



2009 Air Quality Progress Report for Castlereagh Borough Council

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

Date 15th May, 2010

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Executive Summary

The Air Quality Strategy has established the framework for air quality management in the UK. Local Authorities have a duty under the Environment Act 1995 and subsequent regulations to review and assess air quality in their areas on a periodic basis so as to identify all areas where the air quality objectives are being or are likely to be exceeded. A phased approach has been adopted for the review and assessment process so that the level of assessment undertaken is commensurate with the risk of an exceedence of an air quality objective.

An updating and screening assessment (USA) is required to be prepared every three years by all local authorities in the UK. The last updating and screening assessment of air quality was undertaken in 2009 and the next is due by the end of April 2012, with two interim progress reports.

This report is the 2010 progress report and has been completed using the recommended template. The assessment is fully compliant with the applicable policy and technical guidance.

Castlereagh Borough lies to the southeast of Belfast in Northern Ireland. The Borough is of mixed urban and rural character. It is mainly residential with no significant industrial activity. Many residents work in Belfast and this, combined with the major arterial routes passing through the Borough, makes road transport the major air pollution concern. There are currently no Air Quality Management Areas within the Borough.

Following the 2009 Update and screening assessment a detailed assessment was carried out. This concluded the NO₂ air quality objective was exceeded on A20 Upper Newtownards Road and relevant exposure was identified, ie Normandy Court.

Following this detailed assessment the triplicate NO₂ diffusion tubes positioned kerb side were moved to the façade of Normandy Court in November 2009. The results have decreased by approximately 31% so Castlereagh borough Council has decided to delay declaring an AQMA at this location until 12 months data is available at the relevant exposure.

There are no other air quality exceedences within the Borough.

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1 Introduction

1.1 Description of Local Authority Area

Castlereagh Borough Council covers an administrative area of 84Km² to the southeast of Belfast and in 2006 was home to a population of 66,633. The Borough is of mixed and urban rural character and the predominant wind direction is from the southwest.

The Borough is surrounded by five neighbouring councils. Its position in relation to Belfast, has made it a very popular area to live. Commuting time to the city centre from the Borough is relatively short and this combined with major arterial routes passing through the Borough into Belfast, has made road transport the major air pollution concern.

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 microgrammes per cubic metre $\mu\text{g}/\text{m}^3$ (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 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
	3.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2010
1,3-Butadiene	2.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
Carbon monoxide	10.0 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.5 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2004
	0.25 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2008
Nitrogen dioxide	200 $\mu\text{g}/\text{m}^3$ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2005
Particles (PM₁₀) (gravimetric)	50 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2004
Sulphur dioxide	350 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

1.4 Summary of Previous Review and Assessments

Castlereagh Borough Council has completed the following reviews and assessments of air quality in earlier rounds of the assessment process:

Stage 1 Report (CBC, 2000)	The first stage review and assessment found that the air quality objectives for 4 of the 7 specified parameters namely carbon monoxide, nitrogen dioxide, PM ₁₀ and sulphur dioxide were all unlikely to be achieved by 2003-2005.
Stage 2/3 Air Quality Review (CBC, 2003, 2004)	The stage 2/3 review for road emissions and domestic fuel combustion concluded that an Air Quality Management Area (AQMA) should not be declared for NO ₂ , PM ₁₀ and SO ₂ , as there were not predicted to be exceedences of the air quality objectives.
Progress report (CBC2005)	The progress reported for 2004 concluding that PM ₁₀ , NO ₂ and SO ₂ were not predicted to cause exceedences of the air quality objectives at relevant receptors.
Updating and Screening Assessment (USA, 2006)	This reported data for 2005. This indicated that current objectives in relation to SO ₂ , NO ₂ and PM ₁₀ would be achieved at the location of the automatic monitoring stations. The diffusion tube measurements at the A20 Upper Newtownards road in Dundonald indicated the possibility of exceedences in relation to NO ₂ .
Progress report (EG, 2007)	This reported the 2006 measurements and the decommissioning of the SO ₂ automatic site in Espie way and the analyser to be replaced with an NO ₂ . The station was relocated to Dundonald, where the NO ₂ diffusion results were close to the objective.
Progress report (EG, 2008)	This reported the 2007 measurements. Although based on 76% data capture, the annual mean NO ₂ concentration at the Dundonald automatic monitoring site was below the objective.
Updating and Screening Assessment (USA, 2009)	This reported 2008 measurements. The A20 Dundonald NO ₂ diffusion tube site exceeded the objective, and a detailed assessment was initiated.
Detailed assessment	A detailed assessment was carried out for NO ₂ for the A20 in the Dundonald area.

Figure 1.1 Map of AQMA Boundaries

(N/A)

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

Castlereagh Borough Council presently has two automatic sites both measuring NOx and PM10 using chemiluminescence analysers and the TEOM technique respectively. The TEOM data were reported as gravimetric equivalent using a factor of 1.3.

Castlereagh Lough View Drive (A1)
 Castlereagh Dundonald (A2)

Figure 2.1 Map(s) of Automatic Monitoring Sites and diffusion tube sites

Overview map of Castlereagh Borough Council showing location of air pollution monitoring sites (circles and triangles)

The automatic NOx and PM10 sites are denoted by triangles

[A1 = Lough View Drive, A2 = Dundonald]

The NO2 diffusion tube sites are also indicated on this map denoted by circles

[DT1 = Cregagh Road, DT2 = Everton Drive, DT4 = Upper Newtownards Road, DT5 = Newtownbreda Road, DT6=Saintfield Road.]

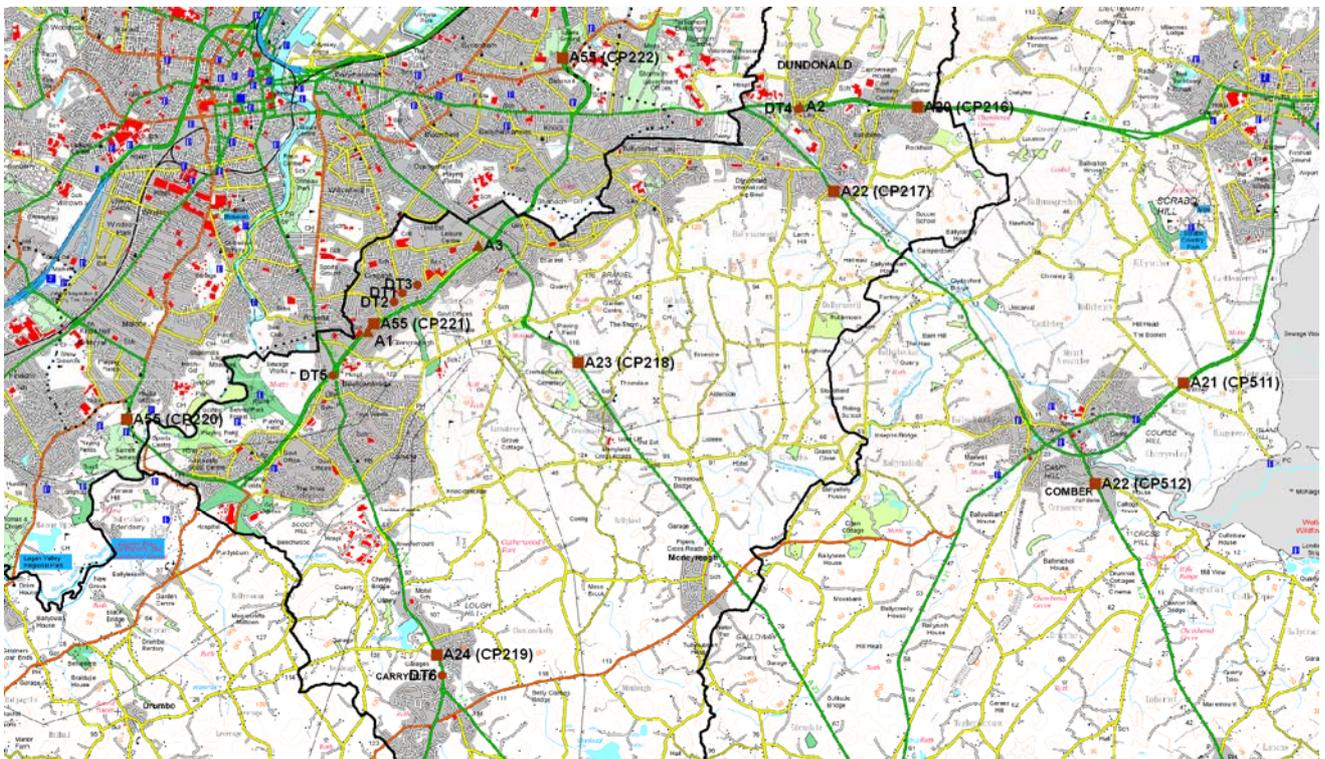


Table 2.1 Details of Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	Monitoring Technique	In AQMA ?	Relevant Exposure ? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Does this location represent worst-case exposure ?
Castlereagh Loughview Drive	Roadside	E 335749	N370711	PM10 NOx	TEOM Chemiluminescent analyser	N	Y 22M	3m	Y
Castlereagh Dundonald	Roadside	E 342016	N374041	PM10 NOx	TEOM Chemiluminescent analyser	N	Y 22M	3m	N

2.1.2 Non-Automatic Monitoring

Castlereagh borough Council presently has five NO₂ diffusion tube sites positioned along the main arterial routes into Belfast, the Upper Newtownards Road site having triplicate tubes. Monitoring was ceased at this site in March 2008 after the automatic station was installed within close proximity. Due to comments received from the DOE after the 2008 progress report, monitoring at the original A20 Upper Newtownards diffusion tube site was reinstated in October 2008. The NO₂ diffusion tubes are supplied by Bureau Veritas. Preparation method is 20% TEA in water. A co-location study is carried out at both automatic sites in the Borough, and the bias adjustment factor applied to the results is an average of these two sites.

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

Included in figure 2.1

Table 2.2 Details of Non- Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	In AQMA ?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location?
Cregagh Road	Roadside	E336257	N371278	NO ₂	N	Y (28m)	3m	
Everton Drive	Background	E336132	N371141	NO ₂	N	Y (98m)	1m	
Upper Newtownards Road	Roadside	E341991	N374013	NO ₂	N	Y (2.5)	0.5m	Y
Newtownbreda Road	Roadside	E335246	N370061	NO ₂	N	Y (12m)	2m	
Saintfield Road	Roadside	E336832	N365625	NO ₂	N	Y (70m)	3m	
Castlereagh Loughview Drive	Co-location	E335749	N370711	NO ₂	N	Y (22m)	3m	
Castlereagh dundonald	Co-location	E342016	N274041	NO ₂	N	Y (22m)	3m	

2.2 Comparison of Monitoring Results with Air Quality Objectives

In the following section results are presented for NO₂ at the automatic and diffusion tube sites and compared with the objective. All sites except the diffusion tube site on the A20 Upper Newtownards Road meet the objective

2.2.1 Nitrogen Dioxide

Tables 2.3a presents the annual mean concentrations of NO₂ determined at the two automatic sites in 2009 from the hourly measurements. An hourly mean plot can be found in Appendix B1. The results for 2007 and 2008 are also included in the table, the Dundonald automatic site was installed in March 2007 and therefore data capture for that year was only 78.7%.

Automatic Monitoring Data

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

Site ID	Location	Within AQMA?	Data Capture for monitoring period ^a %	Data Capture for full calendar year 2009 ^b %	Annual mean concentrations (µg/m ³)		
					2007 ^{c, d}	2008 ^{c, d}	2009 ^c
A1	Castlereagh Loughview Drive	N	99.9	99.9	22.5	21.8	21
A2	Castlereagh Dundonald	N	99.9	99.9	38.8(a)	32.3	36

(a) New site in 2007, measurements commenced in April 2007 data capture 78.7%^a

Figure 2.3 Trends in Annual Mean Nitrogen Dioxide Concentration Measured at Automatic Monitoring Sites.

Results have been consistent at both sites since monitoring commenced.

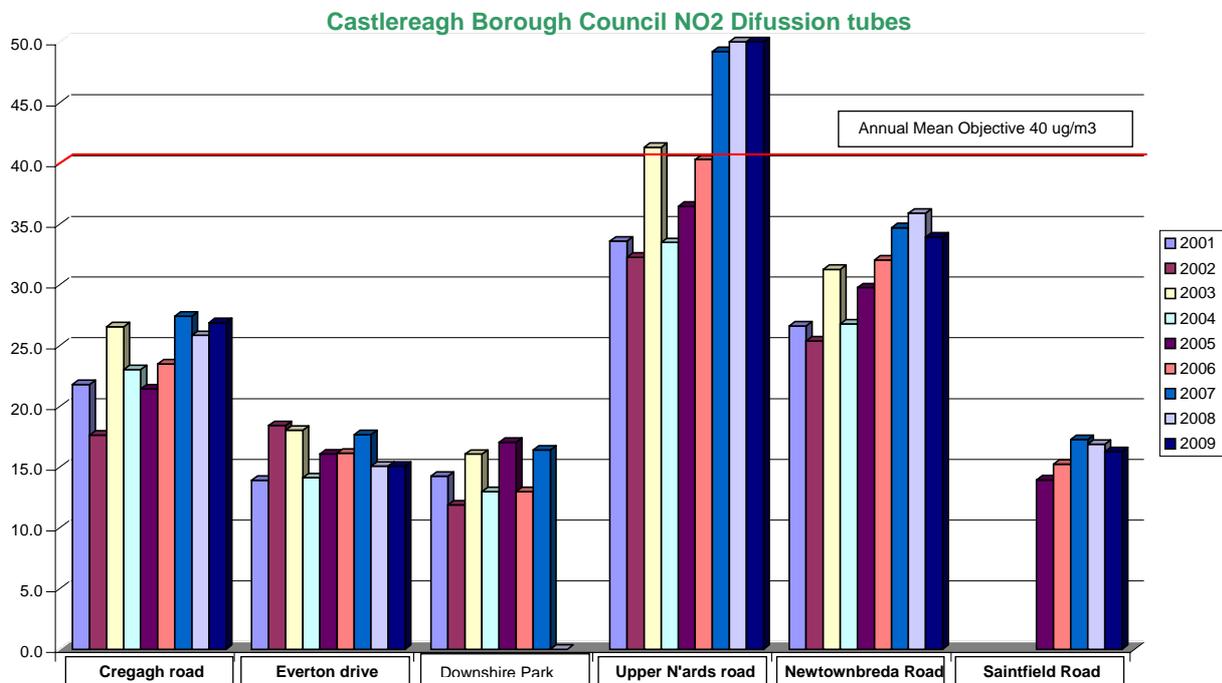
Table 2.3b Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with 1-hour Mean Objective

Site ID	Location	Within AQMA?	Data Capture for monitoring period ^a %	Data Capture for full calendar year 2009 ^b %	Number of Exceedences of hourly mean (200 µg/m ³)		
					2007 ^c	2008 ^c	2009
A1	Castlereagh Loughview Drive	N		99.9	0	0	0
A2	Castlereagh Dundonald	N		99.9	2 (a)	3	0

(a) New site in 2007, measurements commenced in April 2007 data capture 78.7%^a

Figure 2.4

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



Downshire Park background site was discontinued in January 2008.

Diffusion Tube Monitoring Data

A trend for the five diffusion tube sites within the borough is shown above in figure 2.4. There has been no significant change except at the Upper Newtownards Road site which has been exceeding the objective. A detailed assessment was carried out for this site in 2009. An AQMA has not yet been declared as there are only two years full data and the position of the tubes was an old roadside site and not directly at the relevant exposure. In November 2009 the triplicate tubes at this site were moved to the façade of the relevant exposure ie. Normandy Court Apartments. There has been a significant drop in results of approximately 31% so it was felt further monitoring was required. A bias adjustment factor of 0.80 was applied to the results. This was based on the average of the two co-located studies in the Borough, the Loughview and Dundonald automatic sites. This was calculated using the R&A support precision and accuracy spreadsheet.

Table 2.4 Results of Nitrogen Dioxide Diffusion Tubes

Site ID	Location	Within AQMA?	Data Capture for monitoring period ^a %	Data Capture for full calendar year 2009 ^b %	Annual mean concentrations ($\mu\text{g}/\text{m}^3$)		
					2007 ^{c, d}	2008 ^{c, d}	2009 ^c
DT1	Cregagh Road	N		100	27.4 (a)	25.8	26.9
DT2	Everton Drive	N		100	17.7	15.1 (a)	15.1
DT4	Upper Newtownards Road	N		100	49.2	65.6	57.4
DT5	Newtownbreda Road	N		100	34.7	35.9	33.9
DT6	Saintfield Road	N		100	17.3	16.9	16.3

(a) Data capture for 2007 at the Cregagh Road site was 91.6%

Data capture for 2008 at the Upper Newtownards Road site was only 41.6%

Data capture for 2008 at the Everton Drive site was 91.6%

2.2.2 PM₁₀

There are presently two PM₁₀, TEOM automatic monitoring sites positioned along side the NO₂ automatic analysers. Plots for the hourly mean can be found in Appendix B. The results have been consistently low and both sites remained below the objective of 40 ug/ m³ in 2009.

Table 2.5a Results of PM₁₀ Automatic Monitoring: Comparison with Annual Mean Objective

Site ID	Location	Within AQMA?	Data Capture for monitoring period ^a %	Data Capture for full calendar year 2009 ^b %	Annual mean concentrations (µg/m ³)		
					2007 ^{c, d}	2008 ^{c, d}	2009 ^c
A1	Castlereagh Lough Drive	N		99.6	17	17	15
A2	Castlereagh Dundonald	N		99.4	18(a)	18	17

(a) New site commenced in April 2007 data capture 78.7%

PM10 has been measured with a TEOM instrument, a conversion factor of 1.3 has been applied.

Table 2.5b Results of PM₁₀ Automatic Monitoring: Comparison with 24-hour Mean Objective

Site ID	Location	Within AQMA?	Data Capture for monitoring period ^a %	Data Capture 2009 ^b %	Number of Exceedences of daily mean objective (50 µg/m ³)		
					2007 ^c	2008 ^c	2009 ^c
A1	Castlereagh Loughview	N		99.6	6	0	0
A2	Castlereagh Dundonald	N		99.4	1(a)	4	0

(a) New site commenced in April 2007 data capture 78.7%

2.2.3 Sulphur Dioxide

The SO₂ automatic site in Espie Way Castlereagh was decommissioned in 2007 as there had been no exceedences of the air quality objectives for SO₂ since monitoring commenced in 2003.

2.2.4 Benzene

There were no measurements of Benzene carried out in 2009

2.2.5 Other pollutants monitored

NO₂ and PM₁₀ were the only two pollutants monitored in 2009

2.2.6 Summary of Compliance with AQS Objectives

Castlereagh Borough Council has measured concentrations of NO₂ above the annual mean objective at relevant locations (A20 Upper Newtownards Road Dundonald) a **Detailed Assessment was carried out in 2009**. Castlereagh Borough Council is carrying out further monitoring at the location.

3 New Local Developments

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

4 Conclusions and Proposed Actions

4.1 Conclusions from New Monitoring Data

The NO₂ diffusion tube site on the A20 Upper Newtownards Road site has continued in 2009 to exceed the annual objective. A detailed assessment was carried out in 2009 showing relevant exposure at Normandy Court. The triplicate tubes at this site were moved onto the façade of Normandy Court in November 2009 and a significant drop in results of approximately 31% have been reported. Therefore Castlereagh Borough Council has not declared an AQMS following the detailed assessment until further monitoring is carried out at this location.

No other monitoring sites within the borough showed exceedences of the air quality objectives.

4.2 Proposed Actions

To continue monitoring NO₂ on the façade of Normandy Court using triplicate diffusion tubes and carry out a further assessment of the results when 12 months data is available, with the view to declaring an AQMA..

5 References

- CBC 2000 Air Quality reported submitted to the Department of the Environment Northern Ireland by Castlereagh Borough Council
- CBC 2003/2004 Second/Third stage review and assessment of local air quality submitted to the Department of the Environment by Castlereagh Borough Council
- CBC 2005 Progress report submitted by Castlereagh Borough Council to the Department of the Environment on local air quality
- USA 2006 Air Quality Updating and Screening Assessment submitted to the Department of the Environment by Castlereagh Borough Council and prepared by AEA Technology May 2006
- EG 2007 Eastern Group Air Quality Progress report. Annual report on air quality in the Eastern Group of local authorities including Castlereagh borough Council
- EG 2008 Eastern Group Air Quality Progress report. Annual report on air quality in the Eastern Group of local authorities including Castlereagh borough Council
- USA 2009 Air Quality Updating and Screening Assessment submitted to the Department of the environment by Castlereagh Borough Council and prepared by the National Physical Laboratory May 2009

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Appendices

Appendix A: QA:QC Data

Diffusion Tube Bias Adjustment Factors

The tubes are supplied by Casella/Bureau Veritas labs and the preparation method is 20% TEA in water. The bias adjustment factor from the R&A helpdesk database is 0.81

<http://www.uwe.ac.uk/aqm/review/R&Asupport/diffusiontube310310.xls>

Factor from Local Co-location Studies (if available)

The bias adjustment factors from the two local co-located studies are

Loughview Drive 0.79

Dundonald 0.81

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

Results of NO2 Diffusion tubes

2009		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Castlereagh 5	Cregagh Road	39	47	34	35	29	27	25	29	21	33	37	47
Castlereagh 4	Everton Drive	31	29	17	15	16	14	13	5	13	18	25	30
Castlereagh 10	Upper N'ards road	76	106	80	82	80	66	63	64	49	79	55	62
Castlereagh 9	Newtownbreda Road	37	60	43	50	42	45	40	32	26	37	38	59
Castlereagh 11	Saintfield Road	22	26	17	22	22	21	19	17	13	18	18	29
Castlereagh 12	Dundonald	71	96	84	84	77	63	68	72	49	82	55	63
Castlereagh 13	Dundonald	76	120	77	84	82	65	62	70	50	79	53	61
Castlereagh 13	Dundonald	80	102	78	79	80	70	60	49	47	77	56	62

Results of NO2 Diffusion tubes with local bias adjustment applied of 0.80

2009		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Castlereagh 5	Cregagh Road	31.2	37.6	27.2	28.0	23.2	21.6	20.0	23.2	16.8	26.4	29.6	37.6
Castlereagh 4	Everton Drive	24.8	23.2	13.6	12.0	12.8	11.2	10.4	4.0	10.4	14.4	20.0	24.0
Castlereagh 10	Upper N'ards road	60.5	84.8	63.7	65.9	63.7	52.8	50.7	50.9	38.9	63.5	43.7	49.6
Castlereagh 9	Newtownbreda Road	29.6	48.0	34.4	40.0	33.6	36.0	32.0	25.6	20.8	29.6	30.4	47.2
Castlereagh 9	Saintfield Road	17.6	20.8	13.6	17.6	17.6	16.8	15.2	13.6	10.4	14.4	14.4	23.2

Discussion of Choice of Factor to Use

The local bias adjustment factor of 0.80 was applied to the results. This was based on the average of the two co-located studies in the Borough. The Loughview and Dundonald automatic sites. Castlereagh Borough Council used the the local factor as it was more specific to the location.

PM Monitoring Adjustment

The PM10 was measured using TEOM the results are reported as gravimetric equivalent using a factor of 1.3

Produced by AEA

CASTLEREAGH LOUGH VIEW DRIVE 01 January to 31 December 2009

These data have been fully ratified by AEA

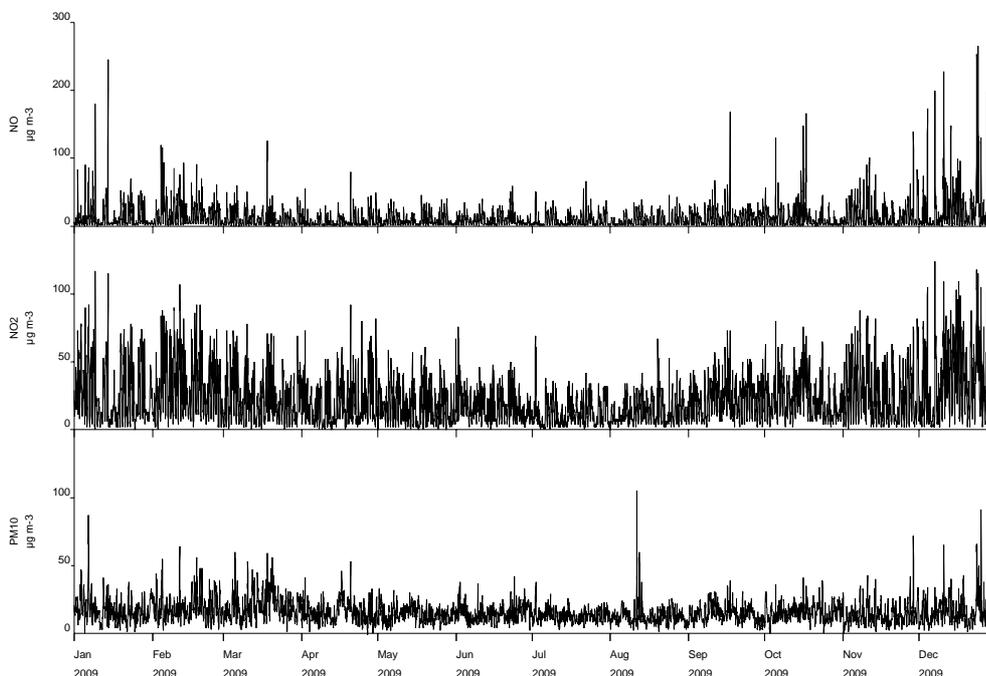
POLLUTANT	NO	NO ₂	PM ₁₀₊
Number Very High	-	0	-
Number High	-	0	-
Number Moderate	-	0	-
Number Low	-	8748	-
Maximum 15-minute mean	356 µgm ⁻³	145 µgm ⁻³	189 µgm ⁻³
Maximum hourly mean	265 µgm ⁻³	124 µgm ⁻³	105 µgm ⁻³
Maximum running 8-hour mean	177 µgm ⁻³	94 µgm ⁻³	63 µgm ⁻³
Maximum running 24-hour mean	126 µgm ⁻³	76 µgm ⁻³	39 µgm ⁻³
Maximum daily mean	79 µgm ⁻³	64 µgm ⁻³	34 µgm ⁻³
Average	11 µgm ⁻³	21 µgm ⁻³	15 µgm ⁻³
Data capture	99.9 %	99.9 %	99.6 %

+ PM₁₀ as measured by a TEOM

All mass units are at 20°C and 1013mb

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

Produced by AEA
Castlereagh Lough View Drive
Hourly Mean Data for 01 January to 31 December 2009



Produced

by AEA

CASTLEREAGH DUNDONALD
01 January to 31 December 2009

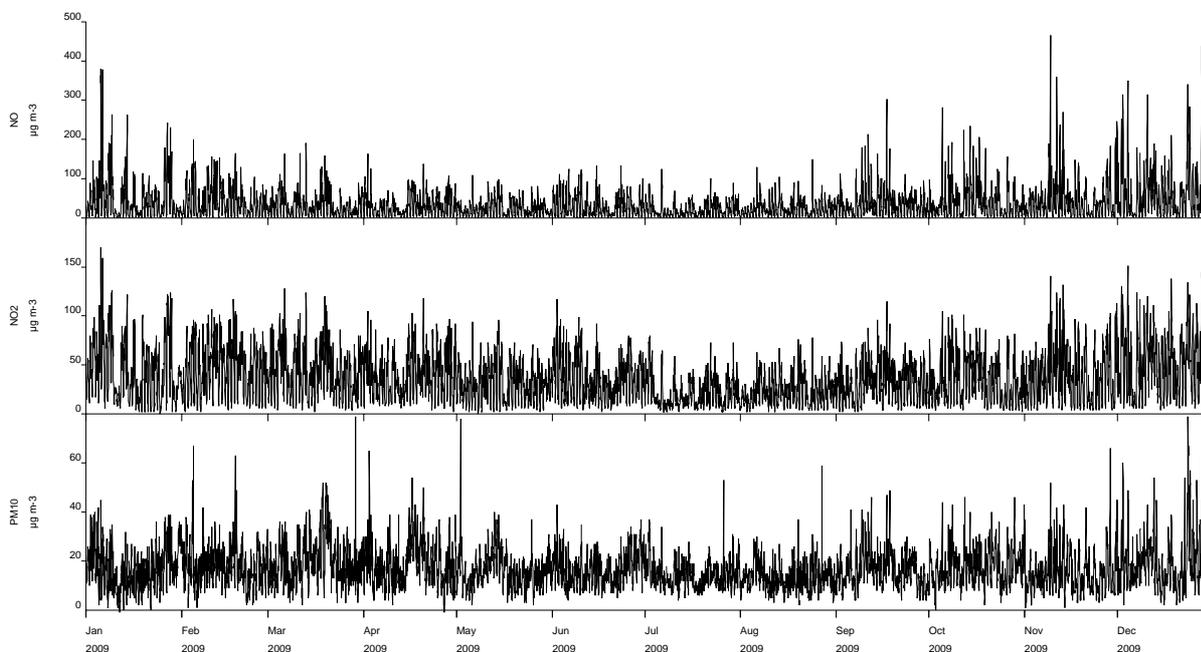
These data have been fully ratified by AEA

POLLUTANT	NO	NO ₂	PM ₁₀₊
Number Very High	-	0	-
Number High	-	0	-
Number Moderate	-	0	-
Number Low	-	8749	-
Maximum 15-minute mean	569 µgm ⁻³	206 µgm ⁻³	251 µgm ⁻³
Maximum hourly mean	466 µgm ⁻³	170 µgm ⁻³	79 µgm ⁻³
Maximum running 8-hour mean	317 µgm ⁻³	132 µgm ⁻³	58 µgm ⁻³
Maximum running 24-hour mean	177 µgm ⁻³	91 µgm ⁻³	45 µgm ⁻³
Maximum daily mean	160 µgm ⁻³	81 µgm ⁻³	34 µgm ⁻³
Average	34 µgm ⁻³	36 µgm ⁻³	17 µgm ⁻³
Data capture	99.9 %	99.9 %	99.4 %

+ PM₁₀ as measured by a TEOM
 All mass units are at 20°C and 1013mb

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

Produced by AEA
Castlereagh Dundonald
Hourly Mean Data for 01 January to 31 December 2009



QA/QC of automatic monitoring

Castlereagh Borough Council commissioned AEA Technology to provide the QA/QC of the automatic measurements of NO₂-NO_x and PM₁₀ from the two sites. 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 fortnightly basis carrying out any manual calibration or filter changes required. Audits of the two sites are carried by AEA Technology on a six monthly basis.

QA/QC of diffusion tube monitoring

The tubes are supplied by Casella/Bureau Veritas labs and the preparation method is 20% TEA in water. Bureau Veritas Laboratories that have demonstrated satisfactory performance in the WASP scheme for analysis of NO₂ diffusion tubes.

http://www.laqmsupport.org.uk/Summary_of_Laboratory_Performance_in_WASP_R103-107.pdf