

2012 Air Quality Updating and Screening Assessment for **North Down Borough Council**

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

June 2012



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Executive Summary

The Environment (Northern Ireland) Order 2002, requires North Down Borough Council to undertake Air Quality Reviews and Assessments in their local areas and to meet the local air quality targets and objectives set out in the UK National Air Quality Strategy (2000). The production of an annual air quality report is now a statutory duty for all local authorities. The process is set out in the Department of Environment's Local Air Quality Management Policy Guidance LAQM PGNI (03).

This report is prepared by the North Down Borough Council to meet its statutory obligations under the above regime and has been prepared using the recommended template. The report has been prepared in accordance with the policy guidance mentioned above and with the relevant technical guidance Local Air Quality Management (LAQM.TG(09)

The Borough of North Down is geographically one of the smallest Council areas in Northern Ireland, but is regarded as economically one of the wealthiest. Population has increased steadily over recent years and is now in the region of 78,900. Air Quality in North Down is generally good as there is good ventilation from sea breezes. There are few industrial processes in the area that are significantly detrimental to air quality and heavy fuel oil is not widely used for heat generation.

However, there are a number of very busy trunk roads in the area the busiest being the A2 commuter route from Bangor to Belfast with average daily traffic flows of 44,000 vehicle movements per day at Holywood. The A2 has now been identified as the only area of concern with relation to Air Quality, for Nitrogen Dioxide and PM_{10} . All monitoring sites are now located at relevant exposure along this main arterial route to Belfast., All present monitoring within the Borough indicates that the objectives in the air quality strategy are not currently being exceeded , and a detailed assessment is not required for any of the pollutants.

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1 Introduction

1.1 Description of Local Authority Area

The Borough of North Down is geographically one of the smallest Council areas in Northern Ireland, but is regarded as economically one of the wealthiest. Population has increased steadily over recent years and is now in the region of 78,000.

Air Quality in North Down is generally good as there is good ventilation from sea breezes. There are few industrial processes in the area that are significantly detrimental to air quality and heavy fuel oil is not widely used for heat generation.



There is still significant use of solid fuel within the Borough for domestic heating. Solid Fuel use was subjected to evaluation in accordance with DETR guidance. In addition, there is over 25 years of data from smoke and SO_2 bubbler sites that have been located in Bangor and Holywood. Studies in relation to solid fuel use were carried out in 2002 to assess the risk of exceeding the air quality objectives in relation to SO_2 and PM_{10} .

There are a number of very busy trunk roads in the area as indicated on the above map. Much of the monitoring work in the area is in relation to NO_2 and PM_{10} at relevant locations particularly in relation to the A2 to Belfast between Ballyrobert and Holywood.

1.2 Purpose of Report

This report fulfils the requirements of the Local Air Quality Management process as set out in the Environment (Northern Ireland) Order 2002, the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 and the relevant Policy and Technical Guidance documents. The 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.

The objective of this Updating and Screening Assessment is to identify any matters that have changed which may lead to risk of an air quality objective being exceeded. A checklist approach and screening tools are used to identify significant new sources or changes and whether there is a need for a Detailed Assessment. The USA report should provide an update of any outstanding information requested previously in Review and Assessment reports.

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 microgrammes per cubic metre $\mu g/m^3$ (milligrammes per cubic metre, mg^{/m³} for carbon monoxide) with the number of exceedences in each year that are permitted (where applicable).

	Air Quality	Date to be	
Pollutant	Concentration	Measured as	achieved by
Bonzono	16.25 <i>µ</i> g/m³	Running annual mean	31.12.2003
Delizerie	3.25 <i>µ</i> g/m ³	Running annual mean	31.12.2010
1,3-Butadiene	2.25 <i>µ</i> g/m ³	Running annual mean	31.12.2003
Carbon monoxide	10.0 mg/m ³	Running 8-hour mean	31.12.2003
	0.5 <i>µ</i> g/m ³	Annual mean	31.12.2004
Lead	$0.25 \ \mu g/m^3$	Annual mean	31.12.2008
Nitrogen dioxide	200 μg/m ³ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 <i>µ</i> g/m ³	Annual mean	31.12.2005
Particles (PM ₁₀) (gravimetric)	50 μg/m ³ , not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 <i>µ</i> g/m ³	Annual mean	31.12.2004
	350 μg/m ³ , not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
Sulphur dioxide	125 μ g/m ³ , not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 µg/m ³ , not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

Table 1.1 Air Quality Objectives included in Regulations for the purpose ofLAQM in Northern Ireland

1.4 Summary of Previous Review and Assessments

Table 1.2 Previous Review and Assessments

Stages Completed	Exceedences Identified / Predicted	Areas Affected	AQMA's Declared
Stage 1 2001	PM10, SO2, NO2	A2 Bangor to Belfast	No
		Road, Clandeboye	
		Road Area.	
Stage 2&3 2004	PM10, SO2, NO2	A2 Bangor to Belfast	No
		Road, Clandeboye	
		Road Area.	
Progress Report 2005	None	A2 Bangor to Belfast	No
		Road, Clandeboye	
		Road Area.	
USA 2006	None	A2 Bangor to Belfast	No
		Road, Clandeboye	
		Road Area	
Progress Report 2007	None	A2 Bangor to Belfast	No
		Road, Clandeboye	
		Road Area	
Progress Report 2008	NO2	A2 Bangor to Belfast	No
		Road,	
USA 2009	None	A2 Bangor to Belfast	No
		Road,	
Progress Report 2010	None	A2 Bangor to Belfast	No
		Road,	
Progress Report 2011	None	A2 Bangor to Belfast	No
		Road,	

Figure 1.1 Map of AQMA Boundaries (if applicable)

N/A

North Down Borough Council does not have an AQMA

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

North Down Borough Council contracted AEA technology to carry out the QA/QC for the automatic monitoring site. This includes data handling, ratification of data and 6monthly site visits. The Eastern Group Air Quality technical officer visits the site on a weekly basis and calibrates the equipment on a fortnightly programme.

Figure 2.1 Maps of the Automatic Monitoring site



Ariel photograph of the Automatic Station situated on the A2 at Marine Parade Holywood



							Relevant Exposure?	Distance to	
							(Y/N with	kerb of	
							distance	nearest	
							(m) to	road	Does this location
		X OS	Y OS Grid	Pollutants		Monitoring	relevant	(N/A if not	represent worst-
Site Name	Site Type	GridRef	Ref	Monitored	In AQMA?	Technique	exposure)	applicable)	case exposure?
Marine Parade Holywood A2	Roadside	X339481	Y379328	NO ₂ , PM ₁₀	NO	Chemiluminescence TEOM	Y 30M	4.6M	Y

Table 2.1 Details of Automatic Monitoring Sites

2.1.2 Non-Automatic Monitoring Sites

North Down Borough Council presently has four triplicate NO₂ diffusion tubes sites positioned along the main arterial route the A2 into Belfast. There is also a colocation study carried out at the Holywood automatic site. They have been sited in accordance with the technical guidance.

The bias adjustment factor from the co-location study is **0.60**.and the results from this have been included in the national data base.

A decision was made to apply a bias adjustment factor of **0.71** to the diffusion tubes. This was derived from an average of the four local Eastern Group co-location studies. Further information on the decision to use this bias adjustment factor and details of the QA/QC of the diffusion tubes can be found in appendix A



Figure 2.2 Map (s) of Non-Automatic Monitoring Sites

Automatic site A2 Holywood Automatic site Bangor Cultra Seahill Seahill Background Ballyrobert NO2 and PM10 (also co-located study) SO2 and PM10 (decommissioned 01/04/2010) NO2 Diffusion Tubes NO2 Diffusion Tubes NO2 Diffusion Tubes NO2 Diffusion Tubes

LAQM USA 2012

Table 2.2 Details of Non-Automatic Monitoring Sites

Site Name	Site Type	X OS Grid Ref (Irish 1964)	Y OS Grid Ref (Irish 1964)	Pollutants Monitored	In AQMA?	Is monitoring collocated with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Does this location represent worst-case exposure?
Holywood A2	Co-location	X339481	Y379328	NO ₂	Ν	Y	N/A	N/A	N/A
Ballyrobert A2	Roadside	X345002	Y380823	NO ₂	N	N	Y (<1m)	3m	Y
Seahill Background	Urban B'Ground	X344128	Y381294	NO ₂	N	N	N\A	250m	Y
Seahill A2	Roadside	X343545	Y381102	NO ₂	N	N	Y (<1m)	10m	Y
Cultra A2	Roadside	X342475	Y380672	NO ₂	N	Ν	Y (<1m)	6.3m	Y

2.2 Comparison of Monitoring Results with AQ Objectives

2.2.1 Nitrogen Dioxide

Automatic Monitoring Data

North Down Borough Council in 2011 had one automatic site on the A2 monitoring NO_2 The annual average from this site in 2011 for NO_2 was **31 ug/m3**.





This graph shows that the NO_2 levels at this site have remained reasonably consistant despite a steady rise in traffic flows. This is probably due to the improvements in vehicle emissions being introduced to newer vehicles. Last year there were no exceedences of the hourly mean which is a reflection that there were no periods of prolonged settled weather.

			Valid Data		Annual Mean Concentration μg/m ³					
Site ID	Site Type	Within AQMA?	Capture for period of monitoring % ^a	Valid Data Capture 2011 % ^b	2007* ^c	2008* ^c	2009* ^c	2010* ^c	2011 °	
Marine Parade Holywood	Roadside	Ν	94.1	94.1	31	32	35	34	31	

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

Table 2.4 Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with 1-hour mean Objective

			Valid Data		Number of Exceedences of Hourly Mean (200 μ g/m ³)					
Site ID	Site Type	Within AQMA?	Capture for period of monitoring % ^a	Valid Data Capture 2011 % ^b	2007* ^c	2008* ^c	2009* ^c	2010* ^c	2011 °	
Marine Parade Holywood	Roadside	N	94.1	94.1	0	0	4	8	0	

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

^b i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%.)

^c If the period of valid data is less than 90%, include the 99.8th percentile of hourly means in brackets

*Number of exceedences for previous years are optional.

Diffusion Tube Monitoring Data

Results of the NO_2 diffusion tube sites, all situated along the A2 main arterial route into Belfast Citry centre are shown below in table 2.5

They are located at relevant exposure and sited in accordance with the technical guidance.LAQM.TG(09)

These tubes continue to demonstrate that the objective for NO_2 is not being exceeded at these sensitive locations.

Details of the bias adjustment factors applied and the QA/QC can be found in Appendix A.

Figure 2.4 Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Diffusion Tube Monitoring Sites

The trends from each site have remained consistent irrespective of the Bias adjustment factor applied. Annual variation is more likely to be as a result of climatic conditions, rather than changes in emissions.



Table 2.5 Results of Nitrogen Dioxide Diffusion Tubes in 2011

				Triplicate or	Data Capture 2011 (Number	Data with less than 9 months has been	Confirm if data has been distance	Annual mean concentration (Bias Adjustment factor = 0.71)
Site ID	Location	Site Type	Within AQMA?	Collocated Tube	of Months or %)	annualised (Y/N)	corrected (Y/N)	2011 (μg/m³)
Holywood	A2							
T loty wood		Co-location	N	Co-located	12 months			31
Ballyrobert	A2	roadside	N	triplicate	12 months			9
Seahill	A2							
Background			N	triplicate	12 months			20
Seahill	A2	roadside	N	triplicate	12 months			10
Cultra	A2	roadside	N	triplicate	12 months			18

Table 2.6 Results of Nitrogen Dioxide Diffusion Tubes (2007 to 2011)

	t <mark>ed for bias)</mark> μ g/m	3					
Site ID	Site Within Type AQMA?		2007* (Bias Adjustment Factor = XX)	2008* (Bias Adjustment Factor = 0.83)	2009* (Bias Adjustment Factor = 0.81)	2010* (Bias Adjustment Factor = 0.84)	2011 (Bias Adjustment Factor = 0.71)
Holywood	Co- location	N	N1/A	07	20	20	24
		<u>IN</u>	N/A	37	30	38	31
Ballyrobert	Roadside	N	N/A	36	25	31	20
Seahill	Urban						
Background	B'Ground	Ν	N/A	10	12	14	9
Seahill	Roadside	Ν	N/A	13	14	16	10
Cultra	Roadside	N	N/A	25	24	25	18

2.2.2 PM₁₀

The monitoring data from Holywood remains below the objective. The Bangor site was decommissioned 01/04/2010 as levels monitored in the previous 7 years were consistently below the objective.

Results from the ratified data and the QA/QC applied can be found in appendix A.

Figure 2.5 Trends in Annual Mean PM₁₀ Concentrations

The Annual PM₁₀ measurements at the A2 Holywood have remained consistent



Table 2.7 Results of Automatic Monitoring of PM₁₀: Comparison with Annual Mean Objective

			Valid Data	Valid	Confirm		Annual Mean Concentration μ g/m ³			
			Capture for	Data	Gravimetric					
		Within	monitoring	Capture	Equivalent					
Site ID	Site Type	AQMA?	Period % ^a	2011 % ^b	(Y or NA)	2007* ^c	2008* ^c	2009* ^c	2010* ^c	2011 ^c
Marine					Y					
Parade	Roadside	Y	95			27.1	25.1	26.2	28.7	26.3
Holywood										

Table 2.8 Results of Automatic Monitoring for PM₁₀: Comparison with 24-hour mean Objective

			Valid Data			Number of Exceedences of 24-Hour Mean (50 μ g/m ³)							
			Capture for	Valid Data	Confirm								
		Within	monitoring	Capture	Gravimetric								
Site ID	Site Type	AQMA?	Period % ^a	2011 % ^b	Equivalent	2007*	2008*	2009*	2010*	2011			
Marine				92	Y								
Parade	Roadside	Y	95			0	3	4	8	6			
Holywood													

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

^b i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%.)

^c if data capture is less than 90%, include the 90th percentile of 24-hour means in brackets

* Optional

2.2.3 Sulphur Dioxide

The SO₂ and PM₁₀ Automatic station in Bangor was decommissioned on 1^{st} April 2010 as there had been no exceedences since the analysers were installed in 2003.

2.2.4 Benzene

There were no measurements of Benzene carried out in 2011

2.2.5 Other pollutants monitored

In 2011 Nitrogen Dioxide and PM_{10} were the only pollutants monitored

2.2.6 Summary of Compliance with AQS Objectives

North Down Borough Council has examined the results from monitoring in the Borough. Concentrations are all below the objectives, therefore there is no need to proceed to a Detailed Assessment.

3 Road Traffic Sources

3.1 Narrow Congested Streets with Residential Properties Close to the Kerb

North Down Borough Council confirms that there are no new/newly identified congested streets with a flow above 5,000 vehicles per day and residential properties close to the kerb, that have not been adequately considered in previous rounds of Review and Assessment.

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

North Down Borough 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.

North Down Borough Council confirms that there are no new/newly identified roads with high flows of buses/HDVs.

3.4 Junctions

North Down Borough Council confirms that there are no new/newly identified busy junctions/busy roads.

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

North Down Borough Council confirms that there are no new/proposed roads.

3.6 Roads with Significantly Changed Traffic Flows

North Down Borough Council confirms that there are no new/newly identified roads with significantly changed traffic flows.

3.7 Bus and Coach Stations

North down Borough Council confirms that there are no relevant bus stations in the Local Authority area.

4 Other Transport Sources

4.1 Airports

North Down borough Council confirms that there are no airports in the Local Authority area.

4.2 Railways (Diesel and Steam Trains)

4.2.1 Stationary Trains

North Down Borough 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

North Down Borough Council confirms that there are no locations with a large number of movements of diesel locomotives, and potential long-term relevant exposure within 30m.

4.3 **Ports (Shipping)**

North Down Borough 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

North Down Borough 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

North Down Borough 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

North Down Borough 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.

5.2 Major Fuel (Petrol) Storage Depots

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

5.3 **Petrol Stations**

North Down Borough Council confirms that there are no petrol stations meeting the specified criteria.

5.4 Poultry Farms

North Down Borough Council confirms that there are no poultry farms meeting the specified criteria.

6 Commercial and Domestic Sources

6.1 **Biomass Combustion – Individual Installations**

Sainsbury Supermarket at 10 Balloo Link Bangor has installed a 600KW Biomass plant to provide space heating and hot water at the new store. It burns manufactured wood pellets. As part of the planning process a detailed impact assessment of emissions of PM_{10} and NO_2 was carried out and it was determined that the plant would not have a significant impact on the surrounding area.

North Down Borough Council has assessed the biomass combustion plant, and concluded that it will not be necessary to proceed to a Detailed Assessment.

6.2 Biomass Combustion – Combined Impacts

North Down Borough Council confirms that there are no biomass combustion plant in the Local Authority area.

6.3 Domestic Solid-Fuel Burning

North Down Borough Council confirms that there are no areas of significant domestic fuel use in the Local Authority area.

7 Fugitive or Uncontrolled Sources

North Down Borough Councill 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

The 2011 monitored data for NO_2 nd PM_{10} has been assessed and has indicated no exceedences of the national air quality objectives. It is therefore not necessary to proceed to a detailed assessment, however monitoring will continue at key locations to allow for comparison in future rounds of review and assessment.

8.2 Conclusions from Assessment of Sources

North Down Borough Council has found no new or significantly changed sources to have likely impacts on air quality.

8.3 Proposed Actions

This 2012 updating and screening Assessment for North Down Borough Council has identified there is no need to proceed to a detailed assessment for any of the pollutants.

Monitoring sites are sited in accordance with the guidance and at relevant exposure,, no new sites have been identified.

North Down Borough Council intends to continue monitoring NO_2 and PM_{10} in 2012 and submit a progress report in 2013.

9 References

TG (2003) Part IV of the Environment Act 1995. Local Air Quality Management: Technical Guidance LAQM.TG(03). Guidance prepared by the Department for Environment, Food and Rural Affairs and the Devolved Administrations, January 2003.

TG (2009) Part IV of the Environment Act 1995. Local Air Quality Management: Technical Guidance LAQM.TG(09). Guidance prepared by the Department for Environment,

Food and Rural Affairs and the Devolved Administrations, February 2009

Appendices

Appendix A: QA:QC Data of automatic monitoring

North Down Borough Council commissioned AEA Technology to provide the QA/QC of the automatic measurements of NO₂ and PM₁₀ from at their Holywood A2 site. AEA Technology is the current QA/QC contractor for the national automatic urban and rural network (AURN) operated by the Department for Environment, Food and Rural Affairs and the Devolved Administrations. Local authority staff act as the local site operator and visit the sites on a weekly basis carrying out any manual calibration or filter changes required. Audits of the site are carried by AEA Technology on a six monthly basis.

Environmental Monitoring Services were employed to service and maintain the analysers.

Produced by AEA on behalf of the Eastern Group

NORTH DOWN HOLYWOOD A2 01 January to 31 December 2011

POLLUTANT	NO	NO ₂	NO _X
Number Very High	-	0	-
Number High	-	0	-
Number Moderate	-	0	-
Number Low	-	8241	-
Maximum 15-minute mean	490 µgm ⁻³	229 µgm ⁻³	955 µgm ⁻³
Maximum hourly mean	446 µgm ⁻³	197 µgm ⁻³	879 µgm ⁻³
Maximum running 8-hour mean	246 µgm ⁻³	149 µgm ⁻³	523 µgm ⁻³
Maximum running 24-hour mean	167 µgm ⁻³	113 µgm ⁻³	369 µgm ⁻³
Maximum daily mean	161 µgm ⁻³	112 µgm ⁻³	357 µgm ⁻³
99.8th percentile of hourly means	-	151 µgm ⁻³	-
Average	26 µgm ⁻³	31 µgm⁻³	70 µgm ⁻³
Data capture	94.1 %	94.1 %	94.1 %

These data have been fully ratified by AEA

All gaseous pollutant mass units are at 20'C and 1013mb. NO_X mass units are NO_X as $NO_2~\mu gm^{\text{-3}}$

Pollutant	Air Quality Regulations (Northern Ireland) 2003	Exceedences	Days
Nitrogen Dioxide	Annual mean > 40 µgm ⁻³	0	-
Nitrogen Dioxide	Hourly mean > 200 μ gm ⁻³	0	0

Appendix A: QA:QC Data of diffusion tube monitoring

2011	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
Seahill													
background	17	13	11	7	6	6	6	7	6	9	11	13	9
Ballyrobert facade	31	20	22	24	11	22	23	23	15	18	18	13	20
Seahill façade	17	10	12	9	8	11	9	11	6	10	8	11	10
Station Road													
façade	29	25	24	18	13	14	12	14	14	14	21	20	18

NO2 diffusion tube results, bias applied 0.71

North Down Borough Council lies within the Eastern Group area. There are five neighbouring councils within the group. Ards Borough Council does not carry out automatic monitoring of NO_2 but the remaining four have carried out co-location studies.

The bias adjustment factor calculation of these is shown below.

The average of these four studies is **0.71**.

They were all calculated using the R&A support precision and accuracy spreadsheet.

http://laqm.defra.gov.uk/bias-adjustment-factors/co-location-data.html

and in accordance to current guidance summarized in the

Technical Guidance LAQM.TG(09).

These results has been included in the national bias adjustment factor database.

Factor from Local Co-location Studies (if available)

North Down Borough Council co-location study

Cł	Checking Precision and Accuracy of Triplicate Tubes													
			Diffu	usion Tu	bes Mea	surements	\$			A	utomat	ic Method	Data Quali	ty 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	P	Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
1	07/01/2011	01/02/2011	81	58	73	71	11.7	17	29.0	52	2	78	Good	Good
2	01/02/2011	01/03/2011	56	55	51	54	2.6	5	6.6	31		91	Good	Good
3	01/03/2011	29/03/2011	60	58	55	58	2.5	4	6.3	32	2	97	Good	Good
4	29/03/2011	05/05/2011	32	35	41	36	4.6	13	11.4	19)	65	Good	or Data Captu
5	05/05/2011	31/05/2011	29	28	30	29	1.0	3	2.5	13	3	98	Good	Good
<u>6 31/05/2011 01/07/2011 36 32 34 2.8 8 25.4 20 98</u>										98	Good	Good		
7	01/07/2011	02/08/2011	27	30	28	28	1.5	5	3.8	17	,	100	Good	Good
8	02/08/2011	30/08/2011	38	36	36	37	1.2	3	2.9	23	3	89	Good	Good
9	30/08/2011	27/09/2011	38	38	38	38	0.0	0	0.0	22	2	100	Good	Good
10	27/09/2011	25/10/2011	38	37	53	43	9.0	21	22.3	26	i	100	Poor Precision	Good
11	25/10/2011	01/12/2011	53	51	58	54	3.6	7	9.0	37	,	75	Good	Good
12	01/12/2011	28/12/2011	43	51	56	50	6.6	13	16.3	24	Ļ	100	Good	Good
13														
lt is n	ecessary to hav	e results for at l	east two tu	ibes in orde	er to calcul	ate the precisi	on of the meas	surements			Overal	l survey>	Good precision	Good Overall DC
Site	e Name/ ID:						Precision	11 out of 1	2 periods h	ave a CV s	maller ti	nan 20%	(Check average	CV & DC from
						1							Accuracy ca	lculations)
	Accuracy	(with 9	95% con	fidence	interval)		Accuracy	(with 9	95% conf	idence int	terval)			
	without pe	riods with C	V larger	than 20	%		WITH ALL	DATA				50%		
	Bias calcula	ated using 1	0 period	s of data	a		Bias calcu	lated using 1	1 period	s of data		E \$25%		
	В	ias factor A	0.6	(0.54 - 0	.67)			Bias factor A	0.6 (0.55 - 0.67	7)	Bia		
		Bias B	67%	(48% -	86%)			Bias B	67%	(50% - 83	3%)	npe 0%		
	Diffusion T	ubes Mean:	45	uam ⁻³			Diffusion 1	Tubes Mean:	45	uam ⁻³		Ē	Without CV>20%	With all data
	Mean CV	7	-3			Mean CV	(Precision)	8	-5		.isn -25%			
	Autor	notio Moon					Ato	motio Moon	<u>`</u>			₩ <u></u> -50%		
	Data Capi	ture for perio	ds used:	µулл 93%			Data Capture for periods used: 93							
	Adjusted T	ubes Mean:	27 (2	4 - 30)	µgm ⁻³		Adjusted 1	Tubes Mean:	27 (25	- 30) µg	gm ⁻³		Jaume Tar	ga, for AEA
						-						Ver	sion 04 - Feb	ruary 2011

Down District Council co-location study

Cł	Checking Precision and Accuracy of Triplicate Tubes													
			Diff	usion Tu	bes Mea	surements	3			Automa	atic Method	Data Quali	ty 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	06/01/2011	03/02/2011	69	67	68	68	1.0	1	2.5	43	97	Good	Good	
2	03/02/2011	28/02/2011	56	61	61	59	2.9	5	7.2	38	100	Good	Good	
3	28/02/2011	28/03/2011	65	63	59	62	3.1	5	7.6	44	100	Good	Good	
4	28/03/2011	06/05/2011	57	44	55	52	7.0	13	17.4	36	100	Good	Good	
5	06/05/2011	01/06/2011	35	34	54	41	11.3	27	28.0	23	100	Poor Precision	Good	
6	01/06/2011	30/06/2011	49	49	44	47	2.9	6	7.2	37	100	Good	Good	
7	30/06/2011	04/08/2011	44	45		45	0.7	2	6.4	35	96	Good	Good	
8	04/08/2011	31/08/2011	45	43	43	44	1.2	3	2.9	34	93	Good	Good	
9	31/08/2011	29/09/2011	45	44	45	45	0.6	1	1.4	33	93	Good	Good	
10	29/09/2011	27/10/2011	47	47	48	47	0.6	1	1.4	37	98	Good	Good	
11	27/10/2011	02/12/2011	54	52	56	54	2.0	4	5.0	40	99	Good	Good	
12	02/12/2011	30/12/2011	44	39	43	42	2.6	6	6.6	36	99	Good	Good	
13														
lt is r	ecessary to hav	e results for at	least two tu	ibes in orde	er to calcul	ate the precisi	on of the meas	surements		Overa	all survey>	Good precision	Good Overall DC	
Site	e Name/ ID:						Precision	11 out of 1	2 periods h	ave a CV smaller	than 20%	(Check average	CV & DC from	
<u> </u>						1			•		-	Accuracy ca	lculations)	
	Accuracy	(with 9	95% con	fidence	interval)		Accuracy	(with 9	95% conf	idence interval)				
	without pe	riods with C	CV larger	than 20	%		WITH ALL	DATA			50%	6] т	I	
	Bias calcula	ated using 1	1 period	s of data	1		Bias calcu	lated using 1	2 periods	s of data	<u>n</u>	. 1	Î	
	В	ias factor A	0.73	(0.69 - C).78)			Bias factor A	0.72	(0.67 - 0.78)	sig 259	6		
		Bias B	37%	(28% -	45%)			Bias B	39%	(28% - 50%)	pe 0%	6 .		
	Diffusion T	ubes Mean:	51	µgm ⁻³			Diffusion 1	Tubes Mean:	51	µgm ⁻³	L L	Without CV>20%	With all data	
	Mean CV	(Precision):	4	_			Mean CV	(Precision):	6		98 -25%	•		
	Automatic Mean: 38 ugm ⁻³						Automatic Mean: 36 ugm ⁻³					<u>،</u> ا		
	Data Cap	ture for peric	ods used:	98%			Data Capture for periods used: 98%							
	Adjusted T	ubes Mean:	38 (3	5 - 40)	µgm ⁻³		Adjusted 1	Tubes Mean:	36 (34	- 39) µgm ⁻³	1	Jaume Tar	ga, for AEA	
						•					Ve	rsion 04 - Feb	ruary 2011	

North Down Borough Council

Cł	Checking Precision and Accuracy of Triplicate Tubes													
			Diffu	usion Tu	bes Mea	surements	3			/ From	Automa	tic Method	Data Quali	ty 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	07/01/2011	02/02/2011	55	52	52	53	1.7	3	4.3		52	100	Good	Good
2	02/02/2011	02/03/2011	31	33	38	34	3.6	11	9.0		23	100	Good	Good
3	02/03/2011	30/03/2011	37	27	37	34	5.8	17	14.3		24	100	Good	Good
4	30/03/2011	05/05/2011	23	25	22	23	1.5	7	3.8		10	100	Good	Good
5	05/05/2011	01/06/2011	25	23	25	24	1.2	5	2.9		13	99	Good	Good
6	01/06/2011	29/06/2011	24	27	27	26	1.7	7	4.3		15	100	Good	Good
7	29/06/2011	03/08/2011	22	19	21	21	1.5	7	3.8		13	99	Good	Good
8	03/08/2011	31/08/2011	26	25	24	25	1.0	4	2.5		16	97	Good	Good
9	31/08/2011	28/09/2011	26	22	26	25	2.3	9	5.7		14	100	Good	Good
10	28/09/2011	26/10/2011	33	32	29	31	2.1	7	5.2		19	100	Good	Good
11	26/10/2011	30/11/2011	29	35	30	31	3.2	10	8.0		24	100	Good	Good
12	30/11/2011	28/12/2011	34	33	37	35	2.1	6	5.2		19	100	Good	Good
13														
lt is r	ecessary to hav	e results for at	least two tu	ibes in orde	er to calcul	ate the precisi	on of the meas	urements			Overa	ll survey>	Good precision	Good Overall DC
Site	e Name/ ID:						Precision	12 out of 1	2 periods h	nave a C	V smaller t	han 20%	(Check average	CV & DC from
<u> </u>									•				Accuracy ca	alculations)
	Accuracy	(with 9	95% con	fidence	interval)		Accuracy	(with 9	95% conf	idence	interval)			
	without pe	riods with C	CV larger	than 20	%		WITH ALL	DATA				50%	1	
	Bias calcula	ated using 1	2 period	s of data	1		Bias calcu	lated using 1	2 period	s of da	ta	<u>m</u>	_	
	В	ias factor A	0.67	(0.59 - 0).78)		E	Bias factor A	0.67	(0.59 -	0.78)	seige 25%		
		Bias B	50%	(29% -	70%)			Bias B	50%	(29% -	70%)	a 0%		
	Diffusion T	uboc Moon:	20	uam ⁻³			Diffucion T	Lubos Moon:	20	uam ⁻³		1 ⁿ	Without CV>20%	With all data
	Diffusion Tubes Mean: 30 µgm						Magn		30	μyπ		.is -25%		
	iviean C v	(Precision).	°				Mean CV (Precision): 8					pitfu		
	Autor Data Cap	natic Mean: ture for peric	20 ods used:	µgm ^{~~} 100%			Data Capture for periods used: 100%							
	Adjusted T	ubes Mean:	20 (1	8 - 24)	µgm ⁻³		Adjusted T	ubes Mean:	20 (18	- 24)	µgm ⁻³		Jaume Tar	ga, for AEA
						-						Ver	sion 04 - Feb	ruary 2011

Lisburn City Council co-location study

Castlereagh Borough Council co-location study

Cł	Checking Precision and Accuracy of Triplicate Tubes													
			Diffu	usion Tu	bes Mea	surements	5				Automat	tic Method	Data Quali	ty 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	07/01/2011	02/02/2011	77	72	81	77	4.5	6	11.2	6	51	99	Good	Good
2	02/02/2011	03/03/2011	60	65	66	64	3.2	5	8.0	4	9	100	Good	Good
3	02/03/2011	31/03/2011	63	67	60	63	3.5	6	8.7	5	5	100	Good	Good
4	30/03/2011	05/05/2011	44	40	44	43	2.3	5	5.7	4	7	100	Good	Good
5	05/05/2011	02/06/2011	36	30	33	33	3.0	9	7.5	2	.7	100	Good	Good
6	01/06/2011	01/07/2011	42	39	43	41	2.1	5	5.2	2	9	99	Good	Good
7	29/06/2011	05/08/2011	24	29	26	26	2.5	10	6.3	2	3	100	Good	Good
8	03/08/2011	31/08/2011	36	35	35	35	0.6	2	1.4	2	5	100	Good	Good
9	31/08/2011	26/09/2011	48	42	47	46	3.2	7	8.0	2	6	72	Good	or Data Captu
10	28/09/2011	24/10/2011	43	46	43	44	1.7	4	4.3	3	0	92	Good	Good
11	26/10/2011	02/12/2011	55	53	46	51	4.7	9	11.7	4	9	80	Good	Good
12	30/11/2011	29/12/2011	47	56	52	52	4.5	9	11.2	4	3	100	Good	Good
13														
lt is r	necessary to hav	e results for at l	least two tu	ıbes in ord	er to calcul	ate the precisi	on of the meas	surements			Overal	l survey>	Good precision	Good Overall DC
Sit	e Name/ ID:						Precision	12 out of 1	2 periods h	ave a CV	smaller t	han 20%	(Check average	CV & DC from
L						1							Accuracy ca	lculations)
	Accuracy	(with 9	95% con	fidence	interval)		Accuracy	(with 9	95% conf	idence ir	nterval)			
	without pe	riods with C	V larger	than 20	%		WITH ALL	DATA				50%	6]	
	Bias calcula	ated using 1	1 period	s of data	3		Bias calcu	Ilated using 1	1 periods	s of data	l.	B S 25%		I
	В	ias factor A	0.83	3 (0.76 - ().91)			Bias factor A	0.83	(0.76 - 0.	.91)	Bia	Ĭ	I
		Bias B	21%	(9% - :	32%)			Bias B	21%	(9% - 3	2%)	npe 0%	6 Mith aut C1/c 200/	With all data
	Diffusion T	ubes Mean:	48	µgm ⁻³			Diffusion 1	Fubes Mean:	48	µgm ⁻³		L no area	without CV>20%	with an data
	Mean CV	(Precision):	6				Mean CV	(Precision):	6			is -25%	•	
	Autor	natic Mean:	40	uam ⁻³			Auto	matic Mean:	40	uam ⁻³		J -50%	, L	
	Data Can	ture for perio	de used.	97%			Data Ca	nture for peri	basu sho	97%				
	Adjusted T	uboc Moon	40 42	7 44)	uam ⁻³		Adjusted	Fubos Mosm	40 (27	44)	uam ⁻³		laume Tar	αa for Δ⊑Λ
	Aujusted 1	ubes Mean:	40 (3	7 - 44)	μgill	I	Aujusted	i upes Mean:	40 (37	-44)	Jugin	1/		90, 101 ALA
												ve	1510f1 04 - Feb	iuary 2011

Diffusion Tube Bias Adjustment Factors

The NO₂ tubes are supplied by ESG (Environmental Scientific Group) in Didcot Oxfordshire. Their preparation method is listed below.

Nitrogen Dioxide Diffusion Tube Analysis Report

The samples have been analysed in accordance with ESG's standard operating procedure HS/WI/1015 issue 15. This method meets the guidelines set out in DEFRA's 'Diffusion Tubes for Ambient NO₂ Monitoring: Practical Guidance.'

The tubes were prepared by spiking acetone:triethanolamine (50:50) onto the grids prior to the tubes being assembled. The tubes were desorbed with distilled water and the extract analysed using a segmented flow autoanalyser with ultraviolet detection. In the WASP intercomparison scheme for comparing spiked Nitrogen Dioxide diffusion tubes, Scientifics is currently ranked as a Category Good laboratory. This result can be found on the LAQM Support Web site

http://laqm.defra.gov.uk/diffusion-tubes/precision.html

The National Bias adjustment factor for ESG is **0.84** found on the LAQM Support Website

http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html

Spreadsheet Version Number: 03/12

National Diffusion Tube Bias Adjustment Factor Spreadsheet Spreadsheet Version Num													
Follow the steps below in the correct order	to show the results o	f <u>relevant</u> co-	locatio	n studies				This one	oodohoot ud	Il he undeted			
Data only apply to tubes exposed monthly an Whenever presenting adjusted data, you shou This spreadhseet will be updated every few m	d are not suitable for Id state the adjustme onths: the factors ma	correcting indi ent factor used y therefore be	vidual s and th subjec	short-term monitoring periods le version of the spreadsheet t to change. This should not di	scourage 1	heir immediate	use.	at the	eadsneet wi end of Septi M Helpdesk	ember 2012			
The LAQM Helpdesk is operated on behalf of De contract partners AECOM and the National Physi	fra and the Devolved A cal Laboratory.	dministrations	by Bure	au Veritas, in conjunction with	Spreadsh compiled	eet maintained I by Air Quality C	by the National consultants Ltd.	Physical	Laboratory	. Original			
Step 1:	Step 2:	Step 3:	Step 3: Step 4:										
Select the Laboratory that Analyses Your Tubes from the Drop-Down List	Select a Preparation Method from the Drop-Down List	Select a Year from the Drop- Down List If a year is not	Wi cautio	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 a laboratory is not shown, we have no data for this laboratory.	for this method at this laboratory.	shown, we have no data ²	ii yo	Management Helpdesk at LAQMHelpdesk@uk.bureauveritas.com or 0800 0327953									
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) (ug/m ³)	Bias (B)	Tube Precision ⁶	Bias Adjustment Factor (A) (Cm/Dm)			
्र र	,т ,	τ.											
Environmental Scientific Groups	50% TEA in acetone	2011	R	Dover District Council	12	42	37	14.0%	G	0.88			
Environmental Scientific Groups	50% TEA in acetone	2011	UB	Medway Council	12	22	26	-15.6%	G	1.19			
Environmental Scientific Groups	50% TEA in acetone	2011	ĸ	North East Lincolnshire Council	10	52	48	8.9%	G	0.92			
Environmental Scientific Groups	50% TEA in acetone	2011	R	North East Lincoinshire Council	9	38	30	7.5%	G	0.93			
Environmental Scientific Groups	50% TEA in acetone	2011	R	North East Lincolnshire Council	12	41	31	32.8%	G	0.75			
Environmental Scientific Groups	50% TEA in acetone	2011	UB P	North East Lincoinshire Council	12	22	21	7.5%	P	0.93			
Environmental Scientific Groups	50% TEA in acetone	2011	B	Weavhow County Paraugh Council	10	32	20	11.00/	6	0.84			
Environmental Scientific Groups	50% TEA in acetone	2011	P	Medway Council	0	26	30	10.0%	G	0.84			
Environmental Scientific Groups	50% TEA in acetone	2011	ĸ	Marylebone Road Intercomparison	11	121	99	21.5%	G	0.82			
Environmental Scientific Groups	50% TEA in acetone	2011	R	Castlereadh Borough Council	11	48	40	20.9%	G	0.83			
Environmental Scientific Groups	50% TEA in acetone	2011	R	Down District Council	12	51	36	39.0%	G	0.72			
Environmental Scientific Groups	50% TEA in acetone	2011	R	Lisburn City Council	12	30	20	49.6%	G	0.67			
Environmental Scientific Groups	50% TEA in acetone	2011	R	North Down Borough Council	11	45	27	66.7%	G	0.60			
Environmental Scientific Groups	50% TEA in Acetone	2011	к	Suffolk Coastal District Council	12	51	43	18.7%	G	0.84			
Environmental Scientific Groups	50% TEA in acetone	2011	R	Dumfries and Gallow ay Council	12	38	32	20.0%	G	0.83			
Environmental Scientific Groups	50% TEA in acetone	2011	R	Rugby Borough Council	10	34	34	-0.3%	G	1.00			
Environmental Scientific Groups	50% TEA in acetone	2011	R	Wycombe District Council	10	43	39	11.5%	G	0.90			
Environmental Scientific Groups	50% TEA in acetone	2011	R	Tunbridge Wells Borough Council	12	59	43	38.5%	Р	0.72			
Environmental Scientific Groups	50% TEA in acetone	2011	R	LB New ham	12	40	47	-14.3%	G	1.17			
Environmental Scientific Groups	50% TEA in acetone	2011	UB	Canterbury City Council	11	17	15	17.8%	G	0.85			
Environmental Scientific Groups	50% TEA in acetone	2011	R	Canterbury City Council	12	39	34	15.5%	G	0.87			
Environmental Scientific Groups	50% TEA in acetone	2011	Overall Factor ³ (22 studies) Use 0.84										

Discussion of Choice of Factor to Use

The national bias adjustment factor for Environmental Scientific Group.is 0.84

There is a collocation study carried out at the Holywood Site and the calculated bias adjustment factor is **0.6**

There are 4 co-location studies carried out within the local Eastern Group area all analysed by Environmental Scientific Group, the average of these is **0.71**.

As North Down Borough Council has confidence in the QA/QC of all the four local studies (all using ratified data), also all the sites are situated in similar location in major provincial towns and climatic conditions, a decision was made to use the average of these 4 local studies rather than the national study which was considerable higher than the local study in North Down of 0.6.

The table below shows the results from the three studies. Using the national higher figure would not have shown any exceedences of the objective, but the local average factor was a more realistic bias adjustment.

Site	Raw Data	Local Bias 0.6	Local Average 0.71	National Average 0.84
Ballyrobert A2	13	8	9	11
Seahill Background	28	17	20	24
Seahill A2	14	8	10	12
Cultra A2	25	15	18	21

PM Monitoring Adjustment

The PM₁₀ TEOM data has been corrected using the Volatile Correction Model (<u>www.volatile-correction-model.info</u>) as detailed on Page 3-10 of LAQM.TG (09).

Produced by AEA on behalf of the Eastern Group

NORTH DOWN HOLYWOOD A2 01 January to 31 December 2011

POLLUTANT	PM ₁₀ +	PM ₁₀ VCM*	PM ₁₀ GR10
Number Very High	-	-	0
Number High	-	-	0
Number Moderate	-	-	26
Number Low	-	-	8312
Maximum 15-minute mean	329 µg m ⁻³	-	428 µg m ⁻³
Maximum hourly mean	129 µg m ⁻³	-	168 µg m ⁻³
Maximum running 8-hour mean	76 µg m⁻³	-	98 µg m ⁻³
Maximum running 24-hour mean	57 µg m ⁻³	-	74 µg m ⁻³
Maximum daily mean	55 µg m ⁻³	71	71 µg m ⁻³
90th percentile of daily means	27 µg m ⁻³	33	35 µg m ⁻³
Average	18 µg m ⁻³	20	23 µg m ⁻³
Data capture	95.6 %	95.1%	95.6 %

These data have been fully ratified by AEA

+ PM₁₀ as measured by a TEOM

*PM₁₀ VCM – TEOM data corrected using Volatile Correction Model PM₁₀ GR10 - indicative gravimetric corrected, i.e. 'raw' TEOM PM₁₀ data with a 1.3 factor applied Particulate matter concentrations are reported at ambient temperature and pressure.

Pollutant	Air Quality Regulations (Northern Ireland) 2003	Exceedences	Days
PM ₁₀ Particulate Matter (VCM Corrected)	Daily mean > 50 µgm ⁻³	10	10
PM ₁₀ Particulate Matter (VCM Corrected)	Annual mean > 40 µgm ⁻³	-	-

The PM₁₀ TEOM data has been corrected using the Volatile Correction Model (<u>www.volatile-correction-model.info</u>) as detailed on Page 3-10 of LAQM.TG (09).

Please be advised the VCM has been calculated using Belfast AURN (contains some provisional data) and locally source ratified FDMS data (Lisburn Dunmurry High School) plus temperature and pressure as selected by the VCM Model

For information – PM₁₀ TEOM data as indicative corrected, i.e. 'raw' TEOM PM₁₀ data with a 1.3 factor applied

Pollutant	Air Quality Regulations (Northern Ireland) 2003	Exceedences	Days
PM ₁₀ Particulate Matter (Gravimetric)	Daily mean > 50 μ g m ⁻³	5	5
PM ₁₀ Particulate Matter (Gravimetric)	Annual mean > 40 μ g m ⁻³	0	-