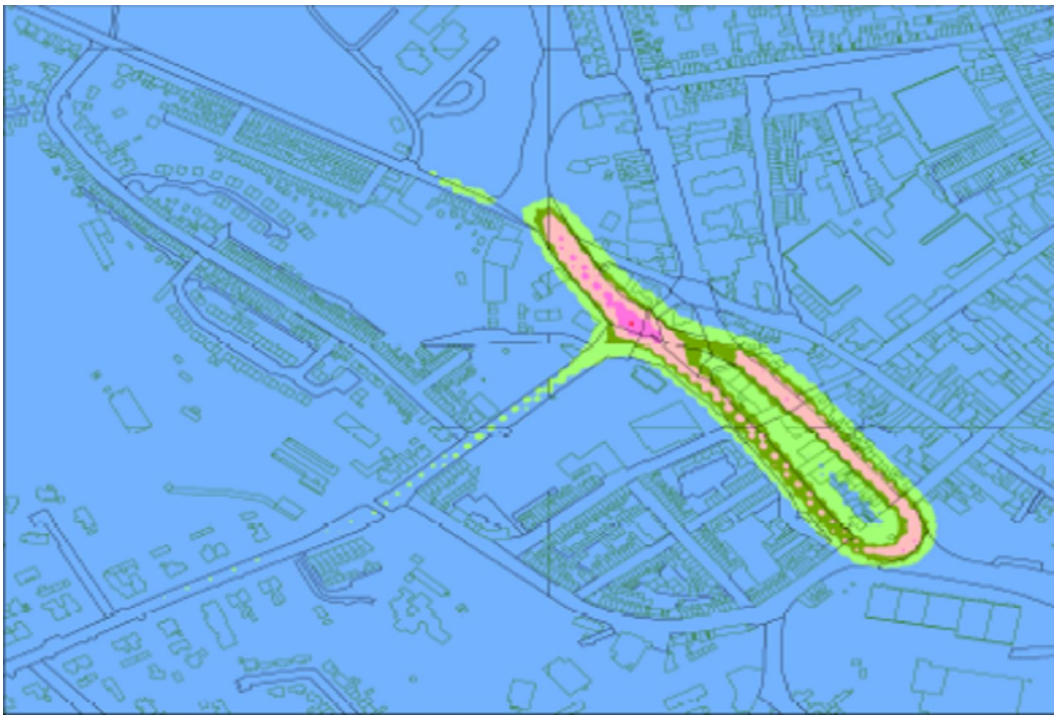
2010 Air Quality Progress Report for *Ballymena Borough Council*

In fulfillment of the Environment (Northern Ireland) Order 2002 –
Local Air Quality Management



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Executive Summary

The 2010 Progress Report prepared for Ballymena Borough Council has concluded the following:

Conclusions from New Monitoring Data

- **Nitrogen Dioxide**

Automatic Monitoring Data

The mean nitrogen dioxide concentrations for the period 1 January 2009 to 31 December 2009 at the North Road site was 29 μgm^{-3} therefore below the Annual Mean Air Quality Objective of 40 μgm^{-3}. One exceedence occurred of the hourly mean, 244μgm^{-3} exceeded the Hourly mean objective of 200 μgm^{-3}. There was no exceedence of the Daily mean objective.

In summary during the 2009 monitoring period there was no exceedences of the hourly, daily or the annual mean, for nitrogen dioxide for automatic monitoring data.

Diffusion Tube Monitoring

UWE Bias adjustment figure:

Exceedences of the nitrogen dioxide annual mean were noted at George St and Linenhall Street. These locations are within the recently declared AQMA for nitrogen dioxide.

Local Bias Adjustment figure:

On using the locally derived figure in addition to the above locations, a further three locations which fall outside the AQMA for nitrogen dioxide, exceeded the annual mean objective. All three of these locations were considered in the detailed assessment for nitrogen dioxide, undertaken by AEA on behalf of Ballymena Borough Council in 2009.

On balance and consideration of Box 3.3 of the technical guidance, in making a choice of bias adjustment factor (locally derived versus national database) for use the nationally derived factor is chosen. Reasons for choice include;

1. Tube exposure is monthly
2. Data capture for the automatic site was 88.2% and is not an AURN site.
3. Tubes on monitoring station are in a ‘open’ environment, those tubes in the AQMA are in a ‘canyon’, thus better to use the results from a variety of studies.
4. Diffusion tube study was over one year.
5. Study was based on 33 sites using Gradko tubes.

However in using the UWE bias adjustment figure, this means our diffusion tubes have over read. There is lack of confidence in this situation, therefore as a precautionary note, the three additional locations will be re-considered in the further assessment.

- **PM_{10} and Sulphur Dioxide**

During the 2009 monitoring period there was no exceedences of the 15- minute, hourly, daily or the annual means. Based on the 2009 monitoring a detailed assessment is to be undertaken with a view to revocation of the Ballykeel and Dunclug AQMAs.

Conclusions relating to New Local Developments

There are no new local developments that will require more detailed consideration in the next Updating and Screening Assessment.

Other Conclusions

A further assessment for nitrogen dioxide will be undertaken to review the recently declared AQMA, including scenarios with a view to action planning.

A detailed assessment with a view to revocation of the AQMAs in Dunclug and Ballykeel will be undertaken.

Planning application consultations will continue to be assessed with regard to potential impact on local air quality.

Proposed Actions

Proposed actions are detailed in the following table;

Action	Date
A further assessment for nitrogen dioxide will be undertaken to review the recently declared AQMA, including scenarios with a view to action planning.	Autumn 2010
A detailed assessment with a view to revocation of the AQMAs in Dunclug and Ballykeel will be undertaken.	Autumn 2010
Submit 2011 Progress Report	April 2011

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1 Introduction

1.1 Description of Local Authority Area

Ballymena Borough has a population of approximately 60,000. The borough is approximately 200 square miles, of a mixed urban and rural character, located in the centre of a prosperous farming region. The Borough has a central location within Northern Ireland with good roads and rail communication network. It is served by the M2 motorway and with a station on the Belfast to Londonderry rail-line.

The International Airport itself is only 18 miles away and the Belfast City Airport is 30 miles from Ballymena. It is also accessible to the seaports of Larne and Belfast, 20 and 27 miles respectively.

The Antrim Coast and Giants Causeway bound it to the north, to the east by Slemish Mountain, to the west the river Bann, and to the south by Lough Neagh. The figure below illustrates the positioning of both Ballymena Town and the surrounding villages.

Figure 1.1 Showing the location of Ballymena Town and surrounding villages.

Local conditions that have a bearing on air quality include:

- Good transport infrastructure
- High levels of owner occupied housing/good quality housing
- Strong manufacturing base
- Above average reliance on agriculture, retail/distribution and public sectors in comparison to Northern Ireland overall.

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 Northern Ireland** are set out in the Air Quality Regulations (Northern Ireland) 2003, Statutory Rules of Northern Ireland 2003, no. 342, 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 Northern Ireland.

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
	40 $\mu g/m^3$	Annual mean	31.12.2004
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

First stage review and assessment (2000/01)

A First Stage Review and assessment of local air quality in Ballymena had highlighted the need to progress to second stage for:

- SO_2 and PM_{10} for domestic fuel burning
- PM_{10} and NO_2 for traffic data
- SO2 from Two Industrial point sources, i.e. plant burning over 5 MW

Second stage review and assessment (2003/04)

A Second Stage Review and assessment concluded the following:

- NO_2 and PM_{10} from Road Traffic

Further DMRB modelling in February 2004 using 2002-04 monitoring data and 2003 road traffic counts confirmed that there was no need to declare an AQMA due to Road Traffic sources for either NO_2 or PM_{10} as these would not exceed objectives in 2004/05.

- SO_2 and PM_{10} from Domestic Fuel Burning

Commenced monitoring of SO_2 by means of Real Time Analyser in August 2002 within the worse case square, Ballykeel in relation to domestic fuel combustion.

Relocation of two existing smoke and sulphur dioxide bubblers in 2002 to more appropriate locations within residential coal burning areas, namely Ballykeel and Dunclug.

Commenced monitoring of SO_2 by Diffusion Tubes in residential areas (10).

Modelling undertook in 2003/04 in respect of domestic fuel combustion for 6 areas of concern. This modelling has concluded that an AQMA be declared in respect of PM_{10} for two areas of concern, broadly named Ballykeel and Dunclug. However further investigative work was required.

- SO_2 and PM_{10} from Industrial Point Sources

GSS Modelling for two industrial plants confirmed that SO_2 and PM_{10} objectives would not be exceeded in 2004.

Third stage review and assessment (2004)

The outcome of domestic fuel combustion modelling resulted in declaration of two AQMAs broadly named Dunclug and Ballykeel in respect of predicted exceedence on PM^{10}. Ballymena Borough Council proceeded to declare two AQMA's in respect of

PM10 on 25th October 2004. A copy of the AQMA Order together with maps is shown in Appendix One.

The department's technical guidance stresses the importance of verifying the dispersion modelling by conducting local monitoring. Therefore a decision to co-locate a PM_{10} Real Time analyser with our existing SO_2 Real Time analyser within the Ballykeel AQMA was implemented in December 2004.

Stage Four Review and Assessment (2004/05).

With updated fuel use data obtained in late 2004 NETCEN were commissioned to conduct a Stage 4 Air Quality Review for domestic emissions sources within both AQMA'S. Importantly at this stage NIHE had embarked on a fuel conversion scheme with the Dunclug AQMA. Fresh data in respect of both areas was incorporated into the study. The report dated September 2005 assessed current and potential future PM_{10} and SO_2 concentrations as a result of domestic fuel combustion emissions in two grids Ballykeel and Dunclug.

It should be noted that the modelling methodology used in the Stage 4 assessment differed from that used in the Stage 3 assessment. Until model verification with local monitoring data can be undertaken these model results are not finalised. This Stage 4 study represents a more accurate modelling exercise using more up to date information than the previous stage 3 modelling.

The conclusions of this report were:

- Particulate Matter (PM_{10} gravimetric)

Detailed modelling has shown that PM_{10} emissions arising from domestic fuel combustion in Ballymena Borough Council was predicted to cause an exceedence of the daily PM_{10} objective at relevant receptors within the assessed areas, specifically Ballykeel.

- Sulphur dioxide (SO_2)

Detailed modelling has shown that SO_2 emissions arising from domestic fuel combustion in Ballymena Borough Council were not predicted to cause an exceedence of the air quality objectives at relevant receptors within the assessed areas.

The modelling had predicted an exceedance of the regulated objectives. The designation of an AQMA remained valid subject to verification of the modelling using local monitoring data. Continuous monitoring of SO_2 was already in place to capture data for the purpose of verification and PM_{10} monitoring was introduced in December 2005.

The modelling has also predicted an exceedance of the provisional PM_{10} annual objective in 2010 in Ballykeel.

Update and Screening Assessment (April 2006)

The purpose of the update and screening assessment (USA) report was to reconsider all seven pollutants screened at first stage accounting for new or changed circumstances which may influence air quality. There are two key findings within the report:

Firstly, detailed assessment to particulate matter in relation to domestic coal burning within the two AQMA's should continue, with a verification study required as sufficient data was now available.

Secondly, in respect of nitrogen dioxide from traffic, a co-location study which was being undertaken using diffusion tubes and our real time analyser, indicated further investigative work is required regarding bias adjustment to diffusion tube data.

The conclusions of this report in respect of all pollutants were as follows;

Pollutant	Detailed Assessment Required
Carbon Monoxide	Yes/No
Benzene	Yes/No
1,3 Butadiene	Yes/No
Lead	Yes/No
Nitrogen Dioxide	Yes/No. However the diffusion tube co-location study remains under review.
Sulphur Dioxide	Yes/No
Particulate Matter	Detailed assessment continues, with the preparation of an action plan.

Progress Report (2007)

The main sources of pollutants in the Ballymena Borough continue to be nitrogen dioxide from road traffic and sulphur dioxide / particulate matter from domestic sources. Nitrogen dioxide, sulphur dioxide and particulate matter will continue to be monitored in key locations, with update to the department provided with reference to the objectives of relevance.

- Nitrogen Dioxide

The 2006 annual average concentrations for the passive nitrogen dioxide monitoring sites at Galgorm Road and Queen Street are above the Annual Mean Air Quality Objective of 40 μgm^{-3} with the application of a **local** (2.07) bias adjustment factor. In using the **national** (1.33) bias adjustment factor all sites remain below the 40 μgm^{-3} objective. In 2005 using a local bias adjustment (1.51) Galgorm Road was under the objective at 36.7 μgm^{-3}, however Queen Street was in exceedence of the objective at 45.7 μgm^{-3}. Importantly in 2005 using a national bias adjustment no site was in exceedence of this objective.

There has been some doubt as to diffusion tube precision used during 2006. Efforts have been made to address this issue, this includes renewing our diffusion tube

contract with an alternative service provider. The contract commenced 1st October 2007. It is proposed to review the matter at the earliest opportunity when sufficient diffusion tube data becomes available and provide an update within the next progress report due April 2008.

- Sulphur Dioxide and Particulate Matter (PM_{10})

The mean 2006 concentrations for both SO_2 and PM_{10} are below the annual air quality objectives for both these pollutants.

The Council has relocated the Ballykeel AQMS to a best-fit location within the Ballykeel AQMA. Once sufficient monitoring data becomes available consideration will be given to the revocation of the Dunclug AQMA and either revocation / amendment of the Ballykeel AQMA.

Progress Report (2008).

The main sources of pollutants in the Ballymena Borough continue to be nitrogen dioxide from road traffic and sulphur dioxide / particulate matter from domestic sources. Nitrogen dioxide, sulphur dioxide and particulate matter will continue to be monitored in key locations, with update to the department provided with reference to the objectives of relevance.

- Nitrogen Dioxide

In using the **national** (1.06 Lambeth) bias adjustment factor all sites remain below the 40 μgm^{-3} objective, however the Gradko bias adjusted (0.89) levels show Linenhall Street and George Street are in exceedence. Four other sites are close to the 40 μgm^{-3} objective. Of these six sites two are not considered relevant as there are no residential properties in these locations, i.e.

- George Street
- Ballymoney Street

For the other four sites it is this departments intention to undertaken further detailed assessment to determine whether declaration of an AQMA(s) is necessary

- Sulphur Dioxide and Particulate Matter (PM_{10})

The mean 2007 concentrations for both SO_2 and PM_{10} are below the annual air quality objectives for both these pollutants.

The Council had relocated the Ballykeel AQMS to a best-fit location within the Ballykeel AQMA and will continue to monitor SO_2 and PM_{10} in this area. FDMS upgrade to the Ballykeel analyser is currently operating and once sufficient monitoring data comparable with that produced within the DEFRA National Network becomes available consideration will be given to either revocation / amendment of the Ballykeel AQMA as required.

It is likely that in light of the re-verification modelling in relation to the 2006 Updating and Screening Assessment that the AQMA for Dunclug will be revoked in 2008.

Update and Screening Report (2009)

The update screening and assessment findings are summarised as follows;

- **Conclusions from New Monitoring Data**

There are two significant conclusions from new monitoring data which support ongoing work since the last round of update and screening, these are;

1. Revocation of the Ballykeel and Dunclug AQMAs.

In October 2004 Ballymena Borough Council declared two Air Quality Management Areas broadly termed Ballykeel and Dunclug. Both AQMAs were designated in relation to likely exceedences of PM10 (annual and daily mean) objectives as specified by the air quality regulations. Source apportionment showed these exceedences were due to domestic coal burning.

The Air Quality Regulations state that PM10 gravimetric concentration as a daily average of 50ug/m^3 should not be exceeded more than 35 times per annum, in addition a target annual mean of 40ug/m^3 should be achieved. Local monitoring in 2008 has shown these objectives are being achieved even within the worst case contour for which the conversion to gas will not be completed until 2011. The major contributor to this improvement in air quality being that over 50% of NIHE housing stock has been converted to natural gas there has been a positive impact even on this worst case contour. In addition it is hoped that fuel efficiency work undertaken by this department has also had a beneficiary impact, including owner occupiers available of various grant aided schemes through sign posting by this department.

2. Declaration of an AQMA in the Linenhall / George Street Area.

A detailed assessment has just been completed by AEA technology on behalf of Ballymena Borough Council (April 2009). This concluded an air quality management area be designated in the Linenhall / George Street area due to modelled nitrogen concentrations along Linenhall and George Street above the objective of 40 ug/m3. This is reflected in the nitrogen dioxide diffusion tube monitoring results.

- **Conclusions from Assessment of Sources**

The assessment of sources has not highlighted any new areas of concern.

- **Proposed Actions**

The Updating and Screening Assessment has not identified the need to proceed to a Detailed Assessment for any new pollutant. As discussed above a detailed assessment has just been completed by AEA technology on behalf of Ballymena Borough Council (April 2009). This concluded an air quality management area be designated in the Linenhall / George Street area due to modelled nitrogen concentrations along Linenhall and George Street above the objective of 40 ug/m3. This report is currently with assessors for validation and approval to proceed with a declaration for an AQMA, as described above.

The Updating and Screening Assessment has not identified any need for additional monitoring, or changes to the existing monitoring programme mainly because there as been a continual review of same since 2006, in particular regarding domestic fuel burning and road traffic sources.

There are changes required to existing Ballykeel and Dunclug AQMAs by way of revocation. The air quality objectives within both areas are now being achieved due to substantial fuel conversion work undertaken by the NIHE since the declaration of these areas. This matter is with the devolved administration for approval. It is not proposed to proceed to a Detailed Assessment due to the number of fuel burning sources that have been removed and local monitoring data.

Next course of action;

- To declare an AQMA along the Linenhall Street / George Street area (subject to approval) due to modelled nitrogen concentrations above the objective of 40 ug/m3. Then to proceed with Action Planning as required.
- To revoke both Ballykeel and Dunclug AQMAs (subject to approval) as local monitoring has shown PM_{10} objectives are being achieved
- Submit 2010 Progress Report.

1.5 Progress since Update and Screening Report (2009).

An Air Quality Management Area (AQMA) was declared for Nitrogen Dioxide in March 2010. A further assessment is being prepared with a view to action planning.

The AQMA Order for Nitrogen Dioxide is detailed in Appendix One, together with those AQMAs declared in 2004 for Particulate Matter.

An Action Plan Progress Report was provided in October 2008, in respect of the AQMA's declared for Particulate Matter.

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

There are three continuous analysers currently in operation, at two locations. All sites were in operation at the last round of update and screening in 2009. Details of monitoring are as follows:-

(1) Sulphur dioxide continuous analyser at Ballykeel
(2) Particulate matter (with FDMS) continuous analyser at Ballykeel
(3) Nitrogen dioxide continuous analyser at North Road

All continuous monitoring stations are part of the Calibration Club managed by AEA. Data from these sites are quality assured to the AURN standards as part of the Calibration Club. In addition a QA/QC audit which includes calibration of the analysers using zero and span gas standards, and other tests for efficiency is undertaken by AEA. Data are fully ratified by AEA staff using procedures as applied to data from the AURN UK national monitoring network sites.

Further information regarding Quality Assurance/Quality Control for Automatic Continuous Analysers is detailed in Appendix Two.

Figure 2.1 Details of Automatic Monitoring Sites

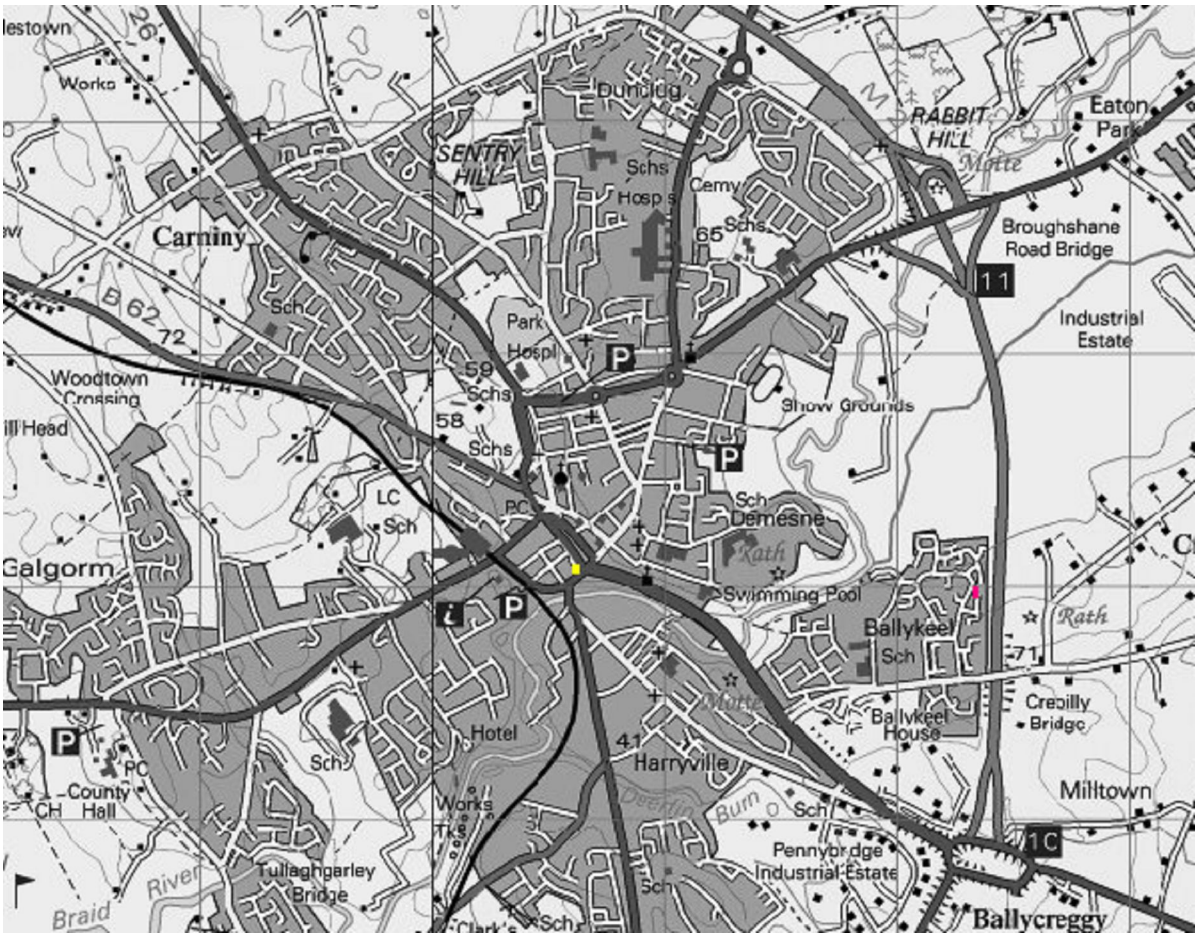
Site Name	Site Type	OS Grid Ref	Pollutants Monitored	In AQMA?	Relevant Exposure?	Distance to kerb of nearest road *(N/A if not applicable)*	Worst-case Location?
Ballykeel	AQMA	402600 N 311900 E	SO_2, PM_{10}	Y	Y	N/A	Y
North Road	Roadside	310636N 403072 E	NO, NOx, NO_2	N	Y	2m	N*

*As preferred worst-case location not an option due to a narrow footpath, the second preferred worst-case location was chosen.

Figure 2.2 Showing photograph of Ballykeel Automatic Analyser

Figure 2.3 Showing photograph of North Road Automatic Analyser

Figure 2.4 Showing location map of Ballykeel and North Road Automatic Analysers



2.1.2 Non-Automatic Monitoring

Ballymena Borough Council operates a network of nitrogen dioxide diffusion tubes across the borough. The diffusion tubes are exposed for a four-week period. In 2009 the diffusion tubes were analysed by Gradko Environmental. The locations of the diffusion tubes in the assessed areas are listed in Table 2.2 also shown in Figures 2.3. In addition, diffusion tubes were collocated with the North Road monitoring site (diffusion tubes 14a, 14b and 14c) in 2009. The location of the monitoring station also represents the location of the co-located diffusion tubes in Figure 2.3.

Table 2.2 Details of Non- Automatic Monitoring Sites – NOx Diffusion Tubes

Site No. & Name	Site Type	OS Grid Ref (Easting, Northing)	Pollutants Monitored	In AQMA?	Relevant Exposure?	Worst-case Location?
1. Leighinmohr Ave	UB	310220 402580	NO_x	N	Y	Y
2 Galgorm Rd	K	310335 403195	NO_x	N	Y	Y
3 Main St C'Backey	K	305730 405730	NO_x	N	Y	Y
4 Cullybackey Rd	K	310346 403442	NO_x	N	Y	Y
5 Larne St	K	310680 402850	NO_x	N	Y	Y
6 Ballyloughan Ave	UB	309530 404480	NO_x	N	Y	Y
7 George St	K	310591 403229	NO_x	N	Y	Y
8 Wellington St	K	310810 403420	NO_x	N	Y	Y
9 Ballymoney St	K	310800 403570	NO_x	N	Y	Y
10 Parkway	K	310900 403920	NO_x	N	Y	Y
11 Lisnevenagh Rd	R	311900 497010	NO_x	N	Y	Y
12 Queen St	K	310744 402213	NO_x	N	Y	Y
14a/b/c North Rd	R	310636 403072	NO_x	N	Y	Y
15 Linenhall St	K	310684 403121	NO_x	N	Y	Y

UB = urban background
K = kerbside
R = Roadside

Figure 2.5 Location Map showing NOx monitoring site locations.

Gradko laboratory precision and WASP scheme performance, in accordance Para 3.23 in TG (09) has been assessed as 'Good'.

The laboratory bias correction factor was calculated using the ''diffusion tube'' spreadsheet tool and co-location study at North Road monitoring station. This diffusion tube spreadsheet tool is published by Air Quality Consultants Ltd on behalf of Defra, the Welsh Assembly Government, the Scottish Executive and the Department of the Environment Northern Ireland and it is available on the UWE website (2009), and is shown in Appendix 4. A bias adjustment factor of 0.90 was calculated from this diffusion tube spreadsheet tool (http://www.uwe.ac.uk/aqm/review/R&Asupport/diffusiontube310309.xls), which used 33 studies from Gradko Services for 2009.

A local co-location study is carried out by exposing triplicate tubes at the location of the automatic station in North Road. A bias adjustment factor of 1.208 was calculated from the diffusion tubes co-located with the North Road site. This was done using the AEA Energy and Environments "Spreadsheet for calculating Precision, Accuracy and Bias Adjustment factors of Diffusion Tubes''. Both bias adjustment factors calculated from these two studies were applied to the raw diffusion tube data from the survey, for annual 2009 annual average at each location. This is shown in the following section. Appendix three shows how the local bias adjustment figure was derived.

2.2 Comparison of Monitoring Results with Air Quality Objectives

2.2.1 Nitrogen Dioxide

An air quality management was declared in March 2010 in the Linenhall / George Street area due to modelled nitrogen dioxide exceedences of the objective of 40 ug/m3.

Automatic Monitoring Data

During the 2009 monitoring period there was no exceedences of the hourly, daily or the annual mean, as shown in the table below.

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

BALLYMENA NORTH ROAD
01 January to 31 December 2009

These data have been fully ratified by AEA

POLLUTANT	NO_X	NO	NO_2
Number Very High	-	-	0
Number High	-	-	0
Number Moderate	-	-	0
Number Low	-	-	7728
Maximum 15-minute mean	2838 µg m^{-3}	1529 µg m^{-3}	502 µg m^{-3}
Maximum hourly mean	997 µg m^{-3}	493 µg m^{-3}	244 µg m^{-3}
Maximum running 8-hour mean	579 µg m^{-3}	293 µg m^{-3}	138 µg m^{-3}
Maximum running 24-hour mean	314 µg m^{-3}	150 µg m^{-3}	93 µg m^{-3}
Maximum daily mean	296 µg m^{-3}	140 µg m^{-3}	82 µg m^{-3}
Average	59 µg m^{-3}	20 µg m^{-3}	29 µg m^{-3}
Data capture	88.2 %	88.2 %	88.2 %

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 (Northern Ireland) 2003	Exceedences	Days
Nitrogen Dioxide	Annual mean > 40 µg m^{-3}	0	-
Nitrogen Dioxide	Hourly mean > 200 µg m^{-3}	1	1

The mean nitrogen dioxide concentrations for the period 1 January 2009 to 31 December 2009 at the North Road site was 29 μgm^{-3} therefore below the Annual Mean Air Quality Objective of 40 μgm^{-3}. Further one exceedence occurred of the hourly mean, 244μgm^{-3} exceeded the Hourly mean objective of 200 μgm^{-3}. There was no exceedence of the Daily mean objective. (Air Quality Regulations (Northern Ireland) 2003)

Diffusion Tube Monitoring Data

Table 2.4 Results of Nitrogen Dioxide Diffusion Tubes

Site No. & Name	Site Type	Unadjusted annual mean*	Corrected with UWE bias adjustment figure (0.9)	Corrected with local bias adjustment figure (1.208)
			Annual mean*	Annual mean*
1. Leighinmohr Ave	UB	12.67	11.4	15.31
2 Galgorm Rd	**K**	**37.25**	**33.53**	**45.00**
3 Main St C'Backey	K	24.08	21.67	29.09
4 Cullybackey Rd	**K**	**33.58**	**30.22**	**40.56**
5 Larne St	K	28.67	25.8	34.63
6 Ballyloughan Ave	UB	12.33	11.1	14.89
7 George St	**K**	**43.33**	**39.0**	**52.34**
8 Wellington St	K	27.67	24.9	33.43
9 Ballymoney St	K	31.92	28.73	38.56
10 Parkway	K	25.83	23.25	31.20
11 Lisnevenagh Rd	R	27.42	24.68	33.12
12 Queen St	**K**	**36.42**	**32.78**	**44.00**
14a/b/c North Rd	R	24.23	21.81	29.27
15 Linenhall St	**K**	**54.58**	**49.12**	**65.93**

*** Indicates nitrogen dioxide concentration in ug/m3**

UWE Bias adjustment figure:

It can be seen from the above table that exceedences of the nitrogen dioxide annual mean remains at locations 7 and 15 (highlighted in blue, namely George St and Linenhall Street). These locations are within the recently declared AQMA for nitrogen dioxide.

Local Bias Adjustment figure:

On using the locally derived figure in addition to locations 7 and 15, a further three locations (highlighted in yellow), which fall outside the AQMA for nitrogen dioxide, exceed the annual mean objective. All three of these locations were considered in the detailed assessment for nitrogen dioxide, undertaken by AEA on behalf of Ballymena Borough Council in 2009.

On consideration of Box 3.3 of the technical guidance, in making a choice of bias adjustment factor (locally derived versus national database) for use the nationally derived factor is chosen. Reasons for choice include;

1. Tube exposure is monthly
2. Data capture for the automatic site was 88.2% and is not an AURN site.
3. Tubes on monitoring station are in a ‘open’ environment, those tubes in the AQMA are in a ‘canyon’, thus better to use the results from a variety of studies.
4. Diffusion tube study was over one year.
5. Study was based on 33 sites using Gradko tubes.

However in using the UWE bias adjustment figure, this means our diffusion tubes have over read. There is lack of confidence in this situation, therefore as a precautionary note, the three additional locations will be re-considered in the further assessment.

2.2.2 PM_{10} and Sulphur Dioxide

During the 2009 monitoring period there was no exceedences of the 15- minute, hourly, daily or the annual means, as appropriate and as shown in the table below. Based on the 2009 monitoring a detailed assessment is to be undertaken with a view to revocation of the Ballykeel and Dunclug AQMAs.

Table 2.5 Results of PM_{10} and Sulphur Dioxide Automatic Monitoring: Comparison with Annual Mean 15-minute, hourly and 24-hour Mean Objectives.

BALLYMENA BALLYKEEL
01 January to 31 December 2009

These data have been fully ratified by AEA

POLLUTANT	SO_2	PM_{10}*+
Number Very High	0	0
Number High	0	0
Number Moderate	0	62
Number Low	32306	7724
Maximum 15-minute mean	146 µg m^{-3}	209 µg m^{-3}
Maximum hourly mean	64 µg m^{-3}	209 µg m^{-3}
Maximum running 8-hour mean	36 µg m^{-3}	161 µg m^{-3}
Maximum running 24-hour mean	25 µg m^{-3}	77 µg m^{-3}
Maximum daily mean	21 µg m^{-3}	74 µg m^{-3}
Average	7 µg m^{-3}	25 µg m^{-3}
Data capture	94.1 %	89.6 %

+ PM_{10} as measured by a FDMS (no correction)
All mass units are at 20'C and 1013mb

Pollutant	Air Quality Regulations (Northern Ireland) 2003	Exceedences	Days
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}	0	-
PM_{10} Particulate Matter (Gravimetric)	Daily mean > 50 µg m^{-3}	6	6
PM_{10} Particulate Matter (Gravimetric)	Annual mean > 40 µg m^{-3}	0	-

Summary of Compliance with AQS Objectives

Ballymena Borough Council has examined the results from monitoring in the borough. Concentrations outside of the AQMA are all below the objectives at relevant locations, therefore there is no need to proceed to a Detailed Assessment.

3 New Local Developments

The following are no new local developments since completion of the Updating and Screening Assessment (August 2009). Further information is given below.

Part A, B and C Processes

There are no new Part A, B or C processes within the borough since the completion of the Updating and Screening Assessment in 2009. This department continues to survey premises whom activities remain below the relevant threshold.

Variations to existing permits have taken place due to changes in practices.

New Retail Developments

There have been no new retail developments that may impact on air quality.

New Road Schemes

Consultation exercises are completed / ongoing regarding new road schemes at the following locations. These were all considered at the USA in 2009.

- Ballee Road East dual carriageway – new design / road layout to include additional slip roads and underpass. Minimal impact on residential properties predicted.
- A26 dual carriageway at Frosses – an extension of dual carriageway towards Ballymoney, will bring existing residential properties closer to kerbside.
- Realignment of single carriageway on Sourhill / Tullygarley Road - will bring existing residential properties closer to kerbside.

Landfill Developments

The Council owned and managed Ballymacvea Landfill, off the A26 dual carriageway closed at the end of March 2007. A temporary waste transfer site now operates at this location. Council is currently seeking a permanent transfer facility in an alternative location. All planning applications are considered by the Environmental Health Department and, where necessary, air quality will be reviewed as part of that consultation process.

There is no licensed landfill operating within the Borough. Domestic waste collections by Council are taken outside of the Borough.

Residential Developments

In addition, there have been a number of large residential developments within the Borough with the potential to increase traffic flow, including:

- Leighinmohr Avenue
- Galgorm Road, Ahoghill (3 additional development sites on the boundary of the village).

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

4 Planning Applications

Residential Developments

Ballymena Borough Council was consulted on a number of planning applications through the planning process on a number of large residential developments, including;

- Ballymoney Road, Ballymena (2 separate large development sites)
- Lands off Main Street, Cullybackey
- Larne Road, Harryville, Ballymena (3 separate large development sites)
- Knockan Road, Broughshane
- Sourhill Road / Dan's Road, Galgorm, Ballymena
- Galgorm Road, Ballymena
- Royal Court, Gracehill, Galgorm, Ballymena
- Caherty Road, Broughshane.

Recently there has been a substantial decrease throughout the Borough in the build of properties. Therefore many of the aforementioned developments have not commenced construction.

Other Developments.

The following developments have been / are being considered at a planning consultation stage and, where necessary, air quality has been / is being reviewed as part of that consultation process.

- Lateral extension to Craig's Quarry, Glenwherry
- Lateral extension to Ballylig Quarry, Broughshane
- Biomass unit for domestic heating system.
- Landfilling, Craig's Quarry, Glenwherry.

5 Conclusions and Proposed Actions

5.1 Conclusions from New Monitoring Data

- **Nitrogen Dioxide**

An air quality management was declared in March 2010 in the Linenhall / George Street area due to modelled nitrogen dioxide exceedences of the objective of 40 ug/m3.

Automatic Monitoring Data

The mean nitrogen dioxide concentrations for the period 1 January 2009 to 31 December 2009 at the North Road site was 29 μgm^{-3} therefore below the Annual Mean Air Quality Objective of 40 μgm^{-3}. Further one exceedence occurred of the hourly mean, 244μgm^{-3} exceeded the Hourly mean objective of 200 μgm^{-3}. There was no exceedence of the Daily mean objective.

In summary during the 2009 monitoring period there was no exceedences of the hourly, daily or the annual mean, for nitrogen dioxide.

Diffusion Tube Monitoring

UWE Bias adjustment figure:

It can be seen from the above table that exceedences of the nitrogen dioxide annual mean remains at locations 7 and 15, namely George St and Linenhall Street. These locations are within the recently declared AQMA for nitrogen dioxide.

Local Bias Adjustment figure:

On using the locally derived figure in addition to locations 7 and 15, a further three locations which fall outside the AQMA for nitrogen dioxide, exceed the annual mean objective. All three of these locations were considered in the detailed assessment for nitrogen dioxide, undertaken by AEA on behalf of Ballymena Borough Council in 2009.

On balance and consideration of Box 3.3 of the technical guidance, in making a choice of bias adjustment factor (locally derived versus national database) for use the nationally derived factor is chosen. Reasons for choice include;

1. Tube exposure is monthly
2. Data capture for the automatic site was 88.2% and is not an AURN site.
3. Tubes on monitoring station are in a ‘open’ environment, those tubes in the AQMA are in a ‘canyon’, thus better to use the results from a variety of studies.

4. Diffusion tube study was over one year.
5. Study was based on 33 sites using Gradko tubes.

However in using the UWE bias adjustment figure, this means our diffusion tubes have over read. There is lack of confidence in this situation, therefore as a precautionary note, the three additional locations will be re-considered in the further assessment.

- **PM_{10} and Sulphur Dioxide**

During the 2009 monitoring period there was no exceedences of the 15- minute, hourly, daily or the annual means, as appropriate and as shown in the table below. Based on the 2009 monitoring a detailed assessment is to be undertaken with a view to revocation of the Ballykeel and Dunclug AQMAs.

5.2 Conclusions relating to New Local Developments

There are no new local developments that will require more detailed consideration in the next Updating and Screening Assessment.

5.3 Other Conclusions

A further assessment for nitrogen dioxide will be undertaken to review the recently declared AQMA, including scenarios with a view to action planning.

A detailed assessment with a view to revocation of the AQMAs in Dunclug and Ballykeel will be undertaken.

Planning application consultations will continue to be assessed with regard to potential impact on local air quality.

5.4 Proposed Actions

Proposed actions are detailed in the following table;

Action	Date
A further assessment for nitrogen dioxide will be undertaken to review the recently declared AQMA, including scenarios with a view to action planning.	Autumn 2010
A detailed assessment with a view to revocation of the AQMAs in Dunclug and Ballykeel will be undertaken.	Autumn 2010
Submit 2011 Progress Report	April 2011

6 References

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

2. Air Quality Review and Assessment – Detailed Assessment, March 2009, AEA Technology.

3. A26 Dualling, Environmental Statement, Scoping Report, March 2009, ARUP, Road Service.

Appendices

Appendix One - AQMA Order for Nitrogen Dioxide

6.1 Air Quality Management Area Order No. 3

Environment (Northern Ireland) Order 2002, Part III, Article 12 (1)

Ballymena Borough Council, in exercise of the powers conferred upon it by Part III, Article 12 (1) of the Environment (Northern Ireland) Order 2002, hereby makes the following Order:-

1. This Order may be cited as the Ballymena Borough Council Air Quality Management Area Order No. 3, Linenhall Street.

2. This Order and the Linenhall Street Air Quality Management Area designated there under shall come into effect on 8th February 2010.

3. The area shown on the map detailed in Appendix 'A', outlined in red, is to be designated as an air quality management area for Linenhall Street.

4. The Area to be designated as an Air Quality Management Area is displayed in map form and can be viewed by visiting the main council offices, 'Ardeevin' 80 Galgorm Road during the period from 9th February 2010 to 30th March 2010. Further information is available by contacting staff of the Environmental Services Department on Tel 028 25 660 300.

The Area is designated in relation to a likely breach of the nitrogen dioxide (annual mean) objective as specified in the Air Quality Regulations (Northern Ireland) 2003.

This Order shall remain in force until it is varied or revoked by a subsequent Order.

Given under the Corporate Seal of Ballymena Borough Council on the 9th day of February 2010.

Present when the Corporate Seal of the Ballymena Borough Council was affixed

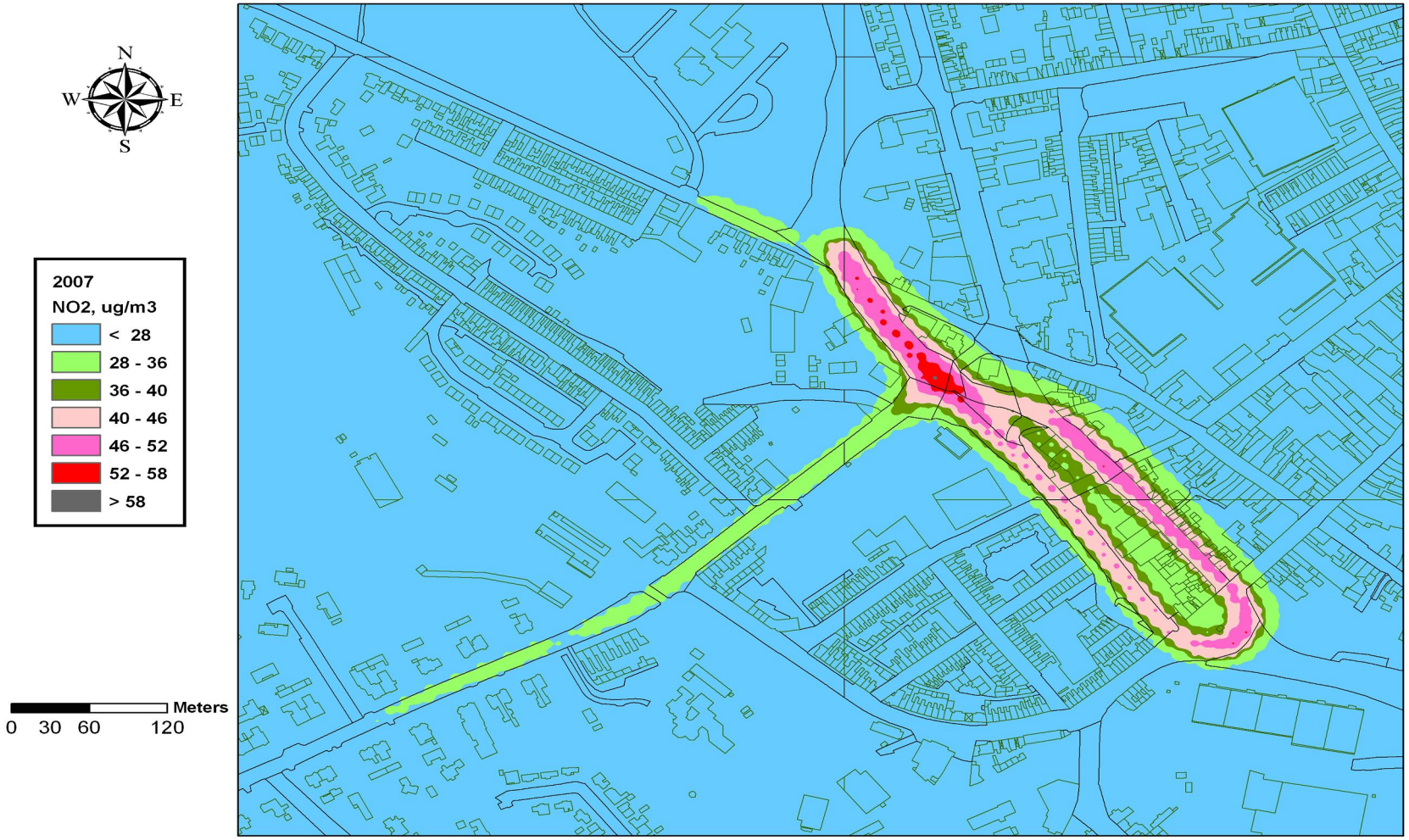
hereto:-

_____

Mayor
Councillor James Currie MBE

_____

Town Clerk and Chief Executive
Mrs Anne Donaghy


N
W
E
S
2007
NO2, ug/m3
< 28
28 - 36
36 - 40
40 - 46
46 - 52
52 - 58
> 58
Meters
0 30 60 120

AQMA Orders for Particulate Matter.

Air Quality Management Area Order No. 1

Environment (Northern Ireland) Order 2002, Part III, Article 12 (1)

Ballymena Borough Council, in exercise of the powers conferred upon it by Part III, Article 12 (1) of the Environment (Northern Ireland) Order 2002, hereby makes the following Order:-

4. This Order may be cited as the Ballymena Borough Council Air Quality Management Area Order No. 1 Ballykeel Area.

5. This Order and the Ballykeel Area Air Quality Management Area designated there under shall come into effect on 1st November 2004.

6. The areas shown on the map detailed in appendix one, outlined in black, are to be designated as an air quality management area for the Ballykeel area.

4. The Area to be designated as an Air Quality Management Area is displayed in map form and can be viewed by visiting the main council offices, 'Ardeevin' 80 Galgorm Road during the period from 2nd November 2004 to 29th December 2004. Further information is available by contacting staff of the Environmental Health Department on Tel 028 25 660 300.

5. The designated air quality management areas incorporate dwellings in the following housing estates:

Ballykeel AQMA

Dwellings in the Ballykeel 1, Ballykeel 2, Chichester Park Central, Chichester Park East and Chichester Park West estates together with certain houses on Crebilly Road, Larne Road, Meadowvale, Moat Road, River View and Knockeen Cresent.

A full list of incorporated streets or parts there of is contained in Appendix Two.

The Area is designated in relation to a likely breach of the Particulate Matter (PM_{10}) (annual and daily mean) objectives as specified in the Air Quality Regulations (Northern Ireland) 2003.

This Order shall remain in force until it is varied or revoked by a subsequent Order.

Given under the Corporate Seal of Ballymena Borough Council on the 1st day of November 2004.

Present when the Corporate Seal of the Ballymena Borough Council was affixed

hereto:-

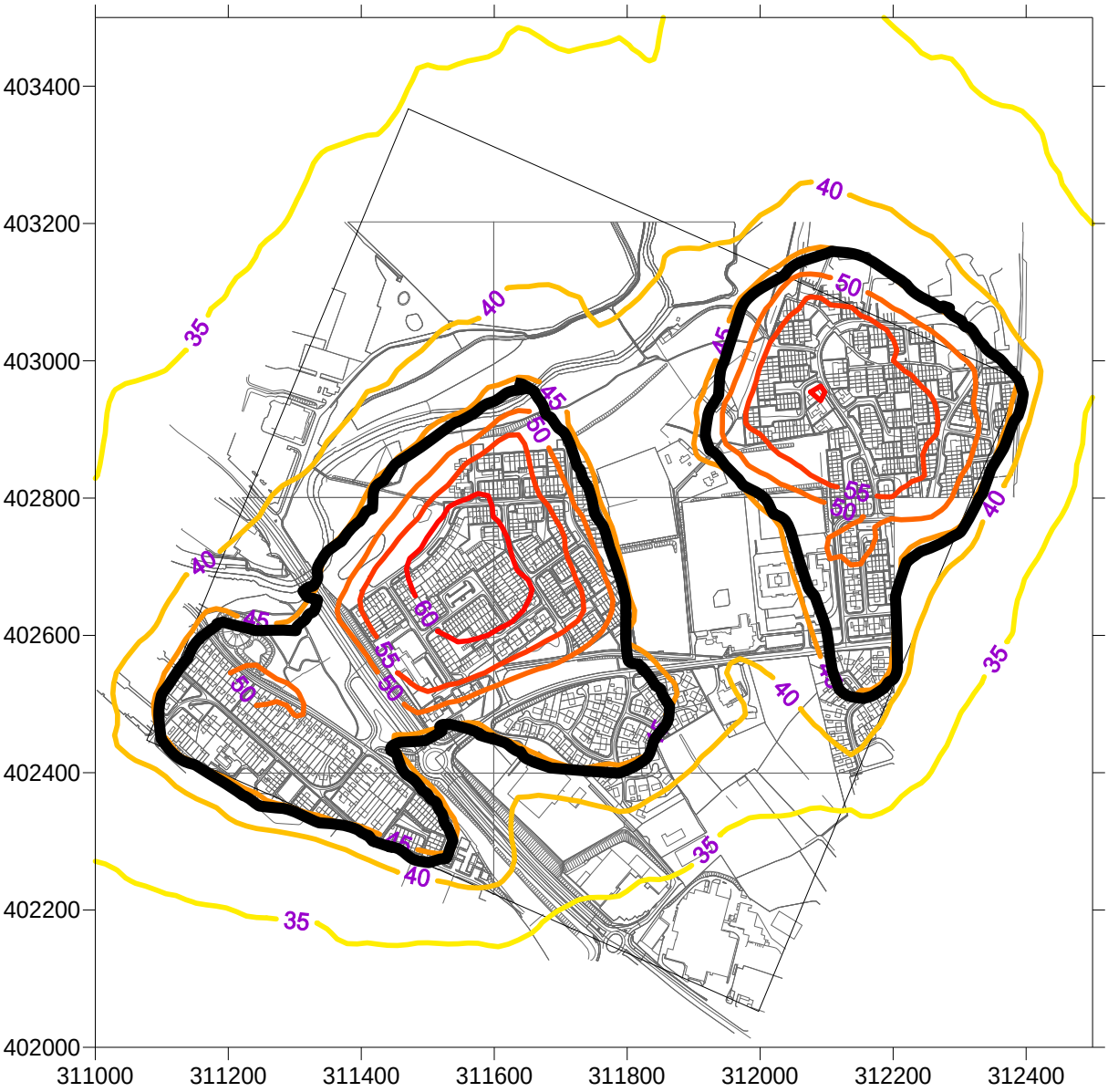
_____

Mayor
Councillor Hubert Nicholl

_____

Town Clerk and Chief Executive
Mervyn G Rankin

Air Quality Management Areas (AQMA) boundaries within Air Quality Management Area Order No.1.



Air Quality Management Area Order No.1 Ballykeel.

Appendix 2

Dwellings in the Ballykeel 1, Ballykeel 2, Chichester Park Central, Chichester Park East and Chichester Park West estates together with certain houses on Crebilly Road, Larne Road, Meadowvale, Moat Road, River View and Knockeen Cresent or Part there of.

Arran Avenue
Barra Drive
Chichester Park Central
Chichester Park East
Chichester Park West
Crebilly Road
Inchkeith Road
Incholm Avenue
Iona Gardens
Kintyre Park
Larne Road
Meadowvale
Moat Road
River View
Shona Green
Colonsay Park
Dalriada Walk
Knockeen Cresent
Knockeen Road
Lewis Park
Orkney Drive
Shetland Gardens
Shetland Park
Skye Park
Staffa Drive

Air Quality Management Area Order No. 2

Environment (Northern Ireland) Order 2002, Part III, Article 12 (1)

Ballymena Borough Council, in exercise of the powers conferred upon it by Part III, Article 12 (1) of the Environment (Northern Ireland) Order 2002, hereby makes the following Order:-

1. This Order may be cited as the Ballymena Borough Council Air Quality Management Area Order No. 2 Dunclug Area.

2. This Order and the Dunclug Area Air Quality Management Area designated there under shall come into effect on 1st November 2004.

3. The areas shown on the map detailed in appendix one, outlined in black, are to be designated as an air quality management area for the Dunclug area.

4. The Area to be designated as an Air Quality Management Area is displayed in map form and can be viewed by visiting the main council offices, 'Ardeevin' 80 Galgorm Road during the period from 2nd November 2004 to 29th December 2004. Further information is available by contacting staff of the Environmental Health Department on Tel 028 25 660 300.

4. The designated air quality management areas incorporate dwellings in the following housing estates:

Dunclug AQMA

Dwellings in the Dunclug Gardens, Dunclug Park, Dunvale, and Millfield estates together with certain houses within Blacksgrove, Cushendall Road, Doury Road, Garvey Wood, Grove Road, Johnston Close, Moorland Close and Parklands.

A full list of incorporated streets or parts thereof is contained in Appendix Two.

The Area is designated in relation to a likely breach of the Particulate Matter (PM_{10}) (annual and daily mean) objectives as specified in the Air Quality Regulations (Northern Ireland) 2003.

This Order shall remain in force until it is varied or revoked by a subsequent Order.

Given under the Corporate Seal of Ballymena Borough Council on the 1st day of November 2004.

Present when the Corporate Seal of the Ballymena Borough Council was affixed hereto:-

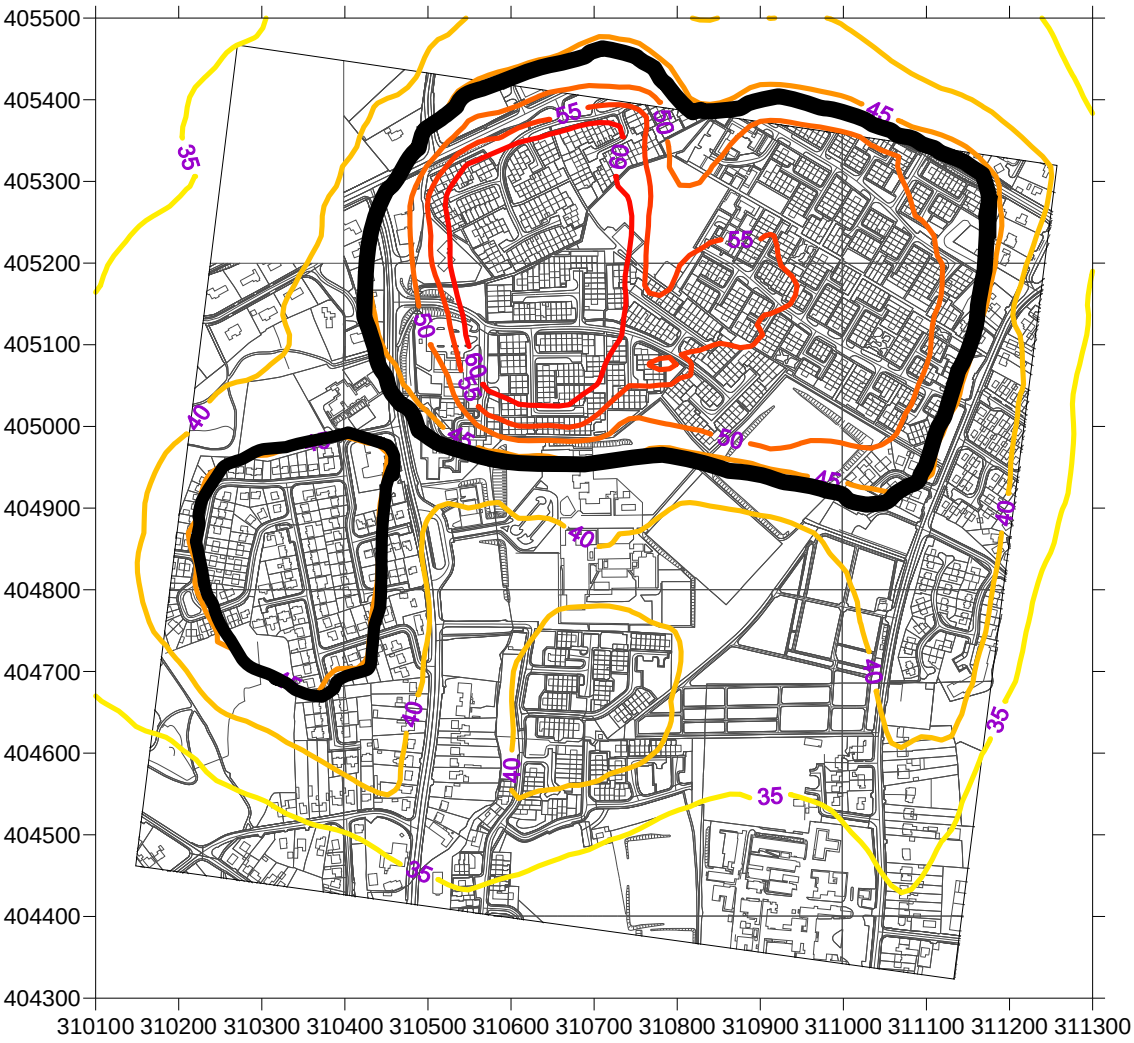
_____

Mayor
Councillor Hubert Nicholl

_____

Town Clerk and Chief Executive
Mervyn G Rankin

Air Quality Management Areas (AQMA) boundaries within Air Quality Management Area Order No.2.



Air Quality Management Area Order No.2 Dunclug.

Appendix Two

Dwellings in the Dunclug Gardens, Dunclug Park, Dunvale, and Millfield, estates together with certain houses within Blacksgrove, Cushendall Road, Doury Road, Garvey Wood, Grove Road, Johnston Close, Moorland Close, Murob Park, Rowallane Drive and Parklands or part there of.

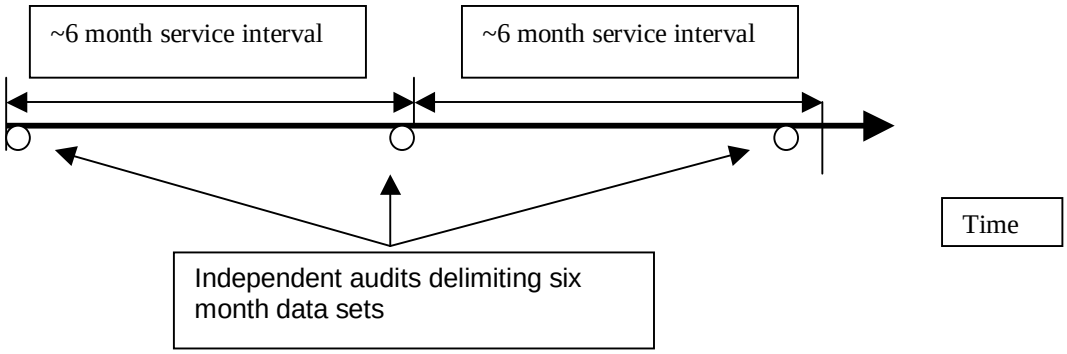
Alveston House
Blacksgrove
Brampton House
Cherrington House
Cushendall Road
Doury Road
Dunclug Gardens
Dunclug Park
Dunvale
Durleston House
Erlington House
Flaxton House
Garvey Wood
Grove Road
Johnston Close
Millfield
Mooreland Close
Murob Park
Parklands
Rowallane Drive

Appendix Two: Quality Assurance/Quality Control for Automatic Continuous Analysers

The purpose of quality control audits is to rigorously test air pollution analysers in order to obtain an assessment of the analyser performance on the day of test. This information, in conjunction with the full analyser data set and additional calibration and service records, helps ensure data quality specifications are being met during the preceding data period. Additionally, six-monthly assessment of the station calibration cylinder concentration ensures that the cylinder concentration, used to scale ambient data, remains stable and thus suitable for scaling purposes.

In April 2007 Ballymena Borough Council commenced a 3 year QA/QC contract with AEA. During the three year contract period, the station will receive seven audits, one took place shortly after commencement of the contract and further scheduled six-monthly audits will be conducted to delimit the station data sets. To aid the data management process for the stations, all equipment support service schedules have been brought into line with the audit schedules as illustrated below:

Figure 13.4 showing support service schedule –v- site audits



Station Audits.

All station audits are undertaken using the procedures described in AEA's internal quality assurance document, Group Working Instruction AEAT/GW1/05/RAMP/43.01 and the audit results recorded on form AEAT/GF/05/RAMP/43.F1. This GWI and associated documents form AEA's extension to UKAS accreditation as Calibration Laboratory 0401 for field calibrations of air quality monitoring stations. AEA currently audits over 1000 air pollution analysers each year.

Analyser performance/parameters tested are:

- **Accuracy** – this is a measure of how closely the measurement system can estimate the concentration of a test sample compared to the "true value" of the concentration. The gaseous analysers are calibrated using UKAS accredited calibration standards and the resulting calibration factors are reported on the UKAS certificate of calibration.

- **Response Time** – this is the time taken for the system to respond to a step change in concentration at its inlet. Response time is defined as the time taken for the system to achieve 90% of its maximum value. Both rise and fall times are checked.

- **Site Calibration Standard Concentration Check** – Site calibration cylinders form the basis of the gaseous calibration systems at the stations and hence make scaling of data from the SO2 and NOx analyser possible. It is therefore important to know the concentration of the gas mixture accurately. An assessment of the concentration of the on-site gas mixtures will be made – based upon the response to gas from the AEA audit transfer standard. This assessment will highlight if a calibration cylinder concentration is drifting and therefore requires replacing. These assessments are undertaken using audit calibration standards certified within AEA's own UKAS accredited calibration laboratory.

- **Linearity** – this is a measure of the relationship of analyser response with changing concentration. For conventional analysers, the relationship should be linear, i.e. twice the concentration will produce twice the output signal etc.

- **Noise Levels** – this is a measure of the change in system output when the pollutant concentration remains constant. Both zero noise, when the concentration is zero, and span noise, when the concentration is held at a particular value, are examined.

- **SO_2 Analyser Hydrocarbon Interference Test** – this test checks the efficiency of the hydrocarbon removal system used on the SO_2 analysers. The purpose of the hydrocarbon removal system is to ensure that hydrocarbon species do not interfere with the measurement of SO_2.

  As well as these tests, other assessments of the sampling and pneumatic systems are carried out. These include system leak checks, and, where possible, manifold pressure drop and flow rate measurements (useful to assess the residence time of sample gas within the manifold system, which should be minimised).

General Principles Adhered to During Station Audits

- Where practicable, test gases are introduced to the analysers via the sample lines that connect the analysers/instrument rack to the sampling manifold. This is to ensure that as much of the ambient sampling line as possible, including the sample inlet filter, is tested.

- While analysers are under test, data should be flagged as audit data as opposed to ambient data. This will utilise the appropriate method for the stations (either "out of service" switches where fitted or by instruction to the data management unit for the stations). This will ensure that data during the audit is not disseminated as ambient data.

- A resettling period of 5 minutes is allowed after completion of the test before the "out of service" switch is reset to signal the collection of ambient data. This period allows the analysers to stabilise on ambient sampling.

- All analyser outputs (with the exception of particulate analyser tests) are taken from the relevant data collection system as un-scaled raw data.

- The pressure in all calibration gas cylinders is checked to ensure it is greater than 300 psi.

UKAS Certificate of Calibration

The output from each audit is in the form of a letter report outlining the results of each six-month audit and a UKAS Certificate of Calibration. The Certificate of Calibration provides a method by which the data management process for the respective stations can be checked (via comparison of the certificate calibration factors with those used to scale the station data). Where **AEA** undertake the stations data management, the letter report will be combined with the output from the stations data management process (described below).

The UKAS Certificate of Calibration provides the following information:

- The calibration and zero response factors for the analysers under test on the day of the audit.
- Uncertainties associated with the above values.

Data Management

The following sections describe the data management package that is provided under the Calibration Club. This includes data acquisition, validation and ratification of the inorganic and particulate pollutants measured by the two monitoring stations.

The **AEA** data acquisition and management system consists of a central computer and telemetry facility that has been developed specifically for the UK's air quality monitoring programmes. Particular benefits of this system include:

- **Flexibility** – it can be easily modified to incorporate the measurement of new species, or the introduction of new data-logging or communications technology.
- **Efficiency** – the system is resident on the AEA Technology Computer Network, enabling a number of processing functions to be carried out rapidly and simultaneously.
- **Proven capability** – the system has been used to provide rapid high quality data from national monitoring programmes for many years.
- **Modular** – the system uses standard PCs and accessories. These can be simply replaced in the event of failure or run in parallel to boost performance.

The AEA system is housed within a specifically designed air-conditioned network control centre at AEA, Culham. All critical computer systems have uninterruptible power supplies installed to minimise downtime in the event of power cuts. AEA uses state of the art computer systems to automatically retrieve raw 15-minute (or hourly data depending of the station equipment) averaged measurements from monitoring stations on a daily basis.

A wide range of data management activities are routinely performed by AEA and these are integrated into the streamlined automatic data management system. Each day, measurement data is retrieved automatically from the monitoring stations (*data acquisition*). The data is then rapidly processed by applying the latest available calibration factors (*data scaling*) and carefully screened using specifically developed computer algorithms to identify suspect data or equipment faults (*data validation*). The provisional data is then appended to the site database (*data archiving*). These operations are carried out automatically by computer systems, with the output manually checked by AEA.

Once validated in this way, the previous day's results can be made available for dissemination to the respective Councils and other interested parties (as advised by the owning Council) on a daily basis via e-mail.

Data Acquisition and Processing

The monitoring site is polled daily to retrieve averaged raw output from station instruments. This data is transmitted via MODEM and automatically appended to the **AEA** air quality site database. The results of automatic overnight auto-calibration checks are also retrived and data based.

Scaling factors, based on the most recent manual calibrations undertaken by this department are applied to the pollutant measurements to produce concentrations in the relevant units. The scaled data is stored as a separate database file, the original raw data is retained at all times.

From the raw values, the hourly averaged results are then calculated. These are the averaging period used for the reporting of both validated and ratified data for all pollutants. Additionally 15-minute data files are provided for SO2 to allow direct comparison with the legislative 15-minute objective.

Initial Validation of Data

To ensure high quality data is obtained with correspondingly high data capture rates, initial data screening is essential. AEA manually reviews data from the stations every day (in addition to their automatic software diagnostics) ensuring that problems are identified as soon as they occur.

All incoming data from the monitoring stations will be screened prior to the release of validated data sets. Experienced staff are on hand to investigate instances of suspect data.

- AEA has developed a number of specially developed algorithms for identifying flagging and editing suspect data.

The automatic screening procedures provide data of the highest quality and lead to the rapid diagnosis of any instrument malfunctions.

Should equipment or site problems be identified, it is possible for data management staff to contact the monitoring station by MODEM manually, in order to access further information. If necessary, this department will be contacted in order to invoke emergency call-out procedures for their equipment support unit.

Final Ratification of Data

A number of essential quality assurance/control details are collated in order to produce a final ratified data set every six months. These are as follows:

- Results of the routine instrument calibrations (undertaken by the relevant local authority)
- Instrument and site infrastructure service records
- Meteorological data (AEA receives daily met reports from the Met Office)
- Results of six-monthly station audits

At the end of each six monthly period, AEA uses this information for each of the stations, together with the following procedures, in order to formulate the final ratified data sets.

- A time series graph and calibration control chart of the validated data for the six months is plotted and reviewed.

- Data is automatically loaded one month at a time into the AEA data-handling package. This will enable 15-minute averaged raw data, scaled concentration data and calibration results to be examined. A site information database containing all comments entered as a result of call out visits or fault investigations, it also opened on screen.

- Concentration values will be deleted where appropriate e.g. during site visits or instrument failures. Raw data will however always be preserved.

- Some adjustments to the data may be necessary for a variety of reasons including:
    - Spikes in the processed zeros or scaling factors
    - Inconsistencies in the site calibrations
    - Inclusion of spurious auto-calibration data
    - Smoothing of calibration and zero drifts

- Daily zero or sensitivity factors may be modified to produce a smooth progression throughout the month, consistent with the auto-calibration response and/or manual calibrations.

- Site operation and data ratification notes are prepared for each instrument. These notes are used for discussion of data quality issues in the six-monthly report.

- Once all modifications to the monthly files have been made, time-series and calibration control charts for the entire six months are again plotted, annotated and examined.

- Following any final corrections, the ratified six-monthly data sets are available to this department.

Data Throughput Activity

A full table of operating tasks to be carried out by the project team is detailed below.

Figure 13.5 showing operating tasks conducted by AEA

	Automated Systems	**Data Management**	**Project Manager**
Daily	Collect raw 15-minute averaged results Collect daily autocalibration results Apply calibration factors to calculate hourly averaged results Apply algorithms to screen data Database hourly results Collate provisional results for daily report	Investigate any suspicious data View previous 48 hours data & latest autocal and calibration factors Enter calibration results from routine and call out visits Send daily e-mail report	Contact Council to investigate instrument problems flagged by data manager
6-Monthly	List out files of RATIFIED results Calculate statistics	Ratify data Supply printouts of data on request Provide data analysis	Review site performance Write report to Council

Appendix Three – Extract from advice issued by the Local Air Quality Support Helpdesk.

Thank you for your enquiry, which has been dealt with by the Local Authority Air Quality Support Helpdesk.

If the 2009 annual mean NO2 concentration at Ballymena North Road, as measured by your diffusion tubes (call it D), was 24 ug/m3, and the annual mean from the automatic analyser (call it C) was 29 ug/m3, the percentage bias is

100*(D-C)/C = 100 * (24 -29)/24 = -21%.
That is, your diffusion tubes are under-reading by 21% relative to the reference method. (Diffusion tubes do sometimes under-read, although it is more common for them to over-read).

Your (locally derived) bias adjustment factor (BAF) would be 29/24 = 1.208.

This is quite a bit different from the “combined” BAF of 0.90, from AQC/UWE’s database. So, your choice of whether to use the “local “ or “combined” BAF could have implications for the conclusions of your Progress Report.

For guidance on whether to use your locally-derived BAF or the combined one, please see box 3.3 of the Technical Guidance, or else the FAQ on the Review and Assessment website at http://www.uwe.ac.uk/aqm/review/mquestions.html#ROADS & NITROGEN DIOXIDE0

Appendix Four – Diffusion Tube Bias Adjustment

Follow the steps below **in the correct order** to show the results of **relevant** co-location studies

This spreadsheet will be updated in late September 2010 on the R&A website

Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods

Whenever presenting adjusted data, you should state the adjustment factor used

This spreadhseet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.

Published by Air Quality Consultants Ltd on behalf of Defra, the Welsh Assembly Government, the Scottish Government and the Department of the Environment Northern Ireland

Step 1: Select the Laboratory that Analyses Your Tubes from the Drop-Down List

If a laboratory is not shown, we have no data for this laboratory.

Step 2: Select a Preparation Method from the Drop-Down List

If a preparation method is not shown, we have no data for this method at this laboratory.

Step 3: Select a Year from the Drop-Down List

If a year is not shown, we have no data[2]

Step 4:

Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor[3] shown in blue at the foot of the final column.

If you have your own co-location study then see footnote[4]. If uncertain what to do then contact the Review and Assessment Helpdesk 0117 328 3668 aqm-review@uwe.ac.uk.

Analysed By[1]	Method (To undo your selection, choose (All) from the pop-up list)	Year[5] (To undo your selection, choose (All))	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m3)	Automatic Monitor Mean Conc. (Cm) (µg/m3)	Bias (B)	Tube Precision[6]	Bias Adjustment Factor (A) (Cm/Dm)
Gradko	20% TEA in Water	2009	R	Lancaster CC	12	37	31	19.0%	G	**0.84**
Gradko	20% TEA in Water	2009	R	Cheshire East Council	12	34	21	62.1%	G	**0.62**
Gradko	20% TEA in Water	2009	R	Dartford Council	12	60	58	4.6%	G	**0.96**
Gradko	20% TEA in Water	2009	R	Fareham BC	11	44	36	21.1%	G	**0.83**
Gradko	20% TEA in Water	2009	R	Gedling BC	12	45	36	25.1%	G	**0.80**
Gradko	20% TEA in Water	2009	UB	East Hertfordshire DC	9	29	33	-11.0%	G	**1.12**
Gradko	20% TEA in Water	2009	R	Exeter CC	12	38	39	-4.0%	G	**1.04**
Gradko	20% TEA in Water	2009	K	New Forest DC	12	54	45	20.0%	G	**0.83**
Gradko	20% TEA in Water	2009	R	New Forest DC	12	37	26	42.4%	G	**0.70**
Gradko	20% TEA in Water	2009	K	South Lakeland DC	10	46	36	27.8%	P	**0.78**
Gradko	20% TEA in Water	2009	R	Carlisle CC	9	38	31	21.5%	G	**0.82**
Gradko	20% TEA in Water	2009	R	Newtownabbey BC	12	37	34	7.0%	G	**0.93**
Gradko	20% TEA in Water	2009	UC	Nottingham CC	12	36	34	8.2%	G	**0.92**
Gradko	20% TEA in Water	2009	R	Nottingham CC	12	45	41	11.8%	G	**0.89**
Gradko	20% TEA in Water	2009	R	Nottingham CC	11	45	41	9.4%	G	**0.91**

Gradko	20% TEA in Water	2009	UC	Belfast CC	10	39	34	14.4%	G	**0.87**
Gradko	20% TEA in Water	2009	R	Bromsgrove DC	9	53	52	1.9%	P	**0.98**
Gradko	20% TEA in Water	2009	R	Chelmsford BC	10	39	36	9.5%	G	**0.91**
Gradko	20% TEA in Water	2009	R	Coventry CC	11	45	44	2.8%	P	**0.97**
Gradko	20% TEA in Water	2009	R	Coventry CC	11	38	30	25.6%	P	**0.80**
Gradko	20% TEA in Water	2009	R	Coventry CC	12	37	36	2.1%	G	**0.98**
Gradko	20% TEA in Water	2009	R	Coventry CC	9	51	65	-22.0%	G	**1.28**
Gradko	20% TEA in Water	2009	R	Dudley MBC	11	42	37	13.1%	G	**0.88**
Gradko	20% TEA in Water	2009	B	Dudley MBC	12	30	27	9.4%	G	**0.91**
Gradko	20% TEA in Water	2009	Rural	Dudley MBC	12	19	17	11.2%	G	**0.90**
Gradko	20% TEA in Water	2009	R	Dudley MBC	12	44	40	11.3%	G	**0.90**
Gradko	20% TEA in Water	2009	R	Sandwell MBC	12	47	44	7.1%	S	**0.93**
Gradko	20% TEA in Water	2009	UB	Sandwell MBC	10	19	16	19.5%	S	**0.84**
Gradko	20% TEA in Water	2009	UB	Sandwell MBC	12	29	27	5.9%	S	**0.94**
Gradko	20% TEA in Water	2009	R	Sandwell MBC	11	42	40	5.8%	S	**0.95**
Gradko	20% TEA in Water	2009	R	Rushmoor BC	10	35	33	6.2%	G	**0.94**
Gradko	20% TEA in Water	2009	K	AEA Tech Intercomparison	12	121	107	12.6%	G	**0.89**
Gradko	20% TEA in Water	2009	R	Cheshire West & Chester Council	11	41	37	10.0%	G	**0.91**
Gradko	20% TEA in Water	2009		**Overall Factor[3] (33 studies)**				**Use**		**0.90**