

North Hertfordshire District Council

Detailed Assessment Report 2011

In fulfilment of Part IV of the Environment Act 1995 Local Air Quality Management

July 2011

DOCUMENT INFORMATION

Local Authority:

North Hertfordshire District Council Council Offices Gernon Road Letchworth Garden City Hertfordshire SG6 3JF

Project Manager:David CarrTelephone:01462 474263Email:david.carr@north-herts.gov.uk

Document Status and Approval Schedule

Issue	Status	Description	Prepared by	Reviewed by
0	Draft	Prepared –	David Carr	Shayne Crowe
	report	June 2011		-
1	Final	Issued to DEFRA –	David Carr	Shayne Crowe
	Report	July 2011		-

TABLE OF CONTENTS

EXEC	UTIVE SUMMARY	iv - v
1	INTRODUCTION	1
1.1 1.2	PROJECT BACKGROUND LEGISLATIVE BACKGROUND	1 1
2.	REVIEW AND ASSESSMENT OF AIR QUALITY UNDERTAKEN BY NORT	ГН3
HERT	FORDSHIRE DISTRICT COUNCIL	3
2.1 2.2 2.3	THE FIRST, SECOND AND THIRD ROUND OF REVIEW AND ASSESSMENT THE FOURTH ROUND OF REVIEW AND ASSESSMENT SCOPE AND METHODOLOGY OF THE 2011 DETAILED ASSESSMENT	3 4 5
3.	2010 AIR QUALITY MONITORING	5
3.1 3.2 3.3 3.4	HITCHIN STREET AND WHITEHORSE STREET, (A505), BALDOCK CAMBRIDGE ROAD AND NIGHTINGALE ROAD, (A505 / B656), HITCHIN HITCHIN HILL ROUNDABOUT AND STEVENAGE ROAD, (A602), HITCHIN PARK WAY AND UPPER TILEHOUSE STREET, (HITCHIN LIBRARY / PAYNES PARK ROUNDABOUT), (A505/A602), HITCHIN	5 9 12 15
4.	DISPERSION MODELLING METHODOLOGY	17
5.	INTERPRETATION OF AIR QUALITY MONITORING RESULTS	
5.1 5.2 5.3 5.4	HITCHIN STREET AND WHITEHORSE STREET, (A505), BALDOCK CAMBRIDGE ROAD AND NIGHTINGALE ROAD, (A505/B656), HITCHIN HITCHIN HILL ROUNDABOUT AND STEVENAGE ROAD, (A602), HITCHIN PARK WAY AND UPPER TILEHOUSE STREET, (HITCHIN LIBRARY / PAYNES PARK ROUNDABOUT), (A505/A602), HITCHIN	
6.	CONCLUSIONS AND RECOMMENDATIONS	27
6.1 6.2 6.3 6.4	HITCHIN STREET AND WHITEHORSE STREET, (A505), BALDOCK CAMBRIDGE ROAD AND NIGHTINGALE ROAD, (A505/B656), HITCHIN HITCHIN HILL ROUNDABOUT AND STEVENAGE ROAD, (A602), HITCHIN PARK WAY AND UPPER TILEHOUSE STREET, (HITCHIN LIBRARY / PAYNES PARK ROUNDABOUT), (A505/A602), HITCHIN	27 27 28 29
7.	REFERENCES	30
APPEN	NDIX 1 Quality Assurance / Quality Control (QA/QC)	
APPEN	NDIX 2 AQC. North Hertfordshire District Council, Hitchin Detailed Assessment	24

FIGURES

Figure 1 – Air Quality Monitoring Locations in the Whitehorse Street Area of Baldock
Figure 2 – Air Quality Monitoring Locations in the Whitehorse Street Area of Baldock7
Figure 3 – Air Quality Monitoring Locations in the Cambridge Road and Nightingale Road Area of Hitchin10
Figure 4 – Air Quality Monitoring Locations in the Cambridge Road and Nightingale Road Area (Grove Road) of Hitchin
Figure 5 – Air Quality Monitoring Locations in the Stevenage Road Area of Hitchin13
Figure 6 - Air Quality Monitoring Locations in the Payne's Park and Upper Tilehouse Street Area of Hitchin
Figure 7 – Traffic Flows Pre and Post Opening of Baldock Bypass in 200619
Figure 8 – Modelled Annual Mean Nitrogen Dioxide Concentrations in the Stevenage Road Area of Hitchin
Figure 9 - Modelled Annual Mean Nitrogen Dioxide Concentrations in the Payne's Park Upper Tilehouse Street Area of Hitchin
TABLES
Table 1.1 – UK Air Quality Strategy Objectives (England)2
Table 3.1 – Details of Air Quality Monitoring Locations in the Baldock Area
Table 3.2 – Results of 2010 Air Quality Monitoring in the Baldock Area
Table 3.3 – Details of Air Quality Monitoring Locations in the Cambridge Road and Nightingale Road Area of Hitchin
Table 3.4 – Results of 2010 Air Quality Monitoring in the Cambridge Road and Nightingale Road Area of Hitchin
Table 3.5 – Details of Air Quality Monitoring Locations in the Stevenage Road (Hitchin Hill roundabout) Area of Hitchin
Table 3.6 – Results of 2010 Air Quality Monitoring in the Stevenage Road (Hitchin Hill) Area of Hitchin
Table 3.7 – Details of Air Quality Monitoring Locations in the Payne's Park and Upper Tilehouse Street Area of Hitchin
Table 3.8 – Results of 2010 Air Quality Monitoring in the Payne's Park and Upper Tilehouse Street Area of Hitchin
Table 5.1 – 2009 and 2010 Data for NH66 and NH6820
Table 5.2 – Annual Average Mean Concentrations for NH45 and NH76 at Stevenage Road near the Hitchin Hill Roundabout, Hitchin
Table 5.3 – Annual Average Mean Concentrations for Diffusion Tubes near the Payne's Park / Upper Tilehouse Street (Hitchin Library) Roundabout, Hitchin24

Executive Summary

This Detailed Assessment of Air Quality has been undertaken in four areas of the District of North Hertfordshire. Three of the areas are located in Hitchin and one is located in Baldock, with Nitrogen Dioxide (NO₂) the pollutant of interest in all cases. This Detailed Assessment was required following a Defra review of NHDC's 2009 Updating and Screening Assessment report (1) and the subsequent 2010 Detailed Assessment report (2). The following are the areas of concern that are addressed by this Detailed Assessment:

- Hitchin Street and Whitehorse Street, (A505), Baldock
- Cambridge Road and Nightingale Road, (A505 / B656), Hitchin
- Hitchin Hill Roundabout and Stevenage Road, (A602), Hitchin
- Park Way and Upper Tilehouse Street, (Hitchin Library / Paynes Park Roundabout), (A505/A602), Hitchin

Hitchin Street and Whitehorse Street, (A505), Baldock

The automatic NO₂ analyser located in the area showed the annual mean average did not exceed the objective for that pollutant and that the hourly mean was not exceeded. However, the annual means from three diffusion tubes in the vicinity of the automatic analyser were in exceedence of the $40\mu g/m^3$ objective. As the diffusion tube data and automatic analyser data are not conclusive regarding an exceedence of the $40\mu g/m^3$ objective and because there is currently no relevant exposure in the immediate vicinity of the area where the higher NO₂ concentrations were detected it has been **concluded that there is no need to declare an Air Quality Management Area.**

An automatic analyser and a reduced network of diffusion tubes, more focussed on where the higher concentrations of NO_2 were detected, has been retained during 2011.

Cambridge Road and Nightingale Road, (A505 / B656), Hitchin

The two diffusion tubes sited closest to the Cambridge Road and Nightingale Road roundabout showed that the NO₂ annual objective of $40\mu g/m^3$ is close to being reached at one site and at the other site is being exceeded. Concentrations of NO₂ measured by the other four tubes in the wider area were below the annual objective. Although there is potential for relevant exposure in the vicinity of the roundabout, because of neighbouring housing, **further data collection and interpretation is considered necessary** before it is possible to conclude whether declaration of the an Air Quality Management Area is necessary.

The diffusion tubes in the area of the Cambridge Road and Nightingale Road roundabout have been retained. Additionally the diffusion tube network in the surrounding area has been refined to include monitoring on the main roads that link the three areas of Hitchin that are being considered by this report.

Hitchin Hill Roundabout and Stevenage Road, (A602), Hitchin

The three diffusion tubes and the automatic NO_2 analyser located in this area all measured annual mean average concentrations above the $40\mu g/m^3$ objective and 7 exceedences of the hourly mean objective were also measured. Air pollution

dispersion modelling was undertaken because of the data and the proximity of housing.

The modelling predicted exceedences of the annual mean NO_2 objective at a block of flats and two houses located alongside Stevenage Road and predicted concentrations of NO_2 just below the same objective at another block of flats and three other houses located along the same road.

It is proposed to declare an Air Quality Management Area that incorporates, but is not necessarily limited to, the three properties identified by the modelling, specifically:

- Dower Court, London Road, Hitchin, SG4 9EX
- 2 Stevenage Road, Hitchin, SG4 9DH
- 12 Stevenage Road, Hitchin, SG4 9DL

The automatic analyser in the area will be retained at least until the end of August 2011. The diffusion tube network in the area has been enhanced to increase the number of monitoring locations along Stevenage Road and to enable measurements to be made along the other roads joining the Hitchin Hill roundabout.

Park Way and Upper Tilehouse Street (Hitchin Library / Payne's Park Roundabout), (A505 / A602), Hitchin

The three diffusion tubes located in this area all measured annual mean average concentrations above the $40\mu g/m^3$ objective. Air pollution dispersion modelling was undertaken because of the data reported and the proximity of housing.

The modelling did not predict exceedences of the annual mean NO_2 objective but did predicted concentrations of NO_2 just below the same objective at three houses, two neighbouring the roundabout that back on to Park Way and one that fronts on to Upper Tilehouse Street.

There is no evidence of relevant exposure to NO_2 above the air quality objectives and so no need to declare an Air Quality Management Area.

The diffusion tube network in the area has been enhanced to increase the number of monitoring locations near Upper Tilehouse Street and to add a monitoring location at Park Way. In addition an automatic NO₂ analyser has been installed at the Hitchin Library monitoring site.

1 Introduction

1.1 Project Background

North Hertfordshire District Council (NHDC) is required to undertake air quality Detailed Assessments for three locations in Hitchin and one in Baldock, as requested by Defra as part of the Local Air Quality Management regime, following its review of NHDC's Updating and Screening Assessment 2009 (1) and subsequent 2010 Detailed Assessment report (2).

Part IV of the Environment Act, 1995 places a statutory duty on Local Authorities to periodically review and assess the air quality within their area. The Detailed Assessment is a requirement of the Fourth Round of Review and Assessment for Local Authorities that have identified areas where there is a risk of exceedence of an air quality objective within their Updating and Screening Assessment.

The four areas in North Hertfordshire where monitoring data exceeded the Air Quality Strategy (AQS) annual mean objective for NO₂ are:

- Hitchin Street & Whitehorse Street, (A505), Baldock.
- Cambridge Road & Nightingale Road, (A505 / B656), Hitchin.
- Hitchin Hill Roundabout & Stevenage Road, (A602), Hitchin.
- Park Way & Upper Tilehouse Street, (Hitchin Library / Paynes Park Roundabout), (A505/A602), Hitchin.

1.2 Legislative Background

The significance of existing and future pollutant levels can be assessed in relation to national air quality standards and objectives, established by the Government. The latest Air Quality Strategy (AQS) $_{(3)}$ released in July 2007 provides the over-arching strategic framework for air quality management in the UK and contains national air quality standards and objectives established by the Government to protect human health. The objectives for ten pollutants, (benzene, 1,3-butadiene, carbon monoxide, lead, nitrogen dioxide, sulphur dioxide, particulates (PM₁₀ and PM_{2.5}), polycyclic aromatic hydrocarbons and ozone), have been prescribed within the Air Quality Strategy based on The Air Quality Standards (England) Regulations 2010 (4). The objectives set out in the AQS for the protection of human health are presented in Table 1.1.

The Air Quality Standards (England) Regulations 2010 (4) bring together in one statutory instrument the Governments requirements to fulfil separate EU Daughter Directives through a single consolidated statutory instrument, which is fully aligned with the proposed new EU Air Quality Directive (CAFÉ – Clean Air For Europe). The Regulations include objectives for Arsenic, Cadmium and Nickel. These are required to be assessed by member states in response to the proposed new EU Air Quality Daughter Directive (CAFÉ), however, the AQS does not contain objectives for these pollutants and local authorities are not currently required to assess against these.

Pollutant	Objective	Concentration measured as	Date to be achieved by
Benzene	16.25 μg/m³	running annual mean	31.12.2003
5.00 μg/m ³		annual mean	31.12.2010
1,3-Butadiene	2.25 μg/m³	running annual mean	31.12.2003
Carbon monoxide	10 mg/m ³	maximum daily running 8 hour mean	31.12.2003
Lead	0.5 μg/m³	annual mean	31.12.2004
	0.25 μg/m³	annual mean	31.12.2008
Nitrogen dioxide	200 μg/m ³ , not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 μg/m ³	annual mean	31.12.2005
Particles (PM ₁₀)	50 μg/m ³ , not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
(gravimetric)	40 μg/m ³	annual mean	31.12.2004
	350 μg/m ³ , not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
Sulphur dioxide	125 μg/m ³ , not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 μg/m ³ , not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

Table 1.1 – UK Air Quality Strategy	Objectives	(England)
-------------------------------------	------------	-----------

This detailed assessment considers the nitrogen dioxide and $\ensuremath{\mathsf{PM}_{10}}$ objectives

2. Review and Assessment of Air Quality undertaken by North Hertfordshire District Council

The Local Air Quality Management (LAQM) regime was first set down in the 1997 National Air Quality Strategy (NAQS) and introduced the idea of Local Authority 'Review and Assessment'. The Government subsequently published policy and technical guidance related to the review and assessment processes in 1998. The guidance has since been reviewed and the latest guidance includes the policy guidance LAQM.PG.(09) (5) and Technical Guidance LAQM.TG (09) (6). The guidance lays down a progressive, but continuous framework for the Local Authorities to carry out their statutory duties to monitor, assess and review air quality in their area and where necessary produce action plans to meet the air quality objectives.

2.1 The First, Second and Third round of Review and Assessment.

Between 1999 and 2003, NHDC undertook its First Round of Review and Assessments of air quality. The First Round assessments concluded that all pollutant levels complied with the Air Quality Strategy (AQS) objectives and no further assessment was required.

The Second Round of Review and Assessment began with a USA in 2003. The report concluded that there was still no risk of exceeding the AQS objectives. As NHDC did not have to proceed to a Detailed Assessment, annual air quality Progress Reports were required in the following years until the Third Round of Review and Assessment. Both Progress Reports concluded that the AQS objectives were still being met and no further action was required.

The Third Round of Review and Assessment began with a USA in 2006 (published in April 2007), which provided an update to air quality issues within the district since the previous round. There were a number of changes made to the technical guidance for the Review and Assessment process since the Second Round, which were taken into account for this assessment.

Having considered each pollutant , it was concluded that the air quality objectives for benzene, 1,3-butadiene, carbon monoxide, lead and sulphur dioxide were still being met. There continues to be no requirement to undertake a Detailed Assessment for these pollutants or to consider an AQMA. However, updated monitoring data for year 2005 showed that three diffusion tubes exceeded the NO₂ annual mean AQS objective:

Two of the locations were in Hitchin:

- Hitchin Hill Roundabout & Stevenage Road, (A602), Hitchin.
- Park Way & Upper Tilehouse Street, (Hitchin Library / Paynes Park Roundabout), (A505/A602), Hitchin.

The third location was in Baldock:

Hitchin Street & Whitehorse Street, (A505), Baldock.

Although both diffusion tubes in Hitchin were considered to be kerbside sites, (therefore not relevant for public exposure), the estimated concentrations at the facades of nearby properties showed that there is still a risk of exceeding the NO₂ annual mean AQS objective at these properties.

No monitoring data was available for particulate matter (PM_{10}), but the predicted concentrations based on the Design Manual for Roads and Bridges screening showed that the daily mean PM_{10} AQS objective was likely to be exceeded at Park Way / Upper Tilehouse Street junction.

Therefore, it was recommended that Detailed Assessments be carried out for these areas in 2007.

For the two Hitchin sites the 2007 Detailed Assessment $_{(7)}$ concluded that it was not necessary to declare an AQMA, but it was recommended that additional diffusion tubes be installed at these locations to confirm the findings of the dispersion modelling.

For the Baldock site the 2007 Detailed Assessment $_{(7)}$ predicted that nitrogen dioxide (NO_2) concentrations would exceed the annual mean objective along the Whitehorse Street, Baldock, part of the A505 and recommended the declaration of an AQMA for some properties on that street, Hitchin Street and the High Street. However, the opening of the Baldock By-Pass in March 2006 provided a reason to reassess that recommendation on the basis of one of its aims being to reduce traffic volumes on Baldock's roads. For this reason no AQMA was declared and no Air Quality Action Plan was required, although additional monitoring would be undertaken.

The 2008 Progress Report ₍₈₎ compared the data from the updated diffusion tube network, as recommended by the 2007 Detailed Assessment, against the relevant Air Quality Objectives. Due to low data capture at the three areas of concern it was not possible to provide conclusive evidence regarding the exceedence of the annual mean objective for NO₂. Therefore, any decisions relating to the need for further Detailed Assessment and AQMA declarations were deferred until the Fourth Round of Review and Assessment.

2.2 The Fourth Round of Review and Assessment

The Fourth Round of Review and Assessment began with a USA in 2009 $_{(1)}$. The USA 2009 concluded that NHDC should progress to Detailed Assessments in 2010 for annual mean NO₂ at the following four locations:

- Hitchin Street & Whitehorse Street, (A505), Baldock.
- Cambridge Road & Nightingale Road, (A505 / B656), Hitchin.
- Hitchin Hill Roundabout & Stevenage Road, (A602), Hitchin.
- Park Way & Upper Tilehouse Street, (Hitchin Library / Paynes Park Roundabout), (A505/A602), Hitchin.

The conclusion of the 2010 Detailed Assessment $_{(2)}$ was that the annual mean, although close to the objective, was not being exceeded at the four locations of concern. However, the data collected during 2009 was considered by Defra to be insufficient to enable a robust enough conclusion to be reached as to the declaration, or otherwise, of an AQMA at any of those locations. Therefore, Defra required that NHDC undertake a further Detailed Assessment in 2011, with diffusion tube data collection in 2010 supplemented with two real-time NO₂ analysers and a PM₁₀ analyser.

This report is the 2011 Detailed Assessment but needs to be read in conjunction with the 2011 Progress Report (9) which was completed in April 2011 and which provides an overview of the air quality across the whole district.

2.3 Scope and Methodology of the 2011 Detailed Assessment.

The Detailed Assessment aims to identify with reasonable certainty whether or not there is likely to be an exceedence of the AQS objectives and if so, define the extent and magnitude of the exceedence.

This is to be achieved by supplementing the information that has been gathered in the earlier review and assessment work at all four sites in order to more accurately assess the impact of pollution sources on receptors local to those areas.

Additional diffusion tubes and real time analysers were positioned to collect data across the four sites and the ADMS-Roads v3.0 dispersion model was used by Air Quality Consultants (AQC) on behalf of NHDC to predict the concentrations of NO_2 at worst case receptor locations at two of the sites.

3. 2010 Air Quality Monitoring

During 2010, in order to support the Detailed Assessment, the air quality monitoring network across the four sites of interest was increased by the addition of two automatic NOx analysers, an automatic TEOM analyser to measure PM_{10} and three diffusion tubes.

All of the diffusion tubes are 50% triethanolamine (TEA) in acetone and are supplied and analysed by Environmental Services Group (ESG) at Harwell Scientific Services. Quality Assurance and Quality Control (QA/QC) information for all monitoring is in Appendix 1.

3.1 Hitchin Street and Whitehorse Street, (A505), Baldock

During 2010 the monitoring network in this area comprised ten diffusion tubes and one automatic NO_2 analyser. This represented an increase of one diffusion tube from 2009 and the presence of an automatic NO_2 analyser where previously there had been no automatic monitoring.

Figures 1 and 2 show the extent of the monitoring network in this area, with diffusion tube NH88 the new tube introduced in 2010 and NH5 identifying the location of the automatic NO_2 analyser. Table 3.1 contains the details of the monitoring network.

The NO_2 analyser is a Horiba APNA360 and was located at Hitchin Street, (A505), Baldock in September 2009 with data collection commencing from October 2009. At the time of reporting the analyser is still operating at Hitchin Street, Baldock.

Calibration visits and filter checks and changes are undertaken on a fortnightly frequency by NHDC staff. The calibration readings are reported to the Environmental Research Group (ERG) at Kings College which is retained by NHDC to verify and ratify the data generated by the analyser. The ratification process is carried out to the Herts and Beds Air Quality Network (HBAQN) Standard, which is as per AURN recommended procedures. In addition Horiba is engaged to undertake two service and on-site calibration visits in a year, one minor service and one major service.



Figure 1: Air Quality Monitoring Locations in the Whitehorse Street area of Baldock



Figure 2: Air Quality Monitoring Locations in the Hitchin Street area of Baldock (including automatic nitrogen dioxide monitor NH5)

Site Name	Site Type	OS Grid Ref.	Pollutants Monitored	In AQMA?	Relevant Exposure	Distance to kerb of nearest road	Worst- case exposure
Grosvenor Road, Baldock (NH09)	Roadside	524709, 234168	Nitrogen Dioxide	No	Y (12m)	3m	Y
High Street, Baldock (NH73)	Roadside	524486, 233856	Nitrogen Dioxide	No	Y (19m)	6m	Y
Hitchin St, nr Town Hall, Baldock (NH61)	Roadside	524428, 233882	Nitrogen Dioxide	No	Y (35m)	2m	Y
Hitchin St, nr Bus Stop, Baldock (NH70)	Roadside	524298, 233784	Nitrogen Dioxide	No	Y (1m)	3.5m	Y
Weston Rd, Baldock (NH85)	Roadside	524200, 233685	Nitrogen Dioxide	No	Y (40m)	2.5m	N
Hitchin St,(Puddleducks), Baldock (NH71)	Roadside	524375, 233844	Nitrogen Dioxide	No	Y (7m)	4m	Y
Whitehorse St (nr Rose & Crown), Baldock (NH72)	Roadside	524502, 233948	Nitrogen Dioxide	No	Y (27m)	2m	Y
Whitehorse St(nr Church) Baldock (NH75)	Kerbside	524502, 233948	Nitrogen Dioxide	No	Y (2m)	0.5m	Y
Clothall Rd, Baldock (NH59)	Roadside	524649, 234061	Nitrogen Dioxide	No	Y (11m)	3m	Y
Church St, Baldock (NH88)	Kerbside	524448, 233898	Nitrogen Dioxide	No	Y (45m)	0.5m	Y
Hitchin Street, Baldock (Town Hall) (NH5)	Roadside automatic	524456, 233889	Nitrogen Dioxide	No	Y (35m)	2m	Y

Table 3.1: Details of Air Quality Monitoring	Locations in the Baldock Area
--	-------------------------------

Table 3.2 summarises the air quality data collected from 2010. The diffusion tube data reported have been bias adjusted and where necessary annualised. The automatic analyser data have been fully ratified.

Site ID	Site Location	In AQMA?	Relevant Exposure	Data capture for 2010 monitoring period ^a %	Data capture full calendar yr 2010 ^b %	Annual Mean Concentration [°] (μg/m ³)	No. of exceed –ences of hourly mean ^c (µg/m ³)
NH09	Grosvenor Rd, Baldock	No	Y (12m)	83	83	29.4	NA
NH73	High St, Baldock	No	Y (19m)	83	83	29.1	NA
NH61	Hitchin St, nr Town Hall, Baldock	No	Y (35m)	67	67	43.6	NA
NH70	Hitchin St, nr Bus Stop, Baldock	No	Y (1m)	83	83	30.9	NA
NH85	Weston Rd Baldock	No	Y (40m)	75	75	33.9	NA
NH71	Hitchin St, (Puddleducks), Baldock	No	Y (7m)	83	83	30.7	NA
NH72	Whitehorse St (nr Rose&Crown), Baldock	No	Y (27m)	67	67	42.1	NA
NH75	Whitehorse St (nr Church) Baldock	No	Y (2m)	75	75	34.7	NA
NH59	Clothall Rd Baldock	No	Y (11m)	83	83	32.2	NA
NH88	Church St, Baldock	No	Y (45m)	75	50	50.7	NA
NH5	Hitchin Street (Town Hall) Baldock	No	Y (7m)	96	96	32	0

Table 3.2: Results of 2010 Air Quality Monitoring in the Baldock Area.

(automatic analyser)

^a i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

^b i.e. data capture for the full calendar year (e.g. if monitoring was carried out for 6 months the maximum data capture for the full calendar year would be 50%) ^c Means should be "annualised" as in Box 3.2 of TG(09), if monitoring was not carried out for the full

^c Means should be "annualised" as in Box 3.2 of TG(09), if monitoring was not carried out for the full year

^d If the period of valid data is less than 90% of a full year, include the 99.8% percentile of hourly means in brackets.

Bias (annual bias correction factor) = 0.85

Annualisation R(a) is carried out for sites with <9 months data as per Box 3.2 of TG(09) = see Appendix 1.

AQS Objective for NO₂ Annual Mean = $40\mu g/m^3$ AQS Objective for number of exceedences of the NO₂ hourly of $200\mu g/m^3 = >18$

3.2 Cambridge Road and Nightingale Road, (A505 / B656), Hitchin

During 2010 the monitoring network in this area comprised six diffusion tubes. This represented an actual increase of one diffusion tube from 2009, but because of insufficient data capture from two of the 2009 tubes, it represents an effective increase of three diffusion tubes.

Figures 3 and 4 show the extent of the monitoring network in this area, with diffusion tube NH86 the new tube introduced in 2010 and diffusion tubes NH83 and NH84 the tubes that were present in 2009 but which did not generate usable data. Table 3.3 contains the details of the monitoring network for this area.



Figure 3: Air Quality Monitoring Locations in the Cambridge Road and Nightingale Road area of Hitchin



Figure 4: Air Quality Monitoring Locations in the Cambridge Road and Nightingale Road Area (Grove Road) of Hitchin

Table 3.3: Details of Air Quality Monitoring Locations in the Cambridge Road and Nightingale Road Area of Hitchin

Site Name	Site Type	OS Grid Ref.	Pollutants Monitored	In AQMA?	Relevant Exposure	Distance to kerb of nearest road	Worst- case exposure
Nr 40 Byron Close, Hitchin (NH68)	Roadside	519587, 229835	Nitrogen Dioxide	No	Y (8m)	1.1m	Y
Meadowbank, Hitchin (NH66)	Roadside	519555, 229909	Nitrogen Dioxide	No	Y (12m)	2m	Y
Grove Rd, Hitchin (NH69)	Roadside	518821, 229993	Nitrogen Dioxide	No	Y (5m)	2m	Y
Walsworth Rd, Hitchin (NH86)	Roadside	519278, 229691	Nitrogen Dioxide	No	Y (5m)	3m	Y
Cambridge Rd (Station A), Hitchin (NH84)	Roadside	519366, 229806	Nitrogen Dioxide	No	Y (20m)	1 <i>m</i>	Y
Cambridge Rd (Station B), Hitchin (NH83)	Roadside	519328, 229752	Nitrogen Dioxide	No	Y (12m)	1.3m	Ŷ

Table 3.4 summarises the air quality data collected from 2010. The diffusion tube data reported have been bias adjusted and where necessary annualised.

AQS Objective for NO₂ Annual Mean = $40\mu g/m^3$

Table 3.4: Results of 2010 Air Quality Monitoring in the Cambridge Road and Nightingale Road Area of Hitchin

Site ID	Site Location	In AQMA?	Relevant Exposure	Data capture for 2010 monitoring period ^a %	Data capture full calendar yr 2010 ^b %	Annual Mean Concentration ^c (μg/m ³)
NH68	Nr 40 Byron Close,	No	Y (8m)	83	83	29.1
NH66	Meadowbank, Hitchin	No	Y (12m)	75	75	30.8
NH69	Grove Rd, Hitchin	No	Y (35m)	67	67	38.3
NH86	Walsworth Rd, Hitchin	No	Y (5m)	75	50	34.8
NH84	Cambridge Rd (Station A), Hitchin	No	Y (20m)	83	83	39.9
NH83	Cambridge Rd (Station B), Hitchin	No	Y (12m)	67	67	48.8

^a i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

^b i.e. data capture for the full calendar year (e.g. if monitoring was carried out for 6 months the maximum data capture for the full calendar year would be 50%)

^c Means should be "annualised" as in Box 3.2 of TG(09), if monitoring was not carried out for the full year

Bias (annual bias correction factor) = 0.85

Annualisation R(a) is carried out for sites with <9 months data as per Box 3.2 of TG(09) = see Appendix 1

3.3 Hitchin Hill Roundabout and Stevenage Road, (A602), Hitchin

During 2010 the monitoring network in this area comprised three diffusion tubes and one automatic NO_2 analyser. This represented an increase of one diffusion tube compared to 2009 and the presence of an automatic NO_2 analyser where previously there had been no automatic monitoring.

Figure 5 shows the extent of the monitoring network in this area, with diffusion tube NH87 the new tube introduced in 2010 and NH_trl identifying the location of the automatic NO₂ analyser. Table 3.5 contains the details of the monitoring network in this area.



Figure 5: Air Quality Monitoring Locations in the Stevenage Road Area of Hitchin (including the automatic NOx analyser NH_trl)

The NO₂ analyser is located at Stevenage Road, (A602), Hitchin, with TRL retained by NHDC to manage the analyser. The analyser has been collecting data since April 2010 and has been extended at least until the end of August 2011.

The analyser is an API 200A and is visited for calibration and filter checks and changes on a fortnightly basis by TRL staff. Any additional maintenance or servicing is undertaken as required during those visits. TRL verify and ratify the data generated by the analyser. The data are logged as 15 minute mean data and on a weekly basis data are examined to establish data validity. Data is ratified as per AURN recommended procedures.

Table 3.5: D	Details of Air	Quality	⁷ Monitoring	Locations i	in the	Stevenag	ge Road	(Hitchi	n Hill
roundabout	Area of Hit	chin	_					-	

Site Name	Site Type	OS Grid Ref.	Pollutants Monitored	In AQMA?	Relevant Exposure	Distance to kerb of nearest road	Worst- case exposure
Dower Crt, Stevenage Rd, Hitchin (NH76)	Roadside	518757, 228334	Nitrogen Dioxide	No	Y (10m)	2m	Y
Stevenage Rd (A), Hitchin (NH45)	Roadside	518708, 228347	Nitrogen Dioxide	No	Y (19m)	2m	Y
Stevenage Rd (B), Hitchin (NH87)	Roadside	518737, 228348	Nitrogen Dioxide	No	Y (15m)	3m	Y
Stevenage Rd, Hitchin (NH_trl)	Roadside automatic	518737, 228350	Nitrogen Dioxide	No	Y(15m)	3m	Y

Table 3.6 summarises the air quality data collected from 2010. The diffusion tube data reported have been bias adjusted and where necessary annualised. The automatic analyser data have been fully ratified.

AQS Objective for NO₂ Annual Mean = $40\mu g/m^3$ AQS Objective for number of exceedences of the NO₂ hourly of $200\mu g/m^3 = >18$

Table 3.6: Results of 2010 Air Quality Monitoring in the Stevenage Road (Hitchin Hill roundabout) Area of Hitchin

Site ID	Site Location	In AQMA?	Relevant Exposure	Data capture for 2010 monitoring period ^a %	Data capture full calendar yr 2010 ^b %	Annual Mean Concentration ^c (μg/m ³)	No. of exceed -ences of hourly mean ^d (μg/m ³)
NH76	Dower Crt, Stevenage Rd, Hitchin	No	Y (10m)	83	83	42.2	NA
NH45	Stevenage Rd (A), Hitchin	No	Y (19m)	75	75	49.1	NA
NH87	Stevenage Rd (B), Hitchin	No	Y (15m)	88	58	54.4	NA
NH_trl	Stevenage Rd, Hitchin	No	Yes	96	68	52.4	7 (168.25)

^a i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of

the year. ^b i.e. data capture for the full calendar year (e.g. if monitoring was carried out for 6 months the maximum data capture for the full calendar year would be 50%) Means should be "annualised" as in Box 3.2 of TG(09), if monitoring was not carried out for the full

year ^a If the period of valid data is less than 90% of a full year, include the 99.8% percentile of hourly means in brackets.

Bias (annual bias correction factor) = 0.85

Annualisation R(a) is carried out for sites with <9 months data as per Box 3.2 of TG(09) = see Appendix 1.

3.4 Park Way and Upper Tilehouse Street, (Hitchin Library / Paynes Park roundabout), (A505/A602), Hitchin

During 2010 the monitoring network in this area comprised three diffusion tubes and one automatic NO_2 analyser. This represented no increase in diffusion tube numbers compared to 2009 but the presence of an automatic PM_{10} analyser where previously there had been no automatic monitoring.

Figure 6 shows the extent of the monitoring network in this area, with NH6 identifying the location of the automatic PM_{10} analyser. Table 3.7 contains the details of the monitoring network in this area.

The Tapered Element Oscillating Measurement (TEOM) PM_{10} analyser is located at the Paynes Park (Hitchin Library) roundabout site (Park Way-A602, Upper Tilehouse Street-A505). The analyser has been collecting data at that location since March 2010 having been moved from its previous location at Breachwood Green. At the time of reporting the analyser is still operating at the Payne's Park roundabout site.

Calibration visits and filter checks and changes are undertaken on a fortnightly frequency by NHDC staff. In addition Supporting U is employed to undertake an annual service/maintenance visit and to respond in the event of any maintenance issues encountered during daily operation. The calibration readings are reported to ERG which is retained by NHDC to verify and ratify the data generated by the analyser. This process includes the application of the volatile correction model (VCM) and the results of the data reported have had this applied and have been demonstrated as equal to the gravimetric equivalent.

Site Name	Site Type	OS Grid Ref.	Pollutants Monitored	In AQMA?	Relevant Exposure	Distance to kerb of nearest road	Worst- case exposure
Upper Tilehouse St (crossing) Hitchin(NH77)	Roadside	518006, 229032	Nitrogen Dioxide	No	Y (5m)	1.5m	Y
Upper Tilehouse St (roundabout) Hitchin (NH82)	Roadside	518129, 229065	Nitrogen Dioxide	No	Y (7m)	1.5m	Y
Hitchin Library, Hitchin (NH63)	Roadside	518160, 229092	Nitrogen Dioxide	No	Y (30m)	3.5m	Ν
Paynes Park, Hitchin (NH6)	Roadside automatic	518161, 229092	Particulate Matter	No	Y (25m)	3m	N

Table 3.7: Details of Air Quality Monitoring Locations in the Paynes Park and Upper Tilehouse Street Area of Hitchin

Table 3.8 summarises the air quality data collected from 2010. The diffusion tube data reported have been bias adjusted and where necessary annualised. The automatic analyser data have been fully ratified.

AQS Objective for NO₂ Annual Mean = $40\mu g/m^3$ AQS Objective for number of exceedences of NO₂ hourly of $200\mu g/m^3 = \le 18$ AQS Objective for PM₁₀ Annual Mean = $40\mu g/m^3$ AQS Objective for number of exceedences of PM₁₀ 24hr daily mean of $50\mu g/m^3 = \le 35$



Figure 6: Air Quality Monitoring Locations in the Payne's Park and Upper Tilehouse Street Area of Hitchin (including the automatic PM₁₀ analyser NH6)

Table 3.8: Results of 2010 Air Quality Monitoring in the Payne's Park and Upper Tilehouse Street Area of Hitchin

Site ID	Site Location	In AQMA?	Relevant Exposure	Data capture for 2010 monitoring period ^a %	Data capture full calendar yr 2010 ^b %	Annual Mean Concentration ^c (μg/m ³)
NH77	Upper Tilehouse St (crossing) Hitchin	No	Y (5m)	75	75	48.7
NH82	Upper Tilehouse St (roundabout) Hitchin	No	Y (7m)	83	83	44.4
NH63	Hitchin Library, Hitchin	No	Y (30m)	75	75	44.0
NH4	Hitchin Library round- about (automatic: PM ₁₀)	No	Y (30m)	92	75	22

There were also no exceedences of the 50µg/m³ 24hr daily mean for PM₁₀ recorded by NH4

^a i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of

the year. ^b i.e. data capture for the full calendar year (e.g. if monitoring was carried out for 6 months the maximum data capture for the full calendar year would be 50%)

^c Means should be "annualised" as in Box 3.2 of TG(09), if monitoring was not carried out for the full year

Bias (annual bias correction factor) = 0.85

Annualisation R(a) is carried out for sites with <9 months data as per Box 3.2 of TG(09) = see Appendix 1.

4. Dispersion Modelling Methodology

Detailed dispersion modelling of NO₂ was undertaken by Air Quality Consultants (AQC) using the ADMS-Roads v3.0 model. The model is used extensively in local air guality management and has formed the basis for many Detailed Assessments. The full details of the methodology and the model inputs can be found within the Modelling Report (10), which is included as Appendix 2 to this report.

AQC was instructed by NHDC to target the air pollution dispersion modelling on two areas of Hitchin with the aim of informing a decision on whether it is necessary to declare an Air Quality Management Area (AQMA). The two areas of Hitchin are:

- Hitchin Hill Roundabout & Stevenage Road, (A602), Hitchin. (Figure 5).
- Park Way & Upper Tilehouse Street, (Hitchin Library / Payne's Park Roundabout), (A505/A602), Hitchin. (Figure 6).

Although these areas are linked by a common road, Park Way, the A602, they have been considered separately because they have slightly different urban characteristics and because the 1km stretch of Park Way between the two areas is not bordered by any sensitive receptor locations. Relevant raffic data was supplied to AQC by NHDC via Hertfordshire County Council.

5. Interpretation of Air Quality Monitoring Results

The following sections consider the results of the monitoring from each of the four areas of interest and discuss the need, or otherwise, to declare Air Quality Management Areas.

5.1 Hitchin Street and Whitehorse Street, (A505), Baldock

Air quality monitoring in this area is focussed on NO_2 with the main source of this pollutant attributable to road traffic using the A505 (recently re-classified as the B656 but referred to throughout as the A505) which runs on a south-west/north-east axis through Baldock. The road links Letchworth to Royston.

Hitchin Street (Figure 2) forms the south-west part of this road and is a narrow road for approximately a 280m stretch between the junction with Norton Road and the roundabout with Whitehorse Street and the High Street. The width from building façade to building façade on opposite sides of Hitchin Street ranges from 11m up to 14m, with the land use a mix of commercial and residential. Along Hitchin Street the properties are a mixture of two, three and four storey buildings.

Whitehorse Street (Figure 1), with the exception of a short stretch immediately after the roundabout with Hitchin Street, is a wider road and forms the north-east part of the A505 through Baldock. The road width from building façade to building façade on opposite sides of Whitehorse Street range from 12m up to 27m, with the land use a mix of two and three storey commercial and residential properties.

Table 3.2 shows that three of the ten diffusion tubes positioned in this area of Baldock returned annual means in excess of the Air Quality Strategy objective of $40\mu g/m^3$. The location of those tubes in comparison to the other seven is characterised by their proximity (15m-35m) to the Hitchin Street - Whitehorse Street roundabout.

- NH88 (Church Street) = $50.7\mu g/m^3$.
- NH61 (Hitchin Street, Town Hall) = 43.6µg/m³.
- NH72 (Whitehorse Street, nr Rose & Crown) = $42.1 \mu g/m^3$.

The range of annual means from the other seven tubes was $29.1 \mu g/m^3$ to $34.7 \mu g/m^3$.

NH88 was a new tube for 2010 and in both 2008 and 2009 data capture from NH61 was below 50% so no comparable data are available for previous years. Tube NH72 returned an annual mean of $36\mu g/m^3$ in 2009 but data collection was below 50% in 2008.

Therefore, the data would appear to indicate that the risk of public exposure to NO_2 at levels above the AQ objective is limited to within about 50m of the Hitchin Street - Whitehorse Street roundabout.

The more comprehensive and accurate NO_2 monitoring data for the area during 2010 was obtained from the automatic APNA360 analyser located in the Town Hall building on Hitchin Street (NH5). The sample inlet point is approximately 3m above street level, directly opposite tube NH88, and within approximately 5m of tube NH61 which is on the same side of the street.

The annual mean reported from NH5 for 2010 was $32\mu g/m^3$ and is considered more appropriate data on which to make a decision about whether it is necessary to declare an Air Quality Management Area (AQMA).

At present public exposure within the vicinity of NH5, NH61, NH72 and NH88 is restricted to people working and visiting retail outlets, because there are no residential properties directly fronting the road in that area. In this regard no exceedences of the hourly mean were identified by the automatic analyser. It is worthy of note, however, that the Town Hall has been vacant for at least 18 months, as has the pub opposite, which would almost certainly have residential accommodation above it, if it were occupied.

Trends in traffic data can be considered in the Baldock area because of the opening in March 2006 of the Baldock Bypass. The following trends are drawn from the One Year and After Study undertaken by Hertfordshire County Council in 2007 (11).

- London Road, (which becomes the High Street) Baldock saw northbound traffic reduced by 64% and southbound reduced by 67%.
- Royston Road, (which becomes Whitehorse Street) Baldock saw northeast bound traffic reduced by 55% and southwest by 56%.
- Hitchin Street, Baldock saw an increase equating to 200 additional vehicles during the peak hours.
- Hitchin Street Whitehorse Street High Street roundabout saw reduced queues.
- Whitehorse Street Clothall Road Station Road roundabout saw reduced queues.
- Royston Road, Whitehorse Street and High Street have seen reductions in heavy goods vehicles of up to 70%.

Longer term Annual Average Week Day Flows of traffic have been obtained from Hertfordshire County Council for a number of relevant roads and these are illustrated in Figure 7.



Figure 7: Traffic Flows Pre & Post Opening of Baldock Bypass in 2006.

NB: Data for Hitchin Street are 16hour flows not AAWD Flows.

Following consideration of the above information, it was decided that public exposure to NO₂ that exceeds the relevant AQS objectives was unlikely given the current situation. It was also decided, given the current situation, that air pollution dispersion modelling for this area of the district was not required to support this conclusion as part of this Detailed Assessment.

5.2 Cambridge Road and Nightingale Road, (A505/B656), Hitchin

Air quality monitoring in this area is focussed on NO_2 with the main source of this pollutant attributable to road traffic using the A505 and B656. The A505 (Nightingale Road) runs on a west/east axis, through the centre of Hitchin and links with the B656 (Walsworth Road) which runs on a broadly south-west/north-east axis, also through the centre of Hitchin. The two roads feed into a roundabout by Hitchin railway station and join to become the A505 (Cambridge Road) that links Hitchin to Letchworth.

Two of the diffusion tubes (NH83, NH84) in this area are positioned within 20m of the roundabout described above and a third (NH86) 60m from the roundabout (Figure 3). The annual mean concentrations recorded in 2010 are:

- NH83 (Cambridge Road-Station B) = 48.8μg/m³.
- NH84 (Cambridge Road-Station A) = $39.9\mu g/m^3$.
- NH86 (Walsworth Road) = $34.8\mu g/m^3$.

A further two tubes (NH66, NH68) were located on the nearest neighbouring roundabout (Meadowbank - Cambridge Road – St Michaels Road) some 200m away. The annual mean averages were lower than that measured at NH86 (Table 3.4). These data and that included in Table 5.1, indicate that the risk of public exposure to NO₂ at levels above the AQ objective is limited to within about 50m of the Nightingale Road – Walsworth Road roundabout.

No reliable historic data are available for NH83, NH84 or NH86. Data capture from NH66 and NH68 was adequate in 2009 and the results were consistent with those from 2010 (Table 5.1).

Site ID	Site Location	Annual Mean Concentration (μg/m ³) 2009	Annual Mean Concentration (μg/m ³) 2010
NH68	Nr 40 Byron Close,	26	29.1
NH66	Meadowbank, Hitchin	28	30.8
NH69	Grove Rd, Hitchin	33	38.3

T F /	1	D · · ·		
Table 5.1: 2009	and 2010	Data for	NH66	and NH68.

The sixth tube (NH69) that was included within the Nightingale Road and Walsworth Road area is some distance from the area and has been included in this report only to be consistent with the 2010 Detailed Assessment ₍₂₎. The tube is positioned on Grove Road, approximately 550m north west of tube NH83, which is a road through a residential area of Hitchin that is used by traffic accessing the Hitchin industrial areas at Wilbury Way and Cadwell Lane. Table 5.1 suggests that there is no evidence of public exposure to elevated NO₂ in 2009 and 2010.

At present public exposure within the vicinity of NH83 and NH84 is limited to six properties (Station Terrace) elevated some 4m above the road level and one property, Bytham Bank which is slightly above the level of the road. All of the properties are set back approximately 10m from the kerb to the east.

Railway land is immediately to the north and to the west is a vacant plot, formerly a retail outlet. To the south is an office block neighboured by some housing and to the south-west further down Walsworth Road the land-use is mixed commercial and residential, although there has been a recent trend of redevelopment of commercial sites with flats. This is a trend that is very strong throughout Hitchin and is considered likely to continue in this area of the town.

A basic "fall off in Nitrogen Dioxide Concentrations with Distance from Road" calculation (Box 2.3 of TG(09)) was undertaken on the annual mean NO₂ result from diffusion tube NH83 as part of the 2011 Progress Report ₍₉₎. It predicted that the annual mean NO₂ concentration at the nearest residential property would be 31.9μ g/m³ and so indicates no relevant exposure above the 40μ g/m³ limit. However, this is a methodology that Defra states is not robust enough for use in Detailed Assessments for the declaration of an Air Quality Management Area.

Following consideration of all of the above information, it was decided that public exposure to NO₂ that exceeds the relevant AQS objectives was unlikely given the current situation and that air pollution dispersion modelling for this area of the district was not required as part of this Detailed Assessment.

5.3 Hitchin Hill Roundabout and Stevenage Road, (A602), Hitchin

Air quality monitoring in this area is focussed on NO_2 with the main source of this pollutant attributable to road traffic using the A602. The A602 (Stevenage Road) runs on a broadly east/west axis, as it passes through the south of Hitchin, via the Hitchin Hill roundabout where the B656 converges with it as does Gosmore Road. (Figure 5). The Stevenage Road links Hitchin to Stevenage and after passing the Hitchin Hill roundabout turns north where it becomes the A505 at the Hitchin Library (Payne's Park) roundabout on the west edge of Hitchin. (Figure 6).

Three diffusion tubes (NH45, NH87 and NH76) were located in this area, within 80m of the roundabout, with NH87 co-located with an automatic NO₂ analyser (NH_trl). All of the tubes are located on Stevenage Road, with NH45, NH87 and NH_trl located on the exit side from the roundabout and NH76 on the approach side of the road. Table 3.6 shows that all three diffusion tubes recorded annual mean average concentrations above the $40\mu g/m^3$ objective as did the automatic analyser, NH_trl.

Stevenage Road has residential premises on both sides of it for the 325m leading to the Hitchin Hill roundabout so public exposure to elevated NO₂ in the area is conceivable. The majority of the properties on the south side of that stretch of Stevenage Road are two storey houses with small front gardens separated from Stevenage Road by a footpath. The exceptions are a three storey block of flats (Griffin Court) approximately 165m from the roundabout and a three storey block of flats (Dower Court) within 30m of the roundabout.

The residential properties on the north side of that stretch of Stevenage Road are a mixture of two storey houses with front gardens and blocks of three storey flats. All of the properties are set back a greater distance from the kerb of Stevenage Road than the residences located on the south side of Stevenage Road. The blocks of flats are located in a row located between 80m and 250m away from the roundabout.

Large detached houses are the predominant residence present to the south of the Hitchin Hill roundabout off London Road (B656) and Gosmore Road. The Three Moorhens Pub is located on the land adjacent to the east of the roundabout and to

the north, off Hitchin Hill (B656) and St John's Road there are two storey houses, typically semi-detached.

Table 5.2 shows the trends in air quality data from the diffusion tubes in the area since 2006 and indicates a consistent exceedence of the $40\mu g/m^3$ objective.

Table 5.2: Annual Average Mean Concentrations for NH45 and NH76 at Stevenage Road near the Hitchin Hill Roundabout, Hitchin.

Site ID	Site Location	Annual Mean Concentration (μg/m ³) 2006	Annual Mean Concentration (μg/m ³) 2007	Annual Mean Concentration (μg/m ³) 2008	Annual Mean Concentration (μg/m ³) 2009	Annual Mean Concentration (μg/m ³) 2010
NH45	Stevenage Road (A)	45	47	53	38	49.1
NH76	Dower Court	No data	No data	<50% data capture	38	42.2

Considering the proximity of the residences along the Stevenage Road, surrounding the Hitchin Hill roundabout and the consistent measurement of NO₂ concentrations in excess of the $40\mu g/m^3$ objective it was deemed necessary to carry out dispersion modelling of NO₂ in the area.

The dispersion modelling report is included as Appendix 2, which is where the detailed inputs to and outputs from the model can be reviewed. The dispersion modelling report refers to the Stevenage Road/Hitchin Hill roundabout area as Study Area B and the main findings of the modelling are summarised below:

- Diffusion tube NH76 (Dower Court) was removed from the verification process because it was located behind a signpost and very close to vegetation that was judged likely to restrict the free movement of air and have resulted in a reduced response.
- A total of 50 receptors were considered within Study Area B, all of which are residences located around the Hitchin Hill roundabout and along Stevenage Road.
- The modelling predicted exceedences of the $40\mu g/m^3$ mean annual average NO₂ objective at 3 receptors:
 - The block of flats at Dower Court (49.5 μ g/m³)
 - \circ 2 Stevenage Road (40.1µg/m³)
 - 12 Stevenage Road (40.1µg/m³)
- The modelling also predicted mean annual average NO₂ concentrations close to the NO₂ objective at the following 4 receptors:
 - 4 Stevenage Road (39.7µg/m³)
 - 4a Stevenage Road (39.3µg/m³)
 - 6 Stevenage Road (37.8µg/m³)
 - Griffin Court, Stevenage Road ($36.7\mu g/m^3$ and $36.0\mu g/m^3$)

It is acknowledged that all of the receptors are positioned on the south side of Stevenage Road and that the modelling has not been verified against monitoring results from that side of the road. However, this fact is not considered to be a significant weakness with the modelling, or invalidate the findings, for the following reason. The location of NH_trl (automatic analyser) can be considered to be returning measurements that are representative of the NO₂ concentrations on the south side of the road, if not slightly underestimating them. This is because the south side of the road is where the traffic approaches the roundabout and tends to queue compared to the north side where the traffic exits the roundabout and would do so more freely.

Following consideration of all of the above information, it is determined that public exposure to NO₂ that exceeds the annual mean average AQS objective of $40\mu g/m^3$ is likely at the properties identified by the red and pink identifiers shown in Figure 8.



Figure 8: Modelled Annual Mean Nitrogen Dioxide Concentrations in the Stevenage Road Area of Hitchin

5.4 Park Way and Upper Tilehouse Street, (Hitchin Library / Payne's Park roundabout), (A505/A602), Hitchin

Air quality monitoring in this area is focussed on NO_2 and PM_{10} with the main source of this pollutant attributable to road traffic using the A602 and the A505. The A602 (Park Way) runs on a broadly north/south axis, through the west edge of Hitchin, via the Payne's Park/Hitchin Library roundabout where the A505 converges with it. The B655 (Pirton Road) converges with and becomes the A505 at Upper Tilehouse Street, which feeds into the Payne's Park roundabout from the west. (Figure 6).

Two diffusion tubes (NH63 and NH82) were located within 5m of the roundabout, as was an automatic TEOM analyser (NH6) for the measurement of particulate matter (PM_{10}). An additional diffusion tube NH77 was positioned on Upper Tilehouse Street 100m east of where the B655 joins with the A505 and 120m west of the Payne's Park roundabout.

Table 8 shows that all three diffusion tubes recorded annual mean average concentrations above the $40\mu g/m^3$ objective. The annual mean PM₁₀ concentration of $22\mu g/m^3$ recorded by the TEOM (NH6) was considerably below the annual mean AQ objective of $40\mu g/m^3$.

Table 5.3 shows the trends in air quality data from the diffusion tubes in the area since 2006 and indicates a consistent exceedence of the $40\mu g/m^3$ objective.

Site ID	Site Location	Annual Mean Concentration (μg/m ³) 2006	Annual Mean Concentration (μg/m ³) 2007	Annual Mean Concentration (μg/m ³) 2008	Annual Mean Concentration (μg/m ³) 2009	Annual Mean Concentration (µg/m ³) 2010
NH63	Hitchin Library	35	54	48.0	<50% data capture	44.0
NH77	Upper Tilehouse St (by traffic lights)	No data	No data	<50% data capture	44.6	48.7
NH82	Upper Tilehouse St (nr roundabout)	No data	No data	No data	<50% data capture	44.4

Table 5.3: Annual Average Mean Concentrations for Diffusion Tubes Near the Payne's Park and Upper Tilehouse Street (Hitchin Library) Roundabout, Hitchin.

The Hitchin Library roundabout has commercial and community buildings located immediately to the north, off Old Park Road (A505) and Payne's Park (A505) north east.

A 148 unit residential development (132 flats and 6 houses) is nearing completion within 15m of the Hitchin Library accessed off Payne's Park (a one-way system feeding into the roundabout).

To the south of the roundabout, 41 Upper Tilehouse Street is located within 10m of the roundabout, on the west side of Park Way, but with access via Upper Tilehouse Street. 36 Tilehouse Street backs onto Park Way and is about 10m from the roundabout. Park Way (A602) itself has no addresses associated to it but residential properties back onto it from the east and west.

To the west of the roundabout there are a few town-house type residential buildings on the south of Upper Tilehouse Street and along the north side of Upper Tilehouse Street there are pairs of semi-detached houses. Therefore, public exposure to elevated NO_2 in the area to the east, south and west of the Hitchin Library roundabout is conceivable.

Considering the proximity of the residences at Payne's Park and Upper Tilehouse Street, to the Hitchin Library roundabout road network and the consistent measurement of NO₂ concentrations in excess of the $40\mu g/m^3$ objective it was deemed necessary to carry out dispersion modelling of NO₂ in the area.

The dispersion modelling report is included as Appendix 2, which is where the detailed inputs to and outputs from the model can be reviewed. The dispersion modelling report refers to the Hitchin Library/Payne's Park roundabout area as Study Area A and the main findings of the modelling are summarised below:

- A total of 36 receptors were considered within Study Area A. They included residences along Upper Tilehouse Street, Old Park Road, Park Way, the residential development on Payne's Park and properties adjacent to Park Way.
- The modelling predicted no exceedences of the $40\mu g/m^3$ mean annual average NO₂ objective within Area A:
- The modelling predicted mean annual average NO₂ concentrations close to the NO₂ objective at the following 3 receptors:
 - 41 Upper Tilehouse Street (38.2µg/m³)
 - 43 Upper Tilehouse Street ($39.9\mu g/m^3$)
 - 36 Tilehouse Street (38.3μg/m³)

Following consideration of all of the above information, it is determined that public exposure to NO₂ that exceeds the annual mean average AQS objective of $40\mu g/m^3$ has not been proven to be likely at the receptors identified in Figure 9.



Figure 9: Modelled Annual Mean Nitrogen Dioxide Concentrations in the Hitchin Payne's Park / Upper Tilehouse Street Area of Hitchin

6. Conclusions and Recommendations

Four areas of the District have been subject to a detailed assessment and the interpretation of and the conclusions drawn from the results of the monitoring are specified below. Also included are recommendations for each of the four areas.

6.1 Hitchin Street and Whitehorse Street, (A505), Baldock

The results of the NO₂ monitoring in this area confirmed that annual mean average concentrations were below the $40\mu g/m^3$ air quality objective at locations greater than 50m from the roundabout junction of Hitchin Street, Whitehorse Street and High Street.

The results of the NO₂ monitoring within 50m of the same roundabout junction were inconclusive with diffusion tubes indicating exceedences of the $40\mu g/m^3$ air quality objective and the automatic analyser reporting an annual mean average of $32\mu g/m^3$.

In conclusion, the current absence of any residential receptors in the immediate vicinity of the roads within 50m of the roundabout is sufficient to be satisfied that there is no relevant exposure to NO_2 above air quality objectives and no justification to declare an Air Quality Management Area.

The following actions are recommended on the basis of the data collected in reaching this conclusion.

- Reduction in the extent of the diffusion tube monitoring network from 10 tubes to 5 tubes, with tubes NH61, NH88, NH70, NH72 and NH59 retained. (Complete: March 2011)
- Retention of the automatic analyser for 2011.
- Assessment of the results of the 2011 monitoring in the 2012 Updated Screening and Assessment (USA) Report.

6.2 Cambridge Road and Nightingale Road, (A505/B656), Hitchin

The results of the NO₂ monitoring in the area have confirmed that annual mean average concentrations were below the $40\mu g/m^3$ air quality objective at locations greater than 50m from the roundabout junction of Cambridge Road and Nightingale Road.

The results of the NO₂ monitoring within 50m of the same roundabout junction were not completely conclusive because one tube returned an annual mean average of $39.9\mu g/m^3$ and the other $48.8\mu g/m^3$. Although, these results do indicate a potential exposure issue, for the following reasons no automatic analyser and no air dispersion modelling was undertaken.

- There was no historic air quality data available in the immediate vicinity of the roundabout so it was not possible to assess the context of the 2010 data.
- It was deemed that the Stevenage Road/Hitchin Hill and the Upper Tilehouse Street/Payne's Park areas of Hitchin were a higher priority for use of Defra funding.

In conclusion insufficient data are available to be satisfied, with the necessary confidence, that there is relevant exposure to NO_2 above the air quality objectives and as such there is no justification to declare an Air Quality Management Area.

The following actions are recommended on the basis of the data collected in reaching this conclusion.

- The 3 diffusion tubes most closely located to the roundabout (NH83, NH84 and NH86) are to be retained.
- Tubes NH66 and NH68 are to be removed. (Complete: March 2011)
- Assessment of the results of the 2011 monitoring in the 2012 Updated Screening and Assessment (USA) Report.

6.3 Hitchin Hill Roundabout and Stevenage Road, (A602), Hitchin

The results of the NO₂ monitoring in the area have confirmed that annual mean average concentrations were above the $40\mu g/m^3$ air quality objective at all of the monitoring locations on the east side of the Hitchin Hill roundabout.

The air pollution dispersion modelling undertaken in this location has predicted that the $40\mu g/m^3$ air quality objective will be exceeded at a block of flats ($49.5\mu g/m^3$) and two houses ($40.1\mu g/m^3$ and $40.1\mu g/m^3$) all with facades fronting Stevenage Road. Estimated public exposure is 26 persons, comprising 8 persons at the two houses (4 persons per property) and 18 persons at the block of flats comprising nine flats (2 persons per flat).

In conclusion sufficient data are available to be satisfied with the necessary confidence that there is relevant exposure to NO_2 above the air quality objectives at residential receptors located on the south side of Stevenage Road, Hitchin. Therefore, it is proposed to declare an Air Quality Management Area incorporating, although not necessarily limited to, the identified properties.

The following actions are recommended on the basis of the data collected in reaching this conclusion.

- Relocate diffusion tube NH76 to ensure appropriate exposure. (Complete: April 2011).
- Increase the diffusion tube network in this area by five tubes to monitor NO₂ further along (east) Stevenage Road, at the two roads feeding into the south of the roundabout and at two locations to the north of the roundabout. (Complete: March 2011).
- Maintain the automatic analyser at the Hitchin Hill roundabout until at least the end of August 2011.
- Act upon any comments made by Defra arising from its review of this report and prepare and implement a remedial Action Plan and undertake a Further Assesment as required.

6.4 Park Way and Upper Tilehouse Street, (Hitchin Library / Paynes Park roundabout), (A505/A602), Hitchin

The results of the NO₂ monitoring in the area have confirmed that annual mean average concentrations were above the $40\mu g/m^3$ air quality objective at all of the monitoring locations in the area.

The air pollution dispersion modelling undertaken in this area has predicted that the $40\mu g/m^3$ air quality objective will not be exceeded at any relevant receptors, although at 3 houses NO₂ concentrations of between $38.3\mu g/m^3$ and $39.9\mu g/m^3$ were predicted.

In conclusion there is no relevant exposure to NO₂ above air quality objectives and therefore no justification to declare an Air Quality Management Area.

The following actions are recommended on the basis of the data collected in reaching this conclusion.

- Maintain the existing diffusion tube network in the area.
- Supplement the diffusion tube network with three new tubes located in the area. (Complete: March 2011)
- Installation of an automatic NO₂ analyser at the existing roadside installation at Hitchin Library. (Complete: March 2011)
- Assessment of the results of the 2011 monitoring in the 2012 Updated Screening and Assessment (USA) Report.

7. References

- 1. Bureau Veritas (for NHDC). June 2009. LAQM Updated and Screening Assessment 2009.
- 2. NHDC. April 2010. LAQM Detailed Assessment 2010.
- 3. Defra. 2007. The United Kingdom Air Quality Strategy 2007. The Stationery Office.
- 4. Defra. 2010. The Air Quality Standards Regulations 2010 No. 1001. The Stationery Office.
- 5. Defra. 2009. LAQM Policy Guidance PG(09), Part IV of the Environment Act 1995. The Stationery Office.
- 6. Defra. 2009. LAQM Technical Guidance TG(09), Part IV of the Environment Act 1995. The Stationery Office.
- 7. NHDC. 2007. LAQM Detailed Assessment 2007.
- 8. Bureau Veritas (for NHDC). January 2009. LAQM Progress Report 2008.
- 9. NHDC. April 2011. LAQM Progress Report 2011.
- 10. Air Quality Consultants. May 2011. North Hertfordshire District Council Hitchin Detailed Assessment Dispersion Modelling.
- 11. Hertfordshire County Council (September 2007) Baldock Bypass 1 Year Before and After Study Report.

Appendix 1: Quality Assurance / Quality Control (QA/QC)

1. Automatic Monitoring

1.1 Calibration

As with most accurate measurement equipment, the APNA 360 and AP1 200A must be calibrated to determine its function. Calibration is simply the testing of equipment against a known quantity to determine whether it produces expected results. In the case of both nitrogen dioxide analysers, calibration takes the form of two routines:

a) The response of the analyser to high concentrations of nitric oxide is assessed by a "span calibration". Simply, a nitric oxide (at a known high concentration) is passed into the analyser and the result produced by it is noted.

b) The response of the analyser to sample containing no oxides of nitrogen (NO_x) is assessed by passing air which as been "scrubbed" clean of NO_x ("zero air") into the analyser and thus conduct a "zero calibration" and the analysed result noted.

The analyser should produce a result, which is close to the absolute concentration at both ends of the scale - the span range.

Span and zero calibrations are conducted regularly by the NOx analyser automatically and stored in the datalogger for periodic inspection. To ensure a consistently high quality assurance standard, the NO_x analyser is calibrated, for both zero and span, every 10 - 14 days and the result used for validation.

Due to the nature of particulate matter and the working of the TEOM, the instrument cannot be calibrated routinely. Quality of the output data is assured by regular servicing and diagnostic of the TEOM by its supplier.

1.2 Rescaling

However, for a host of reasons, analysers such as the APNA 360 do not always produce calibration results that are exactly in line with the anticipated levels during both the span and zero calibration operation. This does not mean that the data produced must be discarded because it is not accurate. "Calibration drift" is common and can be compensated by the use of a scaling calculation; any under/over reading by the analyser is distributed over the span range so that the data produced routinely is altered to reflect any inaccuracy.

The result of rescaling is to ensure that data from the analyser is accurate at the concentrations encountered routinely.

Rescaling is not conducted by North Hertfordshire District Council, but is undertaken by The Environmental Research Group (ERG) under contract at the Baldock site and by TRL at the Stevenage Road, Hitchin site. ERG is an environmental research body associated with Kings College London and is a non-profit organisation, which runs a number of large monitoring networks such as The Herts and Beds Network. TRL is an environmental consultancy that has a specialism in air quality. Rescaling takes place after every manual calibration to ensure a robust data set.

1.3 Data ratification

Whilst calibration can identify problems with the functioning of NOx analyser, it cannot be relied upon to indicate the responsiveness of the equipment on a day to day basis. Data ratification is basically the examination of the data produced by both the TEOM and NOx analysers on a daily basis and the comparison with other analysers locally to determine whether there is anything unusual about the data generated. Data ratification is conducted by (ERG), under contract for the TEOM and the analyser at Baldock and by TRL for the analyser at Stevenage Road, Hitchin, to ensure that any isolated fault with either analyser is identified as quickly as possible.

1.4 Servicing

Complex equipment such as the analysers require regular maintenance to ensure that they function reliably. Horiba Ltd is contracted to service the analyser at Baldock, TRL the analyser at Stevenage Road, Hitchin and Suporting U the TEOM on a programmed basis. However, routine inspection and maintenance of the station is a responsibility of North Hertfordshire District Council and takes place every 10 -14 days.

1.5 TEOM – Volatile Correction Model (VCM)

LAQM.TG (09) sets out the calculation required for TEOM results using the VCM to estimate gravimetric equivalent. This replaces the use of the previous 1.3 factor. Data for 2010 has been corrected using the VCM model by ERG.

2. Diffusion Tubes

2.1 Laboratory Analysis

NHDC undertakes monitoring with non-automatic methods using nitrogen dioxide (NO₂) diffusion tubes at a range of locations across the district. The diffusion tubes are 50% triethanolamine (TEA) in acetone and they are supplied and analysed by Environmental Services Group (ESG) at Harwell Scientific Services. ESG/HSS follows the procedures set out in the Harmonisation Practical Guidance. ESG/HSS also participates in the Workplace Analysis Scheme for Proficiency (WASP) and for the past five quarterly rounds received a Good rating in both old and new criteria.

2.2 Bias Adjustment

No co-location study has been undertaken in the district. Data from the diffusion tubes has been compared and bias corrected to the factors produced from the UK co-location database. The bias adjustment factor has been taken from the April 2011 version of the Diffusion Tube Bias Adjustment Factors spreadsheet available from the Defra Review and Assessment website (http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html).

According to the above database the bias adjustment factor for Harwell Scientific Services in 2010 was 0.85.

2.3 Annualisation of Nitrogen Dioxide Data (Automatic & Non-Automatic)

Where it has only been possible to carry out monitoring at a location, whether automatic or non-automatic, at a site for less than 12 months the results need to be adjusted to enable an estimate of the annual mean for that location to be calculated. It should be noted that a minimum 6 month period is necessary for this process to be valid. Where monitoring is available for less than 6 months it should not be used to draw conclusions on the air quality in an area. The annualisation process is described in Box 3.2 of TG(09) and NHDC's application of it is summarised below.

Site	Annual mean (ugm-3)	Period Mean (ugm-3)	Ratio (ugm-3)
Stevenage, Lytton Way	31	29.1	1.065292096
St Albans, Fleetville	24	22	1.090909091
E.Herts, Sawbridgeworth	31	29.1	1.065292096
	1.07		

Adjustment for Data Collected: March – December 2010

Adjustment for Data Collected: March - November 2010

	Annual mean (ugm-3)	Period Mean (ugm-3)	Ratio (ugm-3)
Stevenage, Lytton Way	31	27	1.148148148
St Albans, Fleetville	24	20.4	1.176470588
E.Herts, Sawbridgeworth	31	27.4	1.131386861
		Average of ratios - R(a)	1.15

Adjustment for Data Collected: June - December 2010

	Annual mean (ugm-3)	Period Mean (ugm-3)	Ratio (ugm-3)
Stevenage, Lytton Way	31	30	1.033333333
St Albans, Fleetville	24	22	1.090909091
E.Herts, Sawbridgeworth	31	29.2	1.061643836
	1.06		

Adjustment for Data Collected: July – December 2010

	Annual mean (ugm-3)	Period Mean (ugm-3)	Ratio (ugm-3)
Stevenage, Lytton Way	31	31.9	0.971786834
St Albans, Fleetville	24	23.2	1.034482759
E.Herts, Sawbridgeworth	31	30.4	1.019736842
	Average of ratios - R(a)	1.01	

Adjustment for Data Collected: April - December 2010

	Annual mean (ugm-3)	Period Mean (ugm-3)	Ratio (ugm-3)
Stevenage, Lytton Way	31	28.9	1.07266436
St Albans, Fleetville	24	21.5	1.11627907
E.Herts, Sawbridgeworth	31	28.7	1.080139373
	1.09		

Appendix 2: Hitchin Detailed Assessment Dispersion Modelling Report – AQC Ltd – May 2011.



North Hertfordshire District Council: Hitchin DA Modelling

May 2011



Experts in air quality management & assessment



Document Control

Client	North Hertfordshire District Council	Principal Contact	David Carr

|--|

Report Prepared By:	Laurence Caird and Penny Wilson
---------------------	---------------------------------

Document Status and Review Schedule

Report No.	Date	Status	Reviewed by
J1226/1/F1	24 th May 2011	Final Report	Prof. Duncan Laxen

This report has been prepared by Air Quality Consultants Ltd on behalf of the Client, taking into account the agreed scope of works. Unless otherwise agreed, this document and all other Intellectual Property Rights remain the property of Air Quality Consultants Ltd.

In preparing this report, Air Quality Consultants Ltd has exercised all reasonable skill and care, taking into account the objectives and the agreed scope of works. Air Quality Consultants Ltd does not accept any liability in negligence for any matters arising outside of the agreed scope of works. The Company operates a formal Quality Management System, which is certified to ISO 9001:2008.

When issued in electronic format, Air Quality Consultants Ltd does not accept any responsibility for any unauthorised changes made by others.

When printed by Air Quality Consultants Ltd, this report will be on Evolve Office, 100% Recycled paper.

Air Quality Consultants Ltd 23 Coldharbour Road, Bristol BS6 7JT Tel: 0117 974 1086 12 Airedale Road, London SW12 8SF Tel: 0208 673 4313 aqc@aqconsultants.co.uk

Registered Office: 12 St Oswalds Road, Bristol, BS6 7HT Companies House Registration No: 2814570



Contents

1	Introduction	2
2	Assessment Methodology	3
3	Model Results	6
4	References	12
A 1	Appendix 1 – Model Verification	13
A2	Appendix 2 - Adjustment of Short-Term Data to Annual Mean	16



1 Introduction

- 1.1 This report describes the methodology and results of dispersion modelling carried out to inform North Hertfordshire District Council's Detailed Assessment of air quality in Hitchin 2011.
- 1.2 The modelling has been undertaken by Air Quality Consultants Ltd on behalf of North Hertfordshire District Council who will use the results of the dispersion modelling to determine whether or not there is a need to declare and Air Quality Management Area (AQMA) in the town of Hitchin.
- 1.3 This report contains the results of dispersion modelling and the methodology used. It is designed to provide input to the Detailed Assessment to be prepared by the Council.



2 Assessment Methodology

Modelling

- 2.1 Modelling has been carried out for two seperate study areas. Study area A covers the area around the Upper Tilehouse Street/Park Way roundabout near Hitchin Library, and study area B covers the area around the Stevenage Road/Hitchin Hill roundabout. These areas have been considered separately as they differ slightly in their urban characteristics and are separated by a 1 km stretch of Park Way, which is not bordered by any sensitive receptor locations and is therefore not considered within the Detailed Assessment.
- 2.2 Annual mean nitrogen dioxide concentrations in 2010 have been predicted within the study areas using the dispersion model ADMS-Roads v3.0. The model outputs have been verified against the nitrogen dioxide monitoring described in Appendix 1. Concentrations have been predicted at 86 worst-case receptor locations within the study area, which are listed in Table1.

Receptor	Location	X	Y	
Study Area A (Upper Tilehouse/Park Way)				
41 Upper Tilehouse	Upper Tilehouse Street	518128	229057	
42 Upper Tilehouse	Upper Tilehouse Street	518108	229052	
43 Upper Tilehouse	Upper Tilehouse Street	518084	229051	
44 Upper Tilehouse	Upper Tilehouse Street	518061	229032	
66 Upper Tilehouse	Upper Tilehouse Street	518068	229060	
65 Upper Tilehouse	Upper Tilehouse Street	518057	229057	
64 Upper Tilehouse	Upper Tilehouse Street	518049	229053	
63 Upper Tilehouse	Upper Tilehouse Street	518043	229052	
62 Upper Tilehouse	Upper Tilehouse Street	518036	229048	
61 Upper Tilehouse	Upper Tilehouse Street	518030	229047	
60 Upper Tilehouse	Upper Tilehouse Street	518025	229044	
59 Upper Tilehouse	Upper Tilehouse Street	518018	229043	
58 Upper Tilehouse	Upper Tilehouse Street	518013	229040	
12 Nuns Close	Old Park Road	518156	229197	
72 Old Park Rd	Old Park Road	518149	229211	
71 Old Park Rd	Old Park Road	518139	229235	
70 Old Park Rd	Old Park Road	518137	229240	
69 Old Park Rd	Old Park Road	518135	229245	
68 Old PArk Rd	Old Park Road	518134	229250	
67 Old Park Rd	Old Park Road	518132	229255	
66 Old Park Rd	Old Park Road	518130	229261	
65 Old Park Rd	Old Park Road	518128	229265	
64 Old Park Rd	Old Park Road	518126	229271	
63 Old Park Rd	Old Park Road	518124	229275	
29 Old Park Rd	Old Park Road	518112	229264	
30 Old Park Rd	Old Park Road	518110	229268	
31 Old Park Rd	Old Park Road	518109	229271	
32 Old Park Rd	Old Park Road	518107	229275	
33 Old Park Rd	Old Park Road	518106	229280	

Table 1: Modelled Receptor Locations



Receptor	Location	X	Y
36 Tilehouse St	Park Way	518158	229042
3 Park Way	Park Way	518139	228997
26-29 Robert Tebbutt	Park Way	518115	228978
32-37 Park Close	Park Way	518126	228919
23-31 Park Close	Park Way	518125	228899
New Flats Payne Pk	Payne Park	518183	229082
New Flats Payne Pk	Payne Park	518210	229103
S	tudy Area B (Stevenage Roa	d/Hitchin Hill)	
Rubicon	Park Way	518552	228325
Endeer Lodge	Park Way	518566	228322
Oakwood	Gosmore Rd	518578	228289
1 Gosmore Rd	Gosmore Rd	518631	228289
5 Gosmore Rd	Gosmore Rd	518597	228266
7 Gosmore Rd	Gosmore Rd	518581	228249
17 Gosmore Rd	Gosmore Rd	518575	228222
2 London Rd	London Rd	518709	228272
4 London Rd	London Rd	518719	228257
1a London Rd	London Rd	518726	228233
6 London Rd	London Rd	518735	228224
8 London Rd	London Rd	518748	228214
10 London Rd	London Rd	518761	228197
12 London Rd	London Rd	518762	228183
6-9 Elmo Ct	London Rd	518765	228238
1-3 Elmo Ct	London Rd	518755	228256
Montserrat	London Rd	518732	228283
1-9 Dower Ct	Stevenage Rd	518714	228332
2 Stevenage Rd	Stevenage Rd	518769	228326
4 Stevenage Rd	Stevenage Rd	518775	228325
4a Stevenage Rd	Stevenage Rd	518779	228323
6 Stevenage Rd	Stevenage Rd	518798	228318
12-14 Stevenage Rd	Stevenage Rd	518828	228312
Griffin Court	Stevenage Rd	518845	228306
Griffin Court	Stevenage Rd	518864	228301
19-24 Priory Ct	Stevenage Rd	518857	228332
13-18 Priory Ct	Stevenage Rd	518840	228336
7-21 Priory Ct	Stevenage Rd	518824	228339
1-6 Priory Ct	Stevenage Rd	518808	228343
29-39 Westbrook Ct	Stevenage Rd	518784	228348
17-27 Westbrook Ct	Stevenage Rd	518770	228352
12 Stevenage Rd	Stevenage Rd	510747	220309
11 Stevenage Pd	Stevenage Rd	510742	220000
	Stevenage Rd	510720	220304
7 Stovopago Pd	Stevenage Rd	519707	220370
5 Stevenage Rd	Stevenage Rd	518700	220370
3 Stevenage Rd	Stevenage Rd	518693	228383
1 Stevenage Rd	Stevenage Rd	518684	228389
Grevfriars Lodge	Hitchin Hill	518648	228406
8 Hitchin Hill	Hitchin Hill	518644	228427
7 Hitchin Hill	Hitchin Hill	518640	228432
6 Hitchin Hill	Hitchin Hill	518636	228436
5 Hitchin Hill	Hitchin Hill	518632	228440
4 Hitchin Hill	Hitchin Hill	518624	228451



Receptor	Location	X	Y
Millford House	Hitchin Hill	518566	228448
10 Park St	Hitchin Hill	518488	228628
8 Park St	Hitchin Hill	518489	228639
6 Park St	Hitchin Hill	518489	228653
2 Park St	Hitchin Hill	518493	228674

2.3 The modelling was carried out using meteorological data for 2010 taken from the meteorological monitoring station at Stansted Airport, approximately 35 km east of Hitchin. This site is considered representative of the Hitchin Detailed Assessment study areas. The wind rose for 2010 from the Stansted Airport meteorological station is displayed in Figure 1 and shows the strong influence of south westerly and north westerly winds during 2010.



Figure 1: 2010 Wind Rose for Stansted Airport Meteorological Station



2.4 Background nitrogen dioxide concentrations were obtained from national background pollutant maps published by Defra (Defra 2011) for each of the study areas. The background nitrogen dioxide concentrations used in the modelling are displayed in Table 2.

Study Area	x	Y	2010 NO ₂ (μg/m ³)
Study Area A (Upper Tilehouse/Park Way)	518500	229500	15.9
Study Area B (Stevenage Road/Hitchin Hill)	518500	228500	13.6
Objectives	-	-	40

Uncertainty

- 2.5 There is an element of uncertainty in all measured and modelled data. All values presented in this report are the best possible estimates, but uncertainties in the results might cause over-predictions or under-predictions. All of the measurements presented have an intrinsic margin of error. Defra (Defra 2009) suggest that this is of the order of plus or minus 20% for diffusion tube data and plus or minus 10% for automatic measurements, provided that appropriate QA/QC procedures are applied. The model results rely on measured and modelled traffic data which has its own inherent uncertainty. There will be additional uncertainties introduced because the modelling has simplified real-world processes into a series of algorithms. For example: it has been assumed the emissions per vehicle conform to the factors published in Defra's Emission Factor Toolkit (EFT V4.2.2); it has been assumed that wind conditions measured at Stansted Airport during 2010 occurred within the study areas, and it has been assumed that the subsequent dispersion of emitted pollutants will conform to a Gaussian distribution over flat terrain. An important step in the assessment is verifying the dispersion model against the measured data. By comparing the model results with measurements, data have been corrected for any under- or over-prediction (see Appendix 3 for details of the model verification).
- 2.6 The limitations to the assessment should be borne in mind when considering the results set out in the following sections. While the model should give an overall accurate picture, i.e. one without bias, there will be uncertainties for individual locations.

3 Model Results

3.1 Predicted annual mean concentrations of nitrogen dioxide at each modelled receptor location are set out in Table 3. Predicted nitrogen dioxide concentrations are also displayed graphically in Figure 2 and Figure 3.



Receptor	x	Y	2010 (μg/m ³)
Study Area A	A (Upper Tilehouse	e/Park Way)	
41 Upper Tilehouse	518128	229057	38.2
42 Upper Tilehouse	518108	229052	33.1
43 Upper Tilehouse	518084	229051	39.9
44 Upper Tilehouse	518061	229032	29.5
66 Upper Tilehouse	518068	229060	31.8
65 Upper Tilehouse	518057	229057	30.0
64 Upper Tilehouse	518049	229053	30.4
63 Upper Tilehouse	518043	229052	29.6
62 Upper Tilehouse	518036	229048	30.4
61 Upper Tilehouse	518030	229047	29.8
60 Upper Tilehouse	518025	229044	30.6
59 Upper Tilehouse	518018	229043	30.0
58 Upper Tilehouse	518013	229040	30.8
12 Nuns Close	518156	229197	31.2
72 Old Park Rd	518149	229211	32.3
71 Old Park Rd	518139	229235	32.4
70 Old Park Rd	518137	229240	32.4
69 Old Park Rd	518135	229245	32.5
68 Old Park Rd	518134	229250	32.0
67 Old Park Rd	518132	229255	32.0
66 Old Park Rd	518130	229261	31.9
65 Old Park Rd	518128	229265	32.2
64 Old Park Rd	518126	229271	32.2
63 Old Park Rd	518124	229275	32.1
29 Old Park Rd	518112	229264	31.3
30 Old Park Rd	518110	229268	31.3
31 Old Park Rd	518109	229271	31.1
32 Old Park Rd	518107	229275	31.0
33 Old Park Rd	518106	229280	31.2
36 Tilehouse St	518158	229042	38.3
3 Park Way	518139	228997	31.6
26-29 Robert Tebbutt	518115	228978	30.0
32-37 Park Close	518126	228919	28.6
23-31 Park Close	518125	228899	28.2
New Flats Payne Pk	518183	229082	34.1
New Flats Payne Pk	518210	229103	32.5

Table 3: Modelled Annual Mean Nitrogen Dioxide Concentrations



Receptor	X	Y	2010 (μg/m³)
Study Area B	(Stevenage Road	Hitchin Hill)	
Rubicon	518552	228325	28.9
Endeer Lodge	518566	228322	28.6
Oakwood	518578	228289	23.5
1 Gosmore Rd	518631	228289	33.0
5 Gosmore Rd	518597	228266	22.4
7 Gosmore Rd	518581	228249	21.0
17 Gosmore Rd	518575	228222	20.1
2 London Rd	518709	228272	29.1
4 London Rd	518719	228257	25.6
1a London Rd	518726	228233	22.5
6 London Rd	518735	228224	22.2
8 London Rd	518748	228214	22.9
10 London Rd	518761	228197	23.1
12 London Rd	518762	228183	21.1
6-9 Elmo Ct	518765	228238	24.5
1-3 Elmo Ct	518755	228256	25.1
Montserrat	518732	228283	28.4
1-9 Dower Ct	518714	228332	49.5
2 Stevenage Rd	518769	228326	40.1
4 Stevenage Rd	518775	228325	39.7
4a Stevenage Rd	518779	228323	39.3
6 Stevenage Rd	518798	228318	37.8
12-14 Stevenage Rd	518828	228312	40.1
Griffin Court	518845	228306	36.7
Griffin Court	518864	228301	36.0
19-24 Priory Ct	518857	228332	28.5
13-18 Priory Ct	518840	228336	28.8
7-21 Priory Ct	518824	228339	29.4
1-6 Priory Ct	518808	228343	29.8
29-39 Westbrook Ct	518784	228348	30.8
17-27 Westbrook Ct	518770	228352	31.0
15 Stevenage Rd	518747	228359	30.9
13 Stevenage Rd	518742	228363	29.3
11 Stevenage Rd	518728	228364	30.5
9 Stevenage Rd	518718	228370	28.3
7 Stevenage Rd	518707	228370	28.9
5 Stevenage Rd	518700	228378	27.0



Receptor	x	Y	2010 (μg/m ³)
3 Stevenage Rd	518693	228383	26.4
1 Stevenage Rd	518684	228389	26.3
Greyfriars Lodge	518648	228406	34.2
8 Hitchin Hill	518644	228427	25.3
7 Hitchin Hill	518640	228432	24.8
6 Hitchin Hill	518636	228436	24.4
5 Hitchin Hill	518632	228440	24.0
4 Hitchin Hill	518624	228451	23.0
Millford House	518566	228448	26.2
10 Park St	518488	228628	31.7
8 Park St	518489	228639	32.1
6 Park St	518489	228653	32.9
2 Park St	518493	228674	32.8
Objec	40		





Figure 2 Modelled Annual Mean Nitrogen Dioxide Concentrations in Study Area A







3.2 There are three predicted exceedences of the annual mean nitrogen dioxide objective at Dower Court, 2 Stevenage Road and 12 Stevenage Road (Study Area B). In addition there are a number of receptors where annual mean nitrogen dioxide concentrations are predicted to be just below the objective, between 36 and 40 μg/m³. These are located at 41 and 43 Upper Tilehouse Street, 36 Tilehouse Street (Study Area A), and 4, 4a, 6, 16-18 and 20 Stevenage Road (Study Area B). Annual mean nitrogen dioxide concentrations are predicted to have been well below the objective in 2010 at all other modelled receptor locations.



4 **References**

AQEG, 2007. Trends in Primary Nitrogen Dioxide in the UK.

Defra, 2009. Review & Assessment: Technical Guidance LAQM.TG(09).

Defra, 2011. Defra Air Quality Website at: <u>http://www.defra.gov.uk/environment/quality/air/airquality/</u>



A1 Appendix 1 – Model Verification

A1.1 Most nitrogen dioxide (NO₂) is produced in the atmosphere by reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emissions of nitrogen oxides (NOx = NO + NO₂). The model has been run to predict the annual mean NOx concentrations during 2010 at three monitoring sites at the Upper Tilehouse Street/Park Way/Old Park Lane Roundabout (Study Area A), and two monitoring sites at Stevenage Road (Studay Area B). A summary of the monitoring sites included in the verification are displayed in Table A1.1.

Site ID	Location	Site Type	X	Y	2010 Annual Mean NO ₂		
Study Area A – Upper Tileshouse/Park Way							
NH82	Upper Tilehouse Street	Diffusion Tube	518129	229065	40.7		
NH77	Upper Tilehouse Street	Diffusion Tube	518006	229032	44.7		
NH63	Hitchin Library Roundabout	Diffusion Tube	518160	229092	40.4		
Study Area B – Stevenage Road/Hitchin Hill							
NH87	Stevenage Road	Automatic	518737	228348	52.7		
NH45	Stevenage Road	Diffusion Tube	518708	228347	45.2		

Table A1.1: Summary of Nitrogen Dioxide Monitoring Sites Used for Model Verification

- A1.2 One local diffusion tube site was omitted from the verification process; NH76 on Stevenage Road. As this tube was mounted behind a signpost during 2010 and results suggest that it was underreading nitrogen dioxide concentrations when compared to NH87 and NH45, it has therefore been discarded from the verification process as a precaution.
- A1.3 Two verification factors have been calculated and used in this assessment. The factor calculated using sites NH82, NH77 and NH63 is deemed representative of the study area A, around the Park Way/Upper Tilehouse Street roundabout. It has been applied to all receptors located adjacent to Upper Tilehouse Street, Park Way, Payne Park and Old Park Road. The factor calculated using sites NH87 and NH45 is deemed representative of the study area B, around the Stevenage Road/Hitchin Hill roundabout. This has been applied to all receptors located adjacent to Stevenage Road, London Road, Gosmore Road, and Hitchin Hill.
- A1.4 The model output of road-NOx (i.e. the component of total NOx coming from road traffic) has been compared with the 'measured' road-NOx for each monitoring site. Measured road-NOx was calculated from the measured NO₂ concentrations and the predicted background NO₂



concentration using the recently updated NOx from NO₂ calculator available on the Defra LAQM Support website (Defra, 2011).

- A1.5 A primary adjustment factor for each study area was determined as the slope of the best fit line between the 'measured' road contributions and the model derived road contributions, forced through zero (Figure A1.1). The calculated factor was then applied to the modelled road-NOx concentration for each monitoring site to provide adjusted modelled road-NOx concentrations. The total nitrogen dioxide concentrations were then determined by combining the adjusted modelled road-NOx concentrations with the predicted background NO₂ concentration within the recently updated NOx from NO₂ calculator available on the Defra Air Quality website (Defra, 2011). A secondary adjustment factor was finally calculated as the slope of the best fit line applied to the adjusted data and forced through zero (Figure A1.2).
- A1.6 The primary and secondary adjustment factors calculated using the nitrogen dioxide monitoring sites in each study area are displayed in Table A1.2.

Study Area	Location	Primary Adjustment	Secondary Adjustment	
Α	Upper Tilehouse Street/Park Way	2.725	1.001	
В	B Stevenage Road/Hitchin Hill		1.000	

Table A1.2: Primary and Secondary Adjustment Factors

- A1.7 Primary adjustment factors have been applied to the modelled road-NOx contributions at each of the receptors in the assessment. The secondary adjustment factors are very minor and have not been applied to the model results.
- A1.8 Figure A1.3 compares final adjusted modelled total NO₂ at each of the monitoring sites, to measured total NO₂, and shows that all results fall well within +/- 10% of a 1:1 relationship.





Figure A2.1: Comparison of Measured Road NOx to Unadjusted Modelled Road NOx Concentrations



Figure A2.2: Comparison of Measured Total NO₂ to Primary Adjusted Modelled Total NO₂ Concentrations



Figure A2.3: Comparison of Measured Total NO₂ to Final Adjusted Modelled Total NO₂ Concentrations, Showing 10% Confidence Limit in 1:1 Relationship



A2 Appendix 2 - Adjustment of Short-Term Data to Annual Mean

- A2.1 The Stevenage Road automatic monitoring site (NH87) was commissioned on the 14th April 2010 and so the data from this site do not represent a full calendar year for 2010. Therefore, in accordance with the guidance set out in Box 3.2 of LAQM.TG(09) (Defra 2009), the data have been adjusted to an annual mean, based on the ratio of concentrations during the short-term monitoring period (14 April 31 December 10) to those over the 2010 calendar year at four background sites operated as part of the Automatic Urban and Rural Network (AURN) where long-term data are available.
- A2.2 The annual mean nitrogen dioxide concentrations and the period means for each of the four monitoring sites from which adjustment factors have been calculated are presented in Table A2.1, along with the Overall Factor.

Period Mean Concentration (µg/m ³)	Coventry Memorial Park	Leamington Spa	Northampton	Oxford St Ebbes	Overall Factor
2010	21.2	28.3	20.6	22.4	-
14 April – 31 December 2010	19.1	24.3	19.3	20.4	-
Adjustment Factor	1.11	1.17	1.07	1.10	1.11

 Table A2.1: Data used to Adjust Short-term Monitoring Data at Stevenage Road to 2010

 Annual Mean