

AIR QUALITY REVIEW AND ASSESSMENT

PROGRESS REPORT

BALLYMONEY BOROUGH COUNCIL

APRIL 2005

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EXECUTIVE SUMMARY

The Environment (Northern Ireland) Order 2002 and subsequent Regulations introduced the Local Air Quality Management (LAQM) system which requires District Councils to undertake regular review and assessment of air quality, with respect to the standards and objectives set in the Air Quality Strategy. In areas where an air quality objective is predicted not to be met by the required date, District Councils are required to establish Air Quality Management Areas (AQMA's) and implement Action Plans to improve air quality. This document forms the Progress Report for Ballymoney Borough Council. In writing this report the Council has had regard to the Government's published guidance confirmed in Progress Report Guidance LAQM.PRGNI(04).

Ballymoney Borough Council completed Stage 2/3 Review & Assessment in July 2004. The report concluded from the modelling work commissioned that no further assessment was required for either PM₁₀ (Particulates) or SO₂ (Sulphur Dioxide) and, therefore, an Air Quality Management Area (AQMA) in relation to the Glebeside Estate, Ballymoney, need not be declared. However, it recommended that PM₁₀ data capture should continue for a further 12 month period, so that sufficient valid local data would be acquired to verify the model results.

The report provides the latest PM₁₀ monitoring results from the station located in the Glebeside estate, from the monitoring of Sulphur Dioxide using the 8-port apparatus technique and from the Nitrogen Dioxide diffusion tube monitoring carried out across the Borough. The Sulphur Dioxide and Nitrogen Dioxide monitoring indicates that the Air Quality Objectives for these pollutants continue to be met and that exceedances are not anticipated. However, PM₁₀ monitoring shows exceedances of the daily objective of 50µg m³. The report recommends that the Council declare an AQMA in respect of PM₁₀ and submit a draft action plan to relevant authorities, consult on the plan and submit a final action plan.

1 INTRODUCTION

The Environment (Northern Ireland) Order 2002 and subsequent Regulations introduced the Local Air Quality Management (LAQM) system which requires District Councils to undertake regular review and assessment of air quality, with respect to the standards and objectives set in the Air Quality Strategy. In areas where an air quality objective is predicted not to be met by the required date, District Councils are required to establish Air Quality Management Areas (AQMA's) and implement Action Plans to improve air quality.

1.1 PURPOSE & ROLE OF PROGRESS REPORTS

The Progress report is intended to ensure continuity in the LAQM process. Its objective is to provide an annual review and update on Air Quality issues, including developments that might be significant to Air Quality. Any significant developments can then be acted on immediately, rather than waiting for the next full round of review and assessment. The benefits to District Councils are set out in Box 1.1 of the Progress Report Guidance LAQM.PRGNI(04), but these included the following: -

- ♦ To provide a readily accessible source of up to date information in Air Quality, which may be useful to District Council staff for dealing with enquiries from members of the public, developers carrying out environmental assessments and to assist in other areas such as transport and land use planning.
- ♦ To ensure continuity in maintaining resourcing, capability and staff skills for LAQM within the District Council.
- ♦ To help get maximum value from the monitoring carried out by the District Council.

This document forms the Progress Report for Ballymoney Borough Council. In writing this report the Council has had regard to the Government's published guidance confirmed in Progress Report Guidance LAQM.PRGNI(04).

1.2 AIR QUALITY STRATEGY OBJECTIVES

The Air Quality Strategy's standards and objectives are shown in Table 1. The table shows the standards in $\mu\text{g m}^{-3}$ (mg m^{-3} for CO) with the number of exceedances that are permitted (where applicable).

Table 1 Objectives included in the Air Quality Regulations (NI) 2003

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene All authorities	$16.25 \mu\text{g m}^{-3}$	running annual mean	31.12.2003
Authorities in England and Wales only	$5.00 \mu\text{g m}^{-3}$	annual mean	31.12.2010
Authorities in Scotland and Northern Ireland only	$3.25 \mu\text{g m}^{-3}$	running annual mean	31.12.2010
1,3-Butadiene	$2.25 \mu\text{g m}^{-3}$	running annual mean	31.12.2003
Carbon monoxide Authorities in England, Wales and Northern Ireland only	10.0 mg m^{-3}	maximum daily running 8-hour mean	31.12.2003
Authorities in Scotland only	10.0 mg m^{-3}	running 8-hour mean	31.12.2003
Lead	$0.5 \mu\text{g m}^{-3}$ $0.25 \mu\text{g m}^{-3}$	annual mean annual mean	31.12.2004 31.12.2008
Nitrogen dioxide ^a	$200 \mu\text{g m}^{-3}$ not to be exceeded more than 18 times a year $40 \mu\text{g m}^{-3}$	1 hour mean annual mean	31.12.2005 31.12.2005
Particles (PM ₁₀) (gravimetric) ^b All authorities	$50 \mu\text{g m}^{-3}$ not to be exceeded more than 35 times a year $40 \mu\text{g m}^{-3}$	24 hour mean annual mean	31.12.2004 31.12.2004
Sulphur dioxide	$350 \mu\text{g m}^{-3}$ not to be exceeded more than 24 times a year $125 \mu\text{g m}^{-3}$ not to be exceeded more than 3 times a year $266 \mu\text{g m}^{-3}$ not to be exceeded more than 35 times a year	1 hour mean 24 hour mean 15 minute mean	31.12.2004 31.12.2004 31.12.2005

a. These objectives are provisional.

b. Measured using the European gravimetric transfer sampler or equivalent.

1.3 CONCLUSIONS OF PREVIOUS REVIEW & ASSESSMENT

Ballymoney Borough Council completed Stage 2/3 Review & Assessment in July 2004. The report concluded from the modelling work commissioned that no further assessment was required for either PM₁₀ (Particulates) or SO₂ (Sulphur Dioxide) and, therefore, an Air Quality Management Area (AQMA) in relation to the Glebeside Estate, Ballymoney, need not be declared. However, it recommended that PM₁₀ data capture should continue for a further 12 month period, so that sufficient valid local data would be acquired to verify the model results. To facilitate this Ballymoney Borough Council purchased a PM10 automatic monitoring station through the Local Air Quality Management Grant Scheme

The report also concluded that Ballymoney Borough Council would continue to operate an 8 port apparatus to gather SO₂ and black smoke data and continue to participate in the UK NO₂ diffusion tube network operating 6 sites, 4 of which provide UK Network data.

2 NEW MONITORING DATA

This section provides a summary of air quality monitoring results available since the last review and assessment was completed.

2.1 AUTOMATIC MONITORING

A Met One BAM 1020 analyser located within the Glebeside residential development in Ballymoney carries out continuous monitoring of PM₁₀. Monitoring commenced at the station in December 2003. The analyser is housed within a secure air-conditioned unit.

QA/QC and data management was carried out by NPL from December 2003 – December 2004 and is currently carried out by NETCEN who validate and ratify the raw data and provide the Council with results on a quarterly basis. Data reports are also provided on a daily basis via e-mail, however this data is not validated.

2.2 PM₁₀ MONITORING

A summary of the PM₁₀ concentrations monitored between December 2003 and December 2004 are presented in Appendix 1 & 2. The annual average is 37 µg m⁻³, which is approaching the annual mean objective of 40µg m⁻³. There were 56 monitored exceedances of the daily objective of 50µg m⁻³. Data Capture was 70.2%, which is below the recommended 75%. Much of the missing data is during the summer periods, data capture over the winter coal burning periods is relatively good. Hourly mean data is available in Appendix 3.

This data has undergone quality control procedures by NPL who commented that the ambient data appeared high in comparison to other data commonly seen throughout Northern Ireland. Whether this is an artifact of the measurement

method, or a true indication of PM₁₀ concentrations in a predominantly solid fuel burning residential area, is not clear. NPL's comments on the ratified data set are provided in Appendix 3. The question of BAM's producing high data has further been explored in the Air Quality Expert Group (AQEG) draft report 'Particulate Matter in the UK' (2004). LAQM.TG (03) guidance states that BAM data is suitable for model verification at the detailed assessment level in review and assessment.

2.3 NO₂ DIFFUSION TUBE MONITORING

Ballymoney Borough Council carry out monitoring of NO₂ by diffusion tubes at six sites within the Borough. Four of the sites are included within the UK NO₂ network.

Table 2 Diffusion Tube Monitoring Site Details in Ballymoney

Site Ref	Site Detail	Location
1N*	Kerbside	19 Linenhall St, Ballymoney
2N*	Kerbside	8 Ballybogey Road, Ballymoney
3N*	Urban Background	Opposite 16 Armour Ave, Ballymoney
4N*	Urban Background	2-4 Semicock Ave, Ballymoney
6N	Kerbside	31 Charles Street, Ballymoney
7N	Kerbside	Opposite 51 Queen Street, Ballymoney

* NO₂ Network Site

Kerbside = 1-5m from kerb, urban background = at least 50m from the kerb of any major road.

The diffusion tubes are analysed by Lambeth Scientific Services Limited (LSSL). They participate in the Analytical Laboratory Performance Testing Scheme, which is run by NETCEN at AEA Technology. The tubes are prepared by impregnating discs with triethanolamine/acetone before being placed in coloured caps. The tubes are completed by placing a white cap on one end of the tube and a coloured cap containing the impregnated discs on the other end. The tubes are analysed using uv/visible (uv/vis) spectrophotometer after complexing with N-1-naphthylethylenediamine dihydrochloride (NEDA) and sulphalinamide.

Diffusion tubes frequently exhibit bias (over- or under-read) relative to the chemiluminescence analyser (the reference technique for NO₂), and the Guidance states that it is necessary to correct for any such bias, when using diffusion tube results for review and assessment purposes. As Ballymoney Borough Council do not have any permanent automatic NO₂ monitoring sites, they are not able to carry out the necessary intercomparison locally. Instead, information can be obtained from other sources. Data are available from a summary spreadsheet of Local Authority co-location studies prepared by Air Quality Consultants and available via the Air Quality Review and Assessment website, at <http://www.uwe.ac.uk/aqm/review>.

Annual mean NO₂ concentrations at these sites for future years were estimated using the approach specified in the Guidance LAQM TG (03), and the adjustment factors in boxes 6.6 and 6.7 of the Guidance. A Table showing annual mean concentration from 2001 to 2004 can be found in Appendix 4, along with predicted annual mean concentrations for 2005 and 2010.

Appendix 5 shows a graph charting annual mean Nitrogen Dioxide concentrations in $\mu\text{g m}^{-3}$. This demonstrates that in all locations, except one, concentrations have decreased.

2.4 SULPHUR DIOXIDE MONITORING

The 8-port apparatus technique is used to measure daily average sulphur dioxide concentrations, which can be directly compared against the 24-hour mean objective. This monitoring equipment has been installed within a secure location at the Robinson Memorial Hospital, Newal Road, Ballymoney. Prior to its siting, an application was made to participate in the UK SO₂ and smoke monitoring network. Approval for the site at the Robinson Hospital, Newal Road, Ballymoney was subsequently granted, the site being named Ballymoney 4 with identification number 161504. As with all similar sites, the equipment is

maintained on a weekly basis with the results of the daily titrations and smoke forwarded to AEA Technology plc on a monthly basis for input to the national database. Training of officers responsible for the equipment has been conducted and accompanied visits to ensure weekly maintenance and validation checks together with auditing of chemical preparation and analysis is carried out as part of internal quality assurance procedures.

If net acidity titration measurements from 8 port apparatus are considered, the measured maximum daily mean concentration should be multiplied by 1.25 to take account of a general tendency for the 8 port apparatus to under-read at high concentrations. This correction factor is open to uncertainty, and will tend to overestimate the concentrations in most cases, but this is consistent with the precautionary approach for the Second Stage review and assessment.

The relationship between daily average maximum sulphur dioxide concentrations and the 99.7th percentile of 1-hour mean concentrations and the 99.9th percentile of 15-minute mean concentrations is uncertain and is dependent upon the occurrence of unusual meteorological conditions and the impact of individual point sources. The relationships can be expressed by the following functions:-

(A) 99.9th percentile (15-min means) = 1.8962 x maximum daily mean.

(B) 99.7th percentile (1-hour means) = 1.3691 x Maximum daily mean.

Function (A) can be used to estimate the 99.9th percentile of 15-minute means from the annual maximum daily mean. To take account of the uncertainty in the relationship, it can be assumed that the 15-minute mean air quality objective is unlikely to be exceeded if the maximum daily mean concentration is less than 80µg/m³ (30.1 ppb).

Function (B) can be used to estimate the 99.7th percentile of 1-hour means from the annual maximum daily mean. To take account of the uncertainty in the

relationship, it can be assumed that the 1-hour mean air quality objective is unlikely to be exceeded if the maximum daily mean concentration is less than $200 \mu\text{g}/\text{m}^3$ (75.2 ppb).

Table 3 indicates the SO_2 maximum daily means using the 8 port apparatus for each month measured from the beginning of January 2001 to end December 2003.

The maximum figure for 2004 occurred on the 28th August and is not likely to have arisen as a result of domestic emissions.

The 24 hour mean objective of $125 \mu\text{g}/\text{m}^3$ (47ppb) approximately equivalent to 99.9th percentile was not exceeded during 2004 as the maximum daily concentration recorded was $27 \mu\text{g}/\text{m}^3$. Applying the correction factor this equates $37 \mu\text{g}/\text{m}^3$. This maximum value was recorded on one occasion only.

Table 3 SO_2 Maximum-Daily Means ($\mu\text{g}/\text{m}^3$)

MONTH	2001	2002	2003	2004
January	20	13	20	13
February	34	14	20	13
March	20	20	20	13
April	28	20	20	13
May	27	19	13	13
June	40	19	45	13
July	20	26	20	13
August	20	20	26	27
September	20	20	13	19
October	20	19	13	13
November	20	13	13	13
December	20	13	13	13

3.0 NEW LOCAL DEVELOPMENTS

A Progress Report should address any local developments that might affect air quality. This includes new Part A, B or C industrial processes, of types specified in Appendix 2 (E) of LAQM.TG(03). It is also relevant to include any processes with substantially changed emissions. New landfill sites or quarries with relevant public exposure should also be included. It is only necessary to consider developments that have actually been granted planning permission.

3.1 New Industrial Processes

No new Part A or B industrial processes (as included in the list in Appendix 2 of the Technical Guidance LAQM.TG (03)) in Ballymoney have commenced or changed significantly. Two Part C authorisations have been granted in the past year. One for a coating process within the town limits, another for a concrete process 6 miles north west of the town. One authorisation was varied due to a substantial change in the process. This process is located 11 miles south of the town.

A poultry-processing factory within the town limits has closed and is currently used for cold storage only.

There are also no new landfill sites, quarries or other sources of fugitive emissions of PM₁₀, which have nearby relevant exposure, however, the landfill site at Crosstagherty has closed and the site is now used as a transfer station. The site is located four miles southeast of the town centre.

3.2 New Developments

There are no new developments granted planning permission (or which are awaiting consent) that are likely to have a significant impact on local air quality through increased traffic flow.

4.0 CONCLUSION

Ballymoney Borough Council has monitored exceedances of the PM₁₀ 2004 daily objective in the relevant year, at a relevant location. Ballymoney Borough Council will proceed to declare an Air Quality Management Area (AQMA) for PM₁₀.

Ballymoney will also carry out further, more detailed studies in order to better define the full extent and source apportionment of the exceeding concentrations. Such information will then be used for informing the action plan that will need to be compiled following declaration of an AQMA.

Nitrogen Dioxide concentrations throughout Ballymoney are predicted to be below the annual mean objectives in 2005 and 2010 and in the majority of cases the 2004 diffusion tube data shows a decrease on NO₂ concentrations from the 2003 data.

5.0 RECOMMENDATIONS

The subsequent reporting required by Ballymoney Borough Council is therefore Declaration of an AQMA, submission of a draft action plan to relevant authorities, consultation on the plan and submission of a final action plan.

APPENDIX 1

BALLYMONEY 01 January to 31 December 2004

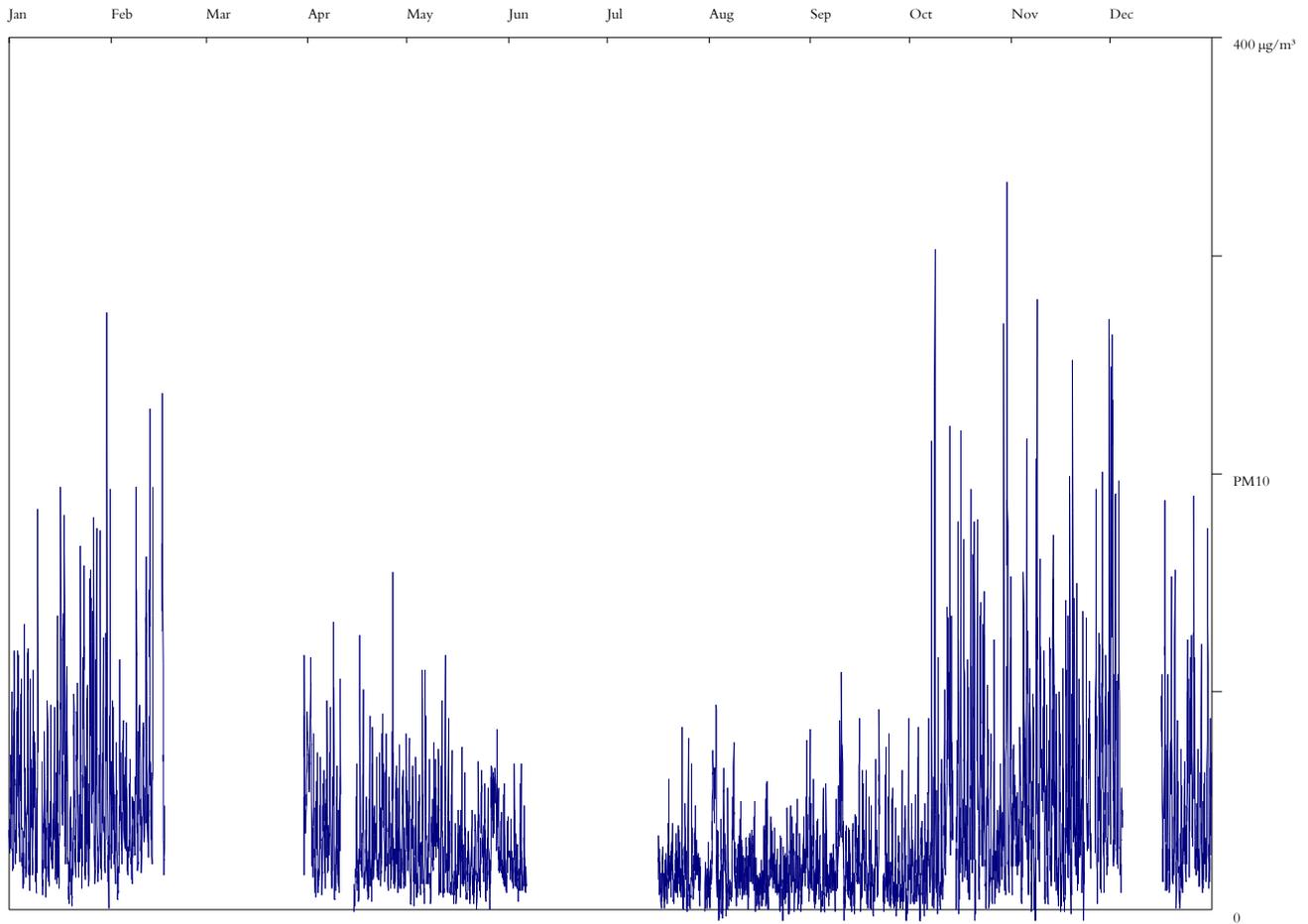
POLLUTANT	PM ₁₀ *
Number Very High	16
Number High	21
Number Moderate	541
Number Low	5431
Maximum hourly mean	334 µg m ⁻³
Maximum running 8-hour mean	193 µg m ⁻³
Maximum running 24-hour mean	137 µg m ⁻³
Maximum daily mean	133 µg m ⁻³
Average	37 µg m ⁻³
90.4%ile daily means	64 µg m ⁻³
Data capture	70.2 %

* PM₁₀ in gravimetric units
All mass units are at 20°C and 1013mb

Pollutant	Air Quality Regulations (Northern Ireland) 2003	Exceedences	Days
PM ₁₀ Particulate Matter (Gravimetric)	Daily mean > 50 µg m ⁻³	56	56
PM ₁₀ Particulate Matter (Gravimetric)	Annual mean > 40 µg m ⁻³	0	-

APPENDIX 2

Ballymoney Air Monitoring Hourly Mean Data for 01 January to 31 December 2004



APPENDIX 3

Lynne,

I attach a file containing the ratified data from January to December 2004. These data have been compiled in the absence of any instrument calibrations or service/repair reports other than those checks carried out by NPL.

The NPL checks have shown that the flow rate maintained by the analyser was within acceptable limits, and that the analyser sensitivity, when measured with an independent calibration plate, was correctly set. The instrument was not leaking. No data have, therefore, been lost as a result of issues to do with the analyser calibration.

As we have seen before, and has been noted previously, the ambient data seem high in comparison to those which are commonly seen throughout the United Kingdom, using TEOM analysers. Whether this is an artefact of the measurement method, or a true indication of PM10 concentrations in a predominantly coal burning residential area, is not clear.

As part of the CEN work on standardisation of particle monitoring methods, NPL have compared data from TEOM, BAM, and manual weighing samplers over a 16 week period (January to May 03) in Teddington. For daily average measurements, there was reasonable agreement between BAM and manual weighing methods, but the TEOM analyser under-read the manual method by approximately one half. Given these findings it is not surprising that higher concentrations were measured by your BAM analyser compared with network measurements using TEOMs. From the comparison with manual methods, though, it could be argued that the network data are too low.

While there are such large discrepancies between what are considered to be well tested measurement methods, it is clear that PM10 measurements have, at this stage, far larger uncertainties than we would hope for.

You will note that there are some data which are negative, down to -5 ug/m^3 . This, we believe, due to analyser noise. If these data were deleted, this would bias the resultant averaged data upwards. If -5 ug/m^3 were used as an offset this would have a larger systematic effect on the data. We believe that the most reliable way to treat these negative data, in the absence of any information to the contrary, is to assume they are due to signal noise at low concentrations, and as such to include them as we would other data.

The data summary is as follows:

Summary data for Ballymoney PM10 Automatic Monitoring Site for January to December 2004

Annual mean PM10 =	35.9 ugm^{-3}
number of daily averages $> 50 \text{ ugm}^{-3}$ =	55
maximum hourly average =	334 ugm^{-3}
maximum daily average =	129 ugm^{-3}
data capture =	70 %

APPENDIX 4

Site	Site Type	Site Location	Bias Corrected					Predicted 2005	Predicted 2010
			2001	2002	2003	2004			
1N	Kerbside	19 Linenhall Street	23	31	30	28	27	22	
2N	Kerbside	8 Ballybogey Road	n/a	22	20	17	17	14	
3N	Urban Background	Opposite 16 Armour Avenue	19	13	16	15	15	13	
4N	Urban Background	2-4 Semicock Avenue	19	14	13	17	17	14	
6N	Kerbside	31 Charles Street			23	21	20	16	
7N	Kerbside	Opposite 51 Queen Street			25	24	23	18	

Appendix 5

Nitrogen Dioxide Annual Mean Concentrations

