Air Quality in the District of Richmondshire

Progress Report

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Executive Summary

This Progress Report was produced as a requirement of Part IV of the Environment Act 1995, which requires all Local Authorities to periodically review and assess the current and likely future air quality within their Districts. Areas which are unlikely to achieve the set air quality objectives must be designated Air Quality Management Areas (AQMA'S).

The first round of Review and Assessment was completed for the District of Richmondshire in 2000. No potential exceedences of the air quality objectives were identified and therefore no AQMA's were declared.

The second round of Review and Assessment began in 2003 with an Updating and Screening of Air Quality (USA) in the District of Richmondshire. This reported available monitoring data and identified pollutant sources. The USA would be repeated every three years, with Progress Reports being produced in the intervening years, unless a Detailed Assessment was required for any of the pollutants under investigation. The conclusions of the 2003 USA were that no further action was required for sources of carbon monoxide, benzene, 1,3-butadiene, lead, nitrogen dioxide and PM_{10}.

A Detailed Assessment was found to be necessary for sulphur dioxide emissions from domestic solid fuel burning in a small number of densely populated settlements that do not have mains gas supplies.

The conclusions of the Detailed Assessment were that sulphur dioxide emissions from domestic solid fuel burning do have an impact on atmospheric concentrations, but no likely exceedences of the objectives were identified. There was no requirement, therefore, to declare Quality Management Areas (AQMA) for sulphur dioxide at any location within the District. Due to technical problems during the monitoring exercise, the Detailed Assessment was not completed by the end of April 2004, but instead was submitted along with the 2005 Progress Report.

The conclusions of the 2005 Progress Report were that no further action was required for sources of carbon monoxide, 1,3-butadiene, lead, nitrogen dioxide and PM_{10} and sulphur dioxide as there was no likelihood of the exceedence of any of the air quality objectives for the above-mentioned pollutants.

The third round of Review and Assessment began in 2006 with another Updating, Screening and Assessment. The 2006 USA concluded that no action was required for sources of any of the pollutants outlined in Table 1 as no likely exceedences air quality objectives were identified.

This, the 2007 Progress Report, highlights any changes within the District since the 2006 USA which could potentially cause an exceedence of any of the air quality objectives set by the government.

Air Quality Progress Report For the District of Richmondshire

Introduction

This progress report has been produced as a requirement of Part IV of the Environment Act 1995. This places a duty on Local Authorities to periodically review and assess the current and likely future air quality in their area. The role of this process is to identify areas where it is unlikely that the air quality objectives will be achieved. If necessary, these areas will be designated as Air Quality Management Areas (AQMA's) and subject to active management.

Air quality changes in response to changes to emitting activities. Air quality objectives and Review and Assessment guidance change with advances in knowledge. Review and Assessment is a long-term, rolling process, structured in a series of rounds. The first round has been completed and concluded that no objective exceedences were likely, although domestic coal burning as a source of sulphur dioxide had not been considered[i].

For round two, the Local Air Quality Management Technical Guidance (LAQM. TG(03))[ii] sets out a phased approach to review and assessment. The guidance prescribed an initial Updating and Screening Assessment (USA), which was completed in July 2003 on behalf of Richmondshire District Council by Air Quality Consultants, Bristol[iii]. The purpose of this was to identify any changes since the first round that could result in the exceedence of any of the air quality objectives.

The conclusions of the USA were that a Detailed Assessment for sulphur dioxide was required because of the emissions from domestic coal burning in some densely populated rural locations that do not have a mains gas supply. This took the form of a fuel use survey, completed in July 2003 on behalf of Richmondshire District Council by Air Quality Consultants, Bristol[iv]. This identified the town of Middleham, near Leyburn, as being most at risk of exceeding the sulphur dioxide objectives. The same consultancy arranged for monitoring of sulphur dioxide to take place in the winter of 2003/4, however, problems obtaining quality assured data from the monitor meant that the exercise had to be repeated the following year. The completed Detailed Assessment[v] by Air Quality Consultants was submitted with the 2005 Progress Report[vi] and concluded that sulphur dioxide emissions from domestic solid fuel burning do have an impact on atmospheric concentrations in Middleham, but no likely exceedences of the objectives were identified. There was no requirement therefore to declare an Air Quality Management Area (AQMA) in Middleham or - as Middleham was identified as the worst case scenario - any other location within the District.

The 2005 Progress Report concluded there was no likelihood of the exceedence of any of the other air quality objectives.

The third round of Review and Assessment begin in 2006 with another Updating and Screening Assessment (USA).[vii] The 2006 USA concluded that there was no likelihood of exceedences of any of the air quality objectives.

The Government's Air Quality Strategy for England, Scotland, Wales and Northern Ireland[viii] and the addendum to it, published in February 2003[ix] set out a framework for air quality improvements. It defines both standards and objectives for each of a range of pollutants. The standards are based on scientific and medical evidence and are set at levels below which risks to public health, even in sensitive groups, would be very slight. The 'objectives' set out the extent to which the Government expects the standards to be achieved by a certain date. They take account of the costs, benefits, feasibility and practicality of achieving the standards. The objectives are prescribed within The Air Quality (England) Regulations 2000[x] and The Air Quality (England) (Amendment) Regulations 2002[xi]. Table 1 summarises the objectives relevant to this report.

An Updating and Screening Assessment is required every 3 years, the last one being in 2006. The years between, unless a Detailed Assessment is being performed, require a Progress Report to be produced. This ensures continuity in the Local Air Quality Management process by reporting any potential changes in air quality that may occur between the Updating and Screening Assessments. A Progress Report was not produced by Richmondshire District Council in 2004 because of the Detailed Assessment for sulphur dioxide. The next Updating and Screening Assessment is due by the end of April 2009.

The next section outlines the current position within the District of Richmondshire regarding the 7 pollutants for which the Government have provided objectives.

Table 1: Air Quality Objectives Relevant to This Report.

Pollutant	Time Period	Objective	To be achieved by[1]
Benzene	Running annual mean	16.25 μg/m^3	2003
	Annual mean	5 μg/m^3	2010
1,3-Butadiene	Running annual mean	2.25 μg/m^3	2003
Carbon Monoxide	Maximum daily running 8-hour mean	10 mg/m^3	2003
Lead	Annual mean	0.5 μg/m^3	2004
	Annual mean	0.25 μg/m^3	2008
Nitrogen Dioxide	1-hour mean	200 μg/m^3 not to be exceeded more than 18 times a year	2005
	Annual mean	40 μg/m^3	2005
Sulphur Dioxide	1-hour mean	350 μg/m^3 not to be exceeded more than 24 times a year	2004
	24-hour mean	125 μg/m^3 not to be exceeded more than 3 times a year	2004
	15-minutes mean	266 μg/m^3 not to be exceeded more than 35 times a year	2005
Fine particles (PM_{10})[2]	24-hour mean	50 μg/m^3 not to be exceeded more than 35 times a year	2004
	Annual mean	40 μg/m^3	2004
	24-hour mean [3]	50 μg/m^3 not to be exceeded more than 7 times a year	2010
	Annual mean [3]	20 μg/m^3	2010

[1] The achievement dates are all by the end of the specified year.

[2] Measured by the gravimetric method.

[3] Provisional objectives not included in the Regulations.

Carbon Monoxide (CO)

Introduction

Carbon monoxide is a colourless, odourless, poisonous gas that is produced by the incomplete combustion of carbon-containing fuels, such as fossil fuels and other hydrocarbons.

Exposure to very high concentrations of CO may promote the formation of carboxyhaemoglobin in the blood, which reduces the capacity to carry oxygen. Effects are most pronounced in those suffering from an existing disease which affects the delivery of oxygen to the heart or brain.

CO Objectives

To bring the objective in line with the second Air Quality Daughter Directive limit value, the UK Government and Devolved Administrations have set a maximum daily running 8-hour mean concentration of 10μg/m^3 for carbon monoxide, to be achieved by the end of 2003.

Findings of 2006 Updating and Screening Assessment of Air Quality in the District of Richmondshire

The 2006 Updating and Screening Assessment of Air Quality in the District of Richmondshire found there was no risk of the above objective being exceeded and therefore no further monitoring was required. There was also no need to progress to a detailed assessment for carbon monoxide.

New Monitoring Data

None required.

New Local Developments

There have been no new developments that would have a significant effect on CO concentrations.

Conclusions for Carbon Monoxide

No further action required for CO.

Benzene (C_6H_6)

Introduction

Benzene is a volatile organic compound. It is a minor constituent of petrol and is released from petrol-engined vehicle exhausts and due to fugitive emissions from petrol refining and distribution. Small amounts are derived from diesel fuel.

Benzene is a genotoxic human carcinogen, related to excess risk of leukaemia.

Benzene Objectives

The UK Government and Devolved Administrations have adopted a running annual mean concentration of 16.25μg/m^3 as the air quality standard for benzene, with an objective for the standard to be achieved by the end of 2003. Following health advice from EPAQS and the Department of Health's Carcinogenicity of Chemicals in Food, Consumer Products and the Environment (COC) to reduce concentrations of benzene in air to as low as possible, an annual mean objective of 5μg/m^3 has been set. This is to be achieved by the end of 2010.

The EU second Air Quality Daughter Directive includes an annual mean of 5μg/m^3 to be achieved by 1 January 2010.

Findings of 2006 Updating and Screening Assessment of Air Quality in the District of Richmondshire

The 2006 Updating and Screening Assessment of Air Quality in the District of Richmondshire found there was no risk of the above objective being exceeded and therefore no further monitoring was required. There was also no need to progress to a detailed assessment for benzene.

New Monitoring Data

None required.

New Local Developments

There have been no new developments that would have a significant effect on benzene concentrations.

Conclusions for Benzene

No further action required for benzene.

1,3-Butadiene (C_4H_6)

Introduction

1,3-butadiene is a colourless, flammable gas at room temperature. It is used in industry for the production of rubber, but its main source is from the combustion of petrol and other automotive fuels.

1,3-butadiene is a genotoxic human carcinogen, linked to cancers of the lymphoid system and blood forming tissues, lymphomas and leukaemia.

1,3-Butadiene Objectives

The UK Government and Devolved Administrations have adopted a maximum running annual mean concentration of 2.25μg/m^3 as the air quality standard for 1,3-butadiene. The objective is for the standard to be achieved by the end of 2003.

Findings of 2006 Updating and Screening Assessment of Air Quality in the District of Richmondshire

The 2006 Updating and Screening Assessment of Air Quality in the District of Richmondshire found there was no risk of the above objective being exceeded and therefore no further monitoring was required. There was also no need to progress to a detailed assessment for 1,3-butadiene.

New Monitoring Data

None required.

New Local Developments

There have been no new developments that would have a significant effect on 1,3-butadiene concentrations.

Conclusions for 1,3-Butadiene

No further action required for 1,3-butadiene.

Lead (Pb)

Introduction

Lead is a dense, dull grey, soft and malleable metallic element. It is extracted mainly from the ore galena (lead sulphide) (PbS). Particulate lead in air results from activities such as fossil fuel combustion (including vehicles), metal processing industries and waste incineration. Its single largest industrial use world-wide is in the manufacture of batteries. As tetraethyl lead, it has been used for many years as an additive in petrol; however the sale of leaded petrol was banned in the UK on 1 January 2000.

Exposure to very high levels may result in toxic biochemical effects, causing problems in the synthesis of haemoglobin and the possible inhibition of intellectual development in infants as well as effects on the kidneys, gastrointestinal tract, joints and reproductive system, and acute or chronic damage to the nervous system.

Lead Objectives

The UK Government and Devolved Administrations have adopted an annual mean concentration of 0.5μg/m^3 as the air quality standard for lead, with an objective for the standard to be achieved by the end of 2004. A lower air quality objective of 0.25μg/m^3 has also been set, to be achieved by the end of 2008.

Findings of 2006 Updating and Screening Assessment of Air Quality in the District of Richmondshire

The 2006 Updating and Screening Assessment of Air Quality in the District of Richmondshire found there was no risk of the above objectives being exceeded and therefore no further monitoring was required. There was also no need to progress to a detailed assessment for lead.

New Monitoring Data

None required.

New Local Developments

There have been no new developments that would have a significant effect on lead concentrations.

Conclusions for Lead

No further action required for lead.

Nitrogen Dioxide (NO_2)

Introduction

Oxides of nitrogen are produced by all combustion processes. These include nitric oxide (NO) and nitrogen dioxide (NO_2), which together are known as nitrogen oxides (NO_X). The majority of NO_X emissions are in the form of NO. NO then reacts with ozone (O_3) in the atmosphere to produce NO_2 which can give rise to adverse health effects.

About half of the emissions of NO_X in the UK come from road transport. Other significant contributors are combustible fuel power stations and industry. Road transport has the greatest effect upon low-level NO_X concentrations. The highest levels are found within a narrow band a few meters wide running alongside the busiest roads.

Short-term exposure to high concentrations of NO_2 may cause inflammation of respiratory airways. Long-term exposure may affect lung function and enhance responses to allergens in sensitised individuals. Asthmatics are particularly vulnerable.

NO_2 Objectives

The United Kingdom Government and the Devolved Administrations have adopted two Air Quality Objectives for nitrogen dioxide. The first is an annual mean of 40μg/m^3 and the second is a 1-hour mean concentration of 200μg/m^3 not to be exceeded more than 18 times a year. These objectives were to be achieved by the end of 2005. This stems from the European Union First Daughter Directive which includes a 1-hour limit value of 200μg/m^3 not to be exceeded more than 18 times a year and an annual mean limit value of 40μg/m^3. These values do not have to be achieved until 1 January 2010. Only the annual mean is calculated in Richmondshire, as concentrations of nitrogen dioxide have so far been well below the objective.

Findings of 2006 Updating and Screening Assessment of Air Quality in the District of Richmondshire

No further action was required for nitrogen dioxide other than to continue the monitoring outlined below.

New Monitoring Data

Nitrogen Dioxide has been measured using diffusion tubes at four locations in Richmond, formerly as part of the now defunct National Diffusion Tube Network. They now provide valuable information regarding NO_2 levels and assist with the process of local air quality management.
The tubes are supplied by Harwell Scientifics. Jesmond Dene Laboratory In Newcastle upon Tyne which is part of the WASP laboratory intercomparison scheme, analyses the diffusion tubes. The tubes contain a mesh which is

doped with 50% v/v triethanolamine (TEA) in acetone. They are exposed according to the monthly schedule dictated by NETCEN. The above arrangements remain the same as those described in the 2003 and 2006 Updating and Screening Assessments of Air Quality in the District of Richmondshire.

The locations of the diffusion tubes are outlined in table 2 below and illustrated in map 1.

Table 2: Diffusion Tube Locations

Richmondshire Site Reference	NO_2 Network Site Reference	Location	Easting	Northing
R1	7N (Code 83536) Roadside	38 Victoria Road Richmond North Yorkshire DL10 4UA	416,688	501,097
R2	2N (Code 81750) Roadside	5 Queens Road Richmond North Yorkshire DL10 4AJ	417,180	501,125
R3	8N (Code 83537) Roadside	Nursery 47 Darlington Road Richmond North Yorkshire DL10 7BG	418,066	501,490
R4	6N (Code 82723) Background	1 White Rose Crescent Richmond North Yorkshire DL10 7DW	418,504	501,455

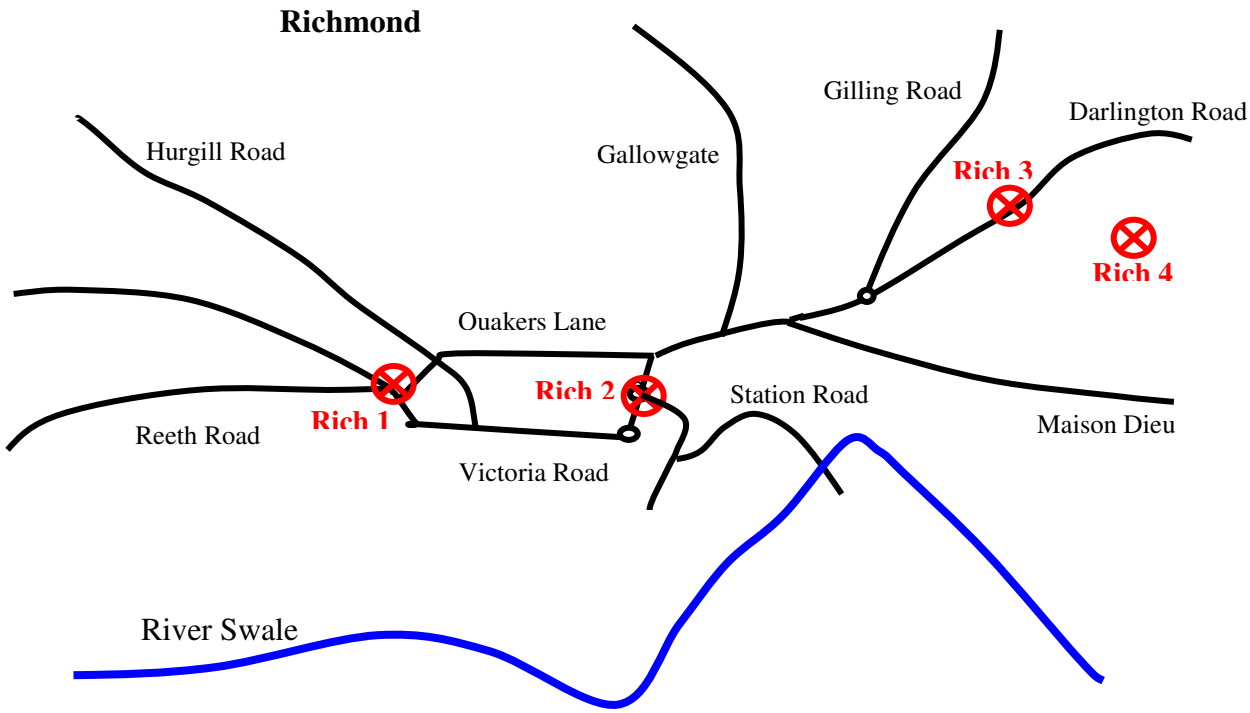
Table 3 details the supply, analysis and QA/QC (quality assurance and quality control) methods for the diffusion tubes.

Table 3: Nitrogen Dioxide Diffusion Tube Monitoring QA/QC

Supply	AEA Technology, Harwell Scientifics
Analysis	Jesmond Dene Laboratory
Preparation Method	50% v/v TEA in acetone
Type of tube	Palmes tube
Type of absorbent	Doped triethanolamine mesh
Membership of inter-laboratory comparison scheme	WASP
Method accreditation	No accreditation for laboratory

Nitrogen Dioxide Diffusion Tube Monitoring Locations in Richmondshire

⊗ Diffusion Tube Monitoring Locations



Map 1: Diffusion Tube Locations in Richmond, North Yorkshire

Table 4: 2006 Diffusion Tube Bias and Bias Adjustment Factor Calculated From Diffusion Tube (50% v/v TEA in acetone) / Automatic Chemiluminesence Monitor Co-location Studies[xii]

Year	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) ($\mu g/m^3$)	Automatic Monitor Mean Conc. (Cm) ($\mu g/m^3$)	Bias (B) (Dm-Cm)/Cm	Bias Adjustment Factor (A) (Cm / Dm)
2006	Gateshead Council	12	46	40	16.1%	0.86
	Gateshead Council	12	50	36	37.9%	0.73
	Gateshead Council	11	42	36	16.8%	0.86
	Gateshead Council	11	43	36	19.9%	0.83
	Newcastle upon Tyne C.C.	12	49	43	13.1%	0.88
	Newcastle upon Tyne C.C.	10	37	30	23.2%	0.81
	AEA E&E Intercomparison	12	121	111	8.5%	0.92
7 studies - Overall Bias (B) use 19.36%; Overall Factor use 0.84						

It is known that there are systematic differences in the performance of different laboratories and preparation methods of diffusion tubes. Table 4 shows the studies that have been used to compare results from diffusion tubes (analysed by the same laboratory as used by Richmondshire District Council) to results of co-located automatic chemiluminesence monitors, where data has been collected for 9 months or more. The results are for 2006, and contain data for the 12 months following those contained in the last Updating and Screening Assessment.

From these studies it can be seen that the overall bias (B) over this period is 19.36% (i.e. the diffusion tubes were over-reading by an average of 19.36%). A bias adjustment factor (A) of 0.84 has therefore to be applied (multiplied) to the diffusion tube results for this period. Table 5 shows the data obtained from the national network diffusion tube sites before the application of the bias adjustment factor and table 6 shows them after.

Table 5: Annual Mean Measured Nitrogen Dioxide Concentrations (µg/m^3) at the National Network Diffusion Tube Sites

	Roadside			Background
	R1 (7N)	R2 (2N)	R3 (8N)	R4 (6N)
2006	26	32	24	17

Table 6: Annual Mean Measured Nitrogen Dioxide Concentrations (µg/m^3) at the National Network Diffusion Tube Sites After Application of Bias Adjustment Factor (0.84)

	Roadside			Background
	R1 (7N)	R2 (2N)	R3 (8N)	R4 (6N)
2006	22	27	20	14

The objectives for NO_2 had to be achieved by the end of 2005. This was achieved within Richmondshire. Correction factors are used to predict NO_2 concentrations in years where data is unavailable. The correction factors used are outlined in table 7 and are obtained from Local Air Quality Management Technical Guidance (LAQM. TG(03))[ii].

Table 7: Correction Factors to Estimate Annual Average NO_2 Concentrations in Future Years from Measured Data at Roadside Sites

Year	Correction Factor	Year	Correction Factor
1999	1.075	2005	0.892
2000	1.033	2006	0.863
2001	1.000	2007	0.832
2002	0.969	2008	0.799
2003	0.941	2009	0.765
2004	0.915	2010	0.734

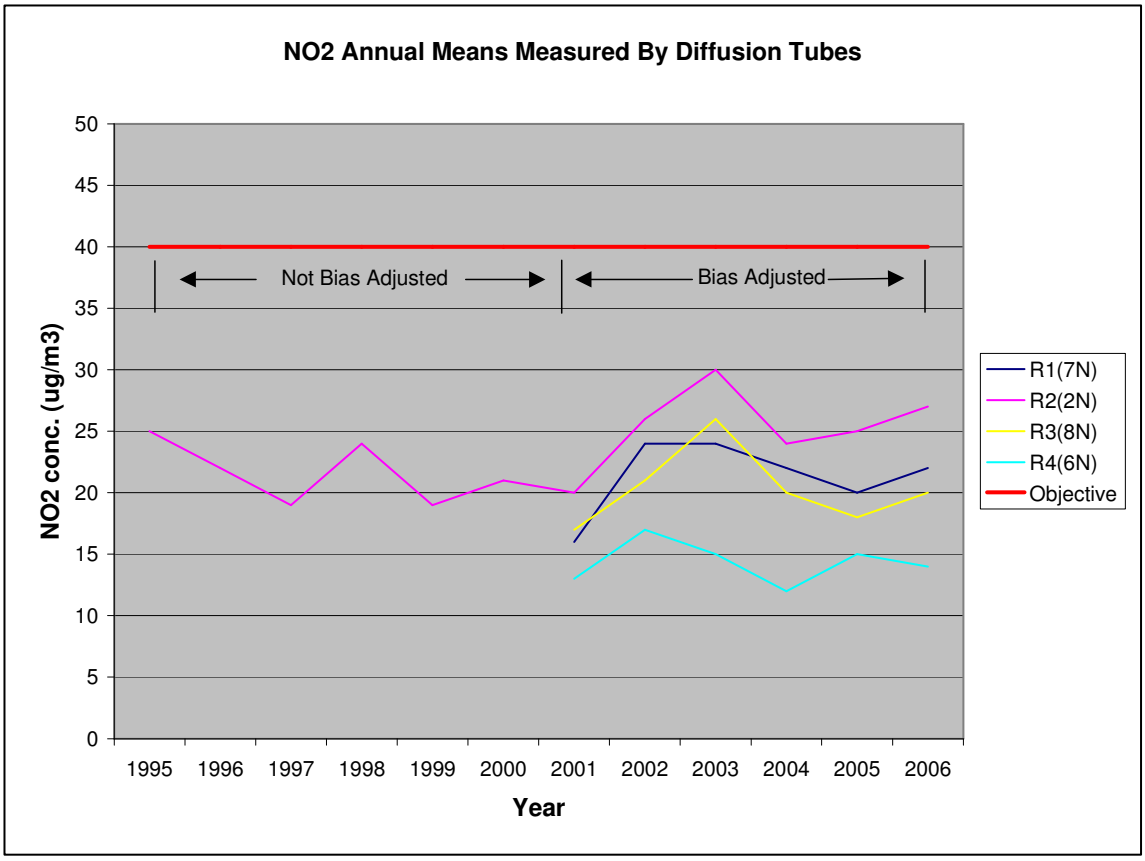
Table 8 shows the future projections for 2007 based on the annual average values from 2006. None of the values obtained exceed, or are likely to exceed the annual mean objective of 40µg/m^3 in 2007. This is illustrated in Figure 1. The data from site R2 (2N) is not bias adjusted before 2001.

Table 8: Future Projections of Bias Adjusted Annual Mean Measured Nitrogen Dioxide Concentrations (µg/m^3) at the National Network Diffusion Tube Sites

	Roadside			Background
	Objective = 40µg/m^3 in 2005			
	R1 (7N)	R2 (2N)	R3 (8N)	R4 (6N)
2006	22	27	20	14
2007	22x(0.832/0.863) =**21**	27x(0.832/0.863) =**26**	20x(0.832/0.863) =**19**	14x(0.832/0.863) =**13**
2010	22x(0.734/0.863) =**19**	27x(0.734/0.863) =**23**	20x(0.734/0.863) =**17**	14x(0.734/0.863) =**12**

Future Projections Based on Factors in Review and Assessment Technical Guidance LAQM.TQ(03), Defra 2003

Figure 1 Nitrogen Dioxide Annual Means Measured By Diffusion Tubes



New Local Developments

The last 12 moths have seen work commence by the Highways Agency to convert the A66 to dual carriageway on sections between Greta Bridge and Stephen Bank and Carkin Moor and Scotch Corner. The reason for the conversion is to avoid accidents caused by frustrated drivers overtaking slow-moving traffic. No increase in traffic is expected as a result. The majority of the development lies within Richmondshire.

An Environmental Statement for the development was produced on behalf of the Highways Agency by Mouchel Parkman of Northallerton, North Yorkshire[xiii]. In this statement several locations were predicted as exceeding the annual mean air quality objective for nitrogen dioxide. The predictions are summarised in Table 9. The predictions contradict the findings of the 2003 and 2006 Updating and Screening Assessments produced by Richmondshire District Council.

Table 9: Environmental Statement Predicted Nitrogen Dioxide Levels at Locations Along the A66 Comparing the "With Scheme" to the "Do Minimum" Situation in the Year 2006

Location	2006 Annual Mean NO_2 (µg/m^3) Objective = 40 µg/m^3	
	Do Minimum	With Scheme
Grove House	41	36
The Lodge (Hargill)	46	39
Granary Cottage	50	43
Gatherley Moor Farm	50	43
The Lodge (Sedbury)	49	45
Lay-by Cafe	41	33
Vintage Motel	46	39
Scotch Corner Hotel	57	56

To monitor nitrogen dioxide levels by the A66 Richmondshire District Council placed a diffusion tube at Gatherley Moor Farm for 7 months between January and August 2004. This tube was not part of the National Diffusion Tube Network however, following the Technical Guidance, [ii] the results obtained can be used to adjust the Environmental Statement predictions.

The mean NO_2 concentration measured for this period was bias adjusted using collocation data obtained for the same period by the Jesmond Dene Laboratory. The bias adjustment is summarised in Table 10.

Table 10: Bias Adjustment for 7 Month Period from January to August 2004

Diff Tube Mean (Dm) (µg/m^3)	Monitor Mean (Cm) (µg/m^3)	Bias (Dm-Cm)/Cm	Bias Adjustment Factor (Cm / Dm)
25	27	-0.074	1.08

The results from table 10 show the bias to be –0.074. This means the tube was under reading by 7.4%. The mean concentration for this period must therefore be multiplied by the bias adjustment factor 1.08. The mean diffusion tube NO_2 concentration at Gatherley Moor Farm for this period was 28µg/m^3.

The bias adjusted figure **M** = 28 x 1.08 = **30µg/m^3.**

As there is not enough data to give an annual mean for 2004, it is necessary to calculate the annual mean.

The annual means from the four Richmondshire diffusion tubes from the previous year, 2003, are taken and the ratio of the annual mean to the period mean at Gatherley Moor Farm is calculated for each site. This is summarised in Table 11.

Table 11: Calculation of Annual Site Mean for Gatherly Moor Farm

Long-term site	Annual mean 2003 (Am)	Period Mean 2004 (Pm)	Ratio (R) (Am/Pm)
R1	24	25	0.960
R2	30	21	1.429
R3	26	20	1.300
R4	15	12	1.250
		Average (Ra)	1.235

Annual mean for **2003** at Gatherley Moor Farm is:

$$\mathbf{M \times Ra} = 30 \times 1.235 = 37 \mu g/m^3.$$

To convert the result to that expected for 2006, the year of the predicted annual mean objective failure, the correction factors from Table 7 are used.

Annual mean for **2006** at Gatherley Moor Farm is:

$$37 \times (0.863/0.941) = 34 \mu g/m^3.$$

The ratio of the annual NO_2 means for 2006 for Gatherley Moor Farm derived from the measured diffusion tube data and Environmental Statement do minimum prediction can be expressed as 34/50 = 0.68.

This ratio can be used as a correction factor and multiplied by the Environmental Statement predicted annual means at the locations in Table 9. The results are presented in Table 12 below.

Table 12: Corrected Environmental Statement Predicted Nitrogen Dioxide Levels at Locations Along the A66 Comparing the "With Scheme" to the "Do Minimum" Situation in the Year 2006

Location	2006 Annual Mean NO_2 (µg/m^3) Objective = 40 µg/m^3	
	Do Minimum	With Scheme
Grove House	29	24
The Lodge (Hargill)	31	27
Granary Cottage	34	29
Gatherley Moor Farm	34	29
The Lodge (Sedbury)	33	31
Lay-by Cafe	28	22
Vintage Motel	31	27
Scotch Corner Hotel	39	38

All of the annual means for "do minimum" are within the objective of 40 µg/m^3 and the dual carriageway scheme is predicted to lower them further. Since these results were for 2006 and the objective had to be achieved by the end of 2005, the correction factors from Table 7 can again be used to calculate whether this was achieved. A projection can also be made up to 2010 to see if there is a possibility of future exceedences. The results for the site with the highest predicted values, the Scotch Corner Hotel "do minimum", are presented in Table 13.

Table 13: Annual Mean NO2 Concentration Calculations for the Scotch Corner Hotel for 2005 and 2010

Location	Annual Mean NO_2 (µg/m^3) Objective = 40 µg/m^3	
	2005	2010
ScotchCorner Hotel	40	33

Table 13 demonstrates that the 2005 annual mean objective for nitrogen dioxide was met at the Scotch Corner Hotel and therefore at the other locations along the A66 which had lower predicted values. Nitrogen dioxide levels are predicted to fall to 2010.

Conclusions for Nitrogen Dioxide

No further action required for nitrogen dioxide.

Sulphur Dioxide (SO_2)

Introduction

Sulphur Dioxide is an acidic gas found naturally in releases from volcanoes, oceans, biological decay and forest fires. Man-made sources are the combustion of fossil fuels, smelting, manufacture of sulphuric acid, conversion of wood pulp to paper, incineration of refuse and production of elemental sulphur.
The principal source of this gas in the UK is power stations burning fossil fuels which contain sulphur. The last 40 years have seen a decline in coal burning (domestic, industrial and in power generation) As a result, ambient concentrations of this pollutant in the UK have decreased steadily over this period.

Very high concentrations of SO_2 may constrict respiratory airways by stimulating nerves in the lining of the nose, throat and lung. Asthmatics and those with chronic lung disease will be particularly at risk.

SO_2 Objectives

The UK Government and Devolved Administrations have adopted a 15-minute mean of 266μg/m^3 as an air quality standard for SO_2, with an objective for the standard not to be exceeded more than 35 times in a year by the end of 2005. Objectives have also been set equivalent to EU limit values specified in the First Air Quality Daughter Directive. These are, a one hour mean objective of 350μg/m^3 to be exceeded no more than 24 times per year and a 24-hour objective of 125μg/m^3 to be exceeded no more than 3 times per year, to be achieved by the end of 2004.

Findings of 2006 Updating and Screening Assessment of Air Quality in the District of Richmondshire

The 2006 Updating and Screening Assessment of Air Quality in the District of Richmondshire found a Detailed Assessment was necessary for sulphur dioxide emissions from domestic solid fuel use. No further action was required for any other sources of sulphur dioxide.

New Monitoring Data

None required.

New Local Developments

There have been no new developments that would have a significant effect on SO_2 concentrations.

Conclusions for Sulphur Dioxide

No further action required for sulphur dioxide.

Particulate Matter Less Than 10μm In Diameter (PM_{10})

Introduction

PM_{10} is a complex mixture of organic and inorganic substances present in the atmosphere both as liquids and solids. It can be divided into 3 main groups:

Primary Particulates (fine particles)
- Formed by combustion processes;
- Emitted directly to atmosphere;
- <2.5μm diameter.

Secondary Particulates (fine particles)
- Formed in atmosphere from reaction between NO_X and SO_2;
- <2.5μm depending on humidity.

Tertiary Particulates (course particles)
- Formed by non-combustion processes;
- Contain crustal materials from road transport, the construction industry, mineral extraction processes, wind-blown dusts and soils, sea salt and biological particles.
- >2.5μm.

The principal source of PM_{10} in the UK used to be as a result of domestic coal burning for heating. However, with the introduction of smokeless zones and alternative fuels, the main source of PM_{10} is now from diesel engines.

Due to its size, PM_{10} penetrates deep into the lungs. Long-term exposure to PM_{10} is associated with a marked reduction in life expectancy, primarily due to increased heart and lung disease and lung cancer mortality. Impaired lung function in both children and adults has also been identified. Short-term exposure is associated with increased mortality in susceptible individuals, such as those with asthma and COPD (chronic, obstructive, pulmonary disorder).

PM_{10} Objectives

The UK Government and Devolved Administrations have adopted two Air Quality Objectives for PM_{10}, which are equivalent to the EU Stage 1 limit values in the First Air Quality Daughter Directive. The objectives are 40μg/m^3 as the annual mean, and 50μg/m^3 as the fixed 24-hour mean to be exceeded on no more than 35 days per year, to be achieved by the end of 2004. The objectives are based upon measurements carried out using the European gravimetric transfer reference sampler or equivalent.

The EU has set indicative limit values for PM_{10}, which are to be achieved by 1 January 2010. These Stage 2 values are 20μg/m^3 as the annual mean and 50μg/m^3 as the 24-hour mean to be exceeded on no more than 7 days per

year. The UK government has introduced provisional objectives to be achieved by the end of 2010 that are in line with the Stage 2 limit values. They are a 24-hour mean of 50μg/m^3 not to be exceeded more than 7 days per year and an annual mean of 20μg/m^3 to be achieved by the end of 2010.

Findings of 2006 Updating and Screening Assessment of Air Quality in the District of Richmondshire

The 2006 Updating and Screening Assessment of Air Quality in the District of Richmondshire found there was no risk of the above objectives being exceeded and therefore no further monitoring was required. There was also no need to progress to a detailed assessment for PM_{10}.

New Monitoring Data

None required.

New Local Developments

There have been no new developments that would have a significant effect on PM_{10} concentrations.

Conclusions for PM_{10}

No further action required for PM_{10}.

Overall Conclusions

The conclusions of the 2007 Progress Report are that no further action is required for sources of carbon monoxide, 1,3-butadiene, lead, nitrogen dioxide and PM_{10} and sulphur dioxide as there is no likelihood of the exceedence of any of the air quality objectives for the above-mentioned pollutants.

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