Nottingham City Council

Local Air Quality Management

Progress Report

July 2008

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Abbreviations

AADT	Annual Average Daily Traffic
ADMS	Atmospheric Dispersion Modelling System
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
AQMS	Air Quality Monitoring Station
AQO	Air Quality Objective
AURN	Automatic Urban and Rural Network
DA	Detailed Assessment
Defra	Department for Environment Food and Rural Affairs
DT	Diffusion Tube
HGV	Heavy Goods Vehicles
LAQM	Local Air Quality Management
LAQM.PG(03)	Local Air Quality Management Policy Guidance
LAQM.PGA(05)	Local Air Quality Management Policy Guidance Addendum
LAQM.TG(03)	Local Air Quality Management Technical Guidance
LGV	Light Goods Vehicles
LSO	Local Site Operator
LTP	Local Transport Plan
NO_2	Nitrogen dioxide
NOx	Oxides of nitrogen
PM_{10}	Particles 10 microns or less in diameter
$PM_{2.5}$	Particles 2.5 microns or less in diameter
PR	Progress Report
USA	Updating and Screening Assessment

Local Air Quality Management - Introduction

The Environment Act 1995 (the Act) required the Secretary of State to prepare a strategy i.e. the National Air Quality Strategy, containing policies for the assessment and management of air quality. The process of Local Air Quality Management (LAQM) has arisen from the Act.

Section 82 of this Act requires Local Authorities to review the air quality in their area and assess whether legislated Air Quality Standards and Objectives will be achieved by the prescribed date for each pollutant of concern.

The National Air Quality Objectives and timescales applicable to the LAQM process are part of the National Air Quality Strategy (the Strategy) published by the Government in January 2000 and implemented by the Air Quality (England) Regulations 2000 (as amended). See Table 1, page 4.

The Regulations state that ‘achievement or likely achievement of the Air Quality Objectives is to be determined by reference to the quality of the air at locations which are situated outside of buildings... and where members of the public are regularly present’. The Strategy requires that ‘… Local Authorities should have regard to those locations where members of the public are likely to be regularly present and are likely to be exposed over the averaging period of the objective.’ Examples of the types of locations and where the objectives should or should not apply are outlined in Table 2, page 5.

Where it has been determined that an Air Quality Objective will not be achieved by the specified date, Section 83 of the Environment Act 1995 requires Local Authorities to designate Air Quality Management Areas (AQMAs) by Order and formulate and publish corresponding Air Quality Action Plans (AQAPs). The AQAP must specify what actions a Local Authority intends to take 'in pursuit of the air quality objectives', including a timetable for implementing the plan.

Table 1

National Air Quality Objectives

(The Air Quality Strategy for England, Scotland, Wales and Northern Ireland Vol. 1 July 2007)

Pollutant	Applies to	Objective	Concentration measured as	Date to be achieved by and maintained thereafter
Benzene	UK	16.25 μg/m^3	running annual mean	31 December 2003
	England & Wales	5 μg/m^3	annual average	31 December 2010
	Scotland, Northern Ireland	3.25 μg/m^3	running annual mean	31 December 2010
1,3 Butadiene	UK	2.25 μg/m^3	running annual mean	31 December 2003
Carbon monoxide	England Wales & Northern Ireland	10 mg/m^3	maximum daily running 8-hour mean	31 December 2003
	Scotland	10 mg/m^3	running 8-hour mean	31 December 2003
Lead	UK	0.5 μg/m^3	annual mean	31 December 2004
		0.25 μg/m^3	annual mean	31 December 2008
Nitrogen dioxide	UK	200 μg/m^3 not to be exceeded more than 18 times a year	1 hour mean	31 December 2005
	UK	40 μg/m^3	annual mean	31 December 2005
Particles, PM_{10}	UK	50 μg/m^3 not to be exceeded more than 35 times a year	24 hour mean	31 December 2004
	UK	40 μg/m^3	annual mean	31st December 2004
Sulphur dioxide	UK	125 μg/m^3 not to be exceeded more than 3 times a year	24 hr mean	31 December 2004
	UK	350 μg/m^3 not to be exceeded more than 24 times a year	1 hr mean	31 December 2004
	UK	266 μg/m^3 not to be exceeded more than 35 times a year	15 min mean	31 December 2005

Note: Indicative 2010 objectives for PM_{10} (from the 2000 Strategy and 2003 Addendum) have been dropped.

Table 2

Examples of where the Air Quality Objectives should/should not apply.

Averaging Period	***Objectives should apply at***	***Objectives should generally not apply at***
Annual mean	All locations where members of the public might be regularly exposed. Facades of residential properties, schools, hospitals, libraries	Building facades of offices or other places of work. Gardens of residential properties. Kerbside sites or locations where public exposure is likely to be short term.
24-hour mean, 8-hour mean	All locations where the annual mean objective would apply. Gardens of residential properties.	Kerbside sites or any other location where public exposure is expected to be short term.
1-hour mean	All locations where the annual mean and 24 and 8-hour mean objectives apply. Kerbside sites (e.g. pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where the public might reasonably be expected to spend 1-hour or more. Any outdoor locations to which the public might reasonably be expected to spend 1-hour or longer.	Kerbside sites where the public would not be expected to have regular access.
15-mean	All locations where members of the public might reasonably be exposed for a period of 15 minutes or longer	

When assessing likely exposure with respect to the long-term objectives LAQM.TG (03) cites 'in the case of the 24-hour objectives, a relevant location would be one where members of the public may be exposed for 8 hours or more in a day, while for the annual mean objectives this might be where people are exposed for a cumulative period of 6 months in a year'.

The Defra guidance documents, LAQM.PG (03) Policy Guidance (+ subsequent addenda) and LAQM.TG (03) Technical Guidance - published in February 2003 advised Local Authorities to follow the recommended phased approach to the review and assessment process with a sequence of annual reports on a three year rolling programme shown in Table 3, page 6.

Table 3

Recommended timescales for submission of Reviews and Assessments and Progress Reports

LAQM Activity	Completion Date	Which Authorities?
Detailed Assessment	End of April 2007	Those authorities which identified the need for a DA in their April 2006 USA
Progress Report	End of April 2007	Those authorities which identified that there was no need for a DA in their April 2006 USA
Progress Report	End of April 2008	All authorities
USA	End of April 2009	All authorities
Detailed Assessment	End of April 2010	Those authorities which have identified the need for one in their April 2009 USA
Progress Report	End of April 2010	Those authorities which identified that there was no need for a DA in their April 2009 USA

The **Updating and Screening Assessment** (USA) is for identifying those aspects that have changed since the first round of reviews and assessments.
A **Detailed Assessment** of those pollutants and specific locations that are identified in the USA as requiring further work.
A **Progress Report** on the Local Authorities progress in implementing Air Quality Action Plans (AQAPs) or maintaining air quality where the Air Quality Objectives are being met.

Section 84(1) of the Environment Act 1995 also requires authorities to carry out a further assessment of existing and likely future air quality in an AQMA. LAQM TG (03) advises 'The intention is that this further assessment will be used to define the relative contribution of different sources within the areas of exceedance, so as to allow a focused action plan to be prepared.'

Nottingham City Council Air Quality Review and Assessment Reports 2000 - 2008
Over the past eight years Nottingham City Council has conducted reviews and assessments of its local air quality and published the findings in the following reports:-

Air Quality Review and Assessment First Stage & Second Stage April 2000
Air Quality Review and Assessment Second & Third Stage Report September 2001

Stage Four Review and Assessment of Nottingham's Air Quality Management Areas July 2003
Local Air Quality Management: Updating and Screening Assessment October 2003
Local Air Quality Management: Detailed Assessment October 2004
Local Air Quality Management: Progress Report April 2005
Local Air Quality Management: Updating and Screening Assessment June 2006
Local Air Quality Management: Detailed Assessment May 2008

These reports may be viewed at Nottingham City Council Offices or by visiting the Council's internet site:-
http://www.nottinghamcity.gov.uk/sitemap/environment/pollution/air_pollution/air_quality.htm

Updating and Screening Assessment 2006: Conclusions

The 2006 Updating and Screening Assessment concluded that it was unnecessary to proceed to a Detailed Assessment for lead, carbon monoxide, benzene, 1, 3 butadiene and sulphur dioxide.

It was concluded that is was necessary to proceed to a Detailed Assessment for:

i Nitrogen dioxide - for a number of roads and junctions with traffic flows meeting the guidance criteria and some of the diffusion tubes monitoring results indicate exceedance of the NO_2 annual mean objective.

ii Particles (PM_{10}) - for two roads that meet the criteria specified in the guidance.

Detailed Assessment 2008: Conclusions

The preparation of the Detailed Assessment report due by end of April 2007 was delayed consequently it was submitted to Defra in May 2008. The document is out for consultation and approval of the report from Defra is awaited.

Nitrogen dioxide

The Detailed Assessment concluded that the nitrogen dioxide annual mean AQO of $40\mu gm^{-3}$ is likely to be met in most of the Nottingham City area. However there are parts of the City, mainly near existing AQMAs, where modelling (and diffusion tube results) suggested that the objective is being exceeded at locations with relevant exposure of members of the public.

The continuous monitoring results for 2004 -2006 showed that both the nitrogen dioxide annual mean AQO and hourly AQO of 200$\mu g/m^3$ were not exceeded. The 2006 modelling results did not indicate exceedance of the hourly objective.

It was determined that it was not necessary to declare any new Air Quality Management Areas for nitrogen dioxide but modification of both of the existing AQMAs to reflect the findings of the modelling and diffusion tube monitoring in respect of the annual mean air quality objective was needed.

Particles, PM_{10}

The Detailed Assessment of the 2004 -2006 particulate matter monitoring and 2006 modelling results showed that the Air Quality Objectives of annual mean of less than 40μgm^{-3} and 24 hour mean of less than 50μgm^{-3} not to be exceeded more than 35 times; have not been exceeded; and the Objectives are unlikely to be exceeded at locations of 'relevant exposure' in the Nottingham City area in the future.

It was concluded that it is not necessary to declare Air Quality Management Areas for this pollutant.

Progress Report 2008

This is Nottingham City Council's second LAQM Progress Report carried out as part of the National Air Quality Strategy.
It details:

- Air quality monitoring information from a number of sites in the City
- An assessment of the monitoring results with respect to the air quality objectives
- Current and proposed developments that may affect or be affected by air quality

Monitoring Information

Monitoring assists in demonstrating whether Air Quality Objectives (AQOs) are being met and as part of the assessment of whether there is a significant risk of the objectives being exceeded at relevant locations. Nottingham City Council undertakes automatic monitoring in a number of locations and provides local site operators, LSOs for Defra's Automatic Urban and Rural Network, AURN site on Clinton Street East.

The monitoring programme also includes non-automatic sampling for nitrogen dioxide using passive diffusion tubes. Diffusion tubes are low cost and low maintenance and allow an increased number of locations/areas to be monitored. Non-automatic sampling of benzene and black smoke is undertaken at the AURN site.

Figure 1, page 12 shows map locations of the continuous and diffusion tube monitoring sites and the Air Quality Management Areas.

Monitoring location descriptions

Eight site types are described by LAQM.TG (03). to assist in identifying monitoring localities and their appropriateness for use in air quality assessments. The continuous monitoring locations in Nottingham can be described as;

Urban centre	an urban location representative of typical population exposure in towns or city centres.
Roadside	a site between 1m of the kerbside of a busy road and the back of the pavement. Typically this will be within 5m of the road, but could be up to 15m.
Other	any special source-orientated or location category covering monitoring undertaken in relation to specific emission sources

Continuous Automatic Monitoring

Nottingham City Council undertakes continuous monitoring at a number of locations in its area and Defra have an AURN site in the City centre.

AURN, Clinton Street East

The AURN station is located in the city centre and classified as an 'Urban centre' site. The surrounding area comprises retail outlets and city centre business premises in an urban pedestrianised area. The nearest road, the A6008, approximately 30 metres from the site, is no longer a major through-route following completion of the City Centre Major Scheme to divert and redirect traffic around the City Centre and limit access to certain vehicles types such as buses. Relevant exposure is at residential properties approximately 40 metres to the South and approximately 23 metres to the North East.

The monitoring equipment is housed in a self-contained, air-conditioned fixed unit; the manifold inlet is approximately 3 metres high and has continuous automatic analysers that measure carbon monoxide (CO), nitric oxide (NO), nitrogen dioxide (NO_2), oxides of nitrogen (NOx), particles (PM_{10}), sulphur dioxide (SO_2) and ozone (O_3). Monitoring for CO ceased at this site in October 2007.

AQMS – Air Quality Monitoring Station, Queens Medical Centre, Derby Road

While the AQMS station is a mobile unit it has been in its current location since March 2002. The site is a suburban mixed industrial/commercial/residential area of the City adjacent to the A52. It is 25 metres from the A52 ring road and approximately 5 metres from a minor service road and is classed as an 'Other' site. It is approximately 10 metres from the nearest relevant exposure.

The self-contained, air-conditioned station has a sampling inlet approximately 2.5 metres high and has continuous automatic analysers that measure CO, NO, NO_2, NOx, PM_{10}, SO_2 and O_3.

CG NOx - Carter Gate NOx Station, Carter Gate

This is a fixed unit and has been located at Carter Gate since December 2003. The site is a suburban mixed commercial/residential area of the City adjacent to the A60. It is classed as a 'Roadside' site and is approximately 10 metres from a major traffic route, the A60 and approximately 3 metres from a busy B road. There are residential properties approximately 14 metres from the unit and 8 metres away from the A60.

The sampling inlet for the self-contained, air-conditioned enclosure is approximately 2.5 metres high. NO, NO_2 and NOx are measured using a continuous automatic analyser. The site also has an SO_2 analyser installed, which was relocated from a site that has been discontinued.

LS NOx, Lace Street NOx Station, Dunkirk

This is a fixed unit located at Lace Street since March 2007. Monitoring was initiated at this site as a result of previous rounds of the LAQM process. The site is a suburban mixed commercial/residential area of the City adjacent to the A6005 (a busy road traffic route). It is classed as a 'Roadside' site and is approximately 4 metres from the A6005 and approximately 1 metre from a minor road. The unit is sited on the pavement at the boundary with a residential property.

The sampling inlet for the self-contained, air-conditioned enclosure is approximately 1.5 metres high. NO, NO_2 and NOx are measured using a continuous automatic analyser. The NOx instrument at Lace Street is a Monitor Labs Europe chemiluminescence analyser similar to those located in the AQMS and at CG NOx, Carter Gate.

Previous modelling exercises suggested that there was a likelihood of the annual mean nitrogen dioxide AQO being exceeded close by part of the AQMA in Dunkirk. The LS NOx continuously monitoring site was set up on the boundary of the existing AQMA No: 3 to assist in identifying whether this was occurring.

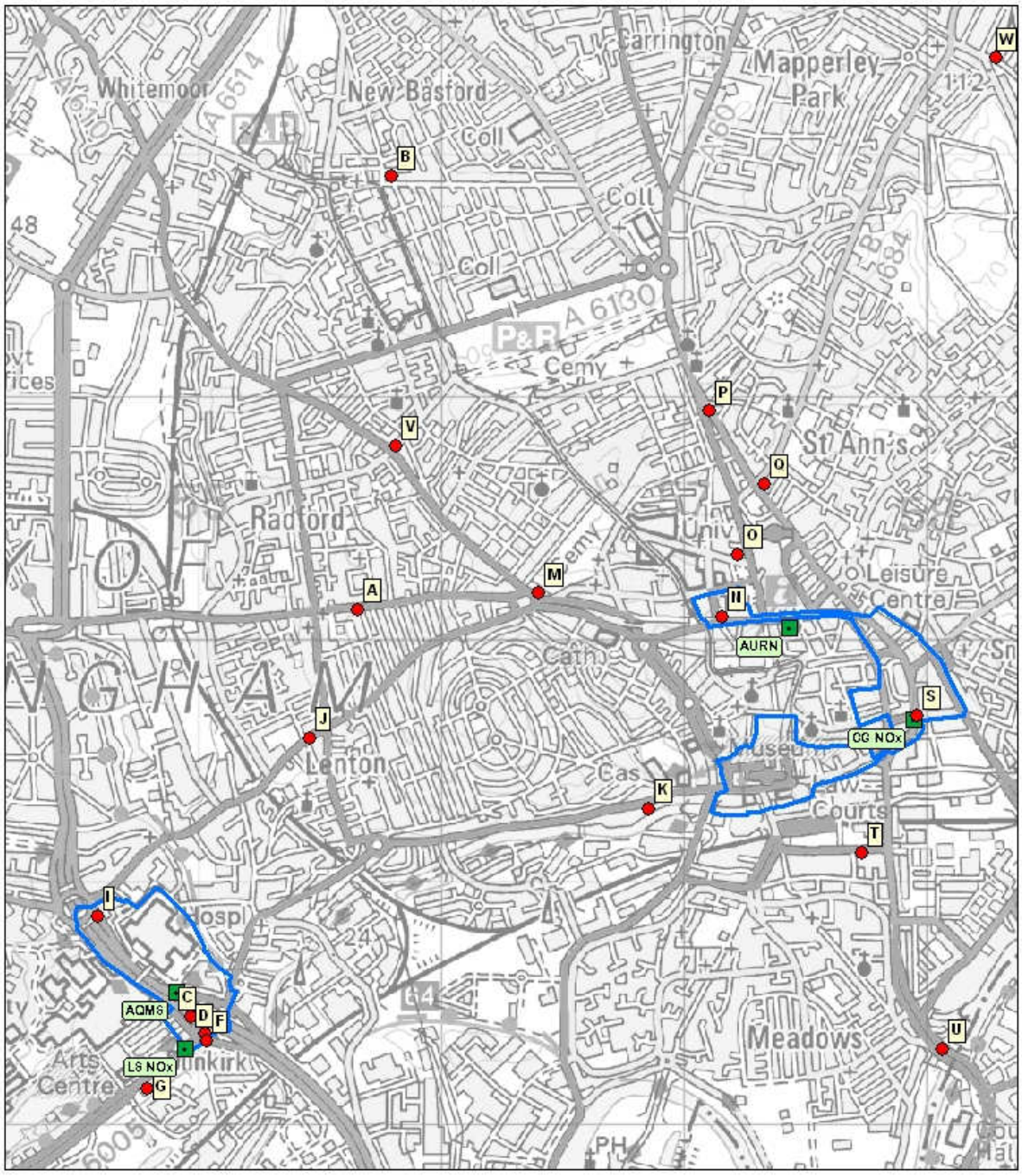
Nottingham City Council's Second and Third Stage Review and Assessment 2001 - Technical Annexe gives information on the types of monitoring equipment operated and the QA/QC procedures used. The QA/QC procedures carried out at all Local Authority sites are similar to those used for the AQMS.

Monitoring Data – Continuous Analysers Sites

The guidance recommends the monitoring data is reported over the period of a calendar year. This gives clarity of measurement period and allows results over the range of yearly weather conditions to be reported. Where this is not the case the data has been annotated.

Summaries of monitoring data are given in Tables 4 to 7, pages 13-15.

Figure 1 **Monitoring Sites**



Nottingham City Council Monitoring Sites - 2007

Diffusion Tube Sites

Continuous monitoring sites

Existing AQMAs

Scale 1:22,000

N

Nottingham City Council

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Table 4

2007 Annual Summary Statistics for Pollutants Measured at AURN, Clinton Street East, City Centre

Nitrogen Dioxide NO_2	**μgm^{-3}**	**Objective exceeded?**
Annual mean	33.3	No
Maximum 1 hour mean	183	No
Data Capture	96.7%	
Sulphur Dioxide SO_2	**μgm^{-3}**	**Objective exceeded?**
Maximum 15 minute mean	48	No
Maximum 1 hour mean	45	No
Maximum 24 hour mean	13	No
Data Capture	98.3%	
Particles PM_{10} (TEOM FDMS)	**μgm^{-3}**	**Objective exceeded?**
* Annual Mean	22	No
* Maximum 24 hour mean	136 10 occurrences >= 50 μgm^{-3}	No
*Data Capture	99.1%	
Carbon Monoxide CO	**mgm^{-3}**	**Objective exceeded?**
**Maximum daily running 8 hour mean	1.6	No
**Data Capture	97.6%	
Benzene	**μgm^{-3}**	**Objective exceeded?**
Annual Mean	0.84	No
Data Capture	100%	
Ozone	**μgm^{-3}**	**Objective exceeded?**
Maximum daily 8 hr mean	110	Not applicable
Data Capture	98.3%	

All data are ratified, 12 months data – 01.01.2007 to 31.12.07 except:
*$PM_{10\ (TEOM\ FDMS)}$ - PM_{10} measured using a TEOM with Filter Dynamic Measurement System installed in the AURN in March 2007. 9 months data from 27/03/07 - 31/12/2007
** CO – 9 months data 01.01.07 to 30.09.07. CO is no longer measured at this station.

Table 5

2007 Annual Summary Statistics for Pollutants Measured at AQMS, Queens Medical Centre, Clifton Boulevard

Nitrogen Dioxide NO_2	**μgm^{-3}**	**Objective exceeded?**
Annual mean	34	No
Maximum 1 hour mean	135.6	No
Data Capture	98.8%	
Sulphur Dioxide SO_2	**μgm^{-3}**	**Objective exceeded?**
Maximum 15 minute mean	34.6	No
Maximum 1 hour mean	26.6	No
Maximum 24 hour mean	13.3	No
Data Capture	99.2%	
Particles PM_{10} (TEOM Gr eq)	**μgm^{-3}**	**Objective exceeded?**
Annual mean	23.5	No
Maximum 24 hour mean	143 15 occurrences >= 50 μgm^{-3}	No
Data Capture	97.2%	
Carbon Monoxide CO	**mgm^{-3}**	**Objective exceeded?**
Maximum daily running 8 hour mean	2.5	No
Data Capture	99.3%	
Ozone	**μgm^{-3}**	**Objective exceeded?**
Maximum 8 hour mean	137	Not applicable
Data Capture	94.9	

12 months ratified data – 01.01.2007 to 31.12.2007 Ratified

$PM_{10\ (TEOM\ Gr\ eq)}$ - PM_{10} measured using a TEOM gravimetric equivalent (i.e.1.3 factor applied)

Table 6

2007 Annual Summary Statistics for Nitrogen Dioxide and Sulphur Dioxide Measured at CG NOx, Carter Gate, City Centre

Nitrogen Dioxide NO_2	**μgm^{-3}**	**Objective exceeded?**
Annual mean	42.4	Yes
Maximum 1 hour mean	406.8 3 occurrences >= 200 μgm^{-3}	No
Data Capture	91.9%	
Sulphur Dioxide SO_2	**μgm^{-3}**	**Objective exceeded?**
Maximum 15 minute mean	151.6	No
Maximum 1 hour mean	93.1	No
Maximum 24 hour mean	18.6	No
Data Capture	89.3%	

12 months data NO_2 01.01.2007 to 31.12.2007 ratified
7 months data SO_2 01.05.2007 to 31.12.2007 ratified

Table 7

2007 Annual Summary Statistics for Nitrogen Dioxide Measured at LS NOx, Lace Street, Dunkirk

Nitrogen Dioxide NO_2	**μgm^{-3}**	**Objective exceeded?**
Annual mean	43.7	Yes
Maximum 1 hour mean	149 >= 200 μgm^{-3}	No
Data Capture	79.5%	

9 months data 01.04.2007 to 31.12.2007 ratified

The 2007 summary data shows that the Air Quality Objectives for SO_2, PM_{10} and CO were not exceeded at any of the sites.

The annual mean objective for nitrogen dioxide was exceeded at CG NOx, Carter Gate which is a roadside site within AQMA 2. The 9 month mean for LS NOx, Lace Street a roadside site within AQMA 3 suggests that the annual mean NO_2 AQO would have been exceeded.

Non Continuous Monitoring

Nitrogen Dioxide (NO_2) Diffusion Tube Monitoring

Nottingham City participates in the UK NO_2 diffusion tube network and has 23 diffusion tube monitoring sites (including co-located tubes). Tubes have been exposed in and near AQMAs 2 and 3 and in other areas where there may be 'hot spots' due to road and/or traffic changes. Tubes are exposed at site for a month before being sent for laboratory analysis.

The geographical locations of the tube sites (excluding, for clarity, those co-located at continuous sites) and the AQMAs are shown in Figure 1 page 12.

The tubes are mostly located at building façades of residential properties at a range of sites classified mainly as roadside and urban background. Co-location of three NO_2 diffusion tubes at each of the continuous monitoring sites i.e. AURN, AQMS and CG NOx to enable 'bias correction' factors to be determined commenced in 2005. Co-location at LS NOx commenced in 2007 and ceased at the AQMS at the same time. Bias adjustment was used to adjust for the over-estimation of diffusion tube measured NO_2 levels compared with the continuously measured concentrations.

The 2007 NO_2 annual mean diffusion tube results are shown below in Table 8. A bias adjustment factor A = 0.865 was applied to the measured diffusion tube results and the table shows both the adjusted and unadjusted nitrogen dioxide concentrations.
Information about the bias adjustment factor and its derivation; on the laboratory used for diffusion tubes supply and analysis; the tube preparation method and the exposure period are given in Appendix 1 page 35

Quality Assurance and Control QA/QC and Laboratory Information

Appendix 4 of Nottingham City Council's Second and Third Stage Review and Assessment 2001 - Technical Annexe contains information on the diffusion tubes and the Nottingham City Council's QA/QC procedures used.

Table 8

2007 Annual Mean Nitrogen Dioxide Concentrations - Diffusion Tube Measurement

Site Type	Tube Id	Site	Duration of Monitoring Months	Raw Data Annual Mean NO_2 μgm^{-3}	Bias Adjusted Annual Mean NO_2 μgm^{-3}
R	A	Ilkeston Road (NS)	12	30.2	27.7
UB	B	Noel Street Baths (NS)	12	29.0	25.1
UB	W	Ransom Drive (NS)	12	7.0	6.1
R	C	Clifton Boulevard	12	34.2	29.6
R	D	Beeston Road (1)	11	58.3	**50.4**
R	F	Beeston Road (2)	11	60.7	**52.5**
R	G	Beeston Road (4)	12	45.6	39.4
R	H*	Beeston Road (3)	12	52.9	**45.8**
R	I	Derby Road (1)	12	38.3	33.1
R	J	Derby Road (2)	12	37.8	32.7
R	K	Castle Boulevard	12	51.1	**44.2**
R	M	Canning Terrace	12	53.8	**46.5**
R	N	Upper Parliament St.	11	54.5	**47.1**
R	O	Shakespeare St.	7	62.4	**54.0**
R	P	Mansfield Road	12	54.3	**47.0**
R	Q	Woodborough Road	12	59.8	**51.7**
R	S	Carter Gate	11	46.9	**40.6**
R	T	Queens Road	12	52.9	**45.8**
R	U	Trent Bridge	12	35.3	30.5
R	V	Alfreton Rd./Bentinck Rd.	12	44.2	38.2

R = roadside UB =urban background NS = national survey

* not on map -Figure 1, all other sites shown

Where the concentrations are above the AQO for annual mean NO_2 they are in bold type face.

The majority of the tubes are sited within existing AQMAs or at sites that have been identified as possible hot spots due to changes in traffic flow and/or road layout. More than half the sites have measured annual mean nitrogen dioxide levels that exceed the NO_2 annual mean AQO.

Exceedances were measured at sites N (47.1μgm^{-3}) and S (40.6μgm^{-3}) inside AQMA 2 in the City centre, and at M (46.5μgm^{-3}), P (47μgm^{-3}), Q (51.7μgm^{-3}) which are close to roads that have had changes in traffic flow or road layout.

Annual mean nitrogen dioxide levels at sites C (29.6μgm^{-3}), D (50.4μgm^{-3}), F (52.5μgm^{-3}) and I (33.1μgm^{-3}) inside AQMA 3 in the Dunkirk area; G (39.4μgm^{-3}) and H (45.8μgm^{-3}) close to the south west boundary of the area showed the AQO was exceeded at some sites and not others. D, F, G and H are on building facades near a heavily trafficked dual carriageway that leads to Nottingham University and the Highfields Science Park.

Pollutant Trend Data

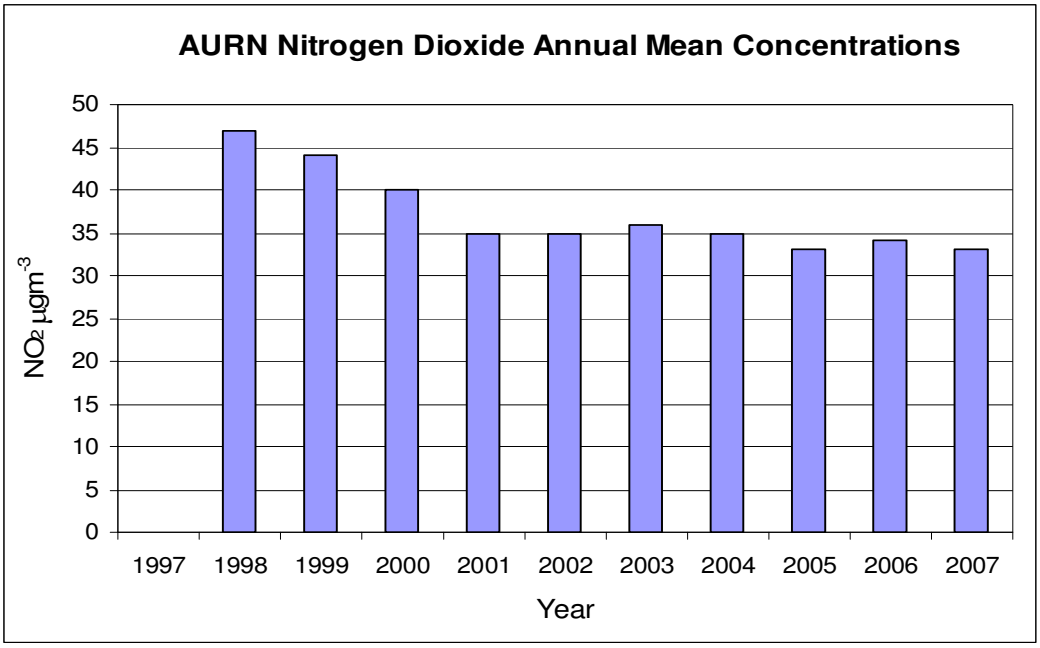
Nitrogen Dioxide

Of the four continuous monitoring sites the AURN, established in September 1996 and the AQMS have five years or more of monitoring data.

The main pollutant of concern for the purposes of this report and to which the AQMAs relate is nitrogen dioxide. Graphs of the annual means for continuously monitored NO_2 between 1997 or 1998 and 2007 at the AURN and AQMS are shown in Figures 2 and 3, page 19. The equivalent data for PM_{10}, CO, SO_2 and ozone are given in Appendix 1 Figures A1-1 and A1-2, pages 39 and 40.

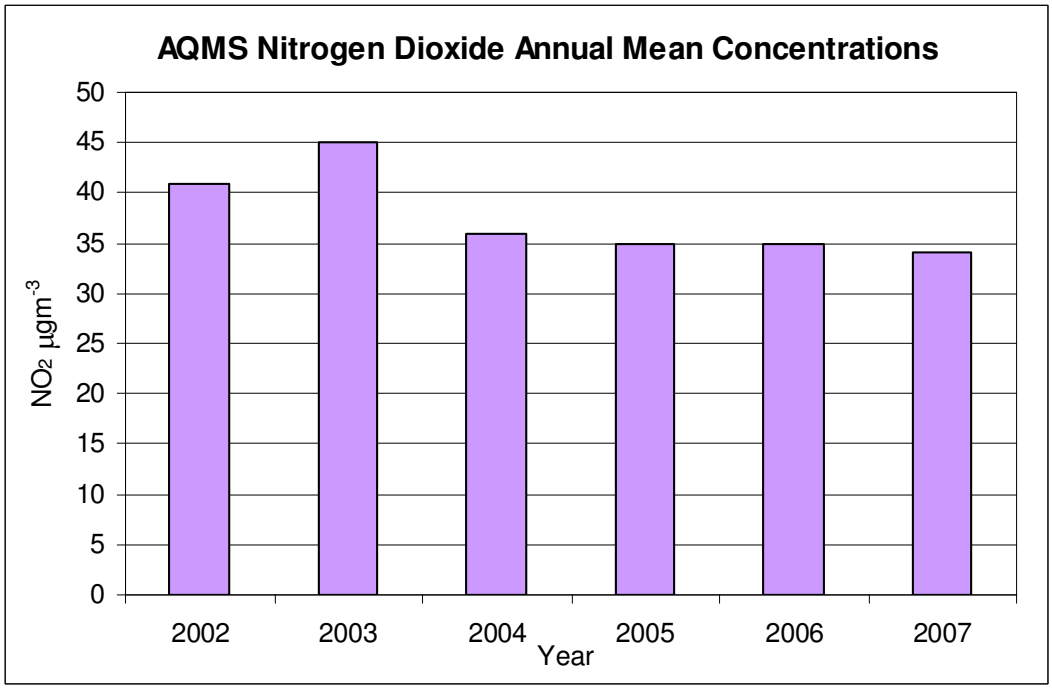
Three of the NO_2 diffusion tube sites have been part of the National Nitrogen Dioxide Survey since 1997 and the annual mean concentrations between then and 2007 are shown in the graph, Figure 4, page 20.

Figure 2



Nitrogen dioxide levels decreased between 1998 and 2001. For the last seven years the levels have been similar. The annual mean AQO has not been exceeded at this site since 2000.

Figure 3

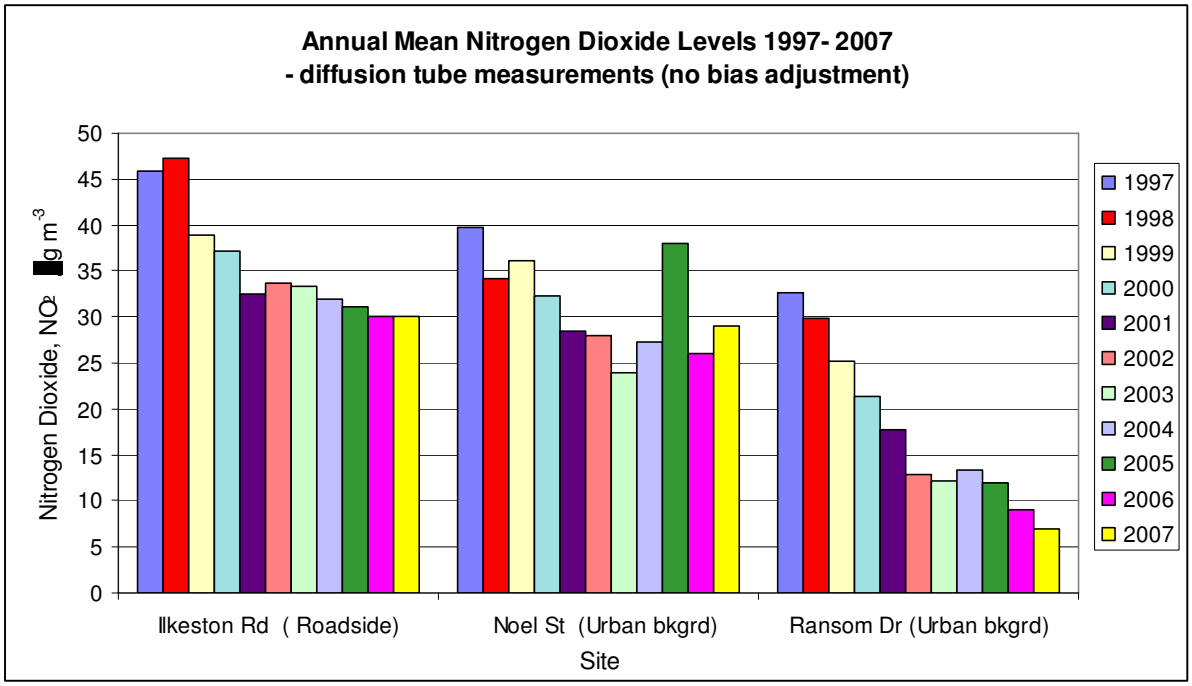


In 2002 and 2003 the nitrogen dioxide annual mean AQO was exceeded at this site however for the last 4 years the levels have been consistently between 34 and 36µgm^{-3}. The trends at both sites suggest that year on year nitrogen dioxide levels are similar and do not show any significant variation.

Diffusion Tube Annual Mean Nitrogen Dioxide Trends

The UK network sites have been in place since 1993. The annual mean results for these sites for 1997-2007 are reported in Figure 4 and show that there is a general downward trend in NO_2 levels at the 'roadside' site and one of the 'urban background' site. At the other 'urban background', Noel St concentrations decreased up to 2001 and have been fairly static since then. The annual mean AQO has not been exceeded at any of these sites since 1999.

Figure 4



No bias adjustment has been made to the results shown in the graph Figure 4 because prior to 2005 no diffusion tubes were co-located with continuous analysers.

Assessment of Monitoring Data in Relation to Likely Exceedance of Objectives

Of the pollutants monitored by Nottingham City Council in 2007, only nitrogen dioxide concentrations have led to exceedance of an AQO. Annual mean nitrogen dioxide concentrations greater than $40\mu gm^{-3}$ have been measured at several sites which means the AQO has been exceeded at these locations.

City Centre Area and AQMA No:2 – Nitrogen Dioxide

The monitoring site locations and results referred to in the following paragraphs are given in Figure 1, page 12, Tables 4 and 6, pages 13 and 15 respectively and Figure 2, page 19

The AURN site is not within the AQMA but is close by. The AURN 2007 data and the trend data shows that since 2001 the NO_2 annual mean objective has not been exceeded at this site.

Within this AQMA, the 2007 results from the CG NOx continuous monitoring site and the diffusion tube sites show that the NO_2 annual mean AQO was exceeded. The 2007 tube results for sites to the north and north east outside of the AQMA also show exceedances. The results are consistent with the advanced dispersion modelling undertaken as part of the Detailed Assessment.

Dunkirk Area, Clifton Boulevard, Nottingham A52 Ring Road and AQMA No:3 – Nitrogen Dioxide

The monitoring site locations and results referred to in the following paragraphs are given in Figure 1, page 12 and Tables 5 and 7, pages 14 and 15 respectively.

At the AQMS station situated inside the AQMA, near to the A52 Ring Road, the continuously monitored 2007 annual mean NO_2 concentration was 34μgm^{-3} whilst the nearby diffusion tubes also measured levels considerably below 40μgm^{-3}.

At the LS NOx station which is on the boundary of existing AQMA 3 the 12 month (April 2007 to March 2008) continuously monitored NO_2 mean was 47μgm^{-3} with a data capture rate of 84.2%. The 2007 diffusion tube data show that at the tube monitoring close to the station, both inside and outside the AQMA, the annual mean NO_2 AQO was exceeded.

These results are consistent with the advanced dispersion modelling undertaken as part of the Detailed Assessment.

Progress on Local Air Quality Strategies

Nottingham City is a signatory to the Nottinghamshire Air Quality Strategy (October 2001). The Strategy summarises and re-iterates elements of Local Plans and Local Transport Plans designed to reduce air pollution by encouraging alternative transport modes to the private motor vehicle and encouraging sustainable development.

The Strategy was reviewed and revised by the Nottinghamshire Environmental Protection Working Group and Nottinghamshire Air Quality Steering Group and republished in 2008. The current strategy may be viewed at:

http://www.nottinghamcity.gov.uk/notts_aqs_framework_2007.pdf

Air Quality Action Plan Integration into the Local Transport Plan for Greater Nottingham 2006/7 - 2010/11

The administrative framework LAQM PGA(05) Policy Guidance Addendum (March 2005) recommended that Local Authorities should integrate their Air Quality Action Plans (AQAPs) into their Local Transport Plans (LTPs).

Those Authorities with AQMAs relating to trunk roads/motorways should report within the LTP on any joint work with the Highways Agency and also include measures within the Local Authorities' remit that will improve air quality in the AQMA.

AQMAs 2 and 3 are transport related and therefore an Air Quality Action Plan was integrated within the LTP and can be found in Chapter 8 – Better Air Quality and Environment of the Local Transport Plan for Greater Nottingham 2006/7-2010/11(LTPfGN). The relevant tables are shown on pages 28 - 30.

Progress on Implementing Elements of Local Transport Plan Affecting Air Quality

Nottingham City has a number of strategies and plans that directly or indirectly affect air quality, particularly by the reduction of emissions associated with road transport. Since the 2005 Progress Report the number of plans and reports have been revised, amended and/or incorporated within the:-

- Local Transport Plan for Greater Nottingham 2006/7 to 2010/11 (March 2006)
- LTPfGN Congestion Delivery Plan (April 2007)
- LTPfGN Greater Nottingham Bus Strategy (March 2006)
- Local Transport Plan Delivery Report 2001 – 2006 (July 2006)

The following also remain relevant:-

- New Deal for Transport: Walking and Cycling Strategy 1999
- New Deal for Transport: Better for Nottingham 1999
- Public Transport Plan 2000
- Accessibility Planning for Bus Travel 2003

Local Transport Plan for Greater Nottingham 2006/7 to 2010/11 (March 2006)

The Local Transport Plan is key to delivering conurbation wide air quality improvements by encouraging modal shift from the private motor vehicle to public transport, cycling and walking and reducing congestion. By facilitating and encouraging modal shift and reducing congestion the plan aims to reduce emissions (including nitrogen dioxide) from road transport.

The plan details the proposals in Chapter 12: Implementation Programme:

http://www.nottinghamcity.gov.uk/cdt_ltp2_chapter_12.pdf

The programmed schemes and contributions to objectives from Chapter 12 are included in Appendix 2

The main elements are outlined below:-

Ring Road Major

The Ring Road Major Scheme is the City Council's priority one major scheme for submission for implementation within the LTP2 Plan period.

It is designed to:

- Reduce congestion at critical junctions on this important orbital strategic route,
- Support complementary strategies that encourage modal change for journeys to the City Centre,
- Improve public transport accessibility by improving the reliability of the orbital bus service serving large employment destinations including two large hospital sites and two Nottingham University campuses,
- Allow easier interchange with NET and with radial bus services reducing the need for users to go into the City Centre for some journeys,
- Support large scale redevelopment proposals particularly in the City Centre through the provision of alternative through route capacity,
- Improve air quality by supporting increased public transport use, reducing congestion and increasing the attractiveness of pedestrian and cycle facilities.

Timetable for Ring Road Major Scheme Submission

Submission of Major Scheme Business Case	Spring 2006
Programme Entry	Summer 2006
Conditional Approval	Summer 2007
Full Approval	Autumn 2007
Commence Implementation	Spring 2008
Scheme Completion	By 2012

Nottingham Express Transit Line 1 and Phase 2

Nottingham Express Transit (NET) Line 1 of Nottingham's tram system became operational in March 2004. It operates between the City Centre and Hucknall to the north, with a branch line to serve the Phoenix Park and Ride site close to M1 Junction 26.

NET has added substantial new public transport capacity, moving large numbers of people quickly from the north and west of the conurbation and from the wider region through Park and Ride sites and feeder bus services. The scheme has been extremely successful; 8.5 million passengers were carried in the first year of operation and 9.8 million in the second. It has resulted in significant modal shift – 30% of passengers are estimated as having transferred directly from their car or use the Park and Ride provision. The 3,000 plus Park and Ride spaces account for some 5,000 trips per day.

The House of Commons Transport Committee's report 'Integrated Transport: the Future of Light Rail and Modern Trams in the United Kingdom published April 2005 recognised Nottingham Express Transit as an example of 'a successfully integrated system'.

http://www.publications.parliament.uk/pa/cm200405/cmselect/cmtran/378/378i.pdf

NET Phase 2 proposes two additional NET routes to create a network of light rail lines in Greater Nottingham. The Beeston and Chilwell route will bring very significant benefits by serving a number of important destinations, including the ng2 development site, Queens Medical Centre, University of Nottingham, Beeston town centre and Chilwell. The route terminates at a Park and Ride site serving the A52 and junction 25 of the M1. The Clifton route serves a number of densely populated residential areas including the Meadows, Wilford, Compton Acres and Clifton before terminating at a Park and Ride site serving the A453 and junction 24 of the M1.

The combined effects of NET Line One and the additional Phase 2 lines will:

- Maximise the benefits of the investment in Line One through economies of scale and network effects,
- Carry up to 20 million passengers a year,
- Remove the need for approximately 4 million car journeys,
- Create a transport hub at Nottingham Station allowing easy interchange between tram, rail, bus and taxis within easy walking distance of the City Centre,
- Reintroduce cross-city public transport services linking some of the largest destinations outside the City Centre including the QMC and University campuses,
- Releasing valuable City Centre bus stop capacity to facilitate improved bus service

frequencies in other corridors,

- Electric propulsion for zero emissions at point of use

A Public Inquiry for NET Phase Two was held just before Christmas 2007 and the independent Inspector is expected to present his findings to the Minister in July 2008. It is hoped that a decision will be announced in early 2009. Subject to further design work and approvals, construction could start in 2010 with trams running on the extended NET system in 2013.

http://www.nottinghamcity.gov.uk/cdt_ltp2_chapter_5-2.pdf

Detailed information and maps of the proposed routes can be found on the internet site http://www.netphasetwo.com

NET Phase 2 Timetable for Delivery

Submit Transport and Works Act application	Autumn 2006
Public Inquiry	Summer 2007
Contracts let and works commence on site	2008/9
Services to commence operation	2011/12

Turning Point (City Centre Major)

The integrated transport scheme was completed in 2007. It has reduced the dominance of traffic on parts of Nottingham's inner ring road and created better connections for pedestrians and public transport users, removing general traffic in the area around the Victoria Centre.

Eastside Transport Strategy (Turning Point East)

This strategy is designed to transform the east side of the city by helping to redevelop and regenerate Sneinton Market and the area around the National Ice Centre.

The plans make Huntingdon Street and Lower Parliament Street into a logical two way route for traffic heading north and south through the city. It will mirror the north / south route on the west side of the city along Maid Marian Way.

The Eastside Transport Strategy has been devised to facilitate the redevelopment of the associated regeneration area and further details of the proposals are identified within LTPfGN Chapter 9: Regeneration and Neighbourhood Renewal. The scheme is under development and procurement routes are currently being explored as a number of funding

options exist including a possible major scheme bid to be put forward for consideration within the next round of Regional Funding Allocation prioritisation.

Bellar Gate, which severs the National Ice Centre from Hockley and the rest of the city, will form part of a new direct route for traffic wanting to access the centre, which means more pedestrian crossings can be installed along this route to help the many thousands of visitors getting to and from the Arena, whilst providing valuable Neighbourhood Links to Sneinton and St Ann's.

Nottingham Station Master plan

The Nottingham Station Master plan has the objective of delivering a world class public transport interchange and new business hub for the conurbation.

It aims to provide:

- A comprehensive improvement of the Station and its environs,
- A solution that allows for significant increases in passenger capacity, fully incorporating the NET tram extensions.
- Better passenger information facilities and full access for people with disabilities between transport modes,
- Improved bus, cycle and pedestrian facilities with improved taxi drop off,
- Safeguarding for an additional platform which may be required as part of re-signalling in the future,
- A new multi storey car park to cater for rising rail passenger demand and commercial developments within the Station curtilage.

Workplace Parking Levy (WPL)

Work towards the implementation of the Workplace Parking Levy (to support public transport initiatives and projects) is continuing, although the programme and timetable have been revised.

www.nottinghamcity.gov.uk/sitemap/transport_and_streets/transport_planning/cdt_workplace_parking_levy.htm

Nottingham East Midlands Airport (NEMA) Expansion

Following the Government's White Paper on the Air Industry NEMA proposed and implemented a number of changes to flight paths and routing to facilitate a growth in flight and passenger numbers.

The proposals and their likely impacts were assessed as an increase in flight and passenger numbers has the potential to increase the number of private vehicles accessing NEMA.

The ‘Skylink’ bus service currently offers a frequent and reliable transport alternative to the private motor vehicle.
http://www.skylink.co.uk/

Proposed Nottingham Parkway Railway Station

Midland Mainline and partners have submitted a planning application for an East Midlands Parkway station, with 1,000 car parking spaces plus coach and taxi interchange facilities, to be located in the A453 corridor adjacent to Ratcliffe Power Station within the Plan area.

If approved, in addition to providing a new facility for Greater Nottingham residents to access rail services on the Midland Mainline, encouragement will be given to promoting the station as a park and ride opportunity for commuters, shoppers and visitors to Nottingham City Centre. It will also facilitate the provision of a bus link between Nottingham Parkway and Nottingham East Midlands Airport. (Local Transport Plan 2000/1 – 2005/6 4.4.2).
See also: http://www.emra.gov.uk/files/tg-papers301107.pdf

The Big Wheel

Is the public face of Greater Nottingham’s integrated transport plan.
See http://www.thebigwheel.org.uk

The Big Wheel draws together and promotes an integrated public transport strategic vision using engaging descriptions for each project:

- The Hub – A vision of Nottingham Station as a world class transport interchange. ‘Passengers will alight into a glamorous yet efficient station complex that unites charming historic features with the breathtakingly new. Users will benefit from a spacious new car park, passenger concourse, and tram stop as the Nottingham Express Transit (NET) sweeps in over the rail tracks.’
  http://www.thebigwheel.org.uk/index.php/thehub/

- Clear Zone - in Nottingham’s City centre all but essential traffic is excluded from the designated Clear Zone during the middle of the day.
  http://www.nottinghamcity.gov.uk/sitemap/services/transport_and_streets/clearzone.htm

LTPfGN 2006/7- 2010/11 Summary of Potential Measures to Improve Air Quality in the City Centre and Ring Road AQMAs

Table 8.3: City Centre AQMA Summary of Potential Measures

Measure	Description	Lead Organisation	Air Quality Impact	Timescale	Cost	Non Air Quality Impact	Rank
A60 two-way traffic route	Huntingdon St/ Lower Parliament St to become strategic two-way route	City Council	High	Medium	££££	Development of North - South legible strategic traffic route. Allows central core area to expand eastwards	1
Two-way bus priority route	Cranbrook St/ Bellar Gate bus priority route and local access.	City Council	Medium	Medium	£££	Supports improved public transport accessibility and reliability	2
Primary Pedestrian Routes	Key junctions reconfigured to increase pedestrian priority and quality of routes upgraded.	City Council	Low	Short / Medium	££	Promotes walking, health and improved safety. Helps establish a framework for development	4=
Cycle links	Junction facilities and routes through redevelopment areas	City Council/ developers	Low	Medium	££	Promotes cycling, health and improved safety	4=
Travel Plans	Travel Plans required for major development proposals	Developers	Low	Short / Medium	£	Encourages modal change	4=
Station Masterplan	Rail capacity improvements and transport interchange	Rail industry partners/ City/ County Councils	Low	Medium/ Long	????	Encourages modal change, will reduce congestion and support economic development	4=
Park and Ride	New site at Gamston	County Council	Low	Short	????	Reduces congestion through less vehicle movements to the City Centre	4=

Measure	Description	Lead Organisation	Air Quality Impact	Timescale	Cost	Non Air Quality Impact	Rank
NET Phase 2	Network extensions to Clifton and Chilwell via Beeston	NET promoters	Low	Medium	££££	Encourages modal change, will reduce congestion & support economic development	4=
NET Future Phases	Other network extensions including Gedling/ West Bridgford	NET promoters	Low	Long	££££	Encourages modal change, will reduce congestion and support economic development	4=
A52 Ring Road upgrading	Upgrading of Ring Road Radcliffe to Clifton Bridge as recommended in the A52 MMS	Highways Agency	Medium	Long	££££	Reduced congestion by increasing capacity of alternative cross- city route around the south of the conurbation	3
New River Crossing	New Trent road crossing at Radcliffe	County Council	Medium	Long	££££	Reduced congestion through provision of an alternative route for cross-city traffic movements to the east of the conurbation	5

Timescale: Long = 5-10 years, Medium = 2 to 5 years, Short = Less than 5 years
Cost: ££££ > £1 million, £££ = £500k - £1 million, ££ = £100k - £500k, £ = < £100k
Air Quality Impact: High = >2 μgm^{-3} , Medium = 1 – 2 μgm^{-3} , Low = < 1 μgm^{-3} Rank: 1 = highest

Table 8.4: Ring Road (QMC) AQMA Summary of Potential Measures

Measure	Description	Lead Organisation	Air Quality Impact	Timescale	Cost	Non Air Quality Impact	Rank
NET Phase 2	Network extensions to Clifton and Chilwell via Beeston (Including Park and Ride)	NET promoters	Medium	Medium	££££	Encourages modal change, will reduce congestion and support economic development	1
Ring Road Major	Junction capacity improvements, bus stop/small scale interchange facilities, cycle and footway upgrading, parking provision for residents	City Council	Medium	Medium	££££	Will reduce congestion, encourage modal change and improve safety	2=
Medi-Link Ring Road service	High frequency Ring Road orbital bus service	City Council/ bus operators / Hospitals	Medium	Medium	£££	Improves accessibility and encourages modal change.	2=
QMC interchange	Development of bus interchange and in the future tram within hospital site	City Council/ NHS Trust	Low	Medium / Long	£££	Supports public transport integration	2=
Bus priority	Introduction of bus lanes through roadspace realocation and other bus priority measures on A6200/A52 and A6005 corridors	City Council/ County Council / Higways Agency	Low	Medium	££	Will support modal change but may have adverse congestion impacts	4
Cycle links	Cycle network development	City Council	Low	Medium	££	Promotes cycling, health and improved safety	3=
Travel Plans	Updating of hospital and University plans	NHS trust/ University	Low	Short	£	Encourages modal change	3=

Timescale: Long = 5-10 years, Medium = 2 to 5 years, Short = Less than 5 years
Cost: ££££ > £1 million, £££ = £500k - £1 million, ££ = £100k - £500k, £ = < £100k
Air Quality Impact: High = >2 μgm^{-3} , Medium = 1 – 2 μgm^{-3} , Low = < 1 μgm^{-3} Rank: 1 = highest

Planning Developments that have the Potential to Affect Local Air Quality 2005-2010

Within or adjacent to AQMA 2 - Nitrogen dioxide.

i. Trinity Square Redevelopment, Mansfield Road (nearing completion 2008).
Planning Ref. 03/01246/PFUL3.

Retail, leisure, residential, car parking and associated changes to traffic flows/routes (Turning Point)

An Integrated Transport Assessment (ITA) was undertaken by BWB Partnership in consultation with Nottingham City Council and submitted as part of application's supporting documentation.

ii. Nottingham Eastside, Island Business Centre, City Link
Planning Ref. 04/01403/POUT decided January 2005, not commenced.

Proposed leisure, residential, offices and car parking.

A Transport Assessment i.e. Environmental Statement Volume 3 Transport Assessment Parts 1 and 2 undertaken by the applicant was submitted as part of application's supporting documentation.

The assessment concludes slight increases in peak hour journeys associated with the development but a potential sustained decrease in north-south bound through traffic from when site preparation/construction work commences.

iii. Broadmarsh Redevelopment, Lister Gate
Planning Ref. 02/01261/POUT decided 2004, not commenced.

Retail, leisure, bus/tram interchange, car parking, associated changes to road network flows/routes.

Integrated Transport Assessment (ITA) undertaken by Savell Bird & Axon and submitted as part of application's supporting documentation. The ITA Section 7 Methodology describes the proposals impact and its main outcome of suppressing traffic capacity in the Broadmarsh area and reducing through traffic. The measures have yet to be modelled and their impact on air quality quantified.

iv. Nottingham Station Redevelopment Brief MU3.5

Office, retail uses with car parking. Developers are required to consider the impact of development on air quality.

v. Arkwright Triangle Plaza Redevelopment Brief MU3.3 & 3.9

Office, retail uses with car parking. Developers are required to consider impact of development on air quality.

vi. Meadows Gateway Redevelopment Brief

Office, retail uses with car parking. Developers are required to consider impact of development on air quality.

Within or adjacent to AQMA 3 - Nitrogen Dioxide, Dunkirk Area

Nottingham Express Transit - Phase 2 Nottingham City to Chilwell via Beeston

See page 24.

Elsewhere in Nottingham City Area

See the link below for proposed developments.

http://www.nottinghamcity.gov.uk/sitemap/services/environment/planning/cd_planning-policy-ldf/ldf_evidence_base.htm#sue

New Industrial Developments likely to impact on air quality in Nottingham City Area (between 2005 and July 2008)

None.

Pollution Control Act 1999 - Integrated Pollution Prevention and Control
New Installations/ Activities

Part A(1) - Environment Agency

None.

Part A(2) - Local Authority (LA IPPC):

None.

Part B - Local Authority (LA PPC):

These installations/activities are required to ensure emissions remain within limits detailed in their 'permit'. Installations/activities described as 'closed' have either physically closed, ceased or modified their process so that their emissions have been reduced below a level that requires 'permitting'.

Opened Date 2006-2007

Permit	Name	Street	1st Authorised
2.20.08	Bits At Mick's	Newton Street	26/04/2006
3.50.09	Total Reclaims Demolition	Radford Road	16/05/2006
3.40.108/1	CMEC Demolition Ltd.	Grooms Court, Holy Lane	22/09/2006
6.50.120/1	ADR Accident Repair Centres Ltd	Old Coach Road	08/03/2007
1.35.118	Dunn Line	Beechdale Road	05/03/2007

Closed Date 2006-2007

Permit	Name	Street	Date ceased
PFS76/2	Derby Road Service Station	Derby Road	01/04/2006
PFS40/2	Beechdale Service Station	Beechdale Road	01/04/2006
PFS102/1	National Car Rental Ltd	Mabel Street	01/04/2006
1.35.117/1	Skills Motor Coaches Limited	Belgrave Road	14/06/2006
6.50.405/1	Hill and Tyler	Glaisdale Drive	14/09/2006
6.50.120	ADR Accident Repair Centres Ltd	Crocus Street	08/03/2007

Opened Date 2007-2008

Permit	Name	Street	1st Authorised
6.50.25	Just Car Clinic	Freeth Street	13/02/2008

Closed Date 2007-2008

Permit	Name	Street	Date ceased
2.20.08	Bits At Mick's	Newton Street	31/03/2008
3.40.104/1	Total Reclaims Demolition	Radford Road	31/10/2007
6.50.111/1	Auto Insight Nottingham	Freeth Street	31/01/2008
3.50.09	Total Reclaims Demolition	Radford Road	31/10/2007

Progress Report 2008 Conclusion

Monitoring data shows that annual mean objective of 40μgm^{-3} for nitrogen dioxide was met at some sites but not at others. 12 month NO_2 data i.e. April 2007 to March 2008 for the LS NOx continuous monitoring site which is on the boundary of existing AQMA shows the annual mean nitrogen dioxide AQO was exceeded.

The monitoring information presented in this report confirms the findings of the Detailed Assessment 2008 thus consolidating its conclusion that the boundaries of the existing Air Quality Management Areas No:2 and No:3 need to be modified.

Significant alterations to traffic flows and prolonged disruption arising from implementation of elements of the Transport Plan are likely to have contributed to increased nitrogen dioxide concentrations in parts of AQMA 2. This situation is likely to continue for the next 12 to 36 months whilst other Transport Plan projects are completed.

The potential impact on air quality of these Transport Plan projects and developments has been considered as part of the Local Transport Plan for Greater Nottingham 2006/7- 20/11. However, the actual effects can only be measured and fully assessed following their completion.

What happens next?

Section 84 (1) of the Environment Act 1995 requires Local Authorities to undertake a further assessment of existing and likely future air quality in a newly designated or varied AQMA. Section 84 (2) requires the further assessment to be made within twelve months of designating (or varying) the AQMA. There is also a requirement to consult on the further assessment and make it available to the public.

In the context of the Local Air Quality Management process this Progress Report and the Further Assessment (to be undertaken) will contribute to the next Updating and Screening Assessment which must be submitted by the end of April 2009.

Appendix 1

Additional Monitoring Information

Bias Correction of Nitrogen Dioxide Diffusion Tube Data

A co-location study of triplicate diffusion tubes at the three sites that monitor nitrogen dioxide continuously i.e. AURN, CG NOx and LS NOx between January 2007 and December 2007. Tubes were exposed for monthly periods.

The monthly concentrations were put into a spreadsheet supplied by NETCEN. The spreadsheet calculates the tube bias, accuracy and precision of the results as well as the bias adjustment factor.

The underlying calculation of the bias adjustment factor in the spreadsheet is the same as that given in LAQM.TG (3) i.e.

Bias adjustment factor A = Cm /Dm

Where Cm = annual mean chemiluminescence concentration
Dm = annual mean diffusion tube concentration

A bias adjustment factor was derived for AURN and CG NOx sites both of which had 12 months of data and data capture greater than 90%. These values were then averaged to give a single value. The averaged bias adjustment factor A = 0.865 was applied to the diffusion tube nitrogen dioxide concentrations at all the other sites. Table 8, page 17 main text shows the biased and unbiased concentrations.

This approach was used because the two sites used represent urban background and roadside locations respectively. They are consistent with the majority of Nottingham City's diffusion tube sites and for some sites it would be difficult to determine which of the bias adjustment factors to use.

Table A1-1 2007 Bias Adjustment Factor Details

Continuous Analyser and Diffusion Tube Annual Mean Nitrogen Dioxide Concentrations at Co-Located Sites

Site / Site Type	Cm NO_2 μgm^{-3}	Dm NO_2 μgm^{-3}	Bias Adjustment Factor, A	Data Capture %	Precision (CoV) %
AURN Urban Centre	33	41	0.86	98	15
Carter Gate Roadside	43	49	0.87	96	13
Averaged Bias Adjustment factor, A	-	-	0.865	-	-

12 months Data 1 January 2007 to 31 December 2007

Cm = chemiluminescence (continuous) analyser measurement

Dm = diffusion tube measurement

Bias adjustment factor, A = Cm/Dm

CoV = Coefficient of variation

For Information only

Site / Site Type	Cm NO_2 μgm^{-3}	Dm NO_2 μgm^{-3}	Bias Adjustment Factor, A	Data Capture %	Precision (CoV) %
*Lace Street Roadside	47	51	0.92	84.2	7

* 12 months data 1 April 2007 to 31 March 2008

Nitrogen Dioxide Diffusion Tube and QA/QC Information

Nottingham City Council's diffusion tubes are supplied and analysed by Bureau Veritas Laboratories. The tubes are prepared using a 10% solution of TEA (triethanolamine) in de-ionised water. The tubes are exposed on site for one month before being returned for laboratory analysis.

The laboratory is UKAS accredited and is required to take part in other proficiency schemes. Bureau Veritas Laboratories participate in a number of QA/QC monitoring systems to demonstrate satisfactory performance:

- The Workplace Analysis Scheme for Proficiency (WASP) programme to ensure uniformity in data throughout the year. Only laboratories that are in the WASP scheme are used for analysing tubes from the National Nitrogen Dioxide Diffusion Tube Network. The scheme is operated by HSL

- The monthly field inter-comparison exercise with other laboratories to enable assessment of bias and precision undertaken by HSL on behalf of NETCEN.

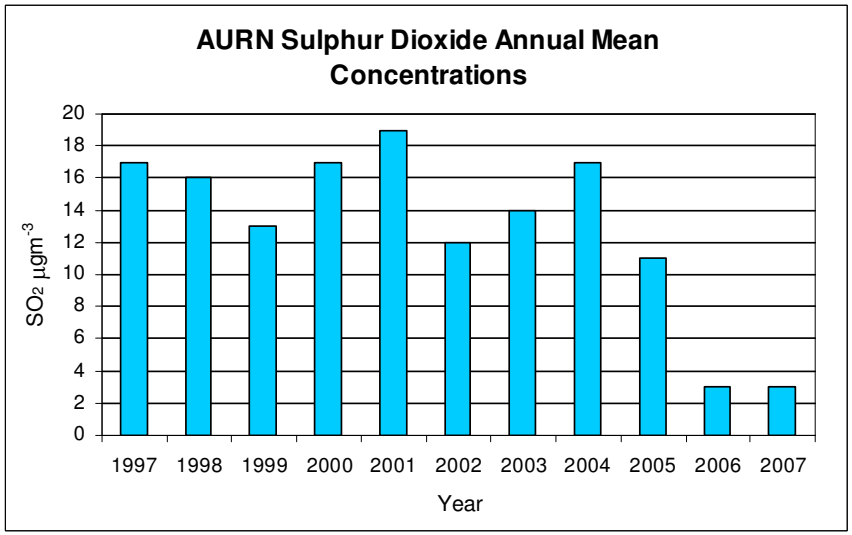
- An external QC scheme to check solutions run by NETCEN.

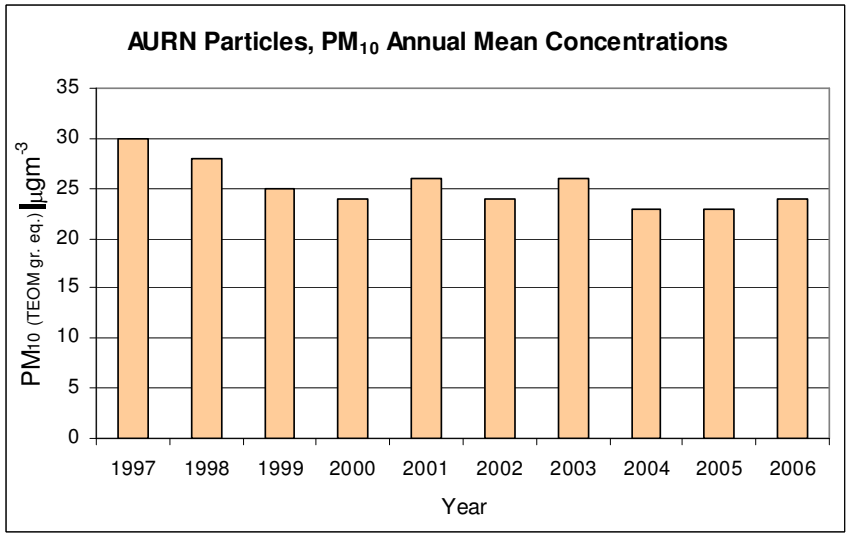
See Nottingham City Council's Second and Third Stage Review and Assessment 2001 - Technical Annexe for further information on diffusion tubes and the QA/QC procedures used.

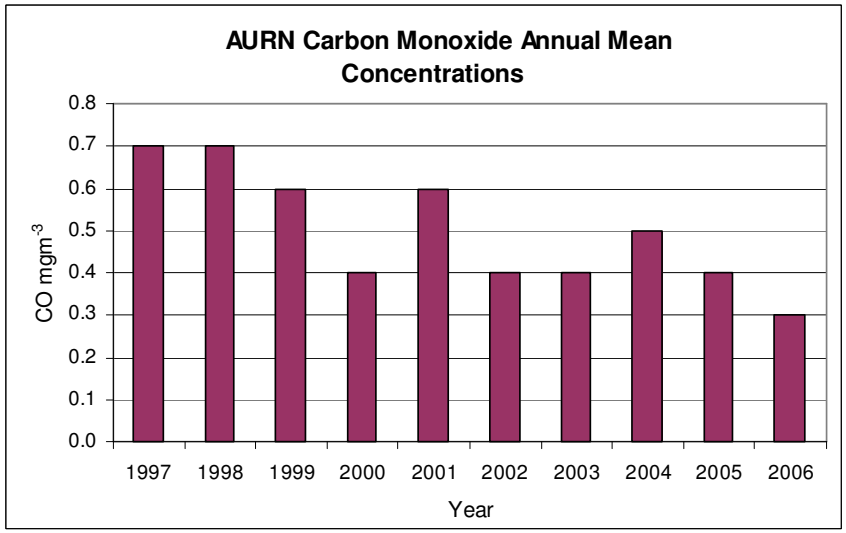
Table A1-2 Monitoring Site Details

Monitoring Sites						Tube at Road to Distance (m)	Tube to Receptor Distance (m)	Road to Receptor Distance (m)
Site Type	Monitor Type	Site Id	Location	OS Coordinates				
Roadside	DT	C	Clifton Boulevard	454963	338447	13	0	13
Roadside	DT	D	Beeston Road (1)	455024	338375	4	0	4
Roadside	DT	F	Beeston Road (2)	455028	338349	4	0	4
Roadside	DT	G	Beeston Road (4)	454782	338146	2	0	2
Roadside	DT	H	Beeston Road (3)	454838	338230	7	0	6
Roadside	DT	I	Derby Road (1)	454577	338860	26	0	18
Roadside	DT	J	Derby Road (2)	455453	339595	12	0	12
Roadside	DT	K	Castle Boulevard	456852	339303	4	0	4
Roadside	DT	M	Canning Terrace	456399	340191	6	0	6
Roadside	DT	N	Upper Parliament St.	457154	340095	4	0	4
Roadside	DT	O	Shakespeare St.	457221	340351	2	0	2
Roadside	DT	P	Mansfield Road	457103	340944	4	0	4
Roadside	DT	Q	Woodborough Road	457329	340643	2	0	2
Roadside	DT	S	Carter Gate	457961	339687	7	0	7
Roadside	DT	T	Queen's Road	457729	339122	2	0	2
Roadside	DT	U	Trent Bridge	458062	338312	5	0	5
Roadside	DT	V	Alfreton Rd./ Bentinck Rd	455808	340799	5.8	0	5.8
Roadside	DT (NS)	A	Ilkeston Road	455653	340126	6	0	6
Urban bkgd	DT (NS)	W	Ransom Drive	458287	342399	2	7	9
Urban bkgd	DT (NS)	B	Noel Street Baths	455795	341911	264	24	240
						Road to site (m)		
Urban Centre	Continuous	AURN	AURN Clinton St East	457437	340049	35	-	-
Roadside	Continuous	CG NOx	Carter Gate	457946	339668	5	-	-
Other	Continuous	AQMS	AQMS QMC	454907	338548	23	-	-
Roadside	Continuous	LS NOx	Lace Street	454941	338315	6	-	-

Figure A1-1 Pollutant Trend Data – AURN, Clinton Street East, City Centre.







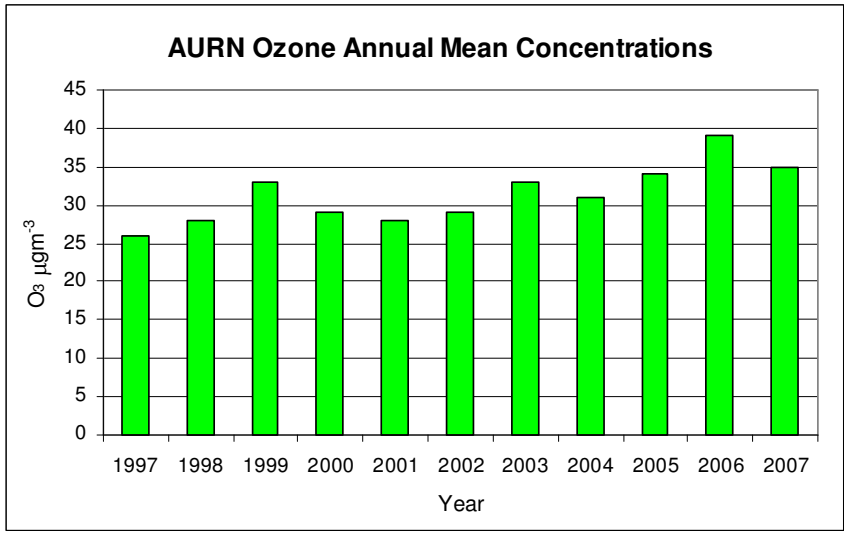
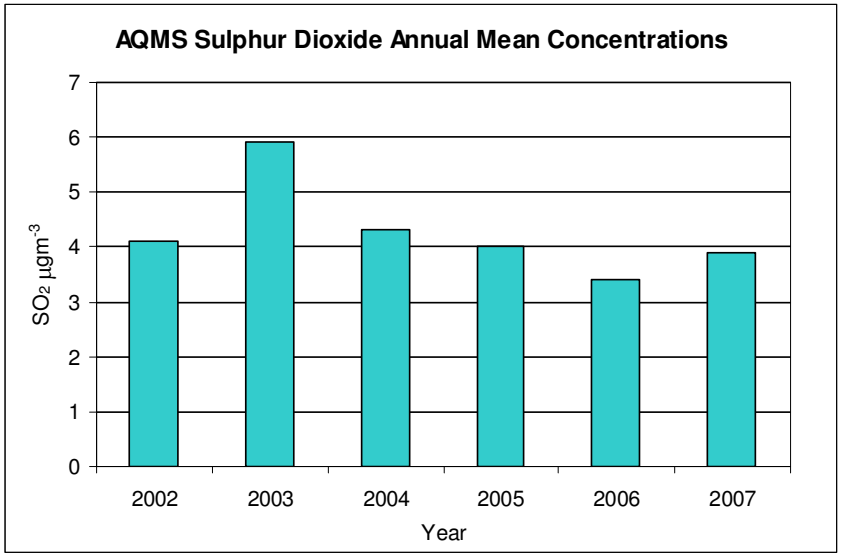
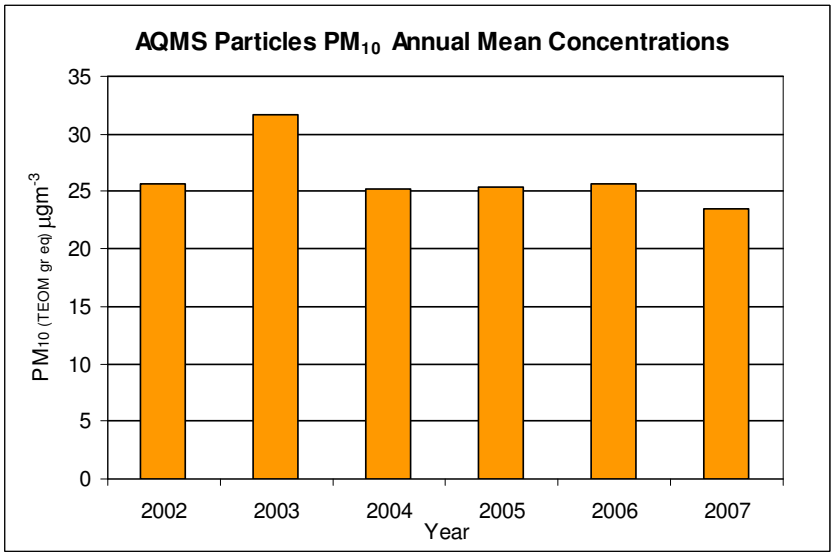
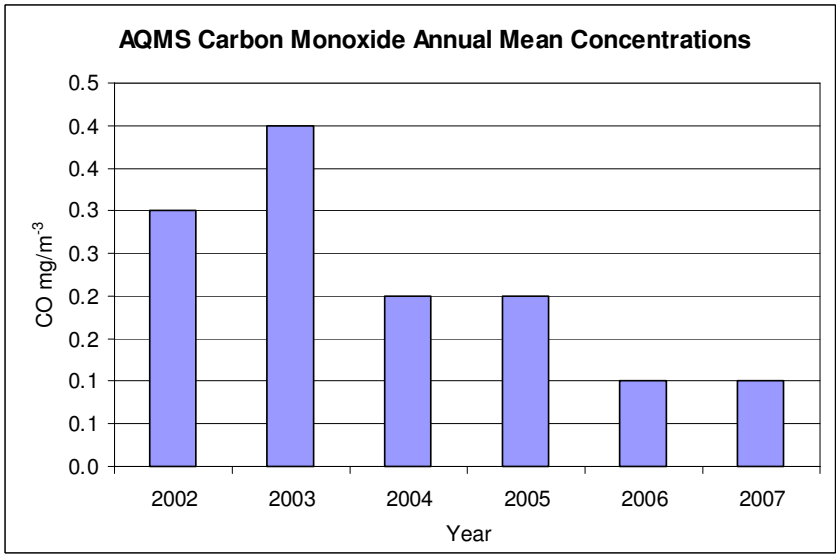
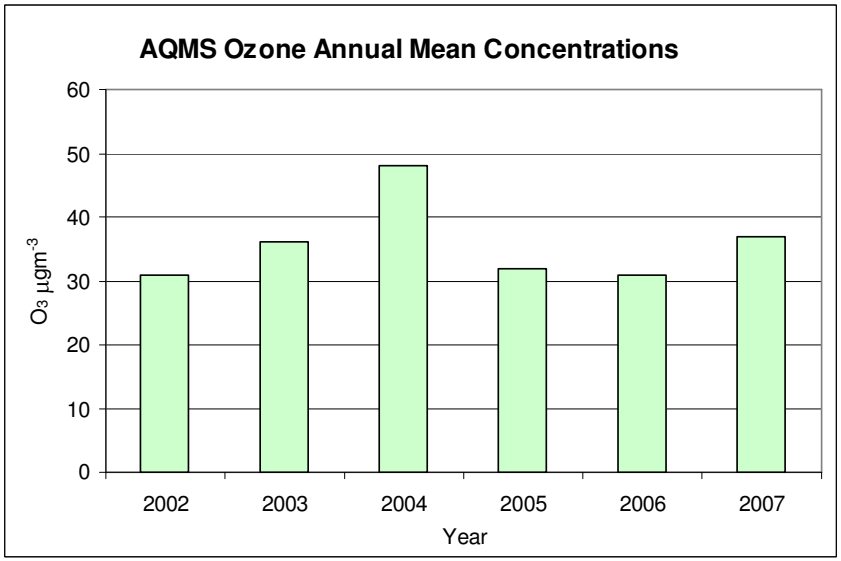


Figure A1-2 Pollutant Trend Data - AQMS, QMC Clifton Boulevard.









Trends in Annual Mean Pollutant Concentrations at the AURN and AQMS Monitoring Stations between 1997 and 2007

With reference to Figures A1-1 and A1-2:

Sulphur dioxide - annual mean levels of this pollutant have consistently been low at both the AURN and the AQMS throughout the last 5 to10 years. The noticeable reduction at the AURN for 2006 and 2007 may be attributable to the significant changes in traffic flow as a result of the Turning Point traffic scheme referred to in the main report.

Carbon monoxide – at both stations there has been a general decrease in annual mean CO concentrations during the time period that measurements have been made.

Particles, PM_{10} – at the AURN between 1997 and 2000 annual mean levels of PM10 showed year on year decreases. Since 2001 PM_{10} concentrations have varied between 23 and 26μgm^{-3}, levels considerably below the annual mean objective of 40μgm^{-3}.

At the AQMS, whilst each year's levels have been slightly higher the AURN equivalent year, this is consistent with the proximity of the AQMS to a major road.

Ozone - this pollutant is not covered by the Air Quality (England) Regulations 2000 (as amended). However the annual mean levels have been included to allow comparison with the other pollutants and national trend data.

From the graph Figure A1-1 it can be seen that at the AURN ozone levels have been higher in the last nine years (between 29 and 39μgm^{-3}) compared with 1997 and 1998 (26 and 28μgm^{-3}) and while there are no extreme year on year variations the general trend is increasing ozone levels.

At the AQMS annual mean ozone concentrations were slightly higher than at AURN and over the years 2002 to 2007 varied between 31 and 49μgm^{-3}. The trend is for similar levels each year.

Appendix 2

Programmed Schemes as detailed in Local Transport Plan for Greater Nottingham 2006/7 to 2010/11 GNLTP: Chapter 12 – Implementation Programme.

Table 12.6: Programmed Schemes and Contribution to Objectives

Classification	Types of Scheme	Programmed Schemes	Scheme information			LTP Objectives						
			Cost Band	Priority	Status	Congestion	Accessibility	Safety	Air Quality	Regeneration	Quality of Life	Maintenance
Bus priority schemes	**Whole route treatments** Bus priority and small scale traffic management measures applied to whole routes on high frequency network prioritised through Bus Quality Partnership.	Mansfield Rd: Carrington to Gregory Boulevard (incl. inbound/outbound bus lanes)	B	A		√		√	√			√
		Wollaton Rd: Russell Av to Ring Rd (inbound)	B	B								
		Nottingham Rd: approach to Ring Rd (inbound/outbound)	C	B								
		Trent Bridge: Meadows Way/London Rd approach (outbound)	B	B								
		Clifton Boulevard/QMC access improvements	D	C								
		West Bridgford approaches to Trent Bridge	D	B								
		A6005 (Chilwell to Beeston)	D	A								
	City Centre Component of emerging Eastside Transport Strategy	City Centre/Eastside bus loop	B	A		√	√	√	√	√		√
PT Interchanges	**Upgrading of interchange facilities** Relocation of bus stops, co-ordinated information, lighting and footway improvements at key nodes such as City Centre and district/local centres. Access improvements to local rail network.	Hospital interchanges	D	A		√	√	√	√			
		Queens Drive	D	B								
		Colwick race course	D	B								
		Bulwell bus station	C	B								
		Victoria bus station	D	B								
		Broadmarsh bus station/ Canal St	C	C								
		Beeston railway station	D	C								
Park and ride schemes	**Park and Ride expansion** New site development and upgrading and extension of existing sites.	Gamston (new site)	A	A		√			√			
		Phoenix Park (expansion)	C	C								

Classification	Types of Scheme	Programmed Schemes	Scheme information			LTP Objectives						
			Cost Band	Priority	Status	Congestion	Accessibility	Safety	Air Quality	Regeneration	Quality of Life	Maintenance
Pedestrian and cycling schemes	**Pedestrian routes** Development of Primary Pedestrian Routes linked to regeneration and neighbourhood schemes and upgrading of street lighting.	Old Market Square (pedestrianisation)	B	B		√	√	√	√	√	√	√
		Hockley	C	A								
		Short Steps	D	C								
		Canning Circus	B	A								
		Arkwright St	C	A								
		Station St	C	A								
		Eastside	B	A								
	Shared pedestrian/cycle network Development of routes including Regeneration Zones.	Embankment/Riverside path (Trent River Park)	B	B		√	√	√	√	√	√	√
		Lady Bay Bridge	A	C								
		Canal embankment link	B	A								
		Kimberley to Hempshill Vale link	D	A								
	Cycle Network Route treatments on commuter corridors, upgrading of existing facilities and missing links.	Castle Boulevard	D	B		√	√	√	√	√	√	√
		Arno Vale Road/ Thackerays Lane, Arnold	D	B								
		Strategic cycle network development – other routes undergoing review	C	B								
	Rights of Way Implementation of schemes identified in Rights of Way Improvement Plan programme.	Local schemes prioritised on an area basis	D	B			√				√	
Smarter travel choices	**Travel Plans** Development and support of work and school travel plans.	Work travel plans	D	A		√	√		√			
		School travel plans	D	A								
	Other behavior change measures Marketing and awareness raising (through Big Wheel), travel information, personal travel planning, car sharing/ car clubs, and homeworking.	Smarter Choices programme including Big Wheel marketing campaign	B	B		√	√		√			

Classification	Types of Scheme	Programmed Schemes	Scheme information			LTP Objectives						
			Cost Band	Priority	Status	Congestion	Accessibility	Safety	Air Quality	Regeneration	Quality of Life	Maintenance
Local safety schemes	**Casualty reduction schemes** Problem sites, route treatments, speed management measures and traffic calming.	Problem site programme prioritised on accident statistics	C	A			√	√		√	√	
		Route treatment programme	C	A								
		Speed management programme	C	A								
	Safer routes networks Development of networks of safer routes, 20mph/school safety zones and school crossing patrol sites. Linked to school travel plans.	School 20 mph zone programme	D	A		√	√	√			√	
		School safety zone programme	C	A								
		School crossing patrol site programme	C	B								
Traffic management	**Intelligent transport systems** Upgrading of the traffic control centre and upgrading SCOOT/MOVA systems and CCTV congestion monitoring.	Upgrading of traffic control centre	C	A		√			√			
		Beeston (SCOOT)	D	A								
		Hucknall (SCOOT)	D	B								
		Arnold (MOVA)	D	A								
	Highway direction signing Comprehensive renewal of static signing & installation of variable message signing for City Centre car parks and park and ride sites.	Highway direction signing programme	D	B		√		√	√	√		
		Variable message signing programme	C	C								
	Neighbourhood traffic management Local improvement schemes including small scale treatments, TROs, accessibility improvements and residents parking schemes. Prioritised by area.	Residents parking scheme programme	D	B			√			√	√	
		Accessibility improvement programme for pedestrians and cyclists	B	B								
		TRO programme including bus lane and moving traffic offences	D	A								

Classification	Types of Scheme	Programmed Schemes	Scheme information			LTP Objectives						
			Cost Band	Priority	Status	Congestion	Accessibility	Safety	Air Quality	Regeneration	Quality of Life	Maintenance
Road crossings	**New crossing facilities** Installation of new and upgrading of signal crossings and refuges. Prioritised on need.	Upgrading of existing crossings programme	D	A			√	√		√		
	Access for disabled people Dropped crossings, facilities at signal crossings and physical access improvement schemes. Prioritised on area basis.	Accessibility for disabled programme including dropped crossings	D	B			√	√			√	
Local roads	**Regeneration Schemes** Changes to highway network to bring forward development within regeneration zones and schemes identified in Area Action Plans.	Cattle Market Road Straightening (Waterside)	A	B		√			√	√	√	√
		City Centre – A60 two way traffic route (Eastside)	A	A								
		Station highway access improvements (Southside)	A	B								
		Meadows Area Action Plan highway improvements	B	C								
Other	**Decriminalised enforcement** Extension of decriminalised parking enforcement to whole of Greater Nottingham. Introduction of moving traffic offence enforcement within City boundary	Decriminalisation of parking enforcement	B	A		√		√	√			
		Moving traffic offences enforcement system – bus lanes	B	A								
		Moving traffic offences enforcement system – Clear Zone/restricted access streets	B	B								
	Local integrated town/ local centre improvement schemes Packages of small-scale measures to improve accessibility and regeneration. Priority schemes to include Arnold, Beeston and West Bridgford Town Centres.	Arnold	B	A			√	√		√	√	√
		Beeston	A	A								
		West Bridgford	A	B								

Classification	Types of Scheme	Programmed Schemes	Scheme information			LTP Objectives						
			Cost Band	Priority	Status	Congestion	Accessibility	Safety	Air Quality	Regeneration	Quality of Life	Maintenance
	Rural schemes Quiet lanes, village speed limit review and other rural schemes	Locally prioritised schemes	D	A			√	√			√	√
Carriageway and footways	**Classified roads** Schemes prioritised on condition.	Classified roads programme	B	A		√		√				√
	Non classified roads Schemes prioritised on condition with local input.	Non-classified roads programme	D	A		√						√
	Footways Schemes prioritised on condition with local input.	Footway programme prioritised within local areas	D	A			√	√			√	√
Bridge strengthening	Strengthening schemes for 40 tonne vehicles prioritised by route importance.	Strengthening programme	C	B								√
Structural maintenance	Existing bridges, subways, culverts and retaining walls prioritised on condition.	Structural maintenance programme	D	B				√				√
Other maintenance	Condition assessment and surveys.	Condition assessment programme	D	B								√

Key: √ - Primary contributor to objective, √ - Supports achievement of objective

Cost band	Actual Cost	Priority			
A	1m >	A	Contribution towards LTP objectives		Designed/prioritised for implementation, expected delivery 2006/07- 2007/08
B	500k - 1m	B			Feasibility/detailed design work in progress, expected delivery 2008/09 – 2009/10
C	250k – 500k	C			Feasibility work required, expected delivery 2010/11-onwards
D	<250k				