UPDATING AND SCREENING ASSESSMENT

Executive Summary

The first round of review and assessment of air quality in the borough of Broxbourne ended in August 2003 with the declaration of three air quality management areas in residential areas close to the M25. One is for particulates (PM10) and nitrogen dioxide. The other two are for nitrogen dioxide alone. An action plan, detailing plans to improve the air quality in these areas and the rest of the Borough is currently being consulted upon.

This updating and screening assessment (USA) marks the start of the second round of review and assessment of air quality. It considers seven key pollutants and assesses the likelihood that air quality objectives will be met by their target dates. Where there has been significant change since the first round, authorities must proceed to a Detailed Assessment. This could be with a few to declaring, amending or revoking an air quality management area for that pollutant.

The USA for the borough of Broxbourne has identified no pollutants that need to be considered further in a Detailed Assessment. In order to continue to check whether there has been any changes in respect of the seven pollutants, a Progress Report must be completed by April 2004, which will include provisional monitoring data for the previous calendar year.

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Consultation

The Council is seeking your views on its Updating and Screening Assessment of air quality. Please send comments by 19th January 2003 to:

Director of Environmental Services
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You can also email comments to: envhealth@broxbourne.gov.uk

Copies of this report are available at the Council Offices, One Stop Shops and online at www.broxbourne.gov.uk/airquality. All comments will be considered and the final report amended appropriately.

List of Consultees

Secretary of State (DEFRA)
Highways Agency
Environment Agency
Hertfordshire County Council: Transport Department and Environment Unit
Mayor of London
London Borough of Enfield
Welwyn Hatfield Council
East Hertfordshire District Council
Epping Forest District Council
Lee Valley Park Authority

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Introduction

It is important to tackle poor air quality because of its link with human health. Furthermore, some policies that improve air quality can reduce greenhouse gas emissions and help to tackle climate change.

Local authorities have an obligation under Part IV of the Environment Act 1995 to review and assess the air quality in their area "from time to time". The Air Quality Regulations 2000 and the Air Quality (England) (Amendment) Regulations 2002 prescribe air quality objectives for seven key pollutants to be achieved by a certain date. (Appendix) Local air quality management helps the UK meet its objectives under the EU Air Quality Framework and Daughter Directives.

The first round of review and assessment of air quality in Broxbourne culminated in the declaration of three Air Quality Management Areas (AQMAs). These had to be declared where the air quality objectives were not likely to be achieved. One AQMA is for nitrogen dioxide and particulates. The other two are for nitrogen dioxide alone. The cause of poor air quality in these areas is traffic on the M25 motorway. The Council has produced an Action Plan, stating how it intends to work towards improving the Borough's air quality. The action plan and stage four report of the first round are currently being consulted upon.

This report marks the beginning of the second round of review and assessment of air quality. There are two parts to this round. The first is the Updating and Screening Assessment (USA). This aims to identify any significant changes since the first round for all seven pollutants. Where there are such changes, the Council must proceed to a Detailed Assessment to decide whether an AQMA should be declared, amended or revoked for that pollutant. Defra has produced policy guidance LAQM. PG(03) and technical guidance LAQM. TG(03) to aid local authorities.

About Broxbourne

The Borough of Broxbourne covers 20 square miles in Southeast Hertfordshire and has a population of about 83 000 people. Broxbourne's towns of Waltham Cross, Cheshunt, Broxbourne and Hoddesdon lie along the Lea Valley's main roads and railways. The green belt protects the surrounding countryside. To the west the Borough extends to include Goffs Oak. The eastern boundary is marked by Lee Valley Park, and the southern boundary by the M25. Broxbourne is urbanised with industrial and commercial activity yet still retains much of its rural atmosphere. It is a favoured place to live for those working in London.

Information used to support this report

DMRB screening model

The Design Manual for Roads and Bridges (DMRB) screening model was used to screen road traffic sources. It was downloaded from the following internet address: www.airquality.co.uk/archive/laqm/tool.php. This required the input of information including:

- Background concentrations

Estimated background concentrations of the pollutants in the relevant future years were mapped by grid square using Excel. The pivot tables created are in Appendix B. The raw data is available on the internet at the following address: www.airquality.co.uk/archive/laqm/tools.php. Double counting has been avoided as advised in the guidance. As Broxbourne is small geographically, data from surrounding authorities has also been used.

- Traffic Data

Manual and automatic traffic count data were obtained from Hertfordshire County Council and the national atmospheric emissions inventory database. Free running car speeds were provided at the locations where the traffic counts were taken. At locations where measured speed data was not available, the speed limit on the road of concern was used. At junctions, a speed of 20kph was used as specified by the guidance. The fraction of HGVs was also provided.

- Traffic Growth

The projected volume of traffic in future years is required. These were calculated using the government's TEMPRO factors.

Maps and distances of receptors from roads

Individual buildings or groups of buildings (receptors) were identified from electronic OS Landline maps of the area. Distances of these receptors from the road were determined from the maps.

Air Quality Monitoring

The council has one continuous monitor in the Borough that measures particulates (PM10) and nitrogen dioxide. It also has eight diffusion tubes that

measure nitrogen dioxide. Further information about monitoring is given in the relevant chapters.

Industrial Sources

The Borough of Broxbourne has two Part A processes, regulated by the Environment Agency and 29 Part B processes regulated by the council.

1.0 Review and assessment of carbon monoxide

1.1 Introduction

The objective for carbon monoxide is 10mg/m^3 measured as a daily running 8-hour mean, to be achieved by the end of 2003.

Carbon Monoxide (CO) is a colourless, odourless poisonous gas produced by incomplete, or inefficient, combustion of fuel including 'cold' or badly tuned engines. (Kings College London website, 2003). It is estimated that road transport is responsible for almost 90% of all carbon monoxide emissions in the UK. Badly ventilated domestic fuel appliances (gas, oil or solid fuel) can cause high levels indoors, as can smoking. The gas effects the transport of oxygen around the body by the blood. At very high levels, this can lead to a significant reduction in the supply of oxygen to the heart, particularly in people suffering from heart disease.

As traffic is a major source of carbon monoxide, ambient concentrations will generally be highest close to busy roads. Monitoring data suggests that annual average CO levels have been decreasing over the last few years. This is probably due to improved vehicle engine efficiency and the introduction of catalytic converters. The effect of technological improvements has been cancelled out to some degree by an increase in traffic levels.

1.2 First round review and assessment conclusions

The first round of review and assessment aimed to identify potentially significant sources of carbon monoxide in the Borough. No significant industrial processes were identified either within the Borough or within sufficient distance to impact upon the Borough. Similarly, it was found that even at the busiest road junctions, exceedences of the objective would be unlikely. Since this study, no new industrial processes have been built. In addition, whilst traffic has increased within the Borough, there are no roads which could provide a significant source of carbon monoxide according to the guidance.

1.3 Screening checklist for carbon monoxide

A. Monitoring data

Local data

Broxbourne Borough Council is part of the Hertfordshire and Bedfordshire Air Quality Monitoring Network (http://www.seiph.umds.ac.uk/hbnet.htm). Within this network three councils monitor for carbon monoxide; Luton, St Albans and Hertsmere. In each of the years 2000, 2001 and 2002, there was no exceedence of the eight-hour mean objective (10mg/m^3, 8.6ppm). The maximum concentration in 2000 was no more than 7.6mg/m^3 and in 2001 and 2002, 3.8mg/m^3, measured as a rolling 8-hour mean. The Environmental Research Group (ERG) at Kings College, London, ratifies this data. As yet, data from June to December 2002 has not been ratified. These results indicate that it is unlikely that carbon monoxide levels exceeded 3.48mg/m^3 in any part of the Borough of Broxbourne in the years 2000 to 2002. The guidance (LAQM.TG (02)) states that authorities should assume that the measured concentration in the year of monitoring is applicable to 2003. Local monitoring data therefore suggests that there will be no exceedences of the objective in 2003.

National data

There were no measured exceedences of the objective at any site in the national network for the period 1999-2001.

Background concentrations

AEA Technology Environment has done modelling to estimate background carbon monoxide concentrations in 2001 at a 1km by 1km grid resolution countrywide. In Broxbourne, the highest pollutant concentration in these squares is 0.394mg/m^3 as an annual mean. The concentration for the area as a whole was 0.3 to 0.4mg/m^3. It is therefore assumed that the objective of 10mg/m^3 as a running eight-hour mean was not exceeded in 2001. This data is available on the Local Air Quality Management website (http://www.airquality.co.uk/archive/laqm/tools.php?tool=background).

There are NO current maximum daily 8-hour concentrations greater than 10mg/m^3

B Very busy roads or junctions in built-up areas

Monitoring data suggests that if the carbon monoxide objective is likely to be exceeded it will be at locations close to very busy roads or junctions in built-up areas. The junction of the M25 and the A10 is classified as a busy junction according to the guidance LAQM.TG(02). However, there is no relevant exposure within 10m of the kerb.

There is no need to proceed to a detailed assessment on the basis of road traffic

Conclusion: It is not necessary to do a detailed assessment for carbon monoxide

2.0 Review and assessment of benzene

2.1 Introduction

The objective for benzene is 16.25µg/m^3 as an annual mean by December 2003 and 5µg/m^3 as an annual mean by December 2010.

Benzene is a hydrocarbon. The term 'hydrocarbons' is often used when discussing traffic pollution. This refers to a group of chemicals of which volatile organic compounds (VOCs) are a subgroup. VOCs comprise a range of chemical compounds, all of which contribute, to varying degrees, to the formation of ground level ozone. In addition, certain VOCs are known to cause cancer. Current attention is focused on 1,3 butadiene, primarily from vehicle exhausts, and benzene. Benzene in the atmosphere either comes from the combustion or evaporation of petrol. Levels are therefore highest close to busy roads or in the vicinity of petrol filling stations.

Long-term exposure to high levels of benzene and 1,3 butadiene has been linked to leukaemia and cancer. Health experts have concluded that the health risks from these pollutants become progressively smaller as cumulative exposure is reduced. Health standards are therefore set based on annual mean levels.

As only very small concentrations of hydrocarbons are typically found in the atmosphere, the monitoring process is very complicated and expensive. As monitoring has only been carried out for the last few years, it is impossible to identify any upward or downward trend in levels. Annual results suggest that the annual mean levels are well below European health standards.

2.2 First round review and assessment conclusions

The first round of review and assessment aimed to identify potentially significant sources of benzene in the Borough. In the first stage report, two Part A Industrial sources were identified as potentially significant: du Vergier Limited and Merck, Sharpe and Dohme Limited. Both are chemical industries involved in the manufacture and use of organic chemicals. The Environment Agency uses a Pollution Inventory to list substances released to atmosphere by Part A Processes (Environment Agency website, 2003). In the years 1998 to 2001, there were no notifiable releases of volatile organic compounds reported to the Agency. This indicates that any releases of benzene were below the reporting threshold and therefore considered as insignificant. On this basis, no further investigation was deemed necessary in the First Round of review and assessment. Since the first round, the licence for du Vergier has been revoked.

For the second round of review and assessment, the guidance (LAQM.TG (02)) states that only those authorities with relevant locations in the vicinity of major

industrial processes that store, handle or emit benzene, will need to progress beyond the updating and screening assessment for the 2003 objective. However the objective for 2010 is more stringent and there may be local exceedences in some authorities.

2.3 Screening checklist for benzene

A Monitoring data

Local data

None of the Councils in the Hertfordshire and Bedfordshire Air Quality group monitor for benzene. Neither do any of the nearer London Boroughs.

National data

Of the national network monitoring sites, London Marylebone Road has the highest concentrations. This site is the only one where benzene levels remain above the 2010 objectives. It emphasises the importance of road traffic as a contributing source. However, there are no similar roads in the Borough. Therefore it is assumed that no roads will contribute significantly to benzene concentrations and both the 2003 and 2010 objectives will be achieved.

Background concentrations

AEA Technology Environment has done modelling to estimate background benzene concentrations in 2001 at a 1km by 1km grid resolution countrywide. In Broxbourne, the highest pollutant concentration in these squares is 0.622µg/m^3 as an annual mean. The concentration for the area as a whole was 0.5 to 0.8µg/m^3. The predictions for 2003 and 2010 are also 0.5 to 0.8µg/m^3. This data is available on the Local Air Quality Management website (http://www.airquality.co.uk/archive/laqm/tools.php?tool=background).

It is therefore assumed that the objectives of 16.25µg/m^3 as a running annual mean in 2003 and 5µ/m^3 as an annual mean in 2010 will not be exceeded.

B Very busy roads or junctions in built-up areas

Data suggests that if the benzene objective is likely to be exceeded it will be at locations close to very busy roads, in areas with high background concentrations. The junction of the M25 and the A10 is classified as a busy junction according to the guidance LAQM.TG(02). However, there is no relevant exposure within 10m of the kerb.

There is no need to proceed to a detailed assessment on the basis of road traffic

C Industrial sources

The process judged to be the most significant for the emission of benzene is petroleum. Also important are carbonisation, cement and lime manufacture, gasification, tar and bitumen processes. In addition, emissions from combustion, manufacture and use of organic chemicals, processes involving halogens, recovery, di-isocyanate, storage of chemicals and acid processes are likely to emit benzene, but these emissions are small compared to those from other sources.

Part A processes

Broxbourne has two Part A processes – Merck, Sharpe and Dome, who manufacture organic chemicals, and Scottish Power gas turbine power station.

Each year, the authorised processes collate data about annual releases of pollutants to air and other media. This information is available at the Local Environment Agency office on the Public Register. A photocopied version is available at the Local Authority Offices. In 2001, the latest year for complete data, Merck, Sharpe and Dome did not release any benzene into the air. This was also the case for 2000. The Scottish Power station did not release benzene into the air in these years either.

Part B processes

Using the checklist in Annex 2 of the Technical Guidance it has been concluded that there are no Part B processes within the boundaries of the District, which are likely to release significant quantities of benzene.

D. Petrol stations

Studies have shown that petrol stations will emit sufficient benzene to put the 2010 objective at risk of being exceeded, especially if combined with higher levels from nearby busy roads. The Borough of Broxbourne has sixteen petrol stations.

There are two petrol stations likely to have an annual throughput of more than 2000m^3 of petrol (2 million litres per annum) that are nearby to a busy road (30000 vehicles per day). These are described as being likely to exceed the 2010 objective by the guidance LAQM.TG (02).

- Tesco Brookfield Centre
- PNG Waltham Cross

However there is no relevant exposure within 10m of the pumps.

There is no need to proceed to a detailed assessment for benzene for petrol stations

E. Major fuel storage depots

There are no major petrol storage depots in the Borough of Broxbourne. There is no need to proceed to a detailed assessment for benzene for this source

Conclusion: It is not necessary to do a detailed assessment for benzene.

3.0 Review and assessment of 1,3-Butadiene

The objective for 1,3-Butadiene is 2.25µg/m^3 as a running annual mean to be achieved by December 2003.

3.1 First round review and assessment conclusions

The first round of review and assessment guidance stated that only specific major industrial processes needed to be considered as potential sources of 1,3-butadiene. No Part B processes were identified as being relevant. The two relevant Part A processes identified were Merck, Sharpe and Dohme Ltd and du Vergier Ltd. Further study showed that the Environment Agency's Pollution Inventory stated that there was no release of 1,3-butadiene from either process. Therefore further investigation was considered unnecessary.

Since the first round of review and assessment, the licence for du Vergier has been revoked.

3.2 Screening checklist for 1,3-butadiene

A Monitoring data

Local data

None of the Councils in the Hertfordshire and Bedfordshire Air Quality group monitor for 1,3-butadiene. Neither do any of the nearer London Boroughs.

National data

Of the national network monitoring sites, London Marylebone Road has the highest concentrations (0.72µg/m3 measured as a running annual mean). Even this site is below the 2003 objective of 2.25µg/m^3. There are no similar roads in the Borough.

Background concentrations

AEA Technology Environment has done modelling to estimate background 1,3-butadiene concentrations in 2001 at a 1km by 1km grid resolution countrywide. In Broxbourne, the highest pollutant concentration in these squares is 0.301µg/m^3 as an annual mean. The estimated concentration for the area as a whole was 0.3 to 0.4µg/m^3 in 2001. The prediction for 2003 is 0.2-0.3µg/m^3. It is therefore assumed that the objectives of 2.25µg/m^3 as a running annual mean by the end of 2003 will not be exceeded. This data is available on the Local Air

Quality Management website (http://www.airquality.co.uk/archive/laqm/tools.php?tool=background).

B. New industrial sources

Since the first round of review and assessment, there are no new industrial sources that could give rise to exceedence of the objective for 1,3-butadiene. The most significant Part A Process for the release of 1,3-butadiene is petrochemicals. Of the Part B processes, rubber is the most important. Neither of these is applicable to Broxbourne.

C. Industrial sources with substantially increased emissions

The first round of review and assessment identified two Part A processes as potentially significant: du Vergier Ltd and Merck, Sharpe and Dohme Ltd. These were later discounted. The license for du Vergier Ltd has since been revoked. Merck, Sharpe and Dohme Ltd still does not release any 1,3-butadiene.

Conclusion: It will not be necessary to proceed to the Detailed Assessment for 1,3-butadiene

4.0 Review and assessment of lead

The objective for lead is 0.5µg/m^3 as an annual mean to be achieved by December 2004 and 0.25µg/m^3 as an annual mean to be achieved by December 2008.

4.1 Introduction

The main source of lead in the atmosphere has historically been from combustion of petrol. Since the phasing out of leaded petrol across Europe, lead levels have fallen sharply and lead monitoring is no longer considered necessary in most parts of the country.

4.2 First round review and assessment conclusions

The first round of review and assessment found that the sources likely to cause an exceedence of the objective for lead were specific industrial processes. There were no relevant processes identified in the Borough.

4.3 Screening checklist for lead

A. Monitoring data outside an AQMA

Local Data

None of the Councils in the Hertfordshire and Bedfordshire monitoring network monitor for lead. Neither do any of the nearest London Boroughs. There is no local data for lead.

National Data

Concentrations at all background and kerbside national Network Monitoring sites are well below the objectives for 2004 and 2008. One exceedence of the 2004 objective was recorded in 2000 in the vicinity of a non-ferrous metals productions facility. National monitoring data generally indicates no exceedences of the 2004 or 2008 objectives.

B. New industrial sources

There are no new industrial sources within or near to the local authority area that could give rise to exceedences of the objective. Neither are there relevant sources outside the Borough that could impact on it.

C. Industrial sources with substantially increased emissions

There were no industrial sources identified as potentially significant in the last round. As such there are no relevant sources with substantially increased emissions.

Conclusion: There is no need to proceed to a Detailed Assessment for Lead

5.0 Review and Assessment of Nitrogen Dioxide

The objective for nitrogen dioxide is 40µg/m^3 as an annual mean and 200µg/m^3 as a one-hour mean (not to be exceeded more than 18 times a year), to be achieved by December 2005.

5.1 Introduction

Nitrogen dioxide ('NO_2') is one of a group of gases called nitrogen oxides ('NO_x') formed in the combustion of fossil fuels. The majority of nitrogen oxides emitted from a vehicle exhaust are in the form of nitric oxide ('NO'), which is not considered harmful to health. However, this gas can react with other gases present both in the exhaust and the atmosphere, to form nitrogen dioxide. Nitrogen dioxide is harmful to health and is also an important component in the formation of ozone.

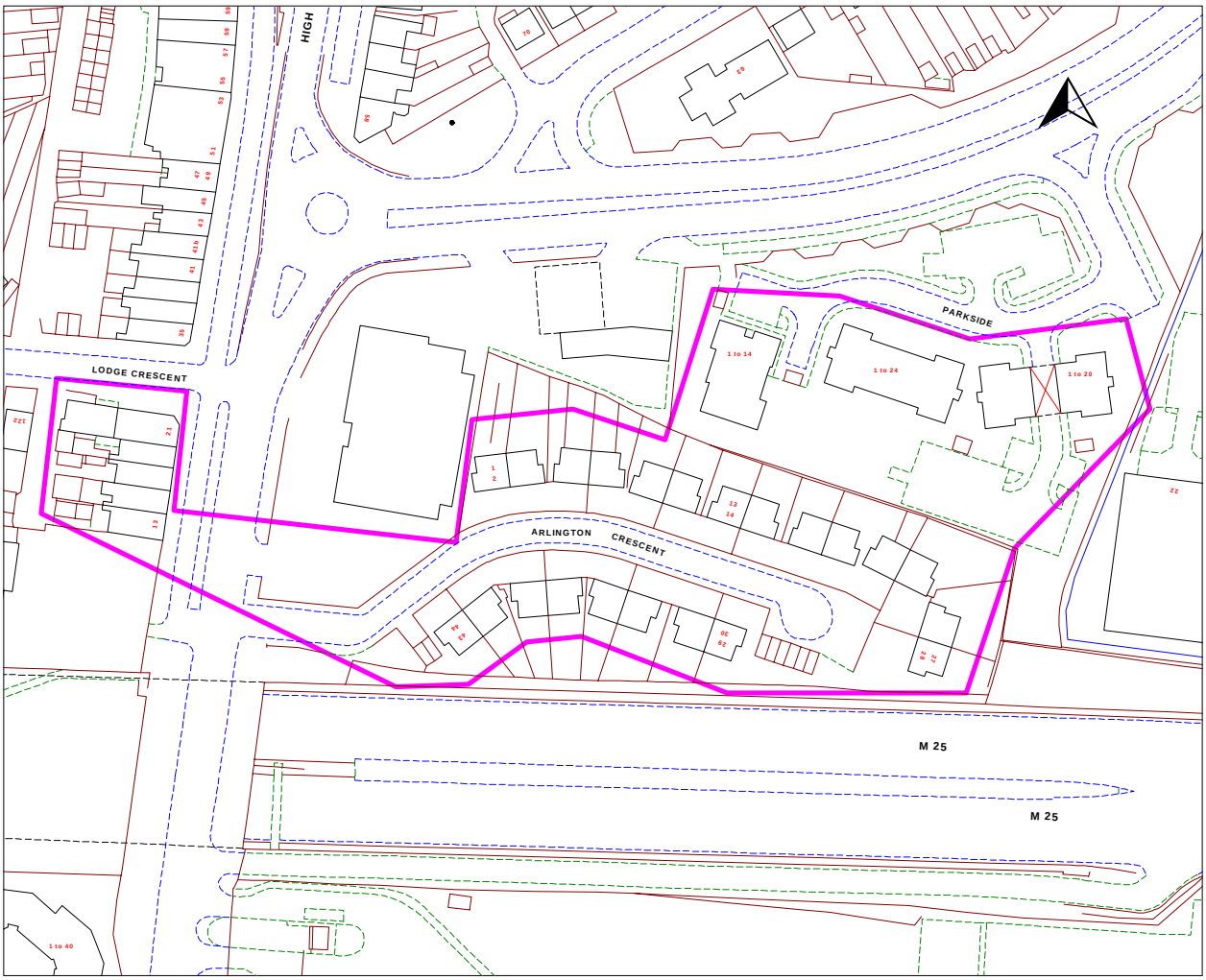
Road transport is estimated to be responsible for about 50% of total emissions of nitrogen oxides (NO_x), power stations contributing another 25%. Because of the domination of traffic sources, mean nitrogen dioxide levels are highest close to busy roads and in large urban areas. At very high levels, nitrogen dioxide gas irritates and inflames the airways of the lungs. This irritation causes a worsening of symptoms of those with lung or respiratory diseases.

A shift from coal to gas-turbine power stations and the increased use of catalytic converters during the 1990s should have lead to a decrease in nitrogen dioxide levels over recent years. It is possible that increases in traffic volume have cancelled out these improvements. The situation is further complicated by complex reactions with other pollutants. A long-term trend is not clearly identifiable from monitoring data.

5.2 First round review and assessment conclusions

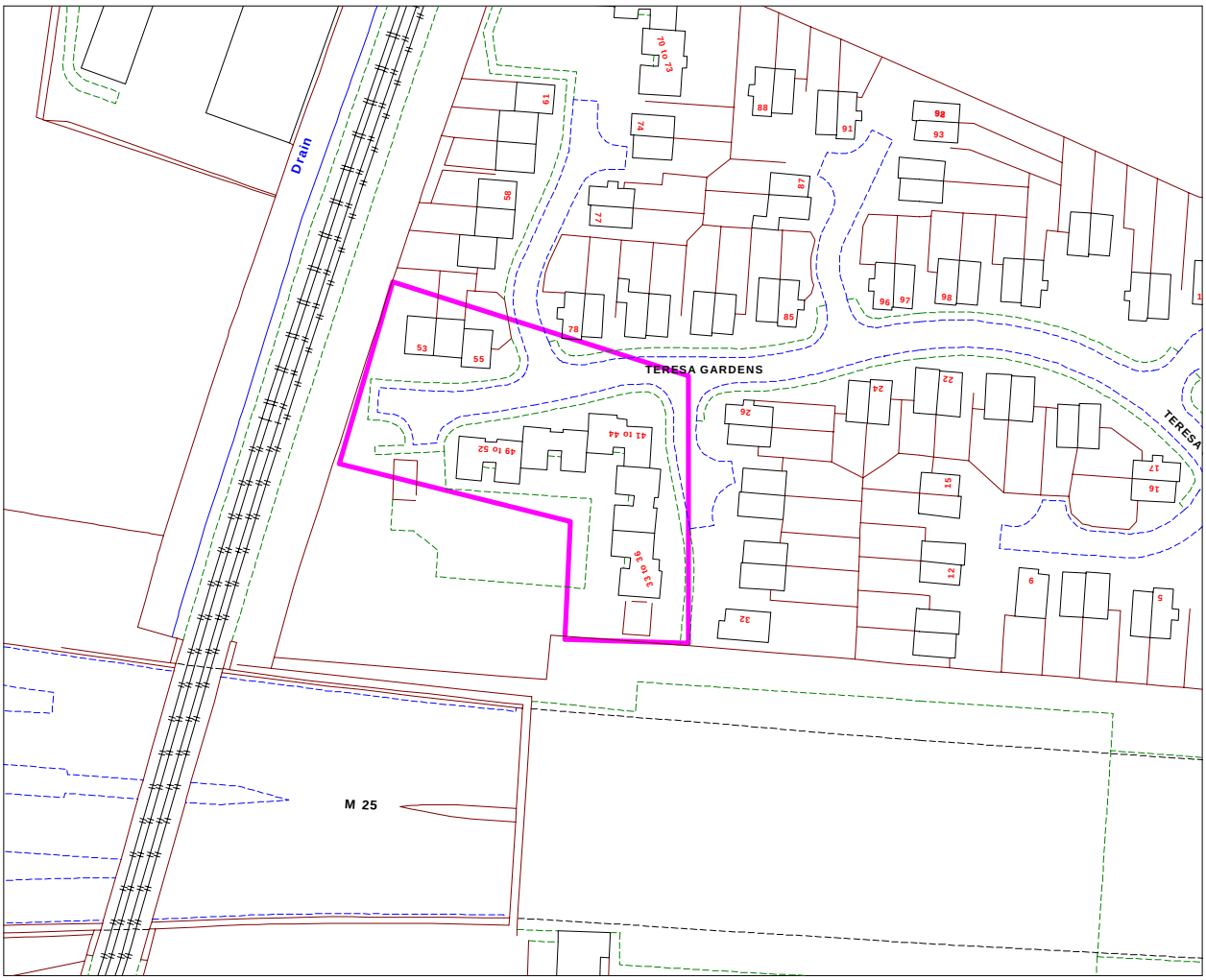
The Stage 3 Review and Assessment concluded in the declaration of an Air Quality Management Area (AQMA) for nitrogen dioxide and particulates in a residential street adjacent to the M25. A further review and assessment of air quality in and around the AQMA finished by extending this AQMA and declaring two new AQMAs for nitrogen dioxide. The main cause of elevated levels of nitrogen dioxide in all AQMAs was found to be traffic on the M25. This study was completed in June 2003 and has been approved by defra. AQMA declaration orders will shortly be sent to defra. A consultation process for the Stage Four report and Air Quality Action Plan will finish by the end of November 2003.

Air Quality Management Area 1 (nitrogen dioxide and particulates)



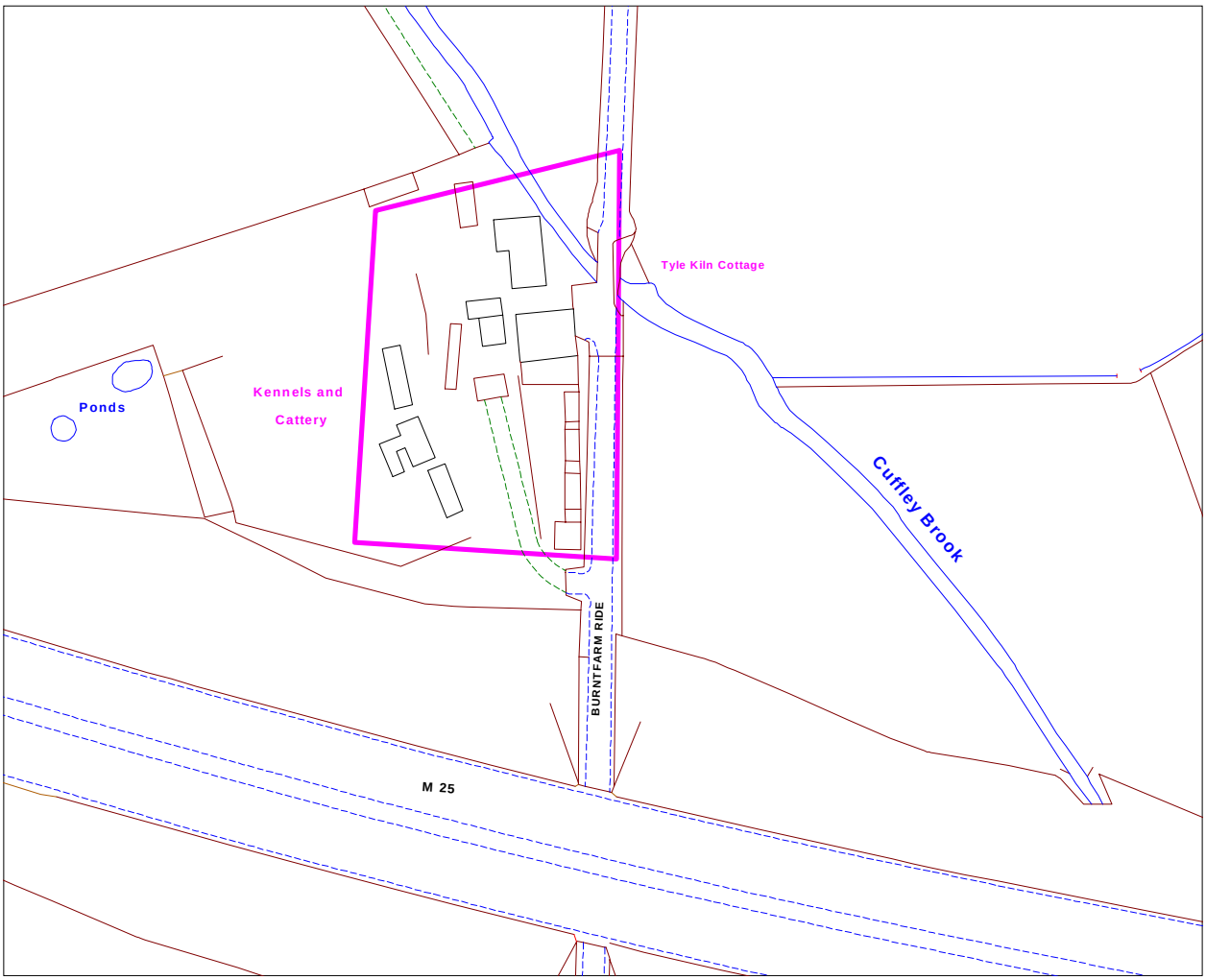
Scale 1cm = 17.5m

Air Quality Management Area 2 (nitrogen dioxide)



Scale 1cm = 15 m

Air Quality Management Area 3 (nitrogen dioxide)



Scale 1cm = 17.5 m

5.3 Screening checklist for nitrogen dioxide

A. Monitoring data outside an AQMA

Local Data

The Borough of Broxbourne Council has one automatic monitoring station, situated within AQMA 1. It also has eight diffusion tubes located over the Borough, three of which are in existing AQMAs.

Diffusion Tube Data

Broxbourne is a member of the UK nitrogen dioxide tube network. The diffusion tubes are prepared with 50% TEA in acetone and are analysed by GRADKO. Data is ratified by netcen. There are no tubes co-located with an automatic analyser in the Borough, so a default bias adjustment factor of 1.36 was used according to Laxen et al (2000). The correction factors used to estimate annual average NO_2 concentrations in 2005 are those provided in the guidance LAQM.TG(03).

The last fully ratified dataset is for 2001. Data for 2002 has been provided for information only as it is unratified and therefore only provisional. Data from 2003 has not been included, as there have been lots of problems with the tubes coming back from the lab marked as “dirty inside”. In particular, many tubes contain spiders and spiders webs at the end of the exposure period.

The following table shows diffusion tube results in Broxbourne since stage 3 of the first round of review and assessment, corrected for analyst bias, and predictions for 2005. Figures shown in bold denote an exceedence of the annual average nitrogen dioxide objective. Five locations are predicted to exceed the annual average nitrogen dioxide objective using 2001 data. Three are in existing AQMAs. The other two are discussed below.

Diffusion tube measurements in Broxbourne, corrected for analyst bias and predictions for 2005.

Tube/location	Site type	Easting	Northing	Annual average (2001)	Annual average corrected for bias (2001)	Prediction for 2005 (based on 2001 results	Annual average (2002) (unratified)	Annual average corrected for bias (2002)	Prediction for 2005 (based on 2002 results)
Cheshunt 1N (Turners Hill, Cheshunt)	K	535930	102200	36	49	**44**	30	41	38
Cheshunt 5N (A10, Cheshunt)	K	535300	102350	40	54	**49**	39	53	**49**
Hoddesdon 2N (Winford Drive, Broxbourne)	B	536950	106430	18	24	22	19	26	24
Hoddesdon 3N (Molesworth, Hoddesdon)	B	537330	110500	20	27	24	22	30	28
Waltham X 1N (in AQMA 1) (Arlington Crescent)	K	536210	100020	47	64	**57**	54	73	**67**
Waltham X 3N (in AQMA 2) (Teresa Gardens, WX)	B	535390	100120	34	46	**41**	31	42	39
Waltham X 4N (in AQMA 1) (High Street, WX)	K	536060	100100	36	49	**44**	38	52	**48**
Wormley 1N (High Street, Wormley)	I	536530	105580	31	42	38	34	46	**42**

Cheshunt 5N, A10

In stage 3 of the first round of Review and Assessment, marginal exceedence was identified along the A10. This was further assessed in the recent stage four report. Initially the DMRB screening model was used. Three receptors were chosen based on their proximity to the roadside. At one location the annual average nitrogen dioxide concentration was predicted to be 39.8μg/m^3, very close to the objective for 2005. As a consequence, this receptor was fed into a further model, the LADS urban model. It found that with BAU, houses along the A10 were unlikely (probability greater than 5% and less than 20% to exceed the objective. Thus an AQMA was not considered necessary. This approach and conclusion has been accepted by defra. There is no new data since the completion of this report.

A detailed assessment will not be required for this site.

Cheshunt 1N, Turners Hill

The concentration of nitrogen dioxide is predicted to be 44μg/m^3 in this location in 2005.

This nitrogen dioxide tube is at the building façade of a bank. The bank is not a relevant receptor. However, the bank is located next to a pavement of a busy street, so the 1-hour mean objective should apply. The Review and Assessment helpdesk states that it is acceptable to assess the hourly nitrogen dioxide objective against a 60μg/m^3 criterion.

A detailed assessment will not be required for this site.

Wormley 1N, High Street Wormley

This location is not predicted to exceed the objective using the 2001 data. However it is predicted to exceed if the provisional 2002 data are used. It has been in place since January 2001 and as such no pollution trend can be established. Data in 2003, also provisional, has only 58% data capture. It is proposed to re-site this tube as it is within 10m of two extractor vents. Furthermore, a new traffic management scheme has been put into place nearby, with two pedestrian crossings affecting the flow of traffic.

The guidance states that decisions must not be based on provisional data alone. Modelling at stage three showed no predicted exceedences in the area. The new dmrb model was used as part of the USA to assess this location. This gave a predicted concentration of 28.2μ g/m^3. This was compared against more

potentially polluting locations such as congested roads using dmrb. No exceedences were predicted. The guidance states that if there are no exceedences of the objectives at the most polluted locations, then it can be reasonably concluded that there should be no exceedences elsewhere.

It is not necessary to proceed to a detailed assessment for this location

Background concentrations

Estimated background concentrations of nitrogen dioxide in 2005 have been mapped as 1km by 1km squares. This information was used to plug into the dmrb traffic model. It can be found in Appendix B. The highest modelled background concentration in 2005 is 30μg/m^3. Concentrations increase in a southerly direction.

B. Monitoring data within an AQMA

The stage four report for Broxbourne was completed in June 2003. There is therefore no new data that would amend the AQMAs.

C. Narrow congested streets with residential properties close to the kerb

1. These locations were not assessed during the first round of review and assessment.
2. Locations were identified using local knowledge. These locations have an average speed of less than 50kph, roads less than 10m wide, and traffic flows of greater than 10 000 vehicles per day.
3. DMRB screening model was then used to assess these locations. Information used to input into the model can be found in Appendix C.

The following table shows the predicted nitrogen dioxide concentrations in 2005 using this model.

Receptor Number	Name	NO_2 concentration (μg/m^3) at receptor
1	69 High Road Wormley	28
2	45 Turners Hill	31
3	17 Turners Hill	33

4	167 Crossbrook Street	33
5	83 Crossbrook Street	33
6	69 Crossbrook Street	33
7	28 Crossbrook Street	34
8	272 High Street Waltham Cross	33

None of the predicted annual means in 2005 are greater than 40µg/m^3. As these locations were considered the most likely to exceed the objective, *it is not necessary to proceed to a detailed assessment for this type of location*.

D. Junctions

There was no specific assessment of junctions during the first round of review and assessment.

1. The following junctions in the borough are defined as busy with relevant exposure within 10m of the kerb:

- Dinant Link Road/Amwell St roundabout
- Winston Churchill Way/Monarchs Way/High St WX roundabout
- A121 Monarchs Way/Eleanor Cross Road/A105 Monarchs Way roundabout

2. The DMRB screening model was used to assess these locations. Information used to input into the model can be found in Appendix C.

The following table shows the predicted nitrogen dioxide concentrations in 2005 using this model.

Receptor Number	Name	NO_2 concentration (µg/m^3) at receptor
9	50 Amwell Street	35
10	67 Queens Road	37
11	40 Eleanor Cross Road	38
12	1a Abbey Road	39
13	207 High Street Waltham Cross	38
14	224 High Street Waltham Cross	38

None of the predicted annual means in 2005 are greater than 40µg/m^3. As these locations were considered the most likely to exceed the objective, *it is not necessary to proceed to a detailed assessment for this type of location.*

E. Busy Streets where people may spend one hour or more close to traffic

1. These locations were not assessed during the first round of review and assessment.
2. The following areas were identified using local knowledge:

Hoddesdon

The majority of Hoddesdon town centre is pedestrianised. Two points close to town centre shops outside the pedestrian area were modelled using DMRB:

- Area next to 9 Amwell Street
- Area next to 49 High Street Hoddesdon

Cheshunt Town Centre

Three representative locations were chosen for DMRB:

- Area next to 45 Turners Hill
- Area next to 81 Turners Hill
- Area next to 22 Newnham Parade, College Road

Waltham Cross Town Centre

The majority of Waltham Cross town centre is pedestrianised. A non-pedestrianised representative location close to this area was modelled using DMRB:

- Area next to 77 High Street Waltham Cross

The following table shows the predicted nitrogen dioxide concentrations in 2005 using this model.

Receptor Number	Name	NO_2 concentration (µg/m^3) at receptor

2	45 Turners Hill	31
15	9 Amwell St	26
16	49 High St Hoddesdon	25
17	81 Turners Hill	33
18	22 Newnham Parade, College Rd	32
19	77 High St Waltham Cross	32

None of the predicted annual means in 2005 are greater than 40μg/m^3.

As these locations were considered the most likely to exceed the objective, *it is not necessary to proceed to a detailed assessment for this type of location.*

F. Roads with high flow of buses and/or HGVs

1. These locations were not assessed during the first round of review and assessment.
2. The traffic data supplied by Hertfordshire County Council, and that supplied by the naei show no roads with greater than 25% of buses/HGVs.
3. There are no bus only streets in the Borough.
4. The following streets have been identified using local knowledge as having high percentages of HGVs/buses:

- Normandy Way, Hoddesdon. However this road only leads to one depot, so the flow will be less than 2500 vehicles per day.

There is no need to proceed to a detailed assessment for these locations.

G. New Roads constructed or proposed since first round of review and assessment

There are no new roads either constructed or proposed since the first round of review and assessment.

There is no need to proceed to a detailed assessment for these locations.

H. Roads close to the objective during the first round of review and assessment

The stage four report for Broxbourne was completed after the changes took place to the emission factors. The report used the new factors.

There is no need to proceed to a detailed assessment for these locations.

I. Roads with significantly changed traffic flows

There are no roads with more than 10000 vehicles per day that have experienced large increases in traffic.

J. Bus Stations

Waltham Cross Bus Station

The flow of buses at Waltham Cross Bus Station is over one thousand per day. However, there is no relevant exposure. The bus station is a local one and it is not expected that the public would be present at a kerbside location for one hour. Furthermore there is a dedicated waiting room for passengers to wait inside.

The DMRB screening model was used to predict the annual mean in 2005 in the vicinity of the bus station. It was found to be 41μg/m^3. A FAQ on the Review and Assessment website states that for hourly exposure, it is sufficient to assess the result against a 60μg/m^3 annual mean exposure.

There is no need to proceed to a detailed assessment for bus stations.

K. New industrial sources

There are no new industrial sources likely to make a significant contribution to nitrogen dioxide concentrations.

There is no need to proceed to a detailed assessment for new industrial sources.

L. Industrial sources with substantially increased emissions

Three part A industrial sources were initially considered as potentially significant in the first round of review and assessment. The three relevant Part A processes identified were Powergen, Merck, Sharpe and Dohme Ltd and du Vergier Ltd.

No part B processes were identified. All of these sources were screened out at Stage Two of the first round.

The license for du Vergier Ltd has since been revoked. Emissions from the remaining two processes have not increased substantially according to guidance LAQM.TG(03).

There is no need to proceed to a detailed assessment for these locations.

M. Aircraft

There are no airports in or close to the Borough of Broxbourne.

There is no need to proceed to a detailed assessment for aircraft.

Conclusion: There is no need to proceed to a detailed assessment for nitrogen dioxide

6.0 Review and assessment of sulphur dioxide

6.1 Introduction

The objective for sulphur dioxide is 266µg/m^3 as fifteen minute mean (not to be exceeded more than 35 times a year), to be achieved by December 2005. There is also a one-hour mean objective of 350µg/m^3 not to be exceeded more than 24 times a year, and a 24-hour objective of 125µg/m^3 not to be exceeded more than 3 times a year, both to be achieved by December 2004.

Sulphur dioxide concentrations are highest in the vicinity of large industrial combustion processes. It is produced when a material or fuel containing sulphur is burned. Levels in this country have dropped considerably over recent years due to cleaner power stations and a decreased use of coal. Short-term exposure to high levels of sulphur dioxide may cause coughing, tightening of the chest and irritation of the lungs.

6.2 First round review and assessment conclusions

The first round of review and assessment did not identify any processes that would be likely to lead to exceedences of the air quality objective for sulphur dioxide. It found that the risk of the objective being exceeded was negligible.

6.3 Screening checklist for sulphur dioxide

A. Monitoring data outside an AQMA

Local Data

Four authorities in the Hertfordshire and Bedfordshire air quality group monitor for sulphur dioxide. These are Watford, St Albans, Luton and Bedford. Of these, only the Bedford rural site records significant levels of sulphur dioxide. These are due to a brickworks. There are short episodes each year but not enough to exceed objective. Broxbourne does not have any similar processes in its area.

The London Borough of Enfield is adjacent to Broxbourne on its southern boundary. It monitors for sulphur dioxide and there is no exceedence of the objective.

National Data

National data records show that the only places likely to exceed the objective are where a large proportion of people uses coal as a domestic fuel. This is not relevant for Broxbourne.

There are no exceedences of the objectives. There is no need to proceed to a detailed assessment on the basis of monitoring data.

Background concentrations

The highest modelled annual mean concentration for sulphur dioxide in 2001 is 10.7μg/m^3 as an annual mean. The guidance states that for the purpose of review and assessment, authorities may assume that background annual mean sulphur dioxide concentrations at the end of 2004 and 2005 will be 75%of the 2001 values. Therefore, according to modelling data it is highly unlikely that the objectives will be exceeded.

B. Monitoring data within an AQMA

There is not an AQMA for sulphur dioxide in the Borough. This section does not apply.

C. New Industrial Sources

There are no new industrial sources for sulphur dioxide within the Borough of Broxbourne.

D. Industrial sources with substantially increased emissions

There are no existing industrial sources for sulphur dioxide with substantially increased emissions.

E. Areas of domestic coal burning

There are no areas in the borough where significant coal burning takes place. A private sector housing condition survey carried out in May 2003 showed that for the Borough as a whole, the primary source of domestic heating is gas central heating (over 95% of dwellings). It is considered unlikely that there are any areas with 100 houses burning solid fuel in any 500m by 500m area in the Borough. Using professional judgement, there are no coal burning odours in the area on a winter's evening.

F. Small boilers> 5MW

The first round of review and assessment found no boilers of over 5MW. Nothing has changed since this assessment.

G. Shipping

There are no shipping movements in the Borough.

H. Railway Locomotives

There are no locations where diesel locomotives are regularly stationary for periods of fifteen minutes or more.

Conclusion: There is no need to proceed to a detailed assessment for sulphur dioxide

7.0 Review and assessment of particulates, PM_{10}

7.1 Introduction

The objective for fine particles (PM_{10}) is 40µg/m^3 as an annual mean and 50µg/m^3 as a 24 hour mean (not to be exceeded more than 35 times a year), to be achieved by December 2004.

Particulate matter in the atmosphere can be from natural sources, such as sand or sea spray, and man made sources, such as construction dust or soot. . As particulate matter is composed of such a large range of chemicals and materials from a variety of sources, the control of pollution levels is very difficult. The amount of particulate matter in the air in urban areas has decreased rapidly over the last 30 years. This is due to a decrease in coal burning, heavy industry and improved industrial pollution control measures. However these improvements are at least partly offset by increased numbers of vehicles on the road. The increased market share of diesel vehicles, which typically emit more PM10 particles than petrol vehicles, exaggerates this.

7.2 First round review and assessment conclusions

The Stage Four study, done by netcen, resulted in the declaration of three Air Quality Management Areas; two for nitrogen dioxide and one for both PM10 and nitrogen dioxide (Air Quality Management Area 1, p14). The main cause of elevated levels of particulates was found to be “background concentrations”. Here this means pollutants from London and industrial Europe. Modelling showed that only a small area was affected by elevated particulate concentrations, and that these concentrations only just exceeded the objective. This area was part of a road closest to the M25. This study was completed in June 2003. AQMA declaration orders will shortly be sent to defra. A consultation process for the Stage Four report and Air Quality Action Plan will finish by the end of November 2003.

7.3 Screening checklist for particulates, PM10

A. Monitoring data outside an AQMA

Local Data

The Borough of Broxbourne Council has one automatic analyser for PM10 that is situated within Air Quality Management Area 1. There is no monitoring for PM10 outside of the AQMA.

Most neighbouring authorities monitor for PM10. The following table shows the annual mean in 2002 and type of site. It also shows the number of exceedences of the 24-hour mean objective. The 24-hour mean objective is expected to be more stringent than the annual mean. Data is ratified and compiled by the Environmental Research Group at Kings College London. The annual mean objective is 40 μg/m^3.

Site	**Annual Mean (μg/m^3)** **In 2002**	**Number of exceedences of 24 hour mean objective in 2002**
Broxbourne Roadside	28	14
East Herts Roadside	27	4
Stevenage Roadside	25	8
Watford Roadside	25	6
Dacorum Background	21	6
East Herts Background	21	4
Hertsmere Background	22	7
Luton Background	25	5
St Albans Background	26	13
South Beds Background	25	17
Three Rivers Background	23	12
Enfield 2 Roadside (Church Street)	35	45
Enfield 3 Urban Background. (Salisbury School Ponders End)	30	28
Enfield 4 roadside. (Derby Road, Upper Edmonton)	43	84

The only local site that exceeds the annual mean objective is Enfield 4 roadside. It is not similar to any location in Broxbourne outside of the AQMA. Both Enfield 2 and Enfield 4 exceed the 24-hour mean objective. Again, there are no comparable sites in Broxbourne.

Concentrations of particulates in the area adjacent to the M25 are higher than those measured in the other authorities in Hertfordshire and Bedfordshire. As future concentrations were predicted to only just exceed the 2004 objectives in a small area adjacent to the motorway, it is assumed that the objectives will not be

exceeded in other parts of the Borough where measured concentrations are likely to be much lower.

Local monitoring suggests that there are no locations outside of the AQMA likely to exceed the air quality objective for particulates.

B. Monitoring data within an AQMA

The stage four report was completed and approved by defra in June 2003. As all of the information used was up to date, including emissions factors, it is considered unnecessary to reconsider this data at this time.

D. Junctions

1. There was no specific assessment of junctions during the first round of review and assessment.

2. The following junctions in the borough are defined as busy with relevant exposure within 10m of the kerb:

- Dinant Link Road/Amwell St roundabout
- Winston Churchill Way/Monarchs Way/High St WX roundabout
- A121 Monarchs Way/Eleanor Cross Road/A105 Monarchs Way roundabout

3. The DMRB screening model was used to assess these locations. Input data can be found in appendix C.

The following table shows the predicted particulate concentrations in 2004 using this model.

Receptor Number	Name	Annual mean PM_{10} concentration ($\mu g/m^3$) at receptor	Number of exceedences of 24-hour mean at receptor
9	50 Amwell Street	28.62	23
10	67 Queens Road	26.31	16
11	40 Eleanor Cross Road	27.33	19
12	1a Abbey Road	28.17	21
13	207 High Street Waltham Cross	28.14	21

14	224 High Street Waltham Cross	27.88	20

There are no predicted exceedences of the air quality objectives at any of the relevant receptors identified.

There is no need to proceed to a detailed assessment these locations.

E. Roads with high flows of buses and/or HGVs

1. These locations were not assessed during the first round of review and assessment.
2. The traffic data supplied by Hertfordshire County Council, and that supplied by the naei show no roads with greater than 25% of buses/HGVs.
3. There are no bus only streets in the Borough.
4. The following streets have been identified using local knowledge as having high percentages of HGVs/buses:

- Normandy Way, Hoddesdon. However this road only leads to one depot, so the flow will be less than 2500 vehicles per day.

There is no need to proceed to a detailed assessment for these locations.

F. New roads constructed or proposed since last round of review and assessment

There are no new roads either constructed or proposed since the first round of review and assessment.

There is no need to proceed to a detailed assessment for these locations.

G. Roads close to the objective during the first round of review and assessment

There were no roads close to the objective identified during the first round of review and assessment. The Stage Four Report included modelling of the roads most likely to exceed the objectives. As this was done recently, it included the new emissions factors.

There is no need to proceed to a detailed assessment for these locations.

H. Roads with significantly changed traffic flows

There are no roads with more than 10000 vehicles per day that have experienced large increases in traffic.

I. New industrial sources

There are no new relevant industrial sources within the Borough.

J. Industrial sources with substantially increased emissions

The following sources were identified as being potentially significant in the first round of review and assessment:

Part A
- du Vergier
- Merck, Sharpe and Dohme, Ltd

Part B
- Bardon Aggregates
- Redland Aggregates
- Fizpatrick Contractors Ltd

All of these sources were discounted at Stage 2, according to the advice in LAQM.TG4(00). The reasons were that there was no relevant exposure, and predicted concentrations were less than 25µg/m^3 in 2004.

There has been no increase in emissions of particulates from any of these sources.

There is no need to proceed to a detailed assessment for these locations.

K. Areas of domestic solid fuel burning

There are no areas in the borough where significant solid fuel burning takes place. A private sector housing condition survey carried out in May 2003 showed that for the Borough as a whole, the primary source of domestic heating is gas central heating (over 95% of dwellings). It is considered unlikely that there are any areas with 100 houses burning solid fuel in any 500m by 500m area in the Borough. Using professional judgement, there are no coal burning odours in the area on a winter's evening.

There is no need to proceed to a detailed assessment for these locations.

L. Quarries/landfill sites/opencast coal/handling of dusty cargoes at ports etc

There are none of the above sources of PM10 within the Borough. Neither are there any other significant sources of fugitive PM10. Dust complaints in the Borough tend to be due to building sites.

There is no need to proceed to a detailed assessment for these sources.

M. Aircraft

There are no airports within the Borough or close enough to impact on local air quality.

Conclusion: There is no need to proceed to a detailed assessment for particulates, PM10

8.0 References

Environment Agency website, (accessed Feb 2003)
http://www.environment-agency.gov.uk/business/301397/255244/255281/?lang=_e&region=

Environment Agency, Apollo Court, 2 Bishops Square Business Park, St Albans Road West, Hatfield, Hertfordshire, AL10 9EX.

Kings College London website, accessed Oct 2003
http://www.erg.kcl.ac.uk/london/asp/information.asp?view=whatis

Bibliography

Broxbourne Local Plan Second Review 2001-2011
Herts and Beds Air Pollution Monitoring Network Annual Report 2002
Broxbourne Air Quality Reviews and Assessments Stages I to IV
Local Air Quality Management Technical Guidance LAQM.TG(03)

Appendix A

Objectives included in the Air Quality Regulations 2000 and (Amendment) Regulations 2002 for the purpose of Local Air Quality Management (LAQM.TG (03))

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene All authorities	16.25μg/m^3	Running annual mean	31.12.2003
Authorities in England and Wales	5.00μg/m^3	Annual mean	31.12.2003
Authorities in Scotland and Northern Ireland[a]	3.25μg/m^3	Running annual mean	31.12.2010
1,3-butadiene	2.25μg/m^3	Running annual mean	31.12.2003
Carbon monoxide Authorities in England, Wales and Northern Ireland[a]	10.0mg/m^3	Maximum daily running 8-hour mean	31.12.2003
Authorities in Scotland	10.0 mg/m^3	Running eight hour mean[b]	31.12.2003
Lead	0.5μg/m^3 0.25μg/m^3	Annual mean Annual mean	31.12.2004 31.12.2008
Nitrogen Dioxide[c]	200μg/m^3 not to be exceeded more than 18 times a year 40μg/m^3	1-hour mean annual mean	31.12.2005 31.12.2005
Particles (PM_{10}) (gravimetric)[d]	50μg/m^3 not to be exceeded more than 35 times a	24-hour mean	31.12.2004

all authorities	year 40μg/m^3	Annual mean	31.12.2004
Authorities in Scotland[e]	50μg/m^3 not to be exceeded more than 7 times a year 18μg/m^3	24-hour mean Annual mean	31.12.2010 31.12.2010
Sulphur Dioxide	350μg/m^3 not to be exceeded more than 24 times a year 125μg/m^3 not to be exceeded more than 3 times a year 266μg/m^3 not to be exceeded more than 35 times a year	1-hour mean 24-hour mean 15-minute mean	31.12.2004 31.12.2004 31.12.2005

a. In Northern Ireland, none of the objectives are currently in regulation. Air Quality (Northern Ireland) Regulations are scheduled for consultation early in 2003
b. The Air Quality Objective in Scotland has been defined Regulations as the running 8-hour mean, in practice this is equivalent to the maximum daily running 8-hour mean
c. The objectives for nitrogen dioxide are provisional
d. Measured using the European gravimetric transfer sampler or equivalent
e. These 2010 Air Quality Objectives for PM10 apply in Scotland only, as set out in the Air Quality (Scotland) Amendment Regulations 2002.

Appendix B

Background Concentrations

Average of NOx 2005 ugm^{-3} as NO_2 annual mean	X								
Y	531500	532500	533500	534500	535500	536500	537500	538500	Grand Total
210500							39.8		39.8
209500					39	40.5	40.8	40.2	40.125
208500					39	40.2	40.6	39.6	39.85
207500					39.8	40.9	40.9		40.53333333
206500				37.9	40.1	40.5			39.5
205500	36.1	35.9	37.5	39.1	40.7	40.9			38.36666667
204500	37.1	37.1	39	41.4	41.9	42.1			39.76666667
203500	38.1	38.2	40.4	42.7	43	43.2			40.93333333
202500	45.5	45.1	47.1	48.7	48.1	47.5			47
201500	46.8	47.3	49.4	51.7	52.6	53.5			50.21666667
200500			50.4	52.8	53.8	54.8	54.3		53.22
Grand Total	40.72	40.72	43.967	44.9	43.8	44.41	43.28	39.9	43.272

Average of NO_2 2005 ugm^{-3} annual mean	X								
Y	531500	532500	533500	534500	535500	536500	537500	538500	Grand Total
210500							24.4		24.4
209500					24.1	24.7	24.8	24.6	24.55
208500					24.1	24.6	24.7	24.3	24.425
207500					24.4	24.9	24.9		24.73333333
206500				23.6	24.5	24.7			24.26666667
205500	22.8	22.7	23.4	24.1	24.8	24.9			23.78333333
204500	23.3	23.3	24.1	25.1	25.3	25.3			24.4
203500	23.7	23.7	24.7	25.6	25.7	25.8			24.86666667
202500	26.7	26.6	27.4	28	27.8	27.6			27.35

201500	27.3	27.5	28.3	29.2	29.6	29.9			28.63333333
200500			28.7	29.6	30	30.4	30.2		29.78
Grand Total	24.76	24.76	26.1	26.457	26.03	26.28	25.8	24.45	25.808

Average of PM10 2004 ugm^{-3} grav. annual mean	X								
Y	531500	532500	533500	534500	535500	536500	537500	538500	Grand Total
210500							20.3		20.3
209500					19.7	20.4	20.5	20.4	20.25
208500					19.8	20.3	20.5	20.4	20.25
207500					19.9	20.5	20.5		20.3
206500				19.7	19.9	20.2			19.93333333
205500	19.5	19.5	19.6	19.8	20	20.2			19.76666667
204500	19.6	19.6	19.8	20.4	20.4	20.5			20.05
203500	19.7	19.7	20	20.5	20.6	20.7			20.2
202500	20.3	20.2	20.5	21.1	21.1	21.2			20.73333333
201500	20.4	20.5	20.7	21.3	21.4	21.6			20.98333333
200500			20.9	21.4	21.6	21.7	21.6		21.44
Grand Total	19.9	19.9	20.25	20.6	20.44	20.73	20.68	20.4	20.412

Average of PM10 2010 ugm-3 grav. annual mean	X								
Y	531500	532500	533500	534500	535500	536500	537500	538500	Grand Total
210500							18.5		18.5
209500					18.1	18.6	18.7	18.7	18.525
208500					18.1	18.6	18.7	18.7	18.525
207500					18.2	18.8	18.8		18.6
206500				18.1	18.2	18.5			18.26666667
205500	17.9	17.9	18	18.2	18.3	18.5			18.13333333
204500	18	18	18.2	18.7	18.7	18.8			18.4
203500	18.1	18.1	18.3	18.8	18.8	18.9			18.5
202500	18.5	18.5	18.7	19.2	19.2	19.4			18.91666667
201500	18.6	18.6	18.9	19.4	19.5	19.7			19.11666667
200500			19	19.5	19.6	19.8	19.7		19.52

Grand Total	18.22	18.22	18.5167	18.8429	18.67	18.96	18.88	18.7	18.666

Average of CO 2001 mgm-3 annual mean	X								
Y	531500	532500	533500	534500	535500	536500	537500	538500	Grand Total
210500							0.33		0.33
209500					0.326	0.333	0.335	0.332	0.3315
208500					0.327	0.333	0.335	0.331	0.3315
207500					0.328	0.333	0.333		0.331333333
206500				0.322	0.329	0.331			0.327333333
205500	0.313	0.312	0.321	0.331	0.335	0.334			0.324333333
204500	0.318	0.319	0.329	0.349	0.35	0.349			0.335666667
203500	0.325	0.326	0.338	0.357	0.357	0.356			0.343166667
202500	0.34	0.34	0.352	0.372	0.371	0.372			0.357833333
201500	0.347	0.348	0.361	0.382	0.385	0.388			0.3685
200500			0.367	0.388	0.39	0.394	0.391		0.386
Grand Total	0.3286	0.329	0.344666667	0.357285714	0.3498	0.3523	0.3448	0.3315	0.3453

Average of Benzene 2010 ugm-3 annual mean	X								
Y	531500	532500	533500	534500	535500	536500	537500	538500	Grand Total
210500							0.338		0.338
209500					0.33	0.346	0.351	0.346	0.34325
208500					0.338	0.352	0.357	0.351	0.3495
207500					0.342	0.354	0.357		0.351
206500				0.33	0.344	0.348			0.340666667
205500	0.318	0.319	0.334	0.355	0.363	0.362			0.341833333
204500	0.33	0.335	0.354	0.393	0.395	0.395			0.367
203500	0.346	0.351	0.375	0.415	0.415	0.414			0.386
202500	0.371	0.375	0.399	0.443	0.445	0.451			0.414

201500	0.386	0.393	0.422	0.467	0.472	0.481			0.436833333
200500			0.435	0.48	0.484	0.495	0.489		0.4766
Grand Total	0.3502	0.3546	0.3865	0.411857143	0.3928	0.3998	0.3784	0.3485	0.38482

Average of SO2 2001 ugm-3 annual mean	X								
Y	531500	532500	533500	534500	535500	536500	537500	538500	Grand Total
210500							3.96		3.96
209500					3.57	3.7	4.24	10.7	5.5525
208500					3.57	3.71	4.26	9.53	5.2675
207500					3.61	4.21	4.32		4.046666667
206500				3.6	3.71	4.18			3.83
205500	3.52	3.56	3.67	3.66	3.76	4.09			3.71
204500	3.59	3.65	3.69	3.78	4.47	4.46			3.94
203500	3.62	3.77	3.78	4.13	5.88	4.69			4.311666667
202500	3.69	3.75	3.81	4.18	5.75	7.73			4.818333333
201500	3.63	3.66	3.72	3.9	4.92	4.94			4.128333333
200500			3.77	3.95	4.41	11.5	5.56		5.838
Grand Total	3.61	3.678	3.74	3.885714286	4.365	5.321	4.468	10.115	4.5102

Appendix C

DMRB input data

Nitrogen Dioxide

Narrow congested streets with residential properties close to the kerb											
Receptor number	Name	x	Y	Receptor Distance (m)	AADT combined veh/day	Annual average speed/kph	%HDV	Road Type	Background Concentration (2005)		NO_2 (2005) Annual mean µg/m^3
									Nox	NO2	
1	69 High Road Wormley	536537	205580	8	22873	35	3	A	35.9	21.7	28
2	45 Turners Hill	535920	202052	9	24051	24	3	B	42.6	25.5	31
3	17 Turners Hill	535935	201966	8	24051	24	3	B	46.2	26.8	33
4	167 Crossbrook Street	535924	201735	9	24051	24	3	B	46.2	26.8	33
5	83 Crossbrook Street	535926	201453	9	24051	24	3	B	47.5	27.6	33
6	69 Crossbrook Street	535925	201343	10	24051	24	3	B	47.5	27.6	33
7	28 Crossbrook Street	535948	201270	7	24051	24	3	B	47.5	27.6	34
8	272 High Street WX	535994	200984	8	24051	24	3	B	47.5	27.6	33

Junctions											
Receptor number	Name	x	Y	Receptor Distance (m)	AADT combined veh/day	Annual average speed/kph	%HDV	Road Type	Background Concentration (2005) Nox	Background Concentration (2005) NO2	NO_2 (2005) Annual mean µg/m^3
9	50 Amwell St	537339	209151	9	20903	20	3	A	35.9	22.7	35.36
				38	33145	20	7	A			
10	67 Queens Road	536339	200448	37	35403	20	4	A	49	28.9	36.52
				55	29391	20	6	A			
11	40 Eleanor Cross Road	536303	200362	26	35403	20	4	A	49	28.9	37.78
				54	29391	20	6	A			
12	1a Abbey Road	536325	200337	18	35403	20	4	A	49	28.9	38.77
				56	29391	20	6	A			
13	207 High St WX	535995	200848	8	23796	20	3	A	47.5	28.9	38.45
				59	35236	20	4	A			
14	224 High St WX	536038	200814	34	23796	20	3	A	47.5	28.9	38.23
				32	35236	20	4	A			

E. Busy streets where people may spend 1-hour or more close to the traffic											
Receptor number	Name	x	Y	Receptor Distance (m)	AADT combined veh/day	Annual average speed/kph	%HDV	Road Type	Background Concentration (2005) Nox	Background Concentration (2005) NO2	NO_2 (2005) Annual mean µg/m^3
2	45 Turners Hill	535919	202068	9	24051	24	3	B	47.6	25.5	31
15	9 Amwell St	537318	208931	8	10000	48	3	B	35.1	22.4	25.5
16	49 High St Hoddesdon	537280	208599	9	10000	48	3	B	35.1	22.4	25.4

17	81 Turners Hill	535912	202249	10	24051	24	3	B	46.2	27.1	32.7
18	22 Newnham Parade, College Rd	535832	202227	17	24000	20	3	B	46.2	27.1	32.0
19	77 High St Waltham Cross	536075	200252	16	24000	48	3	B	49.3	28.3	32.4

Junctions

Receptor number	Name	x	Y	Receptor Distance (m)	AADT combined veh/day	Annual average speed/kph	%HDV	Road Type	Background Concentration (2004)	PM10 *2004)	
										Annual mean µg/m^3	no. of exceedences
9	50 Amwell St	537339	209151	9	20903	20	3	A	19.6	28.62	23
				38	33145	20	7	A			
10	67 Queens Road	536339	200448	37	35403	20	4	A	21.1	26.31	16
				55	29391	20	6	A			
11	40 Eleanor Cross Road	536303	200362	26	35403	20	4	A	21.1	27.33	19
				54	29391	20	6	A			
12	1a Abbey Road	536325	200337	18	35403	20	4	A	21.1	28.17	21
				56	29391	20	6	A			
13	207 High St WX	535995	200848	8	23796	20	3	A	21.1	28.14	21
				59	35236	20	4	A			
14	224 High St WX	536038	200814	34	23796	20	3	A	21.1	27.88	20
				32	35236	20	4	A			

Appendix D

TEMPRO Growth Factors

1991	1	2009	1.2435
1992	1.011	2010	1.2585
1993	1.021		
1994	1.032		
1995	1.042		
1996	1.053		
1997	1.0665		
1998	1.0795		
1999	1.093		
2000	1.1065		
2001	1.12		
2002	1.1355		
2003	1.151		
2004	1.167		
2005	1.1825		
2006	1.198		
2007	1.213		
2008	1.228		

Naei Data (www.naei.org.uk/datawarehouse/7_15_59_9197_east_rtmjr_a.xls)

Road no.	Road	X	Y	Road Class	Year	AADF all vehicles	AADF cars	AADF buses	AADF LGV	AADF HGVr	AADF HGVa	AADF moto
17494	A10	536200	204830	TN	2000	16295	13971	91	1670	350	45	168
26179	A10	535930	204557	TN	2000	33726	25687	114	4760	1451	998	716
28833	A121	537000	200407	PB	1998	26875	21551	319	3465	1182	111	247
36183	A10	536470	210000	TN	2000	41836	32996	207	5328	1679	966	660
36184	A10	535300	202000	TN	2000	43349	33381	131	5727	1852	1114	1144
46186	A10	535920	206800	TN	2000	44465	36181	217	4776	1746	967	578
47577	A1170	536240	204400	PN	1999	19422	17240	49	1667	336	17	113
48110	A1170	535965	204081	TB	1998	6690	5725	14	648	222	28	53
48303	A10	535148	200498	TN	2000	52773	41557	145	7259	1751	1100	961
48768	A121	537400	200500	PB	2000	25443	20646	348	3357	774	84	234
56173	A10	536974	209005	TN	2000	20855	15995	131	2866	972	679	212
58391	A1170	537600	209050	PB	2000	31080	24903	173	3714	1330	756	204
73486	A1010	536320	200200	PB	2000	29423	23807	753	3509	779	105	470
99225	A121	535590	200804	PB	2000	19675	16087	99	2674	538	96	181
99428	A121	536200	200490	PB	2000	33128	26566	399	4550	962	113	538

Road class types:

MB	Built-up motorway
MN	Non built-up motorway
PB	Built-up primary road
PN	Non built-up primary road
TB	Built-up trunk road
TN	Non built-up trunk road

Site Number	Site Location	1998 AAWD*	2001 AAWD	1998 Vehs per hr (in the peak hour)	2001 Vehs per hr (in the peak hour)	2001 % LGV	2001 % HGV	Average Speed (mph)
606	M25 Herts boundary	117,770	121,030	9,730	10270	12.8	18.4	75[1]
135	A10 (M25 to A121 jct)	55,060	53,350	4,230	4010	14.3	7.7	30.1[2]
532	A10 Baas Hill, Broxbourne	47,590	47,770	4,200	4370	-	-	75[1]
533	A10 Hoddesdon	45,700	-	4,100	-	-	-	75[1]
609	A121 Winston Churchill Way	21,750	22,820	1,810	2040	-	-	24.1[2]
249	B176 Crossbrook Street	21,260	22,780	1,830	1890	13.0	3.3	15.1[2]
	A121 Monarch's Way	34,490	-	2,950	-	-	-	18.2[2]
564	B156 Cuffley Hill, Goffs Oak	16,970	15,760	1,540	1510	-	-	26.2[2]
576	C137 Essex Road, Hoddesdon	16,490	16,290	1,500	1420	-	-	29.7[2]
139	A1170 High Street, Hoddesdon	20,930	19,840	1,920	1840	10.4	3.1	22.4[2]
138	A1170 High Roads, Turnford	22,700	21,710	1,900	1820	-	-	21.8[2]
261	A121 Eleanor Cross Road	27,700	29,250	2,250	2520	-	-	40.4[3]
	A10 slip, Hoddesdon	12,300	-	-	-	-	-	-
	A10 slip, Turnford	7,100	-	-	-	-	-	-
566	B176 Lieutenant Ellis Way	16,070	16,900	1,360	1590	-	-	-
	A105 Monarchs Way	-	-	-	-	-	-	-
	A1010 Monarchs Way	33,500	-	2,754	-	-	-	-

* rounded to nearest 10
[1] County mean speed for roads with 70 mph speed limit
[2] No updated speed data collected since 1992
[3] 2001 data from speed monitoring site on adjacent Station Road

AAWD (Average Annual Week Day Flow) is considered by Herts County Council as roughly equalling AADT (Average Annual Daily Traffic).