2009 Air Quality Updating and Screening Assessment for *Carrickfergus Borough Council*

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

April 2009

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Executive Summary

Part III of the Environment (NI) Order 2002 requires each district council to periodically review air quality in its area and the Air Quality Regulations (NI) 2003 prescribe the air quality objectives to be achieved. The process of reviewing and assessing air quality represents a cornerstone in the system of local air quality management (LAQM).

The first round of review and assessment for Carrickfergus Borough Council was completed in April 2004. This concluded that, based on available data, the risk of the air quality objectives in respect of carbon monoxide; benzene; 1,3-butadiene; lead; nitrogen dioxide and sulphur dioxide not being met within the prescribed timescales was negligible.

The review and assessment predicted that PM_{10} particulates would be exceeded in parts of Carrickfergus town and Greenisland as the result of domestic solid fuel burning, and consequently the Council declared two Air Quality Management Areas (AQMA) in September 2004. Subsequent further detailed modelling has shown that PM_{10} emissions arising from domestic fuel combustion in Carrickfergus Borough Council are not predicted to cause an exceedance of the PM_{10} objectives at relevant receptors within the assessed areas. On the basis of this modelling a recommendation is now under consideration for the revocation of the two AQMAs.

This document is Carrickfergus Borough Council's Updating and Screening Assessment and represents the first step of the next round of review and assessment for the area. It has looked primarily at those matters that have changed since the last review and assessment, which might lead to a risk of an air quality objective for one of the seven key pollutants referred to above, being exceeded. It has also looked at areas not fully considered in the first round of review and assessment.

Of the seven key pollutants updated, screened and assessed, the likelihood of the air quality objectives for carbon monoxide, benzene, 1,3-butadiene, lead, sulphur dioxide, nitrogen dioxide, and fine particles (PM_{10}) being exceeded is negligible. There is therefore no requirement to proceed to a detailed assessment for any of these pollutants in Carrickfergus Borough Council.

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1 Introduction

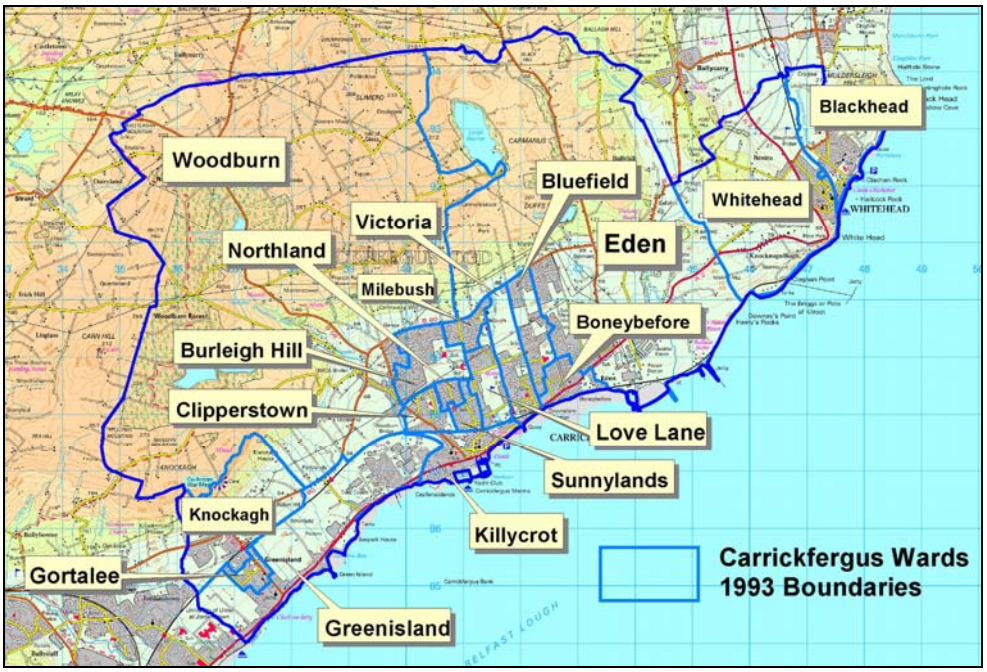
1.1 Description of Local Authority Area

The Borough of Carrickfergus is located on the Northern shore of Belfast Lough, stretching from Greenisland in the southwest to Whitehead in the east. The main settlements in the area are located along a low lying coastal strip. Further inland the ground rises to a height of 275 metres at Knockagh which forms part of the southernmost reaches of the Antrim Plateau. The Borough takes in a total area of 31.67 square miles.

The area enjoys relatively mild winters and warm summers. The average rainfall is approximately 945 mm/year and the south westerly prevailing winds reach average speeds of 6-7 metres/second.

The population of the Borough has increased from 28,500 in 1981 to a revised figure of 40,000 in July 2008.

One of the major air pollutant sources in the borough is from road traffic, particularly along the A2 which is the main road to and from Belfast. The key industrial source in the area is AES Kilroot Power Station. A number of homes in the area continue to burn solid fuel although this number has declined over the years due to the arrival of Phoenix piped natural gas and subsequent Northern Ireland Housing Executive home improvement schemes.



1.2 Purpose of Report

This report fulfils the requirements of the Local Air Quality Management process as set out in Part IV of the Environment Act (1995), the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 and the relevant Policy and Technical Guidance documents. 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 Exceedances are considered likely, the local authority must then declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives.

1.3 Air Quality Objectives

The air quality objectives applicable to LAQM **in 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 exceedances 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	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 $\mu g/m^3$	Running annual mean	31.12.2003
	3.25 $\mu g/m^3$	Running annual mean	31.12.2010
1,3-Butadiene	2.25 $\mu g/m^3$	Running annual mean	31.12.2003
Carbon monoxide	10.0 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.5 $\mu g/m^3$	Annual mean	31.12.2004
	0.25 $\mu g/m^3$	Annual mean	31.12.2008
Nitrogen dioxide	200 $\mu g/m^3$ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 $\mu g/m^3$	Annual mean	31.12.2005
Particles (PM_{10}) (gravimetric)	50 $\mu g/m^3$, not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 $\mu g/m^3$	Annual mean	31.12.2004
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

Air quality monitoring of NO_2 and SO_2 using diffusion tubes has been ongoing in Carrickfergus Borough since March 1997. Real time monitoring of SO_2 and PM_{10} commenced in July 2002 at the Councils Rosebrook Avenue site and continues to date.

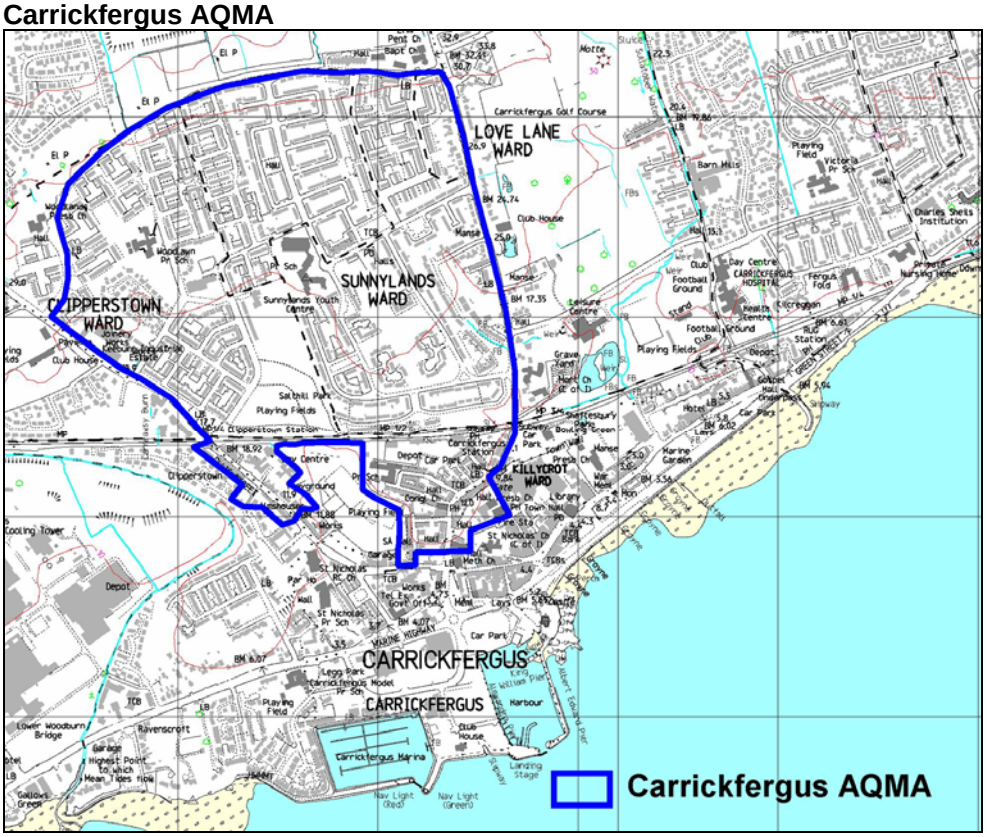
The First Stage Air Quality Review and Assessment completed February 2001 concluded that the pollutants indicated in the following table namely, NO_2 from roads and industrial sources, SO_2 from industrial and domestic sources and PM_{10} from industrial and domestic sources, should be examined during the second stage review.

Pollutant	Exceedance Road Sources	Exceedance Industrial Sources	Exceedance Domestic Sources	Progress to Second Stage Review	Progress to Third Stage Review	Progress to Fourth Stage Review
Carbon Monoxide	None	None	None	No	No	No
Benzene	None	None	None	No	No	No
1,3 Butadiene	None	None	None	No	No	No
Lead	None	None	None	No	No	No
Nitrogen Dioxide	Yes	Yes	None	Yes	No	No
Sulphur Dioxide	None	Yes	Yes	Yes	Yes	No
PM10	Yes	None	Yes	Yes	Yes	Yes

The Second Stage Assessment completed in February 2002 excluded SO_2 and PM_{10} from industrial sources and NO_2 from industrial and road sources.

Third Stage Review and Assessment concentrated on the assessment of the remaining pollutants namely PM_{10} from domestic sources and road sources and SO_2 from domestic sources. Modelling of these pollutants excluded PM_{10} from road sources and SO_2 from domestic sources, but predicted exceedances for PM_{10} from domestic sources in both Carrickfergus town and Greenisland and resulted in the declaration of two Air Quality Management Areas.

Carrickfergus AQMA



Fourth Stage Review and Assessment was commenced at the end of 2004 with an updating of fuel use survey information within the AQMAs and was completed by the autumn of 2005.

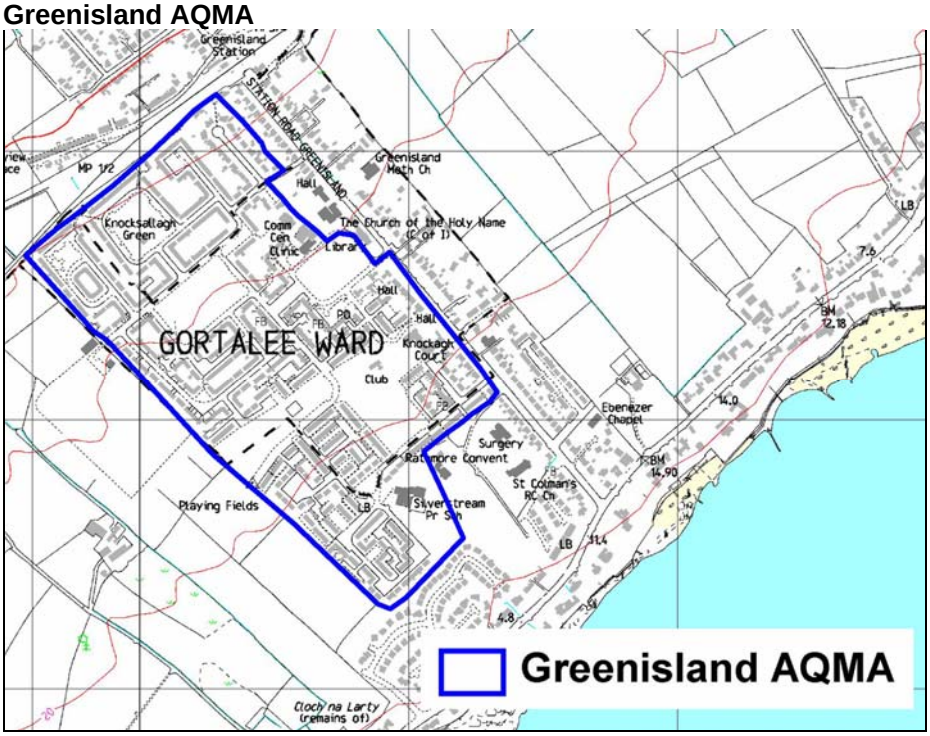
Carrickfergus Borough Council - Northern Ireland

The conclusions Air Quality Review and Assessment Stage 4 - Detailed Modelling for Domestic Fuel Combustion indicated that PM_{10} and SO_2 emissions arising from domestic fuel combustion in Carrickfergus Borough Council are not predicted to cause an exceedance of the PM_{10} objectives at relevant receptors within the assessed areas. This has been confirmed by the monitoring data collected. Netcen who carried out the fourth stage modelling recommended,

"Carrickfergus Borough Council may wish to consider revocation of the AQMA on the basis of these results"

As a consequence of the Netcen recommendation and its subsequent appraisal and acceptance by U.W.E, Carrickfergus Borough Council has revoked the two Air Quality Management Areas for PM_{10} from domestic sources, in Carrickfergus town and Greenisland.

Greenisland AQMA



2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

Map highlighting the location of the Air Quality Monitoring Station, Rosebrook Avenue, Carrickfergus

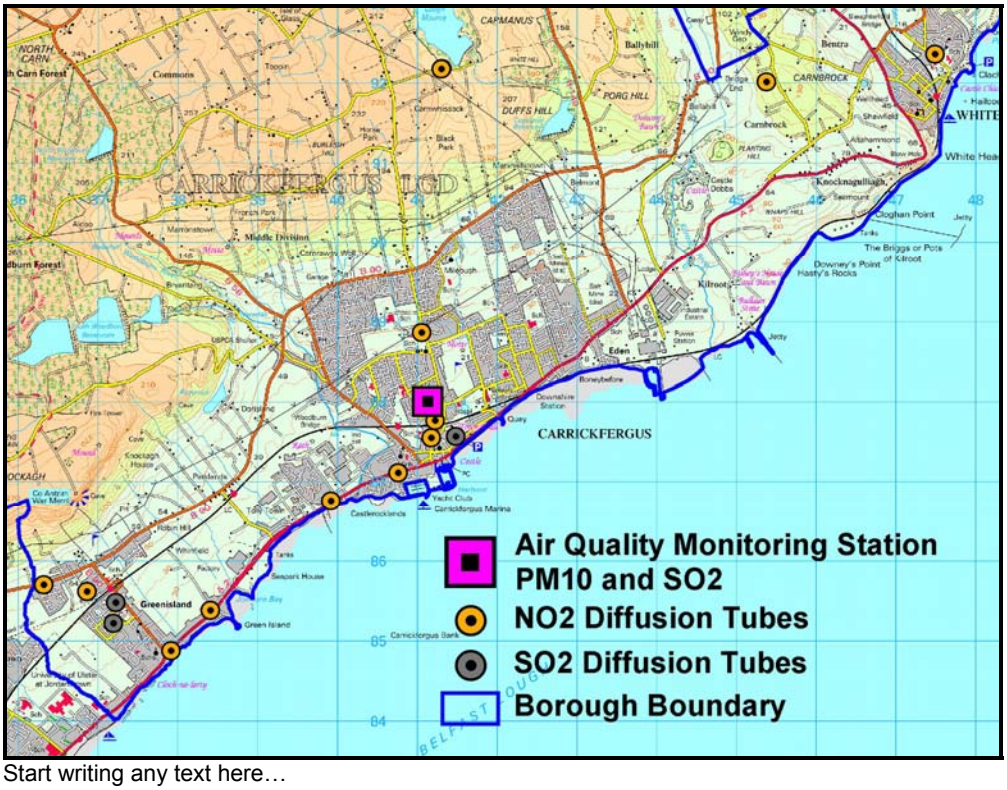


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Table 2.1 Details of Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref	Pollutants Monitored	In AQMA ?	Relevant Exposure? *(Y/N with distance (m) to relevant exposure)*	Distance to kerb of nearest road *(N/A if not applicable)*	Worst-case Location ?
AQMS	Urban background		SO_2 PM_{10}	N	Y (5m)	1m	Y

2.1.2 Non-Automatic Monitoring

Nitrogen dioxide is a respiratory irritant associated with both acute (short-term) and chronic (long-term) effects on human health, particularly in people with asthma. Nitrogen dioxide (NO_2) and nitric oxide (NO) are both oxides of nitrogen, and are collectively referred to as nitrogen oxides (NOx). All combustion processes produce NOx emissions, largely in the form of nitric oxide, which is then converted to nitrogen dioxide, following a reaction with ozone in the atmosphere. It is nitrogen dioxide that is associated with adverse effects upon human health.

The principal source of nitrogen oxides emissions is road transport, which accounted for about 49% of total UK emissions in 2000 (LAQM.TG (03)). Major roads carrying large volumes of high-speed traffic are a predominant source, as are conurbations and city centres with congested traffic. The contribution of road transport to nitrogen oxides emissions has declined significantly in recent years as a result of various policy measures. At a national level, urban traffic nitrogen oxides emissions were estimated to fall by about 20% between 2000 and 2005, and by 46% between 2000 and 2010 (Stedman et al, 2001). Other significant sources of nitrogen oxides emissions include the electricity supply industry and other industrial and commercial sectors. Emissions from both sources have also declined dramatically, due to the fitting of low nitrogen oxides burners, and the increased use of natural gas. Industrial sources make only a very small contribution to annual mean nitrogen dioxide levels.

Pollutant	Objective	To be achieved by
Nitrogen Dioxide	**200µg/m^3 (105ppb) when expressed as a 1 hour mean, not to be exceeded more than 18 times a year**	**31 December 2005**
Nitrogen Dioxide	**40µg/m^3 (21ppb) when expressed as an annual mean**	**31 December 2005**

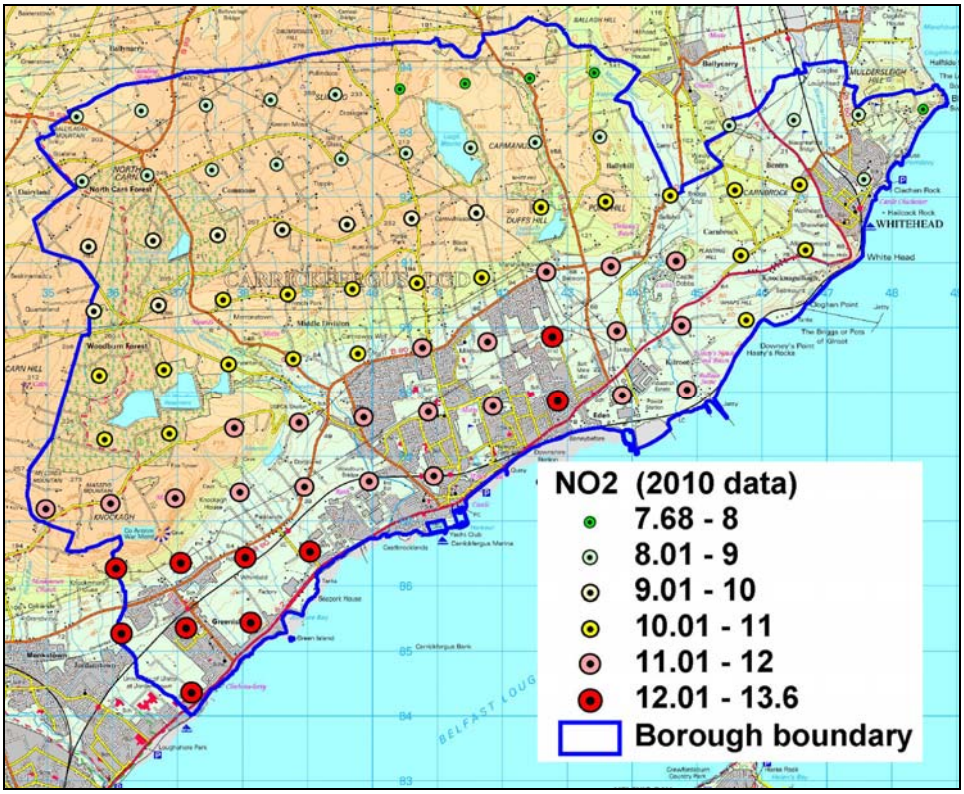
7.2 Conclusions from Previous Review and Assessment

The First Stage Review and Assessment of Air Quality in Carrickfergus Borough Council (2001) concluded that there was a risk of the air quality objective, for nitrogen dioxide from road and industrial sources, being exceeded and it was recommended it be given further consideration in a second stage review and assessment. This Second Stage Review and Assessment, completed in February 2002, looked at NO_2 emissions from Kilroot Power Station, busy roads and road junctions and concluded that there was no risk of the 2005 air quality objectives being exceeded and that there was no need to undertake a third stage review and assessment for nitrogen dioxide.

7.3 Updating and Screening Assessment; Background Concentrations

General backgrounds in the area are reasonably low. The background annual mean concentrations for nitrogen dioxide in 2008 did not exceed 15µg/m^3 anywhere and in

2010 are not predicted to exceed 13.6µg/m^3 in the worst areas. (www.airquality.co.uk/archive/).



7.4 Updating and Screening Assessment; Monitoring Data

Carrickfergus Borough Council has been using passive diffusion tubes to monitor nitrogen dioxide levels throughout the district since 1997. The tubes used are supplied, prepared and analysed by Casella CRE Air. The preparation method used is 10% Triethanolamine (TEA) in Water. Quality assurance and quality control measures for the diffusion tubes are set out in Appendix 2.

The monitoring sites are chosen to represent kerbside locations along the busiest roads in the Borough namely the A2 Shore Road (AADT 27,020 vehicles per day) and B90 (15000 vpd) Upper Road, together with and urban and rural background site.

Results obtained from diffusion tubes need to be corrected by applying an adjustment factor which takes into account the tendency for diffusion tubes from particular suppliers to over or under read concentrations when compared to real-time monitoring. As Carrickfergus Borough Council has no means of automatically monitoring nitrogen dioxide concentrations, and has not carried out a diffusion tube co-location study, the bias adjustment factor for Casella CRE Air has been taken from www.uwe.ac.uk/aqm/review and verified by email from Casella. For the year 2008 the bias adjustment factor is 0.83. Multiplying the measured annual concentration by the adjustment factor carries out correction for bias.

NO_2 Monitoring results for the calendar year 2008 are shown in Table 4.

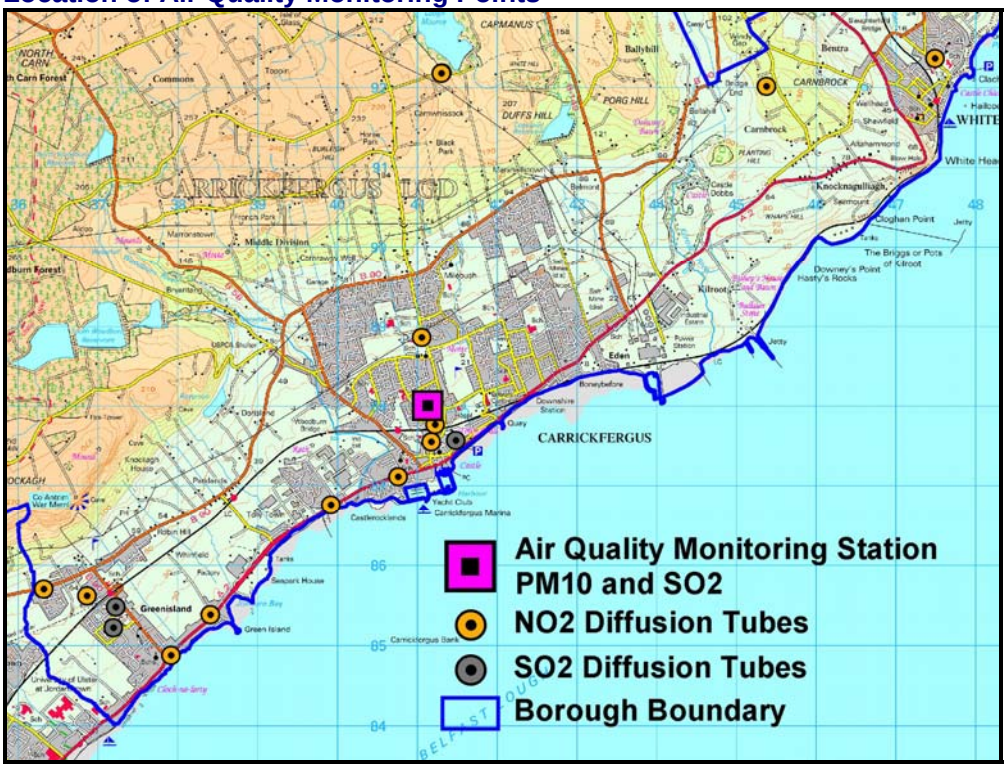
Table 4; Nitrogen Dioxide Monitoring Results for 2008

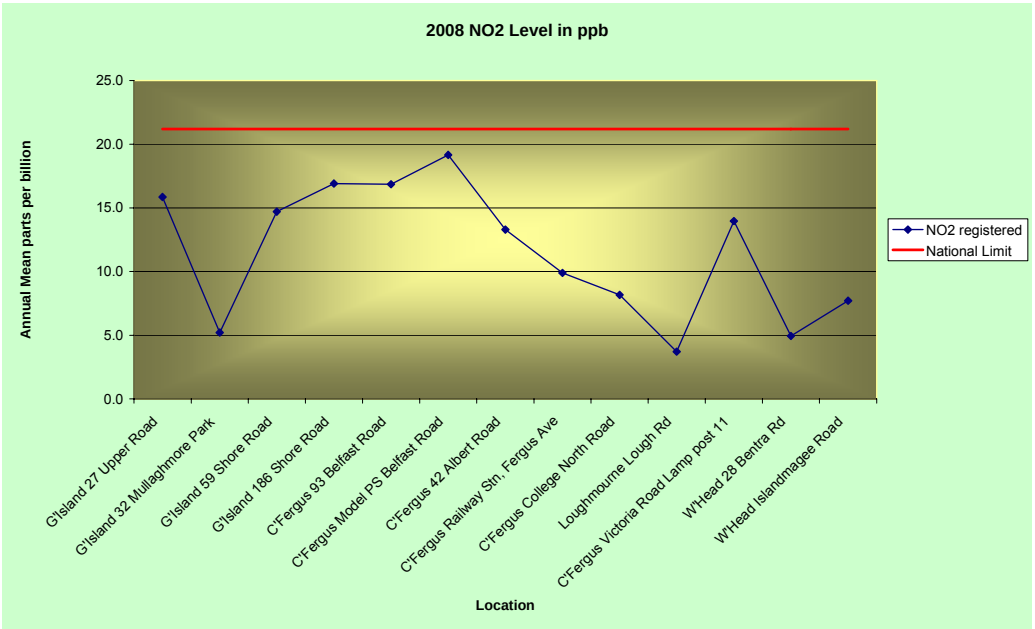
Location	Measured annual mean concentration (µg/m^3)	Bias adjusted annual mean concentration (µg/m^3)
59 Shore Rd, Greenisland, (Roadside A2)	27.75	23.03
Model PS Carrickfergus, (Roadside A2)	36.17	30.02
93 Belfast Rd, Carrickfergus, (Roadside A2) (27020 vpd)	31.82	26.41
Albert Road, Carrickfergus	25.08	20.82
27 Upper Rd, ,Greenisland, (Roadside B90)	29.92	24.83
Fergus Ave (Urban Background)	18.67	15.49
Lough Road (Rural)	7.00	5.81

All of the above locations were specifically chosen to reflect the findings of the last review and assessment of air quality in Carrickfergus Borough Council and represent those road networks with the highest AADTs. Limited traffic information for 2005 was obtained from the Department of Regional Development's Roads Service and is shown in Appendix 1.

Monitoring sites are selected to provide data on locations that appear to be representative of likely residential exposure and, where possible, are close to the nearest receptor to the road of interest.

Location of Air Quality Monitoring Points





2.2 Comparison of Monitoring Results with AQ Objectives

2.2.1 Nitrogen Dioxide

Carrickfergus does not carry out any automatic monitoring for Nitrogen Dioxide

Diffusion Tube Monitoring Data

Carrickfergus Borough Council has 13 NO_2 diffusion tube located across the borough. These range from urban to countryside background. (See previous location diagram on page 14)

Table 2.4a Results of Nitrogen Dioxide Diffusion Tubes

Site ID	Location	Within AQMA?	Data Capture 2008 %	Annual mean concentrations 2008 (μg/m^3) Adjusted for bias
9	27 Upper Road Greenisland	N	100.00%	24.83
1	32 Mullaghmore Park Greenisland	N	100.00%	8.16
10	59 Shore Road Greenisland	N	100.00%	23.03
12	186 Shore Road Greenisland	N	92.00%	26.48
4	93 Belfast Road Carrickfergus	N	92.00%	26.41
6	Model PS Belfast Road C'Fergus	N	100.00%	30.02
8	42 Albert Road C'Fergus	N	100.00%	20.82
3	Railway Stn, Fergus Ave Carrickfergus	N	100.00%	15.49
2	College North Road Carrickfergus	N	100.00%	12.80
7	**Lough Rd Loughmourne**	**N**	**83.00%**	**5.81**
13	Victoria Road Lamp post 11	N	92.00%	21.88
11	28 Bentra Rd Whitehead	N	100.00%	7.74
5	**Islandmagee Road Whitehead**	**N**	**75.00%**	**12.08**

Highlighted indicates that data capture was less than 90%

Nitrogen dioxide corrected Annual Mean 2008

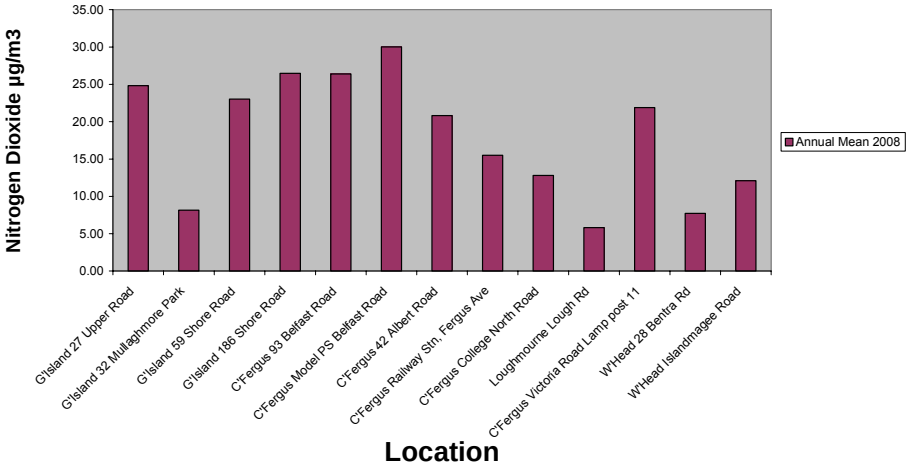
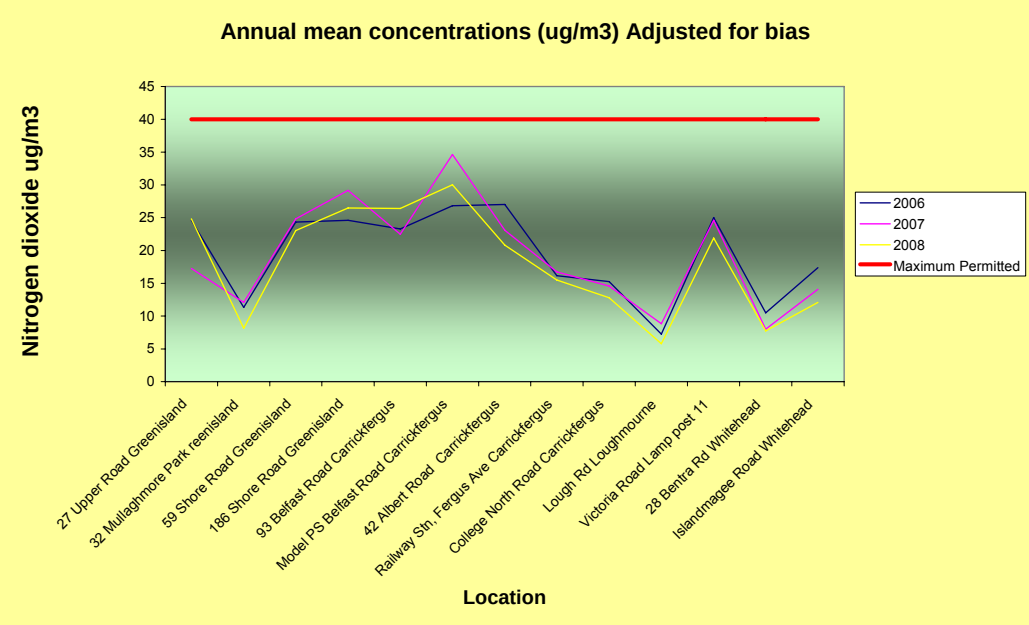


Table 2.4b Results of Nitrogen Dioxide Diffusion Tubes

Site ID	Location	Within AQMA ?	Annual mean concentration ($\mu g/m^3$) Adjusted for bias		
			2006 *	2007 *	2008
9	27 Upper Road Greenisland	N	24.58	17.27	24.83
1	32 Mullaghmore Park Greenisland	N	11.33	12.09	8.16
10	59 Shore Road Greenisland	N	24.33	24.83	23.03
12	186 Shore Road Greenisland	N	24.58	29.18	26.48
4	93 Belfast Road Carrickfergus	N	23.29	22.50	26.41
6	Model PS Belfast Road Carrickfergus	N	26.83	34.64	30.02
8	42 Albert Road Carrickfergus	N	27.00	23.08	20.82
3	Railway Stn, Fergus Ave Carrickfergus	N	16.17	16.75	15.49
2	College North Road Carrickfergus	N	15.26	14.58	12.80
7	Lough Rd Loughmourne	N	7.25	8.83	5.81
13	Victoria Road Lamp post 11	N	25.00	24.58	21.88
11	28 Bentra Rd Whitehead	N	10.50	8.00	7.74
5	Islandmagee Road Whitehead	N	17.4	14.10	12.08


Annual mean concentrations (ug/m3) Adjusted for bias
Nitrogen dioxide ug/m3
45
40
35
30
25
20
15
10
5
0
2006
2007
2008
Maximum Permitted
27 Upper Road Greenisland
32 Mullaghmore Park reenisland
59 Shore Road Greenisland
186 Shore Road Greenisland
93 Belfast Road Carrickfergus
Model PS Belfast Road Carrickfergus
42 Albert Road Carrickfergus
Railway Stn, Fergus Ave Carrickfergus
College North Road Carrickfergus
Lough Rd Loughmourne
Victoria Road Lamp post 11
28 Bentra Rd Whitehead
Islandmagee Road Whitehead
Location

2.2.2 PM_{10}

Particulate matter is of major health concern, as it has been linked with both increased morbidity and premature mortality. A wide range of emission sources contributes to PM_{10} concentrations in the UK. Research studies have confirmed that these sources can be divided into 3 main categories (APEG, 1999):

I) *Primary particle* emissions are derived directly from combustion sources, including road traffic, power generation, industrial processes etc.
II) *Secondary particles* are formed by chemical reactions in the atmosphere, and comprise principally of sulphates and nitrates.
III) *Coarse particles* comprise of emissions from a wide range of sources, including re-suspended dusts from road traffic, construction works, mineral extraction processes, wind-blown dusts and soils, sea salt and biological particles.

The expected reduction in national particle emissions in future years is different for each source type. For example, emissions from road transport will be governed by legislation on vehicle emission standards; emissions of secondary particles will be largely governed by controls on power generation, industrial and transport SO_2 and NOx emissions, both in the UK and in Europe; emissions of coarse particles are largely uncontrolled, and in general are not expected to decline in future years (LAQM.TG (03)).

Pollutant	Objective	To be achieved by
Particulate Matter	**50µg/m^3 when expressed as a 24 hour mean, not to be exceeded more than 35 times a year**	31 December 2004
Particulate Matter	**40µg/m^3 when expressed as an annual mean**	31 December 2004

9.1 Results of Previous Review and Assessment

In the Second Stage of the review and assessment process it was determined that the air quality objectives for PM_{10} were likely to be met and that a third stage review was not required for emissions from vehicular and industrial sources:

As part of the Stage 3 assessment, the Council appointed environmental consultants, NETCEN, to carry out detailed air quality dispersion modelling for the largest areas of domestic solid fuel burning. The NETCEN third stage report concluded that,

"The detailed modelling has shown that PM_{10} emissions arising from domestic fuel combustion in Carrickfergus Borough Council **are likely to cause an exceedence** of the air quality objective within Carrickfergus Town and Greenisland under meteorological conditions conducive to poor dispersion".
Fourth Stage Review and Assessment was commenced at the end of 2004 aimed at carrying out detailed modelling of PM_{10} emissions from domestic sources. This modelling used updated fuel use survey information gathered within the AQMAs (declared for modelled PM_{10} exceedance) and was completed by the autumn of 2005.

The Fourth Stage Review concluded,

"Detailed modelling has shown that PM_{10} emissions arising from domestic fuel combustion in Carrickfergus Borough Council are not predicted to cause an exceedence of the PM_{10} objectives at relevant receptors within the assessed areas".

The review and assessment concluded that, in all areas, exceedences of the objectives were unlikely.

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

Site ID	Location	Within AQMA?	Data Capture 2008 %	Annual mean concentrations (µg/m^3)		
				2006 *	2007 *	2008
	Rosebrook Avenue	N	96.2	22	18	18

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

Site ID	Location	Within AQMA?	Data Capture 2008 %	Number of Exceedances of daily mean objective (50 μg/m^3) *If data capture < 90%, include the 90th percentile of daily means in brackets.*		
				2006*	**2007***	**2008**
	Rosebrook Avenue	N	96.2	4	**2**	**0**

Data to June 2006 only.

2.2.3 Sulphur Dioxide

Sulphur dioxide is an acute respiratory irritant, hence the short averaging time for its objective. The main source of sulphur dioxide in the UK is power generation, which accounted for more than 71% of emissions in 2000. There are also significant emissions from other industrial combustion sources. Domestic sources now only account for less than 4% of emissions, but can be locally much more significant. Road transport currently accounts for less than 1% of emissions (LAQM.TG(09)).

Pollutant	Objective	To be achieved by
Sulphur Dioxide	**35µg/m^3 (132ppb) when expressed as a 1 hour mean, not to be exceeded more than 24 times a year**	**31 December 2004**
Sulphur Dioxide	**125µg/m^3 (47ppb) when expressed as a 24 hour mean, not to be exceeded more than 3 times a year**	**31 December 2004**
Sulphur Dioxide	**266µg/m^3 (100ppb) when expressed as a 15 minute mean, not to be exceeded more than 35 times a year**	**31 December 2005**

The objectives should apply at any location where the public might reasonably be exposed for the relevant period. Thus the 24-hour mean should be applied to building facades and to well-used gardens of residential properties as well as facades of schools, hospitals, etc. The 1-hour and 15-minute means should be applied to the above and to any outdoor locations in which the public might spend an hour or longer or 15 minutes respectively.

Results of Previous Review and Assessment

In the first round of review and assessment Carrickfergus Borough Council considered the impact of domestic and industrial sources on concentrations of sulphur dioxide.

The Stage 2 study modelled emissions from Kilroot Power Station and concluded that the air quality objectives for sulphur dioxide will not be exceeded.

However there are still areas of coal and solid fuel fired homes within the Borough, particularly within former Housing Executive estates in Carrickfergus town and Greenisland. As part of the Stage 3 assessment, the Council appointed environmental consultants, NETCEN, to carry out detailed air quality dispersion modelling for the largest areas of domestic solid fuel burning. The NETCEN third stage report concluded that,

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"The detailed modelling has shown that SO_2 emissions arising from domestic fuel combustion in Carrickfergus Borough Council are ***not predicted to cause an exceedence*** *of the air quality objectives within Carrickfergus and Greenisland".*

Fourth Stage Review and Assessment was commenced at the end of 2004 primarily aimed at carrying out detailed modelling of PM_{10} emission however more detailed examination of SO_2 was also included in the brief. This modelling used updated fuel use survey information gathered within the AQMAs (declared for modelled PM_{10} exceedance) and was completed by the autumn of 2005.

The Fourth Stage Review concluded,

"Detailed modelling has shown that SO_2 emissions arising from domestic fuel combustion in Carrickfergus Borough Council are not predicted to cause an exceedence of the air quality objectives at relevant receptors within the assessed areas. This further confirms the findings of the earlier stage 3 assessment".

Updating and Screening Assessment; Monitoring Data within an Air Quality Management Area (AQMA Declared for PM_{10})

Carrickfergus Borough Council has monitored sulphur dioxide on an automatic continuous basis since July 2002. The site is located at Rosebrook Avenue in the Sunnyland Estate Carrickfergus and represents a site with relevant public exposure.

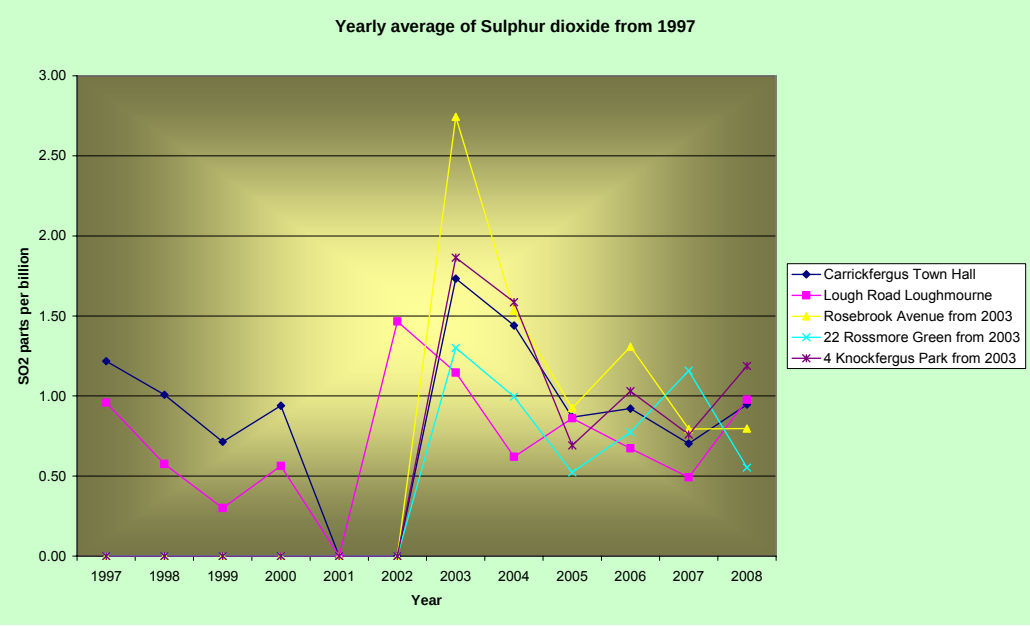
Summary of NETCEN Pollution Reports SO_2 Analyser Rosebrook Avenue Carrickfergus

Time Period	Number of Exceedances SO_2 15-minute mean > 266 µg m^{-3} Hourly mean > 350 µg m^{-3} Daily mean > 125 µg m^{-3}	Capture Rate (Percentage)
Jan-Dec 2002	0	49.6%
Jan-Dec 2003	0	97.2%
Jan-Dec 2004	0	99.7%
Jan-Dec 2005	0	97.6%
Jan – June 2006	0	91.9%
Jan – Dec 2007	0	99.4%
Jan – Dec 2008	0	96.6%

The data capture rate for the sulphur dioxide analyser at Rosebrook Grove exceeds 90% (with the exception of 2002 as monitoring did not commence until July that year). The data collated for the period does not show any exceedence of the objectives at the monitoring site.
Data obtained from Council's real time sulphur dioxide monitor and ratified by NETCEN for 2002 to 2006 is shown in Appendix 3. The Council will continue to monitor at this site.

Updating and Screening Assessment; Monitoring Data outside an Air Quality Management Area (AQMA)

Carrickfergus Borough Council has maintained a number of sulphur dioxide diffusion tube sites since 1997. The results form these sites is displayed in the graph below.



Updating and Screening Assessment; New Industrial Sources

There are no new industrial sources of sulphur dioxide in or close to the borders of the Carrickfergus area.

Updating and Screening Assessment; Industrial Sources with Substantially Increased Emissions

There are no industrial sources with substantially increased emissions in or close to the Carrickfergus Borough Council area.

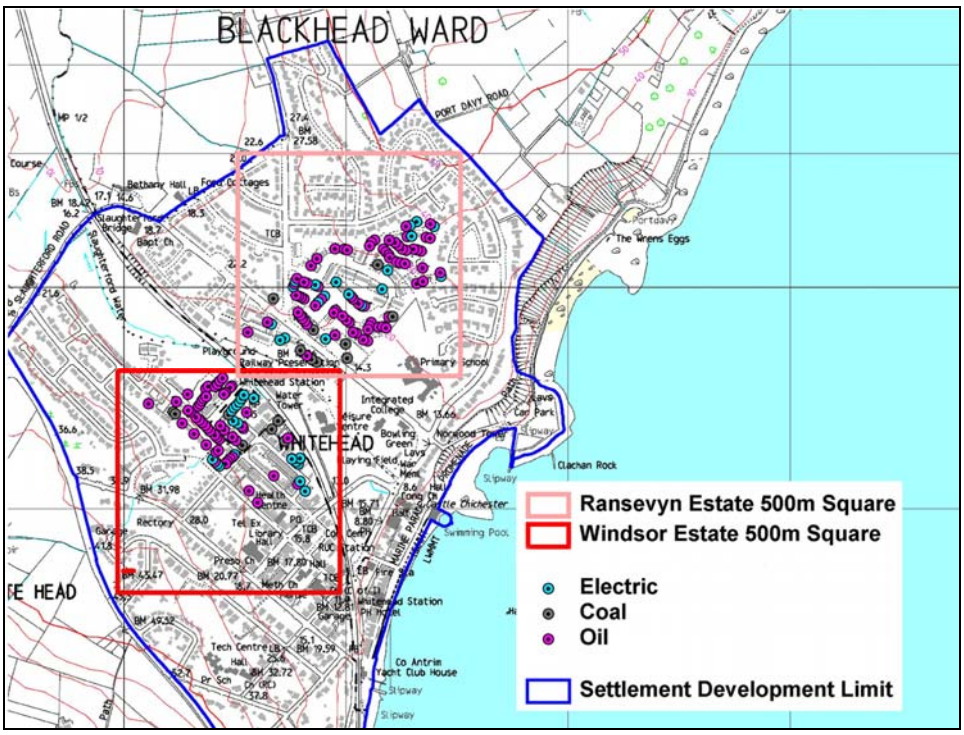
Updating and Screening Assessment; Small Boilers >5MW (Thermal)

All the boiler plants with an output greater than 5MW thermal within the Carrickfergus area were assessed at Stage 2 with no further assessment being required, this situation remains unchanged.

Updating and Screening Assessment; Areas of Domestic Coal Burning

Emissions from domestic sources within the largest solid fuel burning areas in the Borough were considered in the first round, with much of Carrickfergus town and Greenisland being modelled for the Stages 3 and 4 Review and Assessment.

Whilst it is considered that the first round review and assessment findings are still relevant, two 500 x 500m areas in Whitehead were identified, that had not previously been assessed and where solid fuel burning might be a problem. These areas are centred on the Windsor and Ransevyn housing estates in Whitehead as illustrated below.



Data obtained from the Northern Ireland Housing Executive (NIHE), identified tenanted properties and the fuel type in each dwelling. This information was used to establish the number of houses within these areas relying on solid fuel as the primary source of heating.

Work from the previous stage review and assessment indicated that these were the dwellings that are most likely to be reliant upon solid fuel as their primary heating source. Previous fuel use surveys indicated that once NIHE housing stock was sold the heating system was invariably changed from solid fuel to oil or more recently natural gas.

In the Ransevyn Estate the NIHE retains 97 tenanted properties or 20.5% of the total of 472 properties within the 500m square. The fuel use breakdown of these tenanted properties is as follows.

Ransevyn Estate

Fuel Type	Number of Dwellings	Overall Percentage
Oil	72	15.3%
Electric	20	4.2%
Solid Fuel	12	2.5%
Total	**104**	**22.7%**

In the Windsor Estate and surrounding area the NIHE has retained 91 tenanted properties or 16% of the total of 576 properties within the 500m square. The fuel use breakdown of these tenanted properties is as follows.

Windsor Estate

Fuel Type	Nos Dwellings	Percentage
Oil	51	8.6%
Electric	36	6.3%
Solid Fuel	6	1.2%
Total	**93**	**16.1%**

In both cases therefore, there is likely to be significantly less than 100 houses in the 500m x 500m areas to burning coal or solid fuel in any quantities, therefore it is not necessary to proceed to a detailed assessment.

Updating and Screening Assessment; Shipping

There are no longer any commercial ports within the Borough of Carrickfergus and therefore there are no significant emissions from shipping to consider.

Updating and Screening Assessment; Railway Locomotives

There are two railway stations and four halts within the Borough of Carrickfergus forming part of the Belfast to Larne railway line. Information obtained from Translink indicates that only one locomotive is stationary on the line for 13 minutes in the morning at Carrickfergus station. This being the case the guidance suggests it is not necessary to proceed to a detailed assessment.

Conclusion

This updating and screening assessment has indicated that the sulphur dioxide objectives are unlikely to be exceeded and therefore a detailed assessment will not be required.

2.2.4 Benzene

Benzene is a known human carcinogen (cancer causing substance), and also contributes to the formation of ground-level ozone (summer smog). The main sources of benzene emissions in the UK are petrol vehicles, petrol refining, and the fuel distribution from petrol stations without vapour recovery systems. National benzene concentrations have declined in recent years, mainly due to the increasing use of three-way catalytic converters and the introduction of vapour recovery systems in petrol stations.

Since January 2000, EU legislation has reduced the maximum benzene content of petrol to1%, from a previous upper limit of 5%. The European Auto-Oil programme will further reduce emissions for cars and light-duty vehicles, and emissions of benzene from the storage and distribution of petrol (LAQM.TG (03)).

Pollutant	Objective	To be achieved by
Benzene	**16.25µg/m^3 (5ppb) when expressed as a running annual mean**	**31 December 2003**
Benzene	**3.25µg/m^3 when expressed as a running annual mean**	**31 December 2010**

Conclusions from the First Round of Review and Assessment

The First Stage Review and Assessment of Air Quality for Carrickfergus Borough Council concluded that the objective for the pollutant was very likely to be achieved throughout the Borough.

Updating and Screening Assessment; Background Concentrations

The highest background concentration for any 1km grid square in the Carrickfergus area, taken from www.airquality.co.uk, is 0.737 µg/m^3 for 2003 and 0.691 µg/m^3 for 2010.

Updating and Screening Assessment; Monitoring Data

Benzene is not monitored locally within the Carrickfergus area. There are two national monitoring network sites in Belfast and Table 2 shows calendar year mean concentrations of benzene at these sites for 2008.

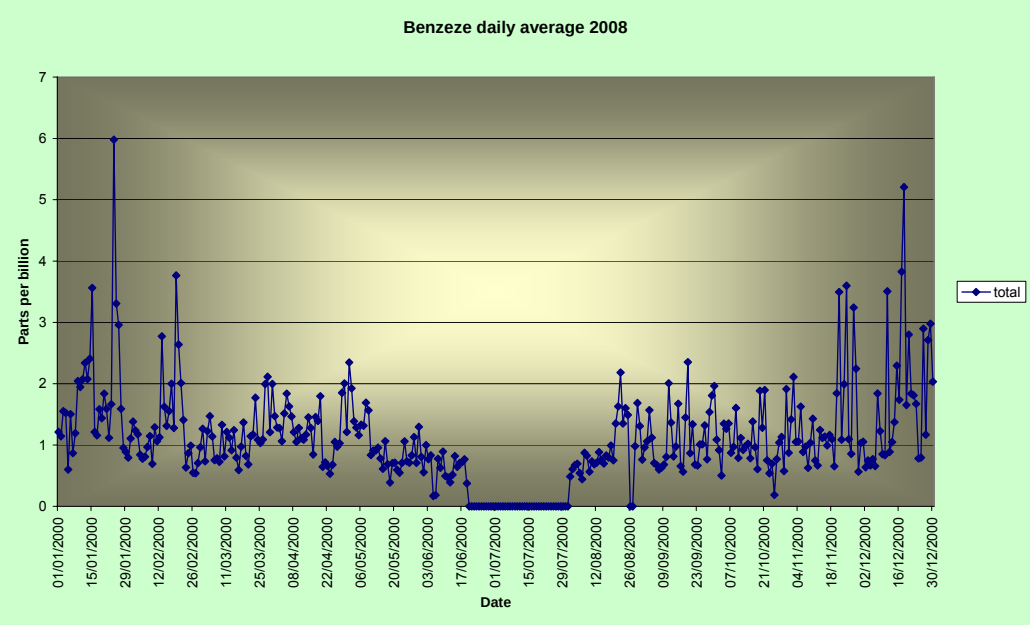
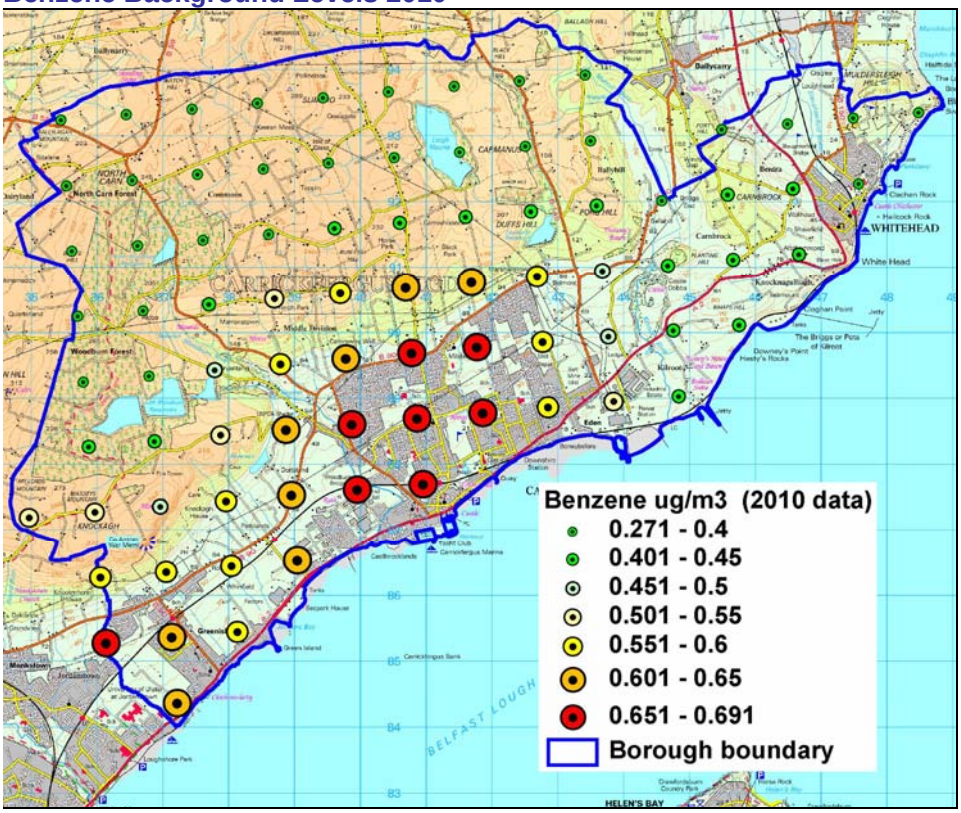


Table 2; Concentrations of Benzene, 2008

Site	Grid Ref.	Data Capture, %	Calendar Year 2008 Mean Concentration ppb
Belfast Centre	J 339 744	88%	1.23
Belfast Roadside	J 379 739	93%	2.69

The annual means for 2008, means of 1.23µg/m^3 and 2.69µg/m^3 for the two sites respectively, are within the 2003 Air Quality Strategy objective and also the 2010 objective for this pollutant.

Benzene Background Levels 2010



Updating and Screening Assessment; Very Busy Roads and Junctions In Built Up Areas

There are no roads or junctions which meet the criteria of 'very busy' given in the Technical Guidance LAQM.TG(09) (i.e. single carriageway roads where the daily average traffic flows exceed 80,000, or dual carriageways where the daily average traffic flows exceed 120,000 or motorways where daily average traffic flows exceed 140,000), where the 2010 background is expected to be above 2 $\mu g/m^3$.

Updating and Screening Assessment; Industrial Sources

Subsequent to the First Stage Review there are no recently commissioned industrial sources within, or close to, the Carrickfergus area which need further consideration regarding benzene.

Updating and Screening Assessment; Petrol Stations

There are 6 petrol filling stations within the Carrickfergus Borough Council area that have been issued with permits under the Pollution Prevention and Control Regulations (Northern Ireland) 2003 with an annual throughput in excess of 1000m^3 of petrol.

Petrol Station	Address	Petrol Throughput 2005 Litres
Raw Brae Service Station	Whitehead	520,000.
Cable Service Station	Belfast Road Whitehead	1,931,828
Carrick Milestone Service Station	Middle Road	3,231,394
Greenisland Service Station	Upper Road	1,433,679
Fortfield Service Station	Belfast Road	3,305,132
Clipperstown Service Station	Woodburn Road	2,100,000
Tesco Service Station	Minorca Place	8,647,730

NI Process Guidance note states that any new (or existing petrol station with a throughput > 3500m^3 must convert to stage 2 vapour recovery by 31st December 2009)
Of the petrol stations in the town of Carrickfergus one, Carrick Milestone converted to Stage 2 vapour recovery on 7th December 2007.

Only one of these, Fortfield Service Station, is located close to a road with approaching 27,020 vehicles per day (A2 Belfast Road) but this filling station does not have any residential properties within 10 metres of the pumps.

Fortfield Service Station

Updating and Screening Assessment; Major Fuel Storage Depots

There are no major fuel depots within the Borough.

Conclusion

The assessment has indicated that the benzene objectives are unlikely to be exceeded at any location within the borough, and therefore a detailed assessment will not be required.

3 Road Traffic Sources

3.1 Narrow Congested Streets with Residential Properties Close to the Kerb

Carrickfergus 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

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

Carrickfergus Borough Council has assessed new/newly identified busy streets where people may spend 1 hour or more close to traffic, that were not assessed in previous rounds of Review and Assessment, and concluded that **it will be necessary to proceed to a Detailed Assessment for nitrogen dioxide.**

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

There are no roads in Carrickfergus that fall into this classification

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

3.4 Junctions

A.4 Junctions (including busy roads and junctions in Scotland)		
Relevant pollutant	**Steps that must be taken to complete the assessment**	**Notes relevant to each step**
Nitrogen dioxide	**Overview** Concentrations are usually higher close to junctions, due to the combined impact o emissions on two roads, and to the higher emissions due to stop start driving. The assessment needs to cor both NO2 and PM10.	
	Approach	
	1. Identify "busy" junctions that are new, or were not previously assessed. This should include streets with new exposure, where exposure was previously not present.	If all such areas were considered during rounds and/or are within an existing AQM NO2 and PM10, then there is no need to further with this part. .A "busy" junction c taken to be one with more than10,000 ve day. For guidance on how to add flows a see Important Notes at the end of this Bo
	2. Determine whether there is relevant exposure within 10 m of the kerb (20 m in major conurbations).	A major conurbation may be considered city with a population in excess of 2 millio If there is no relevant exposure then ther need to proceed further.
	3. Obtain detailed information on traffic flows, speeds and percentage of heavy duty vehicles.	Heavy duty vehicles are all vehicles gr 3.5 tonnes gross. They include HGVs an
	4. Use the DMRB screening model (see Paras 2.18 to 2.20) to predict the current annual mean NO2 concentration and the number of 24-hour exceedences of 50 µg/m3 at relevant locations.	Information will be required on traffic flow speeds, and the proportion of different ve types, as well as on local background concentrations.

	Question		
	• Are any of the predicted annual mean NO_2 concentrations greater than 40 $\mu g/m^3$?	There are no areas in Carrickfergus that the 40 $\mu g/m^3$ for NO_2. There is however a junction which may give rise to figures ab level. Carrickfergus Borough Council fee be prudent to carry out a more detailed s this pollutant.	
	• Are more than 35, 24-hour PM_{10} concentrations above 50 $\mu g/m^3$ predicted?	There are no areas in Carrickfergus that the 50 $\mu g/m^3$ for PM_{10} 24-hour	
	Action		
	If the answer is YES to either of the above, it will be necessary to proceed to a Detailed Assessment for NO_2 and/or PM_{10} at these locations.	If there are monitoring data for these loca then use these results in preference to th model to reach a decision. This assumes have been quality assured (see Chapter Annex 1) and relate to worst-case locatio including those identified by the modellin	

Carrickfergus has assessed new/newly identified junctions meeting the criteria in Section A.4 of Box 5.3 in TG(09), and concluded that **it will be necessary to proceed to a Detailed Assessment for NO_2.**

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

There are no new roads within Carrickfergus that fall into the purview of Section A.5 of Box 5.3 of TG (09)

3.6 Roads with Significantly Changed Traffic Flows

There are no changes in traffic flow since the last submission

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

3.7 Bus and Coach Stations

Carrickfergus Borough Council confirms that there are no relevant bus stations in the District.

4 Other Transport Sources

4.1 Airports

Carrickfergus Borough Council confirms that there are no airports in the District.

4.2 Railways (Diesel and Steam Trains)

4.2.1 Stationary Trains

Carrickfergus 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.

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4.2.2 Moving Trains

Carrickfergus 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.

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4.3 Ports (Shipping)

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

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5 Industrial Sources

5.1 Industrial Installations

Carrickfergus 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.

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

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Carrickfergus 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.

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

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Carrickfergus 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

Carrickfergus Borough Council confirms that there are no petrol stations meeting the specified criteria**.**

5.4 Poultry Farms

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

6 Commercial and Domestic Sources

6.1 Biomass Combustion – Individual Installations

Carrickfergus Borough Council confirms that there are no biomass combustion plant in the District.

6.2 Biomass Combustion – Combined Impacts

Carrickfergus Borough Council confirms that there are no biomass combustion plant in the District.

6.3 Domestic Solid-Fuel Burning

Carrickfergus Borough Council confirms that there are no areas of significant domestic fuel use in the District.

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7 Fugitive or Uncontrolled Sources

Carrickfergus Borough Council confirms that there are no potential sources of fugitive particulate matter emissions in the District.

Conclusions and Proposed Actions

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7.1 Conclusions from New Monitoring Data

There were no exceedances for NO_2, SO_2, PM_{10} from details of diffusion tubes or continuous monitoring at the Air Quality Monitoring Station.

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7.2 Proposed Actions

There may be one new area in Carrickfergus that may be subject to assessment under LG(09). That is the new traffic lights in Minorca Place at the New Tesco's junction.

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8 References

Appendices

Appendix A: QA/QC Data

Appendix B: DMRB Calculations

Appendix 1

Summary of Traffic Data used in Updating and Screening Assessment.

Road Name	Vehicle Count	Year
A2 Shore Road, Tory Town, Trooperslane	27020	2008
A2 Shore Road, Tory Town, Trooperslane	26900	2005
A2 West of Quay Lane	6931	1991
Eden Village	9787	1995
Prospect Road	3357	1996
New Line	2274	1995
Castle Road	3702	1998
Downshire Road	1520	1998
Victoria Road	6758	1998
Prince Andrew Way	3503	1988
North Road	11310	1997
Woodburn Road	6634	1983
Albert Road	12320	1996
Antrim Street	2958	1988
Davys Street	9870	1994
High Street	3500	1988
Lancasterian Street	4549	1988
Irish Quarter West	4320	1996
Minorca Place	9799	1996
Alexander Road	4180	1998
A2 West JTown Stn Rd	28165	2001
B 90	9925	2001
B90 West of Giland Stn Road	13203	2001

Appendix 2

Appendix 2
Quality Assurance and Quality Control of diffusion tubes (QA/QC).

The nitrogen dioxide diffusion tubes used in this study were supplied and analysed by Casella CRE Air.

Casella CRE Air has a defined quality system, which forms part of the UKAS accreditation that the laboratory holds. All accredited methods are fully documented. UKAS assessors visit on an annual basis and review all aspects of the analysis, from sample handling to analysis and reporting. As a condition of accreditation, the laboratory is required to participate in any suitable proficiency schemes in operation. Casella CRE Air participates in the WASP scheme organised by the Health and Safety Laboratory.

Any result from such a scheme that falls outside the relevant limits is immediately investigated and steps taken to rectify the situation. The Quality Manager at Casella also assesses all external proficiency schemes results. The Quality Manager also carries out internal audits.

Quality Control at Casella CRE Air

A series of ten quality control check solutions are analysed before any samples in order to check system stability and performance.

A quality control check is run after every ten samples and is assessed against warning and action limits defined in the method. Quality control solutions are prepared from standards supplied by a different vendor to that of the calibration standards.

An external quality control check solution prepared by NETCEN is analysed once per month in order to check internal QC. Results of this check are reported back to NETCEN.

Tube preparation and analysis

The NO_2 tubes are prepared and analysed in a separate, designated part of the laboratory. Ambient nitrogen dioxide concentrations within the laboratory are monitored routinely. Blanks from each batch of tubes prepared in the laboratory are retained for verification.

Incoming samples are stored in a fridge used solely for this purpose. Calibration standards, QC solutions and other reagents are stored in a separate fridge.

The analyst checks data as it is generated and QC data is plotted immediately after it is obtained. All raw data and data transfer is checked by the supervisor, data entry

into the Laboratory Information Management System is also checked and the final reports are checked before signing.

Carrickfergus Borough Council QA/QC.

Our QA/QC procedure is to ensure that when a tube batch is received they are stored in a refrigerator. On the day of sampling they are removed from the fridge and installed. Laboratory blanks are retained in the fridge and are taken out only when the exposed tubes are being returned to the laboratory.

When tubes are collected from sampling sites they are immediately packaged and sent to the laboratory for analysis.