street and within the Romon300 at Linlithgow High Street. The analysers in Broxburn and Uphall Station have been operating at these sites from July 2008.

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Diffusion tube surveys have been ongoing throughout 2008.

Automatic Monitoring Data

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

Table 2.3a overleaf summarises the annual mean NO_2 concentrations. Results for Linlithgow (20 $\mu g/m^3$) and Uphall Station (22 $\mu g/m^3$) are both below the objective of 40$\mu g/m^3$. The measured annual mean concentration at Broxburn was 40 $\mu g/m^3$.

Both Uphall and Broxburn annual mean concentrations incorporate adjustments to account for shorter term monitoring data as detailed in the QA/QC Short term to long term data adjustment in Appendix B.

The annual mean concentration for NO_2 at Broxburn was adjusted to account for distance to the receptor location. Using the distance correction model (Appendix D) the annual mean concentration drops to 33.3$\mu g/m^3$. 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.

There is therefore 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. It does highlight however that there are elevated levels of NO_2 at the Broxburn 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 relevent exposure being closer to the road than the monitor. The corrected concentration increases the annual mean to 21.4 $\mu g/m^3$. 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 $\mu g/m^3$ 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 200$\mu g/m^3$ at any monitoring location.

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

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

Site ID	Location/ OS Reference	Within AQMA?	Proportion of year with valid data 2008 %	Annual mean concentrations (μg/m^3)		
				2006	2007	2008
Broxburn	East Main Street X 308314 Y 672231	N	88*	NA	NA	40 (33.3)**
Linlithgow	High Street X 299989 Y 677090	N	95	27	23	20 (21.4)**
Uphall Station	Pumpherston Rd X 306219 Y 670160	N	82*	NA	NA	22

***** Monitoring undertaken for just under 6 months and therefore data capture includes 2-3 weeks of no data. Data capture calculated from 01/07/08 to 31/12/08.
** Incorporating distance correction to building façade (receptor).

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

Site ID	Location	Within AQMA?	Data Capture 2008 %	Number of Exceedences of hourly mean (200 μg/m^3) *If the period of valid data is less than 90% of a full year, include the 99.8th %ile of hourly means in brackets.*		
				2006	2007	2008
Broxburn	East Main Street X 308314 Y 672231	N	88	NA	NA	0 (126)*
Linlithgow	High Street X 299989 Y 677090	N	95	0	0	0
Uphall Station	Pumpherston Rd X 306219 Y 670160	N	82	NA	NA	0 (111)*

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

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.

Results of the diffusion tube monitoring for 2008 are shown in Table 2.4a and previous years data in Table 2.4b below.

Table 2.4a Results of Nitrogen Dioxide Diffusion Tubes

Site ID	OS Reference	Within AQMA?	Data Capture 2008 %	Annual mean concentrations 2008 ($\mu g/m^3$) Adjusted for bias
Broxburn West Main Street (to 30/09/08)	X 308192 Y 672223	N	65	31*
Whitburn Cross	X 294687 Y 665030	N	93	24
Dedridge Cedric Rise	X 306403 Y 666341	N	90	13
Bathgate High Street	X 297656 Y 669298	N	83	14*****
Whitehill Inprint (from 01/10/09)	X 298259 Y 666298	N	25	28*****
Linlithgow ROMON	X 299989 Y 677090	N	93	20
Armadale Cross	X 293842 Y 668588	N	84	26*****
Uphall Station	X 306096 Y 670497	N	100	24
Alderston Road	X 304653 Y 667086	N	92	18
Bathgate King Street	X 297570 Y 668583	N	93	31
Wilkieston	X 312070 Y 668476	N	86	17*****

* Data capture less than 90% over full year.

All bias adjustment calculation and monthly data for each site are detailed in Appendix C.

There are no annual mean concentrations in the above Table in excess of the annual objective value of 40 $\mu g/m^3$.

Table 2.4b. Trend Results of Nitrogen Dioxide Diffusion Tubes

Site ID	Location	Within AQMA?	Annual mean concentrations ($\mu g/m^3$) Adjusted for bias		
			2006 *	2007 *	2008
Broxburn West Main Street (to 30/09/08)	X 308192 Y 672223	N	39.5	39.5	31
Whitburn Cross	X 294687 Y 665030	N	25	25	24
Dedridge Cedric Rise	X 306403 Y 666341	N	20.5	17.5	13
Bathgate High Street	X 297656 Y 669298	N	18	16	14
Whitehill Inprint (from 01/10/09)	X 298259 Y 666298	N	NA	NA	28
Linlithgow ROMON	X 299989 Y 677090	N	NA	NA	20
Armadale Cross	X 293842 Y 668588	N	NA	NA	26
Uphall Station	X 306096 Y 670497	N	33.5	31.5	24
Alderston Road	X 304653 Y 667086	N	28.5	22.5	18
Bathgate King Street	X 297570 Y 668583	N	NA	NA	31
Wilkieston	X 312070 Y 668476	N	NA	NA	17

*Bias factors of 1.19 were applied to achieve the above 2006 results and 1.10 for 2007 results.

It is clear from the above Table that there appears to be a significant drop in NO_2 concentration for some locations in 2008. The reason for this is not clear, but WLC will continue to use diffusion tubes at these locations to establish any downward trend from previous years.

2.2.2 Particulate Matter - PM_{10}

Real-time PM_{10} analysers are 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 Linlithgow was upgraded from a TEOM ambient particulate (PM_{10}) monitor, to a Filter Dynamics Measurement System (FDMS) in July 2008. The Broxburn FDMS has been on site from July 2008 whilst the Uphall Station groundhog unit utilises a TEOM unit, which was operational from June 2008.

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

Annual mean concentrations for Linlithgow incorporate corrections using the Volatile Correction Model (VCM) for the TEOM data from 01/01/2008 to 28/04/2008. Data from the FDMS unit was available from 10/07/2008. Therefore data was available for just over 9 months and no adjustment is required for estimating the annual average.

Annual mean data for Uphall Station incorporates corrections using the Volatile Correction Model (VCM) and an adjustment for short term to long term data.

Annual mean concentration for the Broxburn site (FDMS) has also been adjusted to account for only 6 months data.

Roadside monitoring sites selected to obtain the adjustment factor for estimating the annual mean from shorter term data as per Box 3.2 TG(09) are shown in Appendix B.

Annual mean figures have been projected to 2010 as shown in Appendix E.

There are no annual mean concentrations greater than the 2004 objective of 40 µg/m^3 or 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 the monitoring locations is well below the 2004 objective (35 times per year) and the 2010 objective (7 times per year). For both objectives the 98th percentile value for Broxburn and Linlithgow monitoring stations are below 50 µg/m^3.

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

Site ID	Location	Within AQMA?	Data Capture 2008 %	Annual mean concentrations (µg/m^3)			
				2006 *	2007 *	2008	2010 +
Broxburn	East Main Street X 308314 Y 672231	N	87.8	NA	NA	16.4	16
Linlithgow	High Street X 299989 Y 677090	N	79.4	17.7	18.4	16	15.4
Uphall Station	Pumpherston Rd X 306219 Y 670160	N	94.4	NA	NA	12.1	11.9
* Optional + Predicted from 2008 data using the methodology in Box 2.2 of LAQM.TG(09).							

The annual mean concentrations for the Linlithgow High Street would appear to have declined since 2006. This is however primarily due to the use of the 1.3 correction factor applied to the TEOM data prior to 2008 used as a worst-case scenario as opposed to the use of the Volatile Correction Model for 2008 data.

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

Site ID	Location	Within AQMA?	Data Capture 2008 %	Number of Exceedences of 24 hourly mean (50 µg/m^3) *If data capture < 90%, include the 98th %ile of hourly means in brackets.*			
				2006	2007	2008	2010 +
Broxburn	East Main Street X 308314 Y 672231	N	87.8	NA	NA	1(37)	0
Linlithgow	High Street X 299989 Y 677090	N	79.4	7	5	2 (41)	0
Uphall Station	Pumpherston Rd X 306219 Y 670160	N	94.4	NA	NA	0	0
+ 2010 annual mean estimated from 2008 data using the methodology in 2.36 LAQM.TG(09).							

2.2.3 Sulphur Dioxide (SO_2)

The only monitoring location, which measures sulphur dioxide, is at the Uphall Station site, which was operational from July – December 2008. The site is representative of relevant public exposure as detailed in section 2.1.1.

Results of the monitoring data are highlighted in Table 2.5c below.

There are no 15-minute means greater than 266 µg/m^3, 1-hour means greater than 350 µg/m^3 or 24hr means greater than 125 µg/m^3. There are therefore no exceedences of any of the air quality objectives for SO_2.

Table 2.5c Results of SO_2 Automatic Monitoring: Comparison with Objectives

Site ID	Location	Within AQMA?	Data Capture 2008 %	Concentration µg/m^3		
				Max 15min mean	Max 1-hour mean	Max daily mean
Uphall Station	Pumpherston Rd X 306219 Y 670160	N	90	160	10	88

2.2.4 Benzene

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

2.2.5 Carbon Monoxide (CO)

A carbon monoxide analyser is located within the groundhog unit currently located at Uphall Station. Results of the monitoring data are shown in Table 2.5d below.

Table 2.5d Results of CO Automatic Monitoring:

Site ID	Location	Within AQMA?	Data Capture 2008 %	Concentration mg/m^3
				Max Running 8hr mean
Uphall Station	Pumpherston Rd X 306219 Y 670160	N	89	0.9

The results for carbon monoxide are well within the objective of 10 mg/m^3 as a running 8 hour mean.

3 Road Traffic Sources

3.1 Narrow Congested Streets with Residential Properties Close to the Kerb

West Calder High Street has significant traffic flows above 5000 vehicles per day and has been identified as a location, which requires proceeding to a detailed Assessment. The A71 from Edinburgh to Kilmarnock runs through West Calder and has a recorded an Annual Average Daily Traffic (AADT) flow of approximately 13,000 vehicles.

West Lothian Council has identified congested streets with a flow above 5,000 vehicles per day and residential properties close to the kerb, not adequately considered in previous rounds of Review and Assessment, and **will need to proceed to a Detailed Assessment for NO_2 for West Calder High Street.**

3.2 Busy Streets Where People May Spend 1-hour or More Close to Traffic

West Lothian Council confirms that there are no new/newly identified busy streets where people may spend 1 hour or more close to traffic.

3.3 Roads with a High Flow of Buses and/or HGVs.

One location has been identified at the east end of East Main Street in Broxburn at the entrance to East Mains Industrial Estate, which may have a high proportion of Heavy Duty Vehicles (HDV's), which has not been previously assessed. There are receptors within 10m of the junction to the industrial estate. No traffic data however exists and therefore it was not possible to carry out screening using the DMRB model.

An assessment will be undertaken of this location once accurate traffic data has been obtained in the forthcoming year. This will enable the Local Authority to determine whether there is a need to proceed to a detailed assessment.

West Lothian has assessed newly identified road(s) with high flows of buses or HDVs in a busy street where people may spend 1 hour or more close to traffic that it has not previously been assessed, and concluded that it will not yet necessary to proceed to a Detailed Assessment.

3.4 Junctions and Busy Roads

There are a number of junctions or roads in West Lothian that could be considered busy for which there is no available traffic data. An assessment cannot therefore be carried out in accordance with Section A.4 of Box 5.3 of TG(09).

These locations are at Newton, Whitburn Cross, Longridge, Wilkieston, Bathgate Steelyard, West Calder, the entrance to East Mains Industrial Estate, Broxburn, and Linlithgow Low Port/West Port. It is proposed to develop a programme of traffic surveys to obtain data for these locations and re-assess them for the next update and screening report.

One location for which there was suitable traffic data, is East Main Street and West Main Street, Armadale. The DMRB modelled output for this location is shown in Appendix F. Predicted annual means are below the annual objectives for both PM_{10} and NO_2.

West Lothian Council has assessed new/newly identified junctions/roads meeting the criteria in Section A.4 of Box 5.3 in TG(09), and concluded that it will not be necessary to proceed to a Detailed Assessment.

3.5 New Roads Constructed or Proposed Since the Last Round of Review and Assessment

A new road has been constructed which links the Livingston spine road A899 with Howden South Road enabling access to the new Local Authority headquarters building, the Civic Centre, which was under construction in 2008.
There is no relevant exposure within 10m of the new road or Howden south Road and therefore there is no need to proceed further.

West Lothian Council has assessed new/newly identified roads meeting the criteria in Section A.5 of Box 5.3 in TG(09), and concluded that it will not be necessary to proceed to a Detailed Assessment.

3.6 Roads with Significantly Changed Traffic Flows

West Lothian confirms that there are no new/newly identified roads with significantly changed traffic flows.

3.7 Bus and Coach Stations

West Lothian Council confirms that there are no relevant (> 2500 bus movements per day) bus stations in the Local Authority area.

4 Other Transport Sources

4.1 Airports

West Lothian Council confirms that there are no airports with a passenger throughput of 10 million passengers per annum or where the background N0x concentration is higher than 25 µg/m^3 in the Local Authority area.

4.2 Railways (Diesel and Steam Trains)

4.2.1 Stationary Trains

West Lothian Council confirms that there are no locations where diesel or steam trains are regularly stationary for periods of 15 minutes or more, with potential for relevant exposure within 15m.

4.2.2 Moving Trains

The Edinburgh to Glasgow line, which has a large number of diesel locomotives, runs through Linlithgow. Although there is relevent exposure within 30m at some locations, the background NO_2 concentration is not above 25 µg/m^3 and therefore there is no requirement to proceed to a Detailed Assessment.

West Lothian Council confirms that there are no locations with a large number of movements of diesel locomotives, and potential long-term relevant exposure within 30m and where background concentrations of NO_2 are above 25 µg/m^3.

4.3 Ports (Shipping)

West Lothian Council confirms that there are no ports or shipping that meet the specified criteria within the Local Authority area.

5 Industrial Sources

5.1 Industrial Installations

5.1.1 New or Proposed Installations for which an Air Quality Assessment has been Carried Out

West Lothian Council confirms that there are no new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.

5.1.2 Existing Installations where Emissions have Increased Substantially or New Relevant Exposure has been Introduced

West Lothian Council confirms that there are no industrial installations with substantially increased emissions or new relevant exposure in their vicinity within its area or nearby in a neighbouring authority.

5.1.3 New or Significantly Changed Installations with No Previous Air Quality Assessment

Balfour Beatty Rail Track Systems based in South Queensferry, manufactures special track work products. The cast manganese Foundry process is a Part B industrial process authorised by SEPA.
The Foundry process was originally based in Bathgate, which moved to South Queensferry towards the end of 2008 and was operational in 2009. This industrial process will be considered in the Progress Report 2010.

West Lothian Council has assessed new/proposed industrial installations, and concluded that it will not be necessary to proceed to a Detailed Assessment.

DELETE BOX IF NOT APPLICABLE. OTHERWISE ADD LOCAL AUTHORITY NAME AND LEAVE IN.

5.2 Major Fuel (Petrol) Storage Depots

There are no major fuel (petrol) storage depots within the Local Authority area.

5.3 Petrol Stations

West Lothian Council confirms that there are no petrol stations meeting the specified criteria**.**

5.4 Poultry Farms

Clapperton Complex Poultry Farm located on Drumshoreland Road Pumpherston (Pollution and Prevention Control Permit, PPC/A/1016825 PPC) houses approximately 1.3 million birds.
In addition to residential properties located within the farm complex there are a couple of residential receptors outwith the boundary of the site within 100m of the poultry unit.

West Lothian Council has identified a poultry farm meeting the specified criteria, and **will need to proceed to a Detailed Assessment for PM_{10}.**

6 Commercial and Domestic Sources

6.1 Biomass Combustion – Individual Installations

West Lothian Council confirms that there are no biomass (50kW to 20MW) combustion plants in the Local Authority area.

6.2 Biomass Combustion – Combined Impacts

West Lothian Council confirms that there are no biomass combustion plants in the Local Authority area.

6.3 Domestic Solid-Fuel Burning

West Lothian Council confirms that there are no areas of significant domestic fuel use in the Local Authority area.

7 Fugitive or Uncontrolled Sources

West Lothian Council confirms that there are no potential sources of fugitive particulate matter emissions in the Local Authority area.

8 Conclusions and Proposed Actions

8.1 Conclusions from New Monitoring Data

Air quality data from the real time monitoring sites and diffusion tube surveys have not highlighted any exceedences of the air quality objectives for any pollutant in 2008.

A diffusion tube survey in 2006/2007 in East Main Street, Broxburn highlighted elevated levels of NO_2 and potential exceedence of the annual air quality objective (40 µg/m^3). As a result, real-time monitoring was undertaken at a roadside location from July to December 2008 for both NO_2 and PM_{10}.

The measured NO_2 annual concentration of 40 µg/m^3 was adjusted for distance correction to receptor locations. This reduced the estimated annual mean to 33.3 µg/m^3. Whilst there is uncertainty with the use of the distance correction model, due to possible canyon effects and differences in monitoring and receptor heights for which the model may not be completely valid, the annual mean concentration is likely to be under the NO_2 annual 2004 objective.

The annual mean concentration of PM_{10} at Broxburn is 16 µg/m^3, which is below the annual objective. There was only one exceedence of the short-term 24-hour mean.

At the Uphall Station site an air quality assessment, undertaken as part of a planning application for the area, highlighted predicted current and future PM_{10} concentrations to be in excess of the 2010 objective. Real time monitoring at Uphall Station was therefore undertaken using the mobile groundhog unit. Results from the data indicated the annual average for PM_{10} of 12 µg/m^3 is well below the annual mean objective. There were no exceedences of the short-term 24-hour mean. Monitoring results from other monitored pollutants, NO_2, CO and SO_2, were well below their respective short-term and annual objective values.

Monitoring data at Linlithgow site indicates that the annual mean for PM_{10} (16 µg/m^3) is still below the 2010 objective value although it has been borderline in recent years. There were only 2 exceedences of the short-term 24-hour mean. There are no exceedences of any of the NO_2 air quality objectives at this location.

8.2 Conclusions from Assessment of Sources

The assessment of narrow congested streets with residential properties close to the kerb with respect to road traffic sources has highlighted West Calder High Street as a location requiring to proceed to a Detailed Assessment for NO_2.

The east end of East Main Street, Broxburn has been identified as a road, which has potentially a high flow of heavy duty vehicles (HDV's), which has not been previously assessed. At this location there is the only entrance to a large industrial estate. The majority of vehicles using the industrial estate will turn east on exit and will not pass the monitoring station further west on East Main Street. As there are relevant receptors at this location it

was concluded that traffic data would be required to model the potential air quality impacts associated with road transport.

A number of junctions and busy roads have been identified which require to be modelled using the DMRB. However no traffic data currently exists to allow DMRB modelling at this stage.

A poultry farm which houses 1.3 million birds has been identified as requiring a detailed assessment for PM_{10}.

There are no potential air quality impacts identified with other transport, industrial installations, commercial/domestic sources or, fugitive emissions.

8.3 Proposed Actions

The Update and Screening Assessment (USA) has identified the need to proceed to a Detailed Assessment for NO_2 for West Calder High Street, and PM10 at Drumshoreland Road associated with the identified Clapperton Poultry Farm.

There has been an identified need to carry out traffic surveys at various busy roads and junctions in order to facilitate modelling. It is proposed that a programme of road traffic surveys will be established to obtain accurate traffic data for those locations identified in Section 3.3 and 3.4 of this report.

The Groundhog mobile unit will be relocated from Uphall Station to one of the identified busy road traffic junctions, potentially Whitburn Cross, Whitburn.

Real time monitoring will continue at both Linlithgow and Broxburn for both PM10 and NO_2

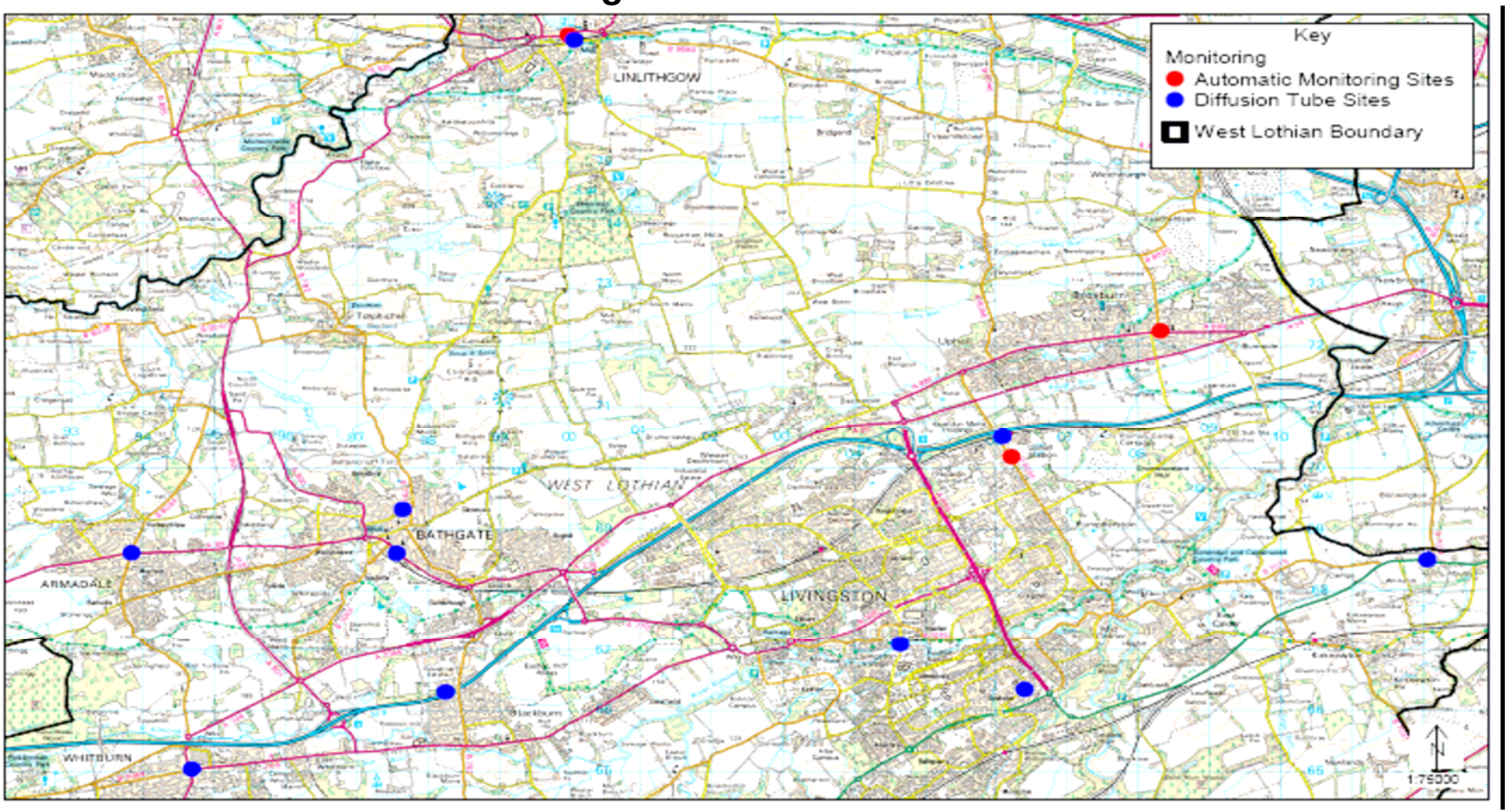
West Lothian Council possess 5 Osiris dust particulate monitors, which are to be deployed as a screening tool for PM_{10} assessment. The locations of these units have yet to be determined. It is anticipated that these will be operation by the beginning of October 2009.

9 References

[1]Local Air Quality Management, Technical Guidance LAQM. TG(09) February 2009

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

APPENDIX A
Monitoring Sites in West Lothian



Appendix B: QA:QC Data

Diffusion Tube Bias Adjustment Factors

See section **2.1.2** and detailed site 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 0.88. 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 Linlithgow incorporate corrections using the Volatile Correction Model (VCM) for the TEOM data from 01/01/2008 to 28/04/2008. Data from the FDMS unit was available from 10/07/2008. Therefore data was available for just over 9 months and no adjustment is required for estimating the annual average.

Annual mean concentrations for Uphall Station (TEOM) incorporate corrections using the VCM and an adjustment for having only six months data. Annual mean concentration for the Broxburn site (FDMS) has been adjusted to account for only 6 months data.

Short-term to Long-term Data adjustment

As highlighted above, there was just less than 6 months data from the automatic monitoring sites at Uphall Station and East Main Street, Broxburn. Measured mean concentrations data for NO_2 and PM_{10} from these sites were adjusted for longer term data using the following average ratio calculated in accordance with Box 3.2 TG (09).

PM_{10}

Site	Site Type	Annual Mean	Period Mean*	Ratio
St Leonards, Edinburgh	Roadside	15.3	14.9	1.02
Anderston Glasgow	Roadside	17.4	17.0	1.02
Whifflet, North Lanarkshire	Roadside	17.6	17.4	1.01
			Average	1.02

- Period Mean from July – December 2008

NO_2

Site	Site Type	Annual Mean	Period Mean*	Ratio
St Leonards, Edinburgh	Roadside	30.9	25.3	1.22
Anderston Glasgow	Roadside	31.9	32.2	0.987
Whifflet, North Lanarkshire	Roadside	23.9	24.8	0.963
			Average	1.06

- Period Mean from July – December 2008

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.
Manual calibrations of analysers were carried out at Uphall Station by West Lothian Council staff every two weeks.

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 analysers used a gravimetric factor of 1.3 for Gravimetric Equivalent. These figures have since been superseded by use of the Volatile Correction Model (VCM). All the PM_{10} monitoring data from the Uphall Station Site has been corrected using the VCM. For Linlithgow High Street due to a change over from a TEOM to an FDMS monitor, only a proportion of the PM_{10} data has been corrected using the VCM from January to the end of April.

Analyser Maintenance and calibration

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, Nitric oxide, Carbon monoxide and Sulphur dioxide are used to calibrate the real-time analysers to ensure the data is valid. These are supplied by Air Liquide.

West Lothian Council performs a manual calibration of the Groundhog and Romon300. 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.

If after a manual calibration has been carried out there is still a large drift, Casella Eti will be notified and are contracted to investigate the fault within 48 hours. In such instances, a diagnostics forwarded to Casella before the engineer visits.

The filter in the TEOM was changed before the lifetime of the filter reaches 85%. 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 Broxburn and Linlithgow is carried every six months by Air Monitors and at the Groundhog by Casella Eti. From July 2008 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 Aquisition

For the first 6 months of 2008 data was downloaded to a stand-alone computer for Linlithgow and Uphall Station through a modem link using Enview 2000 software twice daily. The site at Broxburn incorporated a weblogger. All sites now incorporate a weblogger 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 West Lothian Council

WEST LOTHIAN BROXBURN
01 July to 31 December 2008

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	3883	3897	-
Maximum 15-minute mean	92 µg m^{-3}	174 µg m^{-3}	997 µg m^{-3}
Maximum hourly mean	83 µg m^{-3}	141 µg m^{-3}	840 µg m^{-3}
Maximum running 8-hour mean	69 µg m^{-3}	117 µg m^{-3}	602 µg m^{-3}
Maximum running 24-hour mean	52 µg m^{-3}	93 µg m^{-3}	444 µg m^{-3}
Maximum daily mean	52 µg m^{-3}	92 µg m^{-3}	420 µg m^{-3}
Average	16 µg m^{-3}	38 µg m^{-3}	113 µg m^{-3}
Data capture	87.8 %	88.2 %	88.2 %

+ PM_{10} instruments:
FDMS using a gravimetric factor of 1 from 1 January 2008 to 21 April 2009
All mass units are at 20'C 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}	1	1
PM_{10} Particulate Matter (Gravimetric)	Annual mean > 40 µg m^{-3}	-	-
PM_{10} Particulate Matter (Gravimetric)	Annual mean > 18 µg m^{-3}	-	-
Nitrogen Dioxide	Annual mean > 40 µg m^{-3}	-	-
Nitrogen Dioxide	Hourly mean > 200 µg m^{-3}	0	0
Nitrogen Oxides (NO_2)	Annual mean > 30 µg m^{-3}	-	-

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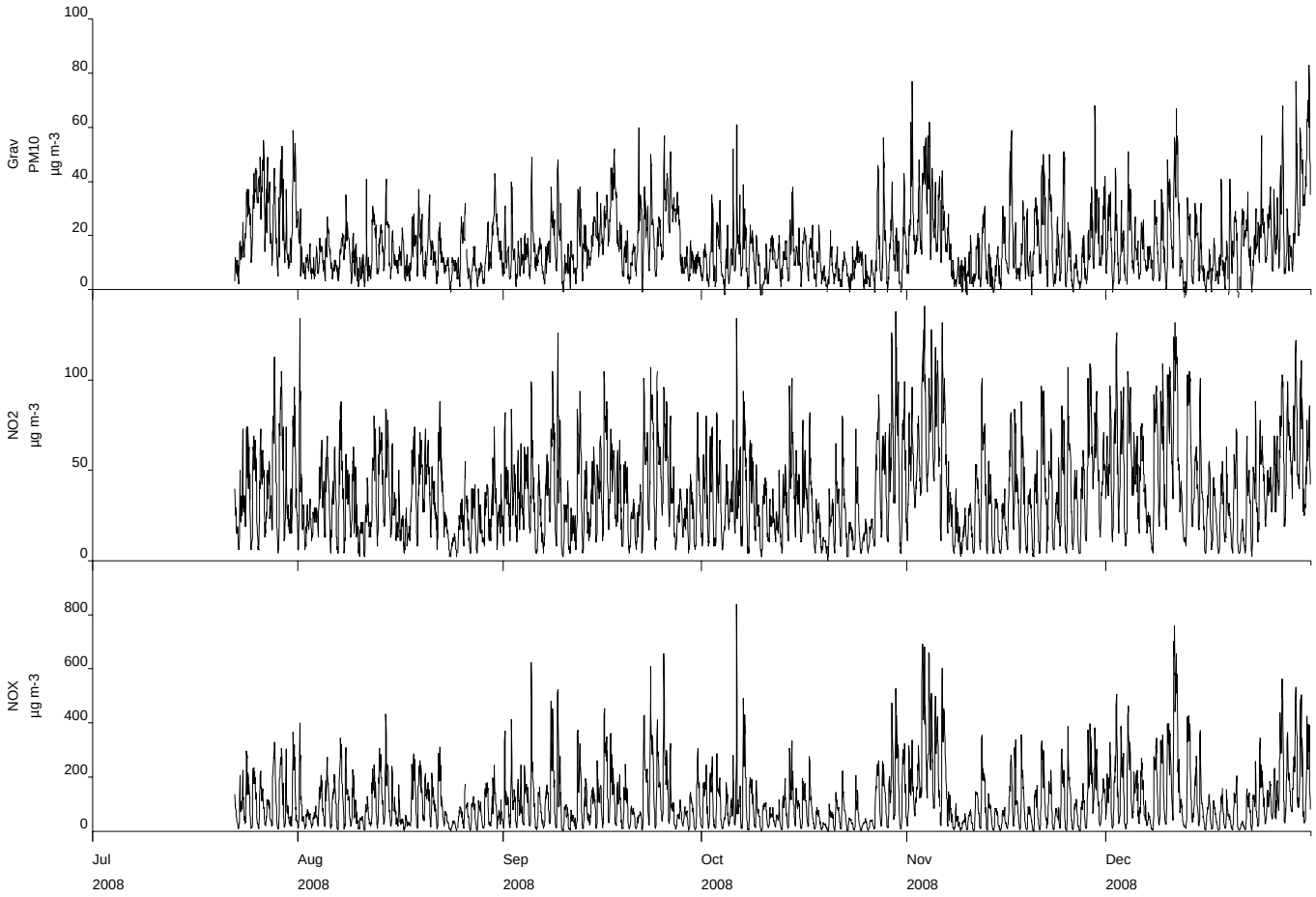
West Lothian Council - Scotland

Air Pollution Report

Produced by AEA on behalf of West Lothian Council

West Lothian Broxburn Air Monitoring
Hourly Mean Data for 01 July to 31 December 2008



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Air Pollution Report

Produced by AEA on behalf of Scottish Government

WEST LOTHIAN LINLITHGOW HIGH STREET
01 January to 31 December 2008

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	18	0	-
Number Low	7022	8310	-
Maximum 15-minute mean	1880 µg m^{-3}	350 µg m^{-3}	1018 µg m^{-3}
Maximum hourly mean	783 µg m^{-3}	166 µg m^{-3}	525 µg m^{-3}
Maximum running 8-hour mean	157 µg m^{-3}	103 µg m^{-3}	450 µg m^{-3}
Maximum running 24-hour mean	73 µg m^{-3}	74 µg m^{-3}	292 µg m^{-3}
Maximum daily mean	68 µg m^{-3}	73 µg m^{-3}	256 µg m^{-3}
Average	17 µg m^{-3}	20 µg m^{-3}	39 µg m^{-3}
Data capture	79.4 %	94.6 %	94.6 %

* PM_{10} Indicative Gravimetric Equivalent µg m^{-3}
+ PM_{10} instruments:
FDMS using a gravimetric factor of 1 from 1 July 2008 to 21 April 2009
TEOM using a gravimetric factor of 1.3 for Indicative Gravimetric Equivalent for all other dates
All mass units are at 20'C 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}	3	3
PM_{10} Particulate Matter (Gravimetric)	Annual mean > 40 µg m^{-3}	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
Nitrogen Oxides (NO_2)	Annual mean > 30 µg m^{-3}	1	-

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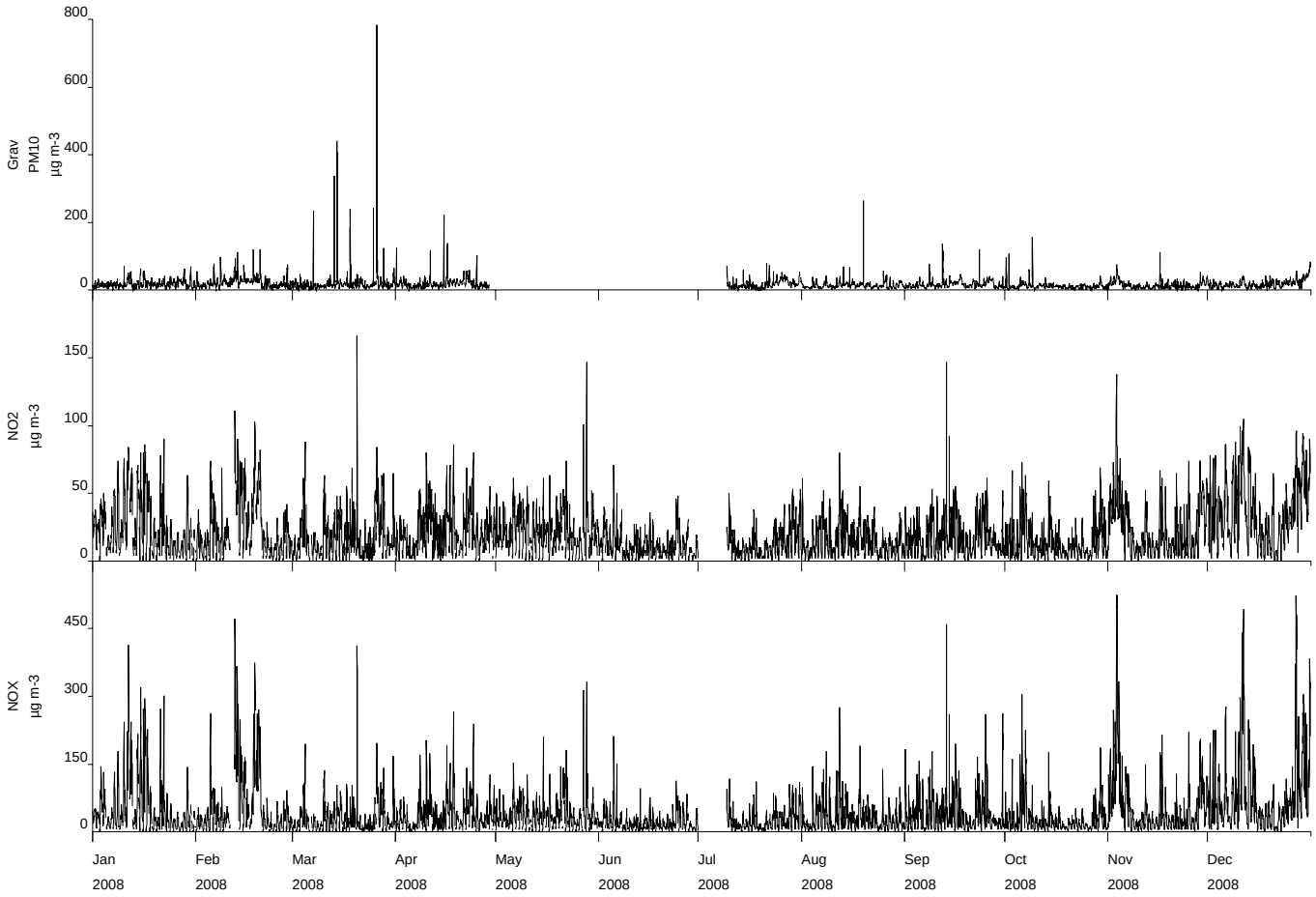
Air Pollution Report

Produced by AEA on behalf of Scottish Government

West Lothian Linlithgow High Street Air Monitoring
Hourly Mean Data for 01 January to 31 December 2008



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Air Pollution Report

Produced by AEA on behalf of The Scottish Government

WEST LOTHIAN LINLITHGOW HIGH STREET
01 July to 31 December 2008

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	4191	4205	-
Maximum 15-minute mean	284 µg m^{-3}	350 µg m^{-3}	1018 µg m^{-3}
Maximum hourly mean	264 µg m^{-3}	147 µg m^{-3}	525 µg m^{-3}
Maximum running 8-hour mean	75 µg m^{-3}	103 µg m^{-3}	450 µg m^{-3}
Maximum running 24-hour mean	55 µg m^{-3}	74 µg m^{-3}	292 µg m^{-3}
Maximum daily mean	55 µg m^{-3}	73 µg m^{-3}	256 µg m^{-3}
Average	16 µg m^{-3}	20 µg m^{-3}	42 µg m^{-3}
Data capture	94.1 %	95.2 %	95.2 %

+ PM_{10} as measured by a FDMS using a gravimetric factor of 1
All mass units are at 20'C 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}	1	1
PM_{10} Particulate Matter (Gravimetric)	Annual mean > 40 µg m^{-3}	-	-
PM_{10} Particulate Matter (Gravimetric)	Annual mean > 18 µg m^{-3}	-	-
Nitrogen Dioxide	Annual mean > 40 µg m^{-3}	-	-
Nitrogen Dioxide	Hourly mean > 200 µg m^{-3}	0	0

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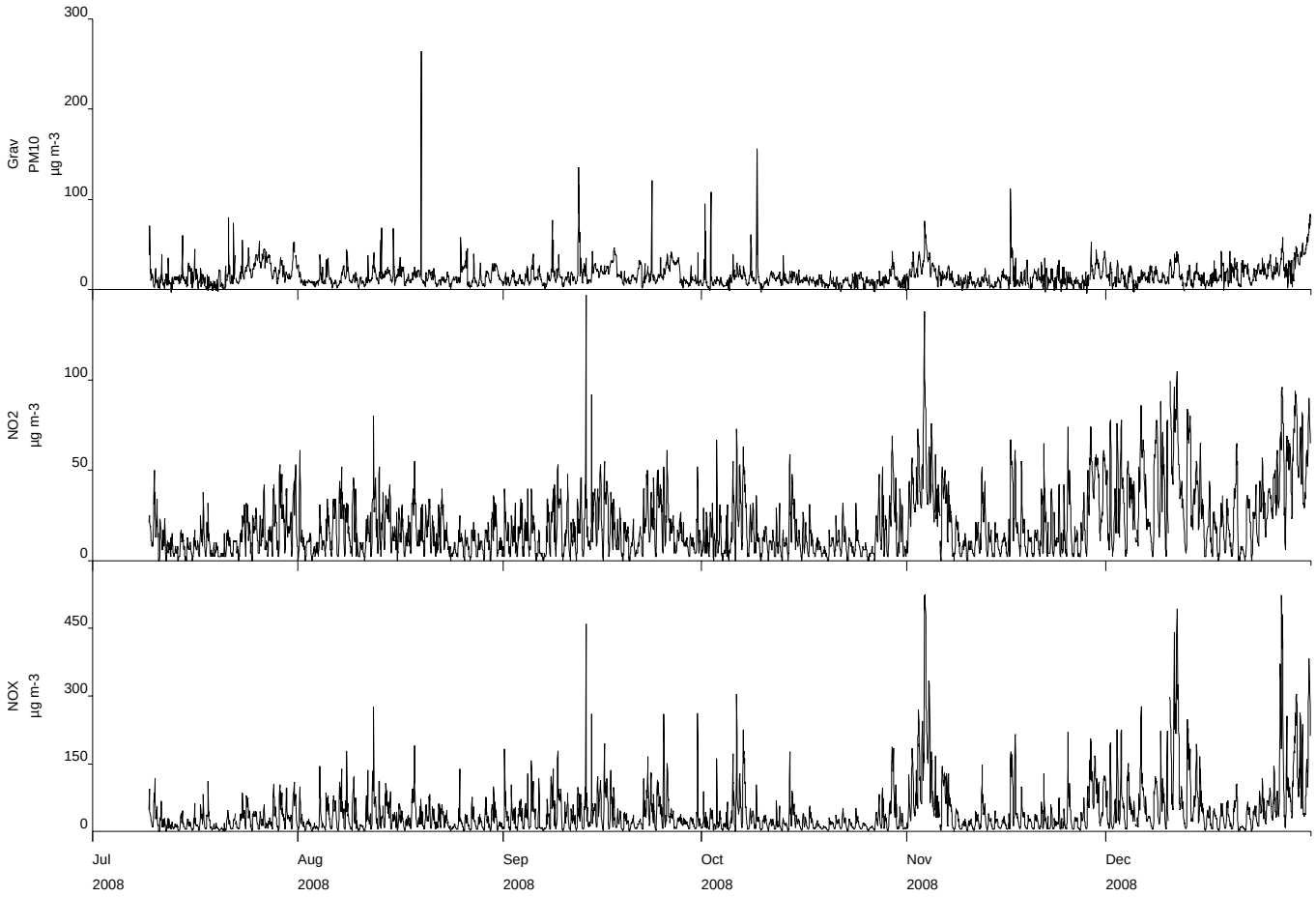
Air Pollution Report

Produced by AEA on behalf of The Scottish Government

West Lothian Linlithgow High Street Air Monitoring
Hourly Mean Data for 01 July to 31 December 2008



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Air Pollution Report

Produced by AEA on behalf of West Lothian Council

WEST LOTHIAN UPHALL
01 July to 31 December 2008

These data have been fully ratified by AEA

POLLUTANT	CO	PM_{10}*+	NO_2	NO_X	SO_2
Number Very High	0	0	0	-	0
Number High	0	0	0	-	0
Number Moderate	0	0	0	-	0
Number Low	4096	4173	3436	-	16166
Maximum 15-minute mean	4.2 mg m^{-3}	629 µg m^{-3}	176 µg m^{-3}	835 µg m^{-3}	160 µg m^{-3}
Maximum hourly mean	1.2 mg m^{-3}	299 µg m^{-3}	159 µg m^{-3}	714 µg m^{-3}	88 µg m^{-3}
Maximum running 8-hour mean	0.9 mg m^{-3}	128 µg m^{-3}	121 µg m^{-3}	455 µg m^{-3}	22 µg m^{-3}
Maximum running 24-hour mean	0.7 mg m^{-3}	51 µg m^{-3}	97 µg m^{-3}	379 µg m^{-3}	12 µg m^{-3}
Maximum daily mean	0.6 mg m^{-3}	51 µg m^{-3}	86 µg m^{-3}	303 µg m^{-3}	10 µg m^{-3}
Average	0.3 mg m^{-3}	15 µg m^{-3}	21 µg m^{-3}	41 µg m^{-3}	2 µg m^{-3}
Data capture	88.9 %	94.4 %	77.8 %	77.8 %	89.9 %

* PM_{10} Indicative Gravimetric Equivalent µg m^{-3}
+ PM_{10} as measured by a TEOM using a gravimetric factor of 1.3 for Indicative Gravimetric Equivalent
All mass units are at 20'C 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
Carbon Monoxide	Running 8-hour mean > 10.0 mg m^{-3}	0	0
PM_{10} Particulate Matter (Gravimetric)	Daily mean > 50 µg m^{-3}	1	1
PM_{10} Particulate Matter (Gravimetric)	Annual mean > 40 µg m^{-3}	-	-
PM_{10} Particulate Matter (Gravimetric)	Annual mean > 18 µg m^{-3}	-	-
Nitrogen Dioxide	Annual mean > 40 µg m^{-3}	-	-
Nitrogen Dioxide	Hourly mean > 200 µg m^{-3}	0	0
Nitrogen Oxides (NO_2)	Annual mean > 30 µg m^{-3}	-	-
Sulphur Dioxide	15-minute mean > 266 µg m^{-3}	0	0
Sulphur Dioxide	Hourly mean > 350 µg m^{-3}	0	0
Sulphur Dioxide	Daily mean > 125 µg m^{-3}	0	0
Sulphur Dioxide	Annual mean > 20 µg m^{-3}	-	-

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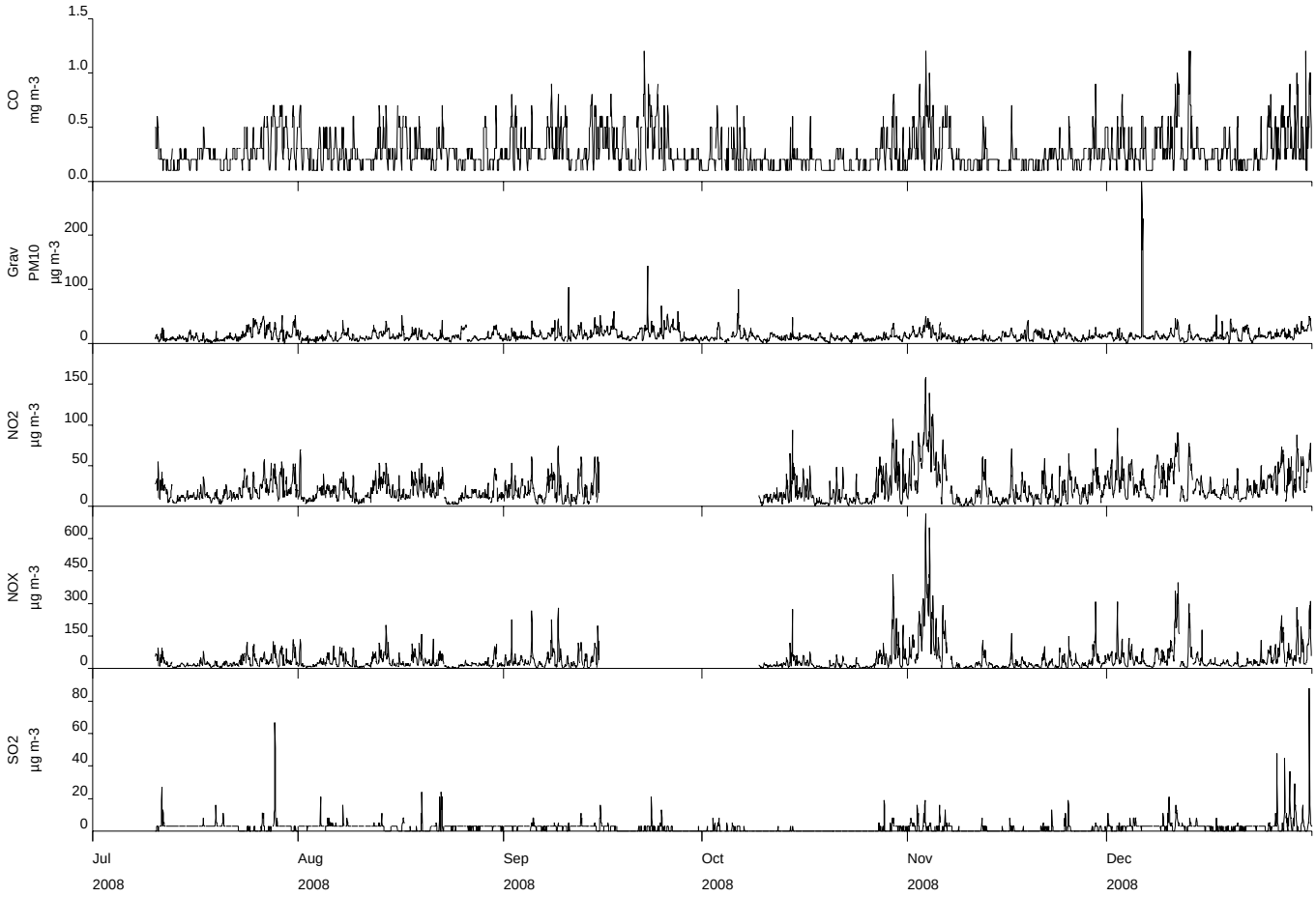
Air Pollution Report

Produced by AEA on behalf of West Lothian Council

West Lothian Uphall Air Monitoring
Hourly Mean Data for 01 July to 31 December 2008



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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	07/01/2008	01/02/2008	20.0	20.0	20.0	20	0.0	0	0.0	24.3	93	Good	Good
2	01/02/2008	29/02/2008	23.0	23.0	23.0	23	0.0	0	0.0	22.8	91.2	Good	Good
3	29/02/2008	03/04/2008	17.0	14.0	17.0	16	1.7	11	4.3	16.8	94.6	Good	Good
4	03/04/2008	02/05/2008	29.0	21.0	26.0	25	4.0	16	10.0	21	95.4	Good	Good
5	02/05/2008	30/05/2008	23.0		27.0	25	2.8	11	25.4	20	93.5	Good	Good
6	30/05/2008	04/07/2008	16.0	18.0	19.0	18	1.5	9	3.8	11	84.6	Good	Good
7	04/07/2008	30/07/2008	17.0	19.0	21.0	19	2.0	11	5.0	13	82.4	Good	Good
8	30/07/2008	04/09/2008	24.0	23.0	25.0	24	1.0	4	2.5	15	100	Good	Good
9	04/09/2008	30/09/2008	23.0	23.0	23.0	23	0.0	0	0.0	18	100	Good	Good
10	30/09/2008	31/10/2008	17.0	19.0	17.0	18	1.2	7	2.9	14	100	Good	Good
11	31/10/2008	02/12/2008	26.0	28.0	23.0	26	2.5	10	6.3	23.4	100	Good	Good
12	02/12/2008	08/01/2009	31.0	36.0	30.0	32	3.2	10	8.0	38.5	99.4	Good	Good
13													
											Overall survey -->	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

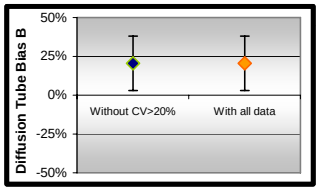
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:	Linlithgow High Street

Precision	12 out of 12 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval) without periods with CV larger than 20%	
Bias calculated using 12 periods of data	
Bias factor A	0.88 (0.76 - 1.04)
Bias B	13% (-4% - 31%)
Diffusion Tubes Mean:	22 µgm^{-3}
Mean CV (Precision):	7
Automatic Mean:	20 µgm^{-3}
Data Capture for periods used:	95%
Adjusted Tubes Mean:	20 (17 - 23) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 12 periods of data	
Bias factor A	0.88 (0.76 - 1.04)
Bias B	13% (-4% - 31%)
Diffusion Tubes Mean:	22 µgm^{-3}
Mean CV (Precision):	7
Automatic Mean:	20 µgm^{-3}
Data Capture for periods used:	95%
Adjusted Tubes Mean:	20 (17 - 23) µgm^{-3}



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Version 03 - November 2006

Broxburn West Main Street diffusion tube results

Adjustment of DUPLICATE or TRIPLICATE Tubes

AEA Energy & Environmen
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	07/01/2008	01/02/2008	29.0	38.0		33.5	6.36	19.00	57.18	Good
2	01/02/2008	29/02/2008	32.0	40.0		36.0	5.66	15.71	50.82	Good
3	29/02/2008	03/04/2008	24.0	24.0		24.0	0.00	0.00	0.00	Good
4	03/04/2008	02/05/2008	44.0	37.0		40.5	4.95	12.22	44.47	Good
5	02/05/2008	30/05/2008	45.0	50.0		47.5	3.54	7.44	31.77	Good
6	30/05/2008	04/07/2008	24.0	28.0		26.0	2.83	10.88	25.41	Good
7	04/07/2008	30/07/2008	33.0	37.0		35.0	2.83	8.08	25.41	Good
8	30/07/2008	04/09/2008								
9	04/09/2008	30/09/2008	42.0	36.0		39.0	4.24	10.88	38.12	Good
10	30/09/2008	31/10/2008								
11	31/10/2008	02/12/2008								
12	02/12/2008	08/01/2009								
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:	Broxburn

Adjusted measurement (95% confidence level)
Without periods with CV larger than 20%
Bias calculated using 12 periods of data
Tube Precision: 7 Automatic DC: 95%
Bias factor A: 0.88 (0.76 - 1.04)
Bias B: 13% (-4% - 31%)
Information about tubes to be adjusted
Diffusion Tube average: 35 μgm^{-3}
Average Precision (CV): 11
Adjusted Tube average: 31 +/- 5 μgm^{-3}

Adjusted measurement (95% confidence level)
with all data
Bias calculated using 12 periods of data
Tube Precision: 7 Automatic DC: 95%
Bias factor A: 0.88 (0.76 - 1.04)
Bias B: 13% (-4% - 31%)
Information about tubes to be adjusted
Diffusion Tube average: 35 μgm^{-3}
Average Precision (CV): 11
Adjusted Tube average: 31 +/- 5 μgm^{-3}

Whitburn Cross diffusion tube results

Adjustment of DUPLICATE or TRIPLICATE Tubes

AEA Energy & Environmen
From the AEA group

Diffusion Tubes Measurements									
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
1	07/01/2008	01/02/2008	26.0	21.0		23.5	3.54	15.04	31.77
2	01/02/2008	29/02/2008	28.0	23.0		25.5	3.54	13.86	31.77
3	29/02/2008	03/04/2008	22.0	17.0		19.5	3.54	18.13	31.77
4	03/04/2008	02/05/2008	14.0	14.0		14.0	0.00	0.00	0.00
5	02/05/2008	30/05/2008	34.0	28.0		31.0	4.24	13.69	38.12
6	30/05/2008	04/07/2008	25.0	26.0		25.5	0.71	2.77	6.35
7	04/07/2008	30/07/2008							
8	30/07/2008	04/09/2008	29.0	28.0		28.5	0.71	2.48	6.35
9	04/09/2008	30/09/2008	34.0	30.0		32.0	2.83	8.84	25.41
10	30/09/2008	31/10/2008	30.0	26.0		28.0	2.83	10.10	25.41
11	31/10/2008	02/12/2008	33.0	38.0		35.5	3.54	9.96	31.77
12	02/12/2008	08/01/2009	37.0	44.0		40.5	4.95	12.22	44.47
13									

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

Data Quality Check
Diffusion Tubes Precision Check
Good
Good
Good
Good
Good
Good
Good
Good
Good
Good
Good

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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 12 periods of data
Tube Precision: 7 **Automatic DC: 95%**
Bias factor A: 0.88 (0.76 - 1.04)
Bias B: 13% (-4% - 31%)
Information about tubes to be adjusted
Diffusion Tube average: 28 µgm^{-3}
Average Precision (CV): 10
Adjusted Tube average: 24 +/- 4 µgm^{-3}

Adjusted measurement (95% confidence level)
with all data
Bias calculated using 12 periods of data
Tube Precision: 7 **Automatic DC: 95%**
Bias factor A: 0.88 (0.76 - 1.04)
Bias B: 13% (-4% - 31%)
Information about tubes to be adjusted
Diffusion Tube average: 28 µgm^{-3}
Average Precision (CV): 10
Adjusted Tube average: 24 +/- 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	07/01/2008	01/02/2008	13.0	17.0		15.0	2.83	18.86	25.41	Good
2	01/02/2008	29/02/2008	16.0	18.0		17.0	1.41	8.32	12.71	Good
3	29/02/2008	03/04/2008	9.0	10.0		9.5	0.71	7.44	6.35	Good
4	03/04/2008	02/05/2008	16.0	16.0		16.0	0.00	0.00	0.00	Good
5	02/05/2008	30/05/2008	15.0	15.0		15.0	0.00	0.00	0.00	Good
6	30/05/2008	04/07/2008	10.0	10.0		10.0	0.00	0.00	0.00	Good
7	04/07/2008	30/07/2008	12.0	12.0		12.0	0.00	0.00	0.00	Good
8	30/07/2008	04/09/2008								
9	04/09/2008	30/09/2008								
10	30/09/2008	31/10/2008	11.0	12.0		11.5	0.71	6.15	6.35	Good
11	31/10/2008	02/12/2008	18.0	18.0		18.0	0.00	0.00	0.00	Good
12	02/12/2008	08/01/2009	26.0	25.0		25.5	0.71	2.77	6.35	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:	Dedridge

Adjusted measurement (95% confidence level)
Without periods with CV larger than 20%
Bias calculated using 12 periods of data
Tube Precision: 7 **Automatic DC: 95%**
Bias factor A: 0.88 (0.76 - 1.04)
Bias B: 13% (-4% - 31%)

Information about tubes to be adjusted
Diffusion Tube average: 15 μgm^{-3}
Average Precision (CV): 4
Adjusted Tube average: 13 +/- 2 μgm^{-3}

Adjusted measurement (95% confidence level)
with all data
Bias calculated using 12 periods of data
Tube Precision: 7 **Automatic DC: 95%**
Bias factor A: 0.88 (0.76 - 1.04)
Bias B: 13% (-4% - 31%)

Information about tubes to be adjusted
Diffusion Tube average: 15 μgm^{-3}
Average Precision (CV): 4
Adjusted Tube average: 13 +/- 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

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
1	07/01/2008	01/02/2008	20.0	19.0		19.5	0.71	3.63	6.35
2	01/02/2008	29/02/2008	21.0	18.0		19.5	2.12	10.88	19.06
3	29/02/2008	03/04/2008	9.0	8.0		8.5	0.71	8.32	6.35
4	03/04/2008	02/05/2008	15.0	14.0		14.5	0.71	4.88	6.35
5	02/05/2008	30/05/2008	9.0	10.0		9.5	0.71	7.44	6.35
6	30/05/2008	04/07/2008	10.0	10.0		10.0	0.00	0.00	0.00
7	04/07/2008	30/07/2008	9.0	12.0		10.5	2.12	**20.20**	19.06
8	30/07/2008	04/09/2008	12.0	11.0		11.5	0.71	6.15	6.35
9	04/09/2008	30/09/2008	17.0	13.0		15.0	2.83	18.86	25.41
10	30/09/2008	31/10/2008							
11	31/10/2008	02/12/2008							
12	02/12/2008	08/01/2009	24.0	56.0		40.0	22.63	**56.57**	203.30
13									

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

Data Quality Check
Diffusion Tubes Precision Check
Good
Good
Good
Good
Good
Good
Poor Precision
Good
Good
Poor Precision

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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 12 periods of data
Tube Precision: 7 **Automatic DC: 95%**
Bias factor A: 0.88 (0.76 - 1.04)
Bias B: 13% (-4% - 31%)

Information about tubes to be adjusted
Diffusion Tube average: 14 µgm^{-3}
Average Precision (CV): 8
Adjusted Tube average: 12 +/- 2 µgm^{-3}

Adjusted measurement (95% confidence level)
with all data
Bias calculated using 12 periods of data
Tube Precision: 7 **Automatic DC: 95%**
Bias factor A: 0.88 (0.76 - 1.04)
Bias B: 13% (-4% - 31%)

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 & Environmen
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	07/01/2008	01/02/2008								
2	01/02/2008	29/02/2008								
3	29/02/2008	03/04/2008								
4	03/04/2008	02/05/2008								
5	02/05/2008	30/05/2008								
6	30/05/2008	04/07/2008								
7	04/07/2008	30/07/2008								
8	30/07/2008	04/09/2008								
9	04/09/2008	30/09/2008								
10	30/09/2008	31/10/2008	28.0	28.0		28.0	0.00	0.00	0.00	Good
11	31/10/2008	02/12/2008	29.0	31.0		30.0	1.41	4.71	12.71	Good
12	02/12/2008	08/01/2009	36.0	38.0		37.0	1.41	3.82	12.71	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:	Whitehill Inprint

Adjusted measurement (95% confidence level)
Without periods with CV larger than 20%
Bias calculated using 12 periods of data
Tube Precision: 7 Automatic DC: 95%
Bias factor A: 0.88 (0.76 - 1.04)
Bias B: 13% (-4% - 31%)
Information about tubes to be adjusted
Diffusion Tube average: 32 μgm^{-3}
Average Precision (CV): 3
Adjusted Tube average: 28 +/- 4 μgm^{-3}

Adjusted measurement (95% confidence level)
with all data
Bias calculated using 12 periods of data
Tube Precision: 7 Automatic DC: 95%
Bias factor A: 0.88 (0.76 - 1.04)
Bias B: 13% (-4% - 31%)
Information about tubes to be adjusted
Diffusion Tube average: 32 μgm^{-3}
Average Precision (CV): 3
Adjusted Tube average: 28 +/- 5 μgm^{-3}

Armadale Cross diffusion tube results

Adjustment of DUPLICATE or TRIPLICATE Tubes

AEA Energy & Environmen
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	07/01/2008	01/02/2008								
2	01/02/2008	29/02/2008								
3	29/02/2008	03/04/2008	27.0	27.0		27.0	0.00	0.00	0.00	Good
4	03/04/2008	02/05/2008	27.0	24.0		25.5	2.12	8.32	19.06	Good
5	02/05/2008	30/05/2008	26.0	23.0		24.5	2.12	8.66	19.06	Good
6	30/05/2008	04/07/2008	25.0	26.0		25.5	0.71	2.77	6.35	Good
7	04/07/2008	30/07/2008	25.0	22.0		23.5	2.12	9.03	19.06	Good
8	30/07/2008	04/09/2008	36.0	32.0		34.0	2.83	8.32	25.41	Good
9	04/09/2008	30/09/2008	27.0	33.0		30.0	4.24	14.14	38.12	Good
10	30/09/2008	31/10/2008	32.0	35.0		33.5	2.12	6.33	19.06	Good
11	31/10/2008	02/12/2008	31.0	31.0		31.0	0.00	0.00	0.00	Good
12	02/12/2008	08/01/2009	44.0	45.0		44.5	0.71	1.59	6.35	Good
13										

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

Site Name/ ID:	Armadale Cross

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Version 03 - November 2006

Adjusted measurement (95% confidence level)
Without periods with CV larger than 20%
Bias calculated using 12 periods of data
Tube Precision: 7 **Automatic DC: 95%**
Bias factor A: 0.88 (0.76 - 1.04)
Bias B: 13% (-4% - 31%)
Information about tubes to be adjusted
Diffusion Tube average: 30 μgm^{-3}
Average Precision (CV): 6
Adjusted Tube average: 26 +/- 4 μgm^{-3}

Adjusted measurement (95% confidence level)
with all data
Bias calculated using 12 periods of data
Tube Precision: 7 **Automatic DC: 95%**
Bias factor A: 0.88 (0.76 - 1.04)
Bias B: 13% (-4% - 31%)
Information about tubes to be adjusted
Diffusion Tube average: 30 μgm^{-3}
Average Precision (CV): 6
Adjusted Tube average: 26 +/- 4 μgm^{-3}

Uphall Station diffusion tube results

Adjustment of DUPLICATE or TRIPLICATE Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements									
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
1	07/01/2008	01/02/2008	24.0	26.0		25.0	1.41	5.66	12.71
2	01/02/2008	29/02/2008	32.0	32.0		32.0	0.00	0.00	0.00
3	29/02/2008	03/04/2008	21.0	22.0		21.5	0.71	3.29	6.35
4	03/04/2008	02/05/2008	31.0	26.0		28.5	3.54	12.41	31.77
5	02/05/2008	30/05/2008	34.0	35.0		34.5	0.71	2.05	6.35
6	30/05/2008	04/07/2008	24.0	22.0		23.0	1.41	6.15	12.71
7	04/07/2008	30/07/2008	25.0	27.0		26.0	1.41	5.44	12.71
8	30/07/2008	04/09/2008	26.0	25.0		25.5	0.71	2.77	6.35
9	04/09/2008	30/09/2008	26.0	28.0		27.0	1.41	5.24	12.71
10	30/09/2008	31/10/2008	22.0	6.0		14.0	11.31	**80.81**	101.65
11	31/10/2008	02/12/2008	29.0	40.0		34.5	7.78	**22.55**	69.88
12	02/12/2008	08/01/2009	23.0	35.0		29.0	8.49	**29.26**	76.24
13									

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

Data Quality Check
Diffusion Tubes Precision Check
Good
Good
Good
Good
Good
Good
Good
Good
Good
Poor Precision
Poor Precision
Poor Precision

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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 12 periods of data
Tube Precision: 7 **Automatic DC: 95%**
Bias factor A: 0.88 (0.76 - 1.04)
Bias B: 13% (-4% - 31%)

Information about tubes to be adjusted
Diffusion Tube average: 27 μgm^{-3}
Average Precision (CV): 5
Adjusted Tube average: 24 +/- 4 μgm^{-3}

Adjusted measurement (95% confidence level)
with all data
Bias calculated using 12 periods of data
Tube Precision: 7 **Automatic DC: 95%**
Bias factor A: 0.88 (0.76 - 1.04)
Bias B: 13% (-4% - 31%)

Information about tubes to be adjusted
Diffusion Tube average: 27 μgm^{-3}
Average Precision (CV): 15
Adjusted Tube average: 24 +/- 4 μgm^{-3}

Livingston Alderstone Road diffusion tube results

Adjustment of DUPLICATE or TRIPLICATE Tubes

AEA Energy & Environmen
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	07/01/2008	01/02/2008	19.0	4.0		11.5	10.61	**92.23**	95.30	Poor Precision
2	01/02/2008	29/02/2008	24.0	23.0		23.5	0.71	3.01	6.35	Good
3	29/02/2008	03/04/2008	20.0	18.0		19.0	1.41	7.44	12.71	Good
4	03/04/2008	02/05/2008	19.0	25.0		22.0	4.24	19.28	38.12	Good
5	02/05/2008	30/05/2008	18.0	20.0		19.0	1.41	7.44	12.71	Good
6	30/05/2008	04/07/2008	19.0	18.0		18.5	0.71	3.82	6.35	Good
7	04/07/2008	30/07/2008	17.0	22.0		19.5	3.54	18.13	31.77	Good
8	30/07/2008	04/09/2008	20.0	22.0		21.0	1.41	6.73	12.71	Good
9	04/09/2008	30/09/2008	20.0	21.0		20.5	0.71	3.45	6.35	Good
10	30/09/2008	31/10/2008								
11	31/10/2008	02/12/2008	24.0	26.0		25.0	1.41	5.66	12.71	Good
12	02/12/2008	08/01/2009	28.0	34.0		31.0	4.24	13.69	38.12	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:	Alderstone Rd Livingston

Adjusted measurement (95% confidence level)
Without periods with CV larger than 20%
Bias calculated using 12 periods of data
Tube Precision: 7 **Automatic DC: 95%**
Bias factor A: 0.88 (0.76 - 1.04)
Bias B: 13% (-4% - 31%)

Information about tubes to be adjusted
Diffusion Tube average: 22 μgm^{-3}
Average Precision (CV): 9
Adjusted Tube average: 19 +/- 3 μgm^{-3}

Adjusted measurement (95% confidence level)
with all data
Bias calculated using 12 periods of data
Tube Precision: 7 **Automatic DC: 95%**
Bias factor A: 0.88 (0.76 - 1.04)
Bias B: 13% (-4% - 31%)

Information about tubes to be adjusted
Diffusion Tube average: 21 μgm^{-3}
Average Precision (CV): 16
Adjusted Tube average: 18 +/- 3 μgm^{-3}

Bathgate King Street diffusion tube results

Adjustment of DUPLICATE or TRIPLICATE Tubes

AEA Energy & Environmen
From the AEA group

Diffusion Tubes Measurements

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	Data Quality Check: Diffusion Tubes Precision Check
1	07/01/2008	01/02/2008								
2	01/02/2008	29/02/2008	25.0	31.0		28.0	4.24	15.15	38.12	Good
3	29/02/2008	03/04/2008	43.0	53.0		48.0	7.07	14.73	63.53	Good
4	03/04/2008	02/05/2008	37.0	39.0		38.0	1.41	3.72	12.71	Good
5	02/05/2008	30/05/2008	28.0	34.0		31.0	4.24	13.69	38.12	Good
6	30/05/2008	04/07/2008	29.0	30.0		29.5	0.71	2.40	6.35	Good
7	04/07/2008	30/07/2008	26.0	28.0		27.0	1.41	5.24	12.71	Good
8	30/07/2008	04/09/2008	39.0	36.0		37.5	2.12	5.66	19.06	Good
9	04/09/2008	30/09/2008	35.0	41.0		38.0	4.24	11.16	38.12	Good
10	30/09/2008	31/10/2008	32.0	20.0		26.0	8.49	32.64	76.24	Poor Precision
11	31/10/2008	02/12/2008	32.0	40.0		36.0	5.66	15.71	50.82	Good
12	02/12/2008	08/01/2009	49.0	54.0		51.5	3.54	6.87	31.77	Good
13										

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

Site Name/ ID:	King St Bathgate

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

Adjusted measurement (95% confidence level)
Without periods with CV larger than 20%
Bias calculated using 12 periods of data
Tube Precision: 7 Automatic DC: 95%
Bias factor A: 0.88 (0.76 - 1.04)
Bias B: 13% (-4% - 31%)
Information about tubes to be adjusted
Diffusion Tube average: 36 μgm^{-3}
Average Precision (CV): 9
Adjusted Tube average: 32 +/- 5 μgm^{-3}

Adjusted measurement (95% confidence level)
with all data
Bias calculated using 12 periods of data
Tube Precision: 7 Automatic DC: 95%
Bias factor A: 0.88 (0.76 - 1.04)
Bias B: 13% (-4% - 31%)
Information about tubes to be adjusted
Diffusion Tube average: 36 μgm^{-3}
Average Precision (CV): 12
Adjusted Tube average: 31 +/- 5 μgm^{-3}

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	07/01/2008	01/02/2008								
2	01/02/2008	29/02/2008	17.0	23.0		20.0	4.24	**21.21**	38.12	**Poor Precision**
3	29/02/2008	03/04/2008	15.0	13.0		14.0	1.41	10.10	12.71	Good
4	03/04/2008	02/05/2008	23.0	19.0		21.0	2.83	13.47	25.41	Good
5	02/05/2008	30/05/2008	21.0	18.0		19.5	2.12	10.88	19.06	Good
6	30/05/2008	04/07/2008	21.0	16.0		18.5	3.54	19.11	31.77	Good
7	04/07/2008	30/07/2008	20.0	18.0		19.0	1.41	7.44	12.71	Good
8	30/07/2008	04/09/2008	16.0	21.0		18.5	3.54	19.11	31.77	Good
9	04/09/2008	30/09/2008								
10	30/09/2008	31/10/2008	18.0	17.0		17.5	0.71	4.04	6.35	Good
11	31/10/2008	02/12/2008	21.0	24.0		22.5	2.12	9.43	19.06	Good
12	02/12/2008	08/01/2009	32.0	24.0		28.0	5.66	**20.20**	50.82	**Poor Precision**
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:	Wilkieston

Adjusted measurement (95% confidence level)
Without periods with CV larger than 20%
Bias calculated using 12 periods of data
Tube Precision: 7 Automatic DC: 95%
Bias factor A: 0.88 (0.76 - 1.04)
Bias B: 13% (-4% - 31%)
Information about tubes to be adjusted
Diffusion Tube average: 19 µgm^{-3}
Average Precision (CV): 12
Adjusted Tube average: 17 +/- 3 µgm^{-3}

Adjusted measurement (95% confidence level)
with all data
Bias calculated using 12 periods of data
Tube Precision: 7 Automatic DC: 95%
Bias factor A: 0.88 (0.76 - 1.04)
Bias B: 13% (-4% - 31%)
Information about tubes to be adjusted
Diffusion Tube average: 20 µgm^{-3}
Average Precision (CV): 13
Adjusted Tube average: 17 +/- 3 µgm^{-3}

Appendix D

Box 2.3 TG(09) Predicting 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.

Air Quality Consultants

Enter data into the yellow cells

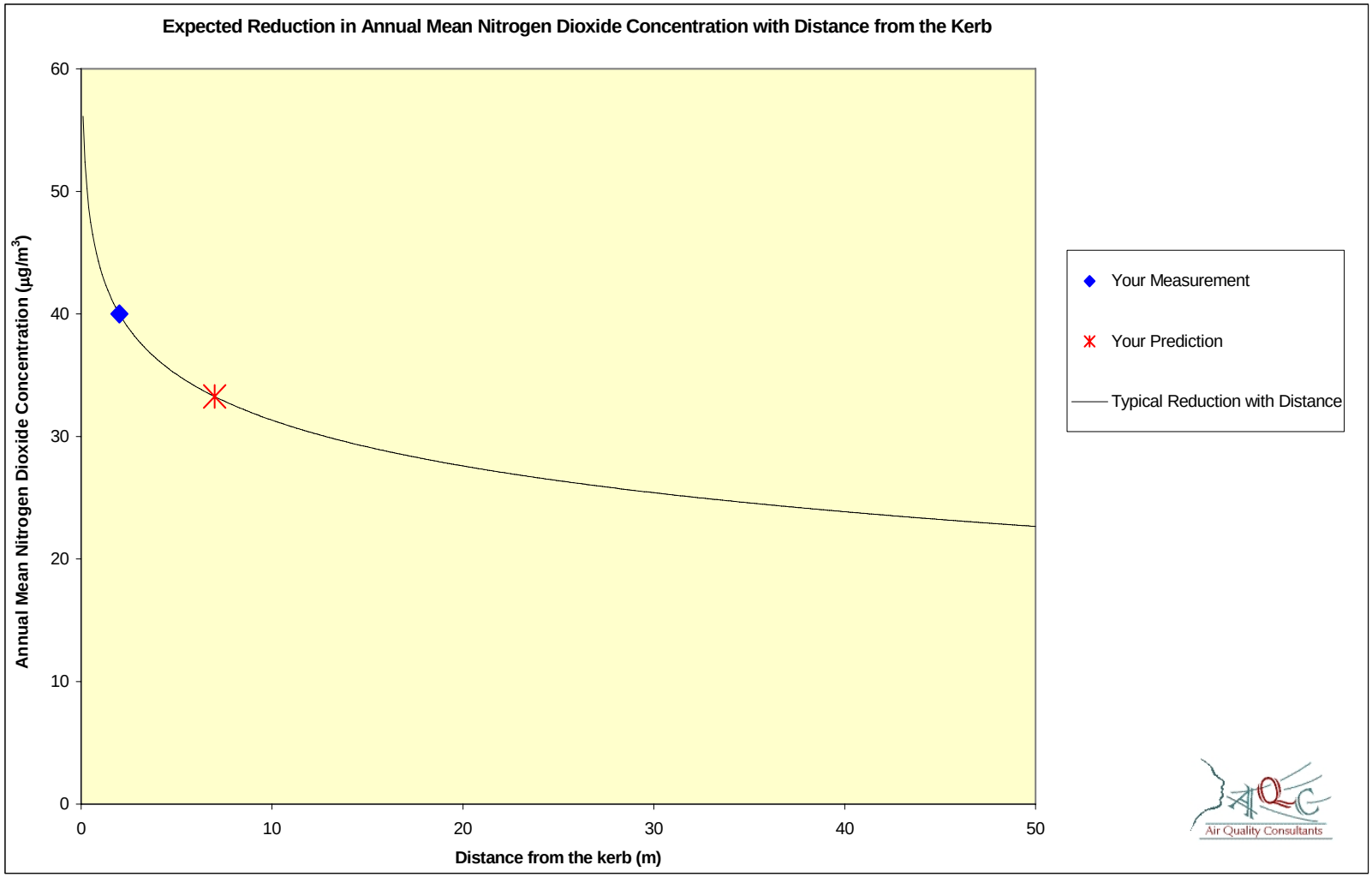
Step 1	**How far from the KERB was your measurement made (in metres)?**	(Note 1)	**2**	metres
Step 2	**How far from the KERB is your receptor (in metres)?**	(Note 1)	**7**	metres
Step 3	**What is the local annual mean background NO_2 concentration (in $\mu g/m^3$)?**	(Note 2)	**17**	$\mu g/m^3$
Step 4	**What is your measured annual mean NO_2 concentration (in $\mu g/m^3$)?**	(Note 2)	**40**	$\mu g/m^3$
Result	**The predicted annual mean NO_2 concentration (in $\mu g/m^3$) at your receptor**	(Note 3)	**33.3**	$\mu g/m^3$

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


Expected Reduction in Annual Mean Nitrogen Dioxide Concentration with Distance from the Kerb
Annual Mean Nitrogen Dioxide Concentration (µg/m3)
60
50
40
30
20
10
0
0
10
20
30
40
50
Distance from the kerb (m)
Your Measurement
Your Prediction
Typical Reduction with Distance
Air Quality Consultants

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.

Air Quality Consultants

Enter data into the yellow cells

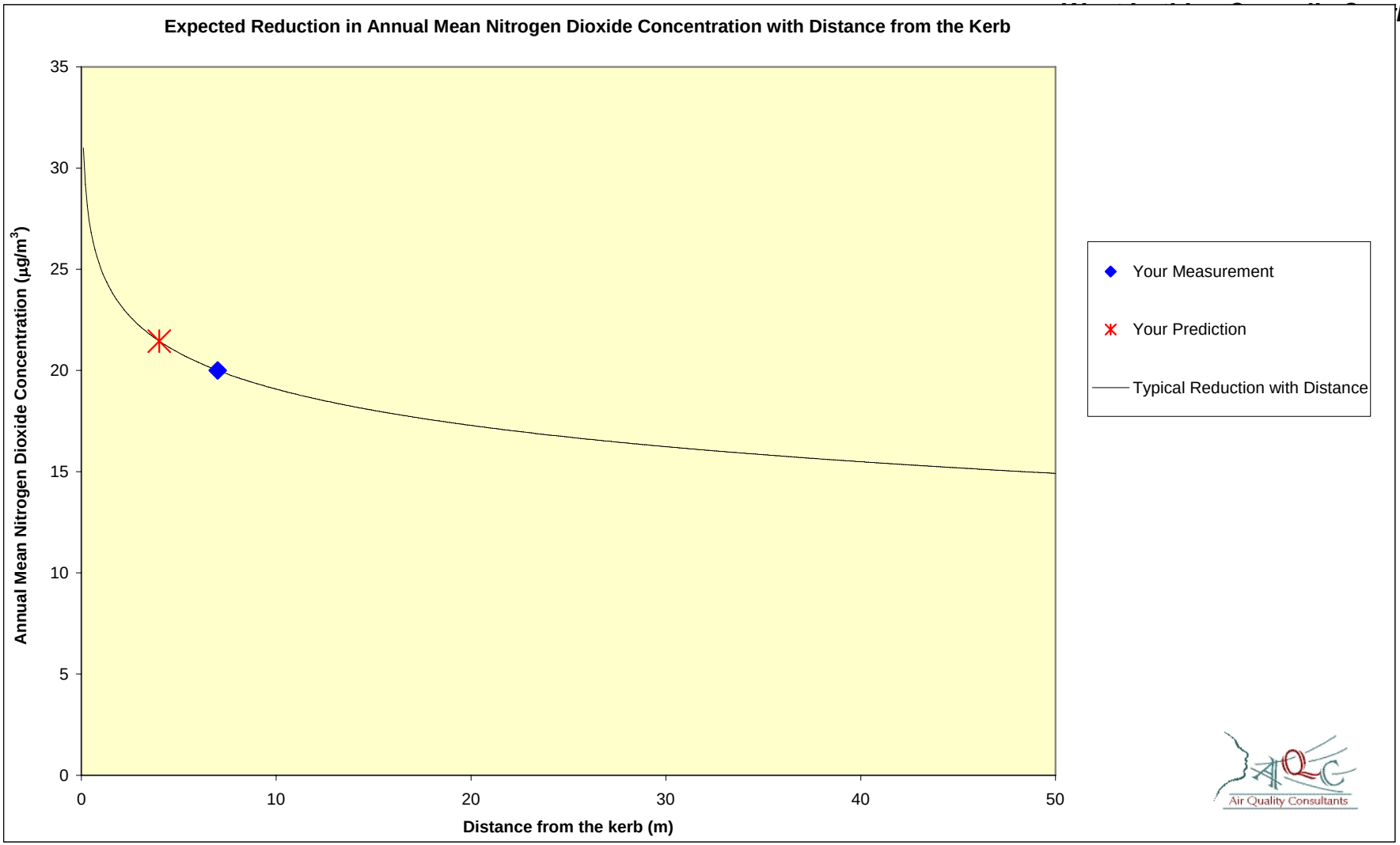
Step 1	**How far from the KERB was your measurement made (in metres)?**	(Note 1)	**7**	metres
Step 2	**How far from the KERB is your receptor (in metres)?**	(Note 1)	**4**	metres
Step 3	**What is the local annual mean background NO_2 concentration (in $\mu g/m^3$)?**	(Note 2)	**12.2**	$\mu g/m^3$
Step 4	**What is your measured annual mean NO_2 concentration (in $\mu g/m^3$)?**	(Note 2)	**20**	$\mu g/m^3$
Result	**The predicted annual mean NO_2 concentration (in $\mu g/m^3$) at your receptor**	(Note 3)	**21.4**	$\mu g/m^3$

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


Expected Reduction in Annual Mean Nitrogen Dioxide Concentration with Distance from the Kerb
Annual Mean Nitrogen Dioxide Concentration (µg/m3)
35
30
25
20
15
10
5
0
0
10
20
30
40
50
Distance from the kerb (m)
Your Measurement
Your Prediction
Typical Reduction with Distance
Air Quality Consultants

Appendix E
Projected PM_{10} data from 2008 to 2010

PM10 Projected Data from 2008 to 2010 **Box 2.2 TG(09)**

Units are $\mu g.m^3$ gravimetric

	Eastern	Northern	Concentration	
LILITHGOW	299500	677500		
Step 1				
From Maps				
Background 2008			**12.4**	
2010			12.1	
Step 2				
Background 2008			12.4	
Measured 2008			16	
Local Road Concentration			**3.6**	
				Step 4
Step 3		Year	**2008**	**2010**
Motorway In			0.31	0.272
Motorway Out			0.17	0.144
Trunk A Rd In			0	0
Trunk A Rd Out			0.0047	0.004
Primary A Rd In			0.075	0.068
Primary A Rd Out			0.072	0.065
Minor Rd In			0.025	0.02
Minor Rd Out			0.061	0.045
Brake Tyre In			0.187	0.186
Brake Tyre Out			0.139	0.139
Background Road Contribution			**1.0437**	**0.943**
Step 5				
Year Adjustment Factor				
BRC 2010 / BRC 2008			**0.90**	
Step 6				
LRC (step2) x adjustment factor				
Local Road Concentration in future year			**3.25**	
Step 7				
Background Concentration 2010			12.1	
Step 8				
LRC 2010+ Background 2010				
Step 6 + Step 7				
2010 TOTAL PM10			**15.4**	

PM10 Projected Data from 2008 to 2010 **Box 2.2 TG(09)**

Units are ug.m-3 gravimetric

	Eastern	Northern	Concentration		
BROXBURN	308500	672500			
Step 1					
From Maps					
Background 2008				**16.4**	
2010					
Step 2					
Background 2008				16.3	
Measured 2008				16.3	
Local Road Concentration				**0**	
					Step 4
Step 3			Year	**2008**	**2010**
Motorway In				0	0
Motorway Out				0.265	0.23
Trunk A Rd In				0	0
Trunk A Rd Out				0.008	0.007
Primary A Rd In				0.056	0.049
Primary A Rd Out				0.119	0.106
Minor Rd In				0.04	0.033
Minor Rd Out				0.084	0.064
Brake Tyre In				0.0427	0.0425
Brake Tyre Out				0.205	0.205
Background Road Contribution				**0.8197**	**0.7365**
Step 5					
Year Adjustment Factor					
BRC 2010 / BRC 2008				**0.90**	
Step 6					
LRC (step2) x adjustment factor					
Local Road Concentration in future year				**0.00**	
Step 7					
Background Concentration 2010				**16**	
Step 8					
LRC 2010+ Background 2010					
Step 6 + Step 7					
2010 TOTAL PM10				**16.0**	

West Lothian Council - Scotland

PM10 Projected Data from 2008 to 2010 **Box 2.2 TG(09)**
Units are ug.m-3 gravimetric

	Eastern	Northern	Concentration		
UPHALL	306500	670000			
Step 1					
From Maps					
Background 2008				**17.4**	
Step 2					
Background 2008				17.4	
Measured 2008				**12.1**	
Local Road Concentration					
					Step 4
Step 3			Year	**2008**	**2010**
Motorway In					
Motorway Out					
Trunk A Rd In					
Trunk A Rd Out					
Primary A Rd In					
Primary A Rd Out					
Minor Rd In					
Minor Rd Out					
Brake Tyre In					
Brake Tyre Out					
Background Road Contribution				**0**	**0**
Step 5					
Year Adjustment Factor					
BRC 2010 / BRC 2008				**#DIV/0!**	
Step 6					
LRC (step2) x adjustment factor					
Local Road Concentration in future year				**#DIV/0!**	
Step 7					
Background Concentration 2010				**17.11**	
Step 8					
LRC 2010+ Background 2010					
Step 6 + Step 7					
2010 TOTAL PM10				**#DIV/0!**	

Background higher than measured., therefore different approach used as per TG(09)Para 2.12 for NO2.

Background Maps 2008	17.4
Background Maps 2010	17.11
Ratio 2010/2008	**0.983**
Projected 2010	
Measured (12.1) 2008 x Ratio	**11.89**

APPENDIX F
DMRB Calculations: Armadale

Input Data

Location/ Receptor	Grid Ref	Background Concentrations			
		Year	NOx	NO_2	PM_{10}
A East Main Street	294434 668626	2008	12.4	10	12.5
		2010	11	8.6	12.1
B West Main Street	293382 668519	2008	12.3	9.5	11.92
		2010	10.8	8.5	11.5
C		2008			
		2010			

East Main Street, Armadale

Link number	Distance from link centre to receptor (m)	Traffic flow & speed		Traffic composition							
		AADT (combined, veh/day)	Annual average speed (km/h)	Road type (A,B,C,D)	Vehicles <3.5t GVW (LDV)			Vehicles>3.5t GVW (HDV)			
					% passen-ger cars	% light goods vehicles	Total % LDV	% buses and coaches	% rigid HGV	% articulated HGV	Total % HDV
1	8	12445	56	D	90.2	6.3		0.3	1.9	1.3	
2	8	12632	56	D	90.2	6.3		0.3	1.9	1.3	
3											
4											

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	East Main Street, Armadale	2008	0.06	0.06	0.05	25.39	14.01	13.70	0.00
2	East Main Street, Armadale	2010	0.11	0.12	0.09	33.33	15.08	14.08	0.00

West Main Street, Armadale

Link number	Distance from link centre to receptor (m)	Traffic flow & speed		Traffic composition							
		AADT (combined, veh/day)	Annual average speed (km/h)	Road type (A,B,C,D)	Vehicles <3.5t GVW (LDV)			Vehicles>3.5t GVW (HDV)			
					% passen-ger cars	% light goods vehicles	Total % LDV	% buses and coaches	% rigid HGV	% articulated HGV	Total % HDV
1	8	7568	42	D	89.7	6.7		0.1	1.9	1.6	
2	8	7681	42	D	89.7	6.7		0.1	1.9	1.6	
3											

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	West Main Street,Armadale	2008	0.04	0.05	0.04	20.64	12.19	12.77	0.00
2	West Main Street,Armadale	2010	0.08	0.09	0.07	25.10	12.92	12.94	0.00

NB 2010 traffic AADT calculated on the basis of 1.5 % increase from 2008