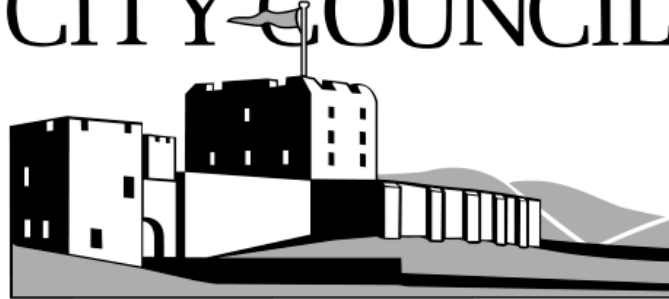


# CARLISLE CITY COUNCIL



[www.carlisle.gov.uk](http://www.carlisle.gov.uk)

ENVIRONMENT ACT 1995

AIR QUALITY UPDATING AND  
SCREENING ASSESSMENT

MAY 2006

<b>CONTENTS</b>	<b>Page</b>
<b>Executive Summary</b>	<b>5</b>
<b>1 Introduction</b>	<b>7</b>
1.1 Aims and Objectives	
1.2 Legislative background	
1.3 Air Quality Management at a National Level	
1.4 Local Air Quality Management	
1.5 Public Exposure	
1.6 Local Air Quality Management – Policy guidance LAQM (03) and Technical Guidance TG (03)	
1.7 Road Traffic Sources	
1.8 Industrial Sources	
1.9 Carlisle City Council – Description of Area	
<b>2 Consultation</b>	<b>16</b>
<b>3 Round 3 – Review and Assessment of Carbon Monoxide</b>	<b>17</b>
3.1 Introduction	
3.2 Standards and Objectives for Carbon Monoxide	
3.3 What are the main outdoor sources of Carbon Monoxide? – National Perspective	
3.4 Results of Rounds 1 & 2 – Review and Assessment of Carbon Monoxide undertaken by Carlisle City Council	
3.5 Round 3 – Updating and Screening Assessment for Carbon Monoxide	
3.6 Conclusion	
<b>4 Round 3 – Review and Assessment of 1,3 Butadiene</b>	<b>20</b>
4.1 Introduction	
4.2 Standards and Objectives	
4.3 What are the main outdoor sources of 1, 3 Butadiene? – National Perspective	
4.4 Results of Rounds 1 & 2 – Review and Assessment of 1,3 Butadiene undertaken by Carlisle City Council	
4.5 Round 3 – Updating and Screening Assessment for 1,3 Butadiene	
4.6 Conclusion	
<b>5 Round 3 – Review and Assessment of Benzene</b>	<b>22</b>
5.1 Introduction	
5.2 Standards and Objectives	
5.3 What are the main outdoor sources of Benzene? – National Perspective	
5.4 Results of Rounds 1 & 2 – Review and Assessment of benzene undertaken by Carlisle City Council	

5.5	Round 3 – Updating and Screening Assessment for Benzene	
5.6	Conclusion	
<b>6</b>	<b>Round 3 – Review and Assessment of Lead</b>	<b>26</b>
6.1	Introduction	
6.2	Standards and Objectives	
6.3	What are the main outdoor sources of Lead? – National Perspective	
6.4	Results of Rounds 1 & 2 – Review and Assessment of Lead undertaken by Carlisle City Council	
6.5	Round 3 – Updating and Screening Assessment for Lead	
6.6	Conclusion	
<b>7</b>	<b>Round 3 – Review and Assessment of Nitrogen Dioxide</b>	<b>29</b>
7.1	Introduction	
7.2	Standards and Objectives	
7.3	What are the main outdoor sources of Nitrogen Dioxide? – National Perspective	
7.4	Results of Rounds 1 & 2 – Review and Assessment of Nitrogen Dioxide undertaken by Carlisle City Council	
7.5	Round 3 – Updating and Screening Assessment for Nitrogen Dioxide	
7.6	Monitoring Data Outside the AQMA	
7.7	Monitoring data within the AQMA – A7 Stanwix Bank / Scotland Road / Kingstown Road	
<b>8</b>	<b>Round 3 – Review and Assessment for Sulphur Dioxide</b>	<b>55</b>
8.1	Introduction	
8.2	Standards and Objectives	
8.3	What are the main outdoor sources of Sulphur dioxide? – National Perspective	
8.4	Results of Rounds 1 & 2 Review and Assessment of Sulphur Dioxide undertaken by Carlisle City Council	
8.5	Round 3 – Updating and Screening Assessment for Sulphur dioxide in the Carlisle City Council Area	
8.6	Conclusion	
<b>9</b>	<b>Round 3 – Review and Assessment for Particulate Matter</b>	<b>61</b>
9.1	Introduction	
9.2	Standards and Objectives	
9.3	What are the main outdoor sources of PM <sub>10</sub> ? – National Perspective	
9.4	Results of Rounds 1 & 2 Review and Assessment of PM <sub>10</sub> undertaken by Carlisle City Council	
9.5	Round 3 – Updating and Screening Assessment for fine particles (PM <sub>10</sub> ) in the Carlisle City Council Area	

## 9.6 Conclusion

Appendix 1	Recommended time scales for submission of reviews and assessments and progress reports	<b>72</b>
Appendix 2	Industrial Processes which have the potential to emit one or more of the 7 pollutants listed in the Air Quality Regulations	<b>73</b>
Appendix 3	List of all industrial Part A, A2 and B processes located within Carlisle City Council	<b>76</b>
Appendix 4	Actions under consideration in the Development of an Action Plan	<b>82</b>
Appendix 5	Quality Assurance / Quality Control (QA / QC)	<b>85</b>
Appendix 6	Proposed Air Quality Management Area – Currock Street	<b>92</b>

## EXECUTIVE SUMMARY

All Local Authorities have a legal duty to periodically review and assess the current and likely future air quality in their area. The purpose of the assessment process is to identify areas within the Local Authority where it is unlikely that specified air quality objectives for 7 common air pollutants will be met.

Where an air quality objective is not likely to be met the Local Authority must declare an Air Quality Management Area (AQMA) and produce an Action Plan outlining how the Authority intends to improve the air quality within the AQMA.

Carlisle City Council has undertaken 2 previous rounds of review and assessment.

The first round was undertaken between 1997 – 2000 and concluded that it was unlikely that any of the air quality objectives would be exceeded at relevant locations within the authority.

The second round of review and assessment was undertaken between 2003 – 2005 and concluded that the annual mean air quality objective for Nitrogen Dioxide was likely to be exceeded at several locations along the A7.

An AQMA was subsequently declared for this area in December 2005 and the City Council is in the process of drafting an Air Quality Action Plan which will set out the measures it will take to improve air quality within the AQMA.

Local Authorities are now entering the third round of the review and assessment and this Updating and Screening Assessment represents the first stage of this third round of the review and assessment process.

The purpose of the Updating and Screening Assessment Report is to update the findings of the previous rounds of Review and Assessment and to identify any matters that have changed since the last Updating and Screening Assessment was undertaken (such as new monitoring data or new pollution sources which have been introduced in the area), which might lead to a risk of an air quality objective being exceeded.

The Updating and Screening Assessment Report concludes that the annual mean air quality objectives for Nitrogen Dioxide is being exceeded at locations alongside Currock Street.

Currock Street is already subject to a detailed assessment which is currently being undertaken on a traffic route to the West of the City Centre which includes, Currock Street, Nelson Bridge, Charlotte Street and Junction Street (and incorporates several busy junctions).

Whilst the detailed assessment is still ongoing for this area, there is sufficient monitoring data at this stage to conclude that an AQMA will have to be declared for relevant locations immediately adjacent to Currock Street. The AQMA may have to be extended following the completion of the detailed assessment in Autumn 2006.

The Updating and Screening Assessment also concludes that it is unlikely that the air quality objective for Carbon Monoxide, 1,3 butadiene, benzene, lead, sulphur dioxide and fine particulate will be breached and no further assessment is necessary for these pollutants.

## **1.0 INTRODUCTION**

### **1.1 Aims and Objectives**

This is an Updating and Screening Assessment Report on Local Air Quality for the Carlisle City Council area and forms the first stage of the third round of review and assessment.

The purpose of this Updating and Screening Assessment (USA) is to identify any matters that have changed since the last round of review and assessment, completed by this authority in May 2003, which might lead to a risk of an air quality objective as set out in the Air Quality Regulations 2000 (as amended) being exceeded.

The Updating Screening and Assessment will cover:

- A review of the previous rounds of review and assessment for each of the 7 pollutants
- New monitoring data
- New sources or significant changes to existing sources
- Other local changes which may affect local air quality.

Where on completion of this Updating and Screening Assessment, a risk is identified that an air quality objective may be exceeded at a location relevant to public exposure, the Authority will be required to go onto the second stage of the review and assessment process, and undertake a detailed assessment.

### **1.2 Legislative Background**

In 1995 the Government published its strategic policy framework for air quality management that culminated in the Environment Act 1995. As a requirement of the Environment Act the Secretary of State published the first National Air Quality Strategy in 1997 which established a framework for securing improvements in air quality in the UK.

Clean air is an essential ingredient of a good quality of life and the overall aim of the Strategy is to minimise the risk of poor air quality to human health. At the heart of the Strategy are the air quality standards and objectives for 7 common pollutants that can cause harm to human health, which occur widely throughout the UK, mainly because of the prevalence of industry and motor vehicles. The air quality standards and objectives are shown in Table 1. There have been no changes to the standards or the objectives since the last round of review and assessment.

**TABLE 1: National Air Quality Standards and Objectives**

Pollutant	10 Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
<b>Benzene</b>			
All authorities	16.25 µg/m <sup>3</sup>	Running annual mean	31.12.2003
Authorities in England and Wales only	5.00 µg/m <sup>3</sup>	Annual mean	31.12.2010
<b>1,3 Butadiene</b>	2.25 µg/m <sup>3</sup>	Running annual mean	31.12.2003
<b>Carbon Monoxide</b>	10.0 mg/m <sup>3</sup>	Maximum daily 8-hour mean	31.12.2003
<b>Lead</b>	0.5 µg/m <sup>3</sup>	Annual mean	31.12.2004
	0.25 µg/m <sup>3</sup>	Annual mean	31.12.2008
<b>Nitrogen dioxide</b>	200 µg/m <sup>3</sup> not to be exceeded more than 18 times a year	1 hour mean	31.12.2005
	40 µg/m <sup>3</sup>	annual mean	31.12.2005
<b>Particles (PM<sub>10</sub>) (gravimetric)</b> All authorities	50 µg/m <sup>3</sup> not to be exceeded more than 35 times a year	24 hour mean	31.12.2004
	40 µg/m <sup>3</sup>	annual mean	31.12.2004
<b>Sulphur Dioxide</b>	350 µg/m <sup>3</sup> not to be exceeded more than 24 times a year	1 hour mean	31.12.2004
	125 µg/m <sup>3</sup> not to be exceeded more than 3 times a year	24 hour mean	31.12.2004
	266 µg/m <sup>3</sup> not to be exceeded more than 35 times a year	15 minute mean	31.12.2005

**The Air Quality Standards** are based on the recommendations of the Expert Panel on Air Quality Standards (EPAQS). The standards are set purely with regard to the best available scientific and medical evidence of the effects of the particular pollutant on health. They represent minimum or no significant risk levels including the effects on susceptible groups and do not take account of costs or issues of technical feasibility.



**The Air Quality Objectives**, represent the Governments present judgement of achievable air quality by a prescribed date on the evidence of costs and benefits and technical feasibility.

The standards and objectives are subject to regular review to take account of the latest information on the health effects of air pollution.

### **1.3 Air Quality Management at a National Level**

The air quality standards and objectives drives air quality policy in the UK. The UK's position in European and International negotiations are directed at achieving these air quality objectives at a national level.

Many policy measures have been introduced at a national / international level since the Air Quality Strategy was first published. An example is the Auto Oil Programme which introduced stringent emission standards for any new vehicles sold after January 2001 and further more stringent standards which applied after January 2006. The programme also brought in tighter fuel quality standards which applied to all petrol and diesel sold from January 2001 and January 2005 which included the banning of leaded fuel. The Programme has resulted in significant reductions in fine particulates, Nitrogen Dioxide, Carbon Dioxide, Lead and Benzene from road transport vehicle emissions.

The Sulphur Content of Certain Liquid Fuel Directive has set maximum levels for the sulphur content in heavy fuel, resulting in reductions in sulphur dioxide emissions from commercial and industrial plant using fuel oil.

A new system of regulating emissions from industrial processes has also been introduced in the UK through the Pollution Prevention and Control Act 1999. This requires individual industrial processes to take measures to comply with the relevant EC Environmental Quality Standard (EQS), which include the limit values in the First Air Quality Directive and daughter directive which are reflected in the Air Quality Regulations.

It is however recognised that, despite these national/international measures, poor air quality hot spots are likely to remain due to various local factors. These are often associated with traffic, which is not directly controlled by any regulatory regime and the Government believes that these are best dealt with at a local level using local measures.

### **1.4 Local Air Quality Management**

To address the above the Environment Act 1995 also laid the foundation for a nationwide system of local air quality management. The Act places a legal duty on all local authorities throughout the UK to periodically review and assess the air quality for their geographical areas against the air quality standards and objectives which have been set out in the Air Quality Regulations 2000 (amended). Where assessed levels are likely to exceed the air quality objectives an Air Quality Management Area must be declared and an Action Plan published. The Action Plan must set out measures the Authority intends to introduce in pursuit of the air quality objectives.

In addition to the air quality objectives set out in the Regulations the EU has set limit values in respect to nitrogen dioxide and PM<sub>10</sub> to be achieved by 2010.

These are:

1. An 1 hour limit value of 200 µgm<sup>-3</sup> not to be exceeded more than 18 times per year and an annual mean limit value of 40 µgm<sup>-3</sup> in respect to Nitrogen Dioxide and
2. An annual mean of 20 µgm<sup>-3</sup> and 50 µgm<sup>-3</sup> as the 24 hour mean to be exceeded no more than 7 days per year in respect to Fine Particulates.

Local Authorities currently have no statutory obligation to assess air quality against the EU limit values but these are considered in this Report.

## 1.5 Public Exposure

The Air Quality Regulations 2000 stipulate that the achievement of objectives is to be determined by reference to the quality of air at locations that are situated outside of buildings where members of the public are regularly present and are likely to be exposed over the averaging period of the objective. Exceedences of the objectives should not be considered where relevant public exposure would not be involved.

Typical examples of where the objective should or should not apply are summarised below:

Averaging Period	Objectives should apply at	Objectives should not apply at
Annual Mean	All background locations where members of the public might regularly be exposed  Building facades of residential properties, schools, hospitals etc	Building facades of offices or other places of work where members of the public do not regularly have access and gardens of residential properties.  Kerbside sites (as opposed to locations at the building façade) or any other location where exposure is expected to be short term.
24 hour mean & 8 hour mean	All locations where the annual mean would apply  Gardens of residential properties	Kerbside sites (as opposed to locations at the building façade) or any other location where exposure is expected to be short term.
1 Hour mean	All locations where the annual and 24 hour and 8 hour mean would apply  Kerbside sites (e.g. pavements of busy shopping streets)  Those parts of car parks and railway stations which are not	Kerbside sites where the public would not be expected to have regular access.

	fully enclosed  Any outdoor locations to which the public might reasonably to expect access	
15 Minute mean	All locations where members of the public might reasonably be exposed for 15 minutes or longer	

## 1.6 Local Air Quality Management – Policy Guidance LAQM PG (03) and Technical Guidance LAQM TG (03)

This Updating Screening and Assessment has been carried out in line with the requirements of the Secretary of State's guidance issued in March 2003 and amended in 2006. The review and assessment is in 2 stages:-

The first stage is an Updating and Screening Assessment to identify any matters that have changed since the last round of review and assessment which might lead to a risk of air quality objective being exceeded. The Updating and Screening Assessment should conclude as to whether a local authority should proceed to a Detailed Assessment.

The second stage is a detailed assessment of those pollutants and specific locations that have been identified as requiring further work.

The timetable for the review and assessment process is shown in Appendix 1.

All Local Authorities are now entering the third round of review and assessment.

Reports on rounds 1 and 2 undertaken by Carlisle City Council are available on the City Councils website. [www.carlisle.gov.uk](http://www.carlisle.gov.uk)

The guidance suggests an approach that follows the checklists for each pollutant listed in LAQM TG (03) as amended. This methodology has been adopted and where further work has been undertaken details are found below each checklist.

All potentially significant source emitters of the 7 pollutants set out in the Air Quality Regulations located within the City Council will be identified in this Updating and Screening Assessment.

Each source will then be screened to determine whether emissions may lead to a risk of an air quality objective being exceeded, through the use of these checklists.

The main sources which will be considered are as follows:

- Road Traffic
- Part A and Part B Industrial Processes
- Other point sources that do not require permits e.g. large boilers
- Areas where significant solid fuel burning take place
- Airports

- Railway locomotives
- Fugitive sources from quarries and landfill sites

## **1.7 Road Traffic Sources**

Emissions from motor vehicle exhausts comprise of a range of pollutants including Carbon Dioxide, Nitrogen Dioxide, Particulate Matter, benzene and 1,3 butadiene.

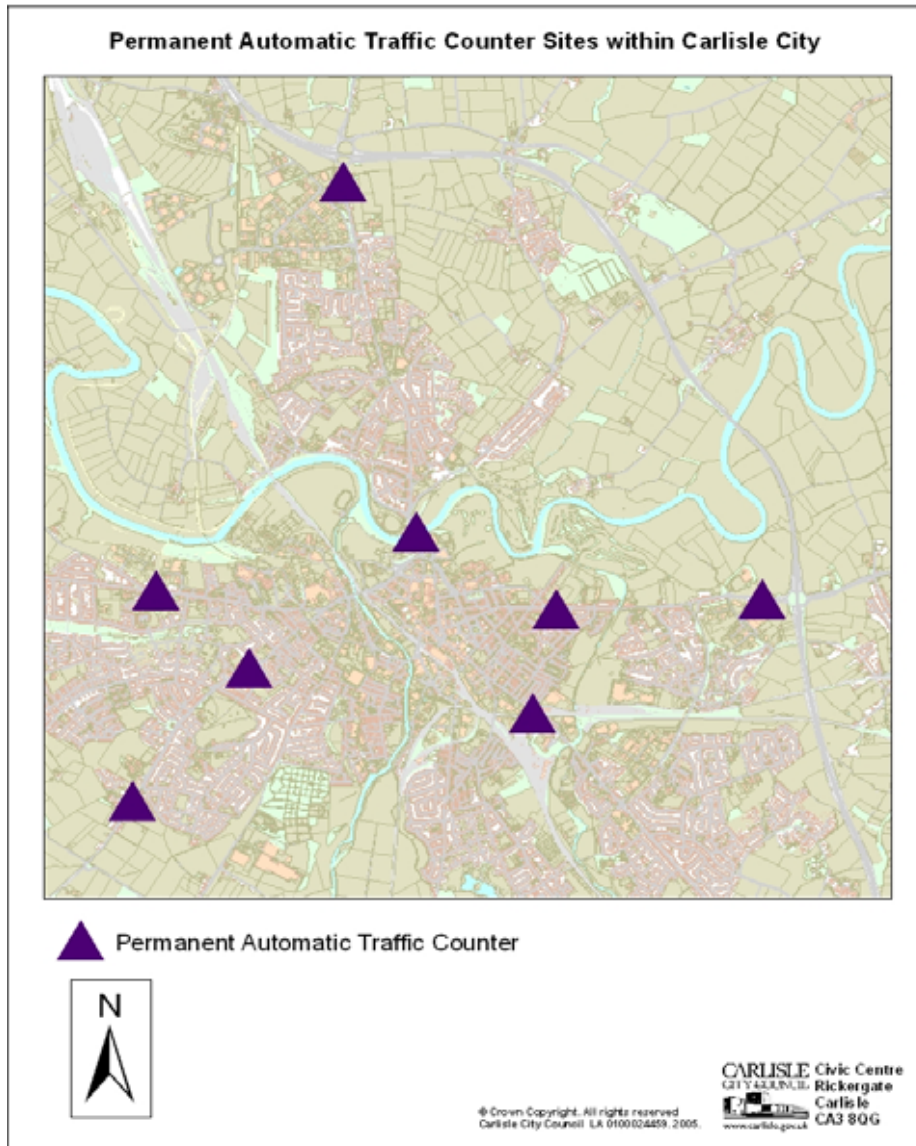
Road traffic within the city centre and commuter routes approaching the city centre is the main source of atmospheric pollution in this authority. The road network is constrained by the River Eden and there are limited routes available to either arrive at or pass round the city. Congestion often occurs on arterial roads during rush hour particularly in the vicinity of major junctions.

There have been no significant changes in the transportation network within this authority since the completion of the last round of review and assessment. However work on the Carlisle Northern Development Route (CNDR) has recently begun. The impact of the CNDR is discussed in this Report.

Continuous monitoring at a roadside location and a city wide network of NO<sub>2</sub> diffusion tubes have been used to assess NO<sub>2</sub> and PM<sub>10</sub> levels associated with road traffic emissions. Where monitoring data is not available the Design Manual for Road and Bridge (DMRB) has been used to predict pollutant concentrations.

Details of road traffic movements in Carlisle District Council are collected by Capita on behalf of Cumbria County Council, and the Highways Agency.

The map below indicates where permanent automatic traffic counters are located within the city.



Details of traffic flows used in this Updating and Screening Assessment have been obtained from these permanent counters and from predictions from the traffic simulation assignment package SATURN, which has been validated against 2005 traffic monitored data.

## 1.8 Industrial Sources

Industrial processes which have the potential to emit air pollution are currently controlled under the Environmental Protection Act 1990 and the Pollution Prevention and Control Act 1999. Industrial Sources are either Part A (large industries such as power stations and chemical works) or Part B/A2 process (such as Petrol Stations, Quarries etc). A list of all industrial processes which have the potential to emit one or more of the 7 pollutants as set out in the Air Quality Regulations is shown in Appendix 2.

Part A processes fall under the jurisdiction of the Environment Agency, whilst control of Part B and A2 processes is a duty carried out by this local authority.

Carlisle City Council currently permits and controls industrial emissions from 68 processes. These are listed in Appendix 3 (a further two applications are pending) There are 5 Part A Process operating within the District and again these are listed in Appendix 3.

## **1.9 Carlisle City Council – Description of Area**

Carlisle City Council is one of the six district councils in Cumbria. Its population is just over 100,000, 30% of which is rural. The District Council is over 1000 square km and adjoins the Dumfries and Galloway and Scottish Borders Council area to the north, Northumberland to the east and the Solway estuary to the west. The northern edge of the Lake District National Park is within 5km of the Districts southern boundary.

Carlisle is a Cathedral City and the county town of Cumbria. Carlisle is remote from other main centres of population being 300 miles from London, more than 120 miles from Manchester, more than 90 miles from Glasgow and Edinburgh and more than 50 miles from Newcastle.

Carlisle is the regional commercial administrative and retail centre serving an extensive but sparsely populated rural area of around 450,000 people that extends over much of Cumbria and the Lake District into the South West Scotland and Northern Pennines.

Carlisle is the hub of communication in the area. It is on the west coast main line and the M6 motorway. Carlisle Airport although without scheduled services at the moment has been acquired by the parent company of Stobart Ltd and substantial investment is planned.

The City of Carlisle supports the highest population concentration in Cumbria with 70,000 people living within the urban area. The rural towns of Brampton and Longtown support the next two highest populations concentration within the local authority, 4000 and 2000 respectively.

The sub regional economy and the local Carlisle economy has significant representation in activities facing continual decline / uncertainties including food processing, agricultural support, automotive component manufacturing and engineering.

Tourism and distribution is a significant feature of the sub-regional economy and increasing important to Carlisle itself.

Over the past year Carlisle has been recovering from one of the most serious civil emergencies ever experienced in the UK. The year 2005 also saw the highest level of redundancies in the City for over a decade. The floods of January 2005 together with Carlisle economic circumstances have led to a Carlisle Renaissance prospectus for the regeneration of the City led by Carlisle City Council.

The Carlisle Renaissance Prospectus published in August 2005 sets out a vision for the regeneration of Carlisle over the next 10 years. Its main objectives are:-

- To establish Carlisle as a Learning City
- To strengthen the City's economic base by stimulating investment
- To maximise the potential of Carlisle as a destination for leisure and business tourism
- To create sustainable communities
- To expand the City Centre
- To improve movement in and around the city for all modes of transport

Carlisle Renaissance is not discussed in any detail in this Updating and Screening Assessment as proposals are not yet finalised. However any development proposals or changes in traffic movement will be considered in future Air Quality Reports.

## **2.0 CONSULTATION**

Schedule II of the Environment Act requires that local authorities consult a number of bodies with regard to this Updating and Screening Assessment. The following bodies have been consulted:

The Secretary of State  
The Environment Agency  
Cumbria County Council  
Neighbouring Local Authorities:-  
Eden District Council  
Allerdale Borough Council  
Dumfries and Galloway  
North Tyneside District Council

This report is also available on the City Council's website.



### 3.0 ROUND 3 - REVIEW AND ASSESSMENT OF CARBON MONOXIDE

#### 3.1 Introduction

Carbon Monoxide (CO) is a toxic gas. The main threat to human health from exposure to CO is the formation of carboxyhaemoglobin, which substantially reduces the capacity of the blood to carry oxygen and deliver it to the tissues, and blockage of important biochemical reactions in the cells. People who have an existing disease which affects the delivery of oxygen to the heart or brain (e.g. angina) are likely to be at particular risk if these delivery systems are further impaired by CO.

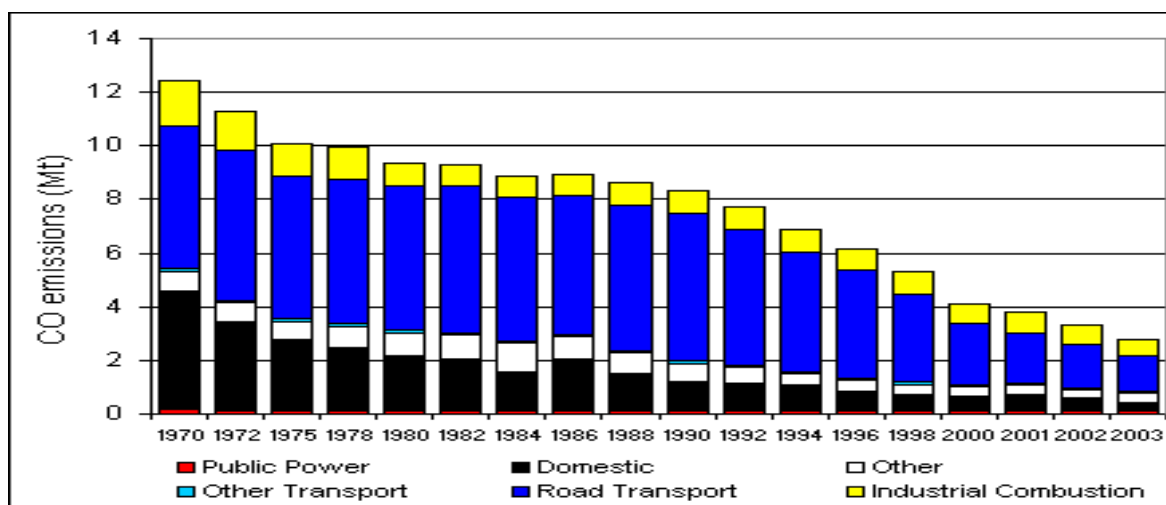
#### 3.2 Standards and Objectives for Carbon Monoxide

The Government has adopted an air quality standard of 10 mg/m<sup>3</sup> as a running 8 hour mean to be met by 31<sup>st</sup> December 2003. This is intended to limit exposure of the population including susceptible individuals and represents a level at which harm is unlikely to occur.

#### 3.3 What are the main outdoor sources of Carbon Monoxide – National Perspective

Carbon monoxide arises from incomplete fuel-combustion. The UK emissions of carbon monoxide are shown in the plot below.

##### UK Atmosphere Emissions for Carbon Monoxide



Source: NAEI

CO emissions are dominated by road transport activities. Over the period 1970-2003 total emissions have however decreased by 78% reflecting significant reduction in emissions from road transport, mainly as a result of tighter emission limits and improved fuel quality, and the domestic and agricultural sectors

Government guidance suggests that, based on available monitoring data, the carbon monoxide objective is unlikely to be exceeded at any location in the UK as a result of action taken at an national/international level.

There have been no AQMA's declared for Carbon Monoxide anywhere in the UK.

### **3.4 Results of Rounds 1 & 2 - Review and Assessment of Carbon Monoxide undertaken by Carlisle City Council**

No sites were identified in the previous rounds of review and assessment that suggested there would be an exceedence of the air quality objectives within this local authority.

### **3.5 Round 3 - Updating and Screening Assessment for Carbon Monoxide**

This Updating and Screening assessment is based on the guidance and checklists provided in Technical Guidance LAQM TG (03) as amended and the results are presented as follows.

#### **Updating and Screening Checklist for Carbon Monoxide**

<b>Source, location and data that needs to be assessed</b>	<b>Steps to be taken to Complete Assessment</b>	<b>Comments</b>
<b>Monitoring Data</b>	Collate All monitoring data	No monitoring for CO is undertaken by Carlisle City Council
<b>Road Traffic</b>	Identify very busy roads and junctions, where current background is expected to be 1 mg/m <sup>3</sup> 'Very busy' is defined as : <ul style="list-style-type: none"><li>• single carriageway roads with daily average flow which exceed 80,000 vehicles per day</li><li>• dual carriageway roads 120,000 vehicles per day</li><li>• Motorways 140,000 per day</li></ul>	There are no roads within the Local Authority, which meet this criteria.

### **3.6 Conclusion**

There are no roads within our area where flows exceed 80,000 vehicles per day.

The Carbon Monoxide objective is unlikely to be exceeded at any location within this local authority and as such a Detailed Assessment will not be required.

## 4.0 ROUND 3 - REVIEW AND ASSESSMENT OF 1, 3 BUTADIENE

### 4.1 Introduction

1,3 butadiene is a human carcinogen.

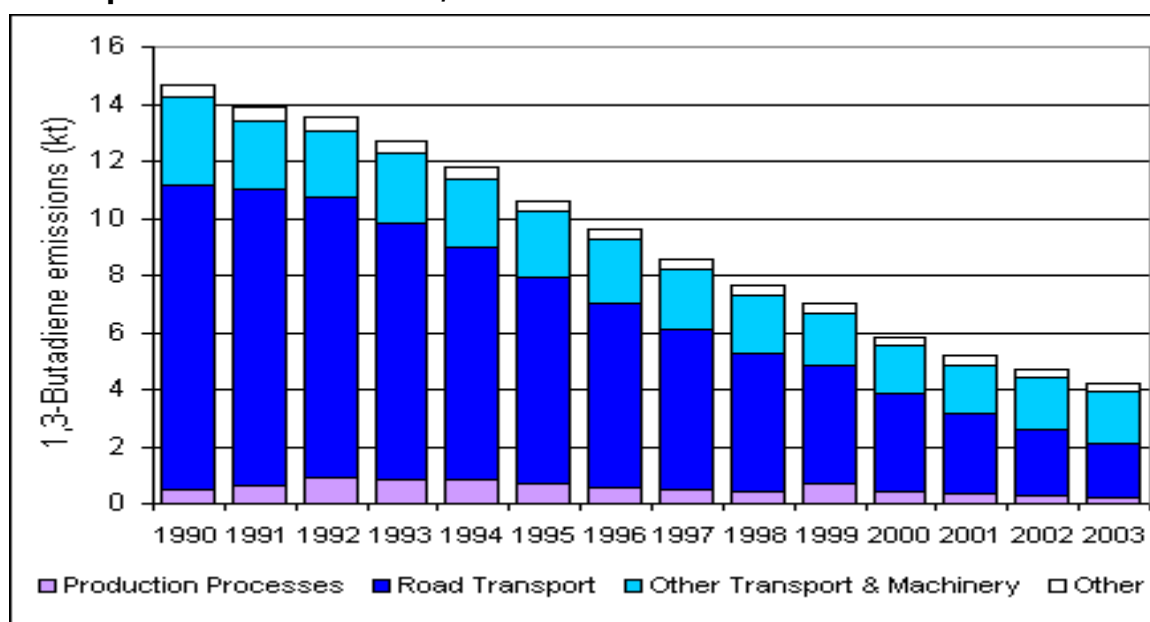
### 4.2 Standards and Objectives

The Government has adopted a maximum running annual mean concentration of  $2.25 \text{ gm}^3$  as an air quality standard for 1,3 butadiene. The objective is for the standard to be achieved by the end of 2003.

### 4.3 What are the main outdoor sources of 1,3 butadiene – National perspective

Emissions of 1,3-butadiene arise from motor vehicle emissions and its manufacture and use in petrochemical and rubber processes. The road transport sector was the major source of UK emissions in 2003. The introduction of catalytic converters in 1991 has however had a significant impact on the emissions from the road transport sector, causing a reduction in emissions of 72% from 1990 to 2003.

#### UK Atmosphere Emissions of 1,3 butadiene



Source: NAEI

Guidance suggests that only those authorities with relevant locations in the vicinity of major industrial processes which stores/handles 1,3 butadiene are likely to proceed beyond an Updating and Screening Assessment.

There have been no AQMA's declared anywhere in the UK as a result of previous rounds of reviews and assessments in respect to 1,3 butadiene.

#### 4.4 Results of Rounds 1 & 2 - Review and Assessment of 1,3 butadiene undertaken by Carlisle City Council

No sites were identified in the previous rounds of review and assessment that suggested that there would be an exceedance of the air quality objectives for 1,3 butadiene within this local authority.

#### 4.5 Round 3 - Updating and Screening Assessment for 1,3 butadiene

This updating and screening assessment is based on the guidance and checklists provided in Technical Guidance LAQM – TG (03) as amended and the results are presented below:

Source, Location or Data that needs to be assessed	Steps taken to complete assessment	Comments
Monitoring Data	Collate all monitoring data	This Authority is currently not monitoring for 1,3 butadiene
<b>Industrial Sources: A list of industrial processes with the potential to emit 1,3 butadiene is set out in Appendix 2</b>		
New Industrial Sources	Determine whether there are new sources to be assessed	There are no new sources and none for which planning approval has been granted since the last USA
Industrial Sources with substantially increased emissions	Determine whether any sources identified in the last round have substantially increased emissions	There are no industrial processes of relevance for 1,3 butadiene in the authority or any of the neighbouring authorities. There has been no change in this position since the last Updating and Screening Assessment.

**Note:** There is one A2 permitted rubber industrial process within the local authority manufacturing tyres, which is regulated by Carlisle City Council. The factory uses polymerised butadiene only and is not considered a significant emitter of 1,3 butadiene.

#### 4.6 Conclusion

There are no significant industrial sources of 1, 3 butadiene located within the authority area or in neighbouring authorities.

There is no need for a detailed assessment to be undertaken in respect of 1, 3 butadiene.

## 5.0 ROUND 3 - REVIEW AND ASSESSMENT OF BENZENE

### 5.1 Introduction

Benzene is a recognised genotoxic human carcinogen. Studies of industrial workers exposed in the past, to high levels of benzene have demonstrated an excess risk of leukaemia which increased in relation to their working lifetime exposure.

### 5.2 Standards and Objectives

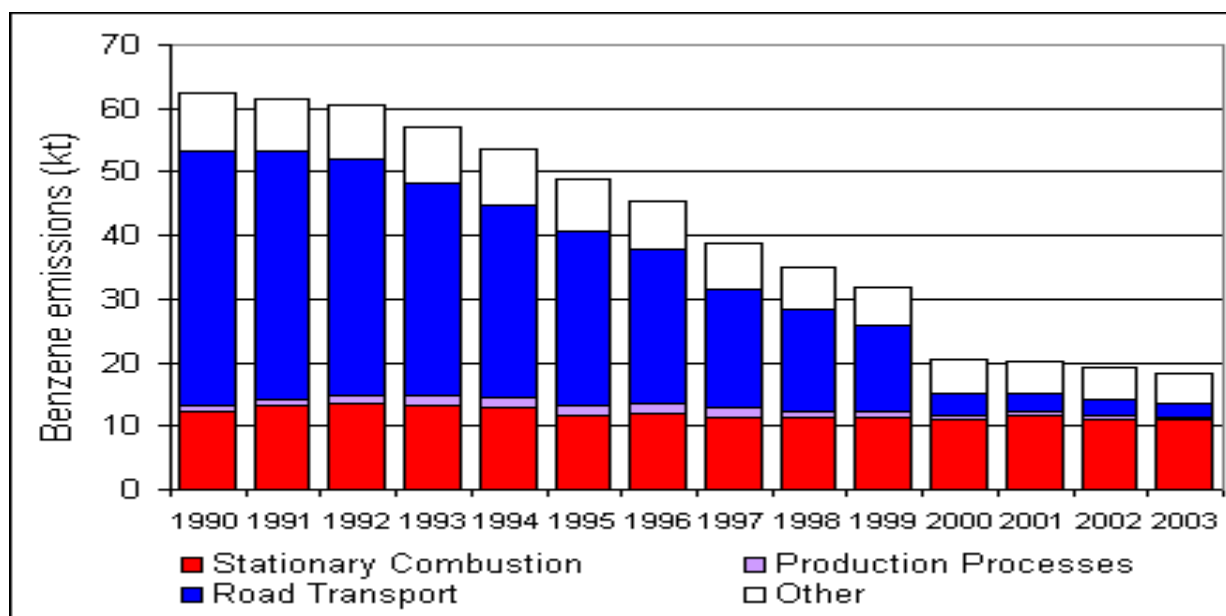
The Government has adopted a running annual mean concentration of  $16.25 \mu\text{g m}^{-3}$  as an air quality standard to be achieved by the end of 2003.

In addition a tighter objective has been set for a fixed annual mean of  $5 \mu\text{g m}^{-3}$  to be achieved by the end of 2010.

### 5.3 What are the main outdoor sources of benzene? – National Perspective

Benzene emissions arise predominately from the evaporation and combustion of petroleum products. As benzene is a constituent of petrol, emissions arise from both evaporative and combustion of petrol. Benzene emissions also arise as stack emissions and, more importantly, fugitive emissions from its manufacture and use in the chemical industry. Benzene emissions have been steadily decreasing since 1990.

#### UK Atmospheric Emissions of Benzene



Source: NAEI

These decreases are primarily due to the introduction in 1991 of cars equipped with catalytic converters, although emissions from the domestic and industrial sectors are also falling. The main outdoor sources of Benzene remaining beyond

2005 are still expected to be petrol engined vehicles, petrol refining and distribution and uncontrolled emissions from petrol station forecourts without petrol vapour recovery systems.

There has been only one AQMA declared in the UK in respect to benzene due to the very close proximity of a school to a petrol filling station.

#### 5.4 Results of Rounds 1 & 2 Review and Assessment of Benzene undertaken by Carlisle City Council

No sites were identified in the previous rounds of review and assessment that suggested that there would be exceedences of the air quality objectives for benzene within the local authority.

#### 5.5 Round 3 - Updating and Screening Assessment for Benzene

The Updating and Screening Assessment was based on the amended guidance and checklists provided in Technical Guidance LAQM TG (03). Where consideration of the checklist questions highlights the need for further consideration then the results are presented below:

Source, Location, or data that need to be assessed	Steps to be taken to complete the assessment	Comments
<b>Monitoring Data</b>	Collate all monitoring data	This authority recently started a diffusion tube monitoring survey in respect to benzene in February 2006 at locations adjacent to BP (Oil) Ltd Dalston. Results will be reported in our next Progress Report 2007.
<b>Very busy roads</b>	<p>Identify very busy roads and junctions in areas where the 2010 background is expected to be above 2 µg/m<sup>3</sup>.</p> <p>Very Busy' is defined as single carriageway roads with daily average flow which exceed 80,000 vehicles per day</p> <p>dual carriageway roads with daily average flow which exceed 120,000 vehicles per day</p> <p>motorways with daily average flow which exceed 140,000 vehicles per day</p>	There are no roads within the authorities area which meet this criteria and the modelled background level is expected to be less than 2 µg/m <sup>3</sup> .
<b>Conclusion: There is no need for a detailed assessment</b>		

<b>Industrial Sources: A list of industrial process with the potential to emit benzene is set out in Appendix 2</b>		
New Industrial Sources	Determine whether there are new sources to be assessed	There are no new sources and none for which planning approval has been granted since the last Updating and Screening Assessment within this local authority or in neighbouring authorities.
Industrial Sources with substantially increased emission	Determine whether any sources identified in the last round have substantially increased emissions	There are no industrial processes of relevance for Benzene (with the exception of BP (Oil) Dalston see below) in the authority or any of the neighbouring authorities. There has been no change in this position since the last review and assessment.
<b>Conclusion: There is no need for a detailed assessment</b>		
<b>Petrol Stations</b>	<p>Identify all petrol stations with an annual throughput &gt;2000m<sup>3</sup> and with a road with AADT of &gt;30,000 vehicles per day nearby.</p> <p>Determine whether there is any relevant exposure within 10m the petrol pumps</p>	<p>There are only two roads within the Local Authority where the AADT is greater than 30,000 vehicles per day with petrol stations adjacent. These are listed in table 5.1.</p> <p>There are no relevant locations within 10m of the petrol pump</p>
<b>Conclusion: There is no need for a detailed assessment</b>		



<b>Major Fuel Storage Depots</b>	<p>Identify any major fuel storage depots handling petrol</p> <p>Determine the distance of the nearest relevant exposure</p> <p>Establish the annual emissions from the storage depot. Use nomograms to determine if the source requires further assessment</p>	<p>There is one medium sized fuel storage depot within our area "BP (Oil), Dalston".</p> <p>There are properties approx. 170m away from the petrol storage tanks.</p> <p>This terminal falls within the Integrated Pollution and Prevention Control (IPPC) requirements enforced by the City Council and in accordance with the requirement of the Petrol Vapour Recovery (Stage 1), a vapour recovery unit has been installed to collect gasoline vapour displaced during the filling of tanks. BP Oil Dalston Ltd was considered during the last round of review and assessment but has been rechecked for the purposes of this Updating and Screening Assessment. Using the Nomogram in Fig 3.3 of the Technical Guidance the most recent modelled emissions data (taken from the NAEI website) for this point source is well below the threshold at which exceedences of the Benzene objectives would occur. Benzene diffusion tube monitoring was however initiated in February 2006 at locations around the site. Data so far indicates monthly concentrations of <math>1\mu\text{g}/\text{m}^3</math>. Monitoring will continue this year and the results will be reported in our Progress Report due April 2007.</p>
	<b>Conclusion: There is no need for a detailed assessment</b>	

**Table 5.1 - Roads with AADT greater than 30,000 vehicles per day with petrol filling stations adjacent**

11 Road/30,000 Vehicles per day	12 Petrol Station	Relevant exposure within 10 metres of petrol pumps
A74	Shell North	No
A74	Moss Filling Station	No
A7/Kingstown Road	Kingstown Filling Station	No

## 5.6 Conclusion:

There is no need for a detailed assessment to be undertaken for Benzene.

## 6.0 ROUND 3 - REVIEW AND ASSESSMENT OF LEAD

### 6.1 Introduction

Exposure to high levels of lead may result in toxic biochemical effects in humans, which in turn causes problems in the synthesis of haemoglobin, effects on the kidneys, gastrointestinal tract, joints and reproductive system and acute and chronic damage to the nervous system. The possible effect of lead on brain development in children is the greatest concern, which can lead to reduced IQ.

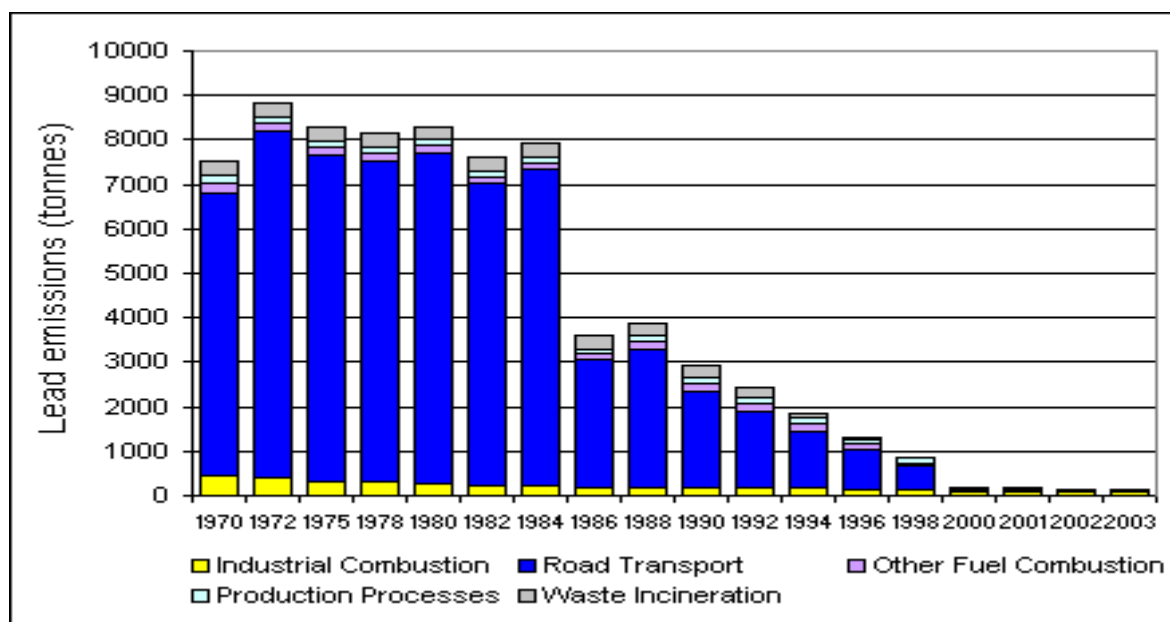
### 6.2 Standards and Objectives

The Government has adopted an annual mean concentration of  $0.5 \mu\text{g m}^{-3}$  as the air quality standard for lead, with an objective for the standard to be achieved by the end of 2004 and a lower air quality standard of  $0.25 \mu\text{g m}^{-3}$  to be achieved by the end of 2008.

### 6.3 What are the Main Outdoor Sources of Lead? – National Perspective

Since 1970 lead emissions have declined by 98%. Prior to 2000 most of the national air borne emissions of lead arose from petrol engined vehicles. However the general sale of leaded petrol in the UK was banned from 01-01-2000, following the implementation of tighter EU fuel quality standards.

#### UK Atmospheric Emissions of Lead



Source: NAEI

Emissions of lead are now restricted to a variety of industrial activities such as battery manufacture, pigments in paints and glazes, alloys, radiation shielding, tank lining and piping.

No industrial sources were however identified during previous rounds of review and assessments anywhere in the UK as likely to give rise to exceedences of the air quality objectives and consequently no Air Quality Management Area have been declared in the UK in respect to lead.

#### **6.4 Results of Rounds 1 & 2 Review and Assessment of Lead undertaken by Carlisle City Council**

No sites were identified in the previous rounds of review and assessment that suggested there would be exceedences of the air quality objectives for lead within this local authority.

#### **6.5 Round 3 - Updating and Screening Assessment for Lead**

This updating and screening assessment is based on the guidance and checklists provided in Technical Guidance LAQM TG (03) as amended and the results are presented below:

##### **Updating and Screening Checklist for Lead**

<b>Source, location or data that needs to be assessed</b>	<b>Steps to be taken to complete assessment</b>	<b>Assessment</b>
<b>Monitoring Data</b>	Collate all monitoring data	This Authority is not currently monitoring lead
<b>Industrial Sources</b>  New Industrial Sources	Determine whether there are any new sources to be assessed	There are no new sources locally and none for which planning approval has been granted since the last Updating and Screening Assessment within this local authority or in neighbouring authorities
Industrial Source with substantial increased emission	Determine whether any sources identified in previous rounds have substantially increased emissions.	There were no significant industrial sources * identified during previous rounds of review and assessment.

\* There is one aluminium and zinc industrial casting process within the Local Authority. Operational output places it below the threshold for IPPC Regulation. There are no emissions to air (no stacks) and it is therefore not considered a significant source of lead.

## **6.6 Conclusions**

There are no significant industrial sources of lead located within the authority area or in neighbouring authorities.

There is no need for a detailed assessment to be undertaken in respect to lead.

## **7.0 ROUND 3 - REVIEW AND ASSESSMENT OF NITROGEN DIOXIDE**

### **7.1 Introduction**

Nitrogen dioxide is a respiratory irritant. At relatively high concentrations, nitrogen dioxide causes inflammation of the airways and exposure to nitrogen dioxide may enhance the response to allergies in sensitised individuals.

### **7.2 Standards and Objectives**

The Government has adopted a 1 hour average of  $200 \mu\text{g m}^{-3}$  as an air quality standard for nitrogen dioxide with an objective for the standard not to be exceeded more than 18 times per year by 31<sup>st</sup> December 2005. It has also adopted an annual mean of  $40 \mu\text{g m}^{-3}$  as an air quality standard with a specific objective to achieve this by 31<sup>st</sup> December 2005.

Note In addition to the above, the EU has set limit values in respect to nitrogen dioxide to be achieved by 2010. These are a 1 hour limit value of  $200 \mu\text{g m}^{-3}$  not to be exceeded more than 18 times per year and an annual mean limit value of  $40 \mu\text{g m}^{-3}$ .

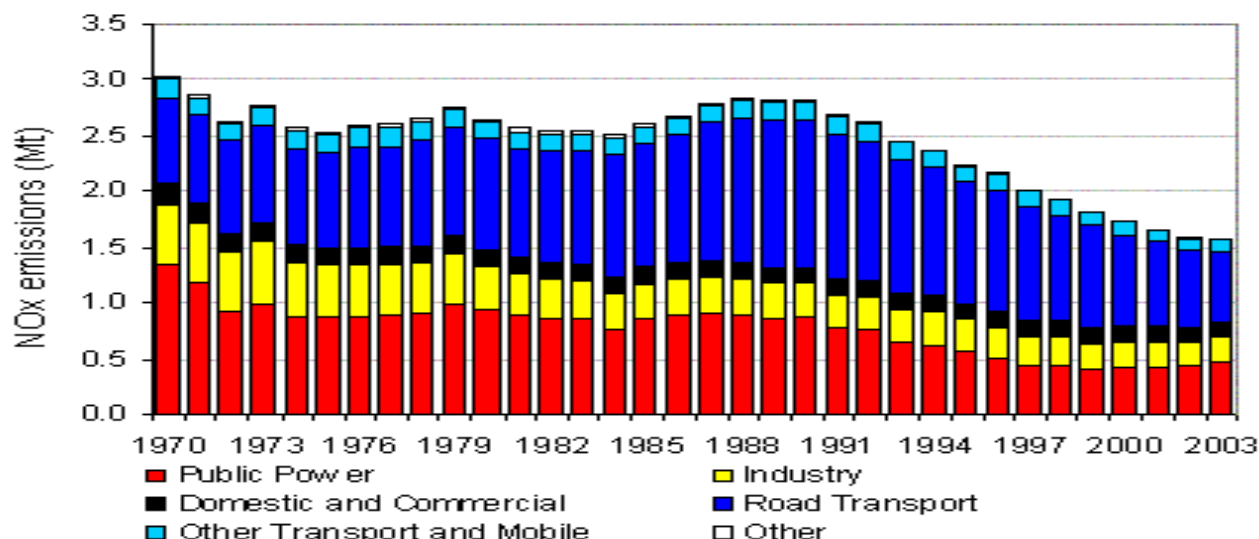
Local authorities have no statutory obligation to assess local air quality against these EU limit values but they are considered in this Updating and Screening Assessment.

### **7.3 What are the main outdoor sources of Nitrogen Dioxide? – National Perspective**

Nitrogen Dioxide ( $\text{NO}_2$ ) and Nitric Oxide ( $\text{NO}$ ) are both oxides of Nitrogen and are collectively referred to as nitrogen oxides ( $\text{NO}_x$ ). All combustion processes produce  $\text{NO}_x$  emissions largely in the form of Nitric Oxide, which is then converted to nitrogen dioxide, mainly as a result of reaction with ozone in the atmosphere.

The major source of  $\text{NO}_x$  emissions in the UK is the road transport sector which overall contributes 40% to the total UK emissions. Other significant sources of nitrogen oxide emissions include the electrical industry and other commercial and industrial sectors (these are listed in Appendix 2). Since 1970, overall  $\text{NO}_x$  emissions have decreased by 48%, although this decrease has not been constant (see plot below). Up to 1984 the  $\text{NO}_x$  emission profile was relatively flat with small peaks in 1973 and 1979 which were largely due to the cold winters in those years. From 1984, emissions rose markedly as a result of the growth in road traffic, reaching a peak in 1989. Since 1989, total  $\text{NO}_x$  emissions have declined by 45% as a result of a 52% decrease from road transport, due to the introduction of catalytic converters and stricter regulations and a 47% reduction from power stations.

## UK Atmospheric Emissions of NO<sub>2</sub>



More than 168 Local Authorities in the UK have declared one or more AQMA's in respect to nitrogen dioxide during previous rounds of review and assessment. The vast majority are related to road traffic emissions where attainment of the annual mean objective was considered unlikely.

Results from previous rounds of review and assessment in the UK suggests that, outside major conurbations, exceedences of the objectives may occur within 10 metres of the kerbside of single carriageway roads, if they are in congested town centre, and is particularly significant where towns have narrow streets with residential properties within 5m of the kerb. In addition guidance suggests that roads with high flows of buses / HGVs may also be at risk of exceeding the objectives.

### 7.4 Results of Round 1 & 2 of Review and Assessment undertaken by Carlisle City Council

During the last round of review and assessment it was identified that exceedences of the annual mean NO<sub>2</sub> objective were likely to occur along sections of the A7 between Stanwix Bank and Kingstown due to road traffic emissions. As a result an AQMA has been declared for this area stretching from Hardwick Circus to Junction 44 of the M6 Motorway.

The City Council is in the process of producing an Action Plan which will specify measures it intends to take in pursuit of reducing nitrogen dioxide concentrations within the AQMA. A draft action plan will be published by December 2006 for consultation. A number of measures being considered as part of the Action Plan are set out in Appendix 4.

The City Council is also currently undertaking a detailed assessment for relevant locations adjacent to busy junctions, and routes leading up to these junctions, within the city where a risk of the annual mean NO<sub>2</sub> objective being exceeded has previously been identified. A report on the detailed assessment will be available in Autumn 2006. However monitoring data for these localities are included in this Updating and Screening Assessment.

### **7.5 Round 3 - Updating and Screening Assessment for Nitrogen Dioxide for Carlisle City Council**

This Updating and Screening Assessment is based on the guidance and checklists provided in Technical Guidance LAQM TG(03) as amended. Where consideration of the checklist questions highlights the need for further consideration these are presented below:

## Updating and Screening Checklist for Nitrogen Dioxide

Source, Location or data that needs to be assessed	COMMENTS
<b>Monitoring Data outside AQMA</b>	<p>A network of diffusion tubes are located at sites throughout the local authority and a continuous analyser is located at Paddys Market. QA/QC information is included in appendix 5. It should be noted that a significant number of the monitoring sites in 2005/06 have been located as part of a detailed assessment which is presently being undertaken by Carlisle City Council at relevant locations adjacent to traffic routes where congestion often occurs at or leading up to busy junctions within the city.</p> <p>Location maps and data obtained from all monitored locations since the last Updating and Screening Assessment are presented in section 7.6.</p>
	<p><b>CONCLUSION: Monitoring data results shows that NO<sub>2</sub> concentrations at relevant locations alongside Currock Street are above the annual mean 2005 objective. Currock Street <u>is already subject to a detailed assessment</u> and is part of a busy route to the west of the City Centre (incorporating Nelson Bridge, Charlotte Street, Junction Street and Dalston Road), under consideration in the detailed assessment. Whilst the detailed assessment is still being undertaken there is sufficient monitoring data at this stage to conclude that an AQMA will have to be declared for relevant locations on Currock Street.</b></p> <p>Monitoring undertaken on Charlotte Street indicates NO<sub>2</sub> concentrations are very close to the annual mean objective. The detailed assessment is still ongoing for this area and additional monitoring and air dispersion modelling is to be undertaken as part of the detailed assessment. It should be noted that the AQMA along Currock Street may have to be extended following completion of the detailed assessment.</p> <p>Monitoring data results also indicate that the annual mean NO<sub>2</sub> concentrations at relevant locations adjacent to the Botchergate/London Road junction and Finkle Street are also very close to the annual mean NO<sub>2</sub> objective. Again these areas are presently subject to a detailed assessment. Additional monitoring locations have been identified and dispersion modelling will be undertaken as part of the detailed assessment. Results will be reported in Autumn 2006.</p>
<b>Monitoring Data within the AQMA</b>	<p>All monitoring data from sites within the AQMA are presented in section 7.7.</p> <p>Data confirms that there are annual mean concentrations at several locations along the A7 that are above 40µgm<sup>-3</sup>.</p>
	<b>CONCLUSION: A detailed assessment is not required</b>



Source, Location or data that needs to be assessed	Steps to be taken to complete assessment	Comments
Road Traffic	Road traffic sources were assessed during previous rounds of review and assessment but have been rechecked following updated traffic flow data provided by Capita and the Highways Agency. Any new "relevant exposure" that may have occurred since the previous round of review and assessment has also been checked.	
Narrow congested streets with residential properties close to the kerb	<p>Information on traffic flows &gt;10,000 vehicle per day obtained from Capita</p> <p>Identify areas on listed roads with residential properties within 5 m of the kerb</p> <p>Monitoring data or the DMRB used to calculate/predict annual mean at relevant locations</p>	<p>Guidance advises that locations where relatively narrow streets (road width less than 10m wide) which have traffic flow &gt;10,000 vehicles per day and where tall buildings are present on both sides of the road (i.e. the height of the building is greater than the width of the road) are identified. Only Botchergate falls within this definition. However residential property occurs only at the lower end of Botchergate, where building height is generally lower. Botchergate was considered during the last Updating and Screening Assessment in 2003. A DMRB model predicted that NO<sub>2</sub> concentrations in 2005 at relevant locations would be 34 µgm<sup>-3</sup>. Monitoring has since been undertaken in Botchergate. The annual mean NO<sub>2</sub> concentration measured 39.6 µgm<sup>-3</sup> in 2005. Relevant locations at the lower end of Botchergate adjacent to the London Road / St. Nicholas Street junction are subject to a detailed assessment. Results are to be reported in Autumn 2006.</p>
<b>CONCLUSION: A detailed assessment is not required</b>		

Junctions	<p>The busiest junctions within the city are at present subject to a detailed assessment. These are:</p> <p>Newtown Road/Wigton Road/Church St Junction Junction St/Dalston Rd Junction Charlotte St/Nelson Bridge Junction James Street/Currock Rd Junction Warwick Road/Victoria Place Junction Victoria Place/Georgian Way Junction Botchergate/London Road Junction Tait St/Botchergate Junction</p>	A report on the findings of the detailed assessment which will include both monitoring and detailed modelling will be published in Autumn 2006.
<b>CONCLUSION: Detailed assessment already in progress</b>		
<p>Busy Streets where people may spend 1 hour or more close to traffic e.g. shopping, outdoor café/bars</p>	<p>These locations were considered during previous rounds of review and assessment by this authority but have been rechecked for the purposes of this assessment to take account of new relevant locations in the City Centre, which has seen significant development in recent years, particularly in respect to outdoor eating places.</p> <p>Streets identified with AADT &gt;10,000 vehicle per day and where people may be exposed for 1 hour or more within 5m of the kerb e.g. streets with outdoor cafes/bars, many shops</p> <p>Information obtained on traffic mix, flow speed etc</p> <p>DMRB use to predict the annual mean in the current year at relevant locations</p>	<p>Street listed in Table 7.1</p> <p>Results presented in table 7.1. There are no predicted annual means greater than 60 <math>\mu\text{gm}^{-3}</math> at any of these locations.</p>
<b>CONCLUSION: A detailed assessment is not required</b>		

Roads with high flow of buses/HDV	<p>This was considered during previous rounds of review and assessment but has been rechecked in response to updated traffic flow data.</p> <p>All roads with &gt;25% HDV identified</p> <p>Determine whether the flow of HDV is greater than 2500 vehicles per day.</p> <p>Determine whether there is relevant exposure within 10m of these roads.</p> <p>Use DMRB screening model to predict annual mean is the most current year at relevant locations</p>	<p>Information supplied by Highways Agency and Capita</p> <p>Roads listed in table 7.2 (a)</p> <p>Listed in Table 7.2 (a)</p> <p>Listed in Table 7.2 (a)</p> <p>Results of DMRB shown in Table 7.2 (b)</p>
<b>CONCLUSION: A detailed assessment is not required</b>		
New roads constructed or proposed since the previous review and assessment	<p>Establish whether the traffic flow on the proposed or new road is greater than 10,000 vehicles per day or whether the new road has increased traffic flow on existing roads previously identified as having 2005 annual mean concentrations greater than <math>36 \mu\text{gm}^{-3}</math> or more than 15 exceedences of <math>200 \mu\text{gm}^{-3}</math>.</p>	<p>The proposed CNDR route Carlisle Northern Development Route (CNDR) was considered during the last Updating and Screening Assessment in 2003. Construction work was due to commence on 2004/05 and the road due to open in 2006/07. Work has only just begun this year and it is not likely to open until 2010. Updated traffic figures for the proposed route and its effects on existing routes have been provided by Capita and are shown in Table 9.2 (a) and (b) located in the PM<sub>10</sub> section of this report.</p> <p>Along the sections of the proposed route where the AADT is expected to be above 10,000, relevant locations within 10 m of the roadside have been identified. A DMRB model has been run for the nearest relevant location. Results indicate that it is unlikely that either the 2005 or 2010 objectives will be exceeded at any of these locations.</p> <p>There is an expected increase in traffic on Georgian Way, the A595 and Peter Lane. None of these roads have previously been identified as being at risk of exceeding the objectives and the increase in traffic on these roads is not considered to be a risk to the objectives being exceeded.</p>
<b>CONCLUSION: A detailed assessment is not required</b>		

Bus Stations	<p>Carlisle has one bus station which was considered during the last round of review and assessment but bus movement have been rechecked for the purposes of this Updating and Screening Assessment.</p> <p>Information collected on the daily movements of buses.</p> <p>Identify whether the flow of vehicles greater than 1,000 bus movements per day.</p>	<p>Updated information provided by the Manager of Carlisle Bus Station.</p> <p>The maximum number of bus movements is below 400 on any day.</p>
<b>CONCLUSION: A detailed assessment is not required.</b>		
Industrial Sources	<b>Government guidance indicates that industrial sources will not make a significant contribution to the annual mean concentrations but could be significant in terms of the 1 hour objective. However, evidence from work carried out during previous rounds in the UK is that very few sources will require consideration. Sources in neighbouring authorities close to our boundary are also included in the assessment. A list of potential industrial sources that have the potential to submit NO<sub>2</sub> given in Appendix 2</b>	
New Industrial Sources	Check whether there are any new industrial sources since the last round of review and assessment	No new industrial sources have been identified either locally or in adjacent areas.
Industrial Sources with increased emissions	Determine whether any sources identified during previous rounds of review and assessment have substantially increased emissions (>30%)	No sources were identified in previous rounds of review and assessment as being significant emitters of NO <sub>2</sub> . None of our industrial process have experienced a substantial (>30%) increase in emissions.
<b>CONCLUSION: A detailed assessment is not required</b>		
Aircraft	<p><b>Carlisle Airport is a small, privately operated site. At present the airport's use is restricted to three main areas:-</b></p> <ul style="list-style-type: none"><li>• <b>Business jet flights</b></li><li>• <b>Private training activities</b></li><li>• <b>Army training.</b></li></ul> <p><b>There are presently no scheduled, chartered or cargo flights and in its current capacity the risk of exceeding the NO<sub>2</sub> objectives is negligible.</b></p> <p>The Airport has recently been acquired by the parent company of Eddie Stobbart Ltd., and substantial investment is planned. The situation will be kept under review.</p>	
<b>CONCLUSION: A detailed assessment is not required</b>		

## **7.6 Monitoring Data Outside the AQMA**

Monitoring of Nitrogen Dioxide within the local authority has continued since the last updating of screening and assessment. Carlisle City Council currently operates 46 diffusion tube monitoring sites and 1 site where continuous chemiluminescent analyser is located. Quality Control/Assurance procedures for both monitoring methods are discussed in Appendix 5.

The diffusion tube monitoring sites are subject to regular review and where sufficient data has been gathered, diffusion tubes are sometimes relocated to new locations of interest.

Occasionally problems occur, such as tubes are stolen or interfered with on a regular basis leading to the sites becoming unsuitable. As a result some diffusion tubes have been relocated to other similar sites close by.

The supply and analysis for all NO<sub>2</sub> diffusion tubes used by Carlisle City Council is undertaken by Casella Creair. Their method of tube preparation is 10% triethanolamine (TEA) in water.

Nitrogen dioxide diffusion tube data has been bias adjusted using a 'national correction factor' for this particular laboratory and method of tube preparation collected on behalf of Defra. All monitoring data sets of 9 months or more in 2004 have been bias adjusted using a correction factor of 0.83 and all monitoring data sets of 9 months or more in 2005 have been bias adjusted using a correction factor of 0.81. Bias adjusted annual means have then been projected forward to 2005 and 2010 to predict the annual mean concentrations in these years using the Year Adjustment Calculator provided by the Defra helpdesk.

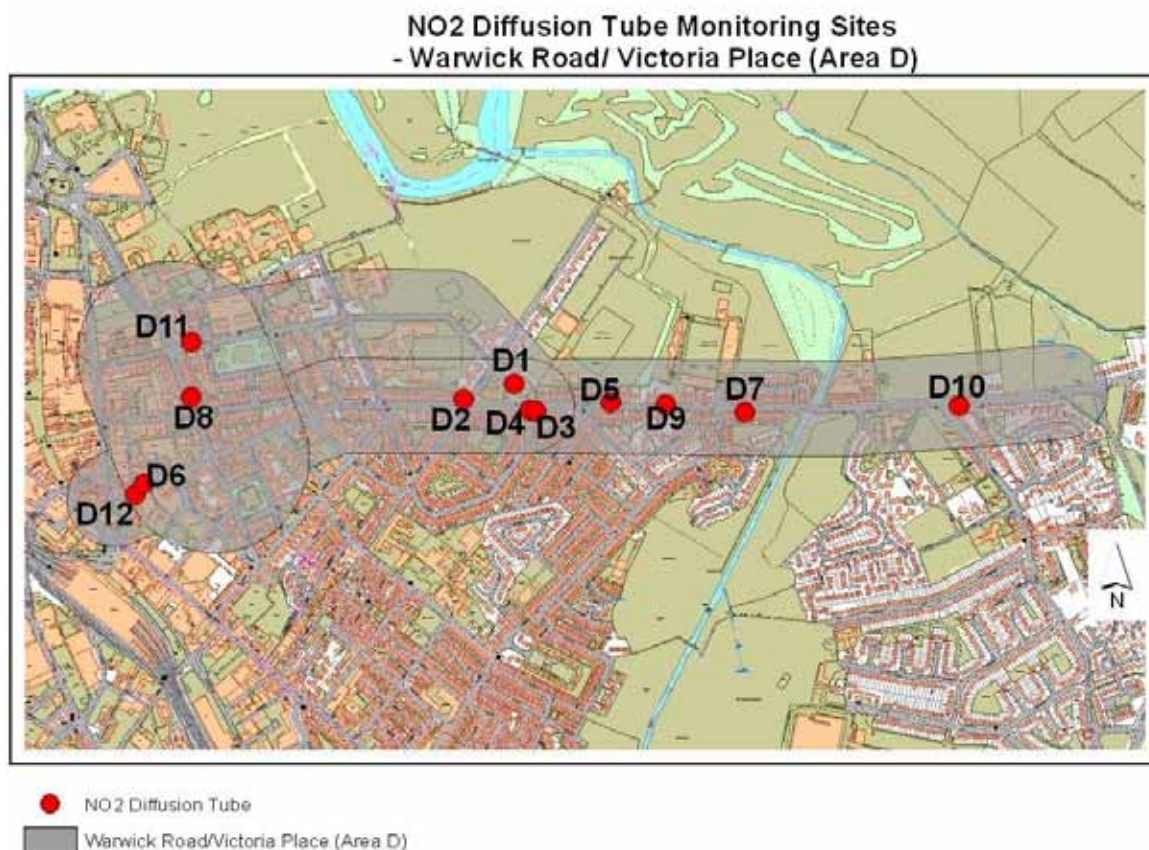
As stated in the checklist above a significant number of the monitoring sites in 2005/06 have been located as part of a detailed assessment which is presently being undertaken by Carlisle City Council at relevant locations adjacent to traffic routes where congestion often occurs adjacent to or leading up to busy junctions within the City.

Monitoring has also been undertaken in suburban residential areas, the city centre pedestrian area (main shopping area), and the 2 largest centres of population outside the City i.e. Longtown and Brampton.

For the purpose of this Report, the City of Carlisle has been divided into areas and all monitoring locations and corresponding data within each area are given in respective tables.

## 7.6.1 A69 Warwick Road/Victoria Place

The map below shows locations within this area that have been monitored since the last updating and screening assessment.



Location	2004 Monthly Mean NO <sub>2</sub> Concentrations gm <sup>-3</sup>												Raw 2004 NO <sub>2</sub> Annual Mean	Bias Adjusted 2004 NO <sub>2</sub> Annual Mean (0.83)	Predicted 2005 NO <sub>2</sub> Annual Mean	Predicted 2010 NO <sub>2</sub> Annual Mean
	J	F	M	A	M	J	J	A	S	O	N	D				
D5	28	44	33	24	29	26	27	32	22	33	39	27	30.3	25.1	24.4	20.5
D6	45	55	47	37	45	38	49	48	42	55	59	42	46.8	38.9	37.8	31.8

Location	2005 Monthly Mean NO <sub>2</sub> Concentrations gm <sup>-3</sup>															Raw 2005 NO <sub>2</sub> Annual Mean	Bias Adjusted 2005 NO <sub>2</sub> Annual Mean	Predicted 2010 NO <sub>2</sub> Annual Mean
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M			
D1					39	34	30	32	41	56	44	47	48			41.2	33.4	28.1
D2		29	28	21														
D3	A	40	38	35	36	35	29	28	44	52	49	A				38.6	31.3	26.3
D5	A	31	31	26	27	23	24	24	26	31	35	34				28.4	23	19.3
D9	A	A	41	39	45	30	38	42	34	A	43	46				39.8	32.2	27.1
D8	A	A	30	39	35	27	32	27	29	41	37	40				33.7	27.3	22.9
D11						17	38	31	41	42	77	45	A	43		41.7	33.8	28.4

Location	2006 Monthly Mean NO <sub>2</sub> Concentration gm <sup>-3</sup>												Raw 2006 NO <sub>2</sub> Annual Mean	Bias Adjusted 2006 NO <sub>2</sub> Annual Mean	Predicted 2010 NO <sub>2</sub> Annual Mean
	J	F	M	A	M	J	J	A	S	O	N	D			
D1	48														
D10	59														
D4	45														
D5	35														
D9	35 50														
D7	50														
D12	67														
D11	A														

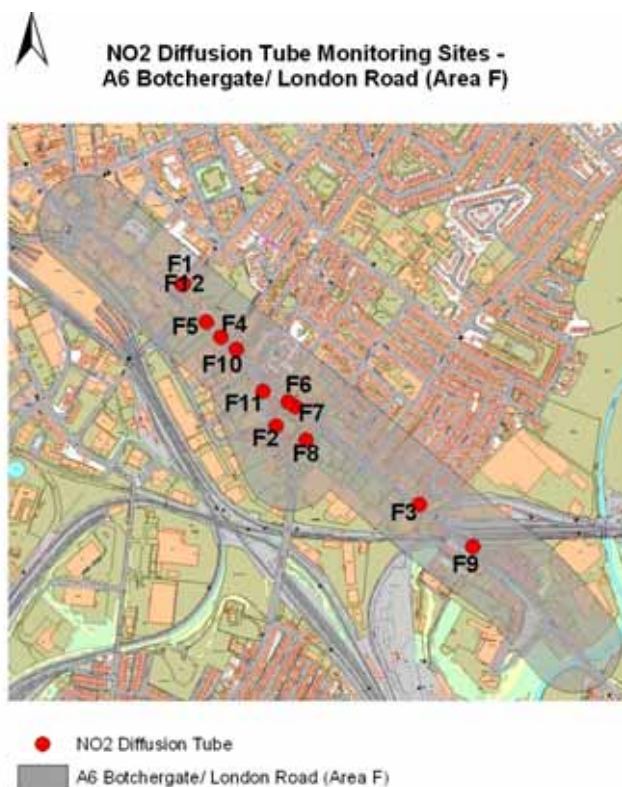
## Discussion

Results of monitoring has so far not identified any exceedence of the 2005 air quality objective for NO<sub>2</sub> in this area. New monitoring sites have however been identified and data will be reported in the detailed assessment report to be published in Autumn 2006.

It is unlikely that the EU limit values for NO<sub>2</sub> will be exceeded in 2010 at any of these locations.

## 7.6.2 A6 Botchergate / London Road

The map below shows locations within this area that have been monitored since the last updating and screening assessment:



Location	2004/2005 Monthly Mean NO <sub>2</sub> Concentrations    gm <sup>-3</sup>																Raw 2004 NO <sub>2</sub> Annual Mean	Bias Adjusted 2004 NO <sub>2</sub> Annual Mean	Predicted 2005 NO <sub>2</sub> Annual Mean	Predicted 2010 NO <sub>2</sub> Annual Mean
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A				
F2							31	36	21	40	29	25	48	41	37	35	34.3	28.5	27.7	23.3
F3							37	34	35	41	50	37	60	47	36	31	40.8	33.9	32.9	27.7
F6 *			59	54	54	50	68	63												
F7									40	61	57	49								
F8							20	23	14	26	25	20	25	29	26	21	22.9	19	18.5	15.5
F4			37	46	47	39	55	52	34	52	57	42					46.1	38.2	37.1	31.2
F1			43	45	45	48	41	43	41	45	55	43					44.9	37.3	36.2	30.5

\* F6 moved to relevant location (F7)



Location	2005 Monthly mean NO <sub>2</sub> Concentrations gm <sup>-3</sup>												Raw 2005 NO <sub>2</sub> Annual Mean	Bias Adjusted 2005 NO <sub>2</sub> Annual Mean	Predicted 2010 NO <sub>2</sub> Annual Mean
	J	F	M	A	M	J	J	A	S	O	N	D			
F7	52	53	53	45	A	46	42	45	45	51	45	52	48.1	38.9	32.7
F4	71	70	54	47	39	36	45	33	38	54	60	40	48.9	39.6	33.3
F12	A	A	41	36	35	27	32	30	36	47	53	49	38.6	31.3	26.3

Location	2006 Monthly Mean NO <sub>2</sub> Concentrations gm <sup>-3</sup>												Raw 2006 NO <sub>2</sub> Annual Mean	Bias Adjusted 2006 NO <sub>2</sub> Annual Mean	Predicted 2010 NO <sub>2</sub> Annual Mean
	J	F	M	A	M	J	J	A	S	O	N	D			
F9	54														
F7	54														
F4	56														
F1	45														
F5															
F11															

## Discussion of Results

Results have not identified any exceedences of the NO<sub>2</sub> objective levels in this area. However locations on both Botchergate and London Road are very close to the objective levels.

A detailed assessment is still ongoing for this locality and additional monitoring sites have been recently located. Detailed air dispersion modelling will also be undertaken.

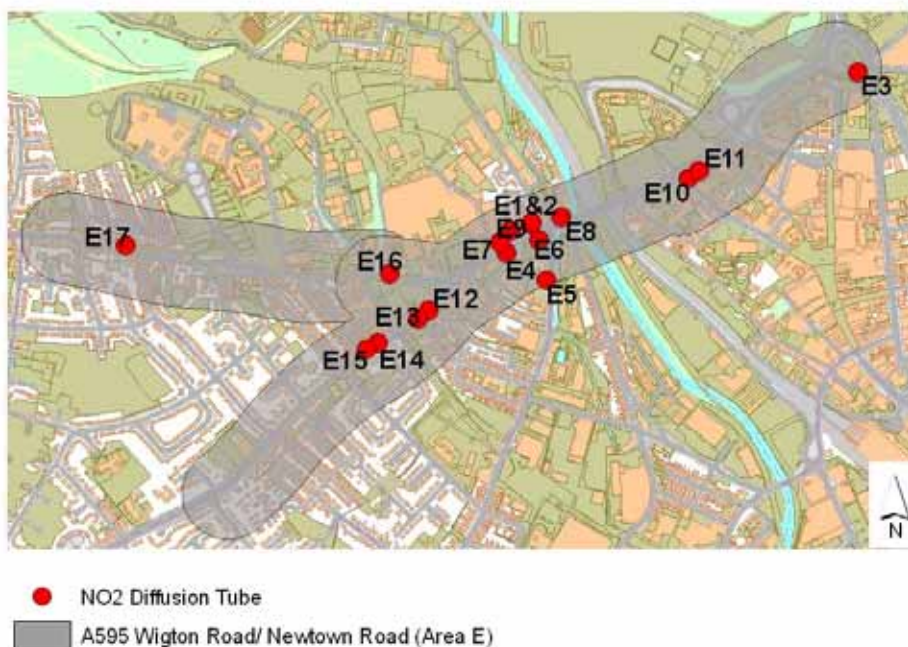
Results of the detailed assessment will be published in Autumn 2006.

It is unlikely that the EU limit values for NO<sub>2</sub> will be exceeded in 2010 at any of these locations.

### 7.6.3 A595 Castleway / Newtown Road / Wigton Road

The map below shows locations that have been monitored since the last updating and screening assessment.

NO2 Diffusion Tube Monitoring Sites  
- A595 Wigton Road/ Newtown Road (Area E)



### Nitrogen Dioxide Diffusion Tube Monitoring Results

Location	2004 Monthly Mean NO <sub>2</sub> Concentrations gm <sup>-3</sup>															Raw 2004 NO <sub>2</sub> Annual Mean	Bias Adjusted 2004 NO <sub>2</sub> Annual Mean (0.83)	Predicted 2005 NO <sub>2</sub> Annual Mean	Predicted 2010 NO <sub>2</sub> Annual Mean
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M				
E1	42	43	35	35	41	37	37	41	41	46	46	47				40.9	33.9	32.9	27.7
E6 (1) Triplicate tubes	39	50		45	45	42	41	45	36	49	49	38				43.5	36.1	35.1	29.5
E6 (2) Triplicate tubes	39	43		43	51	43	45	42	39	50	54	40				44.4	36.8	35.7	30.1
E6 (3) Triplicate tubes	33	42		34	43	38	41	52	40	48	50	36				41.5	34.4	33.4	28.1
E5	25	34	31	28	27	23	28	33	21	47	32	38				30.6	25.4	24.7	20.8
E13									57	50	43	40							
E10					41	40	36	44	43	52	49	43	63	54		46.5	38.6	37.5	31.5
E3	39	35	44	38	37	A	37	38	38	47	56	A				40.9	33.9	32.9	27.7

Location	2005 Monthly Mean NO <sub>2</sub> Concentrations gm <sup>-3</sup>															Raw 2005 NO <sub>2</sub> Annual Mean	Bias Adjusted 2005 NO <sub>2</sub> Annual Mean	Predicted 2010 NO <sub>2</sub> Annual Mean
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M			
E1	44	35	29	42	38	34	30	31	39	49	62	57				40.8	33	27.8
E6 (1) Triplicate tubes	48	58	46	49	33	33	47	21	33	45	43	47				41.9	33.9	28.5
E6 (2) Triplicate tubes	42	55	42	45	37	29	29	21	30	44	45	46				38.7	31.3	26.3
E6 (3) Triplicate tubes	46	41	42	50	40	38	33	21	28	30	48	48				38.7	31.3	26.3
E7						28	35	32	39	52	54	54				42	34	28.6
E8												66	72					
E4	40	40	45	38	34	30	38	29	38	58	52	51				41.8	33.8	28.4
E14						50	43	42	55	55	45	60						
E17												36	34					
E16				53	52	35	32	31	43	61	51		56			46	37.3	31.4
E12	55	44	0	45	40	33	44	37	41	42	46	49				43.3	35.1	29.5
E11						42	41	44	43	66	54	51	51	48		48.9	39.6	33.1
E3	50	49	47	A	34	30	A	28	31	59	54	A				42.4	34.3	28.8

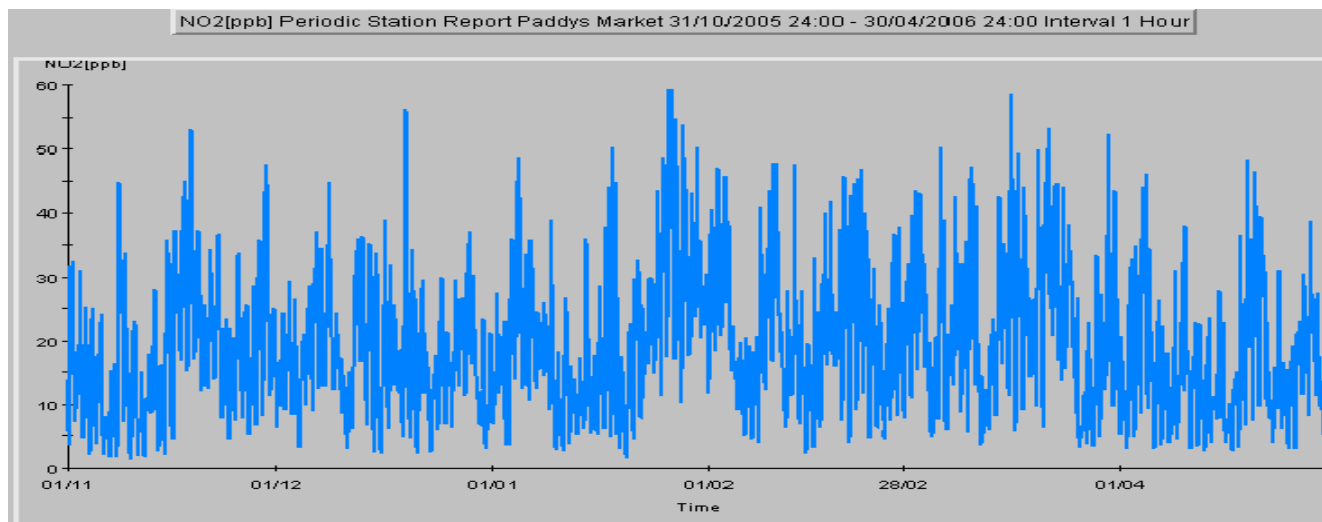
Location	2006 Monthly Mean NO <sub>2</sub> Concentrations gm <sup>-3</sup>													Raw 2006 NO <sub>2</sub> Annual Mean	Bias Adjusted 2006 NO <sub>2</sub> Annual Mean	Predicted 2010 NO <sub>2</sub> Annual Mean
	D	J	F	M	A	M	J	J	A	S	O	N	D			
E2		51	54													
E6 (1) Triplicate tubes		50	48													
E6 (2) Triplicate tubes		47	48													
E6 (3) Triplicate tubes		47	46													
E9		55	45													
E8*	66	72	67													
E15		56	63													
E12		49	A													
E4		58	59													
E11		51	48													
E16		56	54													
E17	36	34	32													

\* Empty Property – Formerly a hostel. Future use unknown

## Nitrogen Dioxide Continuous Analyser Monitoring Results

As well as diffusion tube monitoring undertaken in this area, a continuous analyser is also located adjacent to the Bridge Street / Church Street junction in Caldewgate.

Unfortunately the Nitrogen Dioxide analyser was destroyed during the floods in January 2005. It was replaced in Autumn 2005 but due to commissioning delays the analyser was not in full operation until November 2005. Provisional data is therefore only reported for the period 01.11.05 to 30.04.06 (winter months) and shown in the graph below.



Measurements are in ppb. The period mean (01/11/05 to 30/04/06) measured 19ppb which is equivalent to  $36.3\mu\text{g m}^{-3}$ . At least 9 months of data in a calendar year is required to calculate the annual mean and it has not been possible to estimate the annual mean from the short term data using the procedure in TG (03) due to the data covering 2 calendar years. However as the monitoring data covers the winter months when NO<sub>x</sub> levels are generally higher, it is considered unlikely that an exceedance of the 2005 annual mean objective would occur at this location.

Measurements to accurately assess the likelihood of achieving the Nitrogen Dioxide objective can only be undertaken using a continuous analyser and therefore has only taken place at Paddys Market.

Results indicate hourly means during the monitoring period did not exceed 60 ppb and it is considered unlikely that the 2005 hourly mean objective would be exceeded at this location.

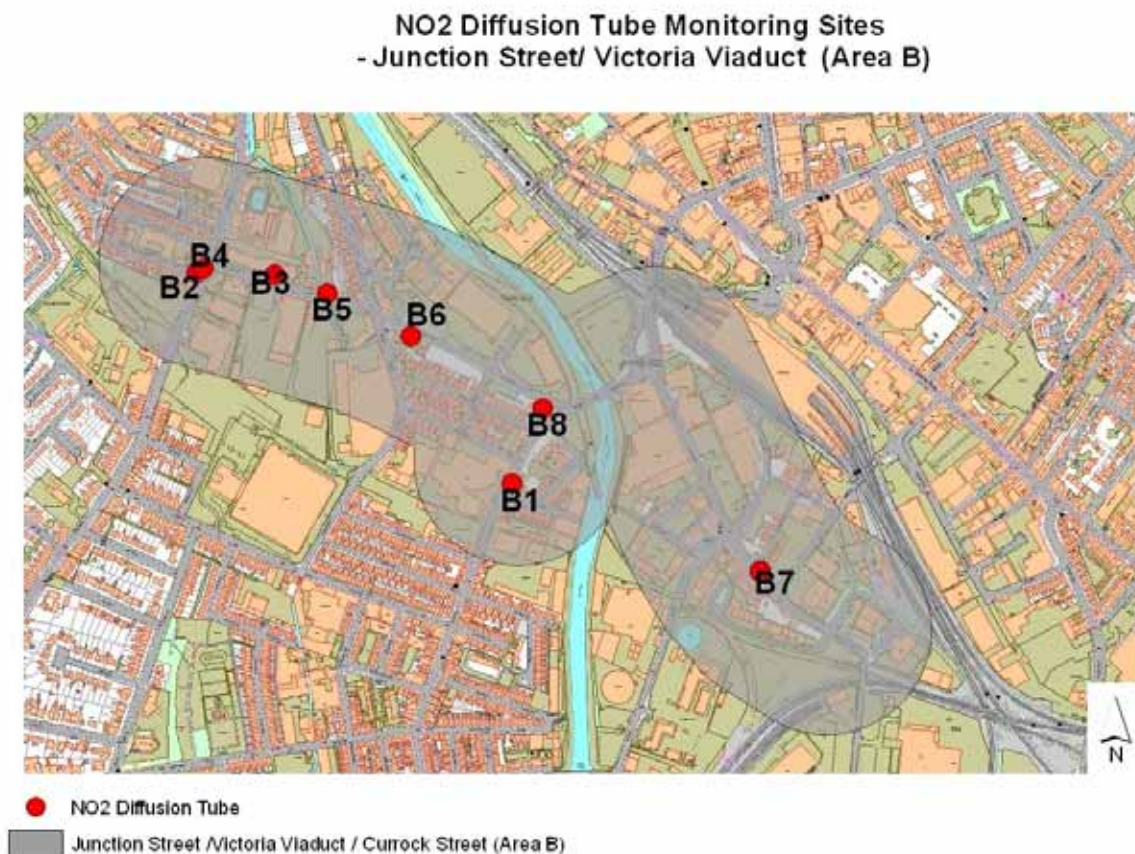
## Discussion

Monitoring undertaken in the Caldewgate area, has so far not identified any exceedance of the NO<sub>2</sub> objectives. However relevant locations alongside Finkle Street are very close to the annual mean objective. The area is still subject to a detailed assessment and additional monitoring sites have been located. Results will be reported in Autumn 2006.

It is considered unlikely that the EU limit values for NO<sub>2</sub> in 2010 will be exceeded at any of these locations.

#### 7.6.4 Junction Street / Victoria Viaduct / Currock Street

The map below shows locations that have been monitored since the last updating and screening assessment:



#### 2004

Location	2004 Monthly Mean NO <sub>2</sub> Concentrations gm <sup>-3</sup>											
	J	F	M	A	M	J	J	A	S	O	N	D
B2									35	46	51	45
B7									45	60	61	50

#### 2005

Location	2005 Monthly Mean NO <sub>2</sub> Concentrations gm <sup>-3</sup>												Raw 2005 NO <sub>2</sub> Annual Mean	Bias Adjusted 2005 NO <sub>2</sub> Annual Mean (0.81)	Predicted 2010 NO <sub>2</sub> Annual Mean
	J	F	M	A	M	J	J	A	S	O	N	D			
B6				49	43	40	39	40	45	56	68	62	49.1	39.8	33.5
B5		72	45	41	40	27	A	28	25	50	51	60	43.9	35.6	29.9
B2	36	47	43	40	34	A	28	27	40	59	48		40.2	32.6	27.4
B7	74	57	56	51	44	45	42	43	53	66	66	64	55.1	44.6	37.5
B1			28	31	20	17	19	16	24	34	46	A	26.1	21.1	17.7

## 2006

Location	2006 Monthly Mean NO <sub>2</sub> Concentrations gm <sup>-3</sup>												Raw 2006 NO <sub>2</sub> Annual Mean	Bias Adjusted 2006 NO <sub>2</sub> Annual Mean	Predicted 2010 NO <sub>2</sub> Annual Mean
	J	F	M	A	M	J	J	A	S	O	N	D			
B8															
B5	55														
B4	45														
B7	61														
B6	54														
B3															

Monitoring results for this area shows that relevant location adjacent to Currock Street are above the annual mean NO<sub>2</sub> objective level for 2005. The City Council will therefore have to declare an AQMA for this area. At present it is proposed that the AQMA would stretch from the Crown Road /Currock Street junction to the James Street/Rome Street Junction and include all residential properties immediately adjacent to the road. A map showing the proposed boundaries of the AQMA are shown in Appendix 6.

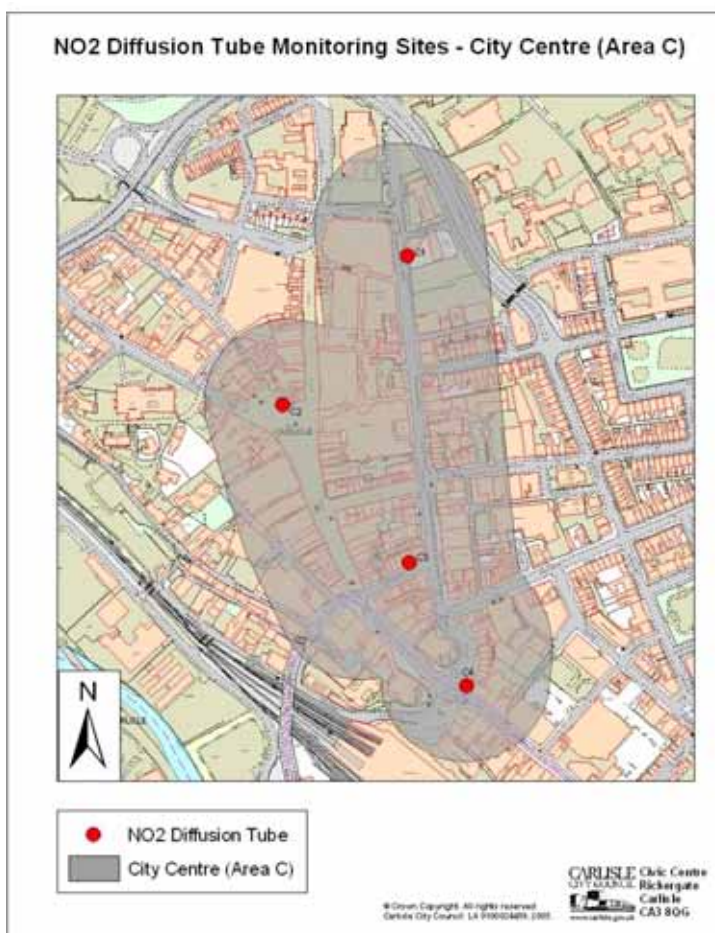
However monitoring at relevant locations alongside Charlotte Street indicates that the NO<sub>2</sub> concentrations are just below the annual mean objective level. A detailed assessment is still ongoing for this locality. Additional monitoring locations have been sited alongside Charlotte Street and Junction Street. The findings of the detailed assessment will be published in Autumn 2006. It is however possible that the AQMA will have to be extended to include other locations along this route.

It is considered unlikely that the EU limit values for NO<sub>2</sub> in 2010 will be exceeded.



## 7.6.5 City Centre

The map below shows locations that have been monitored since the last updating and screening assessment. These sites are located within the centre of the city in areas where shops and cafes are located.



## 2004

Location	2004 Monthly Mean NO <sub>2</sub> Concentrations gm <sup>-3</sup>												Raw 2004 NO <sub>2</sub> Annual Mean	Bias Adjusted 2004 NO <sub>2</sub> Annual Mean (0.83)	Predicted 2005 NO <sub>2</sub> Annual Mean	Predicted 2010 NO <sub>2</sub> Annual Mean
	J	F	M	A	M	J	J	A	S	O	N	D				
C1 Duplicate site	44	40	36	40	39	34	39	38	35	46	49	44	40.3	33.5	32.5	27.4
C1 Duplicate site	37	41	34	41	35	35	40	46	29	45	52	44	39.9	33.1	32.2	27.1
C2	18	28	18	17	14	12	15	19	12	13	25	23	17.8	14.8	14.4	12.1

## 2005

Location	2005 Monthly mean NO <sub>2</sub> concentrations gm <sup>-3</sup>												Raw 2005 NO <sub>2</sub> Annual Mean	Bias Adjusted 2005 NO <sub>2</sub> Annual Mean (0.81)	Predicted 2010 NO <sub>2</sub> Annual Mean
	J	F	M	A	M	J	J	A	S	O	N	D			
C2	24	25	23	23	13	13	13	7	17	26	31	30	20.4	16.5	13.9
C1	56	49	44	41	35	23	34	30	40	51	51	44	41.5	33.6	28.3

## 2006

Location	2006 Monthly Mean NO <sub>2</sub> Concentrations gm <sup>-3</sup>												Raw 2006 NO <sub>2</sub> Annual Mean	Bias Adjusted 2006 NO <sub>2</sub> Annual Mean	Predicted 2010 NO <sub>2</sub> Annual Mean
	J	F	M	A	M	J	J	A	S	O	N	D			
C1	43														
C2	29														
C3	52														
C4	50														

## Discussion

Results indicate the annual mean concentrations are well below the air quality objectives for nitrogen dioxide.

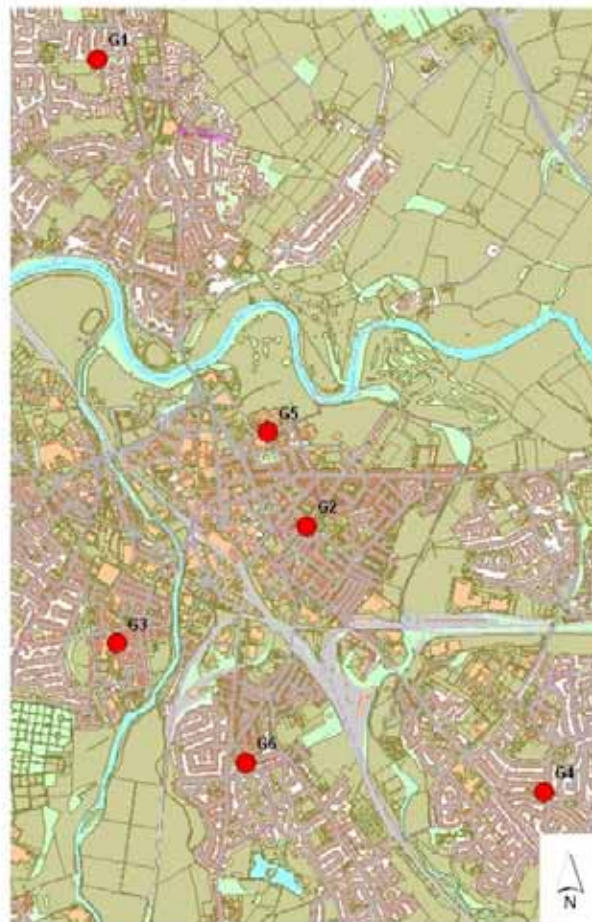
New monitoring locations have recently been sited adjacent to where new outdoor cafes are present within 5m of the kerb busy roads. Monitoring will continue for the year and results will be reported in the next Progress Report due in April 2007.



### 7.6.6 Residential Area / Suburban Area

The map below shows locations that have been monitored since the last Updating and Screening Assessment. These monitoring sites are located in suburban residential areas away from busy roads within the city and represent urban background concentrations.

**NO<sub>2</sub> Diffusion Tube Monitoring Sites  
- Residential/ Suburban (Area G)**



● NO<sub>2</sub> Diffusion Tube

## 2004

Location	2004 Monthly Mean NO <sub>2</sub> Concentrations gm <sup>-3</sup>												Raw 2004 NO <sub>2</sub> Annual Mean	Bias Adjusted 2004 NO <sub>2</sub> Annual Mean (0.83)	Predicted 2005 NO <sub>2</sub> Annual Mean	Predicted 2010 NO <sub>2</sub> Annual Mean
	J	F	M	A	M	J	J	A	S	O	N	D				
G1	9	20	12	14	12	8	12	15	7	18	21	19	13.9	11.5	11.2	9.4
G2	31	36	35	26	27	25	27	27	25	A	44	37	28.4	23.6	22.9	19.3
G3	22	18	20	17	14	11	13	18	11	27	26	23	18.3	15.2	14.8	12.4
G4	18	A	16	27	18	14	17	18	17	28	A	A	19.4	16.1	15.6	13.2
G5	29	28	23	19	17	19	17	17	19	28	34	34	23.7	19.7	19.1	16.1
G6	A	19	17	17	15	11	16	20	13	27	19	14	17.1	14.2	13.8	11.6

## 2005

Location													Raw 2005 NO <sub>2</sub> Annual Mean	Bias Adjusted 2005 NO <sub>2</sub> Annual Mean (0.81)	Predicted 2010 NO <sub>2</sub> Annual Mean
	J	F	M	A	M	J	J	A	S	O	N	D			
G1	15	18	16	14	12	8	9	9	12	12	21	A	13.3	10.7	9
G2	37	33	34	27	25	22	22	12	28	A	48	A	28.8	23.3	19.6
G3	19	27	23	18	14	11	12	11	13	22	29	28	18.9	15.3	12.9

## Discussion

As would be expected annual mean concentrations are significantly below the 2005 air quality objectives for Nitrogen Dioxide

It is considered unlikely that the EU limit values for NO<sub>2</sub> will be exceeded in 2010.

### 7.6.7 LONGTOWN/BRAMPTON

Brampton and Longtown are the two highest centres of population outside the city.

Location	2004 Monthly Mean NO <sub>2</sub> Concentrations gm <sup>-3</sup>												Raw 2004 NO <sub>2</sub> Annual Mean	Bias Adjusted 2004 NO <sub>2</sub> Annual Mean (0.83)	Predicted 2005 NO <sub>2</sub> Annual Mean	Predicted 2010 NO <sub>2</sub> Annual Mean
	J	F	M	A	M	J	J	A	S	O	N	D				
Brampton	14	11	14	11	14	11	11	12		16	21	19	14	11.6	11.3	9.5
Longtown	22	27	26	28	27	21	26	22	24	44	26	33	27.2	22.6	21.9	18.5

Location	2005 Monthly Mean NO <sub>2</sub> Concentrations gm <sup>-3</sup>												Raw 2005 NO <sub>2</sub> Annual Mean	Bias Adjusted 2005 NO <sub>2</sub> Annual Mean (0.81)	Predicted 2010 NO <sub>2</sub> Annual Mean
	J	F	M	A	M	J	J	A	S	O	N	D			
Brampton *	24	18	16	12	10	9	14	17	19	30	22	32	18.6	15.1	12.7
Longtown	32	29	28	31	24	26	20	22	24	31	36	30	27.7	22.4	18.8

\* New site

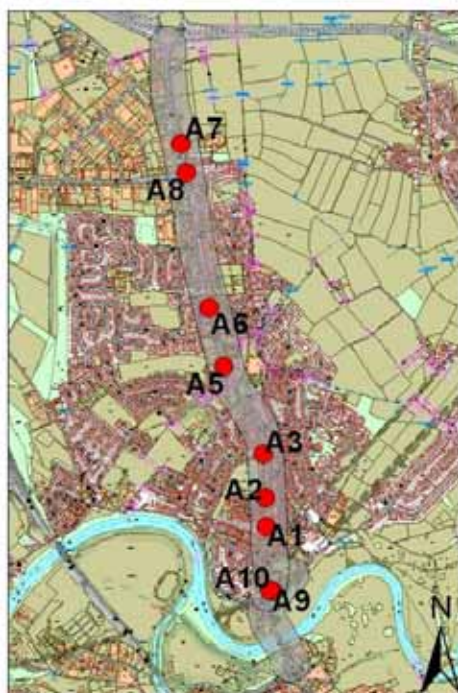
### Discussion

Results indicate that concentrations are well below the 2005 air quality objectives for Nitrogen Dioxide.

It is considered unlikely that the EU limit values for NO<sub>2</sub> will be exceeded in 2010 at any of these locations.

## 7.7 Monitoring Data within the AQMA - A7 Stanwix Bank / Scotland Road / Kingstown Road

NO<sub>2</sub> Diffusion Tube Monitoring Sites -  
A7 Stanwix Bank/ Scotland Road/ Kingstown Road (Area A)



● NO<sub>2</sub> Diffusion Tube  
 A7 Stanwix Bank /Scotland Road /Kingstown Road (Area A)

Location	2004/2005 Monthly Mean NO <sub>2</sub> Concentrations												Raw 2004 NO <sub>2</sub> Annual Mean	Bias Adjusted 2004 NO <sub>2</sub> Annual Mean (0.83)	Predicted 2005 NO <sub>2</sub> Annual Mean	Predicted 2010 NO <sub>2</sub> Annual Mean
	J	F	M	A	M	J	J	A	S	O	N	D				
A1	46	48	4	50	4	32	49	50	49	52	68	64	50.8	42.2	41	34.5
A2			48	48	41	42	45	37	37	42	41	47	42.8	35.5	34.5	29
A7					38	39	36	35	31	45	40	54	39.7	32.9	31.9	26.9
A9									46	51	63	51				
A8			34	38	33	34	35	34	4	44	61	37	38.9	32.3	31.4	26.4
A5			44	55	44	49	52	51	48	50	48	51	49.2	40.8	39.6	33.3
A10					52	49	57	35	45	73	67	50	53.5	44.4	43.1	36.3
A3				25	27	13	19	30	18	35	49	30	27.3	22.7	22.1	18.5
A6				43	33	24	29	38	25	36	46	39	34.8	28.9	28.1	23.6

Location	2005 Monthly Mean NO <sub>2</sub> Concentrations												Raw 2005 NO <sub>2</sub> Annual Mean	Bias Adjusted 2005 NO <sub>2</sub> Annual Mean (0.81)	Predicted 2005 NO <sub>2</sub> Annual Mean at relevant receptor **	Predicted 2010 NO <sub>2</sub> Annual Mean
	J	F	M	A	M	J	J	A	S	O	N	D				
A1 *	71	50	50	A	60	48	47	53	60	67	68	69	58.5	47.3	42.6	35.8
A2	42	58	51	44	43	38	39	43	46	51	61	A	46.9	38		31.9
A7	70	59	A	33	26	33	31	36	44	54	54	58	45.3	36.7		30.9
A9	57	62	49	41	48	43	58	40	51	49	80	69	53.9	43.6		36.7
A5 *	61	70	59	57	56	50	49	48	56	64	75	55	58.3	47.3	42.5	35.7
A8	A	56	44	24	34	25	29	33	34	33	60	A	37.2	30.1		25.3
A10	52	69	66	75	59	44	45	42	59	85	69	70	61.2	49.5		41.6

\* Monitoring location is closer to kerbside than relevant receptor. NO<sub>2</sub> concentrations will be lower at relevant locations.

\*\* Adjustment factor of 0.90 applied to monitored data to assess concentration at facade of relevant locations.

## 2006

Location	2006 Monthly Mean NO <sub>2</sub> concentrations gm <sup>-3</sup>														
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M
A1	63	70													
A7	49	55													
A9	66	59													
A5	65	66													
A10	85	78													

## Discussion

Results of monitoring data show that annual mean NO<sub>2</sub> concentrations at several locations alongside the A7 are above the 2005 objective level. It is also possible that the EU limit values for NO<sub>2</sub> in 2010 could also be exceeded.

A detailed assessment would only be required within an AQMA should exceedences of the NO<sub>2</sub> objectives not be identified.

There is no need to proceed to a detailed assessment.

**Table 7.1 DMRB Results - Busy streets where people may spend 1 hour or more close to traffic e.g. shopping, outdoor cafes**

The following streets have been identified where people may spend more than 1 hour close to traffic. These are streets where outdoor cafes or shops are present.

Streets with traffic flows >10,000 per day	Relevant locations within 5m of the kerb	Predicted NO <sub>2</sub> annual mean concentrations $\mu\text{g m}^{-3}$	
		2005	2010
Botchergate	Yes	40	33
Lowther Street	Yes	28.3	24.1
Devonshire Street	Yes	34	28
The Crescent	Yes	32.4	27.4
Warwick Road	Yes	29.7	25.2

The results of the DMRB has not identified any exceedences of the 2005 1 hour NO<sub>2</sub> objective (equivalent to 60  $\mu\text{g m}^{-3}$ ) at any of these locations.

It is also unlikely that the EU limit values for NO<sub>2</sub> in 2010 will be exceeded at any of these locations.

**Table 7.2 (a) Roads with high flow of buses/HGV's (>25% AADT)**

The following roads have been identified where the proportion of HDV's is greater than 25%. Only the A74(M) has relevant locations within 10m of the road.

Road	% HDV	HDV/Day	Receptors within 10m
J 41-42, M6	29	12760	No
J 42-43, M6	28	12880	No
J43-44, M6	27	12015	No
J44, M6 A74 (M) J22	29	12934	Yes

**Table 7.2 (b) Results of DMRB for roads with high flow of buses/HGV's (>25%) and relevant locations within 10m**

Road	Distance from receptor to road centre (m)	Speed Km/h	2005 AADT	2010 AADT	% HGV	NO <sub>2</sub> annual mean concentrations $\mu\text{g m}^{-3}$	
						2005	2010
J44, M6 J22, A74	18	70	44600	48200	29	29.3	28.6

Results are based on 2005 AADT flows and background concentrations. Results indicate that it is unlikely that the 2005 NO<sub>2</sub> objective would be exceeded.

It is also considered unlikely that the EU limit for NO<sub>2</sub> in 2010 would be exceeded.

## **8.0 ROUND 3 - REVIEW AND ASSESSMENT FOR SULPHUR DIOXIDE**

### **8.1 Introduction**

Sulphur Dioxide is an acute respiratory irritant and can cause constriction of the airway by stimulating nerves in the lining of the nose, throat and airway of the lungs. The latter effect is particularly likely to occur in those suffering from asthma and chronic lung disease. The effects of sulphur dioxide on sensitive subjects appear almost immediately at the start of exposure. Because health effects may be noticeable after only a few minutes the air quality standards are set over short periods of time.

### **8.2 Standards and Objectives**

The Government has adopted a 15 minute mean of  $266 \mu\text{g}/\text{m}^3$  as an air quality standard with an objective for the standard not to be exceeded more than 35 times in a year by the end of 2005.

In addition there is a 1 hour mean objective of  $350 \mu\text{g}/\text{m}^3$  to be exceeded no more than 24 times per year and a 24 hour objective of  $125 \mu\text{g}/\text{m}^3$  to be exceeded no more than 3 times per year, to be achieved by the end of 2004.

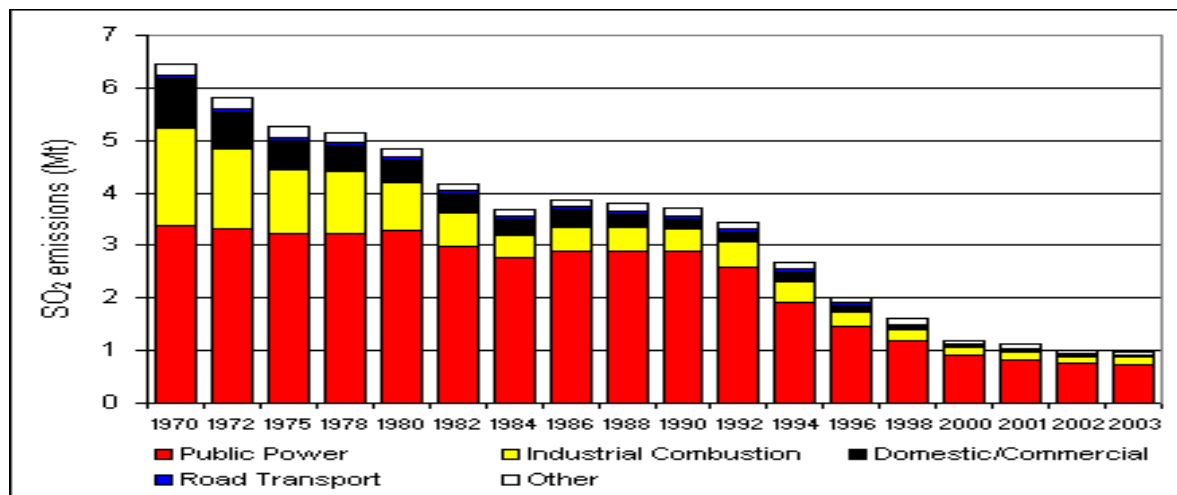
### **8.3 What are the main outdoor sources of Sulphur Dioxide? – National Perspective**

Sulphur Dioxide is a gas at normal temperature and pressure. It dissolves in water to give an acidic solution which is readily oxidised to sulphuric acid.

In the UK, the predominant source of sulphur dioxide is the combustion of sulphur containing fossil fuels, principally coal and heavy oils.

Since 1970 there has been a substantial overall reduction of more than 85% in SO<sub>2</sub> emissions. The emission profile exhibits a steady decline between 1970 and 2003 with the exception of small peaks in 1973 and 1979 corresponding to the harsh winters in those years and a short period at the end of the 1980s when emissions were relatively constant from year to year.

## UK Atmospheric Emissions of SO<sub>2</sub>



Source: NAEI

The two main contributors are solid fuel and petroleum products. Emissions from solid fuel use have declined by 80% since 1970 and those from petroleum by 94%. The most important factors in the fall in emissions from petroleum use are the decline in fuel oil use and the reduction in the sulphur content of gas oil and DERV. The reduction in the sulphur content of gas oil is particularly significant in sectors such as domestic heating, commercial heating and off-road sources where gas oil is used extensively.

Previous rounds of review and assessment in the UK have confirmed that the 15 minute objective was the most stringent for sulphur dioxide and that there are a few sources that have caused exceedences of the air quality objective for Sulphur Dioxide. There are 12 Air Quality Management Areas which have so far been declared in the UK in respect to sulphur dioxide.

Sources include shipping (major ports), large combustion plant, boiler plant and areas where significant domestic coal burning take place (particularly in Northern Ireland).



## 8.4 Results of Rounds 1 & 2 Review and Assessment of Sulphur Dioxide undertaken by Carlisle City Council

No sites were identified in the previous rounds of review and assessment that suggested there would be exceedences of the air quality objectives for sulphur dioxide within this local authority.

## 8.5 Round 3 - Updating and Screening Assessment for Sulphur Dioxide in the Carlisle City Council Area

This Updating and Screening Assessment is based on the updated guidance and checklists provided by Technical Guidance LAQM TG (03) as amended and the results are presented below:

Source, Location or Data that needs to be assessed	13 Steps to be taken to complete assessment	14 Comments
<b>Monitoring Data</b>	Collate all monitoring data	No monitoring for Sulphur Dioxide is currently undertaken in this authority
<b>Industrial Sources</b>	<b>Overview: There are very few industrial sources that cause exceedences of the SO<sub>2</sub> air quality objective, however guidance suggests that large coal burning boilers may be significant. Regulations limiting the sulphur content of fuel oil to less than 1% from 01.01.2003 means that sources burning fuel oil are unlikely to be significant on their own although the combined impact of several sources may be. A list of potential industrial sources which may emit SO<sub>2</sub> are show in Appendix 2.</b>	
New Industrial Sources	Identify any significant new industrial sources	No new industrial sources have been identified either locally or in adjacent areas since the last round of review and assessment.
Industrial Sources with substantially increased emissions or new relevant exposure	Determine whether any sources identified during the last round as significant have substantially increased emission	There is one industrial process (a roadstone coating) located on Willowholme Industrial Estate. The process uses light fuel oil and is not therefore considered significant. There has been no increase in emissions since the last Updating and Screening Assessment
<b>Conclusion: A detailed assessment is not required</b>		

<b>Boilers</b> Small Boiler >5 MW(thermal)	Identify all boiler plant >5 MW (thermal) that burn coal or fuel oil	All medium/large institutional and commercial buildings within the District where large boiler plant may be utilised were contacted during the last round of review and assessment. None were found to be significant sources of SO <sub>2</sub> . The situation has been rechecked for the purposes of this assessment. All large industrial and commercial buildings listed below this checklist have been contacted. Results indicate that there has been no change to this situation.
<b>Conclusion: A detailed assessment is not required</b>		
<b>Domestic Sources</b>	<b>Overview: There are still areas in the UK where domestic coal burning is being carried out and these can be significant sources of sulphur dioxide. Consideration of the results from previous rounds has shown the need to focus on the density of houses burning coal over an area of 500 x 500m</b>	
Areas of Domestic Coal Burning	Identify areas where significant coal burning still takes place. N.B Smokeless fuel has a similar content to coal and is treated in the same way. Significant is taken to be any area of 500 x 500m where there may be 100 houses or more burning solid fuel as the primary source of heating	All villages/towns that do not have main gas available were considered by this authority during the last round of review and assessment in 2003. These are listed in table 8.1. It was not considered likely that there were any locations where the density of coal burning premises exceeded 100 per 500 x 500m area. There has been no significant change to this situation.
<b>Conclusion: A detailed assessment is not required</b>		
<b>Other Source: The fuels used in the transport sector contain varying amounts of sulphur. This section considers the range of possible transport related sources that may represent a risk of exceeding the 15 minute objective. In particular diesel and coal fired locomotive emit sulphur dioxide. Moving locomotives do not need to be considered. However guidance suggests that exposure to stationary locomotive may be more significant, but only in terms of the 15 minute objective.</b>		
Shipping	Not applicable to this area	
Railway Locomotives	Identify locations where diesel or steam locomotives are regularly stationery for periods of 15 minutes or more.  Establish whether there is the potential for regular outdoor exposure of members of the public within 15m of the	Carlisle has a significant railway network. Whilst there are locations throughout the authority which are located within 15m of a railway track there were no locations identified during the last round of review and assessment where trains remain stationery for more than

	Stationary locomotive	<p>15 minutes at those locations.</p> <p>The situation has been rechecked for the purposes of this updating screening and assessment.</p> <p>Discussions and visits with the Railway Station Manager and Managers of the goods yards and sidings at Currock, Durranhill, Kingmoor and Upperby where trains are most likely to be stationary confirms that trains are not regularly stationary for 15 minutes or more at relevant locations.</p>
	<b>Conclusion: A detailed assessment is not required</b>	

## 8.6 Conclusion:

There has been no significant changes with regards to SO<sub>2</sub> emissions in this authority and as such a detailed assessment will not be required.

### **Premises Contacted For Details on Boiler Capacity and Type of Fuel Used**

The premises listed below were contacted as part of this Updating and Screening Assessment requesting updated details on boiler output and type of fuel used:-

Border TV  
 Carlisle College  
 St. Martins College  
 Cumbria Institute of the Arts  
 Cumberland Infirmary  
 Rural Payments Agency  
 Carrs Billington  
 McVities, Carlisle  
 Pirelli Tyres  
 Stead McAlpin & Co Ltd  
 Crown Cork of Seal – Bevcan Europe (Metal Box)  
 Linton Tweeds Ltd  
 Nestle, Dalston  
 Caldew School  
 Lochinvar School  
 William Howard School  
 Trinity School  
 St Aidans County High School  
 NCTC  
 Newman School  
 Roadstone Coating

All premises contacted confirmed they use gas. Nestle, Cumberland Infirmary and Pirelli have stated that they use light fuel oil as a back up only – negligible amount.

Coal and heavy fuel oil is not used at any of these premises.

### **Domestic Sources**

There are a number of villages and a small town within the District that do not have a main gas supply and therefore use alternatives as a primary fuel. These are listed in the table below.

**Table 8.1 - Large Villages and Town without Mains Gas Supply**

<b>Area</b>	<b>Max no of dwellings in 500 x 5000m grid</b>
Hallbankgate	52
Thurstonfield	83
Castle Carrock	77
Great Orton	66
Irthington	53
Longtown *	353

\* Only Longtown was considered a possible location where there may be a risk of exceeding the air quality objective for SO<sub>2</sub> during the last visit in 2003. Questionnaires were subsequently sent to 350 households within a small housing estate located at the Northern Eastern corner of the town in December 2002 requesting details of fuel consumption in the home. 41% of the questionnaires were returned. It was estimated that the number of houses which use coal as the predominant source of heating was 70. This is below the threshold for exceeding the objective.

## **9.0 ROUND 3 - REVIEW AND ASSESSMENT FOR PARTICULATE MATTER**

### **9.1 Introduction**

Particulate matter (PM) consists of solid matter and is categorised according to its size. PM<sub>10</sub> are particulates which are 10 microns or less in diameter. This very fine dust is minute enough to be inhaled into the lungs and can lead to an increased risk of heart and lung disease. In addition fine Particulates may carry surface absorbed carcinogen compounds into the lungs.

### **9.2 Standards and Objectives**

The government has adopted two air quality objectives for PM<sub>10</sub>. The objectives are 40  $\mu\text{g m}^{-3}$  as the annual mean and 50  $\mu\text{g m}^{-3}$  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 the European gravimetric sampler or equivalent.

Note: The EU has also set limit value for PM<sub>10</sub> to be achieved by 2010. These are a 24 hour mean of 50  $\mu\text{g m}^{-3}$  not to be exceeded more than 7 times per year, and an annual mean of 20  $\mu\text{g m}^{-3}$ .

These limit values have not been included in the Air Quality Regulations and subsequently there is no legal requirement for local authorities to undertake a review and assessment in respect to these 2010 objectives. However they are considered as part of this Updating and Screening Assessment.

### **9.3 What are the Main Outdoor Sources for PM<sub>10</sub>? – National Perspective**

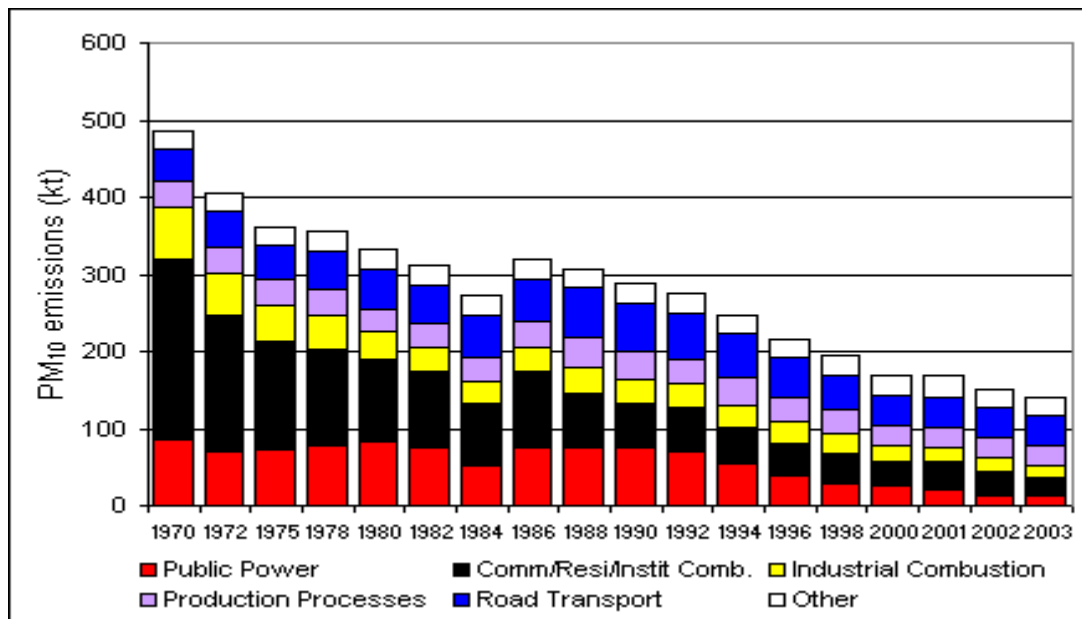
Unlike the other individual gaseous pollutants considered in this Updating and Screening Assessment (which are single, well defined substances) fine particles (PM<sub>10</sub>) come from a wide range of materials arising from a variety of sources. They can be divided into 3 main categories:-

- Primary particle emissions – derived from combustion sources such as road traffic, power generation, and industrial combustion processes, emitted directly into the atmosphere.
- Secondary particle emissions – these comprise mostly of sulphates or nitrates and are formed by chemical reactions in the atmosphere. Their production is generally not locally controllable.
- Coarse particles or 'other particles' – comprise of emissions from other non combustion sources – these include suspended dust from road traffic construction and mineral extraction processes, wind blown dust and soils and sea salt.

The main sources of primary PM<sub>10</sub> are road transport (all road transport emits PM<sub>10</sub>, but diesel vehicles emit a greater mass of particulate per vehicle kilometre), stationary combustion (domestic coal combustion has traditionally been the major

source of particulate emissions in the UK) and industrial processes (including bulk handling, construction, mining and quarrying). Emissions of PM<sub>10</sub> from the UK have declined since 1970. This is due mainly to the reduction in coal use. Domestic emissions have fallen by from 234 kilotonnes (48% of the total emission) in 1970 to 24 kilotonnes (17%) in 2003.

### UK Atmospheric Emissions of PM<sub>10</sub>



Source: NAEI

The expected reduction in particle emissions in future years vary for each type of source. For example, emissions from road transport will be governed by new legislation on vehicle emission standards; emissions of secondary particles will be largely governed by controls on power generation, industrial and transport SO<sub>2</sub> and NO<sub>x</sub> 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.

A total of 71 Air Quality Monitoring Area's have so far been declared in the UK.

More than 50% are due to exceedences of the 24 hour mean objective and arise mainly from road traffic sources. AQMA's have also been declared due to industrial and fugitive sources and domestic coal burning.

Guidance suggests that exceedences of the PM<sub>10</sub> objective may be found in the following areas.

- Urban background sites in central London.
- Areas adjacent to busy roads particularly in major urban areas.
- Areas which have significant areas of domestic solid fuel burning.
- Areas in the vicinity of industrial plant.
- Areas near to processes which may have significant uncontrolled or fugitive emissions (e.g. quarrying).

#### 9.4 Results of Rounds 1 & 2 Reviews and Assessment of PM10 undertaken by Carlisle City Council

No sites were identified in the previous rounds of review and assessment that suggested that there would be exceedences of the 2004 air quality objectives for fine particulates within this local authority.

#### 9.5 Round 3 - Updating and Screening Assessment for Fine Particles (PM10) in the Carlisle City Council Area

This updating and screening assessment is based on the guidance and checklists in technical guidance LAQM.TG(03) as amended and the results are presented below.

##### Updating and Screening Assessment for Fine Particulates (PM)

Source Location update that needs to be	Steps to be taken to complete the assessments	Comments
Monitoring Data	All monitoring data collated  Ratify Data	Carlisle City Council operates one PM <sub>10</sub> (TEOM) at Paddy's Market in Caldewgate.  QA/QC Information is included in Appendix 5  Monitoring results are shown below this checklist in Fig 9.1 and 9.2.  No exceedences of the PM <sub>10</sub> 2004 objectives have been identified for this location.
<b>Conclusion: There is no need for a detailed assessment</b>		
Road Traffic	<b>Overview: Defra has examined the results from previous rounds of review and assessment and looked for locations and levels of traffic that might lead to exceedences of the PM<sub>10</sub> objectives. This part of the assessment is structured around those conclusions.</b>	

Junctions	<p>Major junctions were considered by this Authority during the last review and assessment. Following the results of a DMRB screening model one junction was taken forward to a Detailed Assessment. No exceedences of either of PM<sub>10</sub> 2004 objectives were subsequently found.</p> <p>It should be noted that during the 2003 Updating and Screening Assessment the DMRB screening model results also indicated that the EU limit value for PM<sub>10</sub> in 2010 would be exceeded at a number of busy junctions within the City. No further assessment work has been undertaken at the present time as these limit values have not been included in the Air Quality Regulations.</p>	
<b>Conclusion: There is no need for a detailed assessment</b>		
Roads with high flow of buses/HGV's	<p>This was considered by this Authority during the last review and assessment but has been rechecked for the purposes of this Updating and Screening Assessment using updated traffic data.</p> <p>Identify all roads with an unusually high proportion of HDV (&gt;20%)</p> <p>Determine whether there is relevant exposure within 10m of these roads</p> <p>Obtain information on traffic flows, speeds and the proportions of vehicle types.</p> <p>Use DMRB screening model to predict the number of 24 hour exceedences of 50 µgm<sup>-3</sup> in the current year.</p>	<p>Information provided by Capita and the Highways Agency. All roads listed in Table</p> <p>Relevant locations listed in table</p> <p>Information supplied by Highways Agency and Capita.</p> <p>Results of DMRB are shown in tables 9.1 (a) and (b)</p> <p>No exceedences of the 2004 PM<sub>10</sub> objectives have been identified</p>
<b>Conclusion: There is no need for a detailed assessment.</b>		



New roads constructed or proposed since last round of review and assessment	<p>Establish whether the traffic flow on the new road is more than 10,000 vehicles per day (AADT) or whether the new road has increased traffic flow on existing roads previously identified as having more than 30, 24 hour exceedences of 50 <math>\mu\text{gm}^{-3}</math> in the current year.</p> <p>Identify relevant locations within 10m.</p>	<p>The proposed CNDR route Carlisle Northern Development Route (CNDR) was considered during the last Updating and Screening Assessment in 2003. Construction work was due to commence on 2004/05 and the road due to open in 2006/07. Work has only just begun this year and it is not likely to open until 2010. Updated traffic figures for the proposed route and its effects on existing routes have been provided by Capita and are shown in Table 9.2 (a) and (b). Along the sections of the proposed route where the AADT is expected to be above 10,000, relevant locations within 10 m of the roadside have been identified. A DMRB model has been run for the nearest relevant location. Results indicate that it is unlikely that either the 2004 or 2010 objectives will be exceeded at any of these locations. There is an expected increase in traffic on Georgian Way, the A595 and Peter Lane. None of these roads have previously been identified as being at risk of exceeding the objectives and the increase in traffic on these roads is not considered to be a risk to the objective being exceeded at relevant locations.</p>
	<b>Conclusion: There is no need for a detailed assessment.</b>	
Roads with significantly changed traffic flows, or new relevant locations.	Identify all roads with more than 10,000 vehicles per day that have experienced a large (>25%) increase in traffic flows since the last round of review and assessment or new relevant exposure.	Information supplied by the Highways Agency and Capita indicates that there are no roads within the local authority which meet this criteria.
	<b>Conclusion: There is no need for a detailed assessment.</b>	
Roads close to the objective during the 2 <sup>nd</sup> round of review and assessment.	No roads were identified during previous rounds of review and assessment as being close to the PM <sub>10</sub> 2004 objectives.	
	<b>Conclusion: No further detailed assessment is required.</b>	

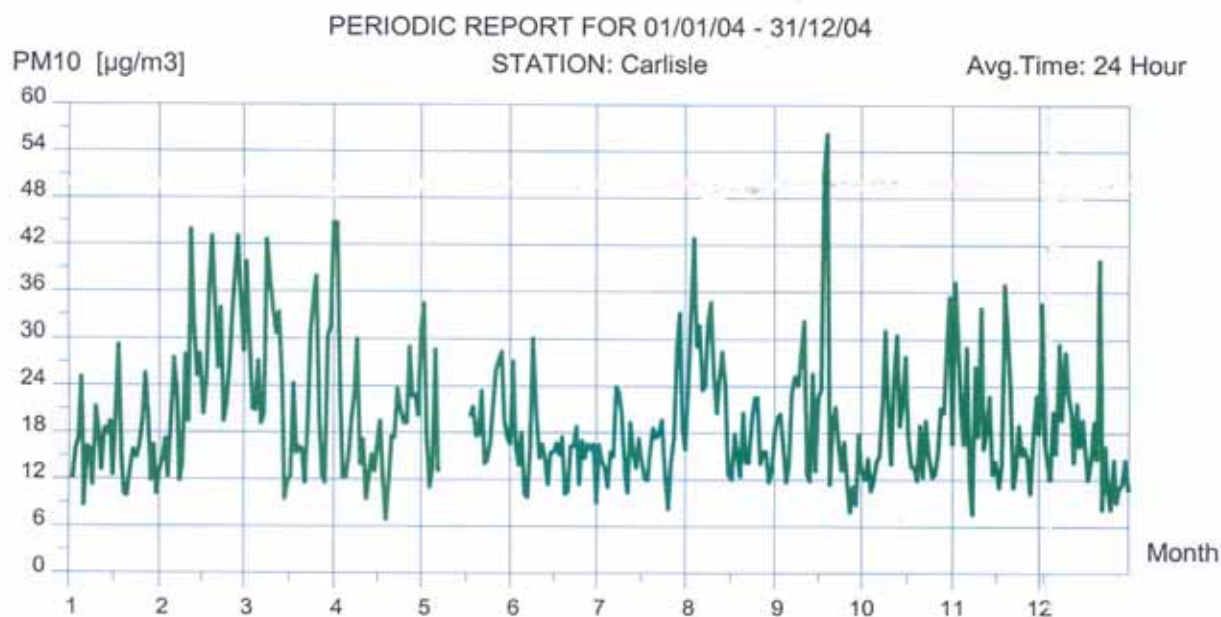
<b>Industrial Sources Overview: Guidance suggests that industrial sources will not make a significant contribution to annual mean concentrations, but could be significant in terms of the 24 hour objective. The evidence from work carried out during previous rounds is that focus should be on fugitive sources, although coal burning boilers and steel works may also be significant. A list of industrial processes that have the potential to emit fine particulates is given in Appendix 2.</b>		
New Industrial Sources	Check whether there are any new industrial sources that have been introduced since the last round of review and assessment.	There have been no new Part A, A <sub>2</sub> or B processes with this local authority or in neighbouring authorities since the completion of the last round of review and assessment.
	<b>Conclusion: There is no need for further detailed assessment.</b>	
Industrial sources with substantially increased emissions.	Determine whether sources identified during the last round of review and assessment have substantially increased (>30%) emissions.	A list of potential industrial process identified in the 2 <sup>nd</sup> round of review and assessment is shown in Table 9.3. None were considered significant None have experienced significant increases in emissions.
	<b>Conclusion: There is no need for further detailed assessment.</b>	
<b>Domestic Sources Overview: There are areas throughout the UK where domestic solid fuel burning still takes place. These can be significant sources of PM<sub>10</sub>. Consideration of the results from previous rounds of review and assessment undertaken in the UK has shown the need to focus on the density of houses burning solid fuel over a 500 x 500m area.</b>		
Areas of domestic solid fuel burning		All towns and villages within the local authority where there is no gas supply was considered in the last Updating and Screening Assessment. (See Table 8.1) Following visits to each area and a questionnaire sent to residents in Longtown in 2003 it was considered that there was no risk to the 2004 PM <sub>10</sub> objectives being exceeded although a risk of the EU limit values in 2010 was identified.  There is no change to this situation.
	<b>Conclusion: There is no need for a further detailed assessment.</b>	

**OTHER SOURCES: A number of other sources may be significant for PM<sub>10</sub>. They include fugitive dust and other transport sources.**

Quarries/landfill sites/coal/handling of dusty cargo at ports	<p>This was considered during the last round of review and assessment but has been re-checked for the purposes of this Updating and Screening Assessment</p> <p>Establish whether there is relevant exposure 'near' to the source.</p> <p>'Near' is taken to be 200m if the 2004 background concentration is <math>&lt;26\mu\text{gm}^{-3}</math>.</p> <p>Determine whether there are any dust concerns associated with the facility</p>	<p>There is one quarry and one landfill site within this Local Authority.</p> <p>The background concentration for both sites is below <math>&lt;26\mu\text{gm}^{-3}</math></p> <p>There are no relevant locations within 200m of either site</p> <p>Recent visits to both sites indicate that there are no dust concerns.</p> <p>A risk of the 2004 PM<sub>10</sub> objectives is not considered likely.</p>
	<b>Conclusion: There is no need for a further detailed assessment</b>	
Aircraft	<p>Carlisle Airport is a small, privately operated site. At present the airport's use is restricted to three main areas:-</p> <ul style="list-style-type: none"> <li>• Business jet flights</li> <li>• Private training activities</li> <li>• Army training.</li> </ul> <p>There are presently no scheduled, chartered or cargo flights and in its current capacity the risk of exceeding the PM<sub>10</sub> objectives is negligible.</p> <p>The Airport has recently been acquired by the parent company of Eddie Stobart Ltd., and substantial investment is planned. The situation will be kept under review.</p>	
	<b>Conclusion: There is no need for a detailed assessment.</b>	

## PM<sub>10</sub> Monitoring Data Results

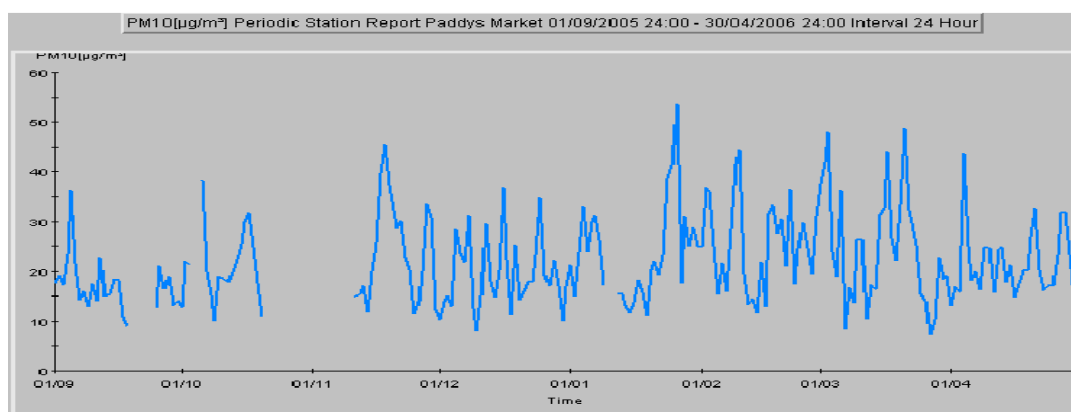
**Fig 9.1 Paddy's Market – Monitored PM<sub>10</sub> Concentration 01.01.04 – 31.12.04**



The annual mean for 2004 measured  $19.8 \mu\text{g}/\text{m}^3$  using the TEOM or  $25.74 \mu\text{g}/\text{m}^3$  when converted to gravimetric. During this period there were 12 days when the TEOM monitor measured 24 hour concentrations greater than  $50 \mu\text{g}/\text{m}^3$  once the data was adjusted to give gravimetric readings. Both the annual mean and number of 24 hour exceedences were below the objective levels for 2004.

Due to flood damage in January 2005 both the NO<sub>x</sub> and PM<sub>10</sub> continuous analysers were damaged beyond repair. Both were replaced in Autumn 2005.

**Fig 9.2 Paddy's Market Monitored PM<sub>10</sub> Concentration – 01.09.05 – 30.04.06**



The period mean 01.09.2005 – 30.04.2006 (8 months of data) measured using the TEOM was  $19 \mu\text{g}/\text{m}^3$  or  $24.7 \mu\text{g}/\text{m}^3$  when converted to gravimetric. During this period there were 12 days when the TEOM monitor measured 24 hour

concentrations greater than  $50 \mu\text{gm}^{-3}$  once the data was adjusted to give gravimetric readings. Whilst this data set is less than 9 months and only 87% data catcher has occurred, it is again considered unlikely that the 2004  $\text{PM}_{10}$  objectives will be exceeded at this location.

**Table 9.1 (a) - Roads with High Flows of HDV (>20%)**

The following roads have been identified where the proportion of HDV's is greater than 20%. Only the A74 (M) has relevant locations within 10m of the road.

Road	% HDV	HDV/Day	Receptors within 10m	Speed
Junction 41-42, M6	29	12760	No	73.7
Junction 42 – 43, M6	28	12880	No	73.7
Junction 43-44, M6	27	12015	No	73.7
Junction 44, M6, A74 (M), J22	29	12934	Yes	70

**9.1 (b) Results of DMRB for roads with high flows of HDV's and relevant locations within 10m**

Road	Distance from Receptor to road centre	Speed Km/hr	2005 AADT	2010 AADT	% HDV	2005 $\text{PM}_{10}$ Concentration		2010 $\text{PM}_{10}$ Concentration	
						DAYS > $50 \mu\text{gm}^{-3}$	Annual Mean	DAYS > $50 \mu\text{gm}^{-3}$	Annual Mean
J44, M6 A74 (m) J22	18	120	44600	48200	29	8	23.1	1	17.7

Results are based on 2005 AADT flows and background concentrations. Results indicates that it is unlikely that the 2004  $\text{PM}_{10}$  objectives would be exceeded at this location.

It is also considered unlikely that the EU limit for  $\text{PM}_{10}$ s in 2010 would be exceeded.

## 9.2 (a) CNDR Estimated Traffic Flow on Proposed Route

The estimated traffic flow figures for the new route have been provided by Capita and are shown below for the opening year 2010. Along the sections where the AADT is expected to be above 10,000 there are no locations of relevant exposure within 10 metres of the roadside.

<b>Proposed CNDR Route – AADT Flows 2010</b>	
<b>Link</b>	<b>2010 AADT Flows</b>
C1022 Parkhouse Road North of Asda	2753
CNDR Northern Link near J44	28835
CNDR Northern Link near Asda	13158
CNDR Northern Link near Kingmoor	15453
CNDR Eden Bridge Link	17882
CNDR South of Burgh Road	14898
CNDR Sandsfield Park Link	11065
CNDR North of Peter Lane	12012
Kingstown Broadway	7482
CNDR Railway Bridge Link	20765
CNDR Southern Link near Kingmoor	15956

## 9.2 (b) CNDR Impact of Route on Existing Traffic Flows

The following figures have been provided by Capita and show the Average Annual Daily Traffic Flows both with and without the development route for main roads in Carlisle in the opening year 2010. The overall effect of the route will be to reduce traffic flows along the main roads into the city.

<b>Impact of Route on Existing Traffic Flows</b>		
<b>Road</b>	<b>With CNDR 2010 AADT</b>	<b>Without CNDR 2010 AADT</b>
Eden Bridge	39831	52065
Castle Way	39011	50899
Georgian Way	35477	32888
Warwick Road	29708	29888
London Road	11322	11689
A7	11981	11981
A689	8931	9974
A74	35185	35627
M6	65145	65121
Kingstown Road North	14648	40443
Kingstown Road South	17358	23505
Scotland Road	22101	29842
C1016 Rockliffe Road	1263	1263
Etterby Street	5041	5780
Burgh Road South	4540	5727

Burgh Road North	1938	1938
Newtown Road East	18521	23223
Newtown Road Central	6212	8324
B5307	5340	5304
C2051	701	701
Orton Road West	1364	5594
Orton Road East	6907	5827
A595	15732	15567
Wigton Road West of Orton Road	10474	14425
Wigton Road East of Orton Road	19457	24393
Wigton Road near Newtown Road	11930	14971
Peter Lane	5282	3546

There is an expected increase in traffic along the following existing roads: Georgian Way, Orton Road, A595 and Peter Lane. None of these roads have been previously identified as being at risk of exceeding the objectives and the slight increase of traffic on these roads is not considered to be a risk to the objective being exceeded.

**Table 9.3 -Industrial Processes within local authority which has the potential to emit fine particulates**

<b>Site Name</b>	<b>Process</b>	<b>Significant Emitter</b>
Carlisle Coated Stone Ltd	Roadstone Coating	No
Pirelli Ltd	Rubber Process	No
W M Thompson (Quarries) Ltd	Quarry	No

## Appendix 1:

### Recommended timescales for submission of reviews and assessments and progress reports

LAQM activity	Completion Date	Which Authorities?
Updating & Screening Assessment	End of May 2003	All authorities <sup>a</sup>
Detailed Assessment	End of April 2004	Those authorities <sup>a</sup> which have identified the need for a detailed assessment in their May 2003 updating and screening assessment
Progress Report	End of April 2004	Those authorities <sup>a</sup> which have identified no need for a detailed assessment in their May 2003 updating and screening assessment
Progress Report	End of April 2005	All authorities
Updating and screening assessment	End of April 2006	All authorities
Detailed assessment	End of April 2007	Those authorities which have identified the need for a detailed assessment in their April 2006 updating and screening assessment
Progress report	End of April 2007	Those authorities which have identified <b>no need</b> for a detailed assessment in their April 2006 updating and screening assessment
Progress report	End of April 2008	All authorities
Updating and screening assessment	End of April 2009	All authorities
Detailed assessment	End of April 2010	Those authorities which have identified the need for a detailed assessment in their April 2009 updating and screening assessment
Progress report	End of April 2010	Those authorities which have identified <b>no need</b> for a detailed assessment in their April 2009 updating and screening assessment



## APPENDIX 2:

### Industrial Processes which have the potential to emit one or more of the 7 pollutants listed in the Air Quality Regulations

#### PART A Processes

The numbers below indicate how significant the process is likely to be for each pollutant as of the total Part A emission in 2000. A blank cell indicates that the process can be ignored. 0 indicates an emission is likely but small in comparison to other Part A sources.

Processes are in order of general significance:

Process ID	IPC Process Name	CO	NOx	PM	SO <sub>2</sub>	Lead	Benzene	1,3 butadiene
2.1	Iron and Steel	57	19	61	9	37		
1.4	Petroleum Process	0	16	4	15	0	73	2
4.1	Petrochemical processes	0	0		0		2	95
1.3	Combustion Processes	1	34	13	45	2	0	0
2.2	Non-ferrous metals	17	1	4	7	23		
4.2	Manufacture and use of organic chemicals	0	0	0	0	35	0	3
1.2	Carbonisation and associated processes	2	6	2	10	2	12	
3.1	Cement/lime manufacture and associated processes	1	9	7	3	1	7	0
4.4	Processes involving halogens	19	1	0	0		0	
3.6	Ceramic production	1	0	4	9			
1.1	Gasification and associated processes	0	4		0		5	
4.5	Inorganic chemical processes	1	4		0	1		
6.3	Tar and bitumen processes	0	0	3	1		1	
4.6	Chemical fertiliser production	0	1	2				
3.3	Other mineral fibres	0	1	1	0	0		
5.1	Incineration	0	2	0	0	0		
6.1	Paper and pulp manufacturing processes	0	0	0	0			
4.3	Acid processes	0	0	0	0		0	
3.5	Glass manufacture and production		0			0		
5.2	Recovery Processes	0	0	0	0	0	0	
6.9	Treatment/processing of animal or vegetable matter	0		0				
5.3	Production of fuel from waste	0	0					
6.5	Coating processes and		0	0				

	printing							
3.2	Processes involving asbestos			0				
6.2	Di-isocyanate processes			0			0	
4.7	Pesticide Production			0				
2.3	Smelting Processes	0		0	0	0		
3.4	Other mineral Processes			0				
4.8	Pharmaceutical production							
4.9	Storage of chemicals in bulk						0	
6.4	Processes involving uranium							
6.6	Manufacture of dyestuffs/printing ink/coating mats			0	0			
6.7	Timber Processes							
6.8	Process involving rubber							0
7.0	Sewage treatment works							

## PART B/A2 Processes

The following table gives an indication (x) of those processes most likely to release significant quantities of the specified substances to air.

Process	PG Note	Carbon Monoxide	Benzene	1,3 butadiene *	Sulphur Dioxide **	Nitrogen Oxides	Lead	PM <sub>10</sub>
Waste Oil Combustion	1/1, 1/2							
Combustion plant 20-50 mwth	1/3, 1/4 . 1/5				X			X
WDF combustion <3mwth	1/10							
Reheat furnaces 20-50 mwth	1/11				X			X
Waste combustion 0.4-3 mwth	1/12							
Processes for the storage, loading and unloading of petrol at terminals	1/13		X					
Unloading of petrol into storage at service station	1/14							
Furnaces for extraction of non-ferrous metals from scrap	2/1						X	
Galvanising	2/2							
Electrical and rotary furnaces	2/3						X	
Foundry Processes	2/1							

Hot land cold blast cupolas	2/5				X		X	
Aluminium and aluminium alloy processes	2/6				X		X	
Zinc and zinc alloy processes	2/7				X		X	
Copper and copper alloy processes	2/8				X		X	
Metal decontamination	2/9							
Blending, packing, loading and use of bulk cement	3/1							
Manufacture of heavy clay goods and refractory goods	3/2				X			
Glass (excluding lead glass) manufacturing processes	3/3				X	X		
Lead glass manufacturing processes	3/4				X		X	
Coal, coke, coal product and petroleum coke processes	3/5							X
Exfoliation of vermiculite and expansion of perlite	3/7							
Quarry Processes	3/8							X
Plaster processes	3/12							
Lime Processes	3/14							
Roadstone coating	3/15				X			X
China and ball clay processes including the spray drying of ceramics	3/17							X
Processes for the surface treatment of metals	4/1							
Incineration processes	5/1, 5/3, 5/4							
Crematoria	5/2							
Processes for the manufacture of particleboard and fibreboard	6/4							
Textile and fabric coating processes (where nitrogen containing solvents are	6/8							

used)								
Manufacture of coating powder	6/9							X
Coil coating (where nitrogen solvents are used)	6/13							X
Heat set web offset printworks	6/16							
Rubber processes	6/28			X				X
Powder coating processes	6/31							
Metal and other thermal spraying process	6/35							
* only if 1,3 butadiene is used as part of the process ** only if process burns coal or heavy fuel oil								

**APPENDIX 3:****List of all industrial Part A, A2 and B processes located within Carlisle City Council**

Name of Business	Address	Postcode	Description	PG Note Number1	Date Authorised
Asda Carlisle Petrol Filling Station	Chandler Way, Parkhouse, Kingstown Industrial Estate	CA3 0JQ	Unloading of petrol into storage at Service Station	PG Note 1/14 (04)	14-Oct-97
Carlisle Crematorium	Dalston Road	CA2 6AL	Crematorium	PG Note 5/2 (04)	22-Apr-92
Rickerby Ltd	Carlisle Branch, Currock Road	CA2 4AU	Waste Oil Combustion	PG Note 1/1 (04)	27-Nov-92
BSW Timber	Carlisle Sawmill, Rockliffe	CA6 4BA	Timber Process	PG Note 6(02)4	28-Nov-91
Michael Douglas Auto Salvage	Station Road, Etterby	CA3 9QU	Waste Oil Combustion	PG Note 1/1 (04)	17-Jan-02
Harraby Green Service Station	London Road	CA1 2PR	Unloading of petrol into storage at Service Station	PG Note 1/14 (04)	13-Feb-98
Transco	Nr Wetheral		Natural Gas Odourisation	PG Note 1/15 (04)	24-Feb-98
Armstrong & Denholm	South Henry Street	CA1 2AE	Waste Oil Combustion	PG Note 1/1 (04)	25-Nov-91
Tuddenhams (Longtown) Ltd	Bridge Street Garage	CA6 5UD	Unloading of petrol into storage at Service Station	PG Note 1/14 (04)	08-Apr-98
Morrison Petrol Service Station	Kingstown Road	CA3 0BJ	Unloading of petrol into storage at Service Station	PG Note 1/14 (04)	08-Jun-98
Andersons Ltd	Denton Holme Sawmills	CA2 5EQ	Timber Process	PG Note 6/02 (04)	23-Jan-93
Solway Leyland DAF	Kingstown Broadway	CA3 0HD	Waste Oil Combustion	PG Note 1/1 (04)	13-Apr-93
Cuthberts Auto Repairs	Corby Hill Garage, Corby Hill	CA4 8PL	Waste Oil Combustion	PG Note 1/1 (04)	23-Oct-03
Andersons Yard	St. Nicholas Street	CA1 2EE	Waste Oil Combustion	PG Note 1/1 (04)	27-Nov-91
Fell View Garage	Hallbankgate	CA8 2NJ	Waste Oil Combustion	PG Note 1/1(04)	25-Nov-91
MGM Motors	Morton Street, Caldewgate	CA2 5UU	Waste Oil Combustion	PG Note 1/1 (04)	01-Nov-91
Bell & Beattie	The Garage, Burgh By Sands	CA5 6AN	Waste Oil Combustion	PG Note 1/1 (04)	02-Jan-96
Hanson Quarry Products Europe	Willowholme Industrial Estate	CA2 4AF	Blending Packing Loading & use of bulk cement	PG Note 3/01 (04)	08-Apr-92

BP Mobil, Morton Service Station	Wigton Road	CA2 6JS	Unloading of petrol into storage at Service Station	PG Note 1/14 (04)	25-Feb-99
Ready Mix Concrete (Northern) td	Kingstown Trading Estate	CA3 0EX	Blending Packing Loading & use of bulk cement	PG Note 3/01 (04)	17-Oct-95
Carlisle Coated Stone	Carlisle Coating Plant, Stephenson Industrial Estate, Willowholme		Roadstone Coating	PG Note 3/15a (04)	15-Apr-92
Esk Building Products	Brisco	CA4 0QY	Lime Process	PG Note 3/14 (04)	20-Jul-92
Tilcon Limited	Willowholme Industrial Estate	CA3 5RT	Blending Packing Loading & use of bulk cement	PG Note 3/01 (04)	09-Nov-95
Bardon Concrete T/A Payne Mix	Stephensons Industrial Estate	CA2 5RN	Blending Packing Loading & use of bulk cement	PG Note 3/01 (04)	08-Apr-99
Newby West Filling Station	Wigton Road	CA2 6QU	Unloading of petrol into storage at Service Station	PG Note 1/14(04)	29-Sep-98
Stead McAlpin	Cummersdale		Coating process and printing	A1	
County Garage	Kingstown		Paint Spraying Road Vehicles	PG Note 6/34 (04)	26-Feb-93



Name of Business	Address	Postcode	Description	PG Note Number1	Date Authorised
Carrs Billington Ltd (A1 Pending)	Parkhill Road, Kingstown	CA3 0ER	Treatment /processing of animal & veg matter	PG Note 6/26 (05)	12-Mar-93
J Foster & Son	Site 24, Brampton Road,	CA6 5TR	Coating process	PG Note 6/23 (04)	03-Jan-95
Pirelli Limited (A2)	Dalston Road	CA2 6AR	Rubber process	PG Note 6/28 (04)	19-Dec-97
Crown Bevcan UK (A2)	Botcherby	CA1 2TL	Coating process and printing	PG Note 6/07 (04)	01-Apr-93
David Street Garage	3 David Street	CA1 2LR	Waste Oil Combustion	PG Note 1/1 (04)	23-Feb-93
Thomson W & M (Quarries) Ltd	Hallbankgate	CA8 2PE	Quarry Process	PG Note 3/08 (04)	22-Nov-93
Hawats Garage	Telford Road, Durranhill Industrial Estate	CA1 3NW	Waste Oil Combustion	PG Note 1/1 (04)	21-Oct-97
J Bendal & SonAlbion Works			Respraying Road Vehicles		
Alexandra Sawmills	Byron Street	CA2 5TB	Manufacture of Timber and Wood Bsed Products	PG Note 6/02 (04)	18-Jul-96
Borderman Trucks Ltd	Brunthill Road, Kingstown Industrial Estate	CA3 0HA	Respraying of Road Vehicles	PG Note 6/34 (04)	23-Jun-00
Doves Limited	St. Nicholas Bridge	CA2 4AA	Timber Process	PG Note 6/02 (04)	28-Oct-96
James Street Service Station	James Street	CA2 5AH	Unloading of petrol into storage at Service Station	PG Note 1/14 (04)	11-Feb-98
Currock Service Station	Currock Road	CA2 4AS	Unloading of petrol into storage at Service Station	PG Note 1/14 (04)	21-Apr-98
Brunton Park	Warwick Road	CA1 2RZ	Unloading of petrol into storage at Service Station	PG Note 1/14 (04)	01-Jan-98
Thomson Accident Repair Centre	Caxton Road, Newtown Industrial Estate	CA2 7NS	Respraying of Road Vehicles	PG Note 6/34 (04)	01-Jun-98
Tesco Filling Station	Warwick Road	CA1 2SB	Unloading of petrol into storage at Service Station	PG Note 1/14(04)	16-Jun-98
BP Oil (terminal)	Barras Lane, Dalston	CA5 7ND	Unloading of petrol into storage at Service Station	PG Note 1/13 (04)	31-Aug-01

Whiteclosegate Filling Station	Brampton Old Road	CA3 0JN	Unloading of petrol into storage at Service Station	PG Note 1/14 (04)	17-Jun-98
Moss Filling Station	Todhills	CA6 4HA	Unloading of petrol into storage at Service Station	PG Note 1/14 (04)	18-Nov-98
Kingstown Filling Station	Kingstown Road	CA3 0BN	Unloading of petrol into storage at Service Station	PG Note 1/14 (04)	29-Sep-98
Corby Hill Garage	Corby Hill	CA4 8PL	Unloading of petrol into storage at Service Station	PG Note 1/14 (04)	29-Sep-98
Carleton Filling Station	London Road	CA4 0AA	Unloading of petrol into storage at Service Station	PG Note 1/14 (04)	10-Nov-98
Golden Fleece Filling Station	Exelby Services Ltd, Londonderry Garage, Londonderry, Northallerton	DL7 9NE	Unloading of petrol into storage at Service Station	PG Note 1/14 (04)	10-Dec-98
Lloyd Motors Ltd	Chandler Way	CA3 0JY	Paint Spraying Road Vehicles	PG Note 6/34 (04)	07-Jun-99
Hardwick Circus Petrol Filling Station	Hardwick Circus		Unloading of petrol into storage at Service Station	PG Note 1/14 (04)	10-Dec-98





Name of Business	Address	Postcode	Description	PG Note Number1	Date Authorised
Shell Carlisle North	A74, North Bound, Todhills	CA6 4HA	Unloading of petrol into storage at Service Station	PG Note 1/14 (04)	10-Dec-98
Ken Hope Ltd	Westmoor Road, Rockliffe	CA6 4BH	Mobile Crusher	PG Note 3/16 (04)	04-Nov-99
Ken Hope Ltd	Westmoor Road, Rockliffe	CA6 4BH	Mobile Crusher	PG Note 3/16 (04)	11-Apr-00
Low Row Service Station	Low Row,	CA8 2JE	Unloading of petrol into storage at Service Station	PG Note 1/14 (04)	23-Nov-01
Ken Hope Ltd (Mobile Crusher)	Westmoor, Rockliffe	CA6 4BH	Crusher	PG Note 3/16/04	11-Aug-04
Bardon Concrete	The Peth, Graham Street	CA6 5NR	Blending Packing Loading & use of bulk cement	PG Note 3/01 (04)	20-Jan-03
Lafarge Cement UK	Carlisle Railfreight Terminal, Brunthill Road, Kingstown Ind Estate		Blending Packing Loading & use of bulk cement	PG Note 3/01 (04)	
Ken Hope Ltd	Westmoor, Rockliffe	CA6 4BH	Blending Packing Loading & use of bulk cement	PG Note 3/01 (04)	
Benfield Motors	Rosehill Estate,	CA1 2UR	Waste Oil Combustion	PG Note 1/1 (04)	
Cumbria Constalury	Northern Traffic Unit, Hadrians Camp Houghton Road	CA3 8QL	Waste Oil Combustion	PG Note 1/1 (04)	04-Mar-04
R Hind Limited (Coulthard)	Kingstown Broadway, Kingstown	CA3 OHA	Spray Booth	PG Note 6/34 (04)	07-Jun-04
Cumbria Waste Management (A1)	Hespin Wood, Landfill Site		A1 Landfill		
McVities UK (A1)	52-54 Church Street, Caldewgate	CA2 5TG	FOOD SECTOR		
Nestle	Dalston Road		FOOD SECTOR		
Cavaghan & Gray Ltd (A1)	London Road		FOOD SECTOR		
Speedy Mortar Ltd	Unit 14, Currock Road Trade Centre, Currock Road	CA2 5AD	Blending Packing Loading & use of bulk cement	PG Note 3/01 (04)	
Herring William	Unit 4, Site 9, Kingstown Broadway, Kingstown Industrial Estate		Waste Oil Combustion	PG Note 1/1 (04)	29-Dec-04
Solway Leyland DAF	Kingstown Broadway, Kingstown Industrial Estate	CA3 OHD	Paint Spraying Road Vehicles	PG Note 6/34 (04)	

JLT Plant Hire	Heads Nook	CA8 9EJ	Mobile Crusher	PG Note 3/16 (04)	11-Jan-06
Port Road Garage	Port Road	CA2 7AJ	Waste Oil Combustion	PG Note 1/1 (04)	18-Oct-05
Newtown Garage	58 Port Road	CA2 7AJ	Waste Oil Combustion	PG Note 1/1 (04)	
Infirmity Street Garage	Infirmity Street	CA2 7AA	Waste Oil Combustion	PG Note 1/1 (04)	
K M Auto Repairs	Unit C Lorne Crescent	CA2 5XW	Waste Oil Combustion	PG Note 1/1 (04)	
Kenneth Charles Irving	Woodvilla	CA6 4BB	Waste Oil Combustion	PG Note 1/1 (04)	
Low Row Service Station	Low Row,	CA8 2JE	Waste Oil Combustion	PG Note 1/1 (04)	
Lakeland drycleaners	113 London Road	CA1 2LS			



## APPENDIX 4:

### ACTIONS UNDER CONSIDERATION IN THE DEVELOPMENT OF AN ACTION PLAN

	Action	Details	Cost/ Benefit
	Reducing Vehicle Emissions – Part of the action plan will focus on reducing vehicle exhaust emissions through the use of cleaner fuels and technologies. The aim of these actions will be to increase the proportion of vehicles with reduced emissions to ensure that air quality standards are met.		
1	Roadside Vehicle Emission Testing	The City Council will consider the viability of testing of vehicle emissions at the roadside. If testing proves to be viable drivers whose vehicles fail the test will be issued with a fixed penalty notice	Med/Low
2	Improve the Council Fleet	The City Council could introduce policies to favour low emission vehicles in its own fleet. The council currently operates around **vehicles. These cover approximately **km per year, predominantly within the city. All vehicles contribute to air pollution within the City and for that reason the Council operating a Green Fleet Policy which establishes principles to the use of cleaner or alternative fuelled vehicles, cleaner petrol and diesel and retro fit technology will set an example to others.	Med/Low
3	Share learning from the Councils greener vehicle fleet	The City Council could share its experiences with commercial vehicle operators	Low/Low
4	Discourage drivers from allowing their engines to idle unnecessarily when parked	The Council will consider campaigns to raise awareness and to discourage drivers from allowing their engines to idle when their vehicles are parked for prolonged periods.	Med/Low
6	Improvement of Traffic Management systems to reduce vehicle emissions	Changes to traffic management offers the potential to reduce vehicle emissions primarily by smoothing flows and reducing congestion and reducing the number of times that vehicles need to stop/start and change speed can have a significant impact on air quality. Traffic management also offers some potential to reduce the impact of emissions by moving traffic streams further from critical junctions and increasing bus priority. Traffic management measures will be considered with Cumbria County Council including the use of "scoot" controlled junctions at key junctions.	High/Med
	Reduce goods vehicle emissions to Euro IV Nox standard by 2010	Good vehicles including heavy good and light goods, typically comprising 18% - 20% of traffic within the AQMA. Reducing emissions from goods vehicle would make an important contribution to improving air quality within the AQMA and the rest of the City. A considerable number of private operators and companies run goods vehicles within the City. The Freight Transport Association and Road Haulage Association represent many of the vehicle operators and could be used as the primary avenue to pursue voluntary compliance with Euro IV standards by 2010.	Low/Med
	Reduce taxi emissions to Euro IV standard by 2010	There are around 250 cabs and private hire vehicles registered to operate within the local authority. Reducing emissions from taxis would contribute to improving clean air quality within the city.  The council will investigate taking action through taxi licensing condition to achieve target of operating at Euro IV by 2010.	Low

	Cleaner Buses and Coaches	Buses have a crucial role as part of the Carlisle City's transport system as an efficient method of moving large numbers of people. However due to their size, age and technology buses can contribute significantly to NOx emissions in air. The Council could work to form emission reduction partnerships with bus operators.	Low/Med
	<b>USING AREA PLANNING MEASURES TO REDUCE TRAFFIC VOLUMES</b>		
7	City Centre congestion charging	The City Council will consider effectiveness of the congestion charging schemes elsewhere in the UK and keep all techniques and approaches under review to see whether they are applied to Carlisle	Low/Low (Implementation High/Med)
8	Management of the number of available City Centre Parking Spaces	The Council could implement policy to maintain the number of short stay parking places in the City Centre. The Council could also seek to reduce the number of publicly available long stay parking spaces in the City Centre	Low/Med
9	Encouragement of City Centre Living	The City Council will continue its strategy to encourage City Centre living.	Low/Med
10	Presumption in favour of mixed use development	The City Council will continue to maintain its policy of encouraging mixed use developments that assist in reducing the need to travel	Low/Med
11	Consideration of air quality in respect of Planning Applications	When assessing Planning Applications the implications of new development for air quality will be taken into consideration	Low/Med
	<b>REDUCING AIR POLLUTION FROM INDUSTRY/COMMERCE AND RESIDENTIAL AREAS</b>		
12	Control of Industrial Emissions	The Council will continue to strictly regulate approximately 80 industrial processes under Part 1 of the Environmental Protection Act 1990. In addition the Council will continue with its programme of searching for additional industrial premises which require an authorisation or permit	Low/Low
13	Emissions from Chimneys	The Council will continue to enforce the provisions of the Clean Air Act 1993 with respect to emissions of smoke from chimneys across the City.	Low/Low
14	Boiler Plant and Chimney Heights	The Council will enforce the provisions of the Clean Air Act 1993 in respect of chimney heights for new plant and smoke control areas.	Low/Low
15	Control of bonfires	The Council will enforce the provisions of the Clean Air Act 1993 and Part II of the Environmental Protection Act 1990 in respect of bonfires across the City. The City Council will continue to provide a free bulk green waste collection service to residents in order to reduce the need for bonfires. The City Council will develop a programme of inspections of commercial premises to verify that waste is being disposed of in compliance with the duty of care provisions of the Environmental Protection Act 1990.	Low/Low
16	Energy Efficiency	The City Council will continue to implement its energy efficiency strategy for residential properties to reduce the level of fuel demand for residential areas.	High/Med
	<b>CHANGING LEVELS OF TRAVEL DEMAND/PROMOTION OF ALTERNATIVE MODES OF TRANSPORT</b>		
17	Promotion of walking	The City Council will promote walking. This will include the production of a good practice handbook and design guide. The programme will focus on the development of safer walking routes and the promotion of walking. The City Council will deliver the initiative in Carlisle. The City Council will continue to take steps to improve the pedestrian environment with	High/Low

		improved priorities.	
18	Promotion of Cycling	The City Council should participate in a major initiative to promote cycling. The initiative could include the development of additional safe cycles routes, provision of facilities such as secure cycle parking and support cycling safety initiatives. In addition the City Council could require that new residential and commercial developments provide secure cycle storage facilities.	High/Low
<b>IMPROVING THE ROADNET WORK TO REDUCE CONGESTION</b>			
5	New road proposals CNDR	The provision of the CNDR will have a significant impact of traffic congestion on the A7 and Castleway. Air Quality Consultants will be examining the impact of the proposed route of the reduction of number and type of vehicles on the road and the reduction of NO <sub>2</sub> as a consequence of this in the near future.	High/Med
19	Provision of park and ride facilities	The City Council could consider the viability of a Park and Ride Scheme within the City in conjunction with Cumbria County Council	
20	Incentives offered to companies with travel plans	The City Council could work with partners to offer incentives to support green travel plans	Med/Low
21	Use planning conditions to promote Travel Plans	The City Council could where appropriate attach planning conditions relating to travel plans to planning consents. The local transport plan states that large employees should implement Travel plans to give their employees a greater choice of travel to, from and at work. The help ensure this objective travel plan measures could be included in new development on a planning condition.	Low/Med
<b>IMPROVING ACCESS TO INFORMATION REGARDING TRANSPORT OPTIONS. BUILDING PUBLIC SUPPORT TO IMPROVE AIR QUALITY MUST BE AN INTEGRAL PART OF THE PLAN</b>			
22	Improvements to branding	The City Council could encourage the Private sector providers of public transport to increase the attractiveness of public transport via a programme of rebranding	High/Low
23	Improving access to information regarding transport options	In the long term improving and sustaining air quality will require behavioural change for individuals and businesses. Individuals can help improve air quality by reducing car use and changing drive styles. Businesses can help improve air quality by implementing travel plans and reducing vehicle emissions. The council could encourage everyone to do their but through the use of Council newsletters, leaflets and provision of information on the City Councils website. The City Council could work with partners to encourage Travel Plans for employers, schools, hospitals The City Council could implement a comprehensive communications strategy in respect of public transport.	Med/Med

## **APPENDIX 5**

### **Quality Assurance/Quality Control (QA/QC)**

When carrying out a review and assessment of air quality the data collected must be trustworthy and scientifically credible.

Detailed documented procedures are laid down to ensure accuracy and precision are kept to acceptable limits. These are referred to as QA/QC procedures. QA/QC systems are essential if uncertainties in data are to be minimised.

### **NO<sub>2</sub> Diffusion Tubes**

#### **a) Description of Monitoring Technique**

The NO<sub>2</sub> diffusion tubes used by Carlisle City Council are supplied and analysed by Casella Cre Air. The tubes are prepared using 10% TEA (triethanolamine) in water. These tubes are exposed for one month periods in accordance with LAQM TG (03) Technical Guidance.

#### **b) Laboratory QA/QC**

Casella Cre Air are an experienced and long standing supplier and analysing laboratory for NO<sub>2</sub> diffusion tubes in the UK. The laboratory has UKAS accreditation. 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 proficiency schemes.

Casella Cre Air participates in the Workplace Analysis Scheme for Proficiency (WASP) which tests the performance of laboratories measuring NO<sub>2</sub> in ambient air. It was established in 1980 and is one of the largest schemes of its kind, with over 200 laboratories participating worldwide.

An accurately doped tube of known concentration only to WASP is sent to participants monthly. The laboratories have one month to analyse the sample and report results to WASP. The results are then compared by WASP against the tube concentration and comparisons are also made with other laboratories in the survey.

Performance is classified as category 1 (good), category 2 (satisfactory) and category 3 (unsatisfactory).

The scheme provides independent verification of the analytical competence of a laboratory.

The WASP results for Casella Cre Air indicate the laboratory results in terms of accuracy and precision fall into category 1 (good). Results for 2005 are available from the Environmental Quality Section.

### **c) Tube Handling**

Where NO<sub>2</sub> is monitored using diffusion tubes in Carlisle the standard method recommended by NETCEN in the "UK Diffusion Tube Survey Manual" has been followed.

NO<sub>2</sub> diffusion tubes are clear plastic tubes with one open end and one closed end containing an NO<sub>2</sub> absorbing chemical.

Prior to sampling, the NO<sub>2</sub> tubes are stored in a cool location within the supplied packaging until use.

The open end is sealed with a plastic cap until it arrives at the monitoring site. At site the cap is removed and the tube is mounted vertically with the open end at the bottom. The tubes are mounted on lamp posts or drain pipes at head height (although some are placed higher where they are likely to be stolen) for an exposure period of 1 month. Each site and tube is given a corresponding number for identification purposes. At the end of the exposure period the cap is replaced and the start/end dates and times are recorded.

During storage the tubes are kept in sealed plastic bags in a refrigerator. A 'field' blank tube is also sent with each batch which remains in the refrigerator during the monitoring period. This acts as a control and is returned with the tubes to the company laboratory along with the recorded start/end dates and times. The tubes are then analysed by the laboratory and results of the NO<sub>2</sub> concentration over the exposure period are provided.

### **Data ratification**

NO<sub>2</sub> diffusion tubes provide a low cost effective means of monitoring at a wide range of monitoring locations. However the precision and accuracy of tubes is variable depending on the tube handling procedures, the specific tube preparation/absorbent mixture and the analysing laboratory.

The precision and accuracy of diffusion tubes can be assessed by locating two or more tubes at the same site to measure precision. Accuracy can also be calculated by comparing the diffusion tube data with data from a continuous analyser (a more accurate method of monitoring) collocated at the same site. (known as a collocation study)

Collocation studies with a continuous analysis enables a default correction factor, known as a bias adjustment factor specific to each laboratory and preparation method to be calculated, which can then be applied to diffusion data to give a corrected annual mean.

Work is conducted on behalf of Defra by Air Quality Consultants to collate and assess data from nitrogen dioxide collocation studies undertaken across the UK. National bias adjustment factors for each calendar year are then published for each laboratory and preparation method.

The bias adjustment factor specific to Casella Cre Air for 2004 and 2005 is 0.83 and 0.81 respectively.

These bias adjustment factors have been applied to data collected in this authority during 2004 and 2005.

Carlisle City Council has also undertaken its own collocation study. However owing to problems in 2004 and 2005 affecting the NO<sub>x</sub> continuous analyser it has not been possible to obtain a full set of data for each year and therefore a local bias adjustment factor has not been available.

However tube precision has been calculated. A set of triplicate tubes have been located at Paddy's Market alongside a continuous analyser during 2004 and 2005. In addition duplicate tubes were located at a site at Lowther Street during 2004.

Results from both studies are given below. The overall survey precision is classified as good.

<b>15 Precision of Duplicate Tubes – Lowther Street</b>									
Period	Start Date	End Date	Tube 1	Tube 2	Duplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean	Tube precision classification
1	07/01/04	02/02/04	44.0	37.0	41	4.9	12	44.5	Good
2	02/02/04	04/03/04	40.0	41.0	41	0.7	2	6.4	Good
3	04/03/04	07/04/04	36.0	34.0	35	1.4	4	12.7	Good
4	07/04/04	07/05/04	40.0	41.0	41	0.7	2	6.4	Good
5	07/05/04	02/06/04	39.0	35.0	37	2.8	8	25.4	Good
6	02/06/04	24/06/04	34.0	35.0	35	0.7	2	6.4	Good
7	08/07/04	06/08/04	39.0	40.0	40	0.7	2	6.4	Good
8	06/08/04	07/09/04	38.0	46.0	42	5.7	13	50.8	Good
9	07/09/04	29/09/04	35.0	29.0	32	4.2	13	38.1	Good
10	29/09/04	29/10/04	46.0	45.0	46	0.7	2	6.4	Good
11	29/10/04	03/12/04	49.0	52.0	51	2.1	4	19.1	Good
12	03/12/04	06/01/05	44.0	44.0	44	0.0	0	0.0	Good
Overall Survey: Good									



<b>16 Precision of Triplicate Tubes – Paddys Market</b>									
Start Date	End Date	Tube 1	Tube 2	Tube 3	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CL of Mean	Tubes Precision Check
31/12/04	02/02/04	39.0	39.0	33.0	37	3.5	9	8.6	Good
02/02/04	01/03/04	50.0	43.0	42.0	45	4.4	10	10.8	Good
01/03/04	31/03/04	-	-	-	-	-	-	-	-
31/03/04	28/04/04	45.0	43.0	34.0	41	5.9	14	14.6	Good
28/04/04	02/06/04	45.0	51.0	43.0	46	4.2	9	10.3	Good
02/06/04	06/07/04	42.0	43.0	38.0	41	2.6	6	6.6	Good
06/07/04	02/08/04	41.0	45.0	41.0	42	2.3	5	5.7	Good
02/08/04	01/09/04	45.0	42.0	52.0	46	5.1	11	12.7	Good
01/09/04	28/09/04	36.0	39.0	40.0	38	2.1	5	5.2	Good
28/09/04	29/10/04	49.0	50.0	48.0	49	1.0	2	2.5	Good
29/10/04	01/12/04	49.0	54.0	50.0	51	2.6	5	6.6	Good
01/12/04	05/01/05	38.0	40.0	36.0	38	2.0	5	5.0	Good
Overall Survey: Good									

<b>17 Precision of Triplicate Tubes – Paddys Market</b>									
Start Date	End Date	Tube 1	Tube 2	Tube 3	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CL of Mean	Tubes Precision Check
05/01/05	01/02/05	48.0	42.0	46.0	45	3.1	7	7.6	Good
01/02/05	01/03/05	58.0	55.0	41.0	51	9.1	18	22.5	Good
01/03/05	05/04/05	46.0	42.0	42.0	43	2.3	5	5.7	-
05/04/05	03/05/05	49.0	45.0	50.0	48	2.6	6	6.6	Good
03/05/05	26/05/05	33.0	37.0	40.0	37	3.5	10	8.7	Good
26/05/05	04/07/05	33.0	29.0	38.0	33	4.5	14	11.2	Good
04/07/05	01/08/05	47.0	29.0	33.0	36	9.5	26	23.5	Poor
01/08/05	30/08/05	21.0	21.0	21.0	21	0.0	0	0.0	Good
30/08/05	04/10/05	33.0	30.0	28.0	30	2.5	8	6.3	Good
04/10/05	02/11/05	45.0	44.0	30.0	40	8.4	21	20.8	Poor
02/11/05	01/12/05	43.0	45.0	48.0	45	2.5	6	6.3	Good
01/12/05	05/01/05	47.0	46.0	48.0	47	1.0	2	2.5	Good
Overall Survey: Good									

## Real Time Continuous Monitoring – Nitrogen Dioxide and Particles (PM<sub>10</sub>)

### a) Description of Monitoring Techniques

Monitoring is also undertaken using the following automatic continuous monitoring analysers.

- Monitor Lab ML9841B Chemiluminescent real time NO<sub>2</sub> analyser
- Rupprecht Patashnick Tapered Element Oscillating Microbalance (TEOM) analyser.

These are sophisticated automatic monitoring systems housed in a purpose built air-conditioned enclosure. The analysers measure and record real time nitrogen dioxide and PM<sub>10</sub> measurements and enables both short term and long term average measurements to be made.

Both types of analysers are in common use throughout the UK and are approved by DEFRA.

## **b) Equipment Maintenance and Calibration**

Routine maintenance/check visits of the equipment are made on a weekly basis and include regular filter changes and sampling head cleaning following manufacturers/suppliers documented procedures.

The analysers and all related equipment are subject to independent routine maintenance and support via a service agreement with Casella ETI (manufacturer approved engineers). This includes a 6 monthly maintenance/service and equipment check.

Under the service agreement non routine visits are also made should the analyser malfunction.

### **Calibration**

Automatic daily calibration of the nitrogen dioxide analyser is carried out according to prescribed procedures by subjecting the analyser to known calibration gases.

A two point calibration is used to quantify the analysers 'zero' and 'span' responses. The zero response is the response of the analyser when the pollutant species being measured is not present in the sample air stream. The 'span' response is the response of the analyser to a gas mixture of an accurately known concentration.

### **Data Management**

Raw data and daily calibration reports are automatically collected via a modem from the monitoring station to a PC located at Carlisle City Council offices. The data is transmitted twice daily. A computer package is used to store and manage the data (Envieu designed by ETI). This package allows the data to be validated and also produces analysis and calibration reports.

### **Data Ratification**

Data is screened daily to check that it does not contain unusual or unlikely results. Nitrogen dioxide data is re-scaled to take account of the internal drift of the analyser, using zero and scaling fractions provided in the calibration reports.

Copies of the raw data are duplicated as backup in case of error.

The final process is data ratification which involves a critical review of all information relating to the data.

TEOM systems underestimate particle mass compared to other techniques, such as Gravimetric methods. This is because the TEOM method preheats sampled air to eliminate interference from water. In doing so it evaporates and so fails to collect the volatile components of the particle sampled.

This volatile, secondary component has been shown to represent significant component and varying proportions of the total mass present.

Guidance recommends that when assessing compliance with current criteria, TEOM readings should be multiplied by 1.3. This correction has been used to adjust the TEOM data to equate with the gravimetric standard used for the PM<sub>10</sub> objectives.

**Carlisle City Council has recently contracted Casella ETI to undertake independent data management and data ratification of data obtained by the automatic analysers. Fully scaled and ratified data will be reported back to Carlisle City Council on a 3 monthly basis.**

## Poposed Air Quality Management Area - Currock Street



Proposed Air Quality Management Area 2